KARABÜK
ÜNİVERSİTESİ

# KARABÜK ÜNİVERSİTESİ

## Safranbolu Başak Cengiz Mimarlık Fakültesi

# ALMANAK 2025

Safranbolu

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# 2025 YILI ALMANAK ÖNSÖZÜ

“Safranbolu Başak Cengiz Mimarlık Fakültesi 2025 Yılı Yayın Kataloğu” başlığı altında hazırlanan bu çalışma, fakültemiz akademisyenlerinin bir yıl boyunca ortaya koyduğu bilimsel üretimi bir araya getirerek akademik çalışmalarımızın kapsamını ve çeşitliliğini ortaya koymaktadır. Makaleler, kitap bölümleri, bilimsel bildiriler ve kitaplar aracılığıyla ortaya konulan bu çalışmalar, fakültemizin bilgi üretimine sunduğu katkıları görünür kılmakta ve akademik birikimimizi gelecek yıllara taşıyan önemli bir kaynak niteliği taşımaktadır.

Köklü bir akademik geleneğe sahip olan fakültemiz, kıdemli akademisyenlerimizin deneyimi ile genç ve enerjik araştırmacılarımızın dinamizmini bir araya getiren güçlü bir akademik yapıya sahiptir. Üniversitemizin en köklü birimlerinden biri olan Safranbolu Başak Cengiz Mimarlık Fakültesi, bu birikim ve enerji sayesinde hem bilimsel üretim kapasitesini geliştirmekte hem de güncel araştırma alanlarını yakından takip ederek çağdaş ve yenilikçi (cutting-edge) çalışmalar ortaya koymaktadır.

Safranbolu gibi tarihî ve kültürel değeri yüksek bir kentte bulunmak, mimarlık eğitimi ve araştırmaları açısından fakültemize önemli bir avantaj sağlamaktadır. Dünya mirası niteliğindeki bu özgün çevre, öğrencilerimiz ve akademisyenlerimiz için hem ilham verici bir araştırma alanı hem de mimarlığın kuramsal ve uygulamalı yönlerinin birlikte ele alınabileceği zengin bir laboratuvar niteliği taşımaktadır.

Mimarlık disiplini doğası gereği birçok alanın kesişiminde yer almaktadır. Sanat, kültür ve toplum ile güçlü bağlara sahip olan mimarlık, aynı zamanda mühendislik ve teknik bilgiyle şekillenen çok yönlü bir meslektir. Tarih boyunca mimarlar arasında edebiyatla, müzikle ve farklı sanat dallarıyla ilgilenen pek çok isim bulunması, mimarlığın üretken ve sanatsal yönünü ortaya koymaktadır. Bununla birlikte mimarlık, güçlü bir teknik altyapı ve mühendislik bilgisi gerektiren disiplinler arası bir alanda yer alır. Fakültemizde yürütülen akademik çalışmalar da bu çok yönlü yapıyı yansıtarak mimarlığın sanatsal, sosyal ve teknik boyutlarını birlikte ele almaktadır.

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Safranbolu Başak Cengiz Mimarlık Fakültesi 2025 Yılı Yayın Kataloğunun fakültemizin akademik gelişimine katkı sağlamasını ve tüm okuyucular için yararlı bir kaynak olmasını temenni ederim.

Saygılarımla.

Prof. Dr. İsmail Rakıp KARAŞ

Safranbolu Başak Cengiz Mimarlık Fakültesi Dekanı

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| BÖLÜM | MAKALE | | | | | | | BİLDİRİ | | | KİTAP | Kitap Bölümü |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SSCI | SCI-E | ESCI | AHCI | SCOPUS | Alan İndeksi | TR Dizin | Diğer | Ulusal | Uluslararası | | |
| Mimarlık Bölümü | 1 | 2 | 7 | 2 | 2 | 4 | 7 | 1 | 1 | 45 | 5 | 23 |
| Peyzaj Mimarlığı Bölümü | - | 1 | - | - | - | 1 | 1 | 1 | - | 9 | 4 | 1 |
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# MAKALELER

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# Sustainable Heritage Planning for Urban Mass Tourism and Rural Abandonment: An Integrated Approach to the Safranbolu–Amasra Eco-Cultural Route

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**Abstract:** Urban mass tourism and rural depopulation increasingly threaten heritage sites worldwide, leading to socio-economic and environmental challenges. This study adopts a holistic approach to sustainable tourism planning by examining 84 cultural and natural heritage sites in and around Safranbolu and Amasra, two cities in Türkiye that are listed on the UNESCO World Heritage List and the Tentative List. Inspired by historical travelers' itineraries, it proposes an eco-cultural tourism route to create a resilient heritage network. A participatory methodology integrates charettes within Erasmus+ workshops, crowdsourcing, various analysis methods while engaging stakeholders, and AI-powered clustering for route determination. The study follows a four-stage framework: (1) data collection via collaborative GIS, (2) eco-cultural route development, (3) stakeholder participation for inclusivity and viability, and (4) assessments and recommendations. Results highlight the strong potential of heritage assets for sustainable tourism while identifying key conservation risks. Interviews and site analysis underscore critical challenges, including the absence of integrated site management strategies, insufficient capacity-building initiatives, and ineffective participatory mechanisms. Moreover, integrating GIS-based crowdsourcing, machine learning clustering, and multi-criteria decision-making can be an effective planning support system. In conclusion, this study enhances the sustainability of heritage and tourism by strengthening participatory eco-cultural development and mitigating mass tourism and abandonment's negative impacts on the heritage sites.

**Keywords:** heritage sites; sustainable tourism; eco-cultural rote; multi-criteria evaluation; participatory approach; mass tourism; rural abandonment; Safranbolu; Amasra

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## 1. Introduction

Ecotourism integrates heritage conservation, local communities, and sustainable travel [1]. Eco-cultural routes and trails reinterpret pathways by embedding them with historical values, memories, narratives, and heritage, assigning them new meanings and significance [2].

Recent studies explore their role in heritage preservation through sustainable tourism. Zhang et al. (2025) highlight the role of eco-cultural networks in integrating cultural heritage and ecological resources within a sustainable network [3]. Lukoseviciute et al. (2024) develop a stakeholder-driven eco-cultural trail management strategy, balancing conservation and tourism [4]. Lin et al. (2024) provide a global review of cultural routes, analyzing 38 cases in terms of distribution, typology, planning, and tourism tools [5]. Trakala et al. (2023) map, assess, and propose eco-cultural tourism routes, estimating their

carrying capacity for sustainable area management [6]. Zhou and Zheng (2022) examine their role in connecting scattered villages and fostering a multicultural model for rural development [7].

This approach offers visitors the opportunity to engage with nature and culture in a sustainable manner, in alignment with the principles of ecotourism [4]. The development of tourism within routes in the context of natural and cultural values is often promoted by governments, non-profit organizations, and various international institutions such as ICOMOS, UNWTO, and the Council of Europe (COE). Such planning processes encompass a wide range of objectives, including the preservation and promotion of heritage, enhancing social interaction and collaboration, supporting sustainable development through culture, sports, arts, research, and education, developing unique tourism products, improving visitor experiences, and ensuring sustainability within heritage sites [8–12].

Around the world, there are tourism routes of various scales that embrace journey-based memories and narratives as their central theme. For example, Route 66 in the USA spans multiple states and reflects values associated with national identity [13]. The Santiago de Compostela Routes, one of the most significant pilgrimage paths for Christians since the Middle Ages, serve to connect countries across Western Europe [14]. There are also route examples that trace the journeys of historical travelers such as Marco Polo and Evliya Çelebi, who explored various parts of the world. Additionally, Stevenson's Path is a regional example in southern France, following the 220 km journey of traveler and writer Robert Louis Stevenson while referencing the concept of responsible tourism [15]. The Lycian Way is Türkiye's first long-distance heritage route, extending 760 km from Fethiye to Antalya. It is renowned for its wealth of ancient cities and the diverse natural landscapes of the Mediterranean region.

Conversely, the role in and impact of tourism on heritage sites have become increasingly prominent topics in scholarly debates over the past decades. Inhabited areas, in particular, have witnessed the adverse consequences of urban mass tourism, including the restriction of local residents' access to essential urban services, shifts in traditional lifestyles, declines in socio-economic well-being, and an increase in the displacement and depopulation of local communities. In cultural heritage sites, tourism may lead to physical degradation and cultural erosion due to profit-driven exploitation of urban spaces and heritage [16–18]. Moreover, the uncontrolled expansion of coastal tourism—fueled by large-scale projects, excessive urbanization, sprawling hotels, and marinas—poses significant threats to natural areas and fragile ecotonal systems. In particular, the coasts, which have long been exposed to the destructive impacts of mass tourism, are witnessing the irreversible degradation of their ecological habitats [19].

Urban areas are the largest contributors to climate change, accounting for 71% to 76% of global $CO_2$ emissions [20]. At the same time, they are among the most vulnerable regions, highly susceptible to the impacts of climate change, as well as to other crises, including wars, pandemics, and economic crises [20,21]. In 1960, 66% of the global population resided in rural areas, whereas by 2023, this figure had declined to 43% [22]. The decline in the rural population alongside the growth of the urban population weakens socio-economic resilience and adversely affects heritage sites in rural areas. In Türkiye, this demographic shift has been even more dramatic. According to World Bank data, while 68% of the population lived in rural areas in 1960, this figure had dropped to 23% by 2023 [23]. Due to rural abandonment, production has come to a complete halt in many settlements, leading to the loss of deeply rooted heritage sites [24,25].

The tourism sector in Türkiye has become increasingly significant in recent years. As of 2023, Türkiye ranked as the fifth most visited country globally. With over 76 million do-

mestic tourists, tourism emerges as a critical factor in balancing rural and urban population dynamics while contributing to the sustainable preservation of heritage sites [26].

The research focuses on the Western Black Sea region of Türkiye and specifically two significant historical towns: Safranbolu and Amasra. Safranbolu, situated in Karabük Province, is recognized as a UNESCO World Heritage Site for its well-preserved Ottoman architecture. Amasra, part of Bartın Province, is listed on the Tentative List of UNESCO World Heritage Sites under the title *"Trading Posts and Fortifications on Genoese Trade Routes from the Mediterranean to the Black Sea"*. Both towns have faced considerable challenges in tourism management and planning in recent years. UNESCO reports, and various studies indicate that, particularly during peak tourist seasons, visitor numbers exceed the towns' carrying capacities. This massive tourism leads to adverse effects on local communities, disrupts daily life, and poses significant threats to both cultural and natural heritage in the region [27–34]. The prolonged pressure of mass tourism has recently sparked debates over the reduction of protected site boundaries and non-sensitive urban plans, particularly concerning the preservation of cultural heritage [31]. On the other hand, migration and abandonment in the region's vast rural areas are irreversibly impacting heritage sites, socio-cultural memory, and collective consciousness in a negative manner [35]. The pandemic period clearly revealed how rural abandonment and dependence on mass tourism have rendered the region highly vulnerable.

Within the framework of the Western Black Sea Tourism Master Plan, the creation and promotion of thematic cultural routes have been identified as key strategies. Over the past five years, various initiatives have been introduced in Karabük and Bartın provinces to develop tourism routes aimed at extending visitor stays, diversifying tourism revenues, fostering branding, enhancing promotion, and supporting product development and planning efforts [36]. However, the unplanned development of mass tourism and the increasing abandonment of heritage sites highlight the urgent need for comprehensive planning to control tourism levels and mitigate their impacts. The pandemic, as a minor reflection of the climate crisis, has clearly demonstrated how rural abandonment and dependence on mass tourism have made the region highly vulnerable.

The study area encompasses the cities of Safranbolu and Amasra, along with the natural and cultural heritage surrounding 82 sites (Figure 1). This study introduces an eco-cultural route aimed at guiding tourism planning in the region to foster sustainable conservation and development. The proposed route integrates the journeys of five travelers who visited the region during the 19th and early 20th centuries. These travelers documented the region's significant natural and cultural assets, each from the perspective of their respective fields of study.

By promoting lesser-known and mostly abandoned vernacular landscapes, the proposed route supports sustainable tourism while preserving the cultural and natural heritage of the region. It fosters economic resilience, encourages the return of local communities, and mitigates the adverse effects of mass tourism in central heritage sites. Additionally, it adopts a participatory approach to route planning, ensuring a viable and inclusive tourism strategy that balances visitor distribution across multiple sites, thereby preventing over-tourism in significant destinations such as Safranbolu and Amasra. Building on participatory approaches to ecotourism in the region's collective memory, this study marks the initial phase of a broader agenda that is expected to inspire new research questions, interdisciplinary studies, and pilot projects in the future.

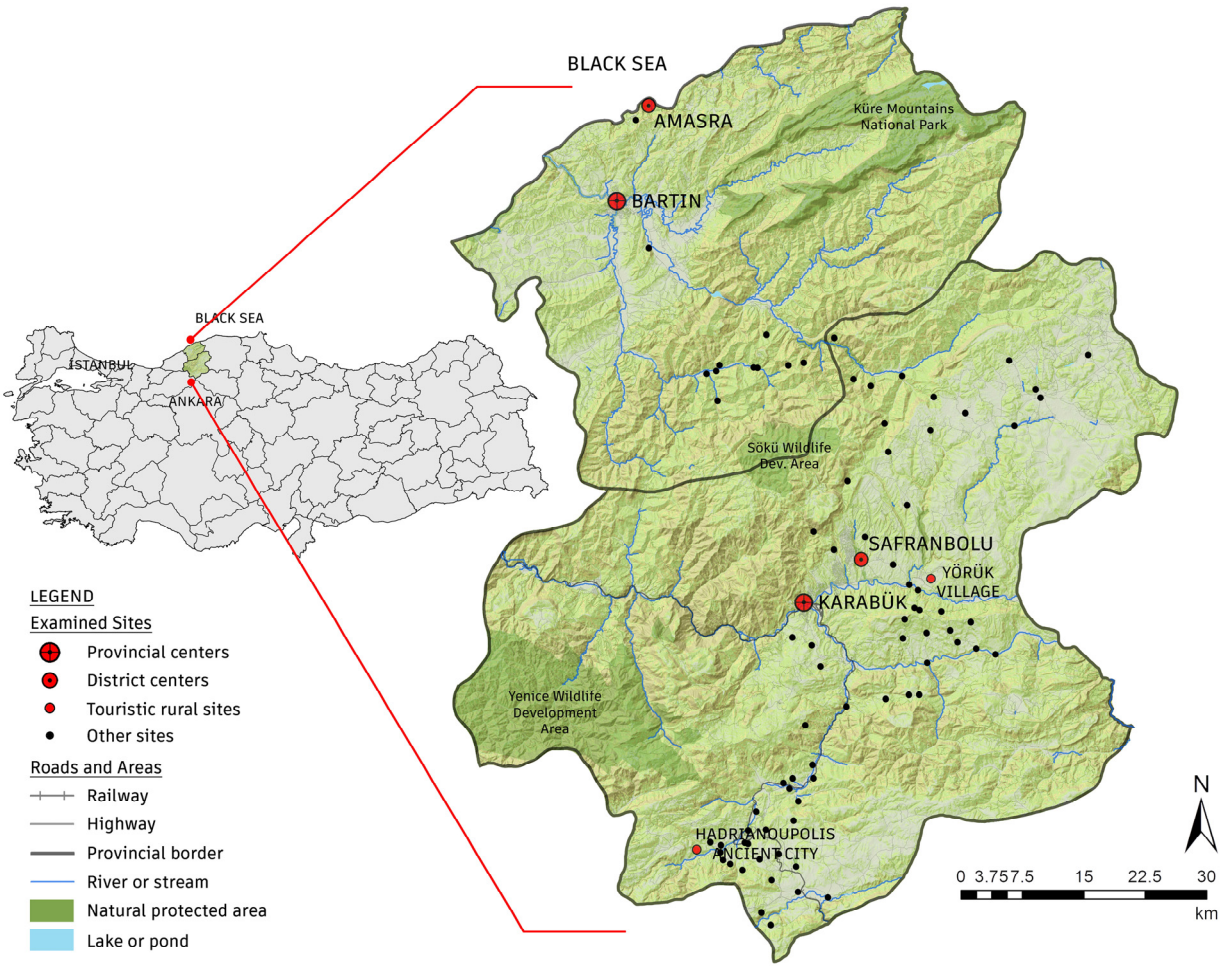


**Figure 1.** Examined sites in the research area.

Methodologies related to route proposals in the literature vary depending on their context and objectives. Unlike many qualitative studies, several researchers employ analytical techniques to develop or evaluate routes [37,38]. This study aims to fill a significant gap in the literature on tourism route planning in complex contexts by incorporating mixed data collection and analysis methods, including Geographic Information Systems (GIS), Analytic Hierarchy Process (AHP), clustering, SWOT analysis, charrette workshops, and interviews.

Furthermore, there is a gap in research addressing their systematic development planning in the early stages of route proposals and through participatory and data-driven methods within the context of heritage conservation in Türkiye and its Black Sea region [5]. This study seeks to bridge this gap by proposing an eco-cultural tourism route based on a replicable model that harnesses collective intelligence, historical narratives, and extensive site analysis. The study area offers a valuable opportunity to examine globally prevalent issues in heritage sites, such as rural abandonment and urban mass tourism.

## 2. Materials and Methods

This article focuses on the initial phase of developing a tourism route, emphasizing the capacity development of the sites and their integration into a cohesive and resilient route scenario. To achieve this, a heritage-based participatory strategy has been developed, aiming to preserve cultural and natural heritage, enhance the well-being of local communities, and promote sustainable development.

The methodology adopts an integrated approach, combining diverse data sources with insights from various stakeholder groups. It consists of four interrelated phases, characterized by participatory methods, as outlined below (Figure 2):

1. Data collection and analysis,
2. Development of the eco-cultural route proposal,
3. Stakeholder participation to ensure inclusivity and viability,
4. Overall assessment and policy recommendations.

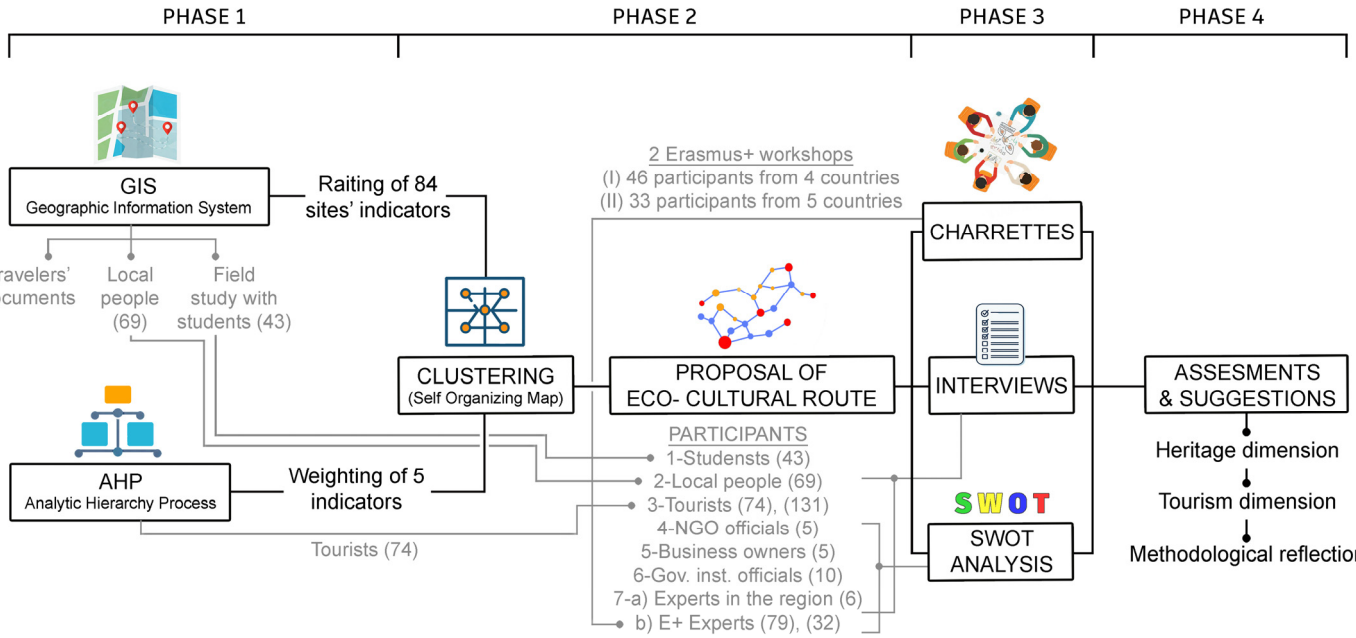


**Figure 2.** Methodological flowchart.

The methods employed and their benefits are outlined as follows:

- Geographic Information System (GIS): It facilitates data collection for 84 sites through crowdsourcing field studies, with sites' data being analyzed according to five indicators and ratings being assigned to each site's indicators.
- Analytic Hierarchy Process (AHP): The 5 indicators used in GIS analysis are weighted through surveys using the Saaty scale (1–9) to identify tourist preferences in the field.
- Clustering: Based on the normalized ratings for each site's 5 indicators obtained from GIS and the indicator weights obtained from AHP, the sites are clustered using Self-organizing Map (SOM), which is a neural network algorithm. According to their similar characteristics, site potential levels (high, medium, and low) are then determined.
- SWOT Analysis: A comprehensive analysis of internal and external factors regarding the proposed eco-cultural route with stakeholders, and data (strengths, weaknesses, opportunities, and threats) are obtained to develop strategies.
- Charrette: The data obtained through GIS, AHP, clustering, interviews, and SWOT analysis are evaluated using multidisciplinary workshops, the potential impacts of the eco-cultural route are discussed, and key strategies for planning are developed.

### *2.1. Data Collection*

#### 2.1.1. Documents of Historical Travelers

Before the Industrial Revolution, commercial activities, production infrastructure, military facilities, administrative units, and population centers were concentrated along the Silk Road. These routes also served as one of the most influential channels for cultural

exchange [39]. After the mid-17th century, Safranbolu emerged as one of the prominent settlements along the Istanbul-Tabriz branch of the Silk Road [40]. Although the region was close to important centers on the Silk Road in Asia Minor, it did not attract the attention of researchers and travelers until the 19th century, the late period of the Ottoman Empire. This part of Anatolia, which deeply impressed travelers with its picturesque appearance and untouched features, has been a focus of researchers and travelers from the first quarter of the 19th century to the beginning of the 20th century.

To plan the eco-cultural route, the travel routes of five travelers with sufficient data regarding their journeys are identified and analyzed. These investigations specifically provide insights into different perspectives on the local history, transportation, and socio-economic structure of the period by utilizing information, maps, and photographs (Figure 3). Ainsworth (1836) provided detailed information on geographical, geological, and archaeological values; Mordtmann (1856) on social and political structure; Anton (1893) on transportation routes, production methods, and archaeological values; Leonhard (1903) on geographical, geological, and archaeological values; and Woods (1906) on transportation routes, the condition of the roads, and social structure in that period [41–45].



(**a**) (**b**)

**Figure 3.** (**a**) A photograph by Woods documenting villagers in Zopran (1906) [45]. (**b**) The same location as (**a**) in Zopran Village, years later.

The works written by travelers in various languages were used to identify the historical traveler routes. The settlements mentioned in the travelers' writings and maps were cross-referenced with the field.

#### 2.1.2. Field Study

The study examined 84 sites, incorporating historical traveler routes. A comprehensive range of tangible cultural heritage (TCH), intangible cultural heritage (ICH), natural heritage (NH), and other site-specific attributes were systematically identified and documented. Data collection employed a multi-source approach, incorporating written, printed, and electronic materials; official protected area designations and registration lists issued by governmental authorities [46,47]; direct field observations; and semi-structured interviews with local community members.

The documentation process was augmented by the participation of 43 students enrolled in conservation and restoration courses during the Fall and Spring semesters of 2023–2024. As part of the fieldwork, photographs of heritage assets were captured, and corresponding electronic data forms were systematically compiled (Figure 4). The incorporation of crowdsourced data collection methodologies further reinforces the study's broader research impact and participatory scope.




(**a**) (**b**)

**Figure 4.** (**a**) A field study conducted with students in a rural site. (**b**) A screenshot of the crowdsourcing (Fulcrum) app.

#### 2.1.3. Stakeholders

The importance of stakeholder participation in sustainable tourism planning and the preservation of cultural heritage sites has long been recognized [48,49]. Recent meta-analysis of participatory design and planning practices indicates that stakeholder groups vary based on the context and participatory setting, with distinct empowerment levels such as informing, consulting, collaboration, and empowerment [50]. In studies on cultural routes and regional tourism planning, the formation of inclusive stakeholder groups is essential to ensure sustainable and contextually appropriate developments [25,51,52]. Accordingly, seven stakeholder groups were identified within the scope of this study: (1) students, (2) local people, (3) tourists, (4) NGOs, (5) business owners, (6) government institution officials, and (7) experts.

Semi-structured, face-to-face interviews were conducted with 69 residents across the study sites. The limited number of participants reflects the extensive depopulation observed in many villages, with certain settlements entirely devoid of residents. The interviews addressed key topics, including prominent cultural and natural heritage values, potential products for promotion, strategies for utilizing historic building stock, and site management approaches aimed at preserving local identity, supporting local production, encouraging reverse migration, and fostering sustainable development. Furthermore, the tourism potential of these settlements was examined. To ensure diverse perspectives, participants were encouraged to engage other community members during the interview process.

The field study was conducted with the participation of 43 university students studying in the field of cultural heritage conservation. The study also incorporated interviews with 131 tourists from the settlements of Safranbolu and Amasra; and 79 international experts participating through the Erasmus+ blended intensive program (2023–2024); 5 representatives from non-governmental organizations (NGOs) dedicated to the preservation of heritage and the promotion of regional tourism; 5 business stakeholders, including hotel, restaurant, and travel agency operators; 10 officials from government institutions directly engaged in heritage and tourism management; and 6 experts from universities in the region and museums specializing in heritage and tourism studies. A total of 348 individuals participated across different phases of the study—diagnosing problems, pooling ideas, deliberating solutions, and co-creation—thereby enhancing the depth, rigor, and comprehensiveness of the research.

This study was approved by the ethics committee of the author's institution (2023/04-30, 18 May 2023). Informed consent was obtained from all subjects involved

in the study. The authors informed all interviewees about the purpose of data collection and their rights.

### *2.2. Data Analysis*

#### 2.2.1. Data Management and Spatial Mapping at GIS

The literature indicates that geographic information systems (GIS) are widely used in similar studies focusing on route planning [25,53,54].

In this study, data pertaining to identified cultural and natural heritage values, along with other relevant parameters, were systematically archived within ArcMap 10.8, an integrated GIS platform and database designed to support comprehensive spatial analyses (Table S1).

Additionally, the Fulcrum mobile and web application [55] was used to obtain visual evidence and enter information about it. The crowdsourced, multi-layered field data collected through the mobile app not only supports the identification of endangered heritage assets but also provides a critical infrastructure for promoting their protection and registration by making this information openly accessible.

Indicators and parameters must be determined to analyze the study area and rate the sites. In particular, the identification of indicators is one of the most critical stages influencing the outcome. In the literature, indicators for tourism route development vary based on the route's context, theme, and objectives. However, studies focusing on cultural and natural heritages commonly categorize indicators under three main headings: (1) cultural and social, (2) natural and ecological, and (3) infrastructure and transportation [37,56,57].

In developing the indicators and parameters for this study, the primary objective was to achieve meaningful and reliable scoring outcomes. To this end, both stakeholder perspectives and the specific characteristics of the sites were considered. Each site was assigned a raw score for each indicator, ranging from 0 to 3, based on predefined parameters (Table 1).

1. Tangible Cultural Heritage (TCH): This indicator evaluates architectural and archaeological assets within the examined sites and their immediate surroundings. The assessment criteria include the presence of archaeological sites (AS) and urban sites (US), the integrity of heritage elements, and the number of monumental structures. Data from the Turkish Ministry of Culture and Tourism database [46] and observations from fieldwork were used to inform this evaluation;
2. Intangible Cultural Heritage (ICH): This indicator encompasses belief and celebration rituals, traditional games, music, literature, cuisine, artisanal crafts, production methods, and trade culture. The identification of ICH relied not only on printed sources but also heavily on interviews conducted with local residents. The applicability and current influence of heritage elements were key criteria for determining appropriate parameters. Additionally, ICH provides valuable insights into the social dynamics and cultural activities present at each site;
3. Natural Heritage (NH): This indicator evaluates Natural Sites (NS), Wildlife Development Areas (WDA), Nature Parks (NP), Registered Caves (RC), potential conservation areas, and sustainable habitats. The identification of NS, WDA, NP, and RC, which are designated according to national legislation, was based on data from the Ministry of Environment, Urbanization, and Climate Change and the Ministry of Agriculture and Forestry [47,58]. Potential conservation areas and sustainable habitats were assessed through consultations with experts. Urban areas lacking nature conservation zones and habitats degraded by activities such as mining or quarrying were assigned a rating of "0";
4. Accessibility to Basic Services (ABS): Three key services were identified as significantly contributing to the assessment of the examined sites: sale of basic goods (SBG),

indicating the availability of essential items such as food, healthcare products, and hygiene goods; settings for social interaction (SSI), referring to spaces that facilitate social engagement, such as museums, exhibition halls, traditional coffee houses, and village meeting rooms; and accessibility to public transport (APT), defined by the presence of public transportation access points within 3 km of the site. For each of these services—SBG, SSI, and APT—1 point was added to the overall rating.

5. Connectivity with Attraction Centers (CAC): CAC measures the connectivity of sites to existing tourist destinations and major population centers. The identified attraction centers within the study area include Safranbolu, Amasra, Yörük, Hadrianoupolis, Karabük, and Bartın. To determine the appropriate parameter for each site, the average distance to the three nearest attraction centers was calculated. Ratings were assigned based on 15 km intervals, as shown in Table 1.

**Table 1.** Indicators and parameters used for the evaluation of sites.

| Indicators | Parameters | Rating |
|---|---|---|
| Tangible Cultural Heritage (TCH) | Values forming a fabric or presence of a protected site or multiple monuments | 3 |
| | Values forming a group or presence of a monument | 2 |
| | Preservation of some examples of values | 1 |
| | Authenticity is vastly degraded, or value is not detected | 0 |
| Intangible Cultural Heritage (ICH) | The value creates regional attractiveness | 3 |
| | The value creates local attractiveness | 2 |
| | The value only exists in memory | 1 |
| | Not enabling to identify value (due to abandonment, etc.) | 0 |
| Natural Heritage (NH) | Presence of protected site/area/registered cave | 3 |
| | Presence of a potential protected site/area/registered cave | 2 |
| | The presence of sustained natural habitat | 1 |
| | Irreversible degradation of natural values | 0 |
| Accessibility to Basic Services (ABS) | Three of the specified basic services can be provided | 3 |
| | Two of the specified basic services can be provided | 2 |
| | One of the specified basic services can be provided | 1 |
| | Lack of specified basic services | 0 |
| Connectivity with Attraction Centers (CAC) | Avg. of 0–15 km from the 3 nearest specified centers | 3 |
| | Avg. of 15.1–30 km from the 3 nearest specified centers | 2 |
| | Avg. of 30.1–45 km from the 3 nearest specified centers | 1 |
| | An average of at least 45 km | 0 |

#### 2.2.2. Multi-Criteria Decision-Making with AHP

Data used in decision-making processes for heritage and tourism management often contain qualitative evaluations. In such cases, it becomes essential for decision-makers to quantitatively assess which components best serve their objectives. The Analytic Hierarchy Process (AHP) is a multi-criteria decision-making method designed to quantitatively prioritize criteria through pairwise comparisons. The hierarchical structure established among indicators facilitates decision-making in complex problems, providing AHP to evaluate and rank alternatives [59].

- The AHP-based route assessment consists of two main stages: (1) identification of indicators and parameters, and (2) weighting of indicators according to tourist preferences.

- The AHP indicators must be consistent with the indicators used in site analysis to ensure the connection between site characteristics and tourist preferences. Identification of indicators and parameters was based on a combination of literature review, context, and expert evaluations (Table 1).
- A type of survey was presented to tourists, created using the Saaty scale (1–9) [59], based on the comparisons of the 5 indicators (TCH, ICH, NH, ABS, CAC) with each other. As a result of comparing the indicators in pairs, a decision matrix was created according to tourist preferences in the region, and indicator weights were determined (Section 4.2).

#### 2.2.3. Clustering

In the literature, clustering techniques have been widely used to support tourism route planning and sustainable development strategies. Examples include the identification of landscape classes using IsoCluster [60], the proposal of tourism routes through hierarchical clustering [61], and the classification of socio-ecological systems in traditional villages to develop conservation and development strategies [62].

The Self-Organizing Map (SOM) is an artificial neural network algorithm that visualizes data on a two-dimensional map, clustering data points with similar characteristics close together while positioning dissimilar elements farther apart, thereby revealing relational structures [63]. This study provides a comprehensive decision-making framework for eco-cultural tourism route planning by integrating GIS analyses and the systematic prioritization of AHP with the neural network capabilities of SOM.

The normalized ratings of each indicator based on GIS data and the indicator weights from AHP Stage 2 were incorporated as priority values in the SOM-Ward clustering method, enabling a robust assessment of site potential for each indicator. By combining these techniques, the study offers a novel approach to addressing multiple criteria across diverse sites, identifying routes with significant cultural and ecological value, and promoting sustainable tourism development.

#### 2.2.4. SWOT Analysis

Considering the contextual dynamics of the area, the SWOT analysis method was employed to investigate and evaluate all factors that could influence tourism and heritage management from a holistic perspective. SWOT analysis is regarded as a critical tool for the success of developed strategies, as it enables the simultaneous assessment of internal factors (strengths and weaknesses) and external factors (opportunities and threats). This method has been widely applied in the field of regional planning [64,65].

The proposed eco-cultural route was presented to 5 NGO representatives, 5 business stakeholders, 10 government officials, and 38 experts, who were asked to provide input through SWOT analysis regarding heritage conservation and tourism practices within the study area. To enhance the depth of the analysis, a detailed map of the study area was used as a reference tool. Participants were instructed to spatially allocate strengths, weaknesses, opportunities, and threats onto the map using green, yellow, blue, and red stickers, respectively. This method facilitated the identification of specific locations where key factors were concentrated, allowing for a spatially contextualized understanding of the issues. The data collected from each stakeholder group were subsequently synthesized and analyzed to provide a comprehensive evaluation.

### *2.3. Charrettes*

To introduce an international perspective, enhance a multidisciplinary approach, and integrate the study into educational processes, charrette workshops were conducted. A charrette is a participatory planning method involving short-term, collaborative efforts

by multidisciplinary professionals and non-professionals to address specific tasks [66]. These workshops were organized through working groups established under the Erasmus+ Blended Intensive Program, which aims to strengthen collaboration and mobility among individuals and institutions across Europe.

Two workshops were held in 2023–2024, covering Safranbolu, Amasra, Yörük, and Hadrianoupolis, with the participation of 79 students and faculty members from universities in Türkiye, Spain, Germany, Poland, Lithuania, Croatia, Romania, and Portugal. Eight working sub-groups addressed diverse, interconnected issues such as walkability, visual identity, and nature-based solutions by creating collective cartographies (Figure 5).



(**a**) (**b**)

**Figure 5.** (**a**) A field study within the scope of the workshop. (**b**) A desk study within the scope of the workshop.

## 3. Research Area

### *3.1. Historical Background*

The study area, located in the western part of the ancient region of Paphlagonia in Anatolia, features a wide distribution of cultural heritage remains from the Phrygian, Roman, and Genoese civilizations, including tumulus, rock-cut tombs, necropolises, churches, ancient settlements, and fortifications. The cities of Hadrianoupolis and Amastris were prominent centers in the region during the Roman period. Hadrianoupolis served as a significant commercial hub along regional trade routes, particularly during the Eastern Roman (Byzantine) period [67], while Amastris retained its importance as a port city due to its natural harbor [68].

During the Ottoman period, the cities of Safranbolu and Bartın emerged as two significant centers in the region. In the 17th century, Safranbolu became an important commercial hub on the Silk Road, linking Istanbul and the interior regions of Anatolia to the Black Sea coast and the city of Kastamonu. At the same time, Bartın, despite being located inland, leveraged the advantages of the Bartın River to develop into a center for shipbuilding and product export [69]. The flourishing trade and craftsmanship during this period also contributed to the region's architectural enrichment [70].

Another element that enriched the region's architecture was the presence of structures belonging to the Greek minority, who lived peacefully in various settlements until the 1923 population exchange between Türkiye and Greece [71]. In this context, the region's cultural diversity and architectural richness provide valuable data for the study of its sociological structure and cultural heritage.

### *3.2. Heritage, Conservation and Tourism*

#### 3.2.1. Urban Areas

Since the 1970s, the collaboration between universities, the Ministry of Culture and Tourism, local authorities, and the community has significantly contributed to the preservation of cultural heritage in Safranbolu. The city was designated as an urban conservation area, comprising three sections: Çukur (the commercial center and Turkish quarters, Figure 6a), Kıranköy (the Greek quarter), and Bağlar (the area of summer residences) [46]. Safranbolu's inclusion on the UNESCO World Heritage List in 1994 increased its national and international visibility, turning the city into a major tourist attraction. Initially, tourism investments had widely observed positive effects, particularly on the preservation of tangible cultural heritage.



(**a**) (**b**)

**Figure 6.** (**a**) A view of Safranbolu (Çukur) from the south. (**b**) Traffic congestion in the historic center of Safranbolu.

However, subsequent reports prepared by the Turkish National Commission for UNESCO highlighted several issues arising from site management policies. These reports noted that tourism activities in Safranbolu have led to increased prices for essential goods and services, adversely affecting the lives of local residents, especially in the Çukur area. Negative impacts were observed on local trade, traditional crafts, transportation, and intangible cultural heritage, contributing to the displacement of local populations and narrowing the city's functions to tourism-related activities (Figure 6b). Furthermore, concerns about profit-driven development have been reported to limit cultural heritage preservation efforts, exerting pressure on traditional architecture, particularly in the city's peripheral areas [28,29]. The recent evaluation suggests that unplanned mass tourism activities may pose a more severe threat to the World Heritage Site in the future [27].

In the coastal town of Amasra, tourism activities can be traced back to the 1940s. The initial conservation efforts began in 1976 with the implementation of preservation regulations. However, despite these measures, including the 1988 Amasra Conservation Development Plan, conservation efforts have failed to prevent uncontrolled construction driven by mass tourism, resulting in the degradation of archaeological sites and civil architectural heritage [32,33] (Figure 7).

Beyond the impacts of urban development, natural areas have also suffered due to increased human activity. For example, the endemic sand lily (Pancratium maritimum), once thriving in Amasra's dune ecosystems, has been eradicated due to intensive coastal tourism, and its habitat has become severely restricted in surrounding areas. Additionally, the expansion of mining and quarrying operations, the proliferation of unregulated landfill

sites, and the planning of energy production facilities have further contributed to the destruction of the region's natural heritage [34].



(**a**) (**b**)

**Figure 7.** (**a**) The fortifications of Amasra as seen from the ancient harbor. (**b**) The overlooked fortifications in the touristic center of Amasra.

Amasra Fortress was added to the Tentative List of UNESCO World Heritage Sites in 2020 as part of the "Trading Posts and Fortifications on Genoese Trade Routes from the Mediterranean to the Black Sea" initiative, alongside sites in other countries [72]. While the city is home to 21 archaeological sites, scientific excavations began only after the fortress's inclusion on the Tentative List. Despite this, there have been no significant efforts to establish a site management unit or to control mass tourism in the area. Furthermore, ongoing debates regarding Amasra's urban conservation plan underscore the need for the development of sustainable preservation strategies [31].

In addition to Safranbolu and Amasra, two urban conservation areas are located in the provincial centers of Karabük and Bartın. In Karabük, the Yenişehir neighborhood, which contains the residential quarters of Türkiye's first heavy industrial complex, holds this designation, while in Bartın, the city's traditional commercial center is recognized as a conservation area [46]. However, the visibility of these sites remains largely confined to the local level, and both areas face significant preservation challenges.

Efforts to preserve intangible cultural heritage in urban areas have remained notably limited. Over time, traditional markets have lost much of their authenticity, and the production of traditional crafts and artisanal works persists only in a few workshops within historic city centers. Nevertheless, initiatives supported by various institutions—such as festivals centered on traditional products like saffron and grapes, city festivals, and certification programs for traditional artisans and artists—have contributed to the revitalization of intangible cultural heritage.

#### 3.2.2. Rural Areas

Migration from rural areas in the region has accelerated since the late 20th century, driven by factors such as the inability of agricultural production to provide sufficient and stable income and limited access to essential services. Field research indicates that many rural settlements now have a significantly reduced permanent population, predominantly consisting of elderly individuals. While some villages still have a few households, the traditional settlements of such villages as Yürük (Üçevler), Kuzyakaöteköy, and Kayı have been completely abandoned. The majority of the remaining rural population consists of

individuals over the age of 65, leading to a marked decline in agricultural activities. This reduction in rural production adversely affects both social and economic resilience.

The depopulation of rural areas also poses a serious threat to cultural heritage. Abandoned structures deteriorate due to neglect and exposure to natural elements, while those still in use are often improperly repaired due to insufficient financial support and a lack of awareness regarding proper preservation methods. Furthermore, archaeological sites in these depopulated areas are increasingly vulnerable to looting by treasure hunters and vandalism by uninformed or malicious individuals.

According to the Turkish Ministry of Culture and Tourism, there are 40 archaeological sites located in the rural areas within the study region. Thirteen of these sites are clustered around the settlements of Hacılarobası and Sallar, while the remaining sites are dispersed across various parts of the area. Hadrianoupolis Ancient City has recently been officially designated as an Open-Air Museum. The rural areas of the study region also contain Urban Conservation Areas, specifically in the villages of Yörük and Bulak [46] (Figure 8). Field studies have also revealed numerous sites that exhibit the characteristics of archaeological or urban conservation areas but have not yet received official designation. Examples include Yazıköy, Hacılarobası, and Ilbarıt (Üçbölük), which have retained their architectural integrity, as well as Toprakcuma, known for preserving its traditional commercial structures.



(**a**) (**b**)

**Figure 8.** (**a**) A street in Bulak Village, located within the urban site area. (**b**) Karakoyunlu rock-cut tomb, currently within the archaeological site, documented by traveler Leonhard in 1903.

Karabük and Bartın are among Türkiye's richest provinces in terms of natural heritage, encompassing vast forests, rivers, canyons, and rare geological formations (Figure 9). Karabük holds the highest proportion of forested land in Türkiye, with 73% of its territory covered by forests [73]. The Yenice Forests within Karabük are recognized as one of the "Hot Spots of European Forests" and are among the 100 most ecologically significant forest areas in Europe [74]. A large portion of these forests falls under the Yenice Wildlife Development Area designation. Within the study area, there are two Nature Parks near Bartın and Amasra; two Wildlife Development Areas near Susunduk and Yörük; seven designated Natural Sites in İmanlar, Karabük (Yenişehir), Safranbolu, Tayyip, Bartın, and Amasra; and one Registered Cave in Mencinis [47,58].

However, the exploitation of forests for raw materials poses a significant barrier to expanding protected areas. Additionally, rural depopulation has led to the abandonment of agricultural lands, prompting environmentally destructive practices—such as the establishment of hydroelectric power plants (HPPs), mining operations, and quarries—to extract short-term economic gains from these areas (Figure 10).



(a) (b)

**Figure 9.** (a) Extensive forest areas between the provinces of Karabük and Bartın; (b) A canyon and geological formations near the village of Karapınar.



(a) (b)

**Figure 10.** (a) Yazkavak Village, surrounded by a quarry; (b) A waterway, dividing the area and restricting access to water for living organisms, leads to an electricity generation facility.

Among the rural settlements, Yörük Village emerges as a significant tourist destination due to its rich cultural heritage. Conservation efforts in the village are notably more organized and community-driven compared to other settlements in the region. In 2024, Yörük Village was included in the UNWTO Best Tourism Villages Upgrade Programme [75]. However, representatives from the local Cultural Heritage Preservation Association report that funding for the restoration of public buildings remains inadequate. Furthermore, the return migration of residents and the revival of rural production are insufficient to achieve sustainable long-term development in the village.

Markets and fairs in the villages have been discontinued, and workshops engaged in traditional production methods have ceased operations. However, prior to the COVID-19 pandemic, villages with strong sociocultural foundations, such as Yazıköy and Karapınar, continued to hold authentic celebrations of traditional festivals, including Bayram, Hıdrellez (spring festival), and special occasions like henna nights and weddings, which served as local attractions. In Yörük Village, Village Day events were organized to promote intangible cultural heritage (Figure 11). Despite these efforts, participation in such activities had been steadily declining since the early 2000s, and their scope was further diminished in the aftermath of the pandemic.

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(**a**) (**b**)

**Figure 11.** (**a**) Folk dances performed to the accompaniment of traditional music during the Village Day in Yörük (2000s) [76]. (**b**) Local women preparing traditional treats for guests during Yörük Village Day (2000s) [76].

#### 3.2.3. Regional Tourism Experiences

The Western Black Sea Tourism Master Plan, implemented in 2020 and encompassing the provinces of Karabük, Bartın, and Zonguldak, highlights the challenges of irregular urban development and infrastructure deficiencies resulting from the overconcentration of tourism activities in specific areas. The plan identifies the absence of integrated regional tourism strategies and the lack of spatial and temporal diversification in tourism activities as significant obstacles to achieving sustainable tourism. Similarly, the Cultural Tourism Focus Group Report by the Western Black Sea Development Agency (BAKKA) emphasizes the need to promote the region's cultural and natural assets through a comprehensive and holistic approach [36]. Moreover, the 2024–2028 Western Black Sea Regional Plan outlines the development of tourism routes within various contexts [77].

Currently, these initiatives are being primarily advanced by relevant public institutions. In alignment with these objectives, several regional tourism routes have been proposed, including the Safranbolu-Eflani Mule Track, the Amastris and Kromna Route, and the Karaelmas Tourist Express. However, the implementation of the Safranbolu-Eflani and Amastris-Kromna routes has been hindered by inadequate infrastructure investments. The Karaelmas Tourist Express, launched in 2024 along the Ankara-Karabük-Zonguldak line, failed to meet expectations and was subsequently discontinued. The primary reasons for its failure included disagreements among stakeholders regarding stop locations and waiting times, as well as elevated ticket prices due to the inaugural trip coinciding with the peak tourism season.

#### 3.2.4. Participatory Planning Experience

The initial steps toward the sustainability of cultural heritage in Safranbolu and the nearby Yörük village in the 1990s were spontaneous yet centered on "participatory tourism". The key actors in this movement included local representatives of the Ministry of Culture and Tourism, local governments (governor's office, municipality, village headman), academics, civil society organizations, and volunteer citizens. Over an extended period, this coalition, led by the governor's office, developed and implemented various projects and activities with a shared objective. As a result, the conservation and restoration of cultural heritage were achieved, and a portion of the local population returned to the region. All stakeholders were actively involved at various stages, including awareness-raising, project development, and implementation. This participatory conservation movement was encapsulated by the slogan "*if Safranbolu succeeds, Türkiye succeeds*", and it served as a model for other cities in Türkiye with cultural heritage sites (Figure 12).



(**a**) (**b**)

**Figure 12.** (**a**) A meeting organized in Safranbolu by an international civil society organization with the participation of local stakeholders (1998). (**b**) An on-site study conducted as part of a participatory workshop in Yörük Village (1993).

In recent years, it has been observed that the policies pursued in the region have diverged from the philosophy of participatory conservation and development. The connections among local stakeholders have weakened, communication and coordination between local governments have diminished, and the supervisory roles in participatory initiatives have become less effective. Moreover, experts have had fewer opportunities to contribute to the policy development processes. Periodic reports and recommendations provided by UNESCO are often insufficiently considered. This situation has negatively impacted the conservation of cultural heritage and the development of sustainable tourism approaches in Safranbolu and the surrounding rural areas. Both the conservation and tourism experiences in the region, along with the findings from various studies conducted within the scope of this article, strongly highlight the significance of local residents, local businesses, and other stakeholders. Thus, it is confirmed that a solution that does not incorporate a participatory approach is not sustainable and viable.

## 4. Results

### *4.1. GIS Application*

#### 4.1.1. Spatial Mapping

The map generated using ArcMap 10.8 integrates identified historical traveler routes, analyzed sites, cultural and natural heritage conservation areas, public roads, and other relevant geographic data. A variety of open-source datasets were employed for elevation data [78], administrative boundaries, and settlement information [79], as well as data on public roads and water resources [80]. Information regarding conservation areas was obtained from officially declared protected area lists [46] and government GIS databases [47,58]. Figure A1 shows that the theme of historical travelers' routes has a spatial pattern of conservation areas suitable for route tourism.

Cultural and natural heritage elements within the study area were documented through photographs and texts using a crowdsourcing approach. The collected materials were systematically categorized based on their attributes and subsequently uploaded to the Fulcrumapp platform for open use in further analysis and evaluation (https://web.fulcrumapp.com/shares/15956227ecc9e0c9?&popup_properties=status,label,administrative_units,type,detection_date,information,photo&title, accessed on 10 February 2025).

4.1.2. Rating of Sites

This study proposes a quantitative approach to assess the potential significance of destinations within the eco-cultural route. A total of 84 sites were evaluated using data from the attribute table in ArcGIS ArcMap 10.8 (Table S1). Each site was scored based on five indicators—TCH, ICH, NH, ABS, and CAC—according to the parameters outlined in Table 1. The raw scores for each indicator, along with their normalized values, are presented in Table A1.

The indicator density maps derived from the normalized values are presented in Figure 13. The distribution patterns of TCH, ICH, and NH demonstrate significant similarities, while ABS and CAC exhibit distinct variations. These patterns are further analyzed in relation to the SOM findings in the following section.

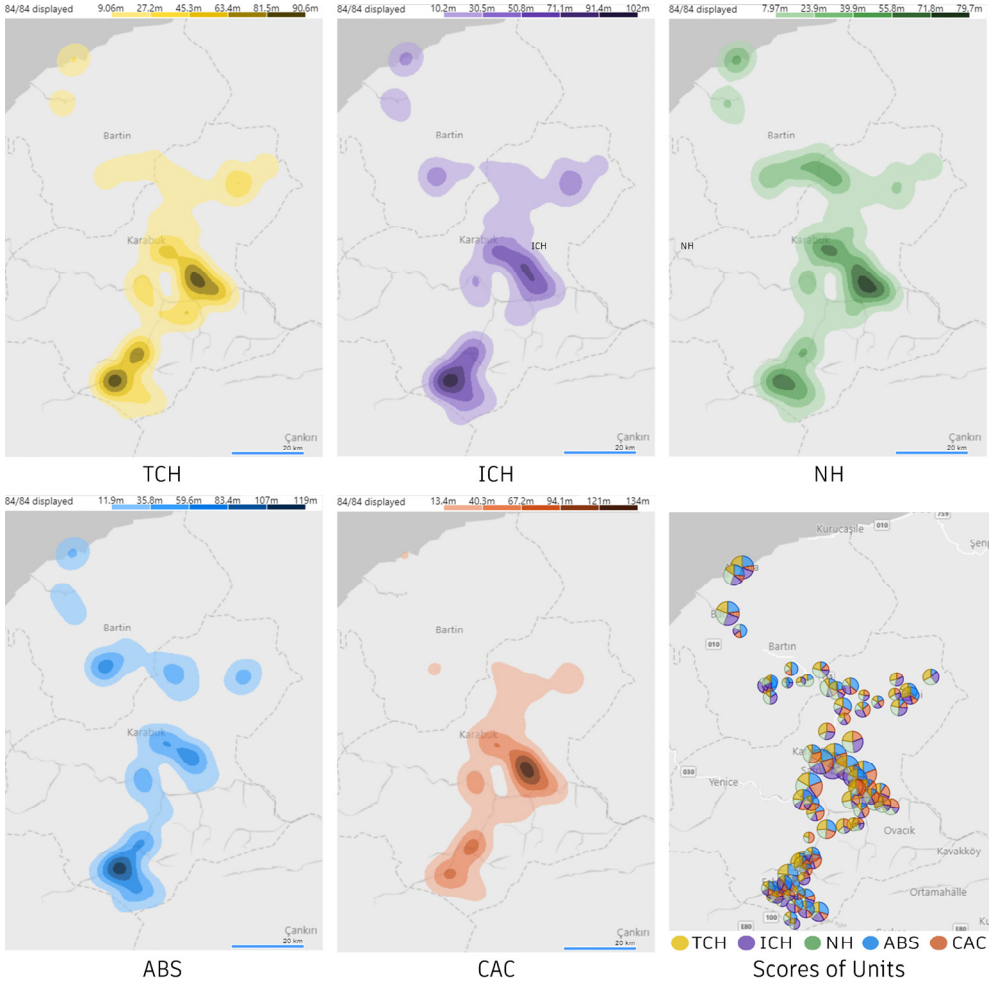


**Figure 13.** Indicator density maps and radial charts of site scores.

*4.2. AHP Application*

To assign weights to the indicators (TCH, ICH, NH, ABS, and CAC), a survey utilizing pairwise comparisons was administered to 131 tourists in the centers of Safranbolu and Amasra. Participants were asked to evaluate each pair of indicators by selecting a value between 1 and 9, where 1 indicated equal importance of both indicators, and 9 signified extreme importance of one indicator over the other.

In both locations, an equal number of responses met the AHP consistency criteria. The geometric mean of 74 matrices was calculated to generate a single aggregated matrix. Following the standardized AHP computation procedures [59], indicator weightings and rankings are presented in Table 2.

**Table 2.** Weights and rankings of indicators according to the decision matrix.

| Indicators | TCH | ICH | NH | ABS | CAC | Weighting | Rank |
|---|---|---|---|---|---|---|---|
| Tangible Cultural Heritage | 1.00 | 1.72 | 0.87 | 2.08 | 1.27 | 0.25 | 2 |
| Intangible Cultural Heritage | 0.58 | 1.00 | 0.43 | 1.08 | 0.72 | 0.14 | 5 |
| Natural Heritage | 1.15 | 2.35 | 1.00 | 1.82 | 1.76 | 0.29 | 1 |
| Accessibility to Basic Services | 0.45 | 0.93 | 0.55 | 1.00 | 0.85 | 0.14 | 4 |
| Connectivity with Attraction Centers | 0.79 | 1.38 | 0.57 | 1.17 | 1.00 | 0.18 | 3 |

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### *4.3. Clustering Results*

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We employed Self-Organizing Map (SOM) analysis to generate routes based on the attributes of 84 sites. Weighted scores were calculated to determine the relative importance of each site (Table A1), using AHP, five key indicators representing diverse tourist expectations were assessed (Table 2). These scores were then analyzed using SOM, which clustered the sites into groups based on underlying patterns and relationships, enabling a detailed evaluation of potential routes.

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The clustering results, presented in Figure 14, reveal three distinct clusters, highlighting the distribution of 84 spatial sites across the indicators. These clusters demonstrate varying levels of site significance, with a specific emphasis on higher-scoring clusters (red and yellow areas in the "Location of Sites"), which inform targeted strategies and optimize route planning. In the "Location of Sites", the red cluster represents high potential sites, the yellow cluster corresponds to medium potential sites, and the blue cluster comprises low potential sites.

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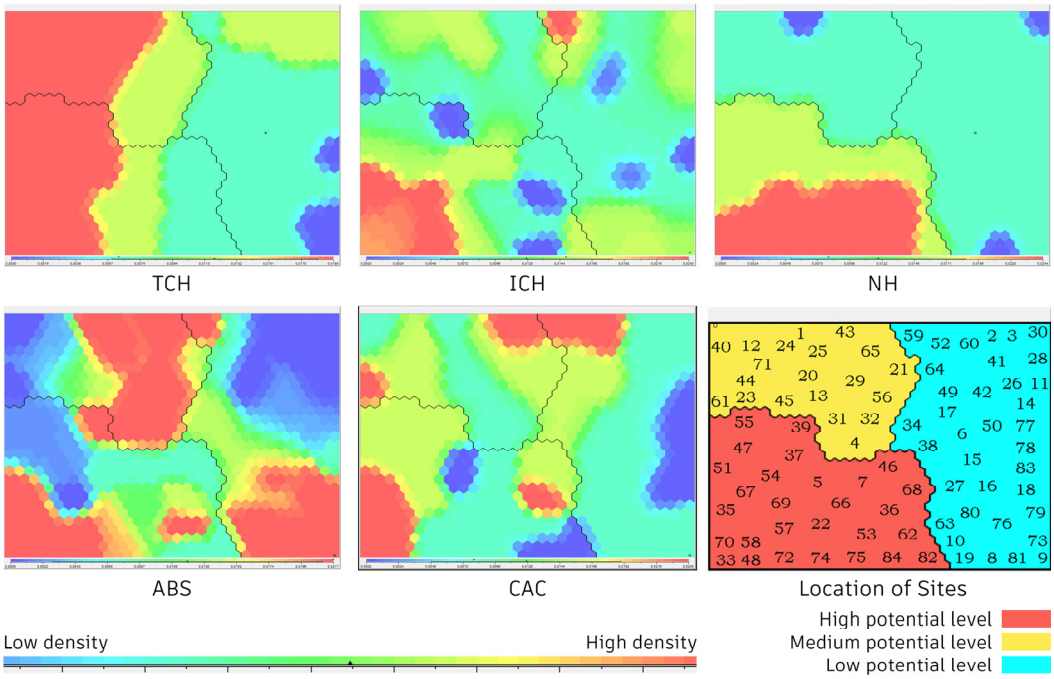


**Figure 14.** SOMs for each indicator.

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The SOM clustering reveals distinct spatial distribution patterns for each indicator. Heritage-based indicators (TCH, ICH, and NH) display significant spatial overlap, indicating a cohesive heritage landscape. In contrast, service- and connectivity-based indicators (ABS and CAC) exhibit fragmented and dispersed patterns, distinguishing them from the heritage indicators.

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A comparative analysis of the protected areas' distributions (Figure A1), indicators' density (Figure 13), and clustering results (Figure 14) indicates that the spatial distribution

A comparative analysis of the protected areas' distributions (Figure A1), indicators' density (Figure 13), and clustering results (Figure 14) indicates that the spatial distribution patterns of the heritage values present considerable opportunities for the development of heritage-focused route tourism in the region. However, to effectively support tourism, ABS requires substantial infrastructure enhancements. Furthermore, improving the CAC indicator could involve introducing targeted attractions at specific points along the route to strengthen connectivity and enhance the overall visitor experience.

### *4.4. Proposal for the Eco-Cultural Route*

The proposed eco-cultural route prioritizes the conservation of natural and cultural heritage sites and the minimization of environmental impact. To achieve this, the entire route follows existing roads, eliminating the need for new infrastructure development. As illustrated in Figure 14 ("Location of Sites" map), the route connects settlements classified as having high and medium potential. The route design focuses on maintaining short travel distances between settlements, ensuring high travel comfort, and maximizing exposure to heritage sites along the way. Where feasible, the route integrates authentic historical roads and historic bridges to enhance cultural authenticity. To avoid increasing environmental impact and potential legal complications, the route avoids traversing Wildlife Development Areas and Nature Reserves. Figure 15 presents the proposed eco-cultural route and the associated heritage sites located throughout the route.

The designated routes are classified based on their difficulty and comfort levels.

- Group A: Routes accessible by public transportation, offering the highest level of comfort.
- Group B: Routes suitable for wheeled eco-vehicles, providing a moderate level of comfort, higher than Groups C and D.
- Group C: Routes consisting primarily of unpaved or deteriorated roads, generally unsuitable for eco-vehicles.
- Group D: Routes where the use of vehicles is not recommended, designed specifically for trekking. These paths offer scenic vistas and natural landscapes, enhancing the traveler's experience.

### *4.5. SWOT Analysis*

An in-depth analysis of the proposed eco-cultural route was conducted using a SWOT analysis. The factors in the SWOT analysis are organized under headings and ranked in tables based on the frequency of mentions by participants. The specific areas where participants primarily associated these factors are depicted in Figure S1. To ensure clarity and ease of interpretation, each participant and factor was assigned a unique identifier (ID) in both the maps and tables.

#### 4.5.1. Strengths

A substantial number of participants concurred on the strengths of the region's natural, archaeological, and architectural heritage. The emphasis on religious heritage, cultural diversity, historical narratives, authentic products, and gastronomic heritage indicates a strong potential for developing alternative tourism strategies centered on intangible cultural heritage. Furthermore, the continued enhancement of tourism infrastructure and facilities to support alternative tourism, the presence of diverse accommodation options, and the organization of festivals and related cultural events contribute to the advancement of eco-tourism in the region (Table S2).

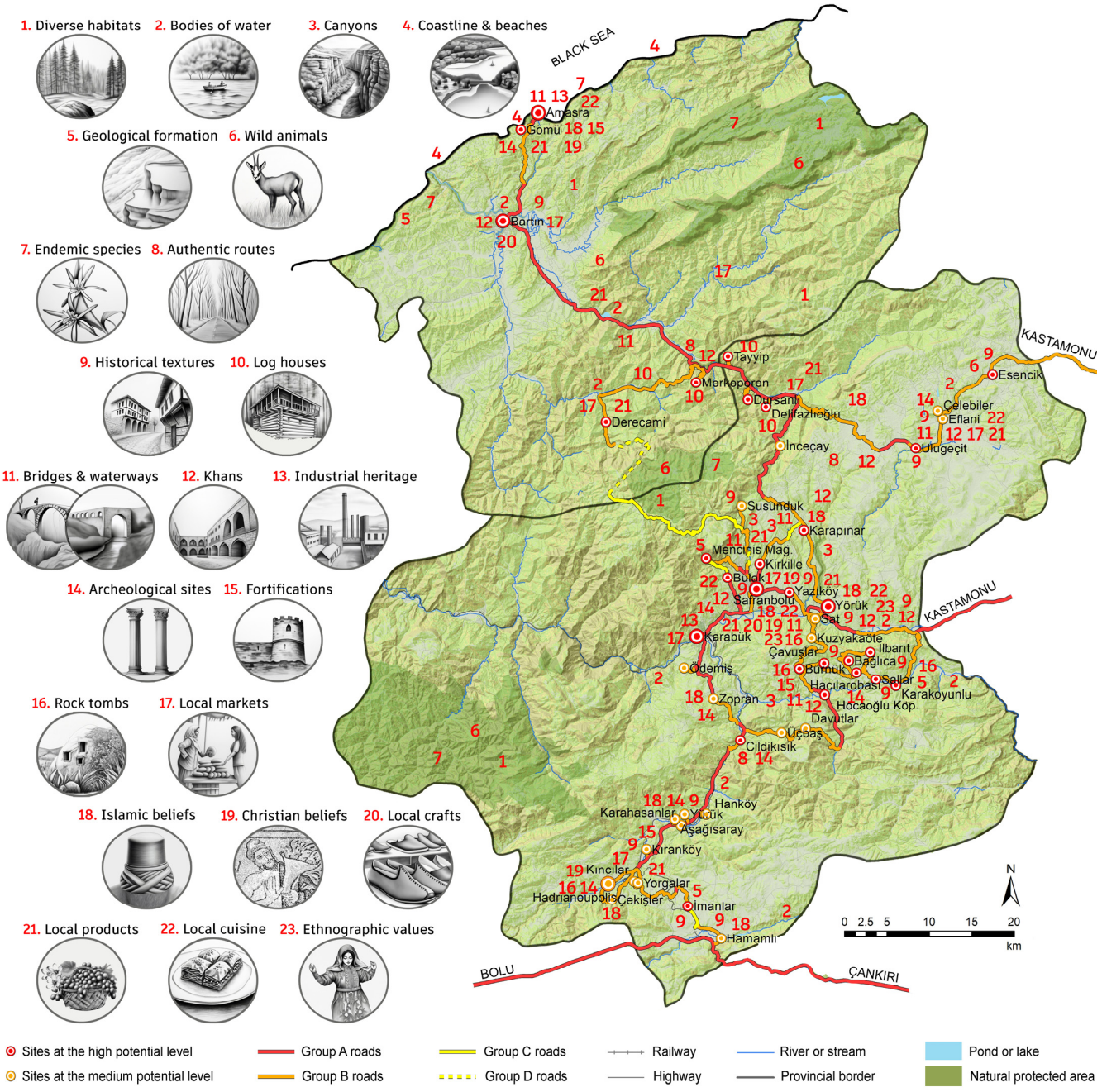


**Figure 15.** Proposal for eco-cultural route and heritage components along the route.

#### 4.5.2. Weaknesses

The analysis reveals significant management challenges related to both conservation and tourism. Key issues include the absence of effective site management mechanisms, a lack of integrated strategies, and limited adoption of participatory approaches. Furthermore, the insufficient involvement of citizens and lack of transparency in policy-making, coupled with political conflicts among stakeholders, were identified as major weaknesses hindering the implementation of participatory management frameworks.

Several factors have been identified as contributing to the deterioration risks of heritage sites, including excessive traffic, irregular and unauthorized construction, industrial pollution, faulty restoration practices, migration, and property ownership challenges (e.g., public buildings under private ownership and fragmented landholdings). Additionally, the lack of awareness among local communities and insufficient funding for conservation and restoration efforts further exacerbate these risks.

Participants also highlighted weaknesses in the management of tourism revenues, the promotion of heritage sites, and the quality control of services and products. In particular, there are significant deficiencies in tourism infrastructure, particularly in rural areas. For example, despite efforts to promote the necropolis sites in the Soğanlı River Valley within Karabük Province, no infrastructure has been developed to support tourism activities in the region (Table S3).

#### 4.5.3. Opportunities

Participants underscored the importance of engaging with international recognition and certification programs such as the UNESCO World Heritage List (Safranbolu), the UNESCO World Heritage Tentative List (Amasra Fortress), the UNWTO Best Tourism Villages Upgrade Programme (Yörük Village), PAN Parks (Küre Mountains National Park), and Cittaslow (Safranbolu). It is widely believed that active participation in these initiatives contributes significantly to both the region's global visibility and the enhancement of heritage conservation standards. Particular emphasis was placed on the inclusion of Amasra in the UNESCO World Heritage List, which was identified as a critical objective for both the region and the proposed eco-cultural route.

The region's proximity to major metropolitan centers, such as Ankara and Istanbul, combined with the availability of alternative transportation—including railways, maritime routes, and historic pathways—was identified as a significant opportunity for tourism development. Notably, participants positively rated initiatives to enhance maritime tourism, which was recognized for its high revenue potential.

Ongoing archaeological excavations in the ancient cities of Amastris (Amasra) and Hadrianoupolis, along with the continuous discovery of new findings, were highlighted as contributing not only to academic knowledge but also to the promotion of the region. The importance of supporting similar scientific research in other cultural and natural heritage sites was also emphasized as a key opportunity (Table S4).

#### 4.5.4. Threats

Participants identified several critical threats to cultural heritage sites, including construction pressures driven by economic interests, the reduction of protected areas, and the proximity of planned mining, energy, and industrial facilities to heritage sites. Seismic activity was also highlighted as a significant risk factor. Both cultural and natural heritage sites are increasingly vulnerable to climate change-related threats, such as wildfires, flooding, and droughts. Additionally, damage caused by treasure hunters and vandals in cultural heritage areas, along with illegal hunting, harvesting, and biological trafficking in natural heritage sites, were identified as pressing concerns that require mitigation through awareness campaigns and regulatory enforcement.

Concerns regarding the environmental, social, and economic impacts of tourism were prominently highlighted. Specifically, the adverse effects on local lifestyles and the overexploitation of natural resources emphasize the necessity for developing a sustainable tourism model.

Participants expressed concerns over the limited scope of legal protection zones, the absence of buffer areas, and inadequate oversight of projects within protected sites. These concerns are exemplified by two recent cases: In Bulak Village, within a designated site in Karabük, the original cobblestone pavements were entirely removed and replaced with new materials under the pretext of improving road comfort, compromising the integrity of the heritage fabric. Similarly, in Bartın, excessive modifications made along the Bartın River as part of a flood prevention project have resulted in the degradation of the natural landscape (Table S5).

### *4.6. Charrettes*

The charrettes marked the final phase of the study, where preliminary findings were critically analyzed and expanded through an interdisciplinary approach. These workshops enabled in-depth discussions of the SWOT analysis results and the potential impacts of the proposed eco-cultural route, promoting collaborative evaluation and refinement of planning strategies. Collective and interdisciplinary perspectives emerged during the Erasmus+ workshops—featuring site excursions, sub-group co-creations (Figure 16), concluding presentations, and deliberations—emphasizing key themes such as cultural and natural heritage, transportation and routes, local communities, inclusivity, capacity building, circularity, and crafts.

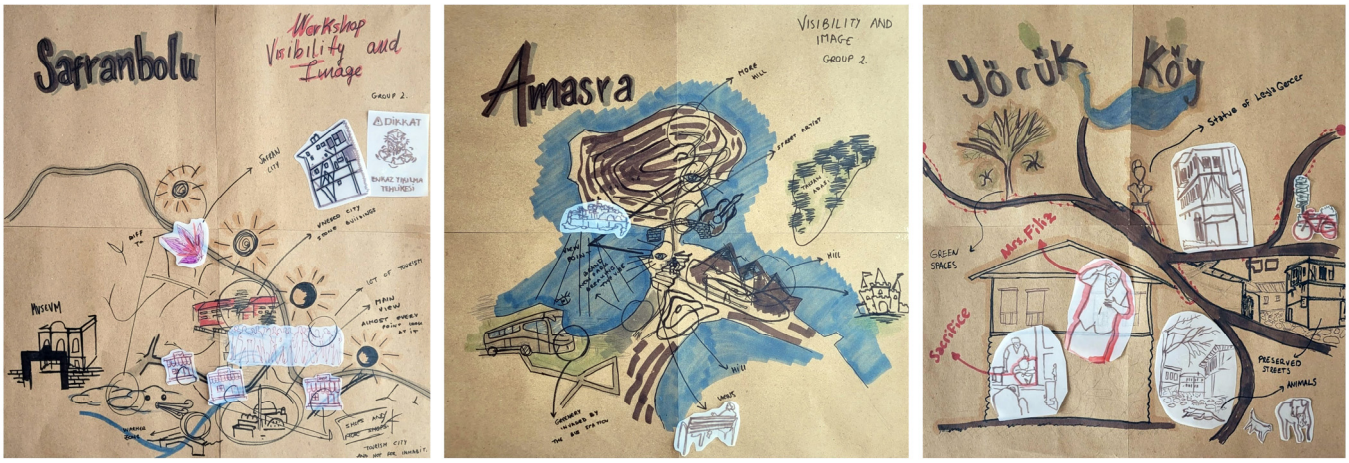


**Figure 16.** Collective cartographies created by sub-groups.

In the urban centers of Safranbolu and Amasra, the groups' discussions highlighted the detrimental impacts of unsustainable human activities—such as over-tourism, excessive traffic, and intensified commercial operations—on cultural heritage sites and coastal zones. The adverse effects of uncontrolled urban sprawl, rapid and dense construction, and inappropriate interventions were also identified as critical threats to heritage preservation. Conversely, in Yörük Village and other rural areas, attention was drawn to the declining local population, insufficient conservation planning, and the absence of effective preservation measures.

One participant identified the primary factor threatening the sustainability of heritage as "*environmental, social, and economic management that lacks the involvement of local communities and stakeholders*". The participant further argued that "*a participatory approach will be effective if all stakeholders are adequately informed about the potential outcomes of strategies and implementations. Therefore, participation must be as broad and democratic as possible*".

Another participant outlined the necessary measures for ensuring the sustainability of heritage sites as follows: *"It is essential to retain local communities within their places of origin and traditional cycles. By doing so, local populations can sustain heritage both materially and spiritually. In the context of the built environment, we have observed a significant disparity between structures that are inhabited and those that are not. Specifically, in Yörük Village, the local community emphasized the critical role of residents in the maintenance of buildings. Cultural heritage is inherently fragile and is sustained through the presence of those who inhabit it. These individuals possess knowledge of their homes' histories, construction methods, and unique attributes. In my view, this intimate connection is what constitutes cultural heritage"*.

The key outcomes of the two interconnected charrettes emphasize the following strategic recommendations:

- Integration of Cultural and Natural Heritage Sites: Establishing eco-cultural routes that link cultural and natural heritage areas to promote comprehensive and diverse visitor experiences.
- Community Participation: Developing mechanisms that facilitate the active and effective involvement of local communities in regional and local planning processes while ensuring transparency as a core principle for institutional practice.
- Regulation of Transportation: Differentiating between motor vehicle roads, eco-friendly transport routes, and pedestrian pathways to mitigate traffic congestion and carbon emissions while promoting walkable environments.
- Accessibility: Implementing inclusive principles and infrastructure to create a barrier-free environment, ensuring accessibility for all individuals.
- Enhancement of Infrastructure: Expanding and improving critical infrastructure and public services to better accommodate the needs and expectations of both locals and tourists. Most notably, prioritizing nature-based solutions and resilience for the climate crisis, including the rehabilitation of green corridors and coastal ecotonal areas, is vital.
- Advancement of Conservation and Promotion Efforts: Developing innovative and robust methods for the protection and presentation of heritage sites to ensure their preservation while fostering collaboration with various stakeholders.

These collectively identified principles and discussions highlight the essential dimensions required to plan an eco-cultural route that is feasible, sustainable, and viable. While the primary outcome of the study may appear to be the route proposal, these collective processes are of critical importance and are indispensable for future progress. To ensure continued development, it is necessary to diversify participants and expand the scope of involvement.

## 5. Discussion

This section examines the following critical dimensions in the context of the findings and existing paradigms in the literature: (1) the sustainable conservation of heritage and the management of heritage sites, (2) the role of tourism in sustainable conservation and development, and (3) the evaluation of the proposed integrated approach.

### *5.1. Heritage Dimension*

The need to manage a range of issues within the extensive area, including tangible and intangible cultural heritage, natural heritage, the negative impacts of mass tourism, and rural depopulation, presents complex, multi-dimensional challenges.

SWOT analyses reveal that factors perceived as threats by some participants can be seen as opportunities by others, underscoring the controversies surrounding the heritage dimension. In our study, we included the diverse perspectives of local residents, organizations, and experts on the future of the region. These perspectives collectively shape 'the common' both in physical (streets, squares, community gardens) and conceptual (norms, laws, bureaucracy) terms [81]. Sennett [82] argues that when the practical and institutional spheres are disconnected, both lose their potential. Therefore, a heritage-driven approach should integrate and enhance both domains to promote the emancipation of citizenship and long-term sustainability.

The study reveals that lack of coordination and collaboration among various stakeholders and institutions in the protection of cultural and natural heritage are one of the primary obstacles to the development of sustainable conservation actions. It has been observed that, in many cases, management plans can mitigate such challenges [83]. However, there is currently no active area management plan within the study area or any of its

sub-areas. Although, as Bozkurt suggests [84], area management units in Türkiye often function more like civil society organizations—coordinating relevant authorities, collecting statistics, and preparing reports—rather than acting as effective public authorities, the establishment of area management units and plans is crucial. Sokka et al. [85] also highlight that the success of heritage management processes is without substantial participation of local communities in processes such as goal setting and strategy development. To achieve genuine participation for heritage preservation, reverse migration to rural areas should be supported in the region.

The studies by MacDonald et al. [86] and Zhang et al. [87] indicate that the primary cause of rural depopulation, particularly in mountain villages across various regions, is insufficient economic income. Interviews conducted for this study revealed that local residents, especially in mountain villages, pointed to agricultural disadvantages due to the terrain, the transformation of much of the land into forests after prolonged periods of abandonment, and the lack of subsidies for agricultural products. This study suggests that ecotourism could present a significant opportunity for sites identified as having "high potential" and "medium potential" (Figure 15). If supported through a multi-dimensional approach, ecotourism could help mitigate depopulation and contribute to sustainable conservation and development.

### *5.2. Tourism Dimension*

The perception of nature as an infinite resource has resulted in unchecked exploitation, ignoring biophysical limits [88,89]. Mounting evidence of environmental degradation underscores the urgency of recognizing these limits to growth [90]. Lefebvre highlights the tension between the right to nature and the right to the city [91]. Integrating heritage conservation with contemporary degrowth and post-growth perspectives, informed by an eco-social framework, it seeks to promote sustainable and just nature-based solutions [92,93].

Balancing conservation and tourism activities in vulnerable heritage sites is one of the most crucial factors for ensuring the sustainability [94]. The primary factor influencing the policies to be adopted in achieving this fundamental objective is identifying which tourism approaches are most suitable for the region.

The literature on heritage sites presents two main perspectives regarding the term "mass tourism". Some studies focus on the detrimental impacts of mass tourism on the environment, heritage sites, and local communities [95,96], while others argue that mass tourism can be planned sustainably [97,98]. For instance, Peeters emphasizes that rather than developing alternative tourism approaches for sustainability, the focus should be on making mass tourism destinations sustainable [99]. Hernandez, on the other hand, suggests that the success of rural tourism destinations can be positively influenced by mass tourism destinations [100].

Before tourism activities began in Safranbolu, the city largely appeared abandoned. The 1990s, a period when tourism began to dominate cultural heritage sites worldwide, coincided with the development of tourism in the city [101]. During this time, mass tourism policies were viewed as the most effective means of preserving cultural heritage. As a result, the city's previously abandoned appearance changed rapidly, and with the return of the local population, steps were taken to preserve both tangible and intangible cultural heritage.

In Amasra, tourism began with camping activities in the 1940s and expanded rapidly after the 1960s. Despite the city's rich cultural heritage, cultural heritage has never been a central focus of the tourism activities carried out. Consequently, for an extended period, tourism activities and cultural heritage sites in Amasra have represented two conflicting aspects [31,34]. Therefore, addressing these two cities together is one of the promising aspects of this study.

Today, both centers are subject to serious criticism regarding tourism approaches and practices. It is evident that adopting a holistic and participatory approach to evaluating the region is crucial for the sustainability of heritage conservation, tourism, development, and the well-being of the local community. Drawing on lessons from the pandemic and, more broadly, the climate crisis, the need for long-term ecosocial approaches was emphasized. Ecocentric approaches, in particular, propose a more democratic paradigm shift by advocating for the inclusion of nature's rights in decision-making processes, especially concerning the commercialization, appropriation, exploitation, and privatization of vulnerable ecological urban and rural areas.

### *5.3. Methodological Reflection*

This study adopts a mixed-methods approach to examine the complex socio-spatial dynamics within the research area. Integrating diverse analytical tools and frameworks offers a holistic perspective to address multifaceted challenges. The collaborative engagement of students played a pivotal role in sustaining extensive fieldwork across the rural region. The incorporation of a crowdsourcing digital participatory platform (DPP) effectively streamlined synchronous and asynchronous data collection, significantly improving efficiency. Furthermore, leveraging this platform in university–public collaborations proved instrumental in identifying and formally registering structures requiring recognition and protection. Unlike technocratic planning support systems, DPPs foster collaboration, empowering people in decision-making, reporting, and co-creation [102].

The selection of indicators and parameters for AHP and unit ratings directly shaped the quantitative outcomes. Adjustments to AHP weightings and the inclusion of new parameters can further refine the SOM-generated route clusters to reflect evolving priorities. AHP's application to assess tourists' expectations and perceptions yielded reliable and consistent findings, facilitating data integration into route planning. Future research will extend AHP surveys to encompass diverse stakeholders, enabling comparative analyses based on variables such as tourist profiles and local versus international preferences.

The comprehensive datasets, shared as open-access resources in Supplementary Materials, provide a foundation for further research and the development of conservation and tourism applications. The study framework is adaptable, allowing variations in themes, locations, and indicators to spark new inquiries. Given the interdisciplinary nature of the topic, further research across economic, sociological, ecological, cultural, and architectural domains is essential. Establishing interactive platforms for stakeholder dialogue is required to strengthen implementation strategies.

Ultimately, our methodology serves as a living laboratory, continuously assessing site-specific dynamics and promoting sustainable eco-cultural development. Future iterations will expand interdisciplinary perspectives and active participation through onsite and digital platforms, enhancing inclusivity and collaboration. Continuous input from local stakeholders and experts, alongside follow-up mechanisms, will support ongoing refinements to ecological, social, and economic dimensions, maintaining relevance and effectiveness over time.

The novel and flexible methodology introduced in this study offers a data-driven and inclusive tourism route planning strategy, presenting a replicable model for other regions facing similar challenges. Designed to support a participatory approach, the methodology provides a holistic framework that strengthens decision-making processes in conservation and tourism planning.

## 6. Conclusions and Recommendations

This study proposes a participatory approach to develop an eco-cultural route that promotes sustainable conservation, development, and the well-being of local communities in 84 heritage sites affected by urban mass tourism or rural depopulation. The key findings highlight the potential of historical travelers' routes to link the region's cultural and natural heritage sites with sustainable tourism strategies. Moreover, the study reveals significant potential and risks for eco-cultural tourism development in the region, particularly by connecting less-visited rural areas to established destinations such as Safranbolu and Amasra.

Within the scope of the study, tourist trends in the area have been evaluated. The integrated assessment of TCH, ICH, and NH promotes sustainable tourism. However, shortcomings, challenges, and management issues highlight the need for capacity building and policy interventions to support ecotourism development.

According to AHP results, the relatively high priorities of the NH (29%) and TCH (25%) indicators, along with the lower priorities of the CAC (18%) and ABS (14%) indicators, indicate that heritage tourism is supported despite issues related to the spatial distribution of attraction centers, as well as deficiencies in services, transportation, and tourism infrastructure. Meanwhile, the value of the ICH (14%) indicator highlights the necessity of improvement and promotion actions for intangible heritage in the region.

In addition to the 28 high-potential sites, 20 medium-potential sites have been included to enhance the geographical and social inclusivity of the eco-cultural route. Evaluations and recommendations regarding the proposed route and sites are provided below.

- The existing tourism dynamics support the potential success of the route. According to 2024 statistics, approximately 2,600,000 people (including daily visitors) visit Safranbolu annually [103], while Amasra receives around 2,500,000 visitors (including daily visitors) annually [104]. These figures can be associated with the potential demand for the final product. However, beyond the quantity of tourists, their expectations, socio-economic status, and diversity are crucial for the proper functioning of the route. At the international level, Amasra's heavy reliance on cruise tourism—particularly with a large proportion of Russian tourists—and Safranbolu's dependency on visitors mainly from China, Taiwan, and Thailand contribute to a limited tourist profile. This lack of diversity increases the vulnerability of the tourism sector in both destinations.
- Among the high-potential sites, the following are recommended as priorities during the initial implementation phase to support the development of surrounding areas: (1) Safranbolu, Amasra, and the nearby sites (Yazıköy, Bulak, Kirkille, and Gömü), (2) the sites located together in the Soğanlı Stream Valley, featuring archaeological heritage and traditional architecture (Hacılarobası, Ilbarıt, Karakoyunlu, Bürnük, Hocaoğlu K., Çavuşlar, Bağlıca, and Sallar), and (3) the two provincial centers, Karabük and Bartın.
- Many successful examples have recognized the "cultural route" as a method for preserving and maintaining cultural heritage. However, numerous initiatives have failed due to prioritizing high revenue generation in the short and medium term [105]. Therefore, in the initial stages of implementation, the eco-cultural route must be subsidized by international, national, and local non-profit organizations. Moreover, for long-term economic sustainability, it is essential to gradually increase the financial contributions of cooperatives (including producers and businesses), local community associations, and private sponsors to the central budget.
- Ensuring income diversification is crucial for sustainable development and socio-economic resilience. Tourism revenues alone may not be sufficient to achieve sustainability in sensitive areas that require protection. In this case, "multiple-use manage-

ment" is recommended [106]. Therefore, developing multiple uses (such as agriculture, livestock, and crafts) that align with the identities of the sites is important. Such regional planning requires interdisciplinary efforts.

- To highlight cultural heritage, we recommend removing structures that damage tangible cultural heritage and disrupt the skyline. Sites that have not yet been protected at the building scale should be urgently safeguarded, and restoration and infrastructure work should be carried out. In this regard, sites such as Amasra Castle and the Yenişehir in Karabük (industrial heritage) should be prioritized. In line with the eco-cultural route context, particularly in rural areas, abandoned caravanserais, hammams, historical bazaars, and mansions should be restored and repurposed for tourism and other services.
- The expansion of the ecological conservation cases exemplified within the research area is crucial for the preservation of natural heritage, particularly through increased local awareness. Interventions that promote eco-social transition—such as erosion and flood prevention, protection of endemic species, and restoration of habitat diversity—should be adopted and implemented by regional and local authorities. Mining, quarry activities, and unplanned construction should be prevented within the area, and restoration projects for natural areas should be carried out.
- The proposed route prioritizes roads that require minimal intervention to reduce environmental impact and address geographic and economic challenges. Alternatives exist for less suitable roads. However, improving public transportation and adapting roads for eco-friendly vehicles is essential. In particular, access to İmanlar, Derecami, and Karapınar should be enhanced. To reduce conflicts among different user groups, roads should also be separated based on user types, and appropriate safety measures should be implemented.
- Especially in sensitive areas where natural and cultural heritage intersect, initiatives that integrate social structures with heritage must be consciously sustained over the long term to ensure success [107]. In the regional dynamics, the efforts that began in the 1970s in Safranbolu and the Yörük village only started to yield positive results toward the 2000s. Therefore, to minimize the potential negative impacts of interventions on the local population and heritage sites (such as degradation, gentrification, migration, unplanned construction, the complete abandonment of traditional production methods), planning must be extended over the long term and periodically reviewed.
- Seven main stages, which must be carried out in coordination, are proposed to ensure the successful implementation of the project: (1) establishing the central budget with contributions from non-profit organizations, (2) conducting awareness-raising activities and developing protection and restoration activities for heritage sites, as well as regulatory activities for tourism areas, (3) implementing measures to enhance road safety and accessibility while supporting ecological transportation methods, (4) supporting the return of the local population and increasing local production through social and economic incentives, (5) developing tourism, production, and infrastructure facilities with an approach that aligns with the characteristics of the sites and the theme of the route, (6) encouraging participation in networks that support ecotourism and conducting promotional activities, and (7) gradually increasing the contributions of cooperatives, local community associations, and sponsors to the central budget, ensuring economic sustainability.
- The study area consists of sub-regions with distinct characteristics. To develop a sustainable conservation and tourism approach, including eco-cultural routes, it is essential to adopt a holistic planning process that considers these unique attributes

and encourages collaboration. These efforts, similarly to past experiences in the region, will drive responsible and robust policy implementation as well as future systemic impacts. In Safranbolu, steps can be taken to enhance the sustainability of tourism activities by prioritizing conservation and educational efforts while also integrating natural heritage areas into planning. In Amasra, which has advantages in tourism diversity and potential activities, ecological solutions should include supporting alternative tourism, reducing coastal tourism pressure, mitigating seasonality effects, and focusing on the sustainability of cultural and natural heritage. For rural areas, projects should promote local tourism products through sustainable certification programs and business networks, emphasizing circular and ecological approaches. Considering both regional and global crises, the proposed strategy is expected to be implemented with truly participatory, sustainable, fair, and circular economy practices.

**Supplementary Materials:** The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/su17073157/s1, Table S1: The attribute table that forms the basis for site rating; Figure S1: Distribution of SWOT factors; Table S2: The strength factors of SWOT analysis; Table S3: The weakness factors of SWOT analysis; Table S4: The opportunity factors of SWOT analysis; Table S5: The threat factors of SWOT analysis.

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**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** Original data will be provided in dialogue with the authors to ensure the safety and anonymity of the people present in the recordings and transcriptions.

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**Conflicts of Interest:** The authors declare no conflicts of interest.

# Appendix A

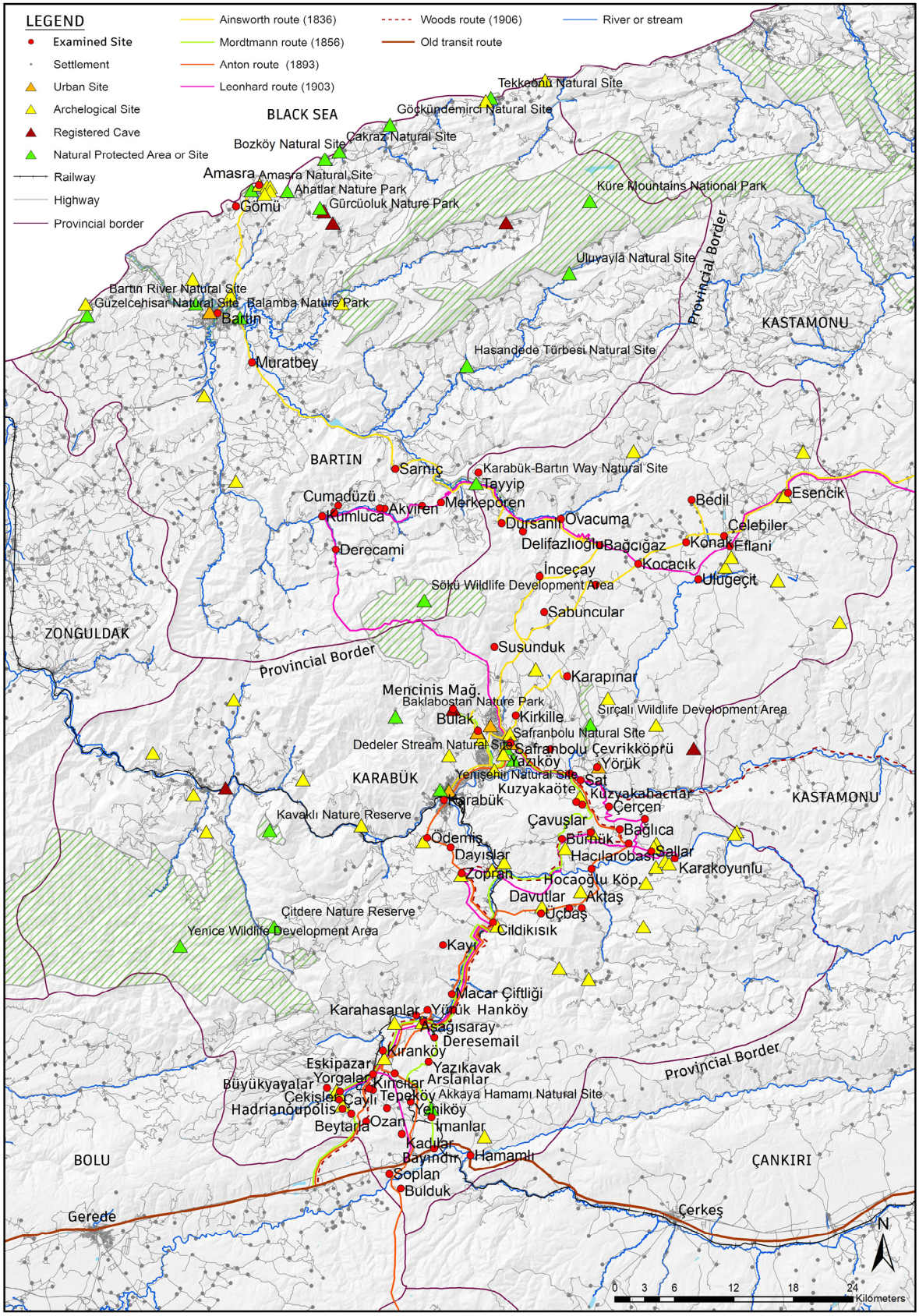


**Figure A1.** The map of research area and historical traveler routes.

## Appendix B

**Table A1.** Ratings of indicators and their normalized values.

| ID | District | Site | TCH Rating (Norm.) | ICH Rating (Norm.) | NH Rating (Norm.) | ABS Rating (Norm.) | CAC Rating (Norm.) |
|---|---|---|---|---|---|---|---|
| 1 | | Eflani | 3 (1.89) | 2 (1.60) | 0 (0.00) | 3 (2.17) | 1 (0.80) |
| 2 | | Konak | 2 (1.26) | 1 (0.80) | 1 (0.81) | 0 (0.00) | 1 (0.80) |
| 3 | | Bedil | 2 (1.26) | 2 (1.60) | 1 (0.81) | 0 (0.00) | 1 (0.80) |
| 4 | Eflani | Çelebiler | 2 (1.26) | 2 (1.60) | 1 (0.81) | 3 (2.17) | 1 (0.80) |
| 5 | | Esencik | 3 (1.89) | 2 (1.60) | 2 (1.63) | 1 (0.72) | 0 (0.00) |
| 6 | | Kocacık | 1 (0.63) | 1 (0.80) | 1 (0.81) | 1 (0.72) | 1 (0.80) |
| 7 | | Ulugeçit | 2 (1.26) | 2 (1.60) | 2 (1.63) | 1 (0.72) | 1 (0.80) |
| 8 | | Eskipazar | 1 (0.63) | 2 (1.60) | 0 (0.00) | 3 (2.17) | 1 (0.80) |
| 9 | | Arslanlar | 0 (0.00) | 2 (1.60) | 1 (0.81) | 3 (2.17) | 1 (0.80) |
| 10 | | Bayındır | 1 (0.63) | 2 (1.60) | 1 (0.81) | 3 (2.17) | 1 (0.80) |
| 11 | | Beytarla | 1 (0.63) | 2 (1.60) | 1 (0.81) | 0 (0.00) | 1 (0.80) |
| 12 | | Çekişler | 3 (1.89) | 2 (1.60) | 1 (0.81) | 0 (0.00) | 1 (0.80) |
| 13 | | Hadrianoupolis | 3 (1.89) | 1 (0.80) | 1 (0.81) | 2 (1.45) | 1 (0.80) |
| 14 | | Bulduk | 1 (0.63) | 2 (1.60) | 1 (0.81) | 0 (0.00) | 0 (0.00) |
| 15 | | Büyükyayalar | 1 (0.63) | 1 (0.80) | 1 (0.81) | 2 (1.45) | 1 (0.80) |
| 16 | | Çaylı | 1 (0.63) | 1 (0.80) | 1 (0.81) | 2 (1.45) | 1 (0.80) |
| 17 | | Deresemail | 1 (0.63) | 1 (0.80) | 1 (0.81) | 1 (0.72) | 1 (0.80) |
| 18 | | Soplan | 1 (0.63) | 1 (0.80) | 1 (0.81) | 3 (2.17) | 0 (0.00) |
| 19 | | Kadılar | 1 (0.63) | 2 (1.60) | 1 (0.81) | 3 (2.17) | 1 (0.80) |
| 20 | Eskipazar | Hamamlı | 3 (1.89) | 2 (1.60) | 1 (0.81) | 3 (2.17) | 1 (0.80) |
| 21 | | Hanköy | 2 (1.26) | 2 (1.60) | 1 (0.81) | 2 (1.45) | 2 (1.60) |
| 22 | | İmanlar | 2 (1.26) | 2 (1.60) | 3 (2.44) | 2 (1.45) | 1 (0.80) |
| 23 | | Karahasanlar | 3 (1.89) | 1 (0.80) | 1 (0.81) | 1 (0.72) | 2 (1.60) |
| 24 | | Aşağısaray | 3 (1.89) | 2 (1.60) | 1 (0.81) | 1 (0.72) | 2 (1.60) |
| 25 | | Kıranköy | 3 (1.89) | 2 (1.60) | 1 (0.81) | 3 (2.17) | 2 (1.60) |
| 26 | | Tepeköy | 1 (0.63) | 1 (0.80) | 1 (0.81) | 0 (0.00) | 1 (0.80) |
| 27 | | Yeniköy | 1 (0.63) | 1 (0.80) | 1 (0.81) | 2 (1.45) | 1 (0.80) |
| 28 | | Ozan | 2 (1.26) | 2 (1.60) | 1 (0.81) | 0 (0.00) | 1 (0.80) |
| 29 | | Yürük (Üçevler) | 2 (1.26) | 1 (0.80) | 1 (0.81) | 3 (2.17) | 2 (1.60) |
| 30 | | Yazıkavak | 2 (1.26) | 2 (1.60) | 0 (0.00) | 0 (0.00) | 1 (0.80) |
| 31 | | Kıncılar | 2 (1.26) | 1 (0.80) | 1 (0.81) | 3 (2.17) | 1 (0.80) |
| 32 | | Yorgalar | 2 (1.26) | 1 (0.80) | 1 (0.81) | 3 (2.17) | 1 (0.80) |
| 33 | | Karabük | 3 (1.89) | 3 (2.40) | 3 (2.44) | 3 (2.17) | 3 (2.40) |
| 34 | | Macar Çiftliği | 1 (0.63) | 1 (0.80) | 1 (0.81) | 2 (1.45) | 2 (1.60) |
| 35 | | Bulak | 3 (1.89) | 3 (2.40) | 2 (1.63) | 3 (2.17) | 3 (2.40) |
| 36 | | Mencinis Cave | 1 (0.63) | 0 (0.00) | 3 (2.44) | 2 (1.45) | 3 (2.40) |
| 37 | | Bürnük | 3 (1.89) | 1 (0.80) | 2 (1.63) | 1 (0.72) | 2 (1.60) |
| 38 | | Dayıslar | 1 (0.63) | 1 (0.80) | 1 (0.81) | 2 (1.45) | 2 (1.60) |
| 39 | Karabük | Cildikısık | 3 (1.89) | 0 (0.00) | 2 (1.63) | 3 (2.17) | 2 (1.60) |
| 40 | | Davutlar | 3 (1.89) | 1 (0.80) | 1 (0.81) | 0 (0.00) | 1 (0.80) |
| 41 | | Aktaş | 2 (1.26) | 1 (0.80) | 1 (0.81) | 0 (0.00) | 1 (0.80) |
| 42 | | Kayı | 1 (0.63) | 0 (0.00) | 1 (0.81) | 0 (0.00) | 2 (1.60) |
| 43 | | Ödemiş | 3 (1.89) | 1 (0.80) | 1 (0.81) | 3 (2.17) | 3 (2.40) |
| 44 | | Üçbaş | 3 (1.89) | 1 (0.80) | 1 (0.81) | 0 (0.00) | 2 (1.60) |
| 45 | | Zopran | 3 (1.89) | 1 (0.80) | 1 (0.81) | 2 (1.45) | 2 (1.60) |

**Table A1.** *Cont.*

| ID | District | Site | TCH Rating (Norm.) | ICH Rating (Norm.) | NH Rating (Norm.) | ABS Rating (Norm.) | CAC Rating (Norm.) |
|---|---|---|---|---|---|---|---|
| 46 | Ovacık | Hocaoğlu Köp. | 1 (0.63) | 1 (0.80) | 2 (1.63) | 1 (0.72) | 2 (1.60) |
| 47 | | Karakoyunlu | 3 (1.89) | 1 (0.80) | 2 (1.63) | 0 (0.00) | 2 (1.60) |
| 48 | Safranbolu | Safranbolu | 3 (1.89) | 3 (2.40) | 3 (2.44) | 3 (2.17) | 3 (2.40) |
| 49 | | Sabuncular | 1 (0.63) | 1 (0.80) | 1 (0.81) | 0 (0.00) | 2 (1.60) |
| 50 | | Bağcığaz | 1 (0.63) | 1 (0.80) | 1 (0.81) | 0 (0.00) | 1 (0.80) |
| 51 | | Çavuşlar | 3 (1.89) | 2 (1.60) | 2 (1.63) | 0 (0.00) | 2 (1.60) |
| 52 | | Çerçen | 2 (1.26) | 2 (1.60) | 1 (0.81) | 1 (0.72) | 3 (2.40) |
| 53 | | Delifazlıoğlu | 2 (1.26) | 1 (0.80) | 3 (2.44) | 2 (1.45) | 1 (0.80) |
| 54 | | Hacılarobası | 3 (1.89) | 2 (1.60) | 2 (1.63) | 0 (0.00) | 2 (1.60) |
| 55 | | Sallar | 3 (1.89) | 1 (0.80) | 2 (1.63) | 0 (0.00) | 2 (1.60) |
| 56 | | İnceçay | 2 (1.26) | 1 (0.80) | 1 (0.81) | 3 (2.17) | 2 (1.60) |
| 57 | | Karapınar | 3 (1.89) | 3 (2.40) | 3 (2.44) | 0 (0.00) | 2 (1.60) |
| 58 | | Kirkille | 3 (1.89) | 2 (1.60) | 3 (2.44) | 3 (2.17) | 3 (2.40) |
| 59 | | Çevrikköprü | 1 (0.63) | 3 (2.40) | 1 (0.81) | 3 (2.17) | 3 (2.40) |
| 60 | | Kuzyakahacılar | 2 (1.26) | 1 (0.80) | 1 (0.81) | 0 (0.00) | 3 (2.40) |
| 61 | | Kuzyakaöte | 3 (1.89) | 0 (0.00) | 1 (0.81) | 0 (0.00) | 3 (2.40) |
| 62 | | Dursanlı | 1 (0.63) | 1 (0.80) | 3 (2.44) | 3 (2.17) | 1 (0.80) |
| 63 | | Ovacuma | 1 (0.63) | 2 (1.60) | 1 (0.81) | 3 (2.17) | 1 (0.80) |
| 64 | | Osmansökü | 1 (0.63) | 2 (1.60) | 1 (0.81) | 1 (0.72) | 2 (1.60) |
| 65 | | Sat | 2 (1.26) | 1 (0.80) | 1 (0.81) | 3 (2.17) | 3 (2.40) |
| 66 | | Tayyip | 2 (1.26) | 1 (0.80) | 3 (2.44) | 1 (0.72) | 1 (0.80) |
| 67 | | Ilbarıt (Üçbölük) | 3 (1.89) | 2 (1.60) | 2 (1.63) | 1 (0.72) | 2 (1.60) |
| 68 | | Bağlıca | 1 (0.63) | 1 (0.80) | 2 (1.63) | 1 (0.72) | 2 (1.60) |
| 69 | | Yazıköy | 3 (1.89) | 3 (2.40) | 2 (1.63) | 3 (2.17) | 3 (2.40) |
| 70 | | Yörük | 3 (1.89) | 3 (2.40) | 3 (2.44) | 3 (2.17) | 3 (2.40) |
| 71 | | Susunduk | 3 (1.89) | 2 (1.60) | 1 (0.81) | 0 (0.00) | 2 (1.60) |
| 72 | Bartın | Bartın | 3 (1.89) | 3 (2.40) | 3 (2.44) | 3 (2.17) | 1 (0.80) |
| 73 | | Muratbey | 0 (0.00) | 1 (0.80) | 1 (0.81) | 3 (2.17) | 1 (0.80) |
| 74 | Amasra | Amasra | 3 (1.89) | 3 (2.40) | 3 (2.44) | 3 (2.17) | 1 (0.80) |
| 75 | | Gömü | 2 (1.26) | 2 (1.60) | 3 (2.44) | 3 (2.17) | 1 (0.80) |
| 76 | Ulus | Sarnıç | 1 (0.63) | 0 (0.00) | 1 (0.81) | 3 (2.17) | 1 (0.80) |
| 77 | | Üçpınar | 1 (0.63) | 1 (0.80) | 1 (0.81) | 0 (0.00) | 0 (0.00) |
| 78 | | Akviren | 1 (0.63) | 1 (0.80) | 1 (0.81) | 1 (0.72) | 0 (0.00) |
| 79 | | Bayraktar | 1 (0.63) | 1 (0.80) | 1 (0.81) | 3 (2.17) | 0 (0.00) |
| 80 | | Ürkütler | 1 (0.63) | 1 (0.80) | 1 (0.81) | 3 (2.17) | 1 (0.80) |
| 81 | | Kumluca | 0 (0.00) | 2 (1.60) | 1 (0.81) | 3 (2.17) | 1 (0.80) |
| 82 | | Derecami | 1 (0.63) | 2 (1.60) | 2 (1.63) | 1 (0.72) | 0 (0.00) |
| 83 | | Cumadüzü | 0 (0.00) | 0 (0.00) | 1 (0.81) | 1 (0.72) | 0 (0.00) |
| 84 | | Merkepören | 1 (0.63) | 0 (0.00) | 3 (2.44) | 1 (0.72) | 0 (0.00) |
| | | TOTAL | 159 (100.00) | 125 (100.00) | 123 (100.00) | 138 (100.00) | 125 (100.00) |

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Zeynep Yeşim İlerisoy, Çağatay Takva, Semahat Merve Top, Berru İzel Gökgöz, Şeyma Gebel, Hüseyin İlcan & Mustafa Şahmaran

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# The effectiveness of 3D concrete printing technology in architectural design: different corner-wall combinations in 3D printed elements and geometric form configurations in residential buildings

Zeynep Yeşim İlerisoy[a], Çağatay Takva[a,b], Semahat Merve Top[c], Berru İzel Gökgöz[d], Şeyma Gebel[a], Hüseyin İlcan[e] and Mustafa Şahmaran[e]

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**ABSTRACT**

3D Concrete Printing (3DCP) is an increasingly popular modern technology in the construction industry. There is a research gap in the basic geometric form decisions of 3DCP in building production about corner-wall combinations and the potential of chamfered corner turns. In this study, it is aimed to provide solutions to this research gap by performing digital fabrication of different architectural design configurations. Additionally, different chamfered turning performances were investigated in relation to the turning difficulties of the nozzle in corner-wall combinations. In this context, a lab-scale 3D printer was used with a cement-based material for the synthesis of prototypes. As a result of 3DCP, comparative analyses were conducted with building evaluation parameters. The obtained results revealed that in corner-wall combinations, chamfered space (r = 5 cm) was the most advantageous in terms of buildability and mass producibility. In geometric form configurations, the chamfered octagon showed optimum behaviour. In terms of buildability, a chamfered octagon offers a 4.2% advantage over a standard octagon. From a cost perspective, chamfered octagon provides a 20% advantage over chamfered square and 46.6% advantage over octagon. In terms of mass producibility, the chamfered octagon is on par with the chamfered hexagon and outperformed the chamfered square by 16.6%.

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3D concrete printing; architectural design; buildability; cost; mass producibility; printing time; corner-wall combination; geometric form

## 1. Introduction

3D Printing (3DP) technology started in 1986 with the entrepreneurship of Charles Hull and developed with the RepRap project of Adrian Bouyers and his team in 2005 (de Rubeis et al. 2024; Kumar et al. 2023). Nowadays, the process of transition from digital to production is progressing with different technical equipment and computer-aided arrangements (Ali et al. 2022; Takva and İlerisoy 2023a). The combination of small-scale printers and products continues day by day with the search for larger printers and products. At this point, 3DP technology is integrated with a multidisciplinary working process (Darwish, El-Wakad, and Farag 2021). This technology, which operates in many fields, also shows itself in the construction industry. As a result of the adaptation of metal, polymer, plastic, composite and clay-based materials to 3DP and the combination of aesthetic designs, the architecture sector has gained a different dimension (Chan et al. 2020). In this sector, digitally fabricated products can be built both in indoor and outdoor environments. A successful 3DP process can be achieved by keeping the material, complexity, and environmental conditions of the structure to be built under control (Asaf et al. 2023). The decrease in costs as a result of the reduced need for workers also shows that 3DP can be adopted as a digital and advanced construction method (Khan et al. 2024a). 3DP technology stands out by offering fast solutions in the production of cost-effective structures with short construction times using developed concrete materials (Moghayedi et al. 2024).

With the development of building and building production techniques, various outputs are obtained in the construction and architecture industry. For instance, Mogra et al. (2023) sought solutions to the structural optimization problem based on 3D Concrete Printing (3DCP) and buildability. By designing a structural element, it is aimed to establish a balance between load-bearing performance and stability during the printing process. Prototypes were produced and the effect of the material on buildability and structural design were evaluated. Alabbasi, Agkathidis, and Chen (2023) aimed to increase efficiency by using 3D concrete printing technology in the fabricating of reinforced concrete structural components for housing projects in Saudi Arabia. Finite element analysis, parametric modelling, and topology optimization were integrated with 3D printing methods in the digital fabrication process. Findings related to buildability and mass customization were presented. Giridhar, Prem, and Kumar (2023) proposed a methodology to develop 3D printable concrete mixtures. Smooth and fibrous mixtures were obtained by using local binders in the concrete material. 24 different trials were made and open time was taken as 45–60 minutes. Batikha et al. (2022) designed a two-storey building

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with 5 construction methods: 3DCP, prefabricated modular concrete, cast-in-place reinforced concrete, cold-formed steel, and hot-rolled steel. It is aimed to compare 3DCP with other methods in terms of construction time and cost. Except for precast modular concrete, 3DCP has been shown to reduce construction time by approximately 95%. Additionally, 3DCP has been found to be the most cost-effective. Weger et al. (2021) examined the first 3D printed residential building constructed in Beckum, Germany. Data regarding the concrete material used in the project, architectural design, and planning process were presented. Details were provided regarding the procedure followed in this new construction method. Ooms et al. (2021) proposed a numerical model for simulating the structural behaviour of 3DCP. A parametric tool has been developed for creating finite element models without requiring extensive manual modelling. With this tool, the structural behaviour of a randomly shaped object is simulated during 3DP. Anton et al. (2021) presented an automatic 3DCP process for columns of different geometries. An evaluation method was proposed on the typologies of columns with complex geometries and inferences were made regarding prefabrication.

The number of studies on corner-wall combinations is limited. The general aim of these studies is to ensure constructability. In this direction, stability in terms of material and geometric form becomes important (Cha et al. 2022). Gündüz and Özkar (2024) created a free-form wall module with clay building material and produced prototypes with 3DP by creating a locking system from the corners of these modules. Martínez-Rocamora et al. (2020) planned 3D printed wall designs with different curvature angles and aimed to reduce material consumption. In addition, cost savings have also been made. Literature studies examining the effect of circularity in 3DP are also limited in number. The positive effect of circularity in different construction systems is emphasized (Almalki et al. 2023; Belniak et al. 2013; Chang and Park 2022; Takva and İlerisoy 2023b). In studies focusing on circular walls in 3DP, it was observed that the stability of the structure increased (Khan and Koç 2023; Suiker et al. 2020). This study focuses on the research gap on the effect of circularity on geometric form in 3DCP.

In literature studies, it has been observed that 3DP technology has different applications related to architectural design in the construction industry. In the studies, it has been observed that laboratory environment is generally used as the printing place and environmental conditions (such as humidity, temperature) are taken into consideration (Khosravani et al. 2020). It has been observed that improvements have been made mostly in structural terms on a subject basis. In recent years, there have been studies focusing on materials and structural analysis suitable for 3DP in the structural design (Delavar, Chen, and Sideris 2024). In addition, optimizations have been carried out for architectural design. In the improvement of existing studies, while the use of less material and more durability are at the forefront in structural terms, the focus is on geometric form and aesthetics in architectural terms (Gebel et al. 2024; Miri, Baaj, and Polak 2025; Takva et al. 2024). When looking at the challenges of improvement, the importance of the material and printer equipment comes to the fore. The fluidity of the material content, its integration into 3DP and extrudability affect efficiency. In addition, printer speed, nozzle size and printer movement area are also limiting factors (An, Zhang, and Yang 2024; Hassan et al. 2024).

Based on the given studies from the available literature, it has been seen that three main elements come to the fore in the 3DCP process: 3D printer and technical equipment, building material, and the final product. In the study, prototypes were produced by integrating these three parameters. The final products were obtained by establishing binary connections between 3D printer-building material, 3D printer-final product, building material-final product and triple motivations between 3D printer-building material-final product. After the 3D printer and technical equipment were made ready for printing in the laboratory environment, cement-based mixture experiments were conducted and the optimum material recipe was reached. Focusing on building production with the obtained concrete material, computer-aided architectural designs were made for the final product. In the two-stage planned methodology, first the effect of the same architectural design on 3DCP was examined by creating different corner-wall combinations. Secondly, architectural designs were planned on a building scale of 80 square metres using different geometric forms. Basic-chamfered geometric architectural design alternatives were developed and the external walls of the designs were transformed into prototype products with 3DCP. Two-stage 3DCP prototype products were compared with building evaluation parameter to examine the effectiveness of architectural design decisions. Geometric designs showing optimum behaviour were determined and constructible, low-cost and mass-producible forms suitable for rapid prototyping were demonstrated.

## 2. Materials and methods

The study consists of four main stages: (i) the development of architectural design alternatives, (ii) the digital planning of designs, (iii) the 3DCP process, and (iiii) comparative analysis and evaluation. A workflow towards digital fabrication was followed by applying different steps at each stage (Figure 1). In the methodology, attention was paid to obtaining a comparable framework by focusing on the production of prototypes of architectural designs as a result of digital fabrication with 3DCP (CAD to CAM). At this point, analyses were conducted with building evaluation parameters obtained from the literature. The geometric form, which offers the best solutions among architectural designs, has been emphasized.

In the study, controlled and balanced planning was made by creating architectural designs with the same square metres and dimensions. The performances of digital and physical output products in geometric detail designs were investigated. Solutions to the following research questions were sought in architectural design alternatives;

(1) How do corner-wall combinations in form decisions affect building construction parameters (printing time, material usage, buildability, defect analysis, cost, and mass producibility) in 3DCP?
(2) What is the potential of chamfered corner turns in basic geometric forms (square, rectangle, hexagon, and octagon) in the construction process?

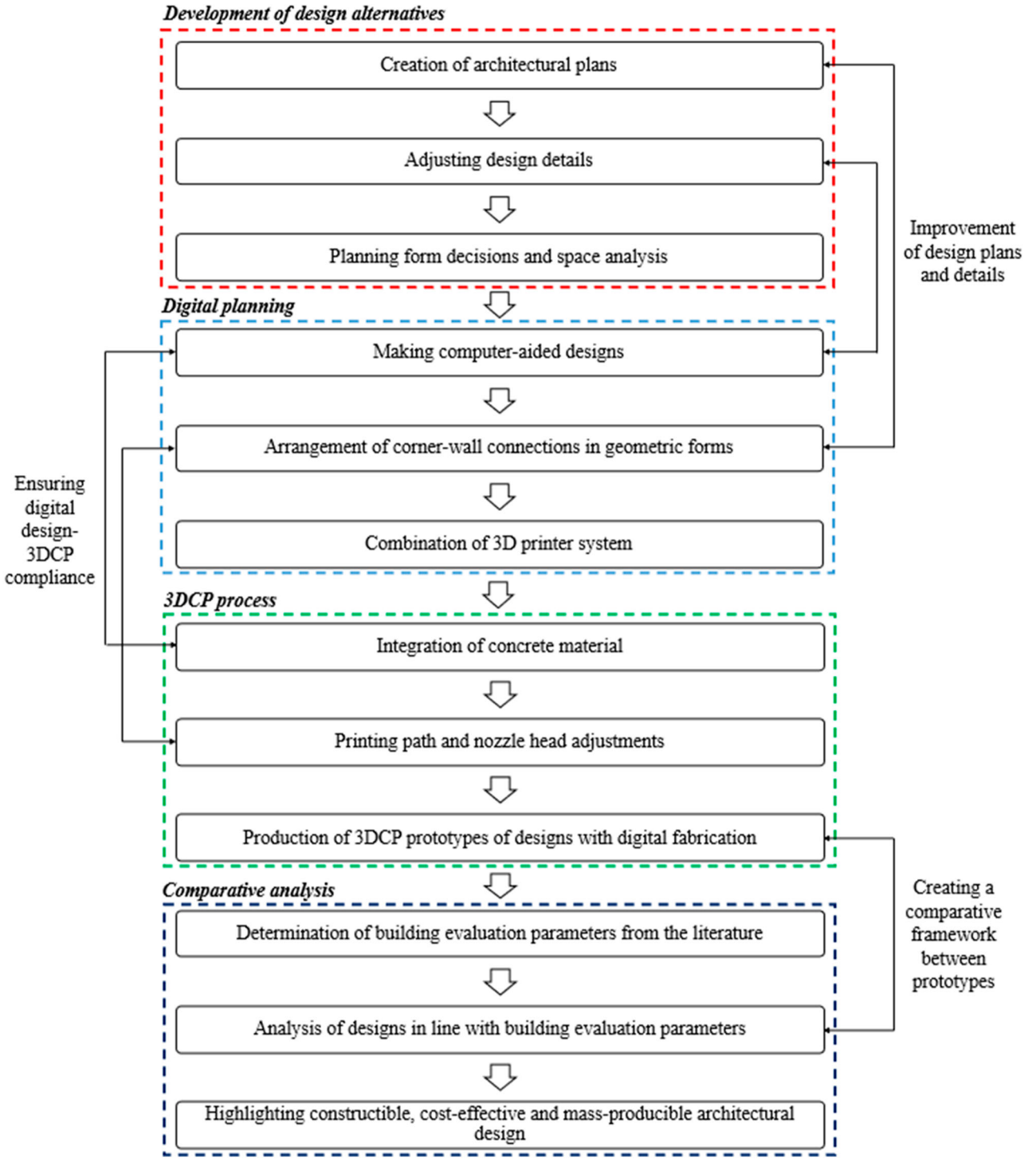



**Figure 1.** Workflow diagram of the methodology consisting of 4 main stages.

In order to make effective evaluations of the research questions, a road map was drawn, especially for the circularity of the connections in two different planes, by examining the buildings built in the 3DCP production strategy and the studies in the literature. The steps in the flowchart of the study were followed (Figure 2).

In the study, alternative solutions were first developed by creating architectural plans. Residential architectures that differ from each other in formal terms were created and no differences were made in the spatial layouts. The main criteria in evaluation are corner-wall combinations and geometric form decisions. Standard dimensions were applied in space solutions. Parker Morris Standards prepared by the UK Government to determine minimum space standards in residences were taken into account. In the first stage of the design process, the effect of corner-wall connections on 3DCP was examined. To observe the effect of chamfered corner combinations on the same architectural plan geometry, three different space formations with basic-chamfered walls were created (Figure 3).

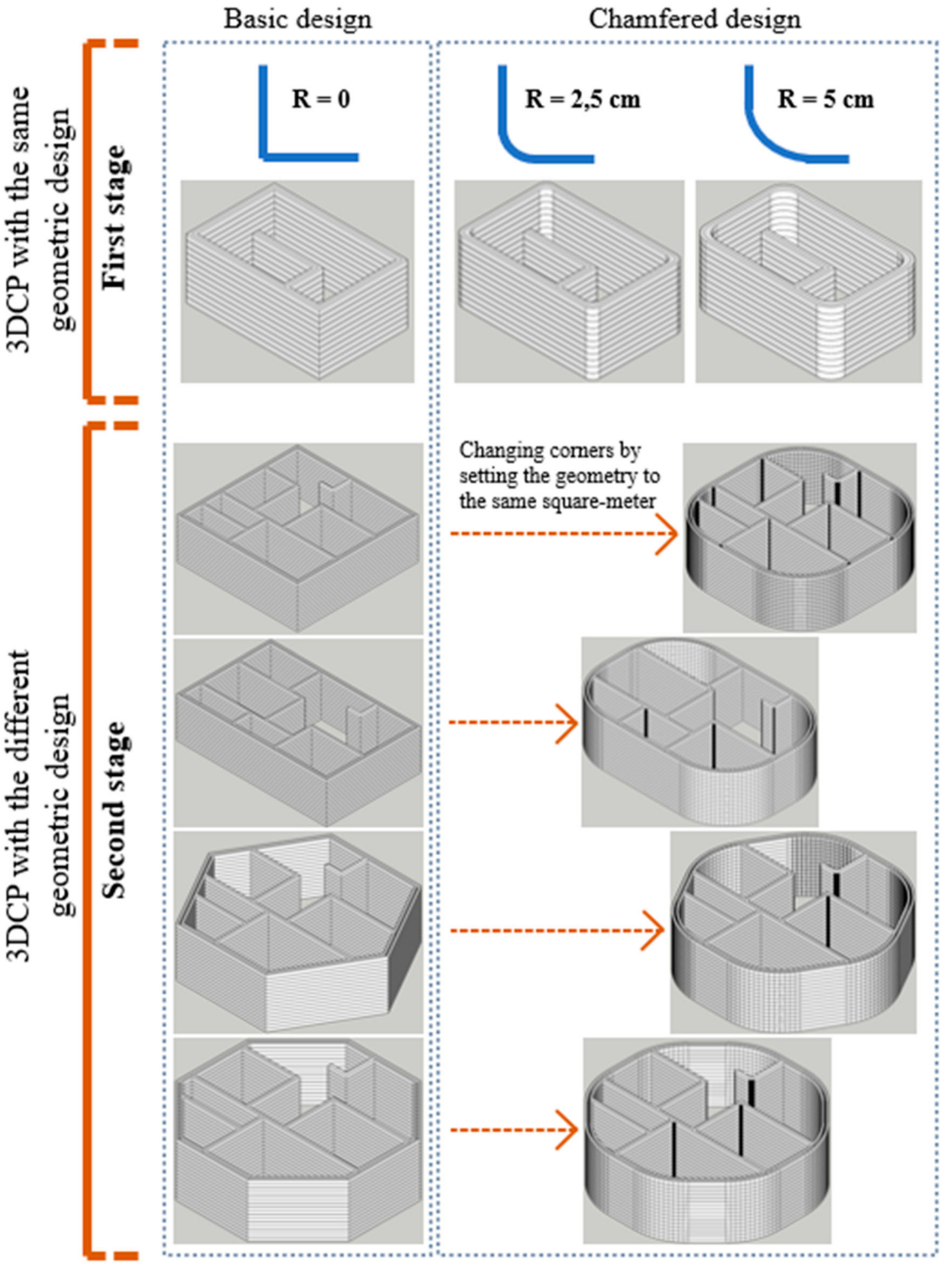



**Figure 2.** Two-stage 3DCP flowchart by developing design alternatives.

According to Parker Morris Standards, 80 square metres, which is the minimum area of a 3-room house for 5 people, is the basic space parameter in the design process (Buxton 2021; Goodchild and Furbey 1986). Four simple geometric form decisions, namely square, rectangle, hexagon, and octagon, according to the determined floor area, were determined as the second independent variable after corner-wall combinations. Since the inertia of geometric forms changes, the chamfering of planes that meet at different angles becomes important in terms of whether similar behaviours are exhibited. In geometric form-based space solutions, space layouts are kept the same in the functioning schemes designed as central (square, hexagon, and octagon) and linear (rectangle). At the point of production, the thickness of the building elements, window and door gaps and roof construction were taken as constant. The spatial units of the residences were created in line with the operation schemes.

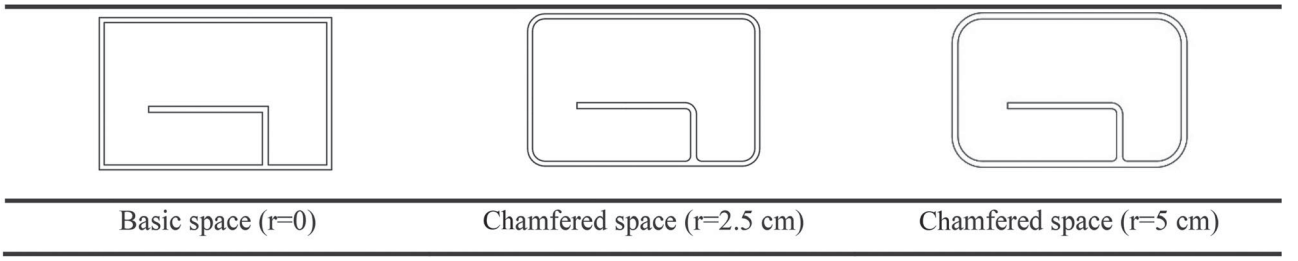



**Figure 3.** Plan plane of 3 different space formations.

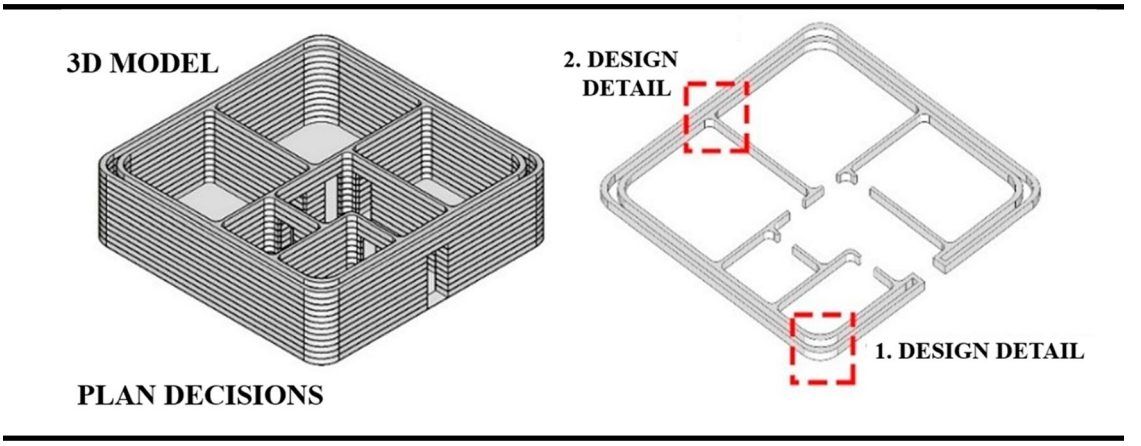



**Figure 4.** Variables in the digital planning process.

Corner geometries of basic forms were also considered as independent variables in plan configuration. Corners, which represent the union of planes on two different axes, affect both aesthetics and construction processes depending on their angular situations. For this reason, in addition to the basic geometric shapes that count the same square metre in plan solutions, forms with chamfered corner turns were produced. During the digital planning of design alternatives and preparation for the 3DCP process, the residences designed in different geometries were adjusted in the computer environment. In digital planning, the designs were checked with software and adapted to the 3D printer (Figure 4). The materials used in the control process and the system architecture produced are an important part of the efficiency of the 3DCP process.

In the preliminary stage of 3DCP, the steps given in Figure 5 were followed during the analysis process using computers and simulation programmes. First, architectural designs were created in 2D on the plan plane in the AutoCAD programme and then turned into 3D solid models. Solid models integrated into the Ultimaker Cura programme were saved in the '.stl' file format. Secondly, the slicing process of the building models was carried out by taking the parameters within the scope of the printer, environmental qualities and material properties as constant. Features in the Ultimaker Cura programme were used to integrate solid models into the printer and assign materials. Plans were made for real scale (1/1) printing and accordingly, a printer system with dimensions of 12 × 12 m was created, depending on the length and width data of the designs. A circular nozzle was used in the printer system and the diameter of the nozzle mouth was arranged as 10 cm. Depending on the dimensions of the nozzle, the layer height was taken as 10 cm in order to perform the slicing process. Since a 10 mm diameter nozzle head, which was also used in previous studies (Khan et al. 2024b), was used in the 3DCP of scaled prototypes, a 10 cm nozzle head was taken in digital planning due to its proportionality.

After the printing path simulations were made in Ultimaker Cura, the Autodesk ArtCAM programme was used to effectively capture G-code data to ensure the integration of architectural designs into the printer. Scaled designs have been tested to measure the impact of independent variables. A printing path was created by introducing G-code values to the 3D printer. In digital printing, it is aimed to measure buildability parameters without support (Table 1). The performances of the printable models were compared in terms of printing time and material usage and crossed with independent variables.

This phase of transition to 3DCP is the process in which the data obtained from the digital environment is put into real-life application. In this process, buildability with 3DCP was investigated. In order to prevent variations due to material, printer type, and production environment, all variables related to these components were taken under control and the focus was only on the production of structures with formally different architectural design decisions.

Prints were made using the in-situ casting technique using a cement-based mixture. To conduct the printing process successfully, the 3D-printable cementitious mixture, which was prepared following the methodology used in the authors' previous study, was utilized (Takva et al. 2024). The selected cement-based mixture has a viscosity that will not cause restrictions in the process of adjusting operational parameters. The mixture consists of traditional Portland cement, water, quartz sand ( $< 2$ mm), and various additives such as superplasticizer

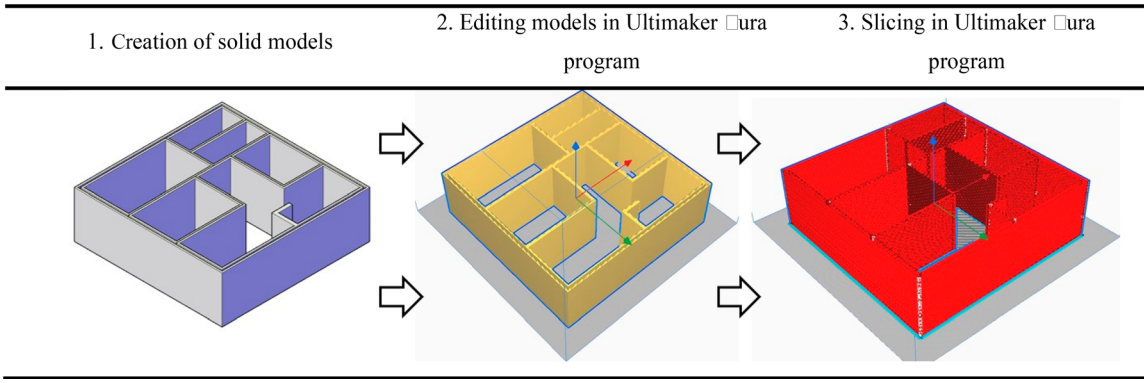



**Figure 5.** Steps for 3DCP in the computer-aided design and digital fabrication process.

**Table 1.** Geometric forms on a 12 × 12 m printer system in digital planning

| Visual in Cura program | Shape after slicing | Visual in Cura program | Shape after slicing |
|---|---|---|---|
| Square | | Chamfered square | |
| Rectangle | | Chamfered rectangle | |
| Hexagon | | Chamfered hexagon | |
| Octagon | | Chamfered octagon | |
| * According to locations and square meters, the biggest difference in total area in all architectural plans is 0.48 square meters. | | * According to locations and square meters, the biggest difference in total area in all architectural plans is 0.8 square meters. | |

**Table 2.** Mixture proportion and properties of 3D-printable cement-based mixture.

| | | | |
|---|---|---|---|
| Portland Cement (CEMI42.5) | 764.4 kg/m$^3$ | Viscosity Modifier (% weight of binder) | 1.5 kg/m$^3$ |
| Quartz Sand ( $<$ 2 mm) | 1146.6 kg/m$^3$ | Setting Retarder (% weight of binder) | 0.2 kg/m$^3$ |
| Water/binder Ratio | 318 kg/m$^3$ | Compressive strength (28th day) | 62.7 MPa |
| Superplasticizer (% weight of binder) | 2.3 kg/m$^3$ | Flow Diameter Values (Flow Table) | 16.5 cm |

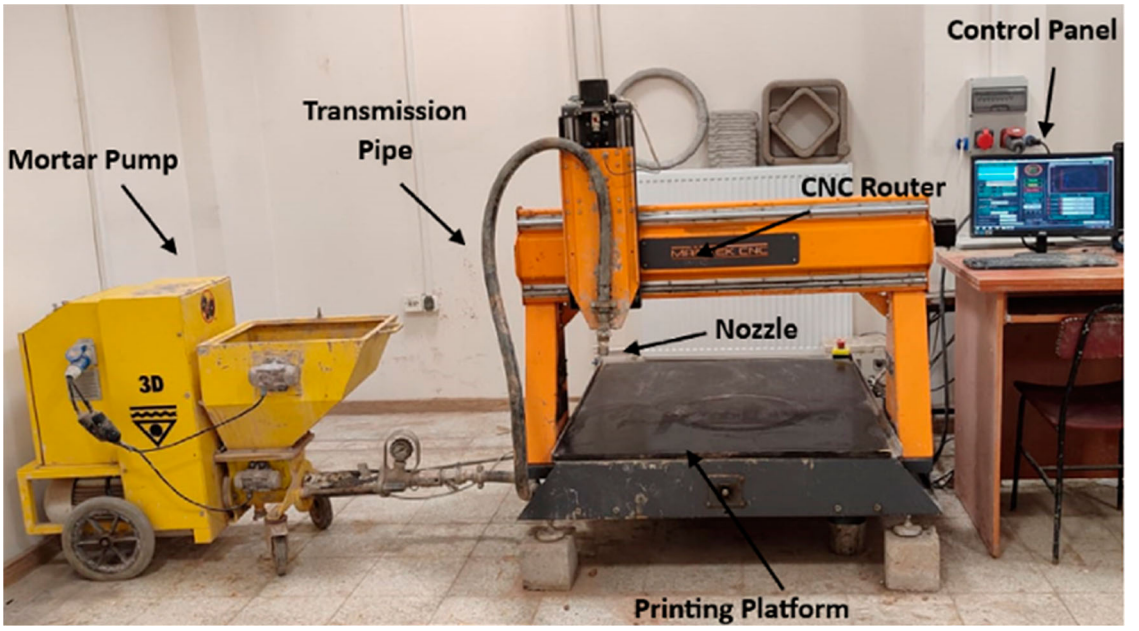



**Figure 6.** 3DCP laboratory equipment.

(Polycarboxylate-based), setting retarder (Citric acid), and viscosity modifier (Methyl cellulose-based). These additives were used to optimize the rheological properties of the mixture for 3DP. The proportions of the 3D-printable cement-based mixture are detailed in Table 2.

A 3D printer with dimensions of 100 × 100 × 40 cm in the laboratory environment was used for the synthesis of prototype products with the cement-based mixture compatible with 3DCP (Ilcan et al. 2022; Khan et al. 2023a; Khan et al. 2023b; Khan et al. 2024b; Şahin et al. 2021). The printer and equipment where the 3DCP process is performed are seen in Figure 6 (İlcan, Külak, and Şahmaran 2024). Real-size architectural designs were adjusted according to the 3DCP system in digital planning, and comparable frameworks of scale prototype products were created with building evaluation parameters among themselves. Stability-governed buildability parameters were obtained as a result of comparative analysis of experimental outputs depending on stiffness. In this context, the 3DCP data of the prototypes enabled the evaluation of stability-governed buildability parameters. Based on reasons such as the difficulty of detecting structural problems on a large scale, cost, and material consumption, the formation of the design and technical fiction was analyzed through small-scale outputs, and adjustments were made at positive or negative points in the design by going back depending on the cycle.

Different scales were used to analyze each selected independent variable in detail. In the first stage of the printing process, it is aimed to understand the advantages and disadvantages of interior-exterior, interior-interior, and exterior-exterior wall combinations in space formations in the 3DCP process. To observe the effect of chamfered corner combinations, 1/10 scale prints of three different space designs with basic-chamfered walls were taken. In the second stage of the printing process, the outer walls of 8 different geometries were printed in order to understand the effect of the form decision on the printing in the 3D printing of fixed variable geometric forms. Considering the lengths in the printable area of the printer, 1/25 scale was preferred to achieve the widest direction and length.

A discussion environment was created during the comparison of post-printing structure production parameters. One of the objectives of the study is to identify possible errors and deficiencies by investigating the design parameters on the final products and to reveal the effect of the details through comparative analysis in line with the examined parameters. Building evaluation parameters created based on research results obtained from the literature show the effectiveness of design decisions that are changed in a controlled manner in buildings with the same architectural plan (Table 3). Printing time, material usage, buildability, defect analysis, dimensional consistency, cost, and mass producibility parameters were used to compare 3DCP prototypes.

## 3. Findings

Depending on the structural features of the 3D printer, factors such as hardware and motion control are kept under control. The open time, which is the time during which the concrete material can flow through the 3D printer's nozzle uninterruptedly and without clogging, was taken as constant. While a nozzle head with a diameter of 10 cm was used in the digital planning phase based on real-scale, a nozzle head with a diameter of 10 mm was

**Table 3.** Building evaluation parameters.

| Research | Printing time | Material usage | Buildability | Defect analysis | Measurement consistency | Cost | Mass producibility |
|---|---|---|---|---|---|---|---|
| Tay et al., 2016 | ●□ | ●□ | ●□ | ●□ | | | |
| Bos et al., 2016 | | ●□ | ●□ | | | ●□ | ●□ |
| Gosselin et al., 2016 | ●□ | ●□ | ●□ | | ●□ | | ●□ |
| Jipa et al., 2016 | | ●□ | ●□ | | | | ●□ |
| Shatornaya et al., 2017 | ●□ | ●□ | ●□ | | | ●□ | ●□ |
| Moini et al., 2018 | | ●□ | | ●□ | ●□ | | ●□ |
| Martens et al., 2018 | | ●□ | | | | | |
| Inozemtcev and Duong, 2020 | ●□ | ●□ | | | ●□ | | |
| Jo et al., 2020 | ●□ | ●□ | | ●□ | ●□ | | |
| Wang et al., 2020 | | ●□ | | | | | ●□ |
| Vantyghem et al., 2020 | ●□ | ●□ | | | | | ●□ |
| Duarte et al., 2021 | | | ●□ | ●□ | | | ●□ |

used in the 3DCP of the scale prototypes. By adjusting the height of the nozzle head, it is aimed to extrude the concrete material efficiently and idealize the layer height. Mix design of concrete material was done and such as workability and setting time, were idealized according to the geometry, size and complexity of prototype prints of architectural designs. The printing speed of the 3D printer was taken as 50 mm/s. Environmental factors (temperature, relative humidity, wind) in the laboratory environment were taken into consideration.

### 3.1. Printing process of corner-wall combinations

The aim at this stage is to determine what role these parameters play in the printing process of 3 designs with the same architectural plans, by changing only the corner-wall combinations. The extent to which corner-wall combinations change the performance of the printer according to the circularity effect and their pros and cons within the scope of buildability were examined. Circularity means a curvilinear path where the nozzle does not move linearly. Circularity effect is the comparison of geometric architectural designs depending on the performance of the 3D printer in curvilinear turns with different diameters. The radius (r) in the designs was changed in order to observe the circularity effect. In this direction, 3 different designs were printed: basic space (r = 0), chamfered space (r = 2.5 cm), and chamfered space (r = 5 cm). In terms of softening corner turns, the outputs also differ. During the printing processes, all geometric designs were collapsed (Figure 7).

According to the 3DCP views in Figure 7 of the space designs with interior and exterior walls shown in Figure 3, it has been observed that the interior walls have greater stability and have not collapsed. Since the external walls consist of a single wall line, their stiffness is lower and therefore they were collapsed. According to the comparison of basic and chamfered space designs, it has been seen that the chamfered space (r = 5 cm) design provides advantages in terms of buildability and applicability in most parameters. Among geometric forms;

- In printing time, chamfered space (r = 5 cm) on a single layer provided an 11.5% advantage over chamfered space (r = 2.5 cm) and 12.25% advantage over basic space.
- In terms of material usage, 2% savings were achieved in the chamfered space (r = 5 cm) on a single layer compared to the chamfered space (r = 2.5 cm) and 5% compared to the basic space.
- In terms of collapse height and number of layers, the chamfered space (r = 5 cm) reached a 31.4% higher position than the chamfered space (r = 2.5 cm) and 40% higher than the basic space.
- According to the perimeter length, the chamfered space (r = 5 cm) covers a perimeter 2% less than the chamfered space (r = 2.5 cm) and 5% less than the basic space.

### 3.2. Printing process of geometric forms

By keeping the printer and material parameters constant, it is aimed to highlight the effect of geometric forms in the printing process. To create a comparable framework between geometric forms and to realize an efficient 3DCP, the focus was on the printing time in single layer printing, material usage by weighing, collapse heights calculated according to the number of layers, and the maximum number of layers reached during the printing process.

Increasing the number of sides in central forms (square, hexagon, and octagon) where the centre of gravity is at the

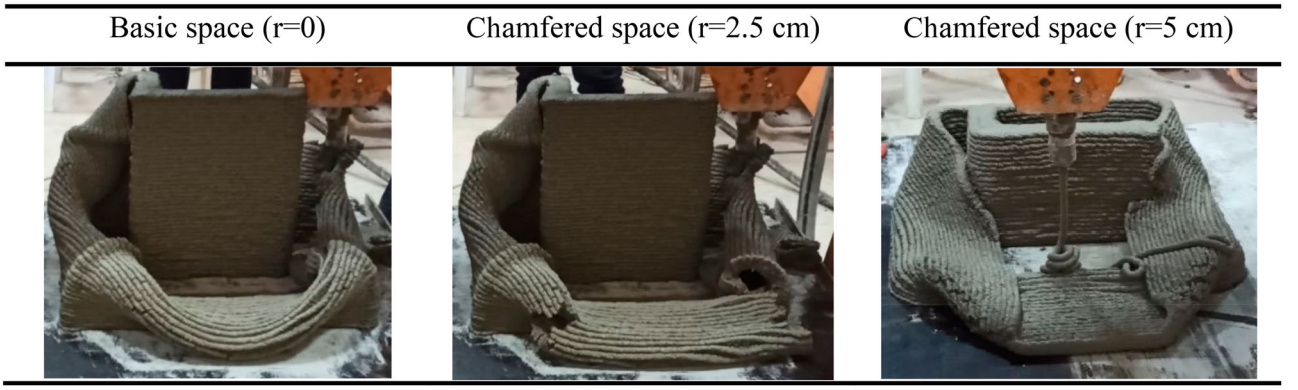



**Figure 7.** Collapse views of basic and chamfered space designs.

midpoint accelerates the transition towards circularity. The purpose of comparing these forms is to examine to what extent the printing parameters change as we move towards circularity. During the printing processes, square, hexagon, and octagon forms were collapsed. The hexagon and octagon form collapses towards the centre of gravity due to its central geometry. Although the square is a central form, two sides are collapsed towards the centre of gravity and two sides are collapsed opposite the centre of gravity. Hexagon showed the best performance in printing time, octagon in material usage, octagon in collapse height and octagon in the number of layers. In geometric forms;

- In printing time, the hexagon provided a 20.5% advantage over the square and 2.22% advantage over the octagon on a single layer.
- In material usage, octagon geometry on a single layer saved 10.46% compared to square and 2.13% compared to hexagon.
- In terms of collapse height and number of layers, the octagon reached a 31.11% higher position than the square and 26.67% higher than the hexagon.

Comparisons were also made between the basic forms and their designs consisting of chamfered wall combinations. In this regard, square-chamfered square, rectangle-chamfered rectangle, hexagon-chamfered hexagon, octagon-chamfered octagon geometries were discussed. In terms of softening corner turns, the outputs also vary. During the printing processes, the architectural designs of the basic forms were completely collapsed, while only the rectangle form was collapsed in the chamfered designs. Chamfered designs of square, hexagon and octagon geometries have reached the maximum height that the 3D printer can print (Figure 8).

Looking at the square, rectangle, hexagon, and octagon forms and the chamfered designs of these forms, chamfered octagon showed the best performance in printing time, chamfered hexagon in material usage, chamfered square, chamfered hexagon, and chamfered octagon because it did not collapse at collapse height, and chamfered square, chamfered hexagon, and chamfered octagon in the number of layers. As a result, it has been observed that chamfered forms generally perform better in terms of buildability than basic forms. Among the chamfered forms, it was determined that hexagon and octagon forms showed very similar behaviour and were at the forefront compared to other forms. Among geometric forms;

- In printing time, the chamfered octagon on a single layer provided a 2% advantage over the chamfered hexagon, which performed closest to this form, and a 23.6% advantage over the rectangle, which performed the furthest from this form.
- In material usage, the chamfered hexagon on a single layer saved 0.1% compared to the chamfered octagon, which performed closest to this form, and 14.25% compared to the rectangle, which performed the furthest from this form.
- In terms of collapse height and number of layers, chamfered square, chamfered hexagon, and chamfered octagon, since they did not collapse, reached a 21.25% higher position than the octagon, which performed closest to these forms, and 49.25% higher than the rectangle, which performed the farthest from these forms.

## 4. Discussions

By comparing the results obtained from 3DCP processes consisting of 2 different stages, inferences regarding the research gap in the literature are presented. According to the parameters that play an active role in 3DCP, buildability, cost and mass producibility parameters include and consist of other evaluation criteria (Figure 9). For this reason, in order for the evaluation to be effective, these parameters are given at the end of the discussion section.

Building evaluation parameters obtained from academic studies in the literature include comparative analyses of design decisions that are changed in a controlled manner in buildings with the same architectural plan and similar square metres. Data on the output products of architectural designs printed at 1/10 and 1/25 scales are shown in Table 4. Cost and mass producibility parameters were reached by developing a scoring system. The total cost analysis was conducted by considering both energy consumption and material usage during printing process for single layer. The total cost score was obtained from Table 7. Mass producibility score was obtained from the sum of printing time, material usage, collapse height, and cost.

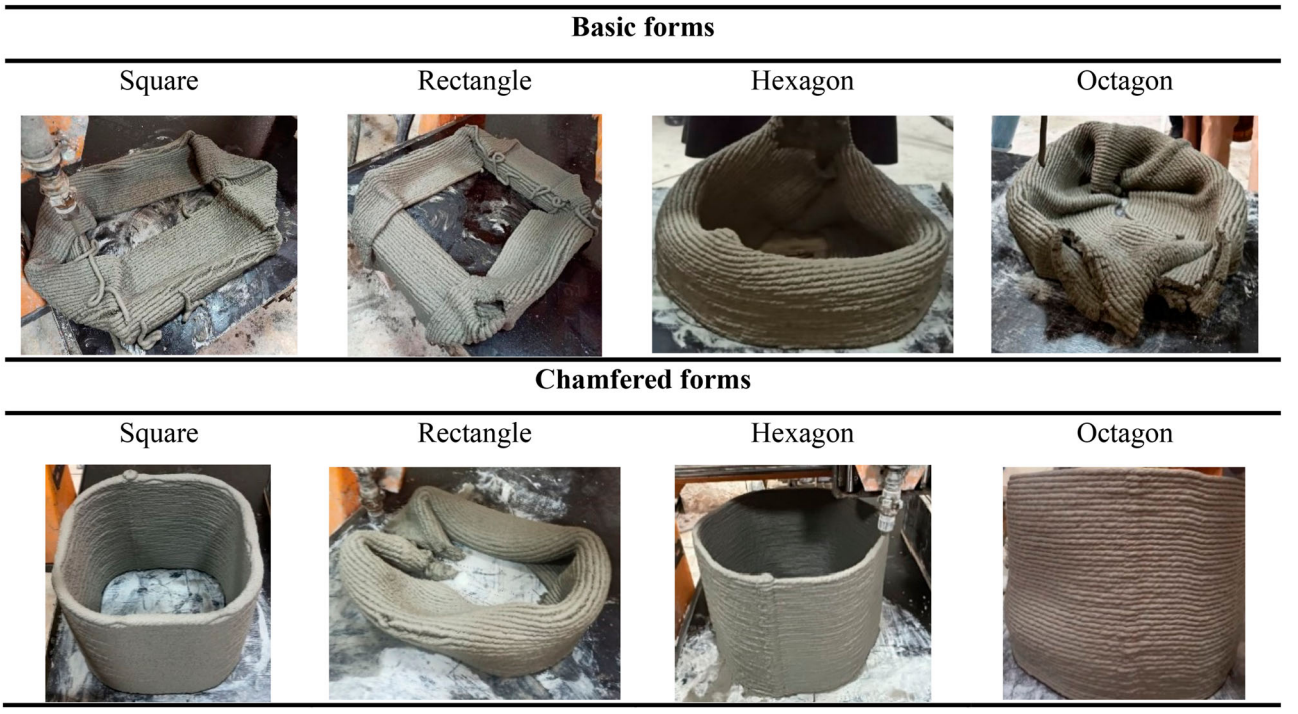



**Figure 8.** Collapsed views of basic forms and chamfered designs and non-collapsible geometries.

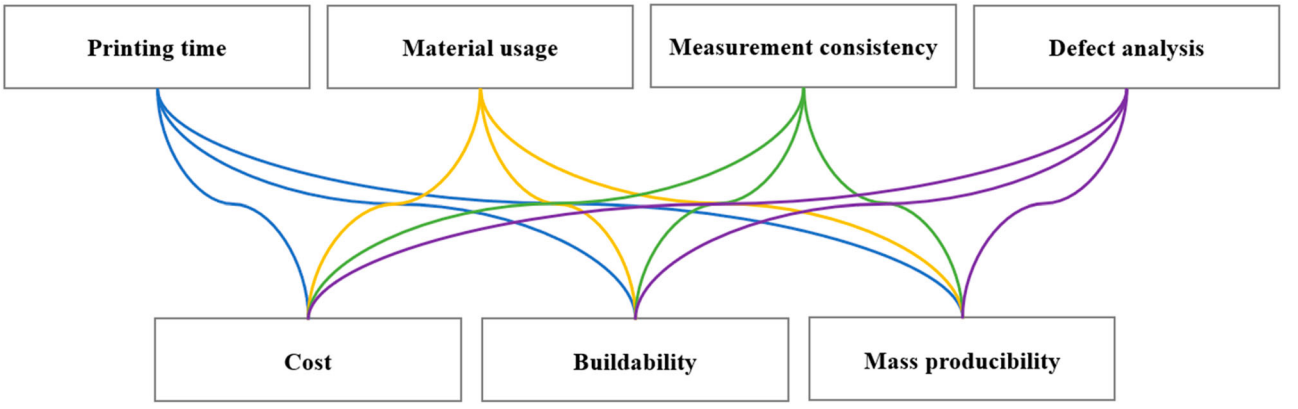



**Figure 9.** Parameters examined in the comparison of scale prototypes produced with 3DCP.

### 4.1. Printing time

Within the scope of the numerical data in Table 4, when evaluations are made in terms of printing times in both printing stages;

- It has been observed that the layer heights of chamfered forms increase compared to basic forms. This has shown that chamfered forms have more buildable heights. In both printing stages, the layer heights of the chamfered designs are higher than the basic designs.
- It has been determined that as the movement area of the nozzle head expands, the printing time increases. It has been observed that when the orientation is made towards circularity, the printing time is shortened. Additionally, it has been determined that steep turns (sharp turns) affect printing time.
- In the first printing stage, in the space plans where the effect of corner-wall combinations on 3DCP was measured, it was observed that the printing time decreased as the radius chamfer increased at the combinations points. In this context, the chamfered space ($r = 5$ cm) has the best performance.
- In the second printing stage, it was observed that the chamfered octagon showed the best performance among the architectural forms, reaching the maximum height in the shortest time. Chamfered hexagon and chamfered square come after this form and showed similar performance characteristics.

Evaluations have shown that corner-wall combinations and geometric forms affect structural performance during printing time.

### 4.2. Material usage

It has been observed that the weight and perimeter length of geometric forms increase in direct proportion, but deviations

**Table 4.** Printing data of architectural designs.

| First stage; corner-wall combinations | | | |
|---|---|---|---|
| Space | Basic space (r = 0) | Chamfered space (r = 2,5 cm) | Chamfered space (r = 5 cm) |
| Printing time (single layer) (second) | 35.1 (1) | 33 (2) | 30.8 (3) |
| Material usage (single layer) (gram) | 576.33 (1) | 558.59 (2) | 547.03 (3) |
| Collapse height (mm) | 280 (3) | 245 (2) | 168 (1) |
| Total cost score | 1 | 2 | 3 |
| Total mass producibility score | 6 | 8 | 10 |

| Second stage; geometric architectural forms | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Geometric form | Square | Chamfered square | Rectangle | Chamfered rectangle | Hexagon | Chamfered hexagon | Octagon | Chamfered octagon |
| Printing time (single layer) (second) | 24.35 (2) | 20.1 (6) | 25 (1) | 20.3 (4) | 20.2 (5) | 19.5 (7) | 20.65 (3) | 19.1 (8) |
| Material usage (single layer) (gram) | 417.19 (2) | 374.18 (6) | 430.1 (1) | 382.79 (4) | 385.74 (3) | 368.81 (8) | 377.68 (5) | 369.35 (7) |
| Collapse height (mm) | 217 (2) | 400 (6) | 203 (1) | 294 (4) | 231 (3) | 400 (6) | 315 (5) | 400 (6) |
| Total cost score | 2 | 6 | 1 | 4 | 3 | 8 | 5 | 7 |
| Total mass producibility score | 8 | 24 | 4 | 16 | 14 | 29 | 18 | 28 |

have been observed due to physical changes during printing (thinning-thickening of the printing filaments, accumulations in the corners). These deviations occurred at points where the nozzle's movement area was restricted or slowed down. This situation also negatively affects the 3DCP process. Irregular layer thicknesses in prototype products indicate that building construction will also be disrupted. For this reason, the 3D printer-material-geometric design combination needs to work in coordination. When total weights are evaluated in prototype printing of geometric forms;

- In the first printing, 2% was saved in the chamfered space (r = 5 cm), which showed the best performance on a single layer in terms of material usage, compared to the chamfered space (r = 2.5 cm) that performed closest to this form. Compared to the basic space (r = 0) that performs furthest from this form, 5% was saved.
- In the second printing, the chamfered hexagon, which showed the best performance on a single layer in terms of material usage, saved 0.14% compared to the chamfered octagon, which performed closest to this form, and 16.61% compared to the rectangle, which performed the furthest from this form.

According to data obtained with 3DCP;

- It has been observed that basic geometries are heavier than chamfered geometries. The reason for this is that the nozzle accelerates at chamfered corners and continues the printing path without material accumulation. This shows that basic geometries require a greater amount of material usage. The extrusion-fluidity of the material and the pumpability performance of the 3D printer system also affected whether the filaments formed uniform layers. The movement of the nozzle without material accumulation and deviations at the points where circularity is effective shows that it is advantageous for the rotations to be circular in wall joints. The positive effect of circularity in prototype products indicates that circularity can also be emphasized in large-scale architectural structures.

### 4.3. Buildability

Buildability with 3DCP enables different architectural designs to be adapted to real life (Huang, Xu, and Li 2022; Nguyen-Van et al. 2023). The focus is on the parameters of corner problems, cracks, collapse, inter-layer deflection amounts, and the height being different in each geometry due to collapse in the layers. The focus is on possible problems encountered in the 3DCP process and the causes of material accumulation. No significant collapse or cracking was observed due to the extrudability and other mechanical properties of the material. In this regard, no parameter has been found where the height is different in each geometry due to collapse in the layers. When prototype products were evaluated, it was determined that the concrete material was at a sufficient constructability level for 3DCP.

It has been observed that there are corner problems and interlayer deviations (overlap problem) in the 3DCP output products of space plans (first printing) and geometric forms (second printing) (Table 5). Material accumulations were detected in the basic forms of square, rectangle, hexagon, and octagon. According to printing processes;

- In space planning, material accumulation occurred at points where the axis of the basic space design (r = 0) changed. This situation arises from the position of the 3DCP architectural product in the coordinate plane (x, y, and z axes), the kinematic properties of the 3D printer system and the rheological characteristics of the material. Changing the coordinate plane in vertical turns (such as transition from x axis to y axis) resulted in the nozzle changing direction by waiting. For this reason, it has been observed that circular rotations have a positive kinematic effect in architectural design-3D printer collaboration.

**Table 5.** Buildability of architectural designs (corner problems and interlayer deviations are highlighted).

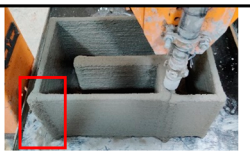
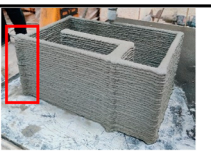
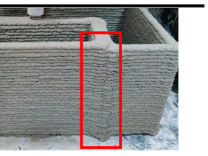
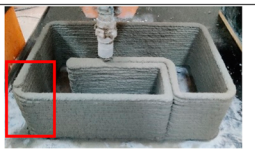
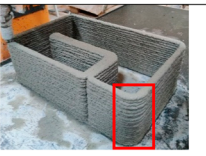
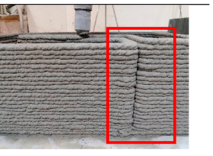
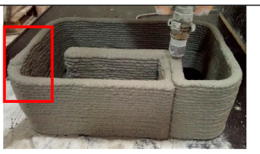
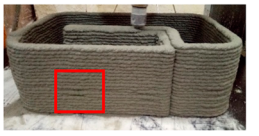
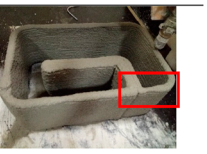
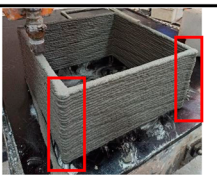
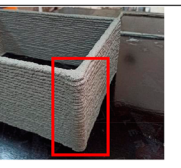
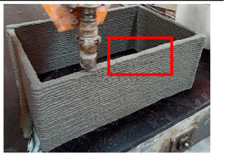
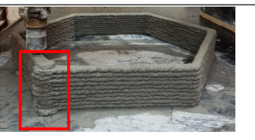
| | | | |
|---|---|---|---|
| **First stage; corner-wall combinations** | | | |
| Basic space (r=0) |  |  |  |
| Chamfered Ch[illegible]ace (r=2.5 cm) |  |  |  |
| Chamfered space (r=5 cm) |  |  |  |
| **Second stage; geometric architectural forms** | | | |
| Square |  |  |  |
| Chamfered square |  |  |  |
| Rectangle |  |  |  |
| Chamfered rectangle |  |  |  |
| Hexagon |  |  |  |
| Chamfered hexagon |  |  |  |
| Octagon |  |  |  |
| Chamfered octagon |  |  |  |

**Table 6.** Dimensions and measurement values of prototypes.

| First stage; corner-wall combinations | | | |
|---|---|---|---|
| Space | Basic space (r = 0) | Chamfered space (r = 2.5 cm) | Chamfered space (r = 5 cm) |
| Circumference (mm) | 2144 | 2078 | 2035 |
| Number of layers | 40 | 35 | 24 |
| Printing time on the last layer reached (minute-second) | 23 min 19 s | 20 min 56 s | 12 min 20 s |

| Second stage; geometric architectural forms | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Geometric form | Square | Chamfered square | Rectangle | Chamfered rectangle | Hexagon | Chamfered hexagon | Octagon | Chamfered octagon |
| Circumference (mm) | 1552 | 1392 | 1600 | 1424 | 1435 | 1372 | 1405 | 1374 |
| Number of layers | 31 | 47 | 29 | 42 | 33 | 47 | 45 | 47 |
| Printing time in digital planning (hour-minute) | 52 h 28 min | 50 h 20 min | 52 h 53 min | 50 h 31 min | 50 h 24 min | 49 h 56 min | 50 h 8 min | 49 h 46 min |
| Printing time on the last layer reached (minute-second) | 12 min 29 s | 11 min 25 s | 12 min 55 s | 12 min 32 s | 11 min 36 s | 11 min 15 s | 10 min 58 s | 10 min 24 s |

**Table 7.** Total cost and cost scores of the 3DCP prototypes according to printing times and material utilization in the context of single-layer.

| First stage; corner-wall combinations | | | |
|---|---|---|---|
| Space | Basic space (r = 0) | Chamfered space (r = 2,5 cm) | Chamfered space (r = 5 cm) |
| Printing time (single layer) (second) | 35.1 | 33 | 30.8 |
| Material usage (single layer) (gram) | 576.33 | 558.59 | 547.03 |
| Total cost (single layer) (US $) | 0.2911 | 0.2821 | 0.2753 |
| Total cost score | 1 | 2 | 3 |

| Second stage; geometric architectural forms | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Geometric form | Square | Chamfered square | Rectangle | Chamfered rectangle | Hexagon | Chamfered hexagon | Octagon | Chamfered octagon |
| Printing time (single layer) (second) | 24.35 | 20.1 | 25 | 20.3 | 20.2 | 19.5 | 20.65 | 19.1 |
| Material usage (single layer) (gram) | 417.19 | 374.18 | 430.1 | 382.79 | 385.74 | 368.81 | 377.68 | 369.35 |
| Total cost (single layer) (US $) | 0.2106 | 0.1888 | 0.2171 | 0.1931 | 0.1945 | 0.1860 | 0.1906 | 0.1863 |
| Total cost score | 2 | 6 | 1 | 4 | 3 | 8 | 5 | 7 |

- It has been observed that the circular nozzle slows down and material accumulates at corner joints due to angle or axis changes.
- Material accumulations were detected at the transition points to the upper layer in geometries such as chamfered square, rectangle, hexagon, and octagon.

It has been observed that layers often overlap in 3DCP products. It has been determined that the maximum amount of deviation between layers is 3 mm. While the layer width should be 10 mm under normal conditions, layer widths varying between 10–13 mm have been observed depending on this amount of deviation.

### 4.4. Defect analysis

The buildability of the material has been questioned along the exterior walls of geometric architectural designs. The fact that there are prototypes reaching a height of 40 centimetres shows the usability of the material for future studies. In the 3DCP of a prototype, the 3D printer operated continuously and the setting status of the material was observed. At this point, it was observed that the fluidity level of the material did not change and the adherence between the layers was achieved.

As seen in Table 4, in terms of printing heights, chamfered designs of square, rectangle, hexagon and octagon geometries were found to be more advantageous than basic designs. In this regard, it has been observed that as the circularity increases, the printable height increases, provided that the concrete material provides sufficient fluidity and bond strength. While material accumulation was observed in basic geometries due to the effect of the nozzle, it was not observed in chamfered turns. The results were made to detect possible defects encountered in the 3DCP process and the durability of geometric forms. Increasing the number of layers of geometric forms can affect the amount of collapse. The data obtained provided a road map for optimizing the 3DCP process and idealizing geometric designs.

### 4.5. Measurement consistency

Measurement consistency refers to the accuracy between digital planning and 3DCP final product regarding dimensioning. Digital/3DCP compatibility was checked as a result of taking G-code data with slicing programmes of the models designed through architectural modelling programmes and software integrated with 3D printers. Measurements and parameters of 3DCP prototypes are shown in Table 6. The extrudability of the concrete material flowing through the printer's nozzle has shown that there is consistency in the dimensions of the input-output products of the designs. In digital planning, arrangements were made according to the actual printing (1/1) with the Ultimaker Cura programme, and the printing time resulting from the digital analysis is given in Table 6. In the experimental 3DCP process, it was determined that the printing time of prototypes and digital planning was directly proportional. According to material use,

53.837 tons of material were used in the chamfered hexagon in digital planning and it provided advantages over other architectural designs. The fact that chamfered hexagon showed the best performance in material usage in 3DCP showed the stability between digital planning and 3DCP. This validates measurement consistency.

### 4.6. Cost

Cost provides input for determining economical architectural design, feasibility and mass production. The total cost analysis was conducted by considering both energy consumption and material usage during printing process for single layer. The energy consumption cost was calculated based on the power ratings of the individual components in the 3D-printing system – including the pump (1800 W), CNC router (320 W), and PC (80 W)-multiplied by the printing duration for single layer and the unit cost of electricity. The electricity rate was considered as ~0.14 US $ per kWh. For material costs, the unit price of the material (0.5 US $ per kg) was multiplied by the amount of material used per layer. Finally, the total cost was determined by combining the energy consumption cost and material usage cost,

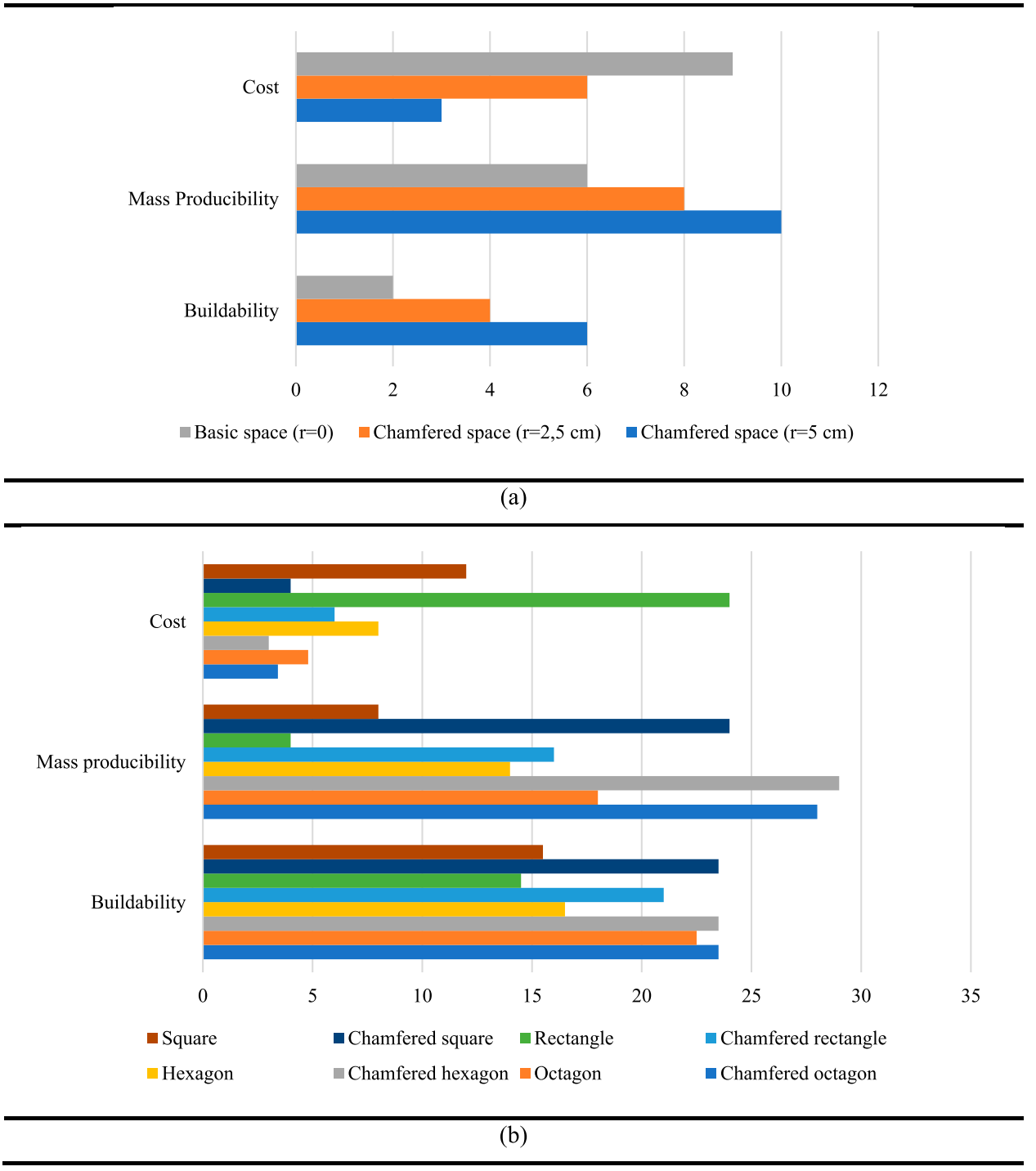



**Figure 10.** 3DCP results; (a) corner-wall combinations, (b) geometric architectural forms.

enabling a comprehensive comparison of operational expenses. At this point, the cost scores and economic levels of the designs were revealed (Table 7).

### 4.7. Mass producibility

The mass producibility is a combination of other building evaluation parameters. Based on the outputs obtained from printing time, material usage, buildability, defect analysis, and cost parameters, the best system was highlighted. Determining the mass production potential of the prototype product is critical to predicting future construction potential. In this context, effective results can be achieved by optimizing quality standards, cost and production efficiency activities.

As a result of the data, according to mass producibility scoring;

- In the first printing, the chamfered space (r = 5 cm) showed the best performance based on the total of evaluation parameters. It has been observed that chamfered corner turns and wall combinations provide advantages at many points compared to the basic space. In this regard, it can be said that chamfered joint details offer effective solutions in building production using 3D printers.
- In the second printing, chamfered hexagon and chamfered octagon showed the best performance in the total of evaluation parameters. Based on the data, chamfered hexagon and chamfered octagon geometries were found to be the best architectural plans for building production with the 3DCP construction method.

In the prototypes produced as a result of 3DCP, it was emphasized that structural and architectural design decisions are of critical importance. Designs with the highest values according to cost, mass producibility, and buildability scores showed the best performance (Figure 10). With the analysis, it was seen that space formations and geometric forms should be handled effectively in architectural design planning. The 3DCP steps laid out in the building construction process not only provide guidance on architectural design, but also serve as a reference for multidisciplinary decision-making processes.

## 5. Conclusions

As the aim and method of the study, 3DCP prototypes based on architecturally different corner-wall combinations and geometric forms were produced and evaluations were made with building evaluation parameters. Within the scope of the study, experiments were conducted on concrete building materials and a cement-based mixture was obtained. Traditional concrete mix design is not a mix design that is valid for production with 3DCP, and different characteristics are focused on to develop a printable building material that provides optimum conditions. These characteristics include extrusion (pumping) ability, multilayer constructability, open time, and adequate interlayer bond strength. The developed concrete material was analyzed in a laboratory environment on architectural designs planned with computer-aided modelling.

An analysis of architectural design decisions was conducted and a two-stage 3DCP planning was made. In the first stage, in line with the first research question stated in the methodology, the corner-wall combinations of the same architectural design were tested and the effectiveness of these decisions in 3DCP was examined. As a result of the analyses, the chamfered space (r = 5 cm) showed optimum behaviour. Chamfered space (r = 5 cm) was the most advantageous in terms of buildability and mass producibility. In the second stage, in line with the second research question stated in the methodology, architectural plan alternatives were developed and spaces were created by designing geometric forms in the same square metres. The design process included geometric arrangements and optimization of spaces used in architectural designs. In terms of cost, the octagon is the most suitable geometric form, followed by the hexagon, square, and rectangle. In terms of mass producibility, the octagon is at the forefront, followed by the hexagon, square, and rectangle.

3DCP technology has been used as a tool to evaluate various aspects of design and fabrication. In the implementation of a building, the chamfered octagonal geometry has come to the fore as a housing design that is constructible, affordable, fast solutions can be obtained and suitable for mass production. With 3DCP analyses using different forms, a housing solution that is suitable for prototyping and can be printed quickly for emergency situations has been achieved. It has been observed that hexagon and octagon geometric forms approaching circularity show ideal results. All the data obtained indicate that a residential structure created by the integration of chamfered octagonal architectural planning and chamfered corner-wall combinations will show optimum behaviour. In future studies, research will be conducted from lab-scale to large-scale in the 3DCP system, in light with the data obtained from the building evaluation parameters.

## Disclosure statement

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to ethical considerations governing this research.

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# SUSTAINABLE BUILDING TECHNOLOGY EVALUATION WITH THE FUZZY AHP METHOD IN 3D CONCRETE PRINTED BUILDING PRODUCTION

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## ABSTRACT

There are many parameters that affect the design, construction and performance of the 3D concrete printing (3DCP) construction process. The aim of this study is to identify and categorize those parameters that are effective in this process, to explain the prominent parameters because of the analysis, and to detail the 3DCP process and how it can be optimized. Therefore, this study optimizes the 3DCP process, which is an important sustainable construction technique. The information obtained from existing research identifies the effective parameters in 3DCP. These parameters were evaluated using the fuzzy AHP method by taking expert opinions. The prominent parameters are explained, and their importance is emphasized. As a result of the analysis, it is determined that material properties are the most important input in the process according to their importance/weight and their criterion level.

## KEYWORDS

Sustainability, 3DCP process, Fuzzy AHP, 3D printed structure, 3D printer, Optimization

## 1. INTRODUCTION

3D printing (3DP) technology (additive manufacturing) is a digital fabrication tool that deals with the process of transforming a geometric representation into a physical object by adding material on top of each other (Shahrubudin et al., 2019). 3D products can be obtained as a result of the integration of the computer-aided design model with software suitable for 3DP. With nanotechnological advances in materials science, 3DP technology has rapidly advanced.

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3D products can be made with polylactic acid (PLA) (Ferreira et al., 2017), metal and its alloys (Nichols, 2019), ceramic, clay-based mixtures (Chan et al., 2020; Chen et al., 2019), and cement-based mixtures (concrete) (Buswell et al., 2018). It is possible to see the effects of 3DP technology in health (Chen et al., 2020), agriculture (Crisostomo et al., 2021), automotive (Chinthavali, 2016), aviation (Koca et al., 2023), and similar industries. Developments in these industries have accelerated the mass production of 3DP products.

The construction sector is one of these sectors. Although production is slower compared to other industries with mass production, significant developments have been seen in recent years (Ali et al., 2022). Environmentally friendly and sustainable approaches, which are prominent in many sectors today, are also reflected in the construction sector, and 3DCP technology has an important place in this direction (Raza and Zhong, 2022). This technology offers a faster, more efficient and more economical construction process compared to traditional methods (Liu et al., 2022). In addition, 3DCP technology has made it possible to build more complex and aesthetic structures (Hunde and Woldeyohanne, 2022). Many companies and architectural offices operate in the construction industry and have made advances in construction techniques that employ 3DCP. Parameters such as materials, robotic systems, cost and labor force increasingly provide quality products and structural integrity (Žujović et al., 2022) of 3DCP constructions. Concrete construction material is at the forefront in the building production process. Based on the chemical and physical properties of concrete building material, it can be shaped due to its adaptability to 3DCP technology (Rollakanti and Prasad, 2022).

The number of academic studies contributing to developing 3DCP technology is increasing. 3DCP technology is now being evaluated in the fields of construction, performance and design (Gebel et al., 2023). Academic studies focusing on construction (Nguyen-Van et al., 2022) performance (Bai et al., 2023), and design (Bi et al., 2022) parameters accelerate the building production process using 3DCP. In addition, experimental studies on materials (physical and mechanical properties) also contribute to the durability and aesthetics of structures (Cui et al., 2022). The cumulative research on 3DCP for construction has advanced to the point where we can now indentify prominent criteria for the evaluation of effective parameters in the production of 3D concrete buildings.

Yang *et al.* (2023) reviewed 70 studies to show how nozzle design affects constructability. As a result, it was determined that nozzle travel speed, nozzle size, shape, and nozzle distance from the structure have the highest potential impact on printability. Tay *et al.* (2022) addressed the adaptive use of 3DP technology according to the variable physical properties of concrete building material. An approach was developed to create a functional concrete material by integrating printing parameters with filament property correlations in the material. It was found that the physical property of the concrete material is linked to the printer's flow rate and movement speed. With the optimized material, the strength-to-weight ratio of the structure improved by about 50%. Yuan *et al.* (2022) developed a real-time tool path planning and extrusion control mechanism. Material requirements, extrusion system and real-time control algorithm are discussed. An experiment was conducted to verify the stability of the algorithms and the control system. The results showed that the control system can be used in the building manufacturing process. Xu *et al.* (2022) showed that the production of a 3D concrete building is still in the development stage, suggesting the need for a workflow from design to construction. This workflow includes multidisciplinary studies such as design strategies, planning of the building site including the development of printing systems, material design and structural assessment. They emphasized the need to select appropriate materials and printers and construction methods to

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produce building components for large-scale concrete printing. In the study by Heywood and Nicholas (2023), it was stated that 3DCP technology reduces the need for formwork, optimizes the use of materials and produces complex geometries without additional costs, making it a sustainable construction technology. However, it was emphasized that 3DCP needs more evaluation tools to measure its environmental impact.

Although studies have identified and developed parameters in the 3DP process, there has not been a comprehensive study in which all parameters are evaluated. Recognizing this research gap in the literature, this study aims to identify the effective parameters in the 3DP process and then evaluate these parameters with a multi-criteria decision-making method. Another aim of the study is to contribute to the development of the 3DP process for future studies and to make this technology more efficient in the construction industry. The method of the study is to make evaluations in the light of the data obtained from the literature by conducting interviews with architects and engineers who are competent in their fields. Firstly, within the framework of the interviews with academicians, information about the parameters that may be effective in the 3DCP process was collected and various parameters that are effective in the 3DCP were determined by reviewing the literature and previous studies. In order to determine which of these parameters are effective in the 3DP process, Fuzzy AHP method was used in multi-criteria decision-making (MCDM) methods. This study will increase the quality and efficiency of 3DCP construction methods, products and structures by focusing on these prominent 3DCP parameters. This study will also offer direction for future research.

## 2. METHODOLOGY

Within the scope of this study, MCDM method was used in line with the objective of "determining and comparing the importance ranking of the factors that are effective in the process of printing a sustainable 3DCP." Decision-making is a process in which alternatives are evaluated to select a choice or course of action to achieve desired goals and objectives. This process starts with first recognizing and defining the problem. These problems are based on multiple criteria and some of the criteria that will affect the decision may conflict with each other (Wu and Abdul-Nour, 2020; Penadés-Plà et al., 2016).

This study's main problem is determining the effective parameters in the 3D concrete building production process and explaining the prominent parameters among these parameters. The 3DCP process, which is an innovative technology, shows that a series of interconnected parameters affect the results (Yang et al., 2023; Tay et al., 2022; Huang et al., 2022; Yuan et al., 2022; Xu et al., 2022). This study, then, becomes a multi-criteria decision-making problem using different aspects in this context. Evaluating and optimizing different parameters together has the potential to increase the efficiency and results of the 3DCP process. The steps followed in this study are given in Figure 1.

### *2.1 Determination of Design Criteria through Problem Structuring and Content Analysis*

The first phase of the methodology was carried out through content analysis (Table 1) and interviews with subject matter experts. Simultaneously, the printers and equipment that influence the printing process were also analyzed (Figure 2). The building production process encompasses many sub-processes, including concrete material mixing, integration into the printer via a pump and the actual printing of the final product. To optimize the printing process with a holistic



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**FIGURE 1.** Methodological framework and steps.

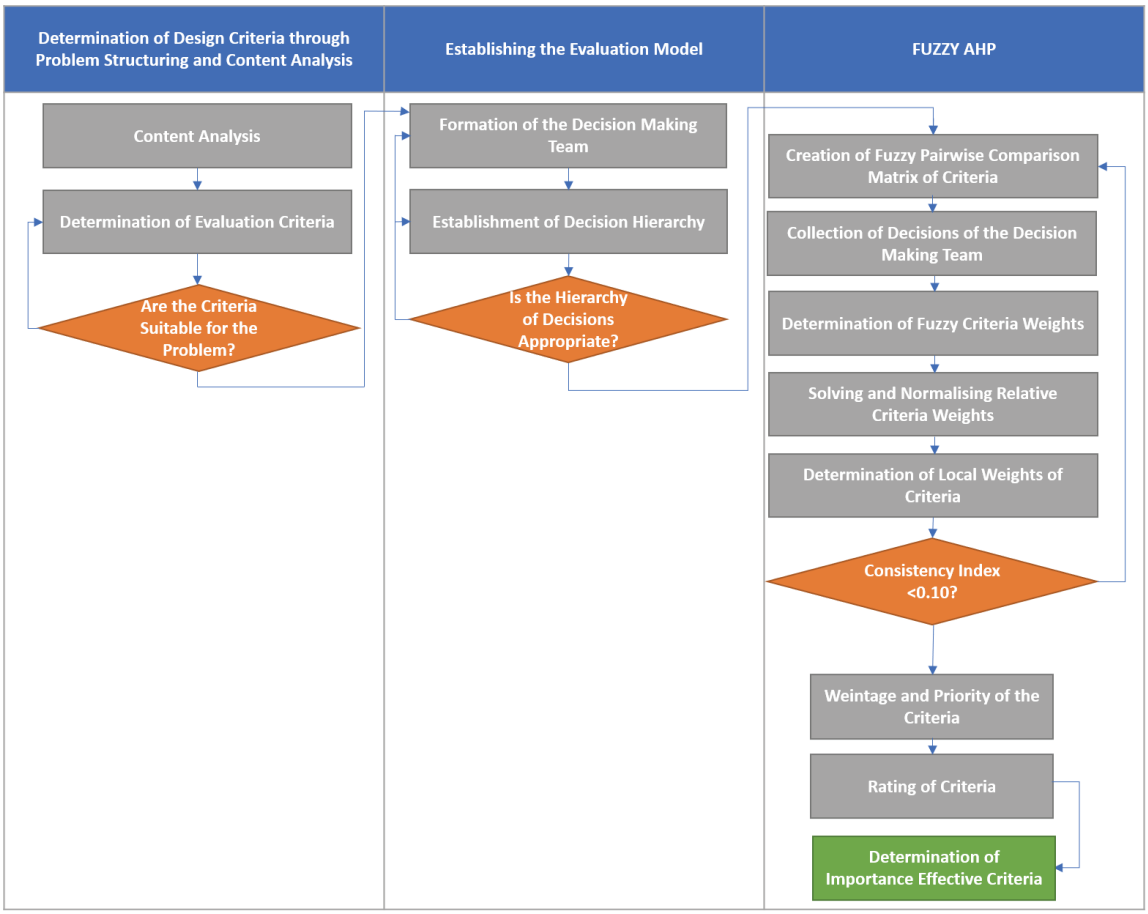
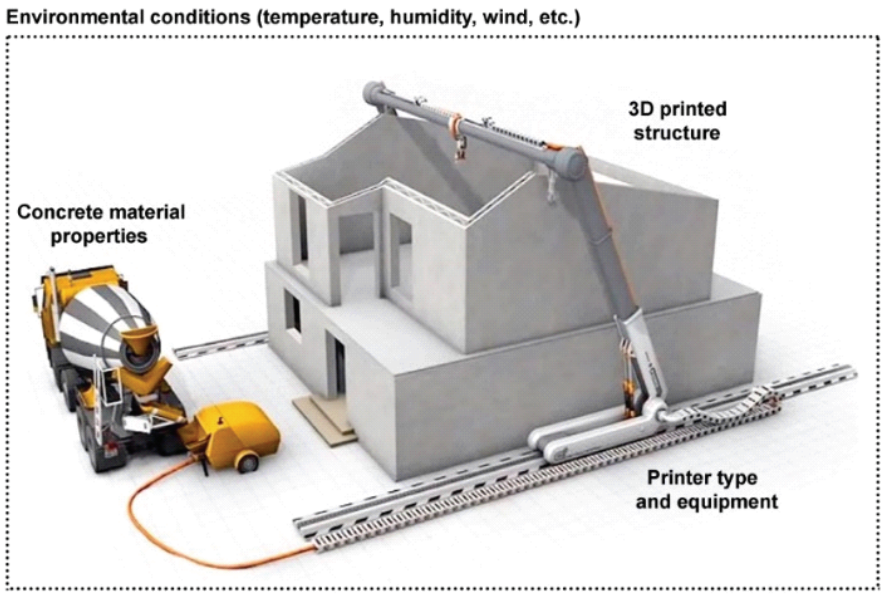



**FIGURE 2.** Parameters that are effective in the 3DCP process.

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approach, thus achieving an efficient production process, the effects of all parameters affecting the printing process were evaluated at this stage. As a result, we identified and described four main categories into which these parameters can be classified: printer, material, 3DP structure and environmental conditions.

First, the **printer feature parameter** is linked to the structural characteristics of the 3D printer. The change of printer types changes the efficiency, cost and construction process of the printing process. At this point, the printer's feature is important in the 3DP process. Structural characteristics include factors such as printer on-time, nozzle size and motion control, as well as hardware-related ones. The second is **the material property parameter**. It is related to the physical and mechanical properties of the material used in the 3DP. Mixing ratios vary depending on the material recipe. The use of different materials or different mixing ratios of the components in the same material is effective in the final 3D-printed product. In this context, material usage plays an important role in the printing phase. In this study, since concrete material will be printed with a 3D printer, properties such as the fluidity of the mixture and setting time were taken into consideration to evaluate the properties of concrete. Thirdly, the **properties of the final product produced with the 3D printer** is considered. In the final product, static and aesthetic factors are important, including factors such as the structure's geometry, size and complexity. Printer and material properties also change as the final product is printed from small-scale industrial products to large-scale structures. As the complexity of the product increases, complex approaches are adopted in the printer and material. Therefore, the final product is of critical importance in 3DP. Finally, the **environmental conditions parameter** includes various external factors affecting the 3DP, such as temperature, humidity, etc., that are relevant for the other parameters to work effectively. The wide-ranging effects of environmental factors must be considered in every printing process. A printing area should be created where the printer can work actively, and the material will not be affected by the physical environment. In this respect, the printing environment directly or indirectly impacts the final product. In order to make a clear assessment of each main category affecting the effectiveness of the 3DP production, literature studies affecting each parameter are given in Table 1.

***The open time*** in the **printer feature parameter** is the time that cement or similar materials can flow through the nozzle of the 3D printer without interruption and clogging (Jo et al., 2020). According to previous studies, the printing times of printers that can print small and large-scale products are different. During the time the machine is on, the hardware that makes up the printer heats up due to factors such as heat dissipation and friction. In this case, the structural tolerance of the printer decreases and deviations can be seen in the print path of the printer (Mueller et al., 2015). ***Nozzle characteristics*** include parameters such as the speed of movement of the nozzle, the size of the nozzle tip, and the nozzle's height. These are the factors that play a major role in structure production when printing cementitious materials. Nozzle characteristics are important to optimize print quality and make the printing process more efficient (Jo et al., 2020; Bos et al., 2016; Tay et al., 2016). ***Motion control*** determines the movement of the nozzle and how the material is layered to form the object to be 3D printed. Changing the motion characteristics can affect printing speed, angle, and distance. As the speed at which the nozzle moves increases, the printing speed can also increase. Similarly, changes in the ability to move in different axes can cause changes in printing angle and distance. Motion control ensures that printers operate accurately and ultimately improves production quality. In addition, it helps to manage printer motion more efficiently, improving energy efficiency (Zhao et al., 2019).



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**TABLE 1.** Evaluation criteria in the 3DP process.

| | Criteria | Reference | | Criteria | Reference |
|---|---|---|---|---|---|
| P. Printer Feature Parameters | P.1. Open Time | Jo et al., 2020<br>Mueller et al., 2015 | C. Characteristics Of The 3D Printed Structure | C.1. Wall Design | Gosselin et al., 2016<br>Khan et al., 2021<br>Martínez-Rocamora et al., 2020<br>Žujović et al., 2022 |
| | P.2. Nozzle Specifications | Bos et al., 2016<br>Jo et al., 2020<br>Lyu et al., 2021<br>Tay et al., 2016 | | C.2. Wall Joint | Lim, 2023<br>Marais et al., 2021<br>Suntharalingam et al., 2021<br>Wang et al., 2020 |
| | P.3. Motion Control | Bos et al., 2016<br>Lyu et al., 2021<br>Zhao et al., 2019 | E. Environmental Condition Parameters | E.1. Relative Humidity | Diggs-McGee et al., 2019<br>Ma *et al.*,2022<br>Moelich et al., 2022 |
| M. Material Feature Parameters | M.1. Filling Density | Lyu et al., 2021<br>Qaidi et al., 2022<br>Ćwikła et al., 2017<br>Gosselin et al., 2016<br>Karalia et al., 2021 | | E.2. Temperature | Diggs-McGee et al., 2019<br>Ma *et al.*,2022 |
| | M.2. Extrudability | Malaeb et al., 2019 | | E.3. Wind | Ma *et al.*,2022<br>Moelich et al., 2022 |
| | M.3. Setting Time | Gunzel, 2021<br>Lyu et al., 2021<br>Özalp and Yilmaz, 2020 | | E.4. Radiation | Pacewicz et al., 2018<br>Siddika et al., 2020 |
| | | | | E.5. Chemical Material | Pacewicz et al., 2018<br>Siddika et al., 2020 |

**The material property parameter** is specific to concrete material and includes mix flowability, extrudability and setting time (Qaidi et al., 2022; Lyu et al., 2021; Gunzel, 2021; Özalp and Yilmaz, 2020; Malaeb et al., 2019; Bos et al., 2016). The ***flowability of the mixture*** is critical to ensure that the structure to be printed has the desired strength, durability and dimensional accuracy. The flowability of the mixture affects its ability to flow through the nozzle and the quality and accuracy of the printed structure (Qaidi et al., 2022). A mixture that is too thick or viscous can clog the nozzle, while a mixture that is too runny or watery can collapse or sag without hardening. ***Extrudability*** is the ability to continuously squeeze the concrete out of the nozzle and this property depends on the flowability. If the concrete is not fluid, it cannot be extruded, and if it cannot be extruded, the constructability mode cannot be achieved (Malaeb et al., 2019). ***Setting time*** is related to the strength gain of concrete. It should be fast and in



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accordance with the required stiffness to prevent deformation of the layers (Lyu et al., 2021; Gunzel, 2021; Özalp and Yilmaz, 2020). The parameters evaluated under this parameter are criteria that contribute to sustainability; sustainable concrete material should have low natural energy requirements, low waste, durability and high thermal mass to minimize their total environmental impact (Naik, 2007). Such concretes contribute to sustainability with low energy costs, high durability and low maintenance requirements.

**The parameters of the constructed structure** consist of wall design, filling denstiy and wall joint (Lim, 2023; Žujović et al., 2022; Karalia et al., 2021; Khan et al., 2021; Martínez-Rocamora et al., 2020; Ćwikła et al., 2017; Gosselin et al., 2016). In construction projects using 3D concrete printers, the design of the wall to be printed plays an important role in the printing process. In this process, the material properties, geometry and design of the wall type to be printed affect the print quality, durability and cost of the final product (Žujović et al., 2022; Khan et al., 2021; Martínez-Rocamora et al., 2020; Gosselin et al., 2016). ***Wall joints*** in 3D printing technology affect the strength, durability and overall performance of the structure (Marais et al., 2021; Suntharalingam et al., 2021; Wang et al., 2020). Form corner joints can be formed at different angles due to aesthetic, cost, durability and functional properties. Angled corner joints are generally simpler and less costly and increase the rigidity of the structure. It also provides an organic look in terms of visual appearance (Lim, 2023).

**The environmental conditions parameter** plays an active role in the 3DCP process. Humidity and temperature are among these factors (Wolfs et al., 2018). In outdoor printing processes, depending on temperature and humidity, the mixing ratios in the concrete material should be adjusted according to the printability and extrudability parameters (Diggs-McGee et al., 2019). Evaporation of moisture from pressurized concrete reduces the hydration of cement and affects the development of the mechanical properties of concrete. In addition, it has been observed that the concrete printing material is affected in the context of temperature and wind (Ma et al., 2022). Low humidity and high wind speed can increase evaporation from the surface of the concrete print (Moelich et al., 2022; Ma et al., 2022). Exposure to ultraviolet radiation and chemicals can also adversely affect the structure resulting from concrete printing. To prevent deterioration of the printed product's durability, environmental factors affecting the printing process should be carefully controlled (Siddika et al., 2020; Pacewicz et al., 2018).

### *2.2 Establishing the Evaluation Model*

The selected parameters were then weighted and compared by a panel of experts. The experts' opinions and experiences were crucial in determining the weights of the parameters and criteria. The Fuzzy AHP method was used to evaluate the proposed model. The weights of the predefined criteria were determined with the input of eight experts. These experts came together within the scope of a scientific project and are competent in the subject. These experts consist of two civil engineering academics with more than 10 years of professional experience, actively engaging with 3DP, and contributing to academic research. Furthermore, this expert group comprises four architectural academics who develop projects in 3DP. The remaining two experts are mechanical engineering professionals working in the industry and holding managerial roles within their respective firms. Pairwise comparison matrices were generated using responses from the experts. The Fuzzy AHP weighting method was used to build the model, as there are both quantitative and qualitative criteria in the decision problem. The aim is to obtain more accurate results by converting qualitative evaluations into quantitative ones.

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### 2.3 Fuzzy AHP

Fuzzy AHP is used in real world problems where observed values are often uncertain (Zhu 2022; Meixner et al., 2020; Meharie et al., 2019). Imprecise or uncertain data can be the result of unmeasurable, incomplete and unobtainable information. The scale used in creating the fuzzy pairwise comparison matrices used in the study is expressed in Table 2.

The fuzzy AHP method used in the study was applied in accordance with the following steps after defining the problem and determining the main and sub-criteria:

- For each pair of criteria, fuzzy pairwise comparisons were made between experts and fuzzy decision matrices were obtained as a result of these comparisons.
- For the fuzzy numbers obtained as a result of the comparisons, the fuzzy scale expressed in Table 1 was used.
- Fuzzy weights were calculated, and these weights were normalized.
- The consistency levels of the obtained fuzzy weights were checked.
- Global fuzzy preference rankings for each alternative were created by combining the weights and sub-criteria values.
- The obtained results are interpreted in detail to guide the decision-making process.

As a result, the decision-making process is supported based on the fuzzy preference rankings obtained using the fuzzy AHP method.

The parameters classified as headings and subheadings because of literature research and expert opinions are given in Figure 3. The fuzzy AHP method was used to determine and rank the importance weights of the categorized parameters. As a result of the applied Fuzzy AHP method and expert evaluations obtained, the relative importance weights of the parameters effective in the 3DCP process were established.

According to the hierarchy given in Figure 3, pairwise comparison matrices were created by the expert group using the linguistic values given in Table 2. The comparison matrix for evaluating the main criteria is given in Table 3 as linguistic data and their corresponding numbers.

**TABLE 2.** Linguistic variables (Huang et al., 2012).

| Code | Linguistic Variables | L | M | U |
|---|---|---|---|---|
| 1 | Equally important | 1 | 1 | 1 |
| 2 | Intermadiate value between 1 and 3 | 1 | 2 | 3 |
| 3 | Slightly important | 2 | 3 | 4 |
| 4 | Intermediate value between 3 and 5 | 3 | 4 | 5 |
| 5 | Important | 4 | 5 | 6 |
| 6 | Intermadiate value between 5 and 7 | 5 | 6 | 7 |
| 7 | Strongly important | 6 | 7 | 8 |
| 8 | Intermadiate value between 7 and 9 | 7 | 8 | 9 |
| 9 | Extremely Important | 9 | 9 | 9 |



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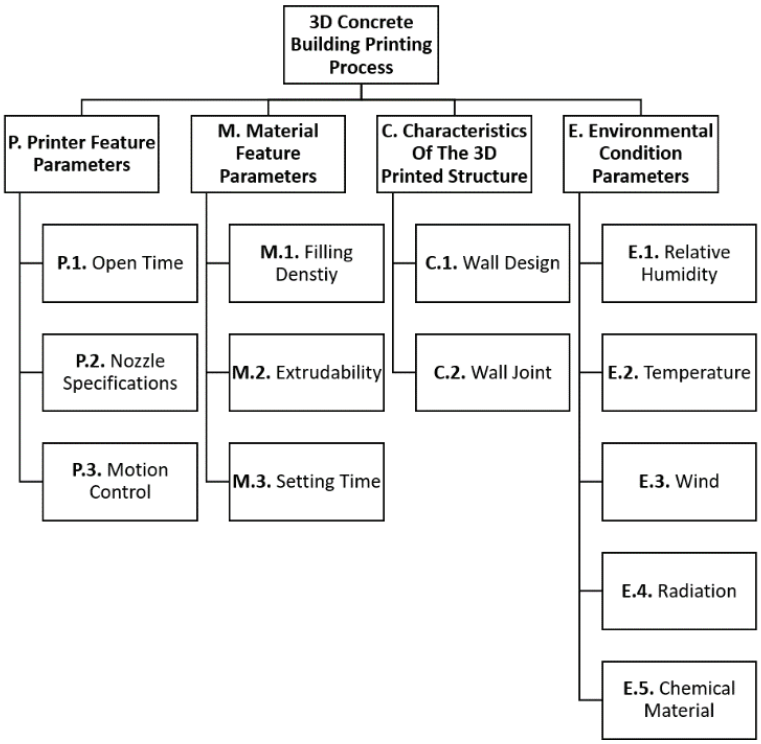
**FIGURE 3.** 3DCP process evaluation hierarchy.




The study's results enable the identification of the main criteria according to the significance/weight values at the criterion level. As a result of this evaluation, the main criteria ranked according to the criterion level were determined as material feature parameters (0.407164238), characteristics of the 3D printed structure parameters (0.308620265), printer feature parameters (0.211054974) and environmental conditions parameters (0.073160522).

The term "fuzzy weight" refers to the weight value calculated based on fuzzy logic. In this context, it is a metric that addresses uncertainties and aims to obtain precise results. While the fuzzy weight expresses the degree of importance of a particular criterion or alternative, fuzzy logic operations are used to calculate this value. The concept of "normalized" refers to the process of transforming data into a specific range or a standard scale. This step is performed to make data with different units comparable and improve the analysis processes. Normalisation of data helps calculations to produce more consistent and meaningful results.

**TABLE 3.** Pairwise comparison matrix.

| | P | | | M | | | C | | | E | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | 1 | 1 | 1 | ¼ | 1/3 | 1/2 | 1 | 1 | 1 | 2 | 3 | 4 |
| M | 2 | 3 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 4 | 5 | 6 |
| C | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 4 | 5 | 6 |
| E | 1/4 | 1/3 | 1/2 | 1/6 | 1/5 | 1/4 | 1/6 | 1/5 | 1/4 | 1 | 1 | 1 |



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After the comparative matrices for the main criteria were completed, the same steps were applied for the sub-criteria of the main criteria. Following the determination of the importance ranking of the main criteria, it was determined which sub-criteria were prioritised within these main criteria. Connections between the main criteria and sub-criteria were established by adopting a flow from general to specific. As a result of these connections, it was observed to what extent which feature is effective in the 3DCP. The sub-criteria weights and rankings are given in Table 4.

According to the significance/weights for the level of criteria shown in Table 4, the ranking of the sub-criteria are wall design (0.64385314), filling density (0.45364546), extrudability (0.45364546), wall joint (0.35614686) and motion control (0.30793335) in the top 5. These criteria are the most useful and decisive in solving or understanding a particular situation or problem. Firstly, **wall** design stands out as the criterion with the highest weight and constitutes a fundamental element for sustainable buildings. **Filling density** and **extrudability** rank second with equal weights, indicating that they are critical to the structural integrity and applicability of the material. **Wall jointing** is instrumental in joining the structural elements together and is an important criterion for durability and stability. Finally, **motion control ranks** fifth as an important factor for the safe production of the structure in the 3DP process.

Looking at the criteria at the end of the ranking, it is seen that the importance weights of the environmental characteristics sub-criteria temperature (0.2838975), wind (0.18032923), radiation (0.07334621) and chemicals (0.07334621) are low. This result implies that the effect

**TABLE 4.** Criteria weight rankings.

| Main Criteria | P. Printer Feature Parameters | | | | | M. Material Feature Parameters | | | C. Characteristics of the 3D Printed Structure | | E. Environmental Condition Parameters | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weight | 0.211054974 | | | | | 0.407164238 | | | 0.308620265 | | 0.073160522 | | | | |
| Sub Criteria | P.1. Open Time | P.2. Nozzle Specifications | | | P.3. Motion Control | M.1. Filling Density | M.2. Extrudability | M.3. Setting Time | C.1. Wall Design | C.2. Wall Joint | E.1. Relative Humidity | E.2. Temperature | E.3. Wind | E.4. Radiation | E.5. Chemical Material |
| | | 0.61295867 | | | | | | | | | | | | | |
| | | Movement Speed of The Nozzle | Size And Shape of The Nozzle Tip | Nozzle Height | | | | | | | | | | | |
| Weight | 0.17302848 | 0.2877 | 0.1941 | 0.1730 | 0.30793335 | 0.45364546 | 0.45364546 | 0.09270907 | 0.64385314 | 0.35614686 | 0.38908083 | 0.2838975 | 0.18032923 | 0.07334621 | 0.07334621 |
| **Ranking** | **10** | **6** | **8** | **10** | **5** | **2** | **2** | **11** | **1** | **4** | **3** | **7** | **9** | **12** | **12** |



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of such criteria on the overall results of the study is less, but relative humidity is effective in the building production process with a 3D concrete printer. The ranking of these criteria emphasizes which elements are prioritized in sustainable building design and which areas more attention and care should be paid. In this way, more informed and effective decisions can be made in designing and implementing sustainable concrete structures produced with 3DP.

## 3. DISCUSSION

According to the results obtained from the evaluations, it was concluded that material properties, which have the highest criterion weight among the main criteria, play a fundamental role in the production of 3D concrete buildings. As stated in the literature, the physical and mechanical properties of concrete have a direct impact on the durability of structures (Qaidi et al., 2022; Lyu et al., 2021; Karalia et al., 2021; Özalp and Yilmaz, 2020; Malaeb et al., 2019; Ćwikła et al., 2017; Gosselin et al., 2016). Fluidity of the mixture, extrudability and setting time criteria, which are sub-criteria of material properties, are decisive for the safety and quality of the design produced in 3D building production.

Following the material properties, the second most important criterion for criteria weight is the constructed structure. 3D concrete buildings are constructed in accordance with specific intended use and design requirements. In addition to being statically strong, the constructed structure is also important in terms of its comfort and aesthetics (Lim, 2023; Žujović et al., 2022; Suntharalingam et al., 2021; Khan et al., 2021; Marais et al., 2021; Wang et al., 2020). The features of the constructed building should be selected according to safe and functional spaces that meet the users' needs. Since the constructed building can be designed as a residence, hotel, office, etc., a separate planning and printing process should be planned for each function. Accordingly, the features of the building are at the center of the printing process.

Printer features, the third criterion in the evaluations, affect the precision of the production process and the quality of the results in 3D concrete building production. Printer features, which include open time, nozzle features and motion control elements, also vary in hardware and software according to the product applied (Lyu et al., 2021; Jo et al., 2020; Zhao et al., 2019; Tay et al., 2016; Bos et al., 2016; Mueller et al., 2015). To implement a 3D printed concrete structure, digital planning and simulations must be performed with the printer. Printer parameters are critical for the correct implementation of the design. The correct adjustment of printers ensures that the desired structural properties are obtained.

According to the parameters determined, environmental conditions are the least important. Environmental conditions vary according to the location of the product to be printed. Measures should be taken depending on whether the concrete product is constructed in an open, semi-open or closed environment (Ma et al., 2022; Moelich et al., 2022; Siddika et al., 2020; Diggs-McGee et al., 2019; Pacewicz et al., 2018). Sub-criteria such as the printer's printing speed and the material's setting feature are important at this point. In the criteria weight ranking made with the Fuzzy AHP method, it was concluded that it indirectly affects the building production process compared to other parameters in the 3D concrete building production. Figure 4 shows the prominent main criteria parameter.

The main features that affect the printing process are the sub-criteria that make up the main criteria. As a result of the findings in the sub-criteria, the wall design, which is the characteristic of the constructed structures, is most prominent based on criterion weight. Factors such as whether the wall is hollow, filled, reinforced or unreinforced change the cost, static stability



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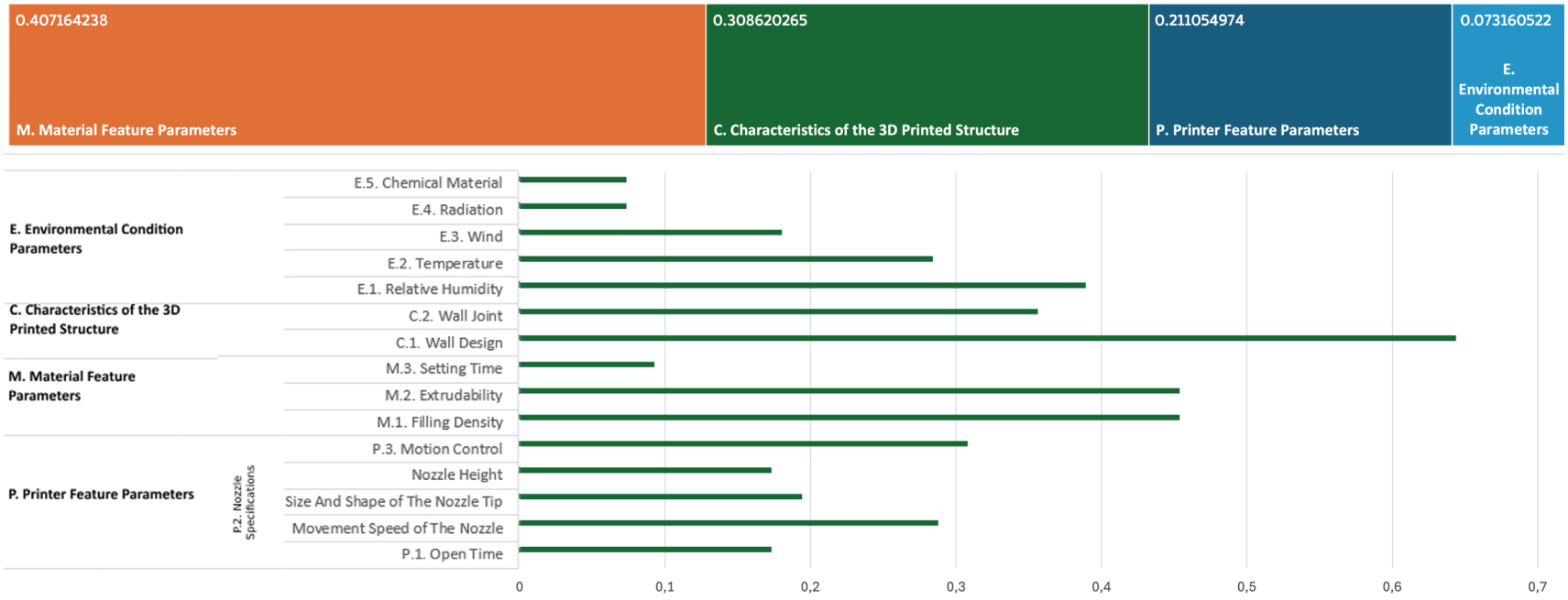
**FIGURE 4.** Main criteria weights.

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and construction process. In addition, straight, curved or parametric wall designs also offer a wide framework by creating different applications in the concrete printing process (Žujović et al., 2022; Khan et al., 2021; Martínez-Rocamora et al., 2020; Gosselin et al., 2016). The wall design should be considered together with the concrete material. In this context, extrudability, filling density and the relative humidity parameters, which come after wall design in the criteria weight ranking, provide integration with wall design. These properties support structural stability and functional effectiveness by ensuring that the wall combinations work in harmony. The wall combination completes the resulting triple combination. At this point, it can be said that wall and material properties constitute the basic conditions for forming spaces in the 3DCP. Printer properties and environmental factors follow these parameters.

As a printer feature, nozzle-related features should be considered according to the static, aesthetic and geometric synthesis of the printed final product. There are heads with different diameters such as 10, 19, and 24 millimeters for nozzle size. Nozzles in square, rectangular and circular shapes are selected according to wall designs. The fact that the nozzle is at different heights to the ground where the structure is applied also affects the layer height. The layer height of the concrete material coming from a nozzle that is too close to the ground is low. In this context, it is also necessary to pay attention to the height of the nozzle from the ground to adjust the layer height. Regarding environmental factors, the temperature, humidity and wind factors affecting the concrete material should be calculated according to the climate and the location where it is applied. At this point, the concrete material should be tested and adjusted to the optimum conditions before the construction process begins. Figure 4 shows the prominent sub-criteria parameters.

With the 3DP process, it is possible to produce structures in different architectural forms with minimal environmental impact. By enabling mold-free construction with higher speed and accuracy (minimum human error) (Lloret et al., 2015), the 3DP method provides advantages to the building industry in terms of material savings, design freedom, reduced carbon dioxide emissions and energy efficiency (Hamidi and Aslani, 2019). Avoiding formwork in construction processes can reduce the total cost of a project by 30–60% as it is one of the major cost inputs of construction (Perrot et al., 2015; Shakor et al., 2017). Considering that the building industry consumes one-third of the world's resources, it is inevitable that production systems with 3DM will provide significant benefits in building production by favoring efficiency and effective construction strategies (Özer, 2020).

When the results for all parameters are analyzed, it is seen that the success of the structures built with 3D printers depends on the presence of well-thought-out and carefully designed walls. Therefore, the importance of architectural design is a key factor determining the future success of this technology. Design is an essential component to continue the revolution and evolution of 3D printers in the construction industry and contribute to the construction of more functional, aesthetic and sustainable buildings.

## 4. CONCLUSION

3DP technology provides fast manufacturing and construction, economic solutions and labor convenience compared to traditional construction methods. It is a promising advance for the construction industry and in the reduction of environmental harm caused by construction projects because it allows for the freedom of design, reduces waste during the construction phase, creates complex structures and is suitable for mass production. These features benefit from the ability to draw from the use of many parameters such as material and printer properties.



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Optimizations in concrete materials, advances in software and hardware in printer systems, and innovations in 3D construction techniques have made it possible to build environmentally sensitive and sustainable structures in relatively short time periods. 3DP technology's successful integration for the construction industry, and its performance and design synthesis advantages, represent the successful integration of human-robot interaction.

This study focuses on optimizing the parameters affecting 3DCP technology in the construction industry and evaluating these parameters for sustainable building production. Focusing on the prominent features in these parameters will facilitate the construction of structures. As a result of literature research and expert opinions, four main categories were identified under the headings of printer, material, manufactured structure features and environmental conditions; the prominent parameters were revealed with the Fuzzy AHP method. With the same method, sub-categories of the four main categories were created, and the parameters were detailed and analyzed. As a result of the analysis, the material category was designated with the highest criterion weight, and it is demonstrated that 3D concrete is the main beneficiary of this process. In the sub-criteria, wall design is another feature of building construction identified by the criterion weight findings that is noted as a critical component of the 3DCP construction process. It is concluded, therefore, that there is a need to focus on concrete material and wall design in building production. In the construction industry, while engineers are effective in performance tests such as material strength, it is the architects who dominate design. Construction projects would benefit from a multidisciplinary working environment that encompasses both engineers and architects

With this study, we see that the necessary regulations for green transformation can be realized in line with net zero emission targets by taking advantage of 3D concrete building production. 3D concrete building production achieves low emissions, especially when integrated with digital production techniques and environmentally friendly planning at the start of a construction project. Future studies will help engineers and architects focus on 3DCP findings that will foster new designs for multi-storey construction while expanding and advancing the printer technology to make such construction more widespread and successful.

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# Reviving and Documenting Architectural Heritage Through Augmented Reality: A New Mobile Interface Experience at the Konya (Türkiye) People's House

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**Abstract**

Traditional methods for documenting cultural heritage often remain inadequate for preserving structural data, making it virtually impossible to archive architectural works that no longer survive. This study investigates the use of augmented reality (AR) technology to improve the sustainability of architectural heritage in the digital environment. The former People's House (Halkevi) building, once located in Konya, Türkiye but no longer standing, was selected as the case study. Drawing on available photographs and historical documents, a 3D model of the building was generated using Autodesk Revit, further refined in 3ds Max, and transferred to an interactive digital platform via AR applications (ARki, Augmentecture, and a custom AR solution developed with Unity 3D + Vuforia). These applications offer an accessible solution for art and architectural historians thanks to their user-friendly interfaces and the fact that they do not require coding knowledge. Among the tested AR platforms, the Unity + Vuforia-based application yielded the most consistent performance, especially in terms of interactivity, visual stability, and environ-mental integration. The findings indicate that augmented reality can serve as a practical tool for the digital documentation of cultural heritage, demonstrating that researchers without advanced technical expertise can effectively utilize these technologies. This study contributes to digital heritage preservation by proposing a simplified AR-based methodology that reduces the need for cross-disciplinary expertise, enabling wider participation of local stakeholders in the documentation and visualization of lost architectural heritage.

**Keywords:** augmented reality applications; architectural heritage; 3D digital documentation; visualization of lost heritage; Konya People's House (Halkevi)

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## 1. Introduction

Documenting architectural heritage involves not only recording the physical form of structures but also preserving their cultural and contextual significance [1–3]. Conventional archiving based on physical materials risks deterioration and loss over time. In particular, for heritage structures that no longer exist physically today, the limitations of archival resources necessitate the adoption of alternative visualization techniques [4,5].

AR has become a key tool for documenting and re-visualizing heritage. These technologies not only serve technically proficient professionals but also offer practical and accessible solutions for researchers in fields such as art history and architectural history, who may have limited experience in digital design and programming [6–8]. The interactive visualization capabilities provided by AR facilitate the reconstruction of models using

archival documents, historical photographs, and written records, thereby contributing to their circulation within both academic and cultural spheres [9,10].

The core research problem of this study lies in addressing how cultural heritage buildings that have completely disappeared can be preserved and transmitted through accessible digital methods. Among such structures, the Konya People's House (Halkevi) was chosen as a case study because of its symbolic significance in the early Republican period of Türkiye. As one of the first People's Houses established in 1932, the building played a central role in the dissemination of cultural, educational, and social reforms, functioning as a hub for literacy, artistic activities, and collective memory. Its demolition and absence today present a critical challenge not only for architectural documentation but also for safeguarding the intangible heritage associated with the modernization policies of the Republic. Accordingly, this research emphasizes the importance of digitally reconstructing the Konya People's House as both a methodological experiment and a response to the broader problem of preserving lost heritage.

In this study, the potential of AR technology for documenting architectural heritage is explored through the example of the Konya People's House (Halkevi) Building—constructed as part of the Republic period's social transformation projects but no longer extant today. Based on a limited number of archival photographs and written documents, the building was digitally modeled using Autodesk Revit 2023 and 3ds Max 2023 software and subsequently transferred to an AR environment via the Unity platform. The model was tested through mobile AR applications such as ARki, Augmentecture, and a custom Unity 3D 2021.3.36f1 (LTS) + Vuforia 10.22.5 (Unity package) solution. Considering the limitations of these existing tools, a new AR prototype was developed as an alternative model. In this context, the primary aim of this study is to present an accessible method that enables disciplines less familiar with digital technologies to benefit from AR, thereby supporting the digital sustainability of lost architectural heritage.

Despite the growing number of studies on AR-based heritage documentation, most approaches require advanced coding or cross-disciplinary expertise, which limits their accessibility for researchers in the humanities. This study addresses this gap by asking: How can AR technologies be simplified and adapted to allow non-technical users, such as art and architectural historians, to actively participate in the digital preservation of lost heritage? By tackling this question, the research positions itself as a methodological contribution that extends the usability of AR beyond technically specialized domains.

## 2. The Role of Augmented Reality Technologies in Documenting Cultural Heritage

The digital documentation and presentation of cultural heritage play a key role beyond aesthetics, as they enable the structuring, interpretation, and dissemination of scientific datasets [11–13]. Visualization techniques make reproducible objects meaningful for scientific communities while ensuring accuracy and reliability [14]. Their effectiveness lies not only in the rapid transmission of information but also in fostering insights that help users build mental models [13,15,16].

The distinction among data, information, and scientific visualization is crucial for disciplines in this field, as these concepts, though often used interchangeably, differ in content and methodology [17,18]. Data visualization refers to structured representation based on attributes and variables, while information visualization involves methods for analyzing abstract data through interactive interfaces. Scientific visualization, in contrast, focuses on physical phenomena, mathematical models, and glyph-based structures [13–19].

Within this framework, the use of VR and AR technologies for transferring cultural heritage into digital environments has grown considerably [20]. Although often seen

as a recent trend, their origins date back to the 1950s with Morton Heilig's "Sensorama", considered the first interactive virtual environment [21]. Today, VR/AR are applied not only in entertainment and gaming but also in the preservation, presentation, and accessibility of cultural heritage [5–22].

Recent studies highlight diverse applications of AR for reviving lost or deteriorated heritage. Fornés et al. (2023) [23] reconstructed the ruins of Ademuz Castle in Valencia with AR/VR, while Anay et al. (2023) [24] developed an AR model to enhance visitor experiences at the Alexandria Troas site. Banfi et al. (2020) [25] digitized the Tomb of Caecilia Metella to sustain Italy's tourism sector during the COVID-19 pandemic. Cannella et al. (2022) [26] virtually reconstructed a Tribuna element in Palermo Cathedral, and Spallone et al. (2022) [27] applied AR/VR to recreate missing parts of a Buddha statue in the Museum of Oriental Art, Turin.

A review of the relevant literature reveals that the digitization of cultural heritage typically relies on existing building remains or photogrammetric data. However, two exceptional studies in this field have succeeded in virtually reconstructing non-extant structures based solely on archival data. One such notable example is the study by Günay (2022) [5], who digitally visualized lost buildings in Izmir and Thessaloniki using a limited set of historical photographs and written documents and applied VR/AR technologies to bring these structures back to life. Using the Image-Based Modeling (IBM) method, the buildings were modeled in SketchUp and then processed in Twinmotion for immersive visualization (Figures 1 and 2).

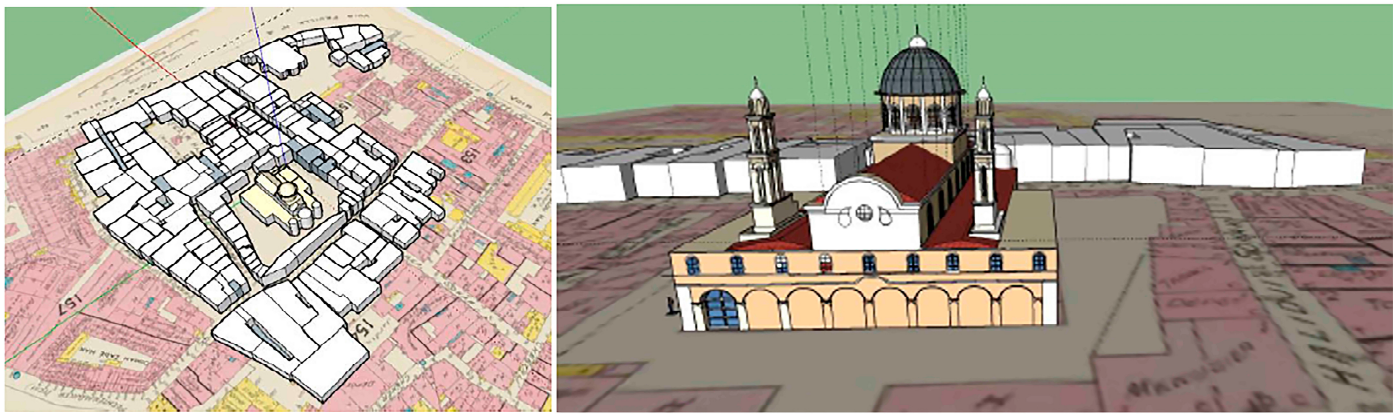

**Figure 1.** The digital reconstruction process of St. George Church by overlaying historical cartographic documents; the modeling was carried out using SketchUp [5].

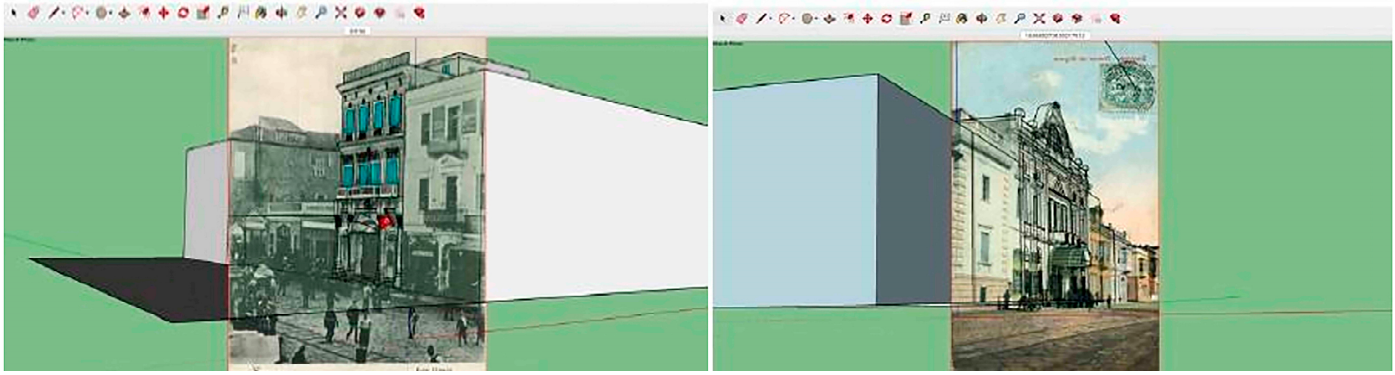

**Figure 2.** Two architectural examples digitally reconstructed in SketchUp using the Image-Based Modeling (IBM) technique: the London Hotel (**left**) and the Smyrna Theatre (**right**); both structures were recreated virtually based on a limited number of archival photographs and written sources [5].

In this regard, augmented reality technologies have become effective tools not only for the preservation of physically extant architectural heritage structures but also for the revival and sustainability of structures that survive only in historical documents.

In their study, Dewitz et al. (2019) [13], examined the Gothic Sophienkirche in Dresden, Germany, a significant example of 13th-century architecture that survived various interventions until the early 1960s but was later completely demolished. The researchers not only virtually reconstructed this structure but also developed the "Urban History 4D" system, which aims to ensure the sustainability of urban memory in the digital realm. Historical photographs of Dresden were digitally scanned, overlaid with a simplified 3D model of the city map, and systematically analyzed based on their shooting angles and spatial positions (Figure 3).

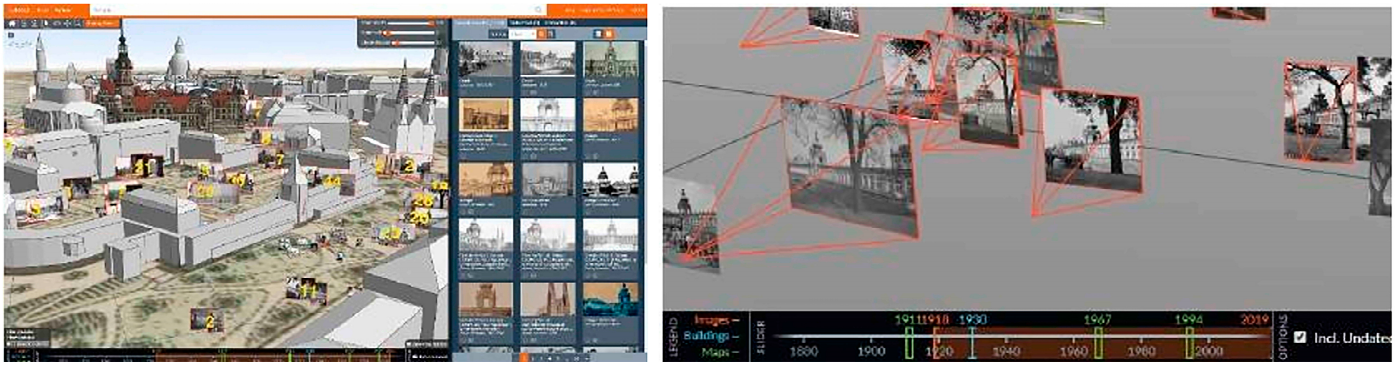


**Figure 3.** Archival photographs positioned with spatial accuracy in the "Urban History 4D" platform (**left**) and the angular distribution chart illustrating the shooting directions (**right**) [13].

In this system, the visual representations of buildings were matched with their spatial locations, and metadata such as the number of photographs, their shooting angles, and associated structures were integrated into the digital platform. Additionally, heat maps were created using this information, allowing researchers to identify which buildings or areas were most frequently photographed and from which perspectives. This integrated system not only provides a foundation for 3D visualization processes but also serves as an interactive digital platform that facilitates access to historical photographs for researchers across disciplines. Furthermore, the virtual reconstruction of the Sophienkirche was realized using AR technology, enabling the structure's original form to be experienced digitally (Figures 4 and 5).

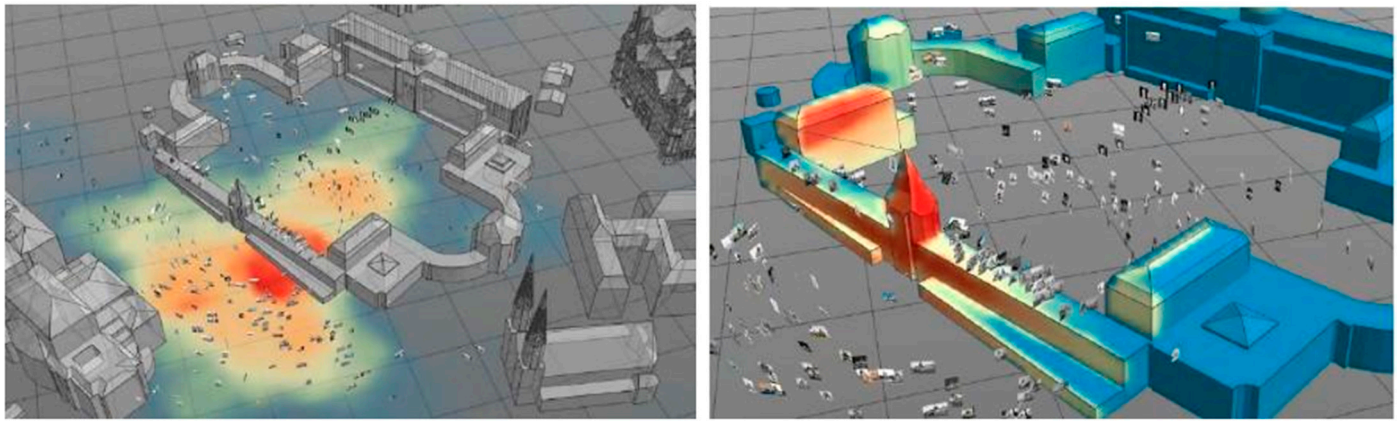

**Figure 4.** Heat map showing the spatial density and frequency of the historical images integrated into the system; areas associated with more documented structures are color-coded accordingly [13].

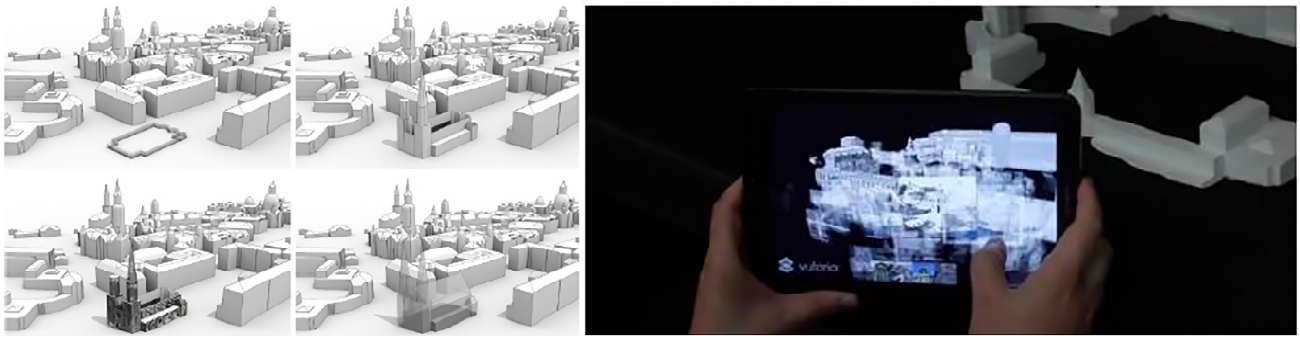

**Figure 5.** The abstract 3D digital model of the Sophienkirche generated from existing data and its integration with AR technology to produce a virtual output [13].

This literature review demonstrates that AR technology is recognized as an effective tool, particularly for digitizing architectural and cultural heritage elements that have entirely disappeared physically. In this regard, the present study aims to digitally reconstruct the Konya People's House (Halkevi) Building in Turkey—a structure that no longer exists physically but which holds significant historical value within local and national education policies. Archival research revealed that only a few historical photographs of specific facades and a limited number of written documents were available. Based on this restricted dataset, a virtual reconstruction of the building was achieved, thereby proposing a digital preservation model to prevent the complete loss of heritage assets with severely limited documentation. Furthermore, following the methodological approach presented by Günay (2022) [5]—which emphasizes generating modeling data through Image-Based Modeling (IBM) before developing an AR application—previously unpublished visual materials related to the Konya People's House were processed technically. These materials were made accessible and experienceable via mobile devices, contributing to the preservation of the structure's cultural memory and its transmission to future generations in a sustainable digital format.

Beyond the technological perspective, it is also necessary to emphasize the historical and cultural significance of the case study selected in this research, namely the Konya People's House (Halkevi).

The Konya People's House, established in 1932, represents one of the earliest examples of the nationwide People's House movement initiated during the early Republican era in Türkiye. These institutions were designed to promote literacy, disseminate cultural and social reforms, and function as hubs of modernization and civic engagement. The Konya People's House, with its library, concert hall, and educational facilities, served as a focal point for cultural and intellectual life in the city. Its complete demolition in later decades not only erased a significant architectural landmark but also left a gap in the cultural memory of the region. For this reason, the building constitutes an important case for exploring how augmented reality can contribute to the digital preservation of architectural heritage that has been entirely lost.

## 3. Developed Methodology

### *3.1. Case Studies*

This research focuses on the Konya People's House (Halkevi), a building that no longer exists today. The case was selected due to its representative value as one of the earliest People's Houses constructed in the early Republican period. Archival visual materials, including unpublished photographs from private collections, were used as the main sources for the reconstruction process. Despite limitations such as the lack of original drawings

and the black-and-white nature of photographs, the available data provided a sufficient basis for creating a digital model to be tested in AR environments.

The Konya People's House was chosen primarily because its complete demolition left no surviving architectural documentation, creating a critical challenge for digital preservation. Limited photographs and written records were analyzed to reconstruct the building's spatial organization. This scarcity of data underscores the importance of developing accessible methodologies for reviving architectural heritage that has otherwise been erased [28].

### 3.2. Significance of the Konya (Türkiye) People's House Building

Following the proclamation of the Republic in 1923, Türkiye embarked on a significant socio-political transformation process, with public education placed at the core of this modernizing agenda. Under the leadership of Mustafa Kemal Atatürk, various educational policies were developed to raise the educational level of the population, build a contemporary social structure, and disseminate the principles of the republican revolutions across society. In this context, the People's Houses (Halkevleri) were officially established on 19 February 1932 by decision of the Grand National Assembly of Türkiye, launching a major social education initiative aimed at supporting individual development, securing public endorsement of the reforms, and promoting cultural advancement [29].

The People's Houses were designed to spread the fundamental values of the Republic to all segments of society, with the mission of fostering "national culture", strengthening "social equality", and supporting the "modernization of the nation" [30]. Within this framework, the Konya People's House began its activities in 1932, initially operating from a temporary building located near the government mansion. However, due to rapidly increasing interest and participation, it was relocated to a larger building within the same year [29].

The Konya People's House building was constructed with three floors, comprising a basement, ground floor, and first floor. The basement served as storage, the ground floor housed a library, and the first floor was used as a concert and conference hall. Individual rooms within the building were allocated for administrative purposes. Given the proximity of the adjacent Military Officers' Club (Orduevi), national celebrations were also organized inside this building [30]. The People's House functioned as a crucial intellectual hub for the people of Konya at the time, providing a rich library that supported literacy initiatives and offered students a resource for their studies [30]. The Konya People's House Library was instrumental in communicating the ideals of the Republican reforms to wider audiences and became an integral component of the early modernization process.

In later years, the structure, which was also repurposed as a municipal cinema, did not survive to the present day [31]. However, this study presents previously unpublished archival photographs related to the building; Figure 6 includes both original visuals from Hasan Çopur's private collection and images already documented in the literature. These visual materials have enabled a more comprehensive documentation of the building's historical context.

The primary reason for selecting the Konya People's House as a case study in this research is that it represents an example of architectural heritage that no longer exists. While literature reviews reveal historical narratives and analyses related to the building, the majority of these studies focus on its educational functions or the architectural features of the later structures constructed afterward [29–31].




**Figure 6.** (**a**) Konya Halkevi rear façade [32]. (**b**) Konya Halkevi front façade [31]. (**c**) Konya Halkevi right side façade [32]. (**d**) Konya Halkevi perspective view [31]. (**e**) Konya Halkevi right side façade [32]. (**f**) Konya Halkevi general view [32].

Consequently, no comprehensive document reflecting the original plan layout or precise measurements of the building could be located.

As a result of extensive archival research, a drawing believed to depict the basement floor plan was identified; this plan was redrawn digitally using AutoCAD 2023 software and incorporated into the analysis (Figure 7). A comparison of the plan with archival photographs revealed that the building featured two separate entrances accessible via independent staircases. However, the spatial functions described in the literature (such as the library, concert hall, administrative offices, etc.) did not correspond precisely with the measurements indicated in the plan, raising questions about its accuracy.

To obtain more definitive plan drawings of the building, extensive searches were conducted in the Ottoman Archives and the Republican Archives of the Prime Ministry; however, no concrete and reliable documents were found. Therefore, the building plan was reconstructed based on the limited available photographs and written records. Window openings and their relative distances were analyzed using the raster image function in the AutoCAD environment, while door openings were determined by referencing similar contemporary public buildings and incorporated into the model.

The digital modeling process continued by transferring the completed drawings, developed in AutoCAD using data from photographs and literature, into the Revit 2023 software (Figure 8). The modeling in Revit was designed to reflect the spatial layout and architectural features of the building as accurately as possible within the constraints of the available data.

The inability to access original architectural drawings and the fact that the structure was demolished long ago lend a unique value to the reconstruction process presented in this study [33]. Digitally reviving the Konya People's House—one of the first People's Houses built in Anatolia as part of the Republic's educational reforms—not only strengthens its place in architectural memory but also contributes to transmitting its cultural significance to future generations.

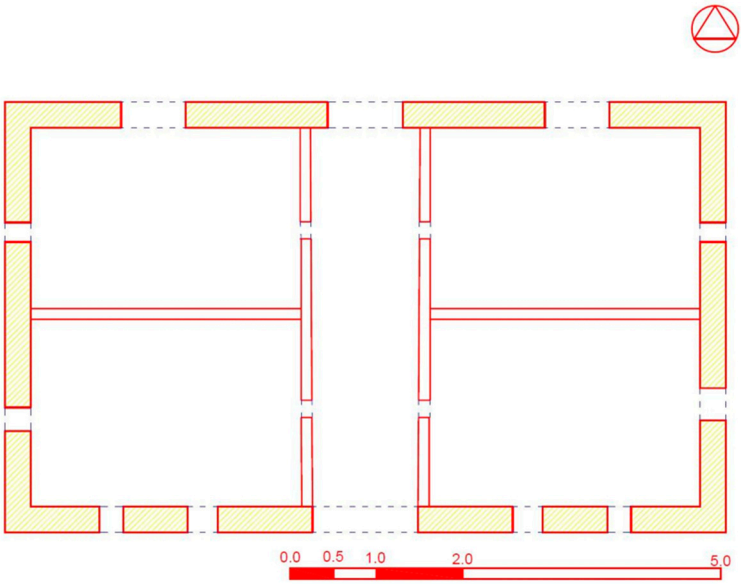


**Figure 7.** Basement floor plan scheme of the Konya People's House as documented in the literature [34] and its digital drawing created in AutoCAD.

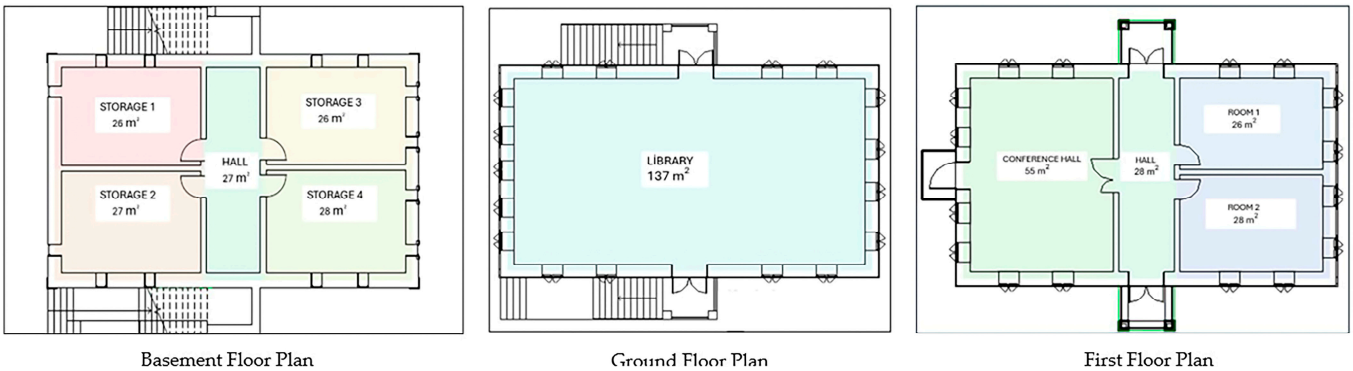


**Figure 8.** Plan schemes created in Revit 2023 based on archival photographs and historical documents of the Konya People's House.

## 4. Methodology

The virtual reconstruction process of the Konya People's House required a multi-stage methodological approach shaped by various constraints. The primary challenge was the building's complete loss, which meant that no physical data could be obtained through conventional digital scanning techniques. Furthermore, the absence of architectural plans, sectional drawings, or technical documents related to the structure in the existing literature further complicated the reconstruction efforts.

In this context, the first stage involved an extensive review of official institutional archives, historical sources pertaining to the relevant period, scholarly publications, and visual materials from private collections. The photographs from the Hasan Çopur archive presented in the table in Figure 6 were entrusted to the authors by the collector prior to his passing, with the intention that they be used for documentation and archival studies, and to serve as a basis for this research. These materials have made a significant contribution to the study. Based on the limited data gathered, two-dimensional plan drawings of the building were recreated using Autodesk AutoCAD 2023 software and subsequently transferred to the Revit 2023 platform. Within the Revit environment, the building was modeled three-dimensionally by referencing historical photographs and material data derived from comparable structures built in the same period. Since no original information on façade cladding was available, a material typology was proposed based on the analysis of similar public buildings constructed in the same region and era (Figure 9).

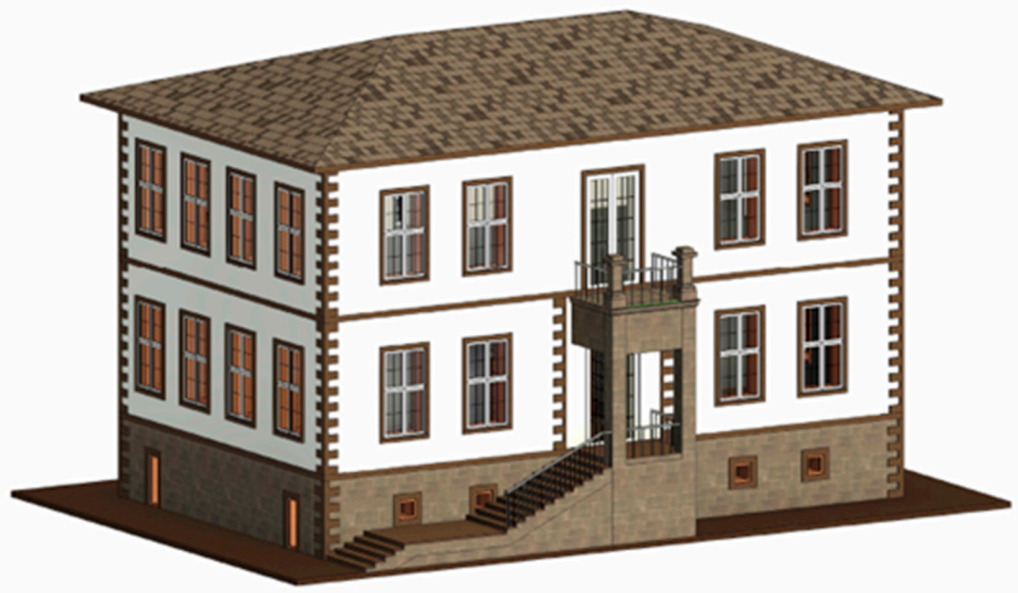

**Figure 9.** Digital reconstruction model of the Konya People's House developed using Revit 2023 software.

To make the three-dimensional model accessible within an augmented reality (AR) environment, software solutions compatible with local conditions in Türkiye were evaluated to enhance user accessibility. In this regard, integration tests were conducted using two different AR applications: Augmentecture, a plug-in specifically developed for Revit, and ARki, a mobile platform application. Additionally, a customized AR application was developed using Unity 3D 2021.3.36f1 (LTS) software, and its performance was analyzed comparatively.

The selected example of the Konya People's House served as a prototype for the proposed augmented reality method, demonstrating that the approach could be applied to

other lost architectural heritage structures of different scales and typologies that also suffer from limited archival data.

Through these tools, the generated model was experienced across multiple platforms, and the results were evaluated through comparative analysis. The entire workflow was structured into four main stages: archival research, creation of two-dimensional technical drawings, three-dimensional digital modeling, and integration with augmented reality applications. The table below (Figure 10) summarizes the key components of this process along with the digital tools utilized.




**Figure 10.** Methodological workflow diagram for the virtual reconstruction process of the Konya People's House.

The model was validated by systematically cross-checking the reconstructed elements with available archival photographs, written records, and secondary architectural sources. Particular attention was given to façade proportions, window placements, and spatial arrangements. While no original architectural drawings survived, triangulating these resources ensured visual and contextual consistency. This validation process reduced subjectivity and enhanced the reliability of the reconstruction despite inevitable interpretative elements. The AR platforms used in this study were chosen based on four criteria: accessibility (requiring no coding knowledge), user-friendliness for non-technical researchers, mobile compatibility for broader accessibility, and performance in terms of stability, interactivity, and environmental integration. These parameters were considered essential to ensure that the methodology could be replicated by researchers in art history and architecture without advanced technical skills. Accordingly, three platforms (ARki, Augmentecture, and Unity + Vuforia) were evaluated to provide a comparative perspective.

## 5. Findings

### *5.1. Augmented Reality Testing with the Augmentecture Application*

The first stage of testing involved the Augmentecture plug-in, which offers direct integration with Revit. The application provided relatively straightforward access, allowing the digital model to be elevated onto a printed plan through marker-based align-

ment. In practice, once limiting markers were added to the footprint, the model aligned more stably with the plan lines and remained attached even when the printed sheet was moved (Figures 11 and 12).

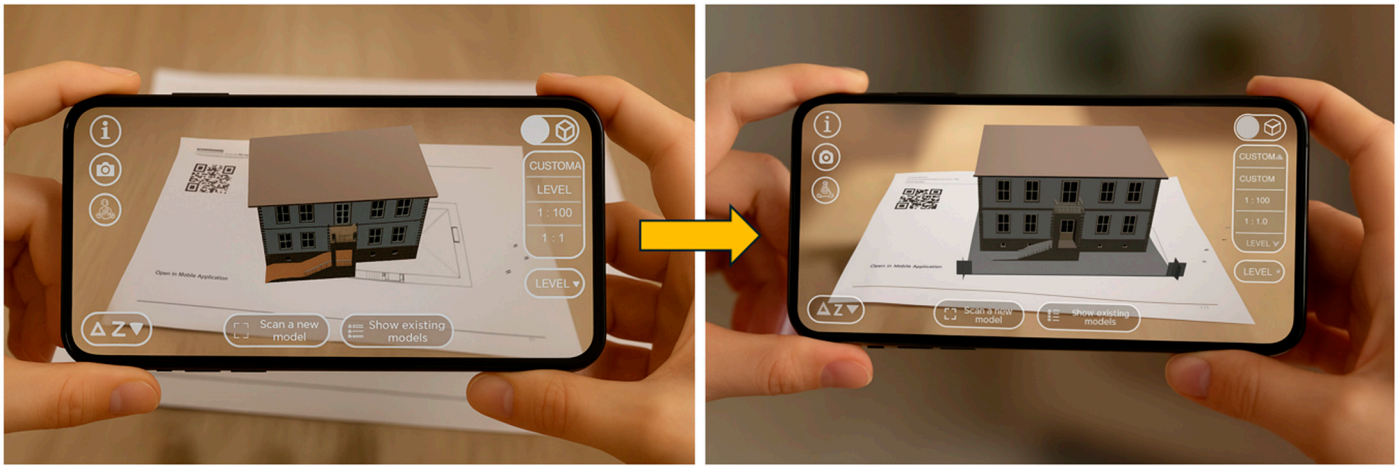


**Figure 11.** Elevation of the Konya People's House on the printed base sheet via the Augmentecture application, aligned with the drawing lines using limiting markers. (QR code for in-app visualization only.)

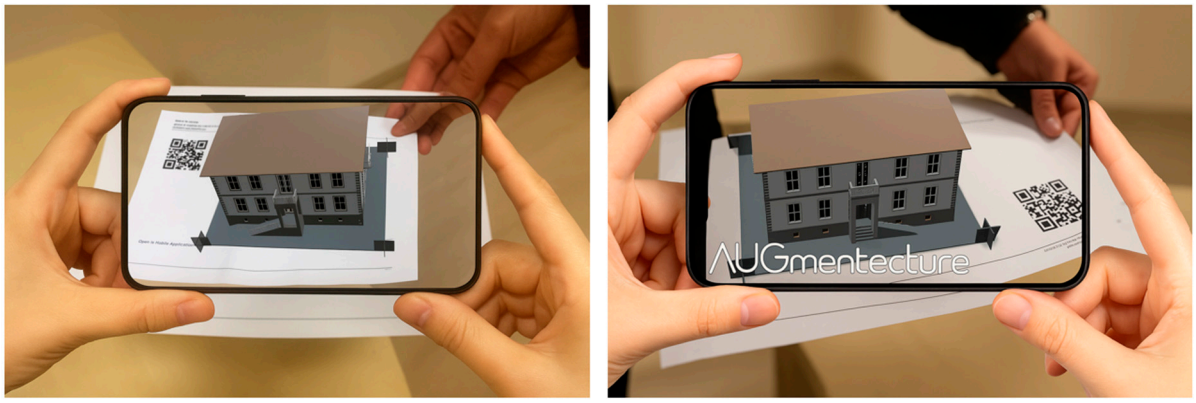


**Figure 12.** AR view of the Konya People's House via the Augmentecture application while the printed base sheet is being moved. (QR code for in-app visualization only.)

Despite these advantages, the platform exhibited some limitations. Its reliance on physical markers restricted scalability and introduced sensitivity to positional errors. Moreover, Augmentecture was constrained to Revit's environment and offered no dedicated data integration beyond basic visualization. These factors limited its use for larger heritage projects, though its ease of setup made it suitable for rapid prototyping. A summary of its evaluation is presented in Table 1.

**Table 1.** Evaluation of the Augmentecture application according to architectural heritage documentation criteria.

| Compatibility with Base Plans | Data Integration | Installation Process | Image Capturing | Material Assignment | Compliance with Architectural Heritage Documentation |
|---|---|---|---|---|---|
| Moderate (requires marker) | No dedicated data integration module | Easy installation, complex application settings | Minimal delays during movement | Revit-dependent only | Moderate |

### *5.2. Augmented Reality Testing with the ARki Application*

The second platform tested was ARki, which supports FBX file formats compatible with multiple modeling tools. This allowed greater flexibility compared to Augmentecture, and the model could be projected directly over a plan sheet in mobile environments. During tests, the model aligned accurately with plan lines and textures were preserved, ensuring a realistic impression of material assignments (Figure 13).

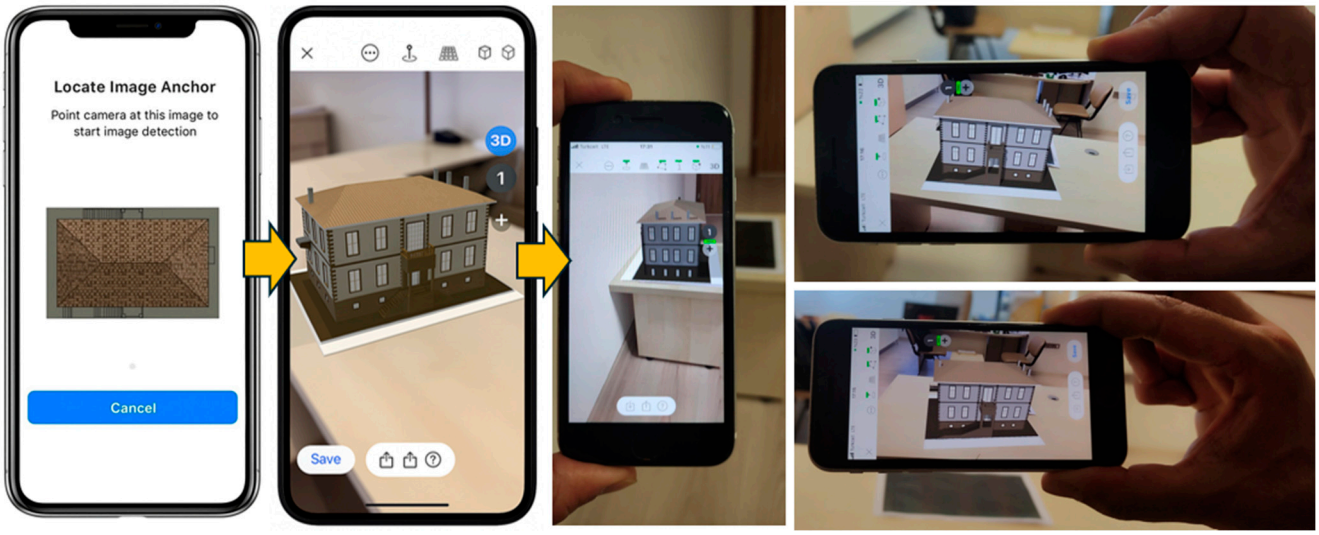


**Figure 13.** Process of adding the site plan image and running the model in the ARki application via a mobile device in the augmented reality environment.

However, the platform required a more complex setup process, including multi-stage preparation of base files, which reduced its accessibility for non-technical users. Additionally, when the printed plan was moved, the digital model followed with a noticeable delay. While this issue did not significantly distort the plan-based alignment, it affected user interaction fluidity. The overall evaluation, highlighting its strengths in file compatibility but limitations in performance, is summarized in Table 2.

**Table 2.** Evaluation of the ARki application according to architectural heritage documentation criteria.

| Compatibility with Base Plan | Data Integration | Installation Process | Image Capture | Material Assignment | Suitability for Architectural Heritage Documentation |
|---|---|---|---|---|---|
| Adequate | No dedicated data integration module | Complex application settings | Significant delays during movement | Processed via 3ds Max | Moderate |

### *5.3. Testing the Newly Developed Augmented Reality Application*

In the final stage, a custom Unity + Vuforia-based application was developed to address the shortcomings observed in the commercial tools. Unlike the previous platforms, this prototype eliminated the need for physical markers and supported the integration of multiple content layers, including textual and visual annotations. This capability provided an enriched user experience and extended the application beyond basic visualization.

Testing revealed that the prototype achieved stable alignment under varying lighting conditions and moved synchronously with the printed plan. The application also demonstrated faster and more consistent behavior than the commercial tools, providing smoother interaction and greater reliability for heritage documentation (Figures 14 and 15).




**Figure 14.** Testing of the new AR application (Arsiv) on an Android mobile device.



**Figure 15.** Demonstration of the developed AR application both when the reference plan is static and when it is moved across the surface.

While the Unity + Vuforia system required more technical expertise to configure, it offered advanced data integration and superior synchronization, making it more suitable for projects where comprehensive documentation and public presentation are critical. Its comparative advantages are summarized in Table 3.

**Table 3.** Evaluation of the developed AR application based on architectural heritage documentation criteria.

| Alignment with Base Plan | Data Integration | Installation Process | Image Capture | Material Assignment | Compatibility with Architectural Heritage Documentation |
|---|---|---|---|---|---|
| High level; occurs quickly after QR code is scanned | Customized data integration module available | Application settings are complex | Base plan and model operate synchronously during movement | Through Unity 3D | High level |

Across the three approaches, the findings highlight that plan-coherent registration, stability during motion, and capacity for data-layer integration are decisive criteria in AR-based heritage documentation. The custom Unity + Vuforia application outperformed the commercial tools particularly in synchronization and content integration, demonstrating its potential as a more robust and inclusive solution.

Beyond the technical performance, user experience emerged as a decisive factor in evaluating the tested AR platforms. While Augmentecture provided a straightforward entry point with minimal setup, its marker dependency limited flexibility for broader applications. Conversely, ARki enabled richer visualization but required multiple preparation steps, thereby reducing accessibility for non-technical users. The developed Unity + Vuforia prototype, despite its more demanding configuration process, offered smoother interactions and greater consistency, ultimately enhancing usability and interpretability for both experts and general audiences.

Particular attention must be drawn to the accessibility challenges of ARki, which restrict its adoption among researchers and institutions lacking advanced technical skills. In contrast, the proposed workflow, designed to minimize coding requirements while ensuring stability, provides a more inclusive framework. Furthermore, the Unity + Vuforia application demonstrated potential for long-term sustainability by enabling flexible integration of content layers and supporting reuse across different heritage sites. This adaptability highlights its value not only as a visualization tool but also as a sustainable method for digital archiving and heritage preservation.

To synthesize the comparative results, a radar chart was generated to visualize the relative strengths and weaknesses of the three AR applications across multiple criteria (Figure 16). As illustrated, the Unity + Vuforia prototype demonstrated superior performance in plan alignment, stability, and data integration, whereas Augmentecture excelled in setup simplicity and accessibility. ARki offered intermediate results with notable flexibility in platform compatibility but limitations in stability. This comparative visualization reinforces the argument that while commercial tools remain valuable for rapid deployment, the proposed prototype provides a more sustainable and comprehensive solution for architectural heritage documentation.

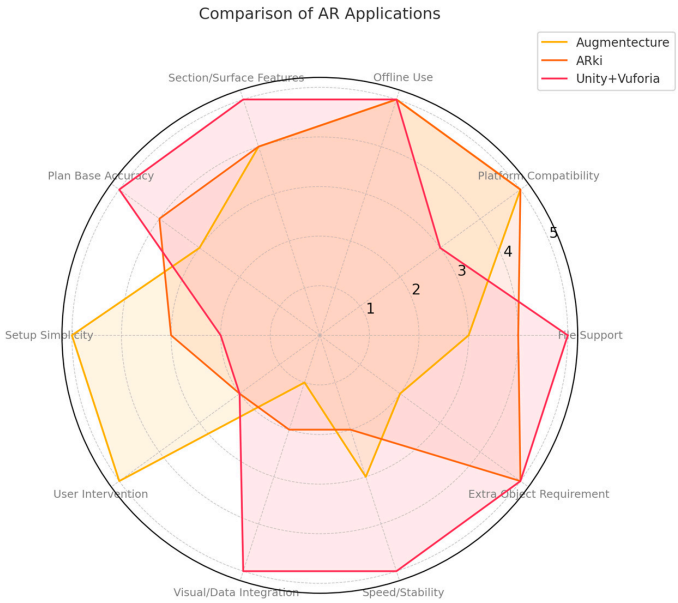


**Figure 16.** A radar chart developed to illustrate the relative strengths and weaknesses of the three AR applications (Augmentecture, ARki, and Unity + Vuforia) across multiple evaluation criteria, serving as a synthesis of the comparative results.

It should be noted that the radar chart does not represent absolute quantitative measurements but rather a comparative visualization derived from the qualitative evaluations summarized in Tables 1–3. The 1–5 scale was applied following observational analysis and expert judgment, in line with common practices in usability and technology assessment studies [35,36]. This approach allowed qualitative findings to be translated into a standardized comparative format, providing a clearer overview of relative strengths and weaknesses. However, the results remain inherently interpretative and may vary across different user groups, reflecting the methodological limitation of expert- and observation-based scoring.

## 6. Evaluation

This study examines the potential use of augmented reality (AR) technology for the digital documentation and visualization of lost architectural heritage, comparing the performance of Augmentecture, ARki, and a custom-developed Unity + Vuforia-based application (Table 4).

**Table 4.** Comparative assessment of the tested AR applications according to architectural heritage documentation criteria.

| Comparison Criteria | Augmentecture | ARki | Unity + Vuforia |
|---|---|---|---|
| File Format Compatibility | Revit plugin via QR code connection | FBX format supported via 3ds Max platform | FBX format natively supported |
| Platform Support | Compatible with iOS and Android devices | Compatible with iOS and Android devices | Compatible with iOS and Android devices |
| Offline Usability | Available | Available | Available |
| Section and Surface Visualization Capability | Includes sectioning and surface detection modes | Supports positioning on real surfaces and plan drawings | Enables interactive overlay of text, images, and videos |
| Plan-Based Projection Accuracy | Medium accuracy (requires physical marker for alignment) | High accuracy | High accuracy; operates without the need for physical markers |
| Installation and Configuration Complexity | Low (direct use via integrated plugin) | Medium (requires multi-platform and software compatibility) | High (requires Unity and Vuforia integration) |
| User Interaction Requirement | Low; operates with limited user intervention | High; requires intensive user input | High; requires application development knowledge |
| Visual and Data Integration Capabilities | Limited; supports only basic 3D model visualization | Limited; no direct data integration module | Advanced; enables holistic integration of static and dynamic content |
| Operational Speed and Processing Stability | Moderate performance and stability | Low; tracking delays were observed | High performance; stable processing under variable lighting and surfaces |
| Physical Marker Requirement | Required for base alignment | Not required | Not required |

Each application demonstrated distinct characteristics in terms of user interaction level, technical complexity, and content integration capacity. The Augmentecture platform, which operates as a Revit plug-in, offers users a straightforward installation and basic integration process. However, while its visualization accuracy based on plan overlays is moderate, its support for dynamic content integration is limited, and it requires additional physical markers for spatial alignment.

In contrast, ARki stands out with its broad cross-platform file format support, enabling integration with various software such as 3ds Max and Google Drive. However, this advantage requires a multi-layered setup process (Figure 17), which can result in time delays and performance issues during model tracking, with limited support for integrating local multimedia content.

Despite its technically more complex configuration, the custom-developed Unity + Vuforia application provides a comprehensive set of features that enable the projection of both static and dynamic content (e.g., images, text, videos) in real time onto a physical plan base. Moreover, this system demonstrated high levels of synchronization and stability even under varying lighting conditions and in mobile scenarios.

In conclusion, while Augmentecture [37] and ARki [38] offer practical solutions for rapid prototyping and basic-level AR visualization needs, the Unity + Vuforia-based system presents a more advanced and holistic approach for the documentation, archiving, and digital presentation of lost architectural heritage [39].

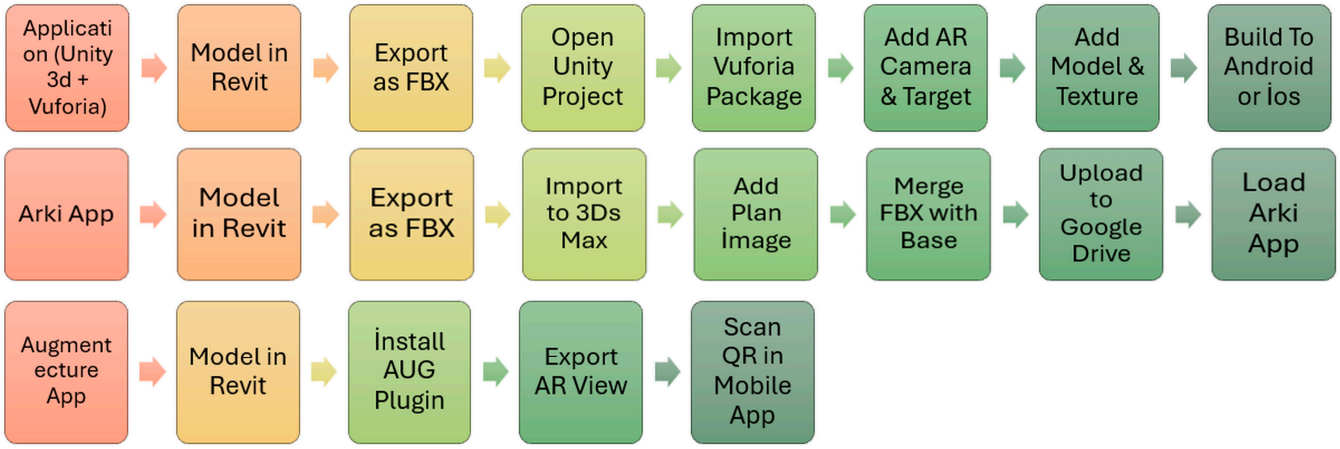


**Figure 17.** Comparative schematic representation of the setup processes for the tested AR applications.

Previous research has highlighted the potential of AR in reconstructing lost architectural heritage [5–13,40]. Building on this body of work, the present study extends the discussion by demonstrating how AR can be applied in the case of the Konya People's House.

Recent bibliometric reviews also underline that AR in cultural heritage is predominantly applied in areas such as 3D reconstruction, digital heritage, virtual museums, tourism, and gamification, confirming the relevance of our case study within broader research trends [41].

Consistent with our findings on the superiority of synchronization in mixed-content overlays, it was demonstrated that multi-user MR systems must maintain real-time positional correspondence among participants to ensure immersive and collaborative heritage exploration [42]. Similarly, our Unity + Vuforia prototype's stable, synchronous tracking represents a critical advantage over marker-dependent tools in fostering synchronized AR experiences.

Our approach's layered integration of visual and textual annotations echoes the multidimensional design of location-based AR applications that combine GPS-triggered content with immersive virtual tours to enrich cultural heritage education [43]. The similarity underscores the importance of multi-layered data in promoting heritage comprehension and engagement. It was highlighted that AR-GIS hybrid systems can articulate detailed construction features in a heritage context—specifically, bridging on-site artifacts with georeferenced overlays to reveal engineering techniques [44]. In a complementary manner, our case of digitally reviving the Konya People's House through AR also emphasizes AR's role in reconstructing lost architectural identity, even in absence of original documentation. In line with previous AR application evaluations, Augmentecture and ARki were comparatively tested within this study. Augmentecture, integrated with Revit, is notable for its easy setup and basic visualization, whereas ARki, despite broader compatibility, poses installation complexity and occasional performance limitations. These findings highlight the added value of the Unity + Vuforia-based application, which provides static and dynamic content placement directly on the plan base, thereby offering a more advanced environment for digital presentation and interaction.

Studies exploring AR integrated with wearable hardware (e.g., HoloLens) for preserving and transmitting historical street layouts found that immersive wearable environments markedly enhance user interaction and heritage perception [45]. While our prototype operates on mobile devices, the shared benefit lies in fostering intuitive heritage engagement beyond traditional visualizations. Similar wearable AR implementations, such as the Kapanca Street project in Türkiye, demonstrated how immersive devices can strengthen both documentation and user engagement, suggesting a strong parallel with our mobile-based

approach [46]. Consistent with prior findings that emphasize the role of mobile AR in cultural heritage dissemination [40], our results demonstrate the feasibility of applying such tools in the case of the Konya People's House.

Moreover, recent studies revealed that AR attributes such as interactivity, vividness, and novelty significantly foster perceived usefulness and enjoyment, which in turn encourage heritage-responsibility behaviors among visitors [47].

However, the performance differences observed among the applications are currently limited to qualitative evaluations. Future studies should support technical parameters such as processing time, device resource usage, render quality, and user interaction duration with quantitative data [20]. Such metrics will enable the developed method to be compared with similar platforms more objectively. A review of Table 4 indicates that the custom Unity + Vuforia solution particularly excels in "Visual/Data Integration", "Plan Base Alignment", "Speed/Stability", and its ability to function without any additional physical objects or markers. This demonstrates that the developed system is not only capable of presenting 3D models but can also synchronize multiple layers of data—such as text, images, and videos—within the AR environment. Furthermore, its capacity to operate fully aligned with the physical plan base, without requiring external markers, is considered a significant advantage for the documentation and public presentation of lost architectural heritage.

The Augmentecture platform performs well in criteria such as "Ease of Use", "Simple Setup", and "Mobile Compatibility", offering a practical solution for basic AR experiences based on plan overlays. However, its limited data integration and reliance on marker-based operation suggest that this platform is more suitable for rapid prototyping scenarios and projects with lower content complexity. The radar chart further highlights that, despite its user-friendly structure, it may fall short for projects requiring high data density.

On the other hand, ARki offers clear advantages in "File Compatibility" and "Multi-Software Support", allowing integration with a wide range of modeling tools. Nonetheless, its multi-layered setup process and user-dependent steps introduce certain challenges during use. The radar analysis clearly reflects this situation in areas where high user interaction is needed but functionality remains relatively limited.

Overall, the comparative evaluation of the three applications illustrates that they differ not only in functionality but also in terms of sustainability, data integration capacity, and user accessibility. The findings demonstrate that the Unity + Vuforia-based system provides a more comprehensive and flexible solution for the documentation and digital dissemination of architectural heritage. This finding resonates with the broader discourse on heritage smart cities, where digital twins, AI, and immersive technologies are increasingly seen as critical tools for balancing preservation, accessibility, and sustainable cultural tourism [48]. Moreover, comparable museum-based AR initiatives have also shown that interactive digital layers not only enhance visitor engagement but also facilitate the understanding of abstract cultural or scientific concepts, underscoring the pedagogical potential of AR in heritage contexts [49].

## 7. Discussion and Limitations

Within the scope of this study, the Augmentecture and ARki applications were tested and found to have parallels with various examples in the existing literature focusing on the documentation of cultural heritage through augmented reality (e.g., [5–13]). However, it was observed that both applications have certain limitations in terms of model elevation on plan bases and data integration processes. In particular, although Augmentecture proves effective for rapid prototyping thanks to its simple Revit-compatible installation, it remains insufficient for large-scale projects due to its limited content integration capacity and dependence on marker-based alignment. Meanwhile, the ARki application offers

advantages in terms of file format compatibility, yet its multi-layered setup process and occasional delays in plan alignment may lead to performance issues that negatively affect the user experience.

In this context, the Unity + Vuforia-based custom AR application, similar to the virtual reconstructions of lost buildings demonstrated by Günay (2022) [5] and Dewitz et al. (2019) [13], provides visualization possibilities based on limited archival data. Its distinctive contribution, however, lies in minimizing the need for technical support from other disciplines, thereby enabling local stakeholders to actively participate in the process. Consequently, the findings reveal that AR technology can evolve beyond being merely a visualization tool into a user-friendly approach for documentation and digital preservation [28].

The original contribution of this study is that, while aligned with the examples of virtual reconstructions of lost architectural heritage in the literature, it proposes an open-source, easily applicable AR prototype that does not require advanced software skills. This makes it accessible to local authorities, collectors, and independent users from different fields, adaptable across diverse cultural and spatial contexts. In this way, the study suggests a more inclusive framework for sustainable digital preservation and cultural transmission.

The primary limitation of this study is that the testing phase was conducted with a limited number of devices and user profiles. Furthermore, the performance assessments were restricted to qualitative observations; parameters such as processing time, render quality, and user interaction time were not supported by quantitative data. Future research should include comprehensive experimental studies with various hardware and software combinations to objectively demonstrate the broader applicability of the proposed method. Accordingly, it is recommended that upcoming studies conduct user tests, measure processing times, and analyze interaction data statistically.

As no original architectural drawings or precise measurements of the Konya People's House have survived, certain aspects of the reconstruction (e.g., façade proportions, interior arrangements) inevitably involved interpretative decisions based on available photographs and written descriptions. This subjectivity represents a limitation of the study.

Future research should prioritize experimental designs that incorporate quantitative measures such as processing time, rendering quality, and user interaction metrics, tested across diverse hardware and software environments. Conducting usability studies with both expert and non-expert participants would provide a more representative understanding of the applicability of AR in heritage documentation. Beyond methodological development, the findings of this study also carry long-term policy and educational implications. Integrating accessible AR tools into heritage conservation strategies can promote sustainable digital preservation practices, while embedding AR-based documentation methods into architectural and art history curricula can strengthen the training of future professionals. These directions highlight the dual role of AR technologies as both practical tools and transformative instruments for cultural heritage management.

## 8. Conclusions

The primary aim of this study is to evaluate user-friendly augmented reality (AR) applications that can contribute to the documentation and archiving of architectural heritage. Considering that researchers and practitioners in fields such as architecture and art history often lack direct integration with technology or advanced software skills, the need for accessible digital tools in this context becomes increasingly evident. Accordingly, this study investigates whether the AR applications examined can support the digital documentation of architectural heritage without requiring programming knowledge or advanced technical assistance.

The applications evaluated were selected with the technical proficiency levels of potential users in mind—particularly collectors, architects, and art historians who are engaged in the production of documentation for the preservation of cultural heritage. This approach aims to enable users with access to technological tools, but with limited capacity for advanced customization, to actively participate in digital documentation processes.

Within the scope of this study, two accessible AR applications were tested for the reconstruction and interactive experience of architectural heritage. Based on identified challenges, a new Unity + Vuforia-based prototype was developed and demonstrated to offer a more advanced environment for digital presentation and interaction.

These applications were technically compared based on aspects such as model elevation on plan drawings, data integration, installation complexity, user-friendliness, and mobile device performance. The findings indicate that the Unity + Vuforia system offers a more holistic and inclusive tool for documenting cultural heritage structures and communicating them to wider audiences through new-generation presentation techniques. In this context, the study demonstrates that mobile AR technologies can serve not only as visualization tools but also as versatile platforms for digital preservation, education, and cultural transmission.

The findings suggest that the proposed method holds potential applicability not only for lost buildings with limited archival data such as the Konya Halkevi but also for cultural heritage sites of different scales and typologies. Moreover, local authorities, museums, and independent collectors can use such accessible AR solutions to conduct documentation processes without the need for technical support from other disciplines, thus contributing to the intergenerational transmission of these structures.

In conclusion, this study aligns with the literature on the virtual reconstruction of lost architectural heritage. Its distinctive contribution lies in reducing the need for cross-disciplinary expertise, thereby enabling local actors to participate more actively in digital documentation processes.

Nonetheless, conducting the study on a single case structure with a limited user profile presents a constraint regarding the generalizability of the findings. Furthermore, since testing was carried out only on specific mobile devices and environments, variations in performance may arise on different hardware and software infrastructures. Therefore, the adaptability of the proposed model to architectural heritage sites of various scales should be validated in future studies with broader examples.

While this study primarily relied on qualitative observations, it is recommended that future research include quantitative measurements of metrics such as processing times, data integration speed, and processor/mobile device resource usage. Such measurements will help demonstrate the performance advantages of the developed AR infrastructure more concretely.

Future studies should design test scenarios involving structures of varying scales and typologies, including wider user groups, to assess the effectiveness of the proposed methods in sustainable preservation and cultural transmission processes more comprehensively. Accordingly, the proposed model can serve not only as a reference point for academic research but also as a practical resource for local government projects and museum applications.

This study contributes to the field not only by demonstrating the feasibility of AR for architectural heritage documentation, but also by introducing a simplified and more accessible workflow. Unlike existing approaches that often require advanced coding or specialized technical expertise, the proposed Unity + Vuforia-based prototype was designed to be adaptable for non-technical researchers and cultural heritage practitioners. This novelty ensures that digital preservation and communication of lost or endangered buildings can be achieved more inclusively and sustainably. Practically, the workflow

enables scholars, educators, and institutions to integrate AR into documentation and educational practices with minimal barriers, offering a replicable model that can support both academic research and long-term heritage conservation strategies.

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# Analysis of Modernization Movements in Housing During the Early Republican Period: Karabük, Türkiye

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**Abstract:** As a unit, housing is one of the most important elements affected by social, economic, and cultural changes in every period of human history. In all ages, from ancient times to the present, housing has not only met the need for shelter, but also reflected people's lifestyles and values and the technological developments of the period. Housing architecture emerges as a type of structure that has been continuously evolving in every period and is affected by the changes experienced by societies. In this study, the idea that houses are not only structural products, but the structures that have become homes for humans, is approached and discussed through concepts such as spatial organization, relationality, accessibility, visibility, density of use, depth, privacy, and belonging. The Yenişehir district in Karabük province, which is thought to have been transformed into design by considering these concepts, also constitutes the focus area of the study idea in this sense. The houses located in the Yenişehir district, which was selected because it contains concrete examples of the modernization efforts of the Early Republican Period of Türkiye and is an example of industrial housing production, have been numerically evaluated within the scope of this study with the data obtained from the space syntax analysis and the depthMapX program (v0.8.0). In this way, it raises the question of whether it is possible to create housing settlements for people in the transition from agricultural society to industrial society without disrupting the socio-cultural structure of society. As a result, it has been seen that the houses in Yenişehir are designed functionally and human-oriented, and they also consider the dynamics of society.

**Keywords:** Karabük; Early Republican Period; housing; modernization; space syntax analysis

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## 1. Introduction

Karabük is a province located in the western part of Türkiye's Black Sea Region, notable for its establishment and development within the context of architectural history (Figure 1). Administratively, it comprises a total of 6 districts, 80 neighborhoods, and 277 villages (Table 1) [1]. In the 1930s, Karabük emerged as one of the significant centers of Türkiye's industrialization efforts. During the Early Republican Period, as part of national goals to expand industrial enterprises, the foundations of the Demir Çelik İşletmeleri (DÇİ, Iron and Steel Enterprises) were laid, accelerating the city's development. At that time, Karabük was a small village named Öğlebeli, subordinate to the Safranbolu district. The establishment of DÇİ brought about population growth and economic vitality, transforming the region's status. Karabük became a township of Safranbolu in 1941 and gained district status on 3 March 1953, through Law No. 6068, with 53 villages annexed to it [2]. On 6 June 1995, Karabük was declared Türkiye's 78th province under Law No. 22305 [3].




**Figure 1.** The location of Karabük on the political map of Türkiye and a map showing its districts (Saraçoğlu Gezer).

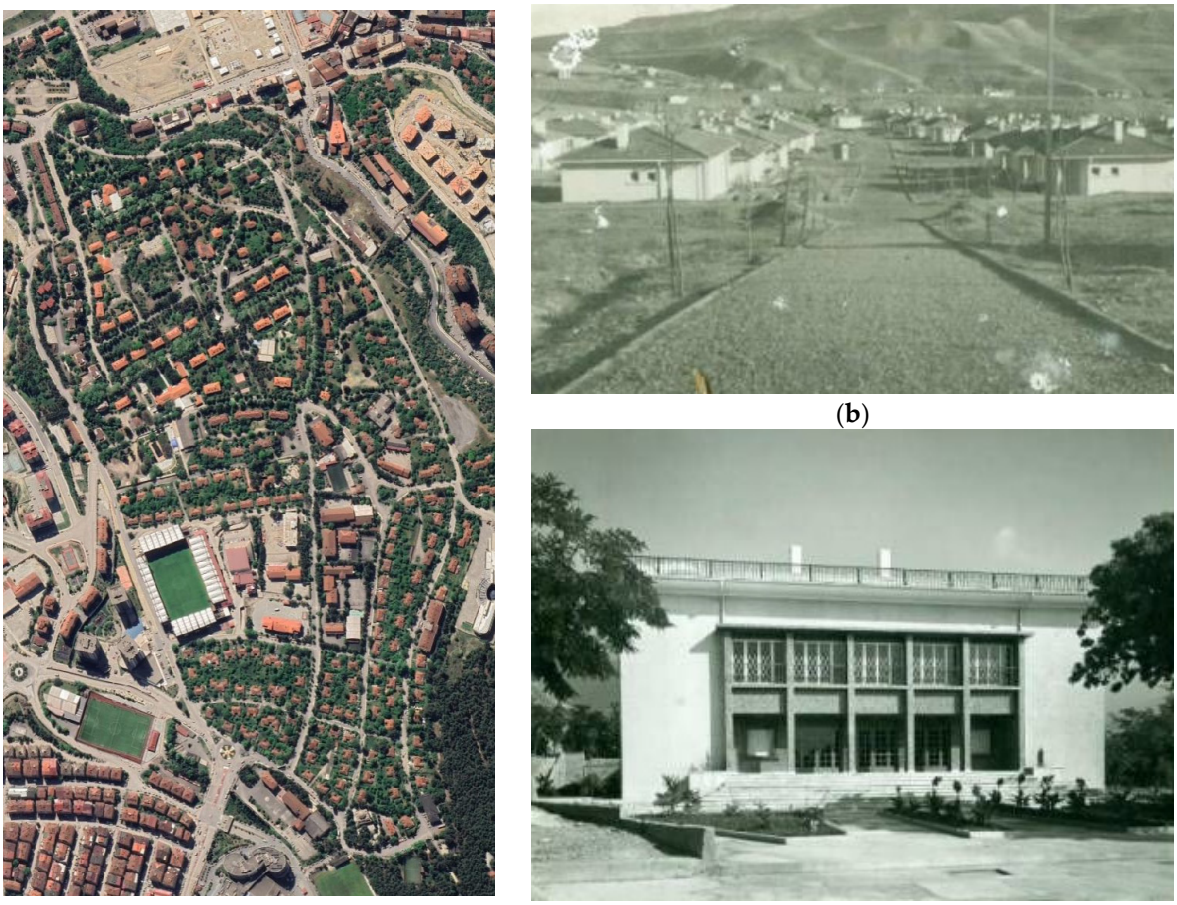
**Table 1.** The number of districts, neighborhoods, and villages in Karabük province [1].

| District | Neighborhoods | Villages |
|---|---|---|
| Merkez (Karabük) | 28 | 37 |
| Eflani | 6 | 54 |
| Eskipazar | 7 | 50 |
| Ovacık | 1 | 42 |
| Safranbolu | 21 | 60 |
| Yenice | 17 | 34 |
| Total | 80 | 277 |

In the Early Republican Period (the first 25 years of the Republic), importance was given to industrialization in Türkiye, and important milestones for industrial initiatives were immediately implemented. As the first step in this context, the Economic Congress (İzmir, 1923) was organized, and the First Five-Year Industrial Plan was implemented. In order to support initiatives to be carried out by the state or individually, the Industrial and Mining Bank was established in 1925, and the rights of entrepreneurs were further strengthened with the Industrial Encouragement Law (Teşvik-i Sanayi Kanunu) in 1927 [4]. However, as a result of the Great Depression in 1929, the Industrial and Mining Bank had to be dissolved, and as a result, two separate banks were established in 1933, Sümerbank to support industry and Etibank to support mining [5]. In order to implement the industrial initiatives that needed to be made on behalf of the state, Sümerbank determined seven separate regions that were not yet urbanized but were open to development and started to implement industrial initiatives. (Among the factories of Sümerbank that became the symbolic buildings of the republic are Kayseri Cloth Factory (1935), İzmit Paper Factory (1936), Ereğli Cloth Factory (1937), Nazilli Cloth Factory (1937), Bursa Merinos Factory (1938), Gemlik Artificial Silk Factory (1938), Karabük Iron and Steel Factory (1939), and Malatya Cloth Factory (1939).) The study area, Karabük, is the region determined for heavy industry development among these seven regions, and the housing modernization movements of the newly established state were examined within this scope.

With the Republic's industrialization drive, Karabük embarked on an urban planning process in which Sümerbank's urbanization policies played a significant role [6]. Yenişehir Neighborhood became a turning point in Karabük's and Türkiye's history of modern urbanization. The city, shaped by the presence of DÇİ, remains a notable example of planned urbanization, preserving its original planning features to this day (Figure 2a). The Republic's modern urban planning vision included the construction of housing for workers during the establishment of DÇİ. In 1938, housing became a pressing issue

for approximately 400 brick workers from Artvin and Erzurum as well as for British engineers involved in the factory construction. Temporary solutions were devised, such as accommodating workers in nearby villages and lodging engineers in newly built hotels in Safranbolu's Kıranköy area. However, this highlighted the need for a long-term settlement policy [7].



(**a**) (**b**) (**c**)

**Figure 2.** (**a**) Aerial photograph of the Yenişehir district. (**b**) View of workers' houses in 1940. (**c**) Yenişehir cinema in 1964.

To address the housing need, renowned urban planner and architect Henri Prost was commissioned, and in 1938, plans for the Yenişehir neighborhood were prepared. (Due to disasters such as fire and flooding in the archives, there is no original plan prepared by Henri Prost today. There is an official letter about the money paid to him by the prime minister of the time for the plan's drawing.) With the development of this planned settlement, Yenişehir marked the beginning of Karabük's modern urbanization journey (Figure 2b). Sümerbank not only focused on housing but also addressed the social and cultural needs of workers and their families through comprehensive planning [8]. Various facilities and services were established to improve workers' living standards, enhance productivity, and foster loyalty to the institution (Figure 2c). These included healthcare and educational, cultural, and religious facilities such as hospitals, nurseries, schools, a public house, a cinema, clubs, a guesthouse, a hotel, and a mosque. Additionally, the neighborhood featured sports fields, playgrounds, parks, a garden with a pool, public baths, and marketplaces.

In addition to these amenities, the residential structures in Yenişehir embraced the modern architectural style of the time. Sümerbank organized housing according to social

class, creating a hierarchy from workers' pavilions to managers' residences. The houses were planned to meet the needs of their occupants and provide a comfortable living environment. At the neighborhood entrance were houses designated for the general manager and guests, followed by residences for managers, engineers, and skilled workers. Dormitories for single workers were built near social facilities but away from family housing. The homes' design aimed to enhance workers' comfort and social lives, with gardens allowing families to engage in agricultural activities and adapt to urban life [6,9–11].

The construction activities in Karabük began in 1936 with 6 cubic-style apartment buildings and a 150-bed dormitory for single workers. These efforts accelerated between 1939 and 1948 with the construction of 920 residences. Sümerbank's urban planning extended beyond housing to include infrastructure, green spaces, sewage systems, and water facilities. For example, Yenişehir adopted a central heating system, a significant innovation for the period.

Today, Yenişehir neighborhood retains its importance as a modern residential area. In 1996, the High Council of Monuments designated it as a protected urban and natural site. (Karabük province, Central district, Yenişehir Neighborhood Natural Protected Area was registered as a "Natural Protected Area—Sustainable Protection and Controlled Use Area" with the Approval of the Ministry dated 21 October 2019 and numbered 246753). Located north of the factory area and at the foothills of Karabük Urban Forest, Yenişehir continues to serve as a social, cultural, and economic center. It also has the distinction of being the region that still exists and has been used for years with its original function among the seven regions determined by Sümerbank.

Despite wars and economic crises, the Early Republican Period prioritized decisions valuing society and individuals. Through industrialization efforts, modern residential plans were implemented in various regions of the country, with settlements that surpassed contemporary standards. This study focuses on Karabük Yenişehir's housing production, emphasizing the principles that guided its development. By analyzing and quantifying these historical, architectural, sociological, and cultural values, the study aims to encourage further research into Yenişehir. Meanwhile, the study analyzes whether the residential settlements produced in the transition from agricultural society to industrial society were planned in accordance with the socio-cultural structure of the society. Finally, unlike previous studies, it also includes archive studies for plan types and presents study findings with numerical values.

## 2. The Concept of Housing and Its Development in Türkiye

Examples of vernacular architecture hold significant value, as they illuminate both the design principles and the way of life of their respective periods. The concept of housing is an interdisciplinary subject that continues to be explored across various fields. Understanding and improving the quality of life in urban areas necessitates considering user demands, which, in turn, sheds light on the underlying reasons for ongoing transformations. Through this approach, it becomes possible to examine how factors such as the demand for change, adaptation to transformation, or being forced into change evolve at both the city-wide and regional scales.

For humans, the primary source of motivation is the fulfillment of the physiological needs essential for survival. According to Maslow's hierarchy of needs, the group of basic necessities—including eating, drinking, and resting—is followed by the need for safety, which encompasses the requirement for shelter [12]. Since the earliest periods, humans, inherently vulnerable to natural conditions, have sought to address this need by constructing shelters. However, in contemporary society, the production of housing—broadly categorized as shelter—is no longer solely aimed at fulfilling this basic necessity.

While shelter remains a fundamental need, a dysfunctional dwelling fails to contribute to the well-being and happiness of its inhabitants.

The theme of the fourth meeting of the International Congress of Modern Architecture (CIAM), held in Athens in 1933 [13], was designated as "The Functional City". As a result of the determinations made regarding residential areas in urban planning, several principles influencing housing design were outlined. Among the suggested principles, which were mainly related to physical factors, a technological dimension was also emphasized. The importance of land conditions such as topography, climate, and sunlight were emphasized when planning residential areas.

As an architectural historian, Sibel Bozdoğan [14] defines architecture as a "carrier of civilization" when evaluating it in the context of housing and life. In making this definition, Bozdoğan includes not only public buildings but also private homes, which are described as the "most intimate family space". This perspective suggests that all changes in family life can be interpreted as internal cultural transformations. Preferences in rooms, furniture, colors, and patterns within homes continuously evolve over time.

Professor Nazan Kırcı [15] defines architecture as the "art of compromise" and emphasizes that the contradictions resulting from changing human demands stem from the differences between the past and the present. He argues that the resolution to this contradiction lies in architectural history. However, this does not imply a mere repetition of the past; rather, it underscores the importance of acknowledging experiences, identity, and collective memory. Understanding these factors provides insights into how individuals shape their living environments based on their chosen lifestyles.

Philosopher–writer Yörükan [16] also adds the concept of "natural conditions" to urban development discussions. He argues that with the growth of urbanization, nature has increasingly been disregarded. As a result of uncontrolled expansion, cities experience not only physical deterioration but also psychological strain on their inhabitants. Urban dwellers, having severed their connection with nature, experience alienation from their authentic selves, lose sensitivity to the allure of the city, and may begin to view their private living spaces—originally intended as shelters—as status symbols.

Throughout history, the selection of settlement sites has been influenced by factors such as proximity to water resources, food availability, suitability for settlement, and security. Prehistoric settlements and housing developments identified in Anatolia reflect these basic factors. The first known settlement structure in Anatolia is found in Çayönü (Diyarbakır), while the oldest known settlement is Çatalhöyük (Konya), and the oldest known religious center is Göbeklitepe (Şanlıurfa). Before settling in Anatolia, Turkish tribes adopted a nomadic and semi-nomadic lifestyle, which led to significant advances in woodworking. When they migrated from Central Asia, they combined their accumulated knowledge and experience with the architectural traditions they encountered in Anatolia and became familiar with stone as a material. The Kubadabad Palace (Figure 3) in Beyşehir, Konya, an example of civil architecture, has an important place in the architectural literature. The name "Kubadabad" means "the place revived and developed by Keykubad", and its complex structure reflects the architectural advances of the period [17].

Numerous examples of civil architecture from this period have survived to the present day, and the "Turkish House" plan type was implemented not only in the Anatolian region but also in various locations across Asia and Europe, where the empire extended its borders. The first systematic study on the Turkish house, which is also referenced in contemporary research, is Sedad Hakkı Eldem's book titled *Türk Evi Plan Tipleri* (*Turkish House Plan Types*), published in 1954 [18]. In this book, Eldem discusses the general characteristics, distinctive features, production processes, and deterioration causes of the Turkish house. Based on approximately 1500 measured drawings, he categorizes Turkish houses into four plan

types (Figure 4) according to their spatial organization. He notes that the Turkish house is typically a single-story structure, while in multi-story examples, each floor is allocated based on its functional role within the dwelling (Figure 5). Accordingly, the ground floor is in direct connection with the garden and accommodates service units. This level does not serve as a living space, and the facades facing public areas remain solid and windowless. Between the ground floor and the main living floor, there is an intermediate level, which is lower in height than the primary floor and is also referred to as the "winter floor". The main floor, where the rooms are located, serves as the primary living area and defines the house's plan type.

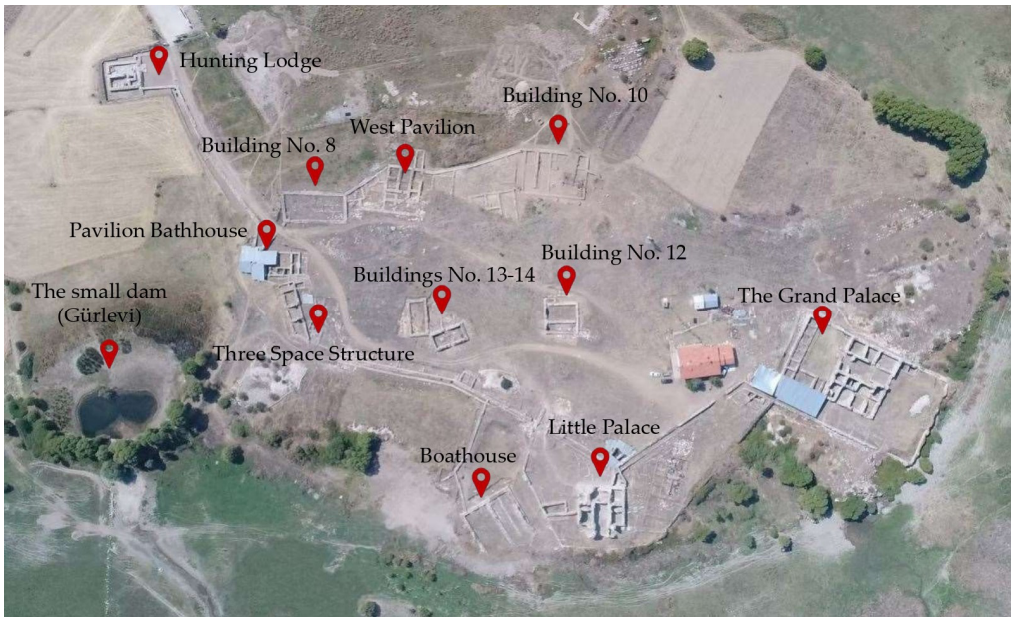



**Figure 3.** Kubadabad palace complex (The author has placed bookmarks on the existing image), Konya/Türkiye [17].

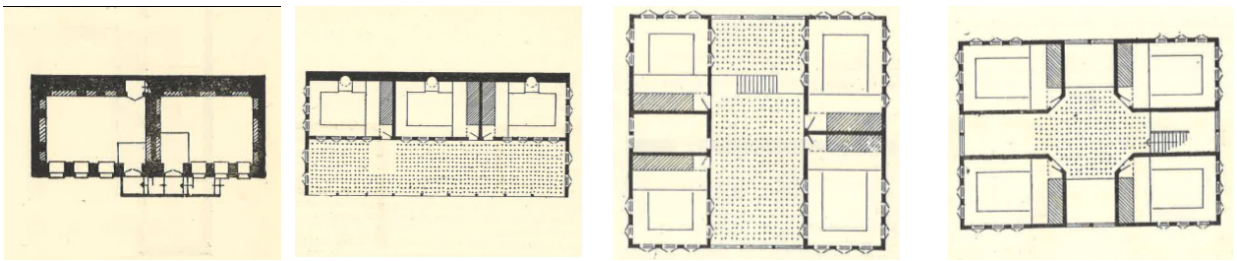



**Figure 4.** Sedad Hakkı Eldem's Turkish house plan type examples (Reprinted from Ref. [18]). (**a**) Plan type without sofa. (**b**) Plan type with outer sofa. (**c**) Plan type with inner sofa. (**d**) Plan type with middle sofa.

Until this period, individual efforts and employer–master relations were seen in housing production as architecture without architects. In the Republican Era, various housing policies were introduced to regulate residential production. This period emphasized the stylistic features inherent to Turkish architecture. However, as this movement did not have a long-lasting impact, modernization efforts emerged in various aspects of society alongside industrialization. During the modernist architectural period, geometric forms were predominantly preferred, functionality became a key design principle, and the technological advancements of the era were effectively utilized [19].

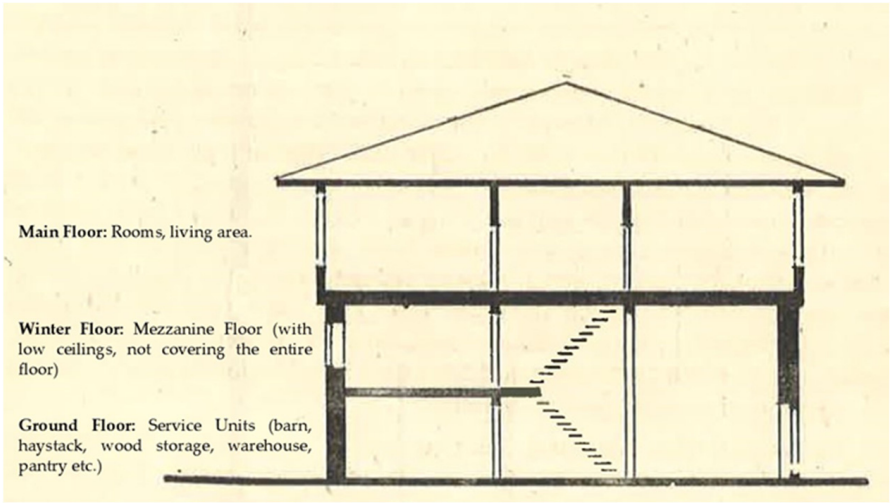



**Figure 5.** Sedad Hakkı Eldem's Turkish house section (Adapted with Ref. [18]).

The rapid population growth of the 1960s led to an urgent need for housing solutions, prompting the development of mass housing projects. These projects, initially carried out by the state or through housing cooperatives, later evolved into large residential complexes. Particularly from the 2000s onward, gated communities have become increasingly prevalent. These settlements, protected by security measures and restricting access to outsiders, function as self-contained urban environments, often incorporating education, healthcare, sports, business, and shopping facilities, as seen in the so-called "space city" developments [20].

After briefly reviewing the history of housing in Anatolia, this section of the study focuses on the Yenişehir district in Karabük, an area of significant importance in the city's housing production history during the Early Republican Period. Yenişehir serves as an exemplary case of modernization through industrial housing production. This evaluation of Yenişehir is expected to provide insights into the changes introduced in housing during the Republican Era and the evolving perspective on human living conditions. By considering the notion that living spaces reflect the socio-cultural characteristics of their respective periods, this study aims to analyze the housing movements of the era from a contemporary perspective.

## 3. Analysis of Residences in Yenişehir District Using the Space Syntax Method

Within the scope of the research method (Figure 6), the plans of the houses in the Yenişehir district in the archive were obtained, and fifteen existing plans were identified. Since it was seen that some plans were derived from each other, three main headings were determined in order to scan the plans with similar features: the number of floors of the building, the number of flats, and the number of entrances to the flat. The number of floors and flats of the building can be used to understand whether it is a detached or an apartment building, and the number of entrances to the flat can give an idea about the interaction between the exterior and interior spaces of the flat. In this context, nine typologies emerged. There are also differences in the number of rooms and square meters among these types, and these details are presented in Table 2. Four of the typified structures are detached houses and five are apartments. Two of the detached houses are single-story, and two are duplex structures.

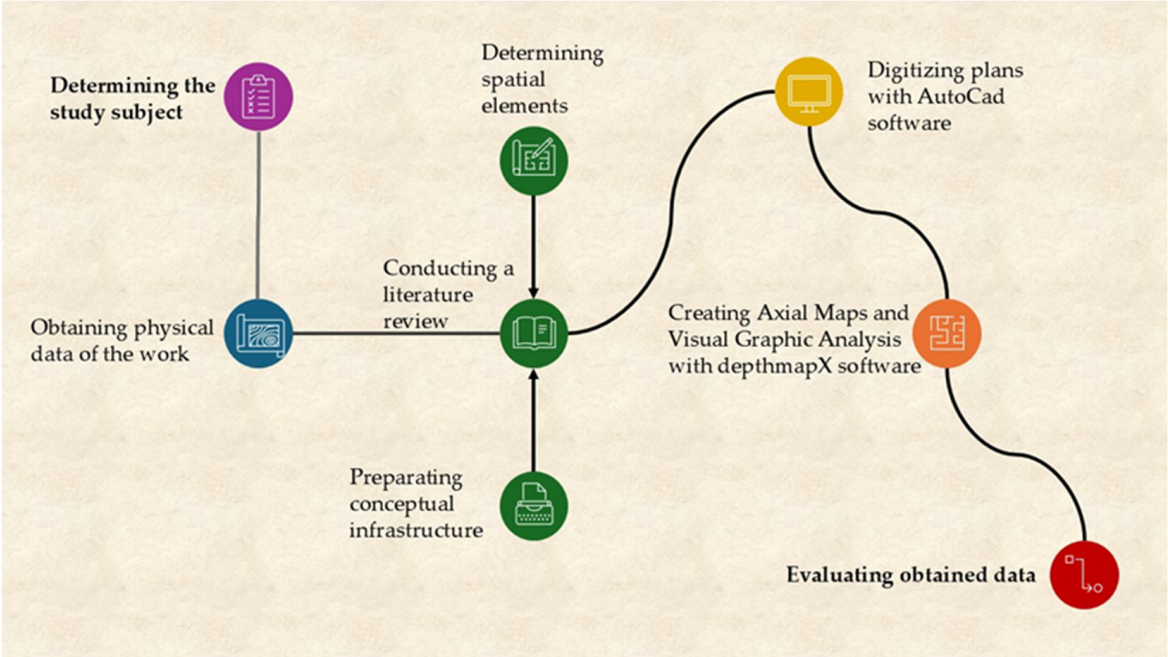



**Figure 6.** Flow chart for the implementation of the research method.

**Table 2.** Features of selected buildings from Yenişehir.

| Type | Area ($m^2$) | Number of Rooms | Number of Floors | Number of Flats | Number of Entrances |
|---|---|---|---|---|---|
| A | 140 $m^2$ | 4 | 2 | 1 | 3 |
| B | 89 $m^2$ | 2 | 2 | 4 | 1 |
| C | 106 $m^2$ | 3 | 2 | 4 | 1 |
| D | 57 $m^2$ | 2 | 2 | 4 | 1 |
| E | 70 $m^2$ | 2 | 1 | 1 | 2 |
| F | 42 $m^2$ | 1 | 1 | 1 | 2 |
| G | 50 $m^2$ | 2 | 2 | 1 | 2 |
| H | 82 $m^2$ | 2 | 4 | 8 | 1 |
| I | 88 $m^2$ | 2 | 4 | 8 | 1 |

In this study, it was decided to use the space syntax method for analysis. The determined study area has been the subject of many studies, but no study has conducted a study on space analysis. This selected method analyzes how spaces are organized, their effects on people, and how they direct social interaction. While functions such as living, eating, and sleeping were carried out in the same room with portable changes before the Republic, specialization (such as living area, bedroom, dining room, study room) is seen in rooms with the Republic. This allows for the analysis of houses not only in terms of structure but also by including the human factor, which is the main purpose of the study.

This method was first developed and used by Bill Hillier and Julienne Hanson in the 1970s based on human movement and visual perception [21]. This method attracts the attention of architects because it can be used both at urban and building scales [22–24]. As did Saraçoğlu Gezer and Sultan Qurraie, we had previously chosen to use this method in our study of the square experience in Karabük province [25]. This method, which has been preferred for many urban studies in a similar form, is preferred in all studies requiring graphical network analysis because it can be worked on an urban scale and because it is a virtual brain that can test the relationships between each of the elements in the city [26–28]. It is a method that can be used at the residential scale [29–31], public building scale [32–34], and even landscape planning [35–37], in addition to the urban scale.

Space syntax is a method used to analyze spatial configurations and how they affect human movement, social interactions, and accessibility. Two key measures in space syntax analysis are connectivity and integration, both of which provide insight into the spatial properties of a given environment [38]. In this study, space syntax analysis was utilized to examine the spatial configuration of residential buildings. This analysis allows for the mapping of spatial transitions and depth while also enabling the calculation of integration values [39]. Furthermore, as a continuation of the space syntax analysis, connectivity and visual graph analyses were conducted using the depthMapX software (Table 3).

**Table 3.** Plans and analyses of the selected buildings from Yenişehir.

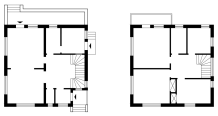
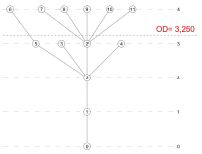
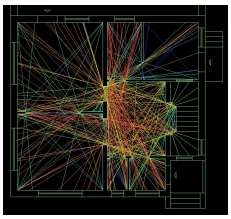
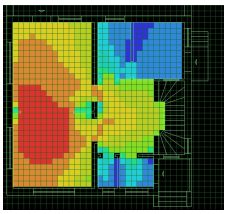
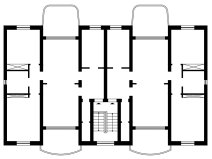
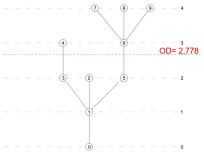
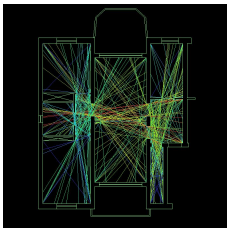
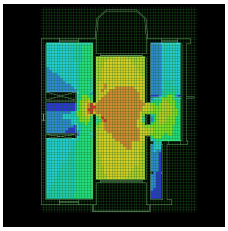
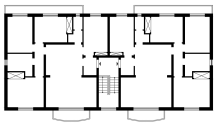
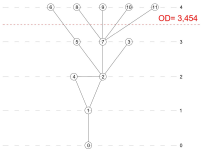
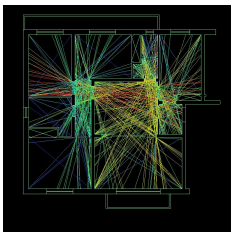
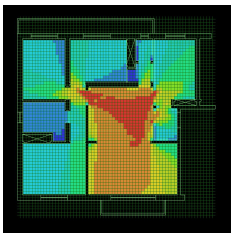
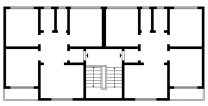
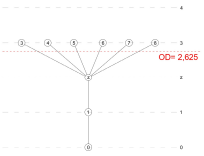
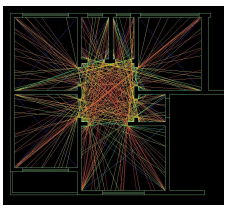
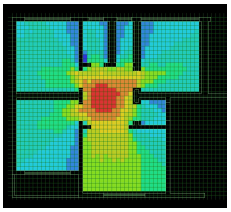
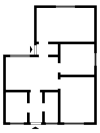
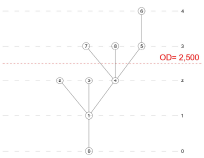
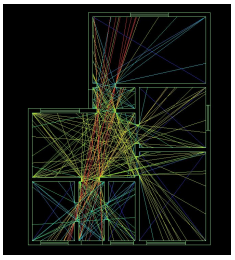
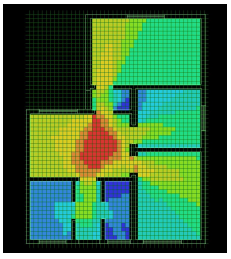
| Type | Plan | Space Syntax | Connectivity | VGA |
|---|---|---|---|---|
| A |  |  |  |  |
| B |  |  |  |  |
| C |  |  |  |  |
| D |  |  |  |  |
| E |  |  |  |  |

**Table 3.** *Cont.*

| Type | Plan | Space Syntax | Connectivity | VGA |
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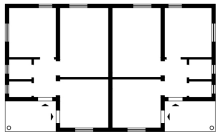
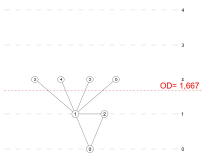
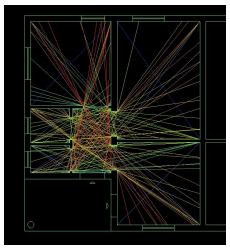
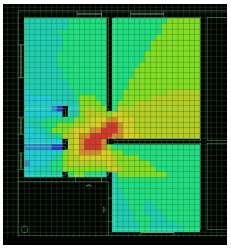
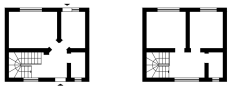
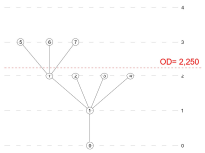
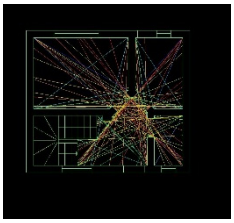
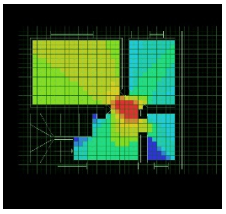
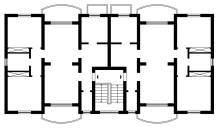
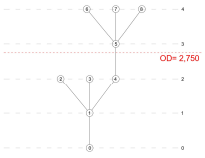
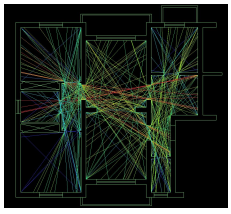
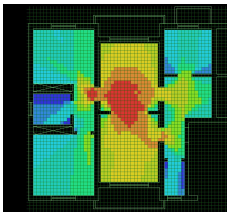
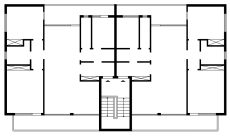
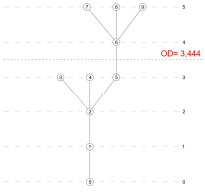
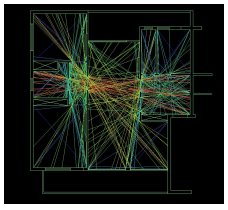
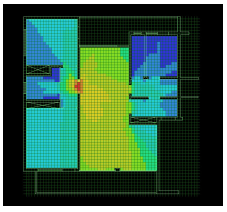
| F |  |  |  |  |
| G |  |  |  |  |
| H |  |  |  |  |
| I |  |  |  |  |

Connectivity analysis, which is used to measure how many connections an area has to adjacent areas, is used to calculate the number of neighboring areas that can be accessed from a given location. The resulting values are evaluated to determine the local accessibility of an area [40,41]. Here, high connectivity indicates that an area is easily accessible and has multiple entry points, while low connectivity values indicate that an area is more isolated or closed. In the case of housing, spaces with a high level of connectivity can be said to have multiple doors opening to different rooms and a central gathering area, while spaces with a low level of connectivity can be said to have only one entrance and have limited access.

The integration value is a general measure that shows the degree to which a space in a system can be reached from all other spaces. It calculates the spatial hierarchy as a whole by the average number of steps required to reach a certain space from all other spaces in the system [42,43]. Here, high integration values indicate that an area is frequently accessible and more central, while low integration values indicate that an area is rarely accessible and isolated. In the case of housing, it can be said that spaces with a high level of integration value are centrally located and efficiently connected to more than one room, while spaces with a low level of integration value are more private and less accessible.

In all these housing units built in Yenişehir as part of industrial-based residential production, engineers, civil servants, and workers employed at various levels in the factory reside. Although some housing groups have been demolished due to structural safety concerns, many of them continue to function as residences. The data obtained through digitization and analysis reveal that these housing units feature timeless and modern

layouts capable of adapting to changing living conditions (Table 4). It has been observed that in all housing types—including single-story detached houses, two-story detached houses, two-story apartment buildings, and four-story apartment buildings—garden use is prioritized, parking spaces are allocated for vehicle owners, basement storage areas are included in apartment-type structures, and while individual housing arrangements are generally preferred, examples of row houses and twin houses can also be found.

**Table 4.** Connectivity and integration data related to the identified structures.

| Type | Connectivity Analysis Values | | | | | Integration Value Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Count | Minimum | Maximum | Average | Std Dev | Spaces | $D_k$ [1] | $D_{mean}$ [2] | RA [3] | RAA [4] |
| A | 219 | 18 | 169 | 117.525 | 38.7698 | 13 | 0.276 | 3.250 | 0.409 | 1.482 |
| B | 248 | 20 | 190 | 95.6613 | 35.6953 | 10 | 0.306 | 2.778 | 0.444 | 1.452 |
| C | 316 | 15 | 238 | 12.7203 | 51.1136 | 12 | 0.285 | 3.091 | 0.418 | 1.467 |
| D | 200 | 25 | 162 | 121.32 | 33.806 | 9 | 0.317 | 2.625 | 0.464 | 1.465 |
| E | 157 | 11 | 118 | 83.0701 | 30.3754 | 9 | 0.317 | 2.500 | 0.429 | 1.352 |
| F | 121 | 18 | 104 | 78.0083 | 20.3801 | 7 | 0.340 | 1.667 | 0.267 | 0.784 |
| G | 96 | 15 | 80 | 56.4583 | 16,319 | 9 | 0.317 | 0.250 | 0.357 | 1.127 |
| H | 218 | 18 | 176 | 92.1101 | 33.8179 | 9 | 0.317 | 2.750 | 0.500 | 1.577 |
| I | 232 | 14 | 191 | 99.8879 | 40.8044 | 10 | 0.306 | 3.444 | 0.611 | 1.997 |

[1.] $D_k$: Table of D-values for k spaces are given by Hillier and Hanson. This value is a fixed value that varies depending on the number of spaces. [2.] $D_{mean}$: Average Depth Calculation. [3.] RA: Relative Asymmetry Value. [4.] RAA: Actual Relative Asymmetry Value.

## 4. Results

Within the scope of architectural history, civil architecture holds as much significance as public buildings, as it provides insights into both the design approach of a given period and the lifestyle it reflects. Just as human history extends far into the past, the history of housing follows a similarly long trajectory. Throughout historical processes, every social transformation has led to changes in societal thought and ways of living, which have, in turn, directly influenced the design and organization of private residential spaces.

Although the primary function of housing is to provide shelter, in contemporary society, it has also become a symbol of social status. Understanding how this transformation is perceived by users and measuring their level of participation in urbanization processes should be planned by local governments. Neighborhoods that differentiate themselves through housing production should be identified as key elements shaping urbanization. Rather than introducing new concepts in housing studies, it is essential to prioritize the accurate use of existing terminologies. Since concepts serve as tools of communication, their correct application is directly linked to a proper understanding of society.

Based on this perspective, the Yenişehir district in the central province of Karabük was selected as the study area due to its construction in line with the industrialization policies of the Early Republican Period, its role as a pioneer in the modernization movements of the Republic, and its significance in housing production related to industrial development. All necessary plans for the analysis of the area were digitized using archival resources from Karabük Iron and Steel Industry and Trade Inc. (KARDEMİR). In addition, the houses identified and included in the study were observed on site, and the use of the houses was examined with the permission of the people living in the houses.

An examination of these housing types reveals that living spaces are more prominently positioned, while bedrooms are located in more secluded areas. In Type A and Type B, a separate night corridor provides access to the bedrooms. During the initial design phase, the separation of living rooms and sitting rooms was a deliberate choice, but in contemporary usage, these two functions have merged into a single living area, eliminating the need for an additional sitting room. The spatial organization of houses varies according to different

user needs. In cases where an additional bedroom is required, a room originally designated as a sitting room may be converted into a child's bedroom, while spaces originally intended for work or guest accommodations may be repurposed as additional sleeping areas. In Type C, bedrooms have been moved entirely to the upper floor, ensuring maximum privacy, while shared spaces such as the living room, kitchen, and bathroom are concentrated on the ground floor.

The conducted analyses demonstrate that the highest connectivity and visibility values in residential floor plans are found in living spaces, confirming that these areas have been strategically positioned for optimal functionality and spatial relationships. The placement of bedrooms in single-floor residences accessible through a separate corridor, and their relocation to upper floors in two-story residences, aligns with privacy needs while also enhancing security within the home.

## 5. Conclusions and Discussion

This study examines residential buildings in one of the seven regions where industrial housing production was carried out in the Early Republican Period of Türkiye. This region, located in Karabük province and called Yenişehir (Turkish meaning 'new city'), is the only surviving residential area that continues to be used with the same function as the day it was built. Sümerbank, which carried out the construction process, determined criteria such as suitability for climate, topography, and easy access to building materials for all regions. The aim of the housing settlements planned in the seven different regions was to integrate a society that made a living from agriculture into industry and to have modern living standards. While doing this, no one was suddenly separated from the land. It planned houses with gardens in accordance with horizontal architecture suitable for human scale.

The changing social structure with the declaration of the Republic brought modernization in housing. With the advancement of technology, sanitary and heating installations can also be seen in these structures built in the 1930s. The examination of these structures, which were pioneers in their time, is important for understanding the development of housing history. The study examines the residential structures in the area and shows how changing residential demands are reflected spatially and how users respond to these transformations.

Research also reveals that despite the changes experienced with modernization, attention is paid to the importance given to living spaces culturally. In analyses based on human movements, the spaces most intensively used and most related to all other units are always in living spaces. Living spaces are a socializing space for family members returning from work and school to get together in the evenings and spend time with relatives and friends on weekends. It is an important notion for individuals and families in socio-cultural terms.

In this context, it is very important to integrate user perspectives into urban planning decisions. Therefore, user demands should be taken seriously. It is recommended to conduct survey studies to evaluate the extent to which residential areas fulfill their goals in line with the developing urbanization dynamics.

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**Conflicts of Interest:** The authors declare no conflicts of interest.

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# Research on adapting historical station buildings to timeless museums according to user preferences: The case study of the Ankara Station Building

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**Highlights:**

- Adapting the Ankara Station Building to the timeless museum
- Service, historical value, museum, activity, shopping, transportation, and occasion factors in SPSS
- To increase users' awareness of the history and importance of the historical station building

**Keywords:**

- Historical Station Building
- Timeless Museum
- User Preferences
- Ankara Station Building
- Adaptive Reuse

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**Graphical/Tabular Abstract**

The study area was determined as the Ankara Station Building in Ankara, Turkey. After literature review and case study, 35 questions were prepared, and a survey was conducted with 521 people. The data was analyzed with IBM SPSS Statistics program and 7 factors were found. The factors are determined as service, historical value, museum, activity, shopping, transportation, and occasion shown in Figure A.

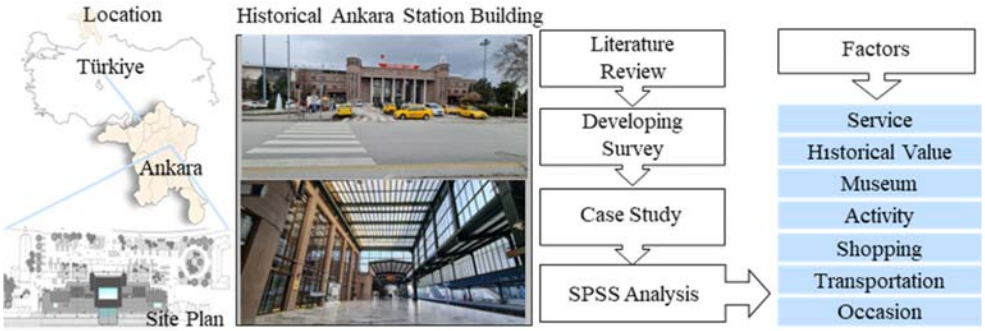


**Figure A.** Case study

**Purpose:** It is important for the sustainability of the historical station buildings, which have an important place in emphasizing the identity of a city, to keep their historical identity at the forefront while continuing their original functions. In this context, it is aimed to develop the timeless museum and model that will make a new contribution to the literature to ensure the sustainability of the station structures. To adapt the model, the opinions of the users of the Ankara Station Building, which was chosen as a case study area, were taken about the building and its adaptation to the timeless museum.

**Theory and Methods:** Creating survey questions with experts in the field, analyzing and interpreting the survey data conducted with 521 people with the IBM SPSS Statistics program. Survey questions were created on a five-point Likert scale. Frequency and percentage distribution information of the demographic characteristics of the survey participants were obtained, dimensions were created by factor analysis, and the factors were subjected to difference tests with one-way ANOVA and t-test according to demographic characteristics.

**Results:** The overall scale reliability coefficient was calculated as Cronbach's Alpa $\alpha = 0.897$. Seven factors were obtained in the study. As a result of the tests, differences of opinion were revealed according to different ages, status, education, marital status, and location.

**Conclusion:** The survey participants' knowledge about the building and their opinions about the adaptation of the building to the timeless museum were evaluated. The data obtained in the study revealed that the users' knowledge about the history and importance of the building was insufficient. In addition, users stated that the building was inadequate in terms of service, social areas, opportunities, and activities to spend quality time. In this context, it is believed that with the timeless museum model that will be adapted to the building, all the deficiencies stated by the users will be eliminated and add value to the building. On the other hand, the adaptability of this innovative, timeless museum model to different historical station buildings will ensure that the cultural heritage is known to the users and the sustainability of the buildings.

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# Tarihi gar binalarının kullanıcı tercihlerine göre zamansız müzeye dönüştürülmesi üzerine bir araştırma: Ankara Gar Binası örneği

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## ÖNEÇIKANLAR

- Ankara Gar Binası'nın zamansız müzeye uyarlanması
- SPSS'de hizmet, tarihi değer, müze, etkinlik, alışveriş, ulaşım ve zaman faktörlerine ulaşılması
- Tarihi gar binasının tarihi ve önemi konusunda kullanıcıların farkındalığının artması

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ÖZ

Bir kentin sahip olduğu mimari formlar ve özelliklerinin yanı sıra, şehre ait gar binaları kentin kimliğini oluşturan önemli unsurlar arasındadır. Tarihi gar yapıları, kenti ziyaret etmek ve deneyimlemek isteyen kişilerin, kent ile ilk karşılaştıkları anı simgeledikleri için insanların hafızalarında önemli bir yer edinir. Bu kapsamda, Türkiye Cumhuriyeti'nin kuruluş döneminde yapılmış ve tarihsel olarak önemli olaylara şahitlik etmiş, hala aktif olarak kullanılan Ankara Gar Binası'nı deneyimleyen kişilerin görüşleri alınarak, kullanıcı tercihleri tespit edilmiş ve yapının zamansız müzeye dönüşümü ile ilgili düşünceleri alınmıştır. Araştırmada nicel araştırma yöntemi kapsamında anket tekniği kullanılmıştır. Örneklem alanını Ankara Gar Binası kullanıcıları oluşturmuş ve kolayda örneklem yöntemi ile anket soruları beşli Likert ölçeğinde hazırlanmıştır. 521 kişinin anket verileri IBM SPSS Statistics programına işlenmiş ve yanıtlar analiz edilerek yorumlanmıştır. Sonuç olarak, bazı faktörler için farklı yaş grupları, meslek grupları, eğitim durumları, medeni durum ve ikamet yeri arasında belirgin farklılıklar ortaya çıkmıştır.

# Research on adapting historical station buildings to timeless museums according to user preferences: The case study of the Ankara Station Building

## HIGHLIGHTS

- Adapting the Ankara Station Building to the timeless museum
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ABSTRACT

Station buildings stand among the significant elements shaping the identity of a city, alongside its architectural form and characteristics. The historical station buildings hold a significant place in people's memories, as they symbolize the initial encounter of individuals who wish to visit and experience the city. In this context, to take the opinions of people who experienced the Ankara Station Building, which was built during the founding of the Republic of Turkey and witnessed historically important events and is still actively used, a survey was conducted to identify user preferences. The aim is to explore the adaptation of the building into the timeless museum. During the study, the survey technique was used within the scope of the quantitative research method. The sampling area consisted of Ankara Station Building users and the survey questions were prepared on a five-point Likert scale with the convenience sampling method. The survey data of 521 people were processed into the IBM SPSS Statistics program and the responses were analyzed and interpreted. As a result, significant differences emerged in some factors between different age groups, employment groups, educational groups, marital status, and location status.

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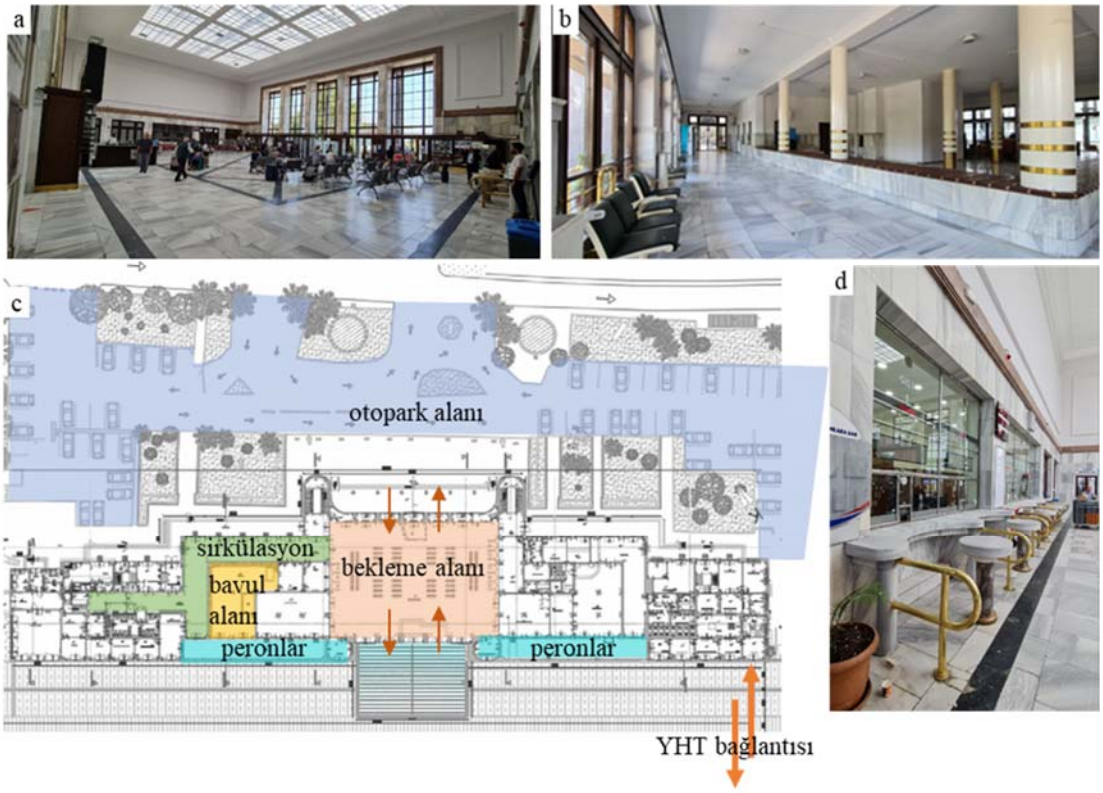
## 1. Giriş (Introduction)

Tarihi yapıların sürekliliğinin sağlanması, kültürel mirasın korunması ve gelecek nesillere aktarılması açısından son derece önemlidir [1]. Zamanla özgün işlevini yitiren ve atıl durumda kalan tarihi yapılar, mimari karakterlerine uygun şekilde yeniden kullanıma uyarlanarak korunmakta ve sürekliliği sağlanmaktadır [2, 3]. Tarihi yapıların farklı işlevlere uyarlanması [4], bu yapıların yaşayan ve kullanılan mekânlara dönüşmesini sağlayarak geçmişle günümüz arasında köprü kurmaktadır. Eğitim yapıları, sağlık yapıları ve sanayi yapıları gibi birçok farklı türden tarihi yapının günümüzde çeşitli işlevleri yerine getirmek üzere uyarlanması ile hizmetine devam ettiği bilinmektedir [5-8]. Bu yapı türlerinden birisi de tarihi gar binalarıdır [9]. Tarihi gar binaları, modern taşımacılık sistemlerine uygun şekilde restore edilerek müzeler, kültürel merkezler, kafeler ve ofisler gibi farklı amaçlar için kullanılabilmektedir [10-12]. Bu adaptasyon, geçmişin izlerini korurken yapıların toplumsal yaşama yeniden entegre olmasını sağlamaktadır.

Gar binaları, tarih boyunca kentlerin gelişimine katkıda bulunarak [13] kritik bir rol oynamıştır [14]. Garlar, sadece tarihsel ve kültürel kimliğin birer yansıması olarak kabul edilmemiş aynı zamanda şehirlerin giriş kapıları olarak [15] rollerini sürdürmüşlerdir. Kentlerin ulaşım merkezleri olan tarihi gar binaları, gün içerisinde şehir içinden ve dışından yapıya gelen birçok insan için ulaşım hizmetinin yanı sıra [16] alışveriş imkanları, bekleme alanları ve sosyal aktivite imkanları gibi farklı hizmet alanları da sunmaktadır [17, 18]. Yapıyı ulaşım amacı ile kullanan yolcuların veya geçiş amaçlı kullanan diğer bireylerin gar binalarının tarihi değerinin farkına varmaları, yapının simgelediği kültürel mirası ön plana çıkarmak adına önemlidir. Bu sebeple, insanların yapı kullanımına dair beklentilerini anlamak ve hizmet kalitesini geliştirmek için kullanıcı görüşleri alınarak değerlendirilmelidir. Kullanıcıların yapıya dair bilgi ve düşüncelerini öğrenmek için yapılan anket çalışmaları [19, 21], gar binalarının modern topluma nasıl entegre edileceğini anlamak ve bu önemli yapıların tarihi ve kültürel mirasını gelecek kuşaklara aktarmada uygulanacak yöntemler için önemli bir rol oynamaktadır.

Ankara'nın giriş kapısı olarak nitelendirilen ve Cumhuriyet Dönemi yapılarından biri olan Ankara Gar Binası, sahip olduğu tarihi değer ve mimari özellikleri ile simge bir yapıdır [22-24]. Ankara Gar Binası, araştırmacı tarafından yapılan alan çalışması ve arşivden elde edilen rölöve çizimleri doğrultusunda, mimari olarak Talatpaşa Bulvarı'na paralel olarak 150 metre boyunca uzanan, simetrik ve yatay bir yapıdır. Yapının mimari hacim düzenlemesi simetridir ve bodrum katından itibaren dört kattan oluşmaktadır. Giriş kütlesinin her iki yanında dairesel merdiven blokları bulunmaktadır ve şu an lojman daireleri olarak kullanılan katlara çıkmaktadır. Bina ana giriş kapılarının bulunduğu cephenin yüksekliği 14,27 metredir ve girişi tanımlayan 9,68 metre yüksekliğinde beş adet cam blok ile giriş kapıları bulunmaktadır. Bu alanı oluşturan hacim, bekleme salonu olarak kullanılmaktadır ve 33x24 metre genişliğe, 12,56 metre yüksekliğe sahiptir (Şekil 1). Bekleme holünün tavanı metal konstrüksiyon üzerine opak lamine camdan oluşmakta ve gün ışığını sönümlenmiş şekilde içeri almaktadır. Bina, merkezde ana kütle ve iki yanda simetrik şekilde küçülen birer hacim olmak üzere toplamda üç adet kütleden meydana gelmektedir. Ana kütle altında bir bodrum kat olmak üzere, toplamda 4 kat, diğer bitişik yan kütlesi ise bodrum kat ile birlikte 3 kattan oluşmaktadır. Betonarme yapı, Ankara taşı ile kaplanmış ve aşırı dekoratif unsurlardan kaçınılarak yapının geometrisi vurgulanmıştır. Bekleme salonunu ile bağlantılı olan yan alanların üst katları lojman olarak kullanılırken, zemin kat giriş

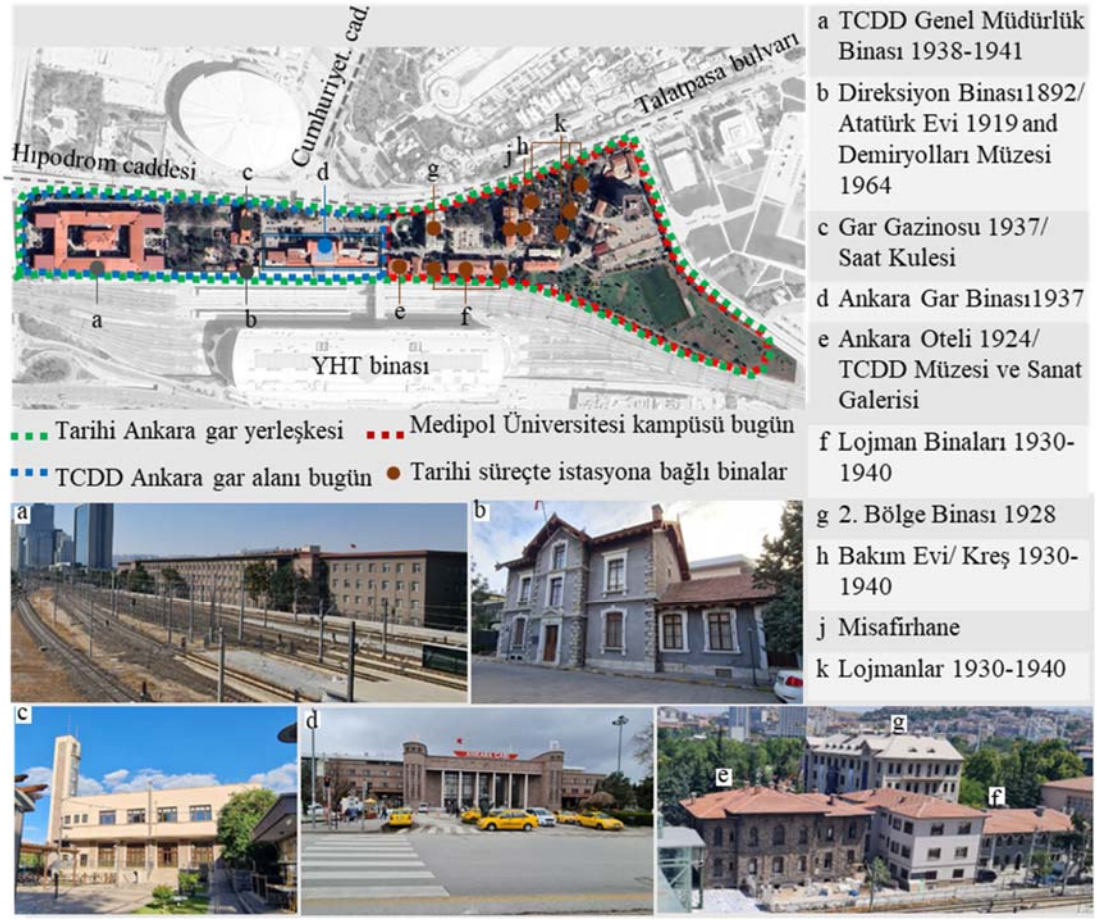



**Şekil 1.** Ankara Gar Binası bekleme salonu (a), bavul alanı (b), zemin kat ve vaziyet planı (TCDD arşivi) (c), bilet gişeleri (d)
(Ankara Station Building waiting area (a), suitcase area (b), ground floor and site plan (c), ticket offices (d))

holünde büfeler, bilet satış gişeleri, bavul alanı, personel ofisleri, berber ve şeref salonu gibi çeşitli birimler bulunmaktadır. Yapıya; ulaşım, ziyaret ve geçiş amaçlı gelen kullanıcılar, yapının zemin kat bekleme holü, bagaj bölümü, ıslak hacim alanı ve iç mekanla bağlantısı olmayan dış cepheye bağlı girişlerden berber dükkânı ve mescit alanlarını kullanabilmektedirler. Bu sebeple gün içindeki sirkülasyon yoğunluğunun büyük bir çoğunluğu bekleme holünde gerçekleşmektedir.

Ankara Gar Binası, mimar Şekip Akalın tarafından tasarlanarak 1937 yılında faaliyetine başlamıştır [25]. Günümüze kadar mimari özgünlüğünü koruyan bina, hala işlevine devam etmektedir. Ankara Gar Binası; yapıldığı dönemde kendisine bağlı TCDD Genel Müdürlük binası (1938-1941), Lojman Binaları (1930-1940), Direksiyon Binası (1892), Gar Gazinosu (1937), Ankara Oteli (1924), 2. Bölge Binası (1928), Bakım Evi (1930-1940) ve Misafirhane gibi diğer binalarla bir kompleks oluştururken, süreç içerisinde bu binaların bir kısmının farklı kurum ve kuruluşlara verilmesi ile yalnızlaşmaya başlamıştır. Şekil 2'de Ankara gar binasının tarihi yerleşkesinde bulunan yapılar ve günümüzde gar yerleşkesinin durumu uydu görüntüsü üzerinden ifade edilmiştir. Ayrıca kütle ve ölçeği ile tarihi binanın görünürlüğünü gölgeleyecek şekilde inşa edilen yüksek hızlı tren (YHT) garının (2016) [25, 26] Ankara Gar Binası'nı geri planda bırakması sebebi ile yapı, tarihi değerini ön plana çıkaramamaktadır (Şekil 3). Belli başlı sebepler ile sahip oldukları mimari ve kültürel değerleri unutulmaya yüz tutmuş veya tarihi kimliğini yeterince yansıtamayan yapıları koruma kapsamında çeşitli çalışmalar yapılmaktadır. Bu kapsamda çalışmaların önemli bir kısmı tarihi yapıların yeniden işlev verilerek günümüze kazandırılması yöntemiyle yapılmaktadır [27]. Bu yapıların birçoğunun, yapının özgünlüğüne müdahale etmemesi ve koruma açısından uygunluğu sebebiyle müzeye dönüşümü tercih edilmektedir.

Tarihi yapılardan dönüştürülen mekanlarda yapının özgün sirkülasyon hatları korunarak, sergi alanları için organizasyon ve plan şemalarının içeriğe uygun bir şekilde oluşturulması veya tasarlanması mümkündür. Planlama aşamasında, sergilemenin nitelik ve ihtiyaçlarının yanı sıra [28] binanın hizmet kalitesi; aktivite, alışveriş imkanları, ziyaretçi yönetimi, bilgilendirme, ulaşım kolaylığı ve zamanın nitelikli bir şekilde geçirileceği ortamların sağlanması ile artmaktadır. Yapılan araştırmalar ile özgün işlevini yitirdikten sonra müzeye dönüştürülmüş tarihi gar binalarından bahsetmek mümkündür. Fakat kurulduğu günden bu yana özgün işlevine devam eden tarihi bir gar binasının işleyişi sırasında kullanıcıları için müze algısı oluşturacak bir dönüşüme rastlanamamıştır. Müze tanımları konusunda literatürde yaşayan müze [29], tarih müzesi [30], interaktif müze [31], sanal müze [32], ekomüze gibi çok fazla çalışma ve tanım bulunmaktadır. Zamansız müze kavramı araştırıldığında, "timeless museum" olarak Aiello vd. 'nin sanal gerçeklik ortamında önerdiği sanal müze betimlemesi olarak karşımıza çıkmaktadır [33]. Ayrıca White ve Wesleyan "timeless museum" kavramını Paris'i anlatan şiirsel bir yaklaşımda "zamanın ötesinde" anlamında kullanmıştır [34]. Negassi ise bu kavramı etnik sağlığa sahip bir ülkeyi tasvir etmek için kullanmıştır [35]. Çalışma için ortaya konulan "zamansız müze" kavramı her ne kadar bu kaynaklarda anılmış olsa da tarihi gar




**Şekil 2.** Ankara Gar kompleksi (Ankara Station Complex)




**Şekil 3.** Saat kulesinden bakış (a), Cumhuriyet Caddesi'nden bakış (b), Gençlik Parkı'ndan YHT binası, Gar Binası ve Ankara Garı eski yerleşkesi (c). (View from the clock tower (a), view from Cumhuriyet Street (b), YHT building, Station Building and old campus of the Ankara Station from Gençlik Park (c).)

binaları için ortaya koyduğumuz ve literatüre katkı sağlayacak yeni bir kavramdır. Zamansız müze, tarihi bir gar binasının özgün işlevine devam ederken, aynı zamanda kullanıcı için müze algısı oluşturularak tarihi yapının sürdürülebilirliğinin ve "yapı dokunulmazlığının" sağlanmasına katkı sunacaktır. Bu model, geleneksel müze tanımının ötesinde, zamansız bir şekilde özgün hizmetine devam ederek geçmişin anlamını günümüze taşıyan gar yapılarının, tarihi ve kültürel değerlerini vurgulamayı amaçlamaktadır. Bu yaklaşım, kültürel mirasın canlı ve dinamik bir şekilde korunmasını ve paylaşılmasını hedeflemektedir. Özellikle gar binaları gibi tarihi ve sembolik öneme sahip yapılar, zamansız müze kavramıyla daha geniş bir kitleye açılacak, ziyaretçilere geçmişle bağ kurma ve tarihi, derinlemesine anlama fırsatı sunacaktır. Bu sayede, tarihi gar binalarının sadece bir ulaşım merkezi olmalarının ötesinde, kültürel ve tarihi bir mekân haline gelmesi de hedeflenmektedir.

Zamansız müze modeli ile; günün her saatinde işleyen ve 7/24 kullanıcılara açık olan tarihi gar binalarının, özgün işlevine devam ederken yapının bulunduğu konum itibariyle tarihi önemini, mimari ve dönemsel özelliklerini çeşitli sergileme yöntemleriyle kullanıcıya sunması düşünülmektedir. Bu sayede yolcuların yapıda beklemeleri ve geçişleri sırasında güzergahları üzerinde oluşturulacak çeşitli sergileme yöntemleri ile yapının tarihi farkındalığı yaşatılacak ve yolcuların gar binasını nitelikli bir şekilde deneyimlemeleri sağlanacaktır. Zamansız müze modeli ile şehir içinden ve dışından gelen kullanıcıların yapıyı keşfedebileceği ve beklemeleri sırasında ziyaretçiye çeşitli sanatsal ve sosyal aktivitelere katılabilecekleri olanaklar sunularak tarihi yapı ile ilgili farkındalıkları artırılacaktır. Bu dönüşümün oluşması için öncelikle kullanıcı görüşleri alınarak bina hizmet alanlarındaki eksiklikler tespit edilmelidir.

Bu çalışma ile Ankara Gar Binası'nın zamansız müzeye dönüştürülmesi sürecinde yapı kullanıcılarından; tercihleri, yapı ile ilgili farkındalık düzeyleri ve yapının müzeye dönüştürülmesi konularında görüşlerinin alınması amaçlanmıştır. Bu sebeple çalışma, Ankara Gar Binası kullanıcılarının (yolcular, personel, ziyaretçiler vb.) görüşlerinin alınmasına yönelik olmasıyla daha önce böyle bir çalışmanın yapılmaması çalışmayı özgün kılmaktadır. Dolayısıyla çalışma, sonuçlarını alana yeni bir bakış açısı getirmesi yönünden önemlidir. Bu nedenle araştırmanın amacına bağlı olarak aşağıdaki temel hipotez ve alt hipotezler geliştirilmiştir. Anket tekniği kullanılan çalışmanın verileri IBM SPSS Statistics programıyla analiz edilmiş ve analizler sonucunda hizmet, tarihi değer, müze, etkinlik, alışveriş, ulaşım ve zaman olmak üzere yedi faktöre ulaşılmıştır. Ortaya çıkan bu faktörler demografik özelliklere göre kıyaslanarak değerlendirilmiştir.

*H1:* Ankara Gar Binası'nı kullananların tarihi yapıya ilişkin farkındalık düzeyleri arasında demografik yapılarına göre anlamlı farklılık vardır.

*H1-1:* Ankara Gar Binasını kullananların tarihi yapıya ilişkin farkındalık düzeyleri cinsiyetlerine göre anlamlı farklılık göstermektedir.
*H1-2:* Ankara Gar Binasını kullananların tarihi yapıya ilişkin farkındalık düzeyleri yaşlarına göre anlamlı farklılık göstermektedir.
*H1-3:* Ankara Gar Binasını kullananların tarihi yapıya ilişkin farkındalık düzeyleri medeni duruma göre anlamlı farklılık göstermektedir.
*H1-4:* Ankara Gar Binasını kullananların tarihi yapıya ilişkin farkındalık düzeyleri statülerine göre anlamlı farklılık göstermektedir.
*H1-5:* Ankara Gar Binasını kullananların tarihi yapıya ilişkin farkındalık düzeyleri ikamet yerlerine göre anlamlı farklılık göstermektedir.
*H1-6:* Ankara Gar Binasını kullananların tarihi yapıya ilişkin farkındalık düzeyleri eğitim durumuna göre anlamlı farklılık göstermektedir.

## 2. Araştırma Yöntemi (Research method)

Bu araştırmada, karma araştırma yönetimi kullanılmıştır. Dolayısıyla hem nitel hem de nicel veriler amacına uygun olarak analiz edilerek değerlendirilmiştir. Araştırmanın nitel tarafında literatür taraması ve uzman görüşlerinin incelenmesi söz konusu iken nicel araştırma kısmında araştırmacı tarafından geliştirilen anket tekniği uygulanmıştır. Anket sorularının hazırlanmasında Ankara Gar Binası ile ilgili detaylı literatür araştırması yapıldıktan sonra [36-38] çalışma alanında yerinde incelemelerde bulunulmuş ve gar binası personelleri ile görüşmeler yapılarak yapı hakkında bilgiler alınmıştır. Elde edilen bilgiler ve literatür doğrultusunda araştırmacı tarafından özgün bir

şekilde oluşturulan anket ifadeleri 15 uzman (7 Mimar, 2 Mimari Restoratör, 1 Sanat Tarihçisi, 1 Arkeolog, 2 Peyzaj Mimarı, 1 İç Mimar ve 1 Çevre Mühendisi) görüşü alınarak geliştirilmiştir. Araştırmanın amacına uygun olarak iki bölümlü bir anket oluşturulmuştur. Anketin birinci bölümü katılımcıların demografik özelliklerini belirlemektedir. İkinci bölüm ise katılımcıların Ankara Gar Binası kullanımı ile ilgili görüşlerini, tarihi değeri hakkındaki bilgilerini ve farkındalıklarını ölçmenin yanı sıra binanın zamansız müze modeline dönüşümü ile ilgili düşüncelerini ölçmek için oluşturulmuştur.

Anket ifadeleri pilot uygulama ile 100 kişiye kolayda örneklem yöntemi kapsamında uygulanmıştır. Sonrasında açımlayıcı faktör analizi yapılarak anket ifadeleri boyutlandırılmış ve saha uygulamasına başlanmıştır. Örneklem sayısının belirlenmesinde sınırsız evrenler ve nicel araştırmalar için geçerli olan $n = \sigma^2 . Z_\alpha^2 / H^2$ formülünden istifade edilmiş olup (N>10.000), standart sapma değeri σ=0,05, anlamlılık düzeyi $Z_{0,05}$=1,96, etki büyüklüğü H=0,05 olarak alındığında örneklem sayısının ez az n=384 olduğu tespit edilmiştir [39]. Hedef katılımcılar, Ankara Gar Binası'nı kullanıp deneyimleyen bireyler arasından seçilmiştir. Ankara Gar Binası ve çevresinde, araştırmacı tarafından kolayda örnekleme yöntemi kullanılarak ankete görüş bildirmeyi kabul eden gönüllü 563 kişi ile yüz yüze uygulama gerçekleştirilmiş, bunlardan 521 katılımcının anketleri geçerli sayılmış ve değerlendirmeler bu sonuçlar üzerinden yapılmıştır.

Anket ifadelerine katılımcıların katılım düzeylerini belirlemek amacıyla Likert ölçeği kullanılmış ve 1 (hiç katılmıyorum), 2 (az katılıyorum), 3 (orta derecede katılıyorum), 4 (çok katılıyorum), 5 (tamamen katılıyorum) şeklinde kategorize edilmiştir. Veriler, IBM SPSS Statistics paket programı kullanılarak analiz edilmiştir. Örneklem grubuna dahil edilen Ankara Gar Binası kullanıcılarının demografik bilgileri ve bina kullanımına dair bilgiler frekans ve yüzde dağılım tablosu oluşturulmuştur. Parametrik test koşullarının sağlanıp, sağlanmadığını belirleyebilmek, uygulanabilirlik ve örneklem yeterlilik tespiti için varyansların homojenliği testi ile normal dağılım testi (Kolmogorov-Smirnov), faktör analizinin yapılabilirliğini ölçmek için de Bartlett testi ile örneklem yeterliliği için Kaiser-Meyer-Olkin (KMO) sonuçları belirlenmiştir. Cronbach-Alpha testi de yapılarak çalışmanın güvenilirliği saptanmıştır. Ayrıca döndürme işlemi uygulanarak faktör analizi yapılmış, ölçek boyutlandırılması gerçekleştirilerek ölçekler araştırmacı tarafından ifadeler çerçevesinde isimlendirilmiştir. Sonuçlar katılımcıların demografik özellikleri açısından farklılık testlerine (T-testi ve ANOVA testi) tabi tutulmuştur. Bu bağlamda elde edilen katsayılar ve p değerleri incelenmiş ve çalışma kapsamında yorumlanmıştır.

## 3. Bulgular (Findings)

Bu kısımda araştırmanın amacına uygun olarak iki bölümden oluşan anket formuna yönelik bulgulara yer verilmiştir.

### *3.1. Demografik Analizler (Demographic analysis)*

Ankara Gar Binası kullanıcılarının tarihi yapı hakkındaki görüşlerinin belirlenmesinin hedeflendiği çalışmada, araştırmaya katılan kullanıcıların demografik özellikleri (cinsiyet, yaş, medeni durum, eğitim durumu, statü, ikamet yeri) ile ilgili bilgilerin yer aldığı değişkenlere dair frekans ve yüzdelik dağılımlar hesaplanarak Tablo 1'de verilmiştir. Çalışmaya katılanların alt yaş sınırı 15 olarak belirlenmiş olup, 15-18 yaş aralığında olan kişilerin görüşleri ailelerinin izni alınarak çalışmaya dahil edilmiştir.

Tablo 1 kapsamında katılımcıların %51,6'sı erkek, %48,4'ü kadındır. Katılımcıların çoğunluğunu %58,6 ile 18-37 yaş aralığında bireyler, %59,5 ile bekar bireyler, %67,6 ile Ankara içinde ikamet edenler, %54,9 ile lisans ve lisansüstü eğitim durumuna sahip bireyler oluşturmaktadır. Ayrıca katılımcıların statülerinin çoğunluğu sırası ile %26,3 devlet memuru, %25,3 öğrenci, %24,2 özel sektör çalışanı, %10,6 serbest çalışan, %8,3 çalışmayan ve %5,4 emekli olarak tespit edilmiştir.

**Tablo 1.** Araştırmaya dahil edilen Ankara Gar Binası kullanıcılarının demografik özelliklerine dair frekans ve yüzde dağılımları (n=521) (Frequency and percentage distributions regarding the demographic characteristics of the users of the Ankara Station Building included in the research)

| Değişkenler | Gruplar | f | % |
|---|---|---|---|
| *Cinsiyet* | Kadın | 252 | 48,4 |
| | Erkek | 269 | 51,6 |
| *Yaş* | 17 ve altı | 27 | 5,2 |
| | 18-27 | 178 | 34,2 |
| | 28-37 | 127 | 24,4 |
| | 38-47 | 97 | 18,6 |
| | 48-57 | 71 | 13,6 |
| | 58-67 | 21 | 4,0 |
| *Medeni Durum* | Evli | 211 | 40,5 |
| | Bekar | 310 | 59,5 |
| *Eğitim Durumu* | İlköğretim | 33 | 6,3 |
| | Lise | 139 | 26,7 |
| | Ön Lisans | 63 | 12,1 |
| | Lisans | 207 | 39,7 |
| | Lisansüstü | 79 | 15,2 |
| *Statü* | Devlet Memuru | 137 | 26,3 |
| | Özel Sektör | 126 | 24,2 |
| | Öğrenci | 132 | 25,3 |
| | Emekli | 28 | 5,4 |
| | Serbest Çalışan | 55 | 10,6 |
| | Çalışmayan | 43 | 8,3 |
| *İkamet Yeriniz* | Ankara | 352 | 67,6 |
| | Ankara Dışı | 169 | 32,4 |

### *3.2. Güvenilirlik ve Geçerlilik Analizleri (Reliability and Validity Analysis)*

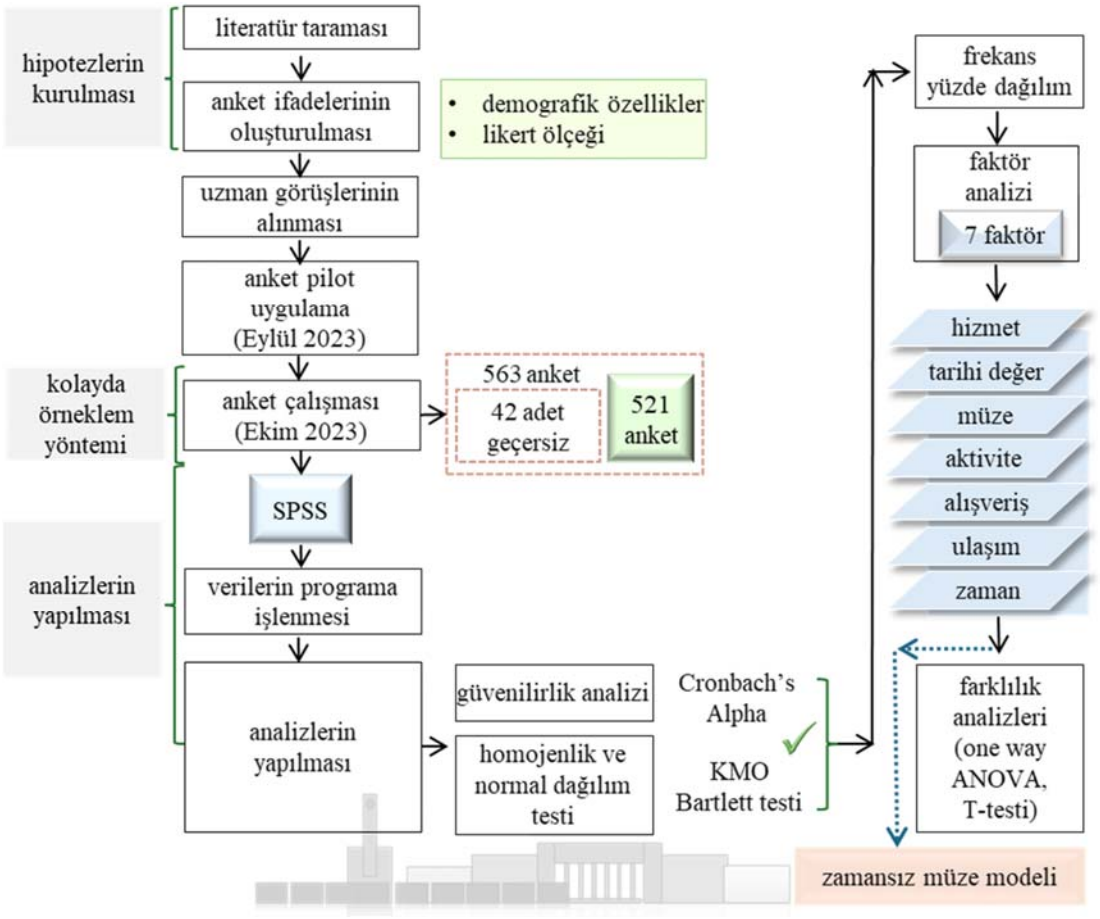
Veri setinin geçerliliği ve uygunluğunu görmek için testler yapılarak değerlere bakılmıştır. Verilerin normalliğin iki bileşeni çarpıklık (skewness) ve basıklıktır (kurtosis). Dağılımın normal olduğunu gösteren değerler ise -1.5 ile +1.5 arlığındadır [40]. Kolmogorov-Smirnov testi neticesinde çarpıklık değeri (skewness)=-0,665 ve basıklık değeri (kurtosis)=+1,117 çıkarak dağılımın normal olduğu görülmüştür. Ayrıca, anket verilerinin analiz sonuçlarının güvenirliğini değerlendirmek için Cronbach's Alfa değeri, güvenilirlik analizinin ölçüsü olarak kullanılmaktadır. Cronbach's Alpha, yani güvenirlik katsayısının bulunabileceği aralıklar $0,60 \leq \alpha < 0,80$ ise ölçek oldukça güvenilir, $0,80 \leq \alpha < 1,00$ ise ölçek yüksek derecede güvenilir olarak kabul edilmektedir [41] Tablo 2'de verilen bütün alt boyutların Cronbach's Alpha değerleri 0,60 değerinin üzerinde olduğu için güvenilirdir. Ayrıca çalışmanın genel ölçek güvenilirliği katsayısı (Cronbach's Alpa) $\alpha$=0,897 olarak hesaplanarak yüksek derecede güvenirlik sağlamıştır. Kaiser-Meyer - Olkin (KMO) testi verilerin faktör analizine uygunluğunu ölçmeye yönelik bir ölçümdür. Bir başka deyişle örneklem büyüklüğünün yeterliliğini test etmektedir. KMO değerlerinin 0,8 ile 1,0 arasında olması örneklemenin yeterli olduğunu göstermektedir [42]. Tablo 2 'de yer alan Kaiser-Meyer-Olkin (KMO)=0,873 değeri ve Bartlett testi= $\chi 2$ =9410,775; p=0,000 değeri ile örneklemin yeterli olduğunu ve faktör analizi yapılabileceğini ifade etmektedir. Yapılan tüm bu analizler neticesinde, verilerin normal dağılıma uygun ve homojen olduğu, örneklem sayısının yeterli olduğu ve güvenilir olduğu, dolayısıyla parametrik test koşullarının sağlandığı ortaya çıkmıştır.

### *3.3. Faktör Analizi (Factor Analysis)*

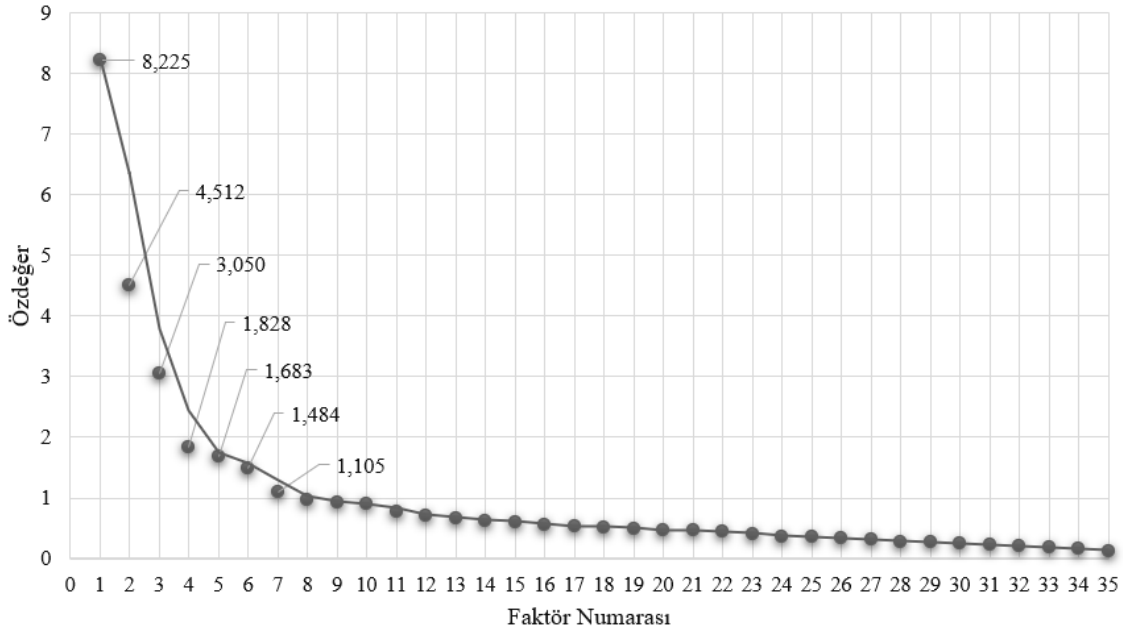
Faktör analizi boyutluluk azaltma analizi olarak isimlendirilmektedir. Bunun önemi, aynı içeriğe yanıt veren birden fazla göstergenin, çok benzer yanıtlara sahip göstergelerle aynı kategoride sınıflandırılması, farklı içeriği yansıtan göstergelerin ise başka kategorilerde sınıflandırılmasıdır [43]. Faktör analizi yaparken rotasyon tekniği olan Varimax ile "Dönüştürülmüş Bileşenler Matrisi" (Rotated Component Matrix) elde edilmiştir. Döndürülmemiş faktörler belirsiz olduğundan, daha iyi yorumlama için faktörler döndürülmektedir. Döndürmenin amacı, her değişken yükün mümkün olduğu kadar az faktöre dayanmasını sağlayan, ancak her değişken üzerindeki yüksek yüklerin sayısını maksimuma çıkaran optimal basit bir yapıya ulaşmaktır [44]. Şekil 4'te, çalışma kapsamında ortaya çıkan her bir özdeğerin ilişkili olduğu faktöre karşı grafiği görülmektedir. Burada özdeğerler, bir faktör tarafından açıklanan varyasyon miktarını temsil etmektedir [45].

Tablo 2'deki sonuçlar incelendiğinde 35 soruya ilişkin ölçeğin 7 faktör (hizmet, tarihi değer, müze, etkinlik, alışveriş, ulaşım ve zaman) altında toplandığı görülmektedir. 7 faktör toplam varyansın %62,534'ünü (Kümülatif Varyans) açıklamaktadır. Her bir soruya ilişkin faktör yükleri Tablo 2'de verilmiştir.

Anket verileri değerlendirildiğinde, yapıya dair iç ve dış mekân temizliği, iklimlendirme koşullarının yeterliliği, engelli erişimine uygunluğu, güvenlik hizmetlerinin yeterliliği, ziyaretçi yönetimi ve bilgilendirme gibi özellikler birinci boyut olan hizmet faktörünü açıklamaktadır. Kullanıcıların gar binasının tarihi ve inşa edildiği dönem, gar binasına bağlı diğer yapılar, yapının mimarı ve mimari




**Şekil 4.** Çalışmaya ait akış şeması (Flow chart of the study)




**Şekil 5.** Özdeğer grafiği (scree plot of the eigenvalues)

özellikleri, gar binasının tarihi kimliği ve yapıya bağlı olan müze ile ilgili farkındalıkları ikinci boyut olan tarihi değer faktörünü açıklamaktadır. Kullanıcıların gar binasının müzeye dönüşümü ve bu durumun yapıya katacağı değer hakkındaki görüşleri ile dönüşüm sonrası yapıya olan ilgileri ve ziyaret sıklığının nasıl değişeceği gibi durumlar üçüncü boyut olan müze faktörünü açıklamaktadır. Kullanıcıların yolculuk öncesi ve sonrası beklemeleri sırasında vaktini nitelikli geçirecek aktivite imkanlarının yeterliliği, bekleme alanlarının konforu, mevcut sosyal hizmet alanları ile ilgili yeterli bilgiye sahip olup olmadıkları gibi özellikler dördüncü boyut olan etkinlik faktörünü açıklamaktadır. Yapının hem mevcut durumda hem de zamansız müzeye dönüşümü söz konusu olduğu durumda alışveriş imkanlarının iyileştirilmesi ile ilgili görüşleri gibi unsurlar beşinci boyut olan alışveriş faktörünü açıklamaktadır. Kullanıcıların yapıya bireysel araç ve toplu taşıma ile ulaşımın rahatlığı ve gar binasının konumunun önemi hakkında görüşleri gibi özellikler altıncı boyut olan ulaşım faktörünü açıklamaktadır. Son olarak, kullanıcıların yapıda zamansız müze modeli kapsamında düzenlenebilecek aktivitelere katılabilecek uygun zamanları ve ilgileri gibi özellikler yedinci boyut olan zaman faktörünü açıklamaktadır.

### *3.4. Farklılık analizleri (Differentiation Analyses)*

Araştırma kapsamında yer alan Ankara Gar Binası'na dair kullanıcı görüşlerinin bireysel özellikler üzerinden karşılaştırılmasında; iki değişkenli bağımsız örneklem grupları olan cinsiyet, medeni durum ve ikamet yeri için T-testi (Independent Samples), yaş, eğitim durumu, çalışma durumu olan ikiden fazla değişken gruplarında tek yönlü varyans analizi (One Way Anova) yöntemlerinden yararlanılmıştır. Testler yapılırken, faktör analizi sonucunda çıkan yedi boyutun her biri demografik özellikler ile parametrik testlere tabi tutularak farklılık bulunan değerler incelenmiştir. T-testi sonucunda arasında anlamlı farklılık bulunan gruplar Tablo 3'te verilmiştir (*P<0,05)*.

Tablo 3 incelendiğinde:

- Cinsiyete göre tarihi değer faktöründe farklılık tespit edilmiş olup (P<0,05), erkek (f=269) kullanıcıların ($\bar{X}$=2,9665), kadın (f=252) kullanıcılara göre ($\bar{X}$=2,7557) yapının tarihi önemi ve mimari özellikleri ile ilgili bilgilerinin daha çok olduğu görülmektedir.
- Cinsiyete göre etkinlik faktöründe farklılık tespit edilmiş olup (P<0,05), erkek (f=269) kullanıcıların ($\bar{X}$=2,7928), kadın (f=252) kullanıcılara göre ($\bar{X}$=2,6280) yapıda beklemeleri sırasında nitelikli vakit geçirebilecek aktivite alanları, sosyal hizmet alanları ve bekleme alanlarının konforu hakkında daha olumlu düşündükleri görülmektedir.
- Medeni duruma göre tarihi değer faktöründe farklılık tespit edilmiş olup (P<0,05), evli (f=211) kullanıcıların ($\bar{X}$=3,0339), bekar (f=310) kullanıcılara ($\bar{X}$=2,7493) göre yapının tarihi değeri hakkındaki farkındalıklarının daha olumlu olduğu görülmektedir.
- İkamet yerine göre hizmet faktöründe farklılık tespit edilmiş olup (P<0,05), ikamet yeri Ankara (f=352) olan kullanıcıların ($\bar{X}$=3,7639), ikamet yeri Ankara dışı (f=169) olanlara göre ($\bar{X}$=3,6089) tarihi değer farkındalıklarının daha olumlu olduğu görülmektedir.
- İkamet yerine göre tarihi değer faktöründe farklılık tespit edilmiş olup (P<0,05), ikamet yeri Ankara (f=352) olan kullanıcıların ($\bar{X}$=2,9736) yapının tarihi değeri ve mimari özellikleri ile ilgili farkındalıklarının ikamet yeri Ankara dışı (f=169) olanlara göre ($\bar{X}$=2,6374) daha olumlu olduğu görülmektedir.
- İkamet yerine göre etkinlik faktöründe farklılık tespit edilmiş olup (P<0,05), ikamet yeri Ankara (f=352) olan kullanıcıların ($\bar{X}$=2,7734) yapıda beklemeleri sırasında nitelikli vakit geçirecek imkanlar, bekleme alanlarının konforu ve gar binasının sosyal hizmet alanları ile ilgili bilgilerinin ikamet yeri Ankara dışı (f=169) olanlara göre ($\bar{X}$=2,5873) daha olumlu olduğu görülmektedir.
- İkamet yerine göre alışveriş faktöründe farklılık tespit edilmiş olup (P<0,05), ikamet yeri Ankara (f=352) olan kullanıcıların ($\bar{X}$=4,0156) alışveriş imkanlarından ikamet yeri Ankara dışı (f=169) olanlara göre ($\bar{X}$=3,7840) daha memnun oldukları görülmektedir.
- İkamet yerine göre zaman faktöründe farklılık tespit edilmiş olup (P<0,05), ikamet yeri Ankara dışı (f=162) olan kullanıcıların yapıda düzenlenebilecek aktivite, sanatsal, sosyal etkinliklere katılma, çocuklar ve gençler için aktivite alanlarının olması konusunda ($\bar{X}$=3,4201), ikamet yeri Ankara olan (f=352) kullanıcılara göre ($\bar{X}$=3,0587) daha olumlu düşündüğü görülmektedir.

**Tablo 2.** Anket ifadelerine ilişkin faktör analizi ve güvenilirlik analizi sonuçları. H: Hizmet; TD: Tarihi Değer; M: Müze; E: Etkinlik; A: Alışveriş; U: Ulaşım; Z: Zaman, A.S.:Anket sırası, F.S.:Faktör sırası.
(Factor analysis and reliability results regarding survey questions. H: Service; TD: Historical Value; M: Museum; E: Activity; A: Shopping; U: Transportation; Z: Occasion, A.S.: Survey order F.S.:Factor order)

| A.S. | F.S. | İfadeler | 1-H | 2-TD | 3-M | 4-E | 5-A | 6-U | 7-Z |
|---|---|---|---|---|---|---|---|---|---|
| *6* | H1 | Gar binasını temizlik konusunda yeterli buluyorum. | 0,709 | | | | | | |
| *7* | H2 | Gar binasının çevre temizliğini yeterli buluyorum. | 0,710 | | | | | | |
| *8* | H3 | Gar binasındaki iklimlendirme (ısıtma-soğutma) koşulları yeterlidir. | 0,450 | | | | | | |
| *9* | H4 | Gar binasının engelli erişimine ve kullanımına uygun olduğunu düşünüyorum. | 0,630 | | | | | | |
| *11* | H5 | Gar binasının güvenlik hizmeti yeterlidir. | 0,805 | | | | | | |
| *12* | H6 | Gar binasında kendimi güvenli hissederim. | 0,809 | | | | | | |
| *14* | H7 | Gar binasında çocuklar ve bebekler için ıslak hacim (wc, lavabo, bebek odası) imkanları yeterlidir. | 0,720 | | | | | | |
| *15* | H8 | Gar binasındaki lavabo/wc hizmetleri yeterlidir. | 0,761 | | | | | | |
| *19* | H9 | Gar binasındaki bilgilendirme ve ziyaretçi yönetim panoları yeterlidir. | 0,535 | | | | | | |
| *20* | H10 | Gar binası hizmet personelleri güler yüzlü ve yardımseverdir. | 0,615 | | | | | | |
| *23* | TD1 | Gar binasının Ankara tarihindeki önemi hakkında bilgi sahibiyim. | | 0,831 | | | | | |
| *24* | TD2 | Gar binasının tarihi bir yapı olduğunun farkındayım ve inşa edildiği dönem hakkında bilgi sahibiyim. | | 0,903 | | | | | |
| *25* | TD3 | Ankara Gar Binası'na bağlı olan diğer yapılar hakkında bilgi sahibiyim. | | 0,894 | | | | | |
| *26* | TD4 | Gar binasının mimarı hakkında bilgi sahibiyim. | | 0,840 | | | | | |
| *27* | TD5 | Gar binasının mimari özellikleri ilgimi çeker. | | 0,567 | | | | | |
| *28* | TD6 | Ankara Gar Binası tarihi kimliğinin ön plana çıkması için gereken hassasiyetin gösterildiğini düşünmekteyim. | | 0,436 | | | | | |
| *29* | TD7 | TCDD Ankara Gar Binası'na bitişik Millî Mücadelede Atatürk Konutu ve Demiryolları Müzesi'ni ziyaret ederim. | | 0,609 | | | | | |
| *30* | M1 | Müze mekânı olarak kullanılması için Ankara Gar Binası uygun bir yapıdır. | | | 0,710 | | | | |
| *31* | M2 | Ankara Gar Binası mevcut işleyişine devam ederken, müze anlayışı içinde ziyaretçiye sunulması yapıya değer katar. | | | 0,784 | | | | |
| *32* | M3 | Gar binasının tarihi özelliklerini öne çıkartacak müzecilik anlayışı içerisinde sergi düzenlemesi yapılması, yapıyı daha sık ziyaret etmeme neden olur. | | | 0,755 | | | | |
| *33* | M4 | Gar binasının tarihi önemi nedeniyle müzeye dönüşmesini isterim. | | | 0,756 | | | | |
| *34* | M5 | Gar binasının mevcut işleyişine devam ederken, Ankara'nın tarihi ve kültürel belleğini simgeleyen sergilemelerin yapılması yolculuğuma değer katar. | | | 0,818 | | | | |
| *35* | M6 | Gar binası özgün işlevine devam ederken yapının interaktif bir anlayışla 7x24 açık bir müze olarak düzenlenmesi ilgimi çeker. | | | 0,826 | | | | |
| *4* | E1 | Gar binasında yolcu ya da karşılayan olarak beklemelerim sırasında zamanımı nitelikli geçirecek aktiviteler bulabilirim. | | | | 0,767 | | | |
| *10* | E2 | Gar binasındaki bekleme alanları konforludur. | | | | 0,507 | | | |
| *13* | E3 | Gar binasının sosyal hizmet alanları (emanet, banka, berber, lokanta vs.) ile ilgili yeterli bilgiye sahibim. | | | | 0,464 | | | |
| *16* | E4 | Bekleme süresi boyunca yapıda kaliteli vakit geçirebilmem için aktivite çeşitliliği yeterlidir. | | | | 0,770 | | | |
| *21* | A1 | Gar binasındaki büfe hizmetinin yanı sıra halkın çeşitli ihtiyaçlarını karşılayabilecek satış noktası ve yeme-içme alanlarının olması ilgimi çeker. | | | | | 0,706 | | |
| *22* | A2 | Gar binasında geleneksel objelerin satıldığı bir satış mağazası olması ilgimi çeker. | | | | | 0,733 | | |
| *1* | U1 | Gar binasına toplu taşıma ile rahat ulaşabilirim. | | | | | | 0,792 | |
| *2* | U2 | Gar binasına bireysel aracımla rahat ulaşabilirim. | | | | | | 0,740 | |
| *3* | U3 | Gar binası konumunun şehir içi ulaşımı açısından önemli bir noktada olduğunu düşünüyorum. | | | | | | 0,714 | |
| *5* | Z1 | Gar binasında düzenlenebilecek aktivitelere katılmak için zamanım yeterlidir. | | | | | | | 0,717 |
| *17* | Z2 | Gar binasında yapılacak olan sanatsal ve sosyal etkinliklere katılmayı düşünürüm. | | | | | | | 0,750 |
| *18* | Z3 | Gar binasında çocuklar ve gençler için aktivite alanlarının olması ilgimi çeker. | | | | | | | 0,602 |
| | | *Özdeğerler (eigenvalues)* | *5,462* | *4,375* | *3,947* | *2,204* | *2,055* | *2,026* | *1,820* |
| | | *Varyansı açıklama oranı* | *15,605* | *12,499* | *11,277* | *6,296* | *5,871* | *5,788* | *5,199* |
| | | *Kümülatif varyans* | *15,605* | *28,104* | *39,381* | *45,677* | *51,548* | *57,336* | *62,534* |
| | | *Alt Boyut Güvenirliği (c)* | *0,892* | *0,881* | *0,883* | *0,704* | *0,678* | *0,725* | *0,666* |
| | | *Genel Ölçek Güvenirliği (Cronbach's Alpha)* | *0,897* | | | | | | |
| | | *Kaiser-Meyer-Olkin (KMO)=0,873* | *Bartlett testi: $\chi^2$ =9410,775; p=0,000* | | | | | | |

**Tablo 3.** Cinsiyet, medeni durum ve ikamet yerlerine göre katılımcıların tarihi değer, etkinlik, alışveriş ve zaman faktörlerine ilişkin bulunan anlamlı farklılıklar (T-testi) (n=521) (Significant differences were found regarding participants' historical values, activity, shopping and occasion factors according to gender, marital status and location)

| Değişkenler | Cinsiyet | N | Ortalama | Standart Sapma | F | P (sig) |
|---|---|---|---|---|---|---|
| Tarihi Değer | Kadın | 252 | 2,7557 | 1,00757 | -2,268 | 0,024 |
| | Erkek | 269 | 2,9665 | 1,10809 | | |
| Etkinlik | Kadın | 252 | 2,6280 | 0,86444 | -2,017 | 0,044 |
| | Erkek | 269 | 2,7928 | 0,99064 | | |
| | Medeni Durum | N | Ortalama | Standart Sapma | F | P (sig) |
| Tarihi Değer | Evli | 211 | 3,0339 | 1,04468 | 3,017 | 0,003 |
| | Bekar | 310 | 2,7493 | 1,06475 | | |
| | İkamet Yeri | N | Ortalama | Standart Sapma | F | P (sig) |
| Hizmet | Ankara | 352 | 3,7639 | 0,76656 | 2,182 | 0,030 |
| | Ankara Dışı | 169 | 3,6089 | 0,74361 | | |
| Tarihi Değer | Ankara | 352 | 2,9736 | 1,08360 | 3,408 | 0,001 |
| | Ankara Dışı | 169 | 2,6374 | 0,98987 | | |
| Etkinlik | Ankara | 352 | 2,7734 | 0,94261 | 2,136 | 0,033 |
| | Ankara Dışı | 169 | 2,5873 | 0,90723 | | |
| Alışveriş | Ankara | 352 | 4,0156 | 0,95804 | 2,612 | 0,009 |
| | Ankara Dışı | 169 | 3,7840 | 0,92539 | | |
| Zaman | Ankara | 352 | 3,0587 | 1,03455 | -3,960 | 0,000 |
| | Ankara Dışı | 169 | 3,4201 | 0,83751 | | |
| Toplam | | 521 | | | | |

*P<0,05*

Sonuç itibari ile araştırmanın alt hipotezlerinden;

*H1-1:* Ankara Gar Binasını kullananların tarihi yapıya ilişkin farkındalık düzeyleri cinsiyetlerine göre anlamlı farklılık göstermektedir.
*H1-3:* Ankara Gar Binasını kullananların tarihi yapıya ilişkin farkındalık düzeyleri medeni duruma göre anlamlı farklılık göstermektedir.
*H1-5:* Ankara Gar Binasını kullananların tarihi yapıya ilişkin farkındalık düzeyleri ikamet yerlerine göre anlamlı farklılık göstermektedir.
Hipotezleri kabul edilmiştir. Arasında anlamlı farklılık bulunan gruplar Tablo 4'te verilmiştir (*P<0,05)*.

Tablo 4 incelendiğinde:

- Yaşa göre tarihi değer faktöründe farklılık tespit edilmiş olup (P<0,05); 17 ve altı yaş ($\bar{X}$=2,3915) grubundakilerin 48-57 yaş ($\bar{X}$=3,2616) grubundakilere göre; 18-27 yaş ($\bar{X}$=2,6364) grubundakilerin 28-37 ($\bar{X}$=3,0191) yaş grubundakilere göre ve 18-27 yaş ($\bar{X}$=2,6364) grubundakilerin 48-57 ($\bar{X}$=3,2616) yaş gruplarındakilere göre tarihi yapı hakkındaki bilgileri ve farkındalıklarının daha düşük olduğu görülmüştür.
- Yaşa göre ulaşım faktöründe farklılık tespit edilmiş olup (P<0,05); 18-27 yaş ($\bar{X}$=4,3333) grubunun 17 ve altı yaş ($\bar{X}$=3,8395) grubuna göre; 28-37 yaş ($\bar{X}$=4,4068) grubunun 17 ve altı yaş ($\bar{X}$=3,8395) grubuna göre yapının konumu ve ulaşım kolaylığı konusunda daha olumlu düşündüğü görülmektedir.
- Statüye göre hizmet faktöründe farklılık tespit edilmiş olup (P<0,05); öğrenci ($\bar{X}$=3,8000) grubundakilerin emekli ($\bar{X}$=3,3214) grubundakilere göre ve serbest çalışanlar ($\bar{X}$=3,9018) grubundakilerin emekli ($\bar{X}$=3,3214) grubundakilere göre binayı temizlik, iklimlendirme koşulları, engelli erişimi, güvenlik ve ıslak hacim imkanları açısından daha olumlu düşündükleri görülmektedir.
- Statüye göre tarihi değer faktöründe farklılık tespit edilmiş olup (P<0,05); devlet memuru ($\bar{X}$=3,3222) grubundakilerin özel sektör ($\bar{X}$=2,8220) grubundakilere göre; devlet memuru ($\bar{X}$=3,3222) grubundakilerin öğrenci ($\bar{X}$=2,5422) grubuna göre; devlet memuru ($\bar{X}$=3,3222) grubundakilerin serbest çalışan ($\bar{X}$=2,5688) grubuna göre tarihi değer farkındalıkları ve yapı hakkındaki bilgilerinin daha fazla olduğu görülmektedir.
- Statüye göre zamansız müze faktöründe farklılık tespit edilmiş olup (P<0,05); devlet memuru ($\bar{X}$=3,9367) grubunun gar binasının müzeye dönüşmesi için uygunluğu ve dönüşümün yapının değerini ortaya çıkaracağı ile ilgili görüşleri öğrenci ($\bar{X}$=3,5947) grubundan daha olumludur.
- Statüye göre ulaşım faktöründe farklılık tespit edilmiş olup (P<0,05); serbest çalışanlar ($\bar{X}$=4,4727) grubunun yapının konumu ve yapıya ulaşımın rahatlığı için görüşleri çalışmayan ($\bar{X}$=4,3411) grubuna göre daha olumludur.
- Statüye göre zaman faktöründe farklılık tespit edilmiş olup (P<0,05); devlet memuru ($\bar{X}$=3,3212) grubundakilerin gar binasında düzenlenebilecek aktivitelere, sanatsal ve sosyal faaliyetlere katılmak için görüşlerinin öğrencilere ($\bar{X}$=2,9722) göre daha olumlu olduğu görülmektedir.
- Eğitim durumuna göre hizmet faktöründe farklılık tespit edilmiş olup (P<0,05); lisans grubunun ($\bar{X}$=3,6657) ilköğretim ($\bar{X}$=4,0727) grubuna göre, lisansüstü grubunun ($\bar{X}$=3,5532) ilköğretim ($\bar{X}$=4,0727) grubuna göre binanın temizlik, engelli erişimi, ıslak hacim imkanları ve iklimlendirme gibi hizmet alanları hakkında daha olumsuz düşündüğü görülmektedir.
- Eğitim durumuna göre zaman faktöründe farklılık tespit edilmiş olup (P<0,05); lisansüstü grubunun ($\bar{X}$=3,4810), lise grubuna göre ($\bar{X}$=2,9544) gar binasında düzenlenebilecek aktivitelere, sanatsal ve sosyal faaliyetlere katılmak için daha olumlu düşündüğü görülmektedir.

Bu durumda;

*H1-2:* Ankara Gar Binasını kullananların tarihi yapıya ilişkin farkındalık düzeyleri yaşlarına göre anlamlı farklılık göstermektedir.
*H1-4:* Ankara Gar Binasını kullananların tarihi yapıya ilişkin farkındalık düzeyleri statülerine göre anlamlı farklılık göstermektedir.
*H1-6:* Ankara Gar Binasını kullananların tarihi yapıya ilişkin farkındalık düzeyleri eğitim durumuna göre anlamlı farklılık göstermektedir.

Hipotezleri kabul edilmiştir.

**Tablo 4.** Yaşlarına, statülerine ve eğitim durumlarına göre katılımcıların hizmet, tarihi değer, müze, ulaşım ve zaman faktörlerine ilişkin bulunan anlamlı farklılıklar (one way ANOVA testi) (n=521) (Significant differences were found regarding the service, historical value, museum, transportation and occasion factors of the participants according to their age, status and education level.)

| | Yaş | N | Ortalama | Standart Sapma | F | P (sig) | Tukey |
|---|---|---|---|---|---|---|---|
| | *Y1: 17 ve altı* | 27 | *2,3915* | 1,04272 | | | |
| *Tarihi Değer* | *Y2: 18-27* | 178 | *2,6364* | 1,01142 | | | |
| | *Y3: 28-37* | 127 | *3,0191* | 0,99405 | 5,624 | *0,000* | *Y1-Y5* |
| | Y4: 38-47 | 97 | 2,9485 | 1,14382 | | | *Y2-Y3* |
| | *Y5: 48-57* | 71 | *3,2616* | 1,04337 | | | *Y2-Y5* |
| | Y6: 58 ve üstü | 21 | 2,7415 | 1,08385 | | | |
| | *Y1:17 ve altı* | 27 | *3,8395* | 0,62955 | | | |
| *Ulaşım* | *Y2: 18-27* | 178 | *4,3333* | 0,86285 | | | |
| | *Y3: 28-37* | 127 | *4,4068* | 0,75932 | 2,778 | *0,017* | *Y1-Y2* |
| | Y4: 38-47 | 97 | 4,3127 | 0,76651 | | | *Y1-Y3* |
| | Y5: 48-57 | 71 | 4,2019 | 0,81158 | | | |
| | Y6: 58 ve üstü | 21 | 4,0952 | 0,83761 | | | |
| | *Statü* | *N* | *Ortalama* | *Standart Sapma* | *F* | *P (sig)* | *Tukey* |
| *Hizmet* | S1: Devlet Memuru | 137 | 3,6745 | 0,79770 | | | |
| | S2: Özel Sektör | 126 | 3,6841 | 0,77917 | | | |
| | *S3: Öğrenci* | 132 | *3,8000* | 0,72796 | 2,669 | *0,021* | *S3-S4* |
| | *S4: Emekli* | 28 | *3,3214* | 0,90405 | | | *S4-S5* |
| | *S5: Serbest Çalışan* | 55 | *3,9018* | 0,62642 | | | |
| | S6: Çalışmayan | 43 | 3,6744 | 0,67545 | | | |
| *Tarihi Değer* | S1: Devlet Memuru | 137 | 3,3222 | 1,04290 | | | |
| | S2: Özel Sektör | 126 | 2,8220 | 1,12205 | | | S1-S2 |
| | S3: Öğrenci | 132 | 2,5422 | 0,97671 | 9,222 | *0,000* | S1-S3 |
| | S4: Emekli | 28 | 2,7398 | 0,90690 | | | S1-S5 |
| | S5: Serbest Çalışan | 55 | 2,5688 | 0,88683 | | | |
| | S6: Çalışmayan | 43 | 2,9801 | 1,01762 | | | |
| *Müze* | S1: Devlet Memuru | 137 | 3,9367 | 0,89756 | | | |
| | S2: Özel Sektör | 126 | 3,8823 | 0,96909 | | | |
| | S3: Öğrenci | 132 | 3,5947 | 1,04524 | 2,330 | *0,041* | S1-S3 |
| | S4: Emekli | 28 | 3,8155 | 0,92111 | | | |
| | S5: Serbest Çalışan | 55 | 3,8545 | 0,90042 | | | |
| | S6: Çalışmayan | 43 | 4,0116 | 0,91098 | | | |
| *Ulaşım* | S1: Devlet Memuru | 137 | 4,2920 | 0,79464 | | | |
| | S2: Özel Sektör | 126 | 4,2910 | 0,89441 | | | |
| | S3: Öğrenci | 132 | 4,3030 | 0,73844 | 2,230 | *0,050* | S4-S5 |
| | S4: Emekli | 28 | 3,8571 | 1,00381 | | | |
| | S5: Serbest Çalışan | 55 | 4,4727 | 0,70182 | | | |
| | S6: Çalışmayan | 43 | 4,3411 | 0,72187 | | | |
| *Zaman* | S1: Devlet Memuru | 137 | 3,3212 | 0,81790 | | | |
| | S2: Özel Sektör | 126 | 3,1931 | 1,00253 | | | |
| | S3: Öğrenci | 132 | 2,9722 | 1,03873 | 2,473 | *0,031* | S1-S3 |
| | S4: Emekli | 28 | 3,0357 | 1,22504 | | | |
| | S5: Serbest Çalışan | 55 | 3,1333 | 1,03955 | | | |
| | S6: Çalışmayan | 43 | 3,4341 | 0,97192 | | | |
| | *Eğitim Durumu* | *N* | *Ortalama* | *Standart Sapma* | *F* | *P (sig)* | *Tukey* |
| | E1: İlköğretim | 33 | 4,0727 | 0,66908 | | | |
| | E2: Lise | 139 | 3,7633 | 0,80173 | | | E1-E4 |
| *Hizmet* | E3: Önlisans | 63 | 3,7746 | 0,81656 | 3,216 | *0,013* | E1-E5 |
| | E4: Lisans | 207 | 3,6657 | 0,71816 | | | |
| | E5: Lisansüstü | 79 | 3,5532 | 0,75053 | | | |
| | E1: İlköğretim | 33 | 3,0000 | 1,11181 | | | |
| | E2: Lise | 139 | 2,9544 | 1,06337 | | | |
| *Zaman* | E3: Önlisans | 63 | 3,2487 | 0,87573 | 4,145 | *0,003* | E2-E5 |
| | E4: Lisans | 207 | 3,2142 | 0,95122 | | | |
| | E5: Lisansüstü | 79 | 3,4810 | 0,89911 | | | |
| *Toplam* | | 521 | | | | | |

*P<0,05*

## 4. Sonuç (Conclusion)

Tarihi yapılar sahip oldukları mimari fiziksel dokuların yanında, mekânın kültürel yansıması ve hafızası ile kentlere bir kimlik kazandırmaktadır. Böylelikle kullanım farklılıklarına bağlı olarak tarihi yapıların fonksiyonel ve biçimsel özellikleri yapıldığı döneme ilişkin fikir edinilmesini sağlamaktadır. Bu kapsamda, bir kentteki kamusal yapılar arasında yer alan tarihi gar binaları da yapıldığı dönemden günümüze kadarki süreçte kent kimliğini yansıtan önemli yapılardır. Yolculukların başlangıç ve bitişine şahitlik eden gar binaları, insanların zihin ve duygularında bıraktığı etki ile de ayrı bir öneme sahiptir. Hizmetine devam eden tarihi yapıların kullanıcılar tarafından fark edilmesi, koruma kapsamında yapıyla ilgili gerekli hassasiyetin gösterilmesi ve kullanıcı isteklerine cevap verilmesi yapının sürdürülebilirliği açısından önemlidir. Bu bağlamda kullanıcı görüşleri, taleplerinin karşılanabilmesi için planlamadan tasarım aşamasına kadar çok önemlidir.

Son dönemde kentlerde sıkça görülmeye başlayan ve farklı konseptlerde müze mekânı olarak dönüştürülen tarihi yapıların sayıları artmaktadır. Hayatı boyunca müze ziyareti gerçekleştirmemiş veya gerçekleştirmeyi düşünmeyen birçok insan, çağdaş müzecilik anlayışı ile düzenlenmiş farklı içerikteki bu müzelere ilgi göstermeye başlamıştır [46]. Bu durum kenti ziyaret edenlerin sayısında da önemli artışlar yaşanmasına neden olmaktadır. Ülkemizde belli bir tasarım konsepti ile inşa edilen müzelere Çanakkale Troya ve Eskişehir Odunpazarı Modern Müzesi [47] gibi müzelerin yanı sıra Bursa Anadolu Arabaları Müzesi, İstanbul Müze Gazhane, Ankara Ulucanlar Cezaevi Müzesi, İstanbul Modern gibi tarihi yapılardan dönüştürülen müzeler örnek verilebilir. Ayrıca, askeri müzeler, sanat müzeleri, jeoloji müzeleri, tarih müzeleri, doğa tarihi müzeleri, arkeoloji müzeleri, etnografya müzeleri ve bilim müzeleri gibi müzeler ise belirli türde eserleri sergileyerek, daha çok eğitim amacıyla veya o alana ilgi duyan kişilerin ziyaret ettiği yerler olarak kullanılmaktadır.

Çalışma kapsamında ele alınan ve literatüre yeni bir bakış açısı kazandıracak olan zamansız müze modeli ile özgün işlevine devam eden tarihi gar binalarının, işleyişine devam ederken kullanıcılara tarihi farkındalık oluşturmanın yanı sıra müzeye dönüştürülerek yapının yaşanabilirliğinin artırılması düşünülmüştür. Oluşturulan bu kuramsal temelin en önemli kısmı, tarihi yapı atıl kalmadan veya tarihi kimliğini tamamen kaybetmeden, özgün işlevi ile müzeye dönüştürülerek yapı dokunulmazlığının sağlanmasıdır.

Araştırmanın temel hipotezi olan "H1: Ankara Gar Binası'nı kullananların tarihi yapıya ilişkin farkındalık düzeyleri arasında demografik yapılarına göre anlamlı farklılık vardır." kısmen kabul edilmiştir. Bu bağlamda yapılan çalışma ile elde edilen sonuçlardan, yapının müzeye dönüşmesi ile ilgili görüşlerin olumlu yönde olduğu görülmüştür. Tüm katılımcıların tarihi değer ile ilgili verdiği cevaplardan katılımcıların yapının Ankara için önemi, yapının inşa edildiği dönem ve mimarisi ile ilgili yeterli bilgiye sahip olmadığı tespit edilmiştir. Özellikle gar binası için ortaya koyduğumuz "zamansız"lık kavramı, yapının bir geçiş alanı olmasının ötesinde tarihi kimliği ile var olmasını sağlamaktır.

Tarihi yapı ile ilgili, kadın katılımcıların binada etkinlik imkanlarını yetersiz gördüklerinin tespit edilmesi, kadın kullanıcılara yönelik etkinlik alanlarının iyileştirilmesi ile yapıyı kullanmaya ilişkin görüşlerini olumlu yönde teşvik edeceği görülmüştür. Zamansız müze modeli ile, sanatsal ve sosyal etkinlik alanlarının oluşturulması ve alışveriş imkanlarının artırılmasıyla bu eksikliğin giderileceği beklenilmektedir. Tarihi değer algısının özellikle öğrenciler ve bekarlar tarafından düşük olduğu sonucuna ulaşılması, genç gruplar, öğrenciler ve bekarlar için tarihi yapı hakkında bilgilerinin ve ilgilerinin yetersiz olduğu şeklinde yorumlanabilir. Dolayısıyla, bu grupların ilgisini çekecek aktivitelerin ve etkinlik alanlarının iyileştirilmesi, yapıda zaman geçirmelerini sağlayarak yapı ile ilgili farkındalıklarını artıracağı düşünülmektedir.

Ankara dışında ikamet eden kullanıcıların Ankara'da ikamet edenlere göre yapının tarihi değeri ile ilgili farkındalıklarının düşük olduğu, etkinlik, hizmet ve alışveriş imkanlarını yetersiz buldukları saptanmıştır. Ayrıca ikamet yeri Ankara dışı olan kullanıcılar, Ankara'da ikamet edenlere göre yapıda düzenlenebilecek aktivitelere, sanatsal ve sosyal etkinliklere katılmak için daha olumlu yaklaşmıştır. Bu noktada şehrin sembol yapılarından biri olan gar binasının şehir dışından gelen ziyaretçilerin hafızasında daha olumlu bir şekilde kalması için gar binası ve kent tarihi hakkında bilgilendirici içeriklerin sunulduğu alanların oluşturulması, beklemeleri sırasında nitelikli vakit geçirebilecekleri etkinlik alanlarının ve alışveriş imkanlarının artırılması ve iyileştirilmesi önerilmektedir.

Ankara Gar Binası'nın zamansız müze olarak dönüştürülmesi ile kullanıcının tarihi farkındalığını artıracak sergiler ve bilgilendirici içeriklerin paylaşılması, yapının sürdürülebilirliğini destekleyecektir. Yapı bünyesinde zamansız müze modeli ile etkinlik, hizmet ve alışveriş imkanlarının da iyileşerek ziyaretçilerin beklemeleri sırasında nitelikli vakit geçirmelerini sağlayacaktır. Bu sayede alanların kullanıcı dostu olması, modern toplumun yaşam tarzına entegre olması ve zaman geçirilebilecek mekânlar haline gelmesi, yapıya olan memnuniyeti de artıracaktır

Bu tür geliştirmeler, tarihi gar binalarının sadece geçiş yerleri olmasının ötesinde, ziyaretçilere anlamlı ve keyifli deneyimler sunan kültürel merkezler haline gelmesi ile toplumun kolektif hafızasında yaşatılmasına katkı sağlayacaktır. Çalışma sonucunda hizmet kalitesinin artırılması ve zamansız müze modeli ile tarihi dokuyu yansıtan düzenlemelerin yapılması, şehir içinden ve dışından gelen kullanıcıların yapıyı keşfetmeleri için önemli bir adım olacaktır.

Hızla değişen ve gelişen dünyada, yaşam koşulları, istekler ve buna bağlı olarak ortaya çıkan gereksinimler, her alanda olduğu gibi mimari alanda da kendini göstermektedir. Tarihi yapıların kullanımlarının özgün işlevlerinden uzaklaşmadan ve mevcut koşullarıyla geleceğe aktarılması konusunda tarihi gar binalarının 'zamansız müze' konsepti ile kullanılması ele alınmıştır. Böylece söz konusu yapıların çevresel, mimari ve yapısal koşullarına uygun ikincil işlevlerle değerlendirilmesi açısından bir farkındalık oluşturulmaya çalışılmıştır.

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# Comparison of Data Integration Methods in BIM Tools for Structural Engineering: An Evaluation through Structural Analysis Tools

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## Highlights

- This paper focuses on the bi-directional data exchange methods, IFC and API, within BIM technology.
- A case study is conducted to find a reliable data exchange method for structural engineering.
- The API is better than IFC; however, it isn't extremely smooth to enable bidirectional data flow.

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**Abstract**

Building Information Modelling (BIM) is a technology that allows data generated by different disciplines using different software to be shared and used in a digital environment. By promising bi-directional data integration between all stakeholders, BIM encourages interoperability in the industry. This study aims to assess the operability and reliability of bidirectional data exchange methods within BIM technology, specifically Industry Foundation Classes (IFC) and Application Programming Interface (API). The study tests these methods between the architecture and structural engineering disciplines using Autodesk Revit along with the structural software packages: ETABS, Robot Structural Analysis, SAP2000, and Tekla Structures. The results show that the IFC file extension causes data losses in information sharing between software, while the API method can provide reliable data integration between different tools. However, the API only works smoothly between the tools developed by the same company. Nevertheless, API may be a promising way to achieve the interoperability goal of BIM technology.

## 1. INTRODUCTION

Architectural design and structural analysis are two distinct yet interrelated domains within a construction project. Each field follows unique procedures and pursues specific objectives in the building design process. The architectural design focuses on determining the configurations of various architectural elements, including their dimensions and materials, while the structural analysis examines the structural and mechanical properties of building components, such as stress, strain, and stability [1]. Both architectural and structural design are crucial for the successful completion of a building's design [2].

Structural design encompasses several tasks, including defining the structure, conducting structural analyses, and creating drawings and technical documentation. To develop a comprehensive project involving multiple disciplines, a series of phases is undertaken by various technical teams, each employing different tools. The information needed for each stage is primarily derived from technical drawings, which often result in omissions and inaccuracies, leading to inconsistencies in the final product. Throughout these processes, it is crucial to have trust in the data exchanged between the different systems. To ensure this trust and facilitate seamless collaboration, a high level of interoperability is essential [3]. At this point, the Building Information Modelling (BIM) concept is promising to centralize and transfer all the information generated throughout the development of the project. BIM serves as a collaborative working platform that

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embodies the physical, analytical, digital, and functional characteristics of a building. It is a smart, object-oriented, and information-rich digital representation of the project, encompassing all necessary details [4]. The essence of BIM is enabling a database for all disciplines of the project to improve collaboration and communication [5]. Therefore, BIM has been embraced to address issues of fragmented workflow, insufficient communication, and ineffective coordination within the Architecture/Engineering/Construction (AEC) industry [6]. BIM provides synchronized data and interoperability of the project from the beginning of the design phase [7], and so, essential information for design, calculation, simulation, execution, operation, maintenance, renovation, and demolition has been automatically acquired. Thus, the crucial aspect is to possess building models that can be easily accessed, modified, and shared within a unified data environment [8]. According to the BIM's undertaking in the literature, importing and exporting data from one BIM software to another is trustworthily achieved [9]. There are different methods for sharing and transferring data contingent upon the extent of interoperability [10], such as Application Programming Interface (API) supplements [11] and Industry Foundation Classes (IFC) based data [12]. With all promises and advantages, the actual implementation of BIM interoperability is still a challenge [13].

This research examines the interoperability between architectural design and structural analysis. The aim is to investigate the BIM interoperability through data transfer processes among various software platforms using two types of pathways: (i) Application Programming Interface (API) or "immediate connection," which refers to the direct link between software programs from the same provider; and (ii) indirect connection Industry Foundation Classes (IFC), which involves transferring information through third-party software or methods/algorithms. The methodology of the research includes a simple case study involving an analysis of data exchange abilities between common architectural and structural software. The main building model in the case is created in Autodesk Revit. For the structural analysis part, ETABS 21, Autodesk Robot Structural Analysis Professional (RSA), SAP2000, and Tekla Structures tools are chosen as the main authorized tools.

## 2. INTEROPERABILITY FOR BI-DIRECTIONAL DATA EXCHANGE

In a standard construction project, multiple entities such as architects, engineers, clients, contractors, subcontractors, specialists, etc., are involved. Each stakeholder employs a range of software tools tailored to their specific needs, supporting large and complex projects. When collaborating with other users, ensuring seamless data exchange between these tools becomes a critical issue for interoperability. The direct one-on-one data format transitions between each participant are excessive and not necessary for the actual exchange of data. Moreover, with the growing complexity of projects, the conventional approach scarcely fulfills the escalating demand for sharing and exchanging data [14]. Achieving interoperability among these software packages is a significant challenge, but essential for ensuring seamless sharing of information models. This is where data-sharing techniques come into play, enabling the analysis of data that needs to be shared and determining the data-sharing requirements for improved collaboration. Seamless interoperability can help minimize delays and cost overruns by eliminating the need for re-modeling in construction projects [1]. At this point, BIM technology has been introduced based on the concept of creating, storing, and managing a large amount of information throughout the building life cycle in an integrated way [15].

The central concept of BIM is interoperability, which means that the data contained within the building model should be shared seamlessly and utilized effectively [16]. As per Sacks et al. [17], interoperability denotes the ability to effortlessly share and utilize information generated by various vendors and software within a team, free from any complications. This reduces the risk of errors, delays, and miscommunications, leading to more efficient and effective project delivery. Especially, in complex building projects, owing to multiple stakeholders, data sharing and exchange between different software tools is inevitable so a common data format is necessary for data interoperability [14]. Arayici and colleagues [18] highlighted the significance of interoperability in facilitating an integrated design approach. Effective collaboration, interaction, and information exchange among team members require interoperability through open standards. The use of open standards is crucial for facilitating a smooth interchange of information, irrespective of the nature of the data or the software employed. Laakso and Kiviniemi [19] emphasized that

interoperability relies on open data standards, enabling the development of universally compatible file formats usable across different applications.

Rammant [10] explains that there are different levels of interoperability depending on the data sharing and exchanging requirements. The basic level is the first level, where team members can export and import data from one software to another. This method requires manual intervention to ensure the data's correct coordinates, and it becomes impractical for complex projects due to the need to redo the import/export process for every revision. Moreover, each discipline employs different software applications, which further complicates the process. Rammant [10] also presented the second tier of interoperability, which encompasses an openly accessible standard format enabling users to retrieve all data. The Industry Foundation Classes (IFC) format is a widely accepted schema in the AEC industry at this level. Ultimately, as outlined by Rammant [10], the highest level involves establishing a direct connection between diverse software, linking two distinct application interfaces through the Application Programming Interface (API). Over recent years, the predominant facilitators of project data exchange have been the API [11] and the open format known as IFC [12].

### 2.1. The Industry Foundation Classes (IFC)

The Architecture, Engineering, Construction & Facility Management (AEC/FM) industry has a need for BIM interoperability, which has led to the development of Industry Foundation Classes (IFC). IFC is a neutral and open standard building data model created and maintained by buildingSMART to facilitate data sharing among all stakeholders throughout the entire lifecycle of a project [20]. In other words, it is an ISO-registered, open, and neutral data exchange standard for BIM [2]. The development of IFC can be traced back to 1994 when Autodesk formed a consortium, the International Alliance for Interoperability (IAI), to promote integrated application development. The IAI was later renamed buildingSMART to reflect its ultimate goal [17]. Sacks et al. [17] described the Industry Foundation Classes (IFC) as an object-oriented data representation schema used for exchanging data between various applications employed by different disciplines. According to buildingSMART International's (2023) data [21], the latest version of IFC is 4.3. ADD 2 specification, but this is under Final Draft International Standard (FDIS) Voting and expected to be published by the International Organization for Standardization (ISO) in early 2024. Therefore, IFC4 and IFC 2x3 versions are available for the exchange file format structure.

The Industry Foundation Classes have two main components: a data schema and an exchange file format structure. The data schema is described using two languages - EXPRESS data specification language and XML Schema definition language (XSD), with the former being the source and the latter being generated from it according to mapping rules defined in ISO 10303-28. To facilitate the exchange and sharing of data, two exchange file formats are specified: a clear text encoding of the exchange structure defined in ISO 10303-21 and Extensible Markup Language (XML) defined in the XML W3C Recommendation. Other exchange file formats may also be used as long as they comply with the data schemas. This IFC release includes both the data schemas (in EXPRESS and XML schema representations) and reference data, which includes definitions of property and quantity names, as well as formal and informative descriptions [21].

According to Khemlani [22], the IFC model covers a wide range of building information, including elements such as walls, columns, and doors, as well as schedule, construction cost, and organization, in the form of data objects throughout all phases of a building's lifecycle, from conceptual planning to occupation and operation. The IFC model is organized around building entities, which makes it an object-based data model. Unlike the conventional geometric data model based on computer-aided design (CAD), a data model provides information that can be shared and utilized for a variety of purposes such as analysis, documentation, visualization, and calculation.

Laakso and Kiviniemi [19] have identified four layers within the architectural IFC data model, which progress from the lowest to the highest. These layers are the resource layer, core layer, interoperability layer, and domain layer. The BIM utilizes the data model to depict geometric data, material properties, and interoperability. Positioned above other layers, the resource layer contains commonly used elements in the AEC industry, categorizing entities based on generic properties like geometry, material, cost, date, and

time. The core layer, the second layer, delineates entities in the upper layers and comprises two schemas: the kernel and extension. The kernel imparts fundamental concepts about elements, relationships, procedures, attributes, and actors, while the extension encompasses control, product, and process extensions. The interoperability layer, the third layer, furnishes a shared platform for the upper domain layer to seamlessly exchange data. Finally, the domain layer, the highest layer in the IFC structure, is tailored to specific AEC domains such as architecture, structural engineering, HVAC, construction management, and others, according to Laakso and Kiviniemi [19]. Official model view definitions (MVDs) are released by buildingSMART International [21] as related specifications. These MVDs are designed to work with IFC 4.3.0 and currently have three levels of implementation: Reference View, Alignment Based Reference View, and Design Transfer view. These levels can be thought of as incremental stages that progressively add more advanced features to the implementations. The data schema architecture of IFC is structured into four conceptual layers, and each schema is allocated to one of these layers.

The IFC model, a versatile compilation of building model data, plays a vital role in facilitating bidirectional data interchange across diverse software platforms. This model incorporates a broad spectrum of entities about building elements (such as windows, doors, and slabs) and business tasks (like construction schedules, costs, and organizational aspects). The organization of objects in the IFC schema is structured according to their relationships, and the IFC "framework model" encompasses various elements like object types, classifications, attributes, materials, geometry, and properties to represent the building model comprehensively. All physical elements are nested within the IFC structure using different entities [19]. The IFC platform encompasses data related to architectural, structural, mechanical, electrical, and plumbing aspects. As a result, the IFC model incorporates multiple dictionaries to facilitate data interpretation. Consequently, when transferring data via an IFC file, the exchanged information needs to be understood in terms of its data category. Subsequently, the model can be converted into compatible data using relevant dictionaries [16].

### 2.2. Application Programming Interface (API)

Application programming interface (API) is a set of subroutine definitions, protocols, and tools for building application software [2]. In BIM technology API is a file transfer method also known as a direct link or direct native link. This link automatically establishes a connection between two different applications. The link operates in both directions, ensuring the seamless exchange of data without loss, as stated by Fleming [23]. As outlined by Sacks et al. [19], direct connections relying on programming-level interfaces represent the oldest but enduringly vital method for data transfer. These interfaces empower software to construct models and perform actions such as exporting, checking, or deleting data. Application interfaces, on the other hand, facilitate the import and adjustment of data to acquire information from other applications. The establishment of direct links occurs between a minimum of two distinct software programs, aiming to streamline data exchange as companies strive for a compatible interface and enhanced support for data export and import. According to Yousefzadeh et al. [24], direct links are delineated as extensions or add-ons designed exclusively for a specific software program, in contrast to IFC files which can be used across multiple software programs. Consequently, data interchange through direct links is characterized by superior quality, yielding more satisfactory final results compared to other file transfer methods. Rammant [10] illustrated that the API has the capability to connect Revit Structure software with Computer-Aided Engineering (CAE) software, enabling the seamless transfer of intelligent models to ETABS, RSA, and Scia Engineer, eliminating the necessity for redundant data entry.

To enhance the functionality of BIM platforms, developers create plug-ins that allow the integration of different external applications. Plug-ins play a crucial role in improving the design stage by increasing productivity, performing calculations, running analysis, and enhancing interoperability. In particular, the development of plug-ins is essential for creating reliable solutions for simulations, and the BIM community needs to collaborate to develop these plug-ins. Developing bi-directional plug-ins with the Revit API and framework is crucial for streamlining the design process and mitigating data loss during cross-platform interactions. This approach promotes interoperability through files, as exemplified by the CSiXRevit plug-ins within Revit, facilitating seamless data exchange between Revit and ETABS/SAP2000 [11, 17]. In

conclusion, the advancement of technology in achieving interoperability enhances the maturity of BIM, leading to the optimization of projects, better building performance, and increased focus on sustainability.

API is utilized to create customized software extensions and add-ons that enhance the functionality of BIM methods. As noted by Yousefzadeh et al. [24], the use of API extensions enables the exchange of high-quality data, contributing to a successful and integrated project lifecycle. However, it is important to recognize that direct links are specific to particular target applications, meaning that a developed direct link is designed to operate exclusively with specific software platforms and their corresponding versions. Consequently, extensions serve as limited transitional pathways between specified programs. Software production firms and their partners develop API-based extensions and plug-ins to facilitate information exchange between target applications such as Revit and its designated application [20]. Plug-ins are utilized primarily to streamline the construction process, enhance interoperability, and boost productivity. They enable team members from different disciplines to perform calculations and execute commands within building tasks. BIM users actively encourage the development of plug-ins as they facilitate the sharing of project data, improving synchronization with external applications. Additionally, plug-ins are leveraged in various areas such as cost estimation, project scheduling, energy efficiency, sustainability analysis, and the utilization of diverse computational tools [11]. According to Ignatova, Zotkin, and Zotkina [25], utilizing the API permits internal analysis by extracting data directly from native building information models. This ensures that the results of the analysis stay within the primary building model. Subsequent sections will assess the effectiveness of this method between Revit and different structural analysis tools.

## 3. CRITICAL REVIEW OF THE LITERATURE

BIM has transformed the construction industry and is increasingly becoming a focal point of discussion in Engineering, Architecture, and Construction firms due to the advantages it offers when implemented [26]. BIM brings various benefits to the industry, such as linking design to detailing, reducing errors, enhancing collaboration, and enhancing structural quality. Construction projects, whether medium or large-scale, involve multiple structural consultants who utilize various structural analysis applications. These technologies and applications suffer from insufficient interoperability, and there remains a lack of research addressing interoperability issues within the field of structural engineering [2].

Despite advancements in the data exchange methods of BIM technology, the literature consistently points to significant challenges in achieving seamless data transfer and interoperability. One major issue is the lack of standardization in data exchange formats, which leads to inconsistencies and loss of information during transfers [27]. Furthermore, the integration of different software platforms often requires extensive manual intervention, which is time-consuming and prone to human error [28], the developments in open data standards such as IFC, practical challenges are due to varying interpretations of these standards by different software platforms, leading to data loss and inconsistencies [27]. The use of APIs and direct links between software from the same provider offers promising solutions for seamless data exchange; however, they are often hindered by the complexity of implementation and the need for extensive customization [29]. Indirect links through third-party tools, while providing broader compatibility, frequently result in data fragmentation and increased error risks [30]. These challenges highlight a critical gap in the standardization and robustness of data exchange formats within the BIM. Furthermore, the disparity in data handling across different BIM tools exacerbates these issues, necessitating manual interventions that are both time-consuming and prone to human error [28]. Addressing these interoperability and data transfer problems is essential for harnessing the full potential of BIM technology in the architecture, engineering, and construction (AEC) industry. For these reasons, this research's case study is selected simply with 3 bays in both directions, including basic structural elements such as concrete columns, beams, shear walls, and slabs. The bi-directional data transfer methods among various software, Revit and RSA, ETABS21, SAP2000, and Tekla Structure, were checked on this simple model.

## 4. MATERIAL AND METHOD

In this study, the effectiveness and reliability of two data transfer approaches, API and IFC, were evaluated using a simple case study with various BIM tools. A building model was created in Autodesk Revit 2023

and transferred to four different structural analysis tools, ETABS, RSA, SAP2000, and Tekla Structures to assess the validity of these data transfer methods. The goal of the case study was to explore how BIM models from architectural designs can be utilized in structural analysis tools and to determine if the analysis results can be accurately transferred back to the main building model. This bi-directional data transfer was tested using both API and IFC methods to evaluate their effectiveness in preserving data integrity.

Revit was chosen as the authoring tool due to its widely used and its ability to support various data exchange methods, as well as its compatibility with various BIM applications. Revit is extensively employed in information modeling technology due to its provision of functional templates for diverse disciplines and its ability to streamline data interchange among various applications within the BIM framework [25]. Revit offers a comprehensive suite of software applications tailored for the construction industry. Its capabilities include everything from creating 3D animations with an emphasis on visual effects to handling simple CAD drawings. Revit products are specifically designed for BIM projects and play a significant role in the planning stages of construction projects [2]. Revit consists of Revit Structural, Architecture and MEP templates. The key feature that makes Revit Structure easy and flexible to use is also what makes it essential. Autodesk Revit is well-suited for structural design in 3D and supports interoperability. The Revit Structure software combines a physical model made of various materials with a separate analytical model, which can be modified and utilized for efficient structural analysis, design, and description [31].

Robot Structural Analysis Professional is specialized software for analyzing structural loads. Revit and RSA tools are software products developed by the same company, Autodesk. It ensures compliance with building codes and facilitates data exchange with Revit through integrated BIM workflows. Utilizing this software allows for the creation of designs that exhibit resilience and constructability, while also delivering precision, effective coordination, and seamless integration within the BIM environment [32].

ETABS and SAP2000 are software for structural and earthquake engineering developed by Computer & Structures, Inc. (CSI). ETABS and SAP2000 are a widely used industry software for finite element analysis. It offers various capabilities including structure modeling, analysis, design processes, and reporting outputs. With the aim of enhancing productivity in the industry, ETABS and SAP2000 have been positioned as an integrated software package, providing improvements in data exchange with Revit [33].

Tekla Structures is a powerful structural BIM software developed by Trimble. Tekla Structures is a specialized structural engineering software designed for construction industry professionals, especially structural engineers. This software allows users to create information-rich 3D Building Information Modeling (BIM) models, allowing them to design and model structures of varying sizes and complexity. Tekla Structures excels at handling materials such as steel, concrete, brick, timber, aluminum, insulation, and composite structures with exceptional precision and detail [34].

### 4.1. Aim and Objectives

The main purpose of the study is to examine the availability of exchange methods for bidirectional data exchange. The objectives of the research are (i) to evaluate the shortcomings and capabilities of distinct transfer strategies: API and IFC, (ii) to test and compare data exchange methods for various structural analysis software, and (iii) to assess the level of interoperability. In light of the objectives, four different structural software packages RSA, ETABS, SAP2000, and Tekla Structures are utilized.

As part of the methodology, a building model developed in Autodesk Revit was exported to BIM-compatible structural analysis software. To ensure the accuracy and completeness of data transfer, the imported models were thoroughly examined for any loss of information. This included the verification of structural grids, axes, columns, beams, slabs, their connections, geometrical configurations, cross-sectional and material properties, and dead loads. Upon confirming the integrity of the transferred data, dead load analyses were conducted to complete the process. The results were then integrated back into the original Revit model to facilitate coordinated information sharing among all project stakeholders. The overall workflow of the study is illustrated in Figure 1.

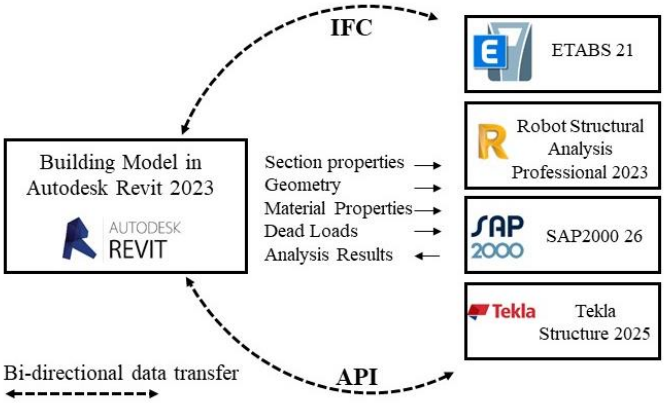



***Figure 1.*** *Research process to examine IFC and API methods for bi-directional data exchange among Revit and various structural analysis tools*

### 4.2. Case Study

The concept of BIM allows for the creation of intelligent objects in a building model. These objects contain more than just geometric information like size, volume, and orientation. They encompass non-geometric factors like material, cost, manufacturer, and specification. In an object-oriented model, each element's physical and functional attributes, material properties, and design parameters are precisely outlined. It is imperative to ensure the accurate exchange of all attributes for each element between software systems. Annotation elements like grids and levels are also part of the building model, and it's important to export and import them into target applications as well.

To test the proposed flow work, a case study is performed. The building model utilized is a symmetrical, small office building designed for this research. It has an eight-story with a 4-meter story height and no basement. The building has three bays in each direction and reinforced concrete frame elements in the perimeter, along with shear walls in the core. The case study is a concrete building, with dead loads that are uniformly distributed on the beams. The major structural components include the external columns, beams, shear walls in the core of the buildings [35]. The physical and analytical models developed using the Revit 2023 Structural Template are seen in Figure 2. Only structural elements; columns, beams, slabs, and shear walls are included in this study. Interior walls and other building elements are excluded. Utilizing this template enables the automatic generation of an analytical model that mirrors the physical model. This analytical model simplifies data interchange with other structural analysis tools, allowing for the verification of connections among all Revit elements and nodes before deploying the model in various analysis platforms. Furthermore, the analytical model is adaptable, permitting manual adjustments and edits by overseeing nodes that connect frame and panel elements [33,36].

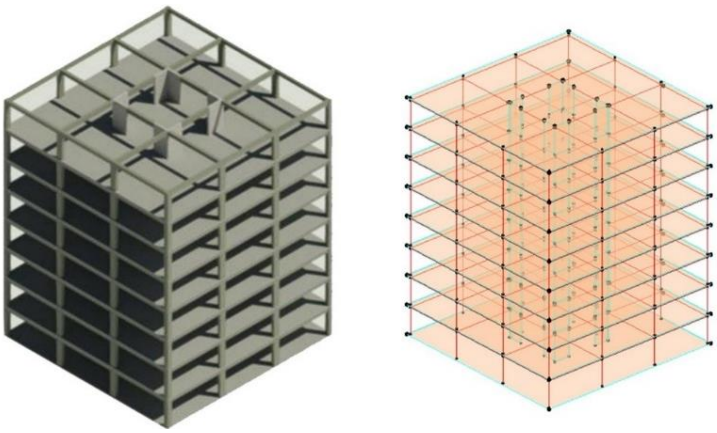


***Figure 2.*** *Physical (architectural) and Analytical (structural) models produced in Revit interface [35]*

## 5. THE RESEARCH FINDINGS

In the exchange process between Revit and structural analysis software tools, two main data transfer paths are compared. In the exchange process between Revit and structural analysis software, two main data transfer paths are compared. The building model is first sent to structural analysis tools with an indirect link through IFC. Then, the same model is exported to structural analysis tools via a direct link API method. Afterward, the structural models in the analysis tools are checked in terms of the achievement of the transfer. If structural models are proper for the analysis, a dead load analysis was carried out with the self-weight of the elements. Lastly, the analysis results return to the main building model in Revit. The findings are illustrated in the following section.

During the data transfer process from Revit to structural analysis tools, building objects, their geometric representations such as size, width, height, orientation, volume, and shape, non-geometric attributes like material, cost, manufacturer, specification, and more should be reliably transferred. Additionally, the building model should include annotation elements like grids and levels, which need to be exported and imported into the intended applications.

### 5.1. Data Exchange with IFC File Format

In this section, the exchange of data between Autodesk Revit and structural analysis tools through the utilization of the IFC file format. The initial step involves exporting the analytical structural model from Revit to an IFC file model, utilizing the IFC 2x3 Coordination View 2.0 version, which represents the most current coordination view. The latest versions of IFC, IFC4x3, and IFC4 structural are also used throughout the trials. However, imported these files into structural analysis tools, many missing structural elements are observed in the analysis tools. Therefore, IFC 2x3 can be accepted as a better data exchange version among IFC versions. In Revit, specific IfcObjects (IfcColumns, IfcBeams, IfcWalls, and IfcSlabs) are selected for export, along with obtaining the quantity, dimensions, and material specification of each type. Then, the IFC extension file is imported into Robot Structural Analysis, ETABS, SAP2000, and Tekla Structures interfaces as seen in Figure 3.

When the IFC file extension is imported to Robot Structural Analysis, no warnings or errors are encountered during the import process. However, it is observed that certain elements are not successfully transferred to the Robot interface. In the imported structural model, some panel elements like the concrete shear walls are transferred deficiently on some floors. Also, some frame elements like beams are missing in the structural model. There is frame instability because of no connection between elements. Therefore, the transferred model cannot be effectively used for analysis purposes. The inability to read elements in the Robot tool may be attributed to issues with the formulation of IFC and the lack of data readability in Robot.

The same IFC file is imported into ETABS. However, upon transferring the model and conducting a thorough examination, several inaccuracies were identified. Some elements lack dimensions and material properties in the structural model, and the connections of frame elements pose issues in the imported model. The unconnected frame elements in the imported structural model show that the existing IFC versions that have been developed and integrated into the current BIM software tools targeted at structural engineers remain highly restrictive. Running analysis through this imported model encounters various warnings like checking the structure carefully for: - inadequate support conditions, or - one or more internal mechanisms, or - zero or negative stiffness properties, or - extremely large stiffness properties, or - buckling due to p-delta or geometric nonlinearity, or - a frequency shift (if any) onto a natural frequency. Likewise, the IFC file is imported into SAP2000, then the software gives a warning. When the imported model is examined, some beam elements are absent. Some elements in the structural model lack dimensions and material attributes, and the imported model has difficulties with frame element connections.

Lastly, IFC file is imported to Tekla Structures. The model is opened in Tekla Structure interface as reference model. Although the imported model arrived in the Tekla interface without errors, the IFC elements are not in a usable version in Tekla. The Convert IFC objects command was used to convert the elements into reusable Tekla objects under the Manage tab in the Tekla interface. However, this processing

did not convert the elements into structural elements such as beams and columns. Therefore, the imported model via IFC in the Tekla interface looks like an image instead of a 3D structural model.

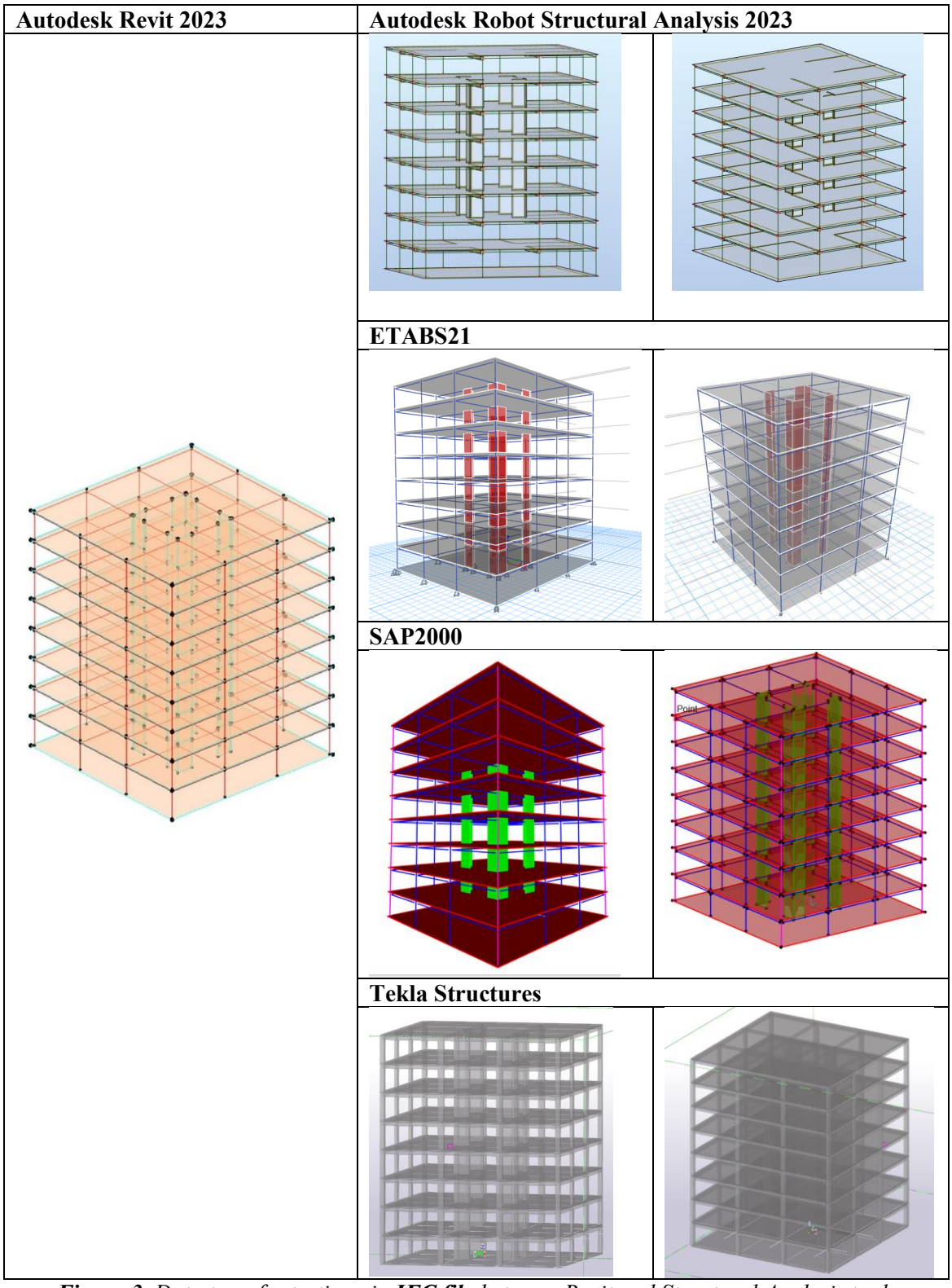



***Figure 3.*** *Data transfer testing via* ***IFC file*** *between Revit and Structural Analysis tools*

### 5.2. Data Exchange with API Extensions and Supplements

This portion concentrates on the transfer of the model through a direct link native file and API between Revit Structure, Robot Structural Analysis Professional, ETABS, SAP2000, and Tekla Structures. First of all, the data exchange process by API between Revit and Robot Structural Analysis was examined. As both Revit and Robot Structural Analysis software are products of the same developer, Autodesk, they provide a direct connection link for a smooth data transfer. When Robot Structural Analysis software is downloaded, it seamlessly integrates with the Revit platform. The Robot Structural Analysis Professional tool is easily accessible within the Revit structural analysis interface, situated under the 'Analyze' tab. Activation of this tool opens the integration link through the Robot Structural Analysis dialog box. Within this dialog box, the user can opt for the direction of data flow. For the initial data exchange, the "Send model" option is selected to facilitate the transfer of data. Through the direct integration link between Revit and Robot Structural Analysis Professional, data can be transferred rapidly in either direction. Revit generates a structural model that corresponds to the analytical model needed for the analysis process, including all essential properties such as material properties, section profiles, loads, load combinations, and boundary conditions. Once in the Robot Structural Analysis interface, which is a software for finite element analysis, it is important to verify if any data loss has occurred in the model. The architectural model in Revit encompasses components such as grids, levels, structural columns and beams, shear walls, floors, material specifications, designated loads and load cases, and member end releases. Through the direct link integration, all these elements and their characteristics are conveyed to Robot. Within the Robot Structural Analysis platform, the model is capable of receiving additional updates by specifying final load cases and combinations, and by incorporating advanced analysis parameters.

From the ETABS and SAP2000 perspective within the BIM concept, CSI has developed an API, a widely used programming language. In the collaboration between ETABS-SAP2000 and Revit, a plug-in named "CSiXRevit" has been developed. This plug-in facilitates bidirectional data exchange between ETABS-SAP2000 and Autodesk Revit Structure. Throughout the data transition, specific elements such as grid lines, story levels, materials, structural frame elements, walls, and flat or non-sloped floors, along with defined loads and load cases (excluding area loads), are transferred from Revit Structure to ETABS and SAP2000, as detailed in the CSI Documentation [33]. Upon installation, CSiXRevit is incorporated into the Revit interface as an external tool in the Add-ins tab. This tool establishes a shared file format, ".exr," for intermediary data exchange. The resulting .exr file can then be imported into ETABS and SAP2000 for further processing.

For the Tekla Structures interoperability concept, Trimble, the Tekla manufacturer, has created a Trimble connection for the live connectivity between tools to provide smooth data interchange between Revit and Tekla Structures. This is a 'File Uploader' plug-in that works with the Revit interface. The structural model in Revit is uploaded to Trimble Connect using this plugin. The uploaded file is then imported into the Tekla Structures interface via the web browser.

Before conducting the structural analysis, the models sent to the RSA, ETABS, SAP2000, and Tekla Structures platforms, as seen in Figure 4, undergo a thorough verification and approval. This includes the successful data exchange of crucial information such as grids, levels, dimensions, and properties of structural components, including their section properties, nodes, dimensions, and material definitions, and the connectivity of frame elements. Finally, the structural models are subjected to rapid analysis for dead load cases, and if the models are proper for the analysis, as the primary objective of this research is to examine the data exchange capabilities of the API method. Accordingly, the goal of this section is to assess the data exchange functionalities of the API method. Efforts are made to transmit the analysis outputs back to Revit to update the building model following the analysis results. In the study, only the structural model in RSA is ready for the analysis. Therefore, analysis results are obtained from RSA, and then the results are transferred again to the Revit interface. The models in ETABS, SAP2000, and Tekla Structures are not proper for the dead load analysis due to the deficiencies of the data transfer.

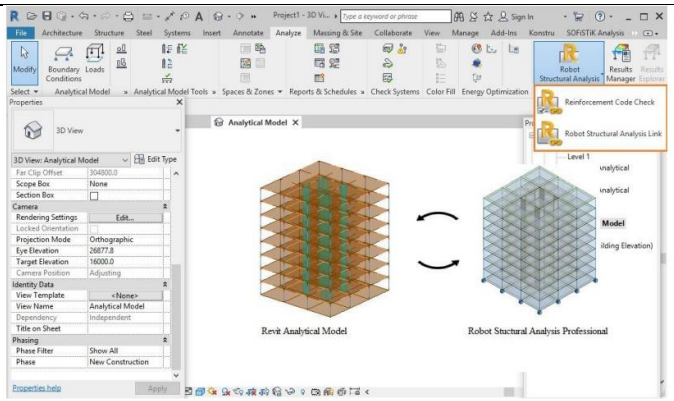
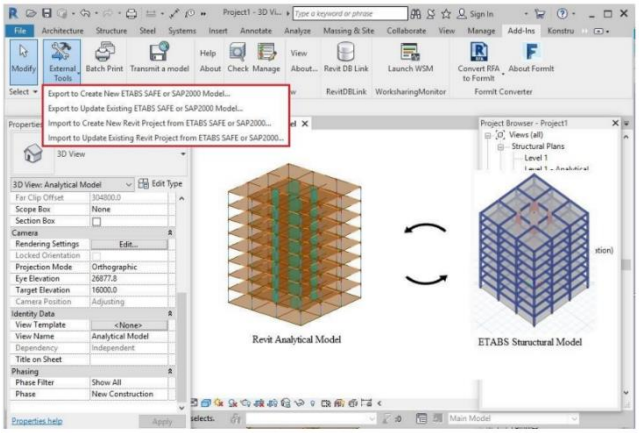
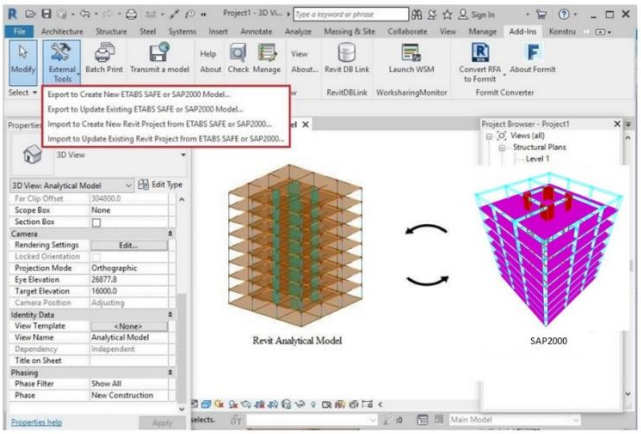
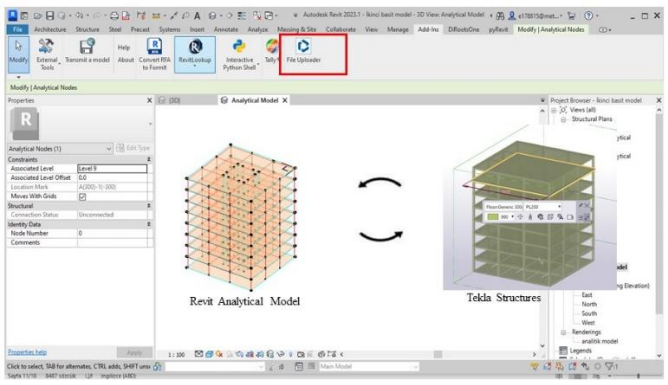
| | |
|---|---|
| **Robot Structural Analysis** |  <br>(Direct Link for Bi-directional Data Exchange) |
| **ETABS** |  <br>(CSiXRevit, Bi-directional Data Flow Plug-in) |
| **SAP2000** |  <br>(CSiXRevit, Bi-directional Data Flow Plug-in) |
| **Tekla Structures** |  <br>(Trimble Connect Live Link) |

***Figure 4.*** *Data transfer testing via* ***API*** *between Revit and Structural Analysis tools*

Initial findings may seem promising, as the direct link integration between Revit and structural analysis tools is smoother and faster. However, there are still some problems with API method data transfer, such as missing data, unstable links, undefined materials or dimensions, except for Robot Structural Analysis, which is the product of Revit's manufacturer. Therefore, the dead load analysis was carried out only in RSA. In other tools, the imported models were still not proper for any analysis.

Revit and RSA emphasize their support for interoperability and their capacity to consolidate all revised data within a building model. The dead load analysis results are seamlessly transmitted to the Revit interface. Following the analysis in RSA, to update the Revit model, the integration direction needs to be set as ''update model and results'' in the Revit interface. Consequently, all modifications and results can be incorporated into the Revit building model. In Revit, the 'result manager' and 'result explorer' add-in tools facilitate the preservation of the updating process, allowing the visualization of structural analysis results, as depicted in Figure 5. In this figure, the deformation and displacement results on slabs under the dead load pressure are sent to the Revit interface, and it is still readable and reliable in the Revit interface. A key advantage of this link between Revit and RSA, highlighting the significance of BIM tools in design and analysis, is its bidirectional functionality, allowing the RSA model to also send data back to Revit. This feature is particularly important as structural designers often need to update and modify designs based on structural specifications.

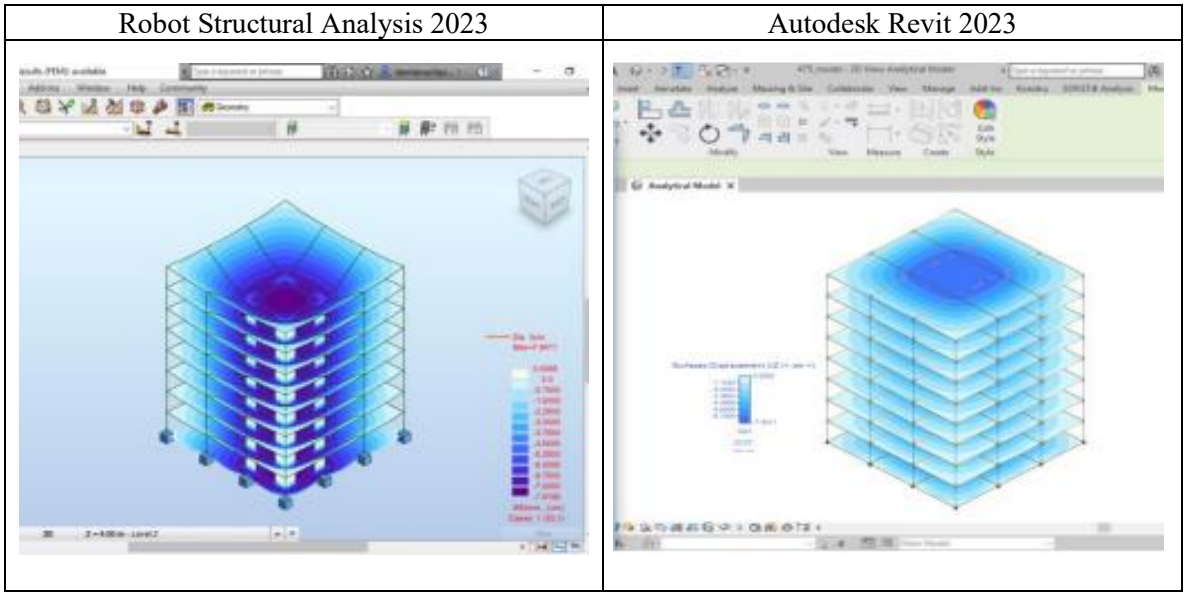



***Figure 5.*** *The analysis results are transferred back from Robot Structural Analysis to the Revit interface via API [35]*

This bidirectional data compatibility is crucial as structural engineers may need to modify the Revit model based on the structural analysis results of their designs. The information transferred is identical to that in the direct link using the native file. Consequently, the results demonstrated that the design modifications and analysis outcomes for the foundation, frame elements, and surfaces can seamlessly transfer to the Revit interface with the output data. The physical model in Revit was updated based on these design changes and analysis results.

## 6. CONCLUSION

### 6.1. Summary of the Research and Discussions

This study focuses on exploring the use of BIM in structural analysis and architectural design by examining interoperability, identifying the more effective data transfer method between architectural and structural software, and determining the viability of these integrated design pathways in structural engineering practice. The research aimed to answer the following questions:

1. How does BIM facilitate interoperability between architectural design and structural analysis?
2. Which data transfer pathway is the most capable among architectural and structural disciplines?
3. What are the outcomes of a bidirectional data transfer process between Autodesk Revit and various structural analysis tools?

At the beginning of the research, the issue of interoperability within the construction sector using BIM technology is reviewed. BIM is a modern approach and process for the AEC industry, which replaces traditional practices with digital construction delivery processes. Establishing two-way data exchange between two separate applications holds great promise for the industry. Thus, this research explores data-sharing methods, namely IFC and API, within BIM technology to evaluate their capabilities and reliability. IFC and API methods are investigated through architecture and structural engineering disciplines. To verify these methods, the five most preferred tools are chosen; Autodesk Revit, Robot Structural Analysis, and ETABS, SAP2000 and Tekla Structures. Then, a case study is carried out.

As a case study, a simple structural system for a building was modeled in Revit. The model consisted of several crucial elements, including axes and concrete frame components such as columns, beams, shear walls, and slabs. Subsequently, the model was exported from Revit to Robot Structural Analysis, ETABS, SAP2000, and Tekla Structures' interfaces to conduct a comprehensive structural analysis using IFC and API methods. Bi-directional data transfer from Revit to structural analysis tools, and vice versa, was tested thoroughly using IFC and API methods. The results of the data transfer were meticulously analyzed, and the findings are presented in Table 1.

***Table 1.*** *The summary of bi-directional data transfer results via IFC and API among selected BIM tools*

| **Transferred Data** | **IFC** (indirect link) | | | | **API** (direct link & native file) | | | |
|---|---|---|---|---|---|---|---|---|
| | Revit RSA | Revit ETABS | Revit SAP2000 | Revit Tekla | Revit RSA | Revit ETABS | Revit SAP2000 | Revit Tekla |
| Annotation Elements | | | | | | | | |
| • Grids and Levels | - | - | - | - | + | + | + | - |
| Section Properties | | | | | | | | |
| • Height and Width | + | + | + | + | + | + | + | + |
| Geometry | | | | | | | | |
| • Length | + | + | + | + | + | + | + | + |
| • Analytical Position | + | + | + | + | + | + | + | + |
| Material Properties | | | | | | | | |
| • Yield stress | - | - | - | - | + | + | - | - |
| • Modules of elasticity | - | - | - | - | + | + | - | - |
| • Shear modulus | - | - | - | - | + | + | - | - |
| • Density | - | - | - | - | + | + | - | - |
| Loads | | | | | | | | |
| • Self-weight loads | - | - | - | - | - | + | - | - |
| Analysis Outputs | | | | | | | | |
| • Dead load analysis results | - | - | - | - | + | - | - | - |

*RSA(Robot Structural Analysis)*
*(+) The data exchange is achieved.*
*(-) The data exchange is not achieved.*

Studies in this research have indicated that there are challenges in exchanging data between different applications when using the IFC file format. During this research, the IFC 2x3 file version is used. Because the latest versions IFC4x3 and IFC4structural do not work during the data exchange processes. The structural analysis tools give errors when trying to open one of these versions. As reviewed from the literature, when importing and exporting an IFC file across various BIM software, there is a risk of data loss and unintentional modifications due to differences in how each software handles modeling properties [12]. The representation of object geometry, properties, and relationships can vary, resulting in inconsistent models when exchanging data between different tools. Additionally, software tools may struggle to recognize certain objects from other disciplines due to their specialized domains [14]. Likewise, in the course of this investigation, within the Revit interface, the building model was converted to the IFC format and then brought into RSA, ETABS, SAP2000, and Tekla Structures. The imported structural models in the analysis tools, deficiencies of elements, and data were observed, and it was not possible to run the analysis. However, the idea of interoperability, reliable data, open and neutral standards, collaboration, flexibility, and sustainability in the building industry based on the openBIM is defined by buildingSMART International. OpenBIM encompasses the creation and maintenance of open and neutral standards, the high-quality implementation of these standards, and the establishment of recognized independent benchmarks to ensure quality and thoroughness. IFC is one of the neutral and open standard data file formats, and IFC provides a foundation for openBIM data exchanges. Therefore, buildingSMART is responsible for developing IFC schemas [37]. With the improvements in the IFC neutral data exchange format, more straightforward platform-to-platform communication can be achieved without any data loss. Thus, data exchange can be smoothly provided among different software developed by different companies without the need for any plug-in.

Considering the different versions of the tools used in the data exchange process, the API does not work between different versions of the tools. In other words, for a direct connection between Revit and Robot Structural Analysis tools, both Revit and Robot must be the same version. Similarly, for data transfer with the API, Revit, ETABS, SAP2000, and also the CSiXRevit plugin must be the same version. At this point, IFC, which is an open file format, does not require the same version for data exchange between programs. In other words, a model produced in Revit 2023 version can be opened with an IFC file in SAP2000 v26 version. However, the SAP2000 v23 version is required for the link received from the Revit model using the CSiXRevit plugin to work correctly.

Employing the API method for data exchange within the BIM framework allows for bidirectional data flow. This approach functions seamlessly in Revit-Robot Structural Analysis connections. However, the other structural analysis tools have some problems with the data exchange process. The data exchange between Revit and Robot Structural Analysis is more seamless compared to the Revit-ETABS, SAP2000, and Tekla Structures link because both Revit and Robot Structural Analysis tools are developed by the same company. The direct integration between Robot and Revit software promotes coordinated working principles. The utilization of the API method enhances the speed and efficiency of project processes while effectively mitigating errors and issues. Essentially, the sophisticated API functions as a state-of-the-art method for data exchange, facilitating bidirectional data flow and enhancing collaboration between Revit software and Robot Structural Analysis Professional. CSI, the developer of ETABS and SAP2000, has created a well-functioning plug-in, CSiXRevit, to encourage the interoperability between Revit and ETABS- SAP2000. CSiXRevit claims to provide a seamless bi-directional data exchange between Revit and ETABS-SAP2000. Yet, during the exchange process, missing elements, dimensions, and specifications are observed. For the smooth data exchange between Tekla Structures, the producer of Tekla, Trimble has developed a Trimble connection for the live link between tools. This is a type of plug-in, 'File Uploader', that works in the Revit Interface. The structural model in Revit is uploaded to the Trimble Connect by using this plugin. Then, this uploaded file is imported into the Tekla Structures interface from the browser. But the imported model is inapplicable for performing a structural analysis.

Consequently, through the conducted research, it becomes possible to identify the optimal approach for structural engineers to adopt, considering the observed limitations in interoperability. The direct link API seems a highly efficient and user-friendly method for data exchange, only between the products of the same

company. Therefore, it is highly likely that the API method will emerge as the optimal pathway for advancing BIM maturity levels in the foreseeable future.

### 6.2. Limitations of the Research

The study has some limitations. The following items address them;

- The experiment was limited to a single project model, which, while useful for identifying issues related to missing information, may not accurately reflect scenarios involving different types of structural models.
- The effectiveness of the API method in dealing with complex and large-scale projects,
- The capability of the API method in the curvilinear and sloped elements,
- The measures taken by the API to guarantee data security and integrity are not examined in this study.

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## CONFLICTS OF INTEREST

No conflict of interest was declared by the authors.

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**Article**

# Energy retrofitting of modern heritage in accordance with passive building standard: The case of Yenişehir Cinema

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## ABSTRACT

Improving the energy performance of existing buildings is crucial for reducing energy demand and transitioning towards renewable energy sources in the building sector. The **Passive Building Standard** serves as a valuable guide by providing a set of strategies for achieving high energy efficiency. **Yenişehir Cinema**, an important modern heritage building, has remained vacant for nearly 12 years. Given its cultural and historical significance, integrating it back into urban life through energy-efficient retrofitting can contribute to urban sustainability.
This study aims to enhance the energy performance of Yenişehir Cinema by transforming it into a **passive building**. The proposed retrofitting strategy involves implementing a **heat recovery ventilation system, improving the building envelope, and mitigating overheating**. The energy performance of both the baseline and retrofitted scenarios was assessed using **energy models developed in Design Builder**.
The results indicate a **92% reduction in annual heating demand** and a **41.3% decrease in total carbon emissions** compared to the baseline scenario. Furthermore, the additional investment costs required for the proposed improvements can be recouped within **seven years**. However, while the overheating in the building was reduced by **40%,** this improvement remains insufficient to fully ensure **thermal comfort**.

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## INTRODUCTION

The construction sector accounts for 36% of global energy consumption and 39% of carbon emissions resulting from energy use (Global Alliance for Buildings and Construction, 2020). Given this impact, the widespread adoption of passive and hybrid systems and their climate-specific optimization are among the key long-term global objectives (Global Alliance for Buildings and Construction, 2020). To reduce the dependence on fossil fuels and minimize carbon emissions, both existing and newly constructed buildings must be designed with high energy efficiency (Sharma et al., 2022). In Europe, 48% of existing buildings were constructed between 1961 and 1990 (Volf et al., 2018), highlighting the urgency of retrofitting older buildings to align with current climate conditions and the growing scarcity of resources.

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Reducing the energy demands of existing buildings should be achieved while maintaining occupant health and comfort (Ruparathna et al., 2016). Passive buildings are designed to have minimal energy demand for heating, yet they still provide high indoor comfort levels (Mihai et al., 2017). The EnerPHit certification system, which allows existing buildings to be upgraded to Passive Building Standard, significantly reduces their heating and cooling loads (Passive House Institute, 2023).

Extensive research has been conducted on the energy retrofitting of existing buildings. A study conducted in China applied Passive Building Standard principles by insulating the building envelope, ensuring airtightness, and integrating a high-efficiency heat recovery mechanical ventilation system. As a result, heating demand was reduced by 90% and cooling demand by 70% compared to the baseline scenario (Liu et al., 2021). Similarly, a study in Sweden demonstrated that carbon emissions could be reduced by 50% to 82% through the use of various insulation materials, facade enhancements, and window improvements (Piccardo et al., 2020). In the UK, a year-long study comparing a conventional house and a passive house found a 62.2% reduction in energy consumption and a 24% improvement in indoor temperatures. Numerical modeling further indicated that heating demand could be reduced by 80% in existing buildings through energy-efficient renovations (Liang et al., 2017).

Retrofitting historical buildings in accordance with Passive Building Standard is also critical for preserving cultural heritage while ensuring energy efficiency. A study on a historic building in Egypt found that thermal comfort levels could be increased to 66% through the implementation of hybrid passive strategies (Ibrahim et al., 2021). Similarly, a 19th-century historic building retrofitted using three passive building strategies achieved a 51.8% reduction in primary energy demand. The payback period for the implemented interventions was estimated at 18 years (Qu et al., 2021).

Türkiye, which remains heavily dependent on foreign energy resources, aims to reduce its primary energy consumption by 14% between 2017 and 2023 in accordance with the National Energy Efficiency Action Plan (Republic of Turkey Ministry of Energy and Natural Resources, 2023). The average energy consumption for heating in buildings across Türkiye is 110 kWh/m² (Allplan GmbH, 2013), whereas maximum permissible heating demand values in other countries are significantly lower: 35 kWh/m² in the UK, 34 kWh/m² in the Netherlands, and 23 kWh/m² in Denmark (Allplan GmbH, 2013). This substantial difference highlights the urgent need for stricter energy efficiency regulations and more effective enforcement mechanisms in Türkiye.

Despite the increasing emphasis on energy efficiency, a lack of legal coordination and institutional collaboration between organizations responsible for heritage protection and energy efficiency poses a significant challenge (Jahed et al., 2020).

Several studies have explored energy retrofitting strategies for historic buildings in Türkiye. Ulu & Arsan (2020) examined 22 buildings in the historic urban fabric of İzmir, demonstrating that proposed retrofit strategies could achieve up to 48% energy savings. Similarly, Timur et al. (2022) analyzed two traditional houses in Muğla, evaluating interventions such as HVAC system optimization, thermal insulation, buffer zone integration, double-glazed windows, and airtightness improvements. Their findings indicated that these measures, when applied together, could reduce annual energy consumption by up to 30%.

Since historical buildings require careful intervention to preserve their architectural integrity and cultural value, energy retrofitting must be approached with sensitivity. Ozbalta et al. (2021) assessed multiple active and passive energy efficiency scenarios for a historic building in İzmir. Their results showed that the optimal energy retrofit combination required 34% less energy compared to other alternatives.

Previous research has demonstrated that implementing Passive Building Standard in existing buildings leads to substantial reductions in energy consumption and carbon emissions, particularly in heating and cooling loads (Liu et al., 2021; Liang et al., 2017; Piccardo et al., 2020). The benefits of Passive Building Standard have also been observed in historic buildings, particularly in terms of energy savings and thermal comfort improvements (Ibrahim et al., 2021; Qu et al., 2021). Most energy retrofitting studies have focused on historical buildings in the Aegean region, primarily examining annual energy savings when passive and hybrid systems are integrated (Ulu & Arsan, 2020; Timur et al., 2022; Ozbalta et al., 2021). However, the complex interrelated parameters that influence overall energy performance are often overlooked.

The novelty of this study lies in its comprehensive approach, which simultaneously considers energy efficiency, carbon emissions, thermal comfort, and cost-effectiveness. The primary objective of this research is to retrofit Yenişehir Cinema—an example of modern cultural heritage—following Passive Building Standard. The target audience includes industry stakeholders, passive building practitioners, Kardemir Steel Industry Inc. (the entity holding the building's usage rights), and academics interested in energy-efficient retrofitting strategies.

## MATERIAL AND METHODOLOGY

This section outlines the case study, and details the methodology applied in this research. The validation of the 3D model, software, and climate data is conducted. Following this validation, decisions regarding the energy model for the operational phase are presented. Finally, the databases and methodologies used for thermal comfort, cost analysis, and environmental impact assessment are described.

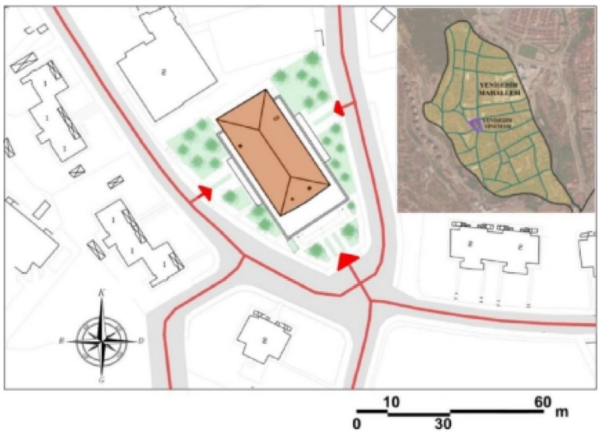



**Figure 1**. Master plan of Yenişehir Cinema Building (Güneş, 2017).

**Case Study**

The primary subject of this study is Yenişehir Cinema, located in Karabük Province, Türkiye. The building is situated in the Yenişehir Neighborhood, within an urban conservation area and a third-degree natural conservation zone. Although it was actively used as a cultural center for a period, the building itself is not officially registered as a heritage structure.

The cinema building covers a total area of 1,500 m², with three open facades and additional facilities at the rear. The net area of the building is 1,350 m², and it has a seating capacity of 750. Additionally, registered pine trees are present in the garden surrounding the cinema.

Architecturally, Yenişehir Cinema was designed by Supreme Architect Münci Tangör, a prominent figure of the Early Republican Period in Türkiye. The construction of the building took place between 1954 and 1958 (Güneş, 2017; Ulusoy, 2022).

Historically, the cinema was among the most popular and well-attended theaters in Türkiye between 1958 and 1990. Between 2008 and 2013, it continued functioning as a cultural center. However, since 2013, the building has remained closed and out of use. In 2017, restoration drawings were initiated, but the project was never implemented (Güneş, 2017). The site plan of the building is presented in Figure 1.

The historic Yenişehir Cinema, which once attracted significant public interest, has remained vacant for nearly twelve years. Yalçınkaya & Bal (2019) highlight the importance of reintegrating Yenişehir Cinema into urban life while preserving its cultural and historical significance to support urban sustainability. Similarly, Güneş (2017) emphasizes that maintaining the building's original function is essential for ensuring both social and spatial sustainability. The exterior and interior views of the building are presented in Figure 2.




**Figure 2**. **(a)** South facade, **(b)** East facade, **(c)** Registered trees, **(d)** Cement-based material (Authors' Archive), **(e, f)** Interiors (Güneş, 2017).

The outer walls of the building are constructed using concrete blocks. The roof structure consists of both hipped and flat sections, covered with tiles and ceramic tiles, respectively. The building system is reinforced concrete. For flooring, vinyl material is used, while most of the windows in their current state feature double glazing. The main exterior door is made of wood, contributing to the building's architectural character. The thermal properties of the existing materials are detailed in Table 1.

**Methodology**

The Passive Building Standard is based on five fundamental principles, which include:

1. High-level insulation (Ud<0.15 W/m²K)
2. High-performance, insulated window and door systems (Up<0.8 W/m²K)
3. Airtight building envelope (<0.6 /h @50 Pa)
4. Architectural detailing to eliminate thermal bridges
5. High-efficiency, heat recovery mechanical ventilation system (Sustainable Energy Association, n.d.).

Additionally, to comply with the Passive Building Standard, a building's annual heating and cooling demand must not exceed 15 kWh/m², and its primary energy demand should remain below 120 kWh/m². From a thermal comfort perspective, indoor temperatures must not exceed 25°C for more than 10% of the total annual hours (International Passive House Association, 2018). However, existing buildings may not fully meet these strict criteria, necessitating the development of the EnerPHit certification system, which provides two alternative compliance pathways. Meeting either of these criteria is sufficient for certification.

The first pathway focuses on building component performance, ensuring that all structural elements adhere to Passive Building Standard. The second pathway is based on energy demand, where the maximum heating load is set at 25 kWh/m² for cool-temperate climates, while the cooling demand limit remains at 15 kWh/m².

The energy demand-based approach further categorizes buildings into three classes: Classic, Plus, and Premium, based on their energy performance (Passive House Institute, 2023). In this study, the EnerPHit Standard was applied using energy demand-based criteria.

Following the Passive Building Standard, the energy retrofit process included:

- Installation of a heat recovery mechanical ventilation and heating-cooling system
- Insulation and airtight sealing of the building envelope
- Upgrading window and door systems.

Firstly, the existing building model was generated and validated. Once the climate data and building model is checked, baseline energy model is adjusted with decisions made in advance. Thereafter, energy retrofits were applied in sequence. According to the simulation results, the overheating was determined and the thermal comfort requirements were evaluated according to the (American Society of Heating, Refrigerating and Air-Conditioning Engineers) ASHRAE-14 Standard. At the conclusion of the study, economic and environmental analyses were conducted. Finally, the results were discussed on the axis of sustainable architecture (Figure 3).

As for the limitations of the study, the side and rear facades of the building are covered with rough plaster, while the entrance facade features mosaic coatings, which enhance

**Table 1.** Material properties of the existing structure

| Building component | Material | Thickness (m) | Thermal conductivity (W/mK) | Specific heat (J/kg-K) | Density (kg/m³) | U value (W/m²K) |
|---|---|---|---|---|---|---|
| Wall | Plaster | 0.02 | 0.4 | 1000 | 1000 | 1.88 |
| | Concrete block | 0.3 | 1.15 | 1000 | 1800 | |
| | Plaster | 0.02 | 0.4 | 1000 | 1000 | |
| Hipped roof | Roof tile | 0.025 | 1 | 800 | 2000 | 3.71 |
| | RC | 0.12 | 1.15 | 1000 | 1800 | |
| Flat roof | Ceramic tile | 0.018 | 0.85 | 840 | 1900 | 3.76 |
| | RC | 0.12 | 1.15 | 1000 | 1800 | |
| Floor | Vinyl flooring | 0.002 | 0.2 | 1000 | 1000 | 3.08 |
| | RC | 0.12 | 1.15 | 1000 | 1800 | |
| Window | Double glazing | - | - | - | - | 2.71 |
| Door | Wooden | | | | | 2.80 |

RC: Reinforced concrete.

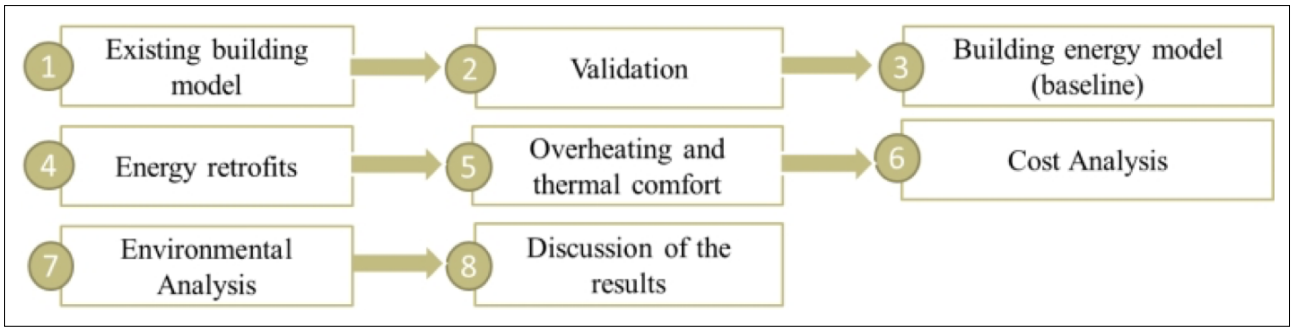



**Figure 3**. Methodology of the study.

its aesthetic quality. Consequently, any proposed external insulation measures would primarily impact the entrance (south) facade. However, this adjustment is beyond the scope of this study. Nonetheless, it is anticipated that the overall exterior appearance of the building will remain unaffected by the other proposed energy efficiency improvements.

**Databases and Methodologies for Validation**

Based on the collected data—including architectural plans, photographs, and information on building materials—a digital model of the structure was developed, and energy simulations were conducted using Design Builder v6.1 software. To ensure accurate climatic inputs, annual climate data for Karabük province was obtained from NASA's Prediction of Worldwide Energy Resources (POWER) Data Access Viewer (DAV) v.2.4.9 (NASA, n.d.).

To validate the accuracy of the simulations, real-time temperature measurements were collected using an RC-51H device, recording data at 1-hour intervals from January 3 to January 7, 2023. Due to the deteriorated state of the building, where windows are broken, measurements were limited to a single room that was as isolated as possible from external environmental influences. The selected room has no direct windows facing the outside, ensuring that the recorded indoor climate data closely represents the building's actual indoor conditions.

The ASHRAE Guideline 14 was utilized to validate the energy model, ensuring its accuracy in representing the building's actual thermal performance. Two widely used statistical methods, Mean Bias Error (MBE) and Coefficient of Variation of the Root Mean Square Error (CV(RMSE)), were employed to minimize discrepancies between the energy model predictions and the real indoor environment (Yılmaz & Oral, 2019; Guo et al., 2021; Li et al., 2021).

To validate the model, temperature measurements obtained from the indoor space were compared with corresponding simulated data generated by the energy model. Based on this comparative analysis, error margins were determined using the following equations:

$$MBE(\%) = \frac{\sum_{i=1}^{n}(Mi-Si)}{\sum_{i=1}^{n}(Mi)} \times 100 \quad (1)$$

where MBE represents "Mean Bias Error", n denotes the number of the data, Mi stands for the measured data, and Si indicates simulation results.

$$\mathrm{CV(RMSE)}(\%) = \frac{\sqrt{\sum_{i=1}^{n}\left(\frac{(Mi-Si)^2}{n}\right)}}{M} \times 100 \quad (2)$$

where CV(RMSE) stands for "Coefficient of Variation of the Root Mean Square Error", M denotes the mean value of the collected data in the field.

According to ASHRAE Guideline 14, for an energy model calibrated with hourly data, the margin of error between real-time measurements and energy simulations should not exceed 10% for Mean Bias Error (MBE) and 30% for Coefficient of Variation of the Root Mean Square Error (CV(RMSE)). In this study, the number of data points (n) was set to 24, corresponding to the number of hours in a day, with measurements recorded hourly.

**Baseline and Retrofitted Energy Models**

In the energy simulations, the baseline case was evaluated under the assumption that the building is still in use. However, since the building has been vacant for an extended period, the occupancy rate, as well as the heating and cooling setback temperatures, were determined based on assumptions.

The basement floor was excluded from the energy simulations, as such areas are typically unheated spaces (Dascalaki et al., 2011). The building's operational hours were assumed to be 08.00 am–10.00 pm, every day. The window-to-wall ratio was calculated as 5%, and some of the trees on the southwest side of the building, which are officially registered, were modeled as shading elements, as they are located along the sun-exposed facade.

Primary energy demand accounts for the total energy consumption associated with room electricity, lighting, heating, cooling, ventilation, and hot water. Historical records indicate that the building was previously heated with solid fuel and naturally ventilated during its period of use.

The baseline energy model represents the closest approximation of the building's original state when it was operational. The assumptions for both the baseline and retrofitted energy models are provided in Table 2. The building is heated and cooled with a variable refrigerant flow system with heat recovery (VRF-HR) in the retrofitted case. A VRF-HR system recovers heat from cooling zones and transfers it to heating zones, enabling simultaneous heating and cooling (Zhang et al., 2018). Additionally, a 3D model image generated in Design Builder is presented in Figure 4.

### Thermal Comfort Criteria

In addition to the Passive Building Standard, the thermal conditions of the building after energy retrofits were assessed using the Predicted Mean Vote (PMV) and Predicted Percentage of Dissatisfied (PPD) methods. These methods are designed to predict thermal comfort under steady conditions and are based on a 7-point Likert scale (Cheung et al., 2019).

For the calculations, the thermal comfort tool developed by Berkeley University, which is based on ASHRAE 55 Standard, was used (Center for the Built Environment, n.d.). According to this methodology:

**Table 2.** Baseline and retrofitted energy model decisions

| Parameters | Baseline | Retrofitted |
|---|---|---|
| Heating period | October-March | October-March |
| Heating temperature - set back | 20 ºC-12 ºC | 20 ºC-12 ºC |
| Heating system | Boiler and radiators | VRF-HR |
| Total efficiency | - | 70% |
| Cooling period | - | June-August |
| Cooling temperature - set back | - | 23ºC-28ºC |
| Cooling system | - | VRF-HR |
| Ventilation system | Natural | Mechanical with HR |
| Occupancy rate | 08.00 am-10.00 pm | 08.00 am-10.00 pm |
| Infiltration rate (ac/h) | 0.7 | 0.59 |

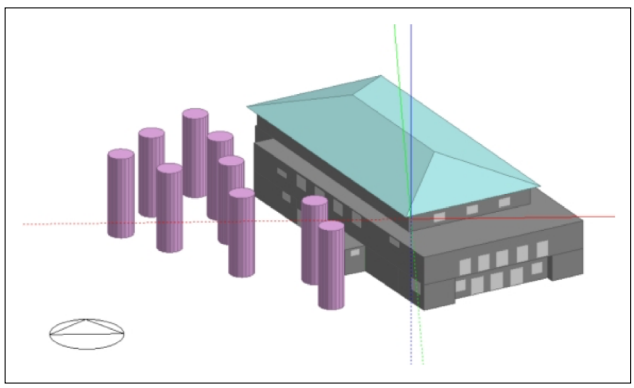


**Figure 4**. 3D model of the building from Design Builder.

- The clothing insulation value (clo) was set to 1.0 clo for typical winter indoor clothing and 0.5 clo for summer indoor clothing, based on operative temperatures. The metabolic rate was taken as 1 met, assuming occupants are seated quietly while watching a movie. Operative temperature and relative humidity values were determined using standard deviation and mean values, ensuring that two-thirds of the data falls within one standard deviation of the mean. Air speed was assumed to be 0.1 m/s.

### Calculation of Economic Savings

At the conclusion of the study, the total costs of all energy improvement measures were calculated to evaluate the economic feasibility of the proposed interventions. This analysis aimed to determine whether the costs associated with the retrofits could be recouped within the building's remaining service life.

The unit prices for key energy efficiency components—including the VRF-HR, rockwool insulation, and low-emissivity (low-E) triple glazing system with argon filling—are detailed in Table 3. Notably, for the VRF-HR system, pricing was obtained on a per-project basis. The cost of insulating the exterior door was excluded from the calculations, as it was considered negligible in comparison to other retrofit measures. The post-retrofit service life of the building was estimated at 30 years, and the electricity tariff (kWh/₺) used in the economic analysis was sourced from the Energy Agency (n.d.). To estimate the payback period of the initial investment costs, the annual energy savings and cumulative cost recovery over time were analyzed, taking into account that electricity tariffs for the public sector in Türkiye increase by 30% annually as indicated by Energy Market Regulatory Authority (*Enerji Piyasası Düzenleme Kurumu, EPDK*) in 2024 (Dünya, 2023).

### Database for Environmental Analysis

A comprehensive environmental analysis requires the assessment of both operational and embodied carbon emissions. The energy retrofits considered in this study include mechanical systems with heat recovery, insulation, and argon-filled triple-glazing window systems.

**Table 3.** Unit costs of proposed applications

| Senarios | Unit | Unit price | Source |
|---|---|---|---|
| VRF | Per project | €200,000 | Personal communication, July 24, 2024 |
| Insulation | 1 m² 1 cm | €0.6 + %18 VAT | Koca, 2023 |
| Window | 1 m² | 1459.15 ₺ + 18% VAT | Yaşasan, 2024 |
| Argon gas | 1 m² | 45 ₺ + 18% VAT | Yaşasan, 2024 |

VAT: Value added tax.

The embodied carbon of conventional buildings typically accounts for less than 20% of the total life cycle carbon (LCC). However, in low-energy buildings, embodied carbon can constitute up to 80% of the LCC (Akbarnezhad & Xiao, 2017). Given this disparity, it is crucial to evaluate both operational and embodied carbon emissions simultaneously to obtain a holistic understanding of environmental impact.

The system boundary for this study is defined as the production stage (A1–A3), while the impact category under investigation is total global warming potential (GWP-total) for embodied carbon calculations. GWP quantifies the amount of heat trapped in the atmosphere by a greenhouse gas relative to $CO_2$, meaning that a higher GWP indicates a stronger warming effect (U.S. Environmental Protection Agency, n.d.). GWP-total is also recognized as one of the seven key environmental impact categories outlined in the EN 15804+A2 Standard (Hill et al., 2018).

To obtain accurate embodied carbon data, this study utilizes the Environmental Product Declaration (EPD) of the selected materials, as detailed in Table 4.

The energy consumed during the operation phase of traditional buildings accounts for approximately 90% of their total energy consumption (Koç et al., 2022). To calculate operational carbon emissions, the electricity consumption point emission factors specified by the Ministry of Energy and Natural Resources were used (Republic of Turkey Ministry of Energy and Natural Resources, n.d.).

According to official data, 1 MWh of electricity consumption corresponds to approximately 0.445 tons of $CO_2$e. Since electrical energy is used for heating, cooling, ventilation, and all other operational activities within the building after energy retrofits, carbon emission calculations were conducted and compared for both the initial (pre-retrofit) and final (post-retrofit) states. For the environmental analysis, the service life of the building was assumed to be 30 years.

## FINDINGS AND DISCUSSION

This section covers the validation and analyzes the material properties and operational energy consumption of the baseline case, followed by the energy simulation of the reference model. Energy savings are calculated based on the reference model, assessing the feasibility of retrofitting the existing building.

Additionally, a comprehensive evaluation is conducted covering energy savings, overheating and thermal comfort, environmental impact, and cost analysis of the proposed interventions. The results are subsequently discussed in detail.

### Validation of the Energy Model

The error margins obtained from the measured and simulated indoor temperature data were compared with the acceptable limit values defined in ASHRAE Guideline 14-2002.

For the climate and building energy model validation, the Mean Bias Error (MBE) was found to be in the range of -6.95% to -10.01%, while the Coefficient of Variation of the Root Mean Square Error (CV(RMSE)) ranged from 11.85% to 23.80% (Figure 5).

Since these values remained within the acceptable thresholds specified by ASHRAE Guideline 14, the building energy model was deemed reliable. Consequently, a comparative analysis of annual energy consumption, carbon emissions,

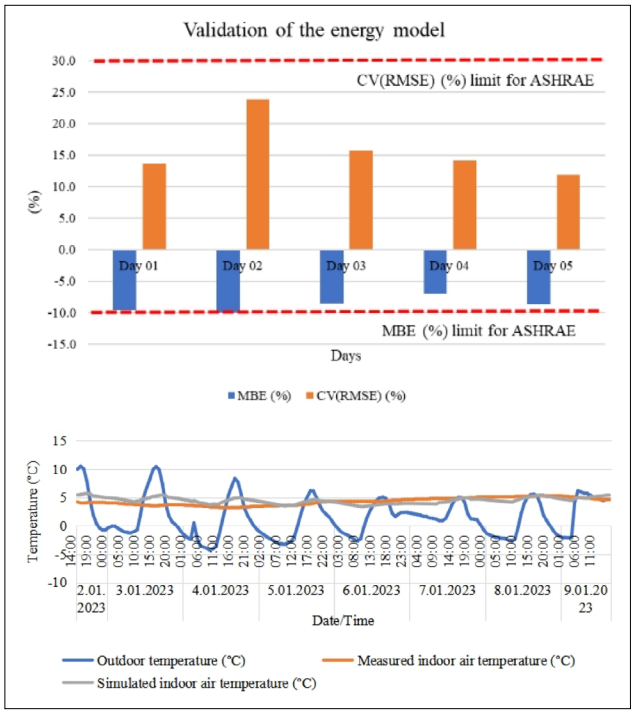



**Figure 5**. Validation of the building energy model (above), real-time measurements and simulation results for the indoor temperatures (below).

**Table 4.** Unit embodied carbon values (A1-A3) of the energy retrofits

| Material/System | Unit | Embodied Carbon (kg $CO_2$-e) | Source |
|---|---|---|---|
| VRF-HR units | 1 product | 5.43E+02 | Daikin, 2024 |
| Rock wool (0.037W/mK, 60 mm, 33 kg/m$^3$) | 1 m$^2$ | 2.62E+00 | Knauf, 2021 |
| Triple glass unit (4-12-4-12-4) | 1 m$^2$ | 4.80E+01 | Environdec, 2023 |

costs, and thermal comfort criteria was conducted for both the baseline and retrofitted scenarios, considering the in-use condition of the building.

**Energy Simulations**

Energy simulations were conducted based on the assumptions used to generate the building energy models. The results indicate that the heating load of the baseline energy model is 90.7 kWh/m²/year. To achieve Passive Building Standard compliance, an 83.4% reduction in heating load is required. Additionally, the primary energy demand is 163.1 kWh/m²/year, necessitating a 26.4% reduction to meet passive building criteria.

Thermal comfort analysis shows that the average indoor temperature exceeds 25°C for 17.6% of the year, while operative temperatures surpass 25°C for 16.4% of the year. According to the Passive Building Standard, these values should be reduced to below 10% to mitigate overheating risks.

The first stage of energy retrofitting involved the integration of energy-efficient HVAC units. Heating and cooling were provided using a heat recovery air conditioning unit, specifically a VRF-HR system.

As a result of this HVAC intervention:

- The heating load decreased to 58.3 kWh/m²/year, representing a 35.7% reduction.
- The primary energy demand dropped to 145.4 kWh/m²/year, achieving a 10.8% reduction.

In the second stage, rock wool insulation panels were applied to the building envelope, increasing its thermal inertia (Table 5). The thicknesses of the insulation layers were determined to ensure that the thermal transmittance of building components remains below 15 W/m²K, as required by the Passive Building Standard.

Furthermore, it was assumed that the airtightness of the structure improved, with air leakage decreasing to 0.59 air changes per hour (ac/h) following the addition of insulation layers.

As a result of the energy simulation, the heating load decreased by 87%, reaching 7.2 kWh/m²/year. Additionally, the primary energy demand was reduced by 36.1%, falling to 94.3 kWh/m²/year. These improvements successfully met the Passive Building Standard requirements for heating and primary energy demand. However, the addition of the insulation layer resulted in a 10.8% increase in cooling load.

In the third stage of the energy retrofit, windows and doors were upgraded to enhance thermal performance. The thermal transmittance (U-value) of the windows was reduced from 2.71 W/m²K to 0.78 W/m²K by installing argon-filled triple glazing. Additionally, insulation was applied to the doors, which are made of painted oak wood, reducing their U-value to 0.56 W/m²K. In addition to enhancing the window glazing, 1-meter-long shading elements made of moderately reflective metal slats were installed inside the windows. In-glass blinds were programmed to remain open during summer (June–August) to optimize thermal performance.

According to the simulation results, the heating load remained unchanged compared to the baseline case, while the cooling load decreased by 13.4%, reaching 14.1 kWh/m²/year. A 2.3% reduction in primary energy demand was achieved, resulting in an energy consumption of 92.1 kWh/m²/year.

**Table 5.** Improving the thermal performance of the building envelope with insulation

| | Material | Thickness (m) | Thermal conductivity (W/mK) | Specific heat (J/kg-K) | Density (kg/m³) | U value (W/m²K) |
|---|---|---|---|---|---|---|
| Wall | Plaster | 0.02 | 0.4 | 1000 | 1000 | 0.143 |
| | Rock wool | 0.24 | 0.037 | 840 | 33 | |
| | Concrete block | 0.30 | 1.15 | 1000 | 1800 | |
| | Plaster | 0.02 | 0.4 | 1000 | 1000 | |
| Hipped roof | Roof tile | 0.025 | 1 | 800 | 2000 | 0.148 |
| | Rock wool | 0.24 | 0.037 | 840 | 33 | |
| | RC | 0.12 | 1.15 | 1000 | 1800 | |
| Flat roof | Ceramic tile | 0.018 | 0.85 | 840 | 1900 | 0.148 |
| | Rock wool | 0.24 | 0.037 | 840 | 33 | |
| | RC | 0.12 | 1.15 | 1000 | 1800 | |
| Floor | Screed | 0.05 | 1.4 | 650 | 2100 | 0.146 |
| | Rock wool | 0.24 | 0.037 | 840 | 33 | |
| | RC | 0.12 | 1.15 | 1000 | 1800 | |

After implementing all energy retrofits, the study determined that a 92% reduction in heating load was achieved, while cooling load and primary energy demand fully complied with Passive Building Standard requirements. VRF-HR system contributed to a 35.7% reduction in heating load, while insulation and airtightness accounted for 88.3% of the total heating reduction. However, window retrofits had no significant impact on heating demand due to the low window-to-wall ratio.

Regarding cooling load, the impact of the VRF-HR system could not be determined, as the building did not previously have a cooling system. Floor, wall, and roof insulation, along with airtightness improvements, caused a 10.8% increase in cooling demand, while window retrofits played a 13.5% role in cooling demand reduction.

Regarding total energy savings, the contributions of individual retrofit measures were as follows: the VRF-HR provided a 10.8% reduction in primary energy demand, insulation and airtightness contributed to a 35.1% reduction, and window improvements resulted in a 2.3% reduction. These combined efforts led to a total energy saving of 43.5% (Figure 6).

### Overheating and Thermal Comfort

After the energy improvements, the operative temperature, which serves as an indicator of thermal comfort and is calculated as the arithmetic average of the radiation temperature and indoor dry-bulb temperature, was analyzed to assess overheating, a key criterion of the Passive Building Standard. According to the passive building requirements, the operative temperature should not exceed 25°C for more than 10% of the hours in a year. The results indicate that the operative temperature exceeds this threshold for 9.8% of the annual hours, demonstrating compliance with the standard. The implemented measures resulted in a 40.2% reduction in overheating hours per year (Figure 7).

Additionally, the average indoor temperature range between 19.4°C and 27.8°C, which falls within the comfort range specified by ASHRAE Standard 55-2017. The average indoor humidity remains between 40% and 60%, meeting the required comfort conditions. These findings confirm that the retrofitting measures not only improved energy efficiency but also prevented the building's overheating (Table 6).

The thermal comfort conditions were also evaluated using the Predicted Mean Vote (PMV) and Predicted Percentage of Dissatisfied (PPD) methods, in accordance with ASHRAE 55-2023 (Center for the Built Environment, n.d.). The results confirmed that overheating alone is not a sufficient criterion for ensuring user thermal comfort. Instead, a comprehensive assessment of is necessary.

The PMV-PPD analysis revealed that only two of the datasets met the thermal comfort criteria. During the summer period, up to 87% of users are likely to experience discomfort (cool) when the operative temperature is below average (Table 7). This suggests that the current conditions may not be optimal for occupant comfort.

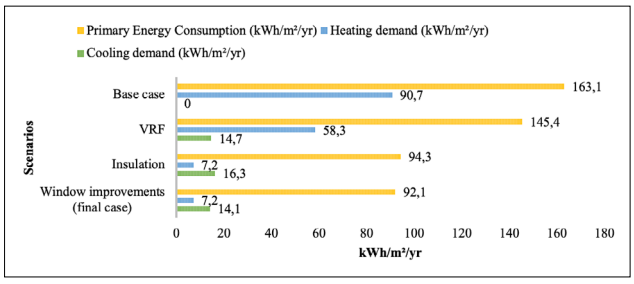



**Figure 6**. The effects of the improvements on the energy performance of the building.

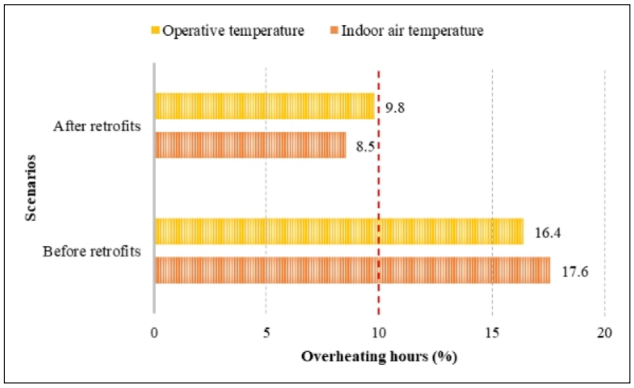



**Figure 7**. Overheating before and after the retrofits.

**Table 6.** Overheating hours of the building during the year after improvements

| Overheating status | Average indoor air temperature | Operative temperature | Relative humidity | Outside dry-bulb temperature |
|---|---|---|---|---|
| Minimum | 15.1 | 17.1 | 10.2 | -9.7 |
| Maximum | 31.5 | 29.9 | 78.7 | 38.6 |
| Mean | 21.9±2.1 | 22.4±2 | 43.8±12.5 | 13±9 |
| Hours above 25°C (uncomfortable) | 741 | 860 | | |
| Total hours in a year | 8760 | | | |
| Uncomfortable hours (%) | 8.5 | 9.8 | | |

**Table 7.** Thermal comfort based on PMV/PPD method

| Operative temperature (°C) | Relative humidity | Clothing level (clo) | PMV | PPD (%) | Sensation |
|---|---|---|---|---|---|
| 20.4 | 31.1 | 0.5 | -2.25 | 87 | Cool |
| 20.4 | 56.3 | 0.5 | -2.09 | 81 | Cool |
| 20.4 | 31.1 | 1.0 | -0.89 | 22 | Slightly cool |
| 20.4 | 56.3 | 1.0 | -0.73 | 16 | Slightly cool |
| 24.4 | 31.1 | 0.5 | -0.77 | 18 | Slightly cool |
| 24.4 | 56.3 | 0.5 | -0.57 | 12 | Slightly cool |
| 24.4 | 31.1 | 1.0 | 0.16 | 6 | Neutral |
| 24.4 | 56.3 | 1.0 | 0.36 | 8 | Neutral |

However, adjusting the operative temperature to above average during winter conditions significantly improves thermal comfort. Under these conditions, the percentage of users experiencing discomfort is reduced to only 6-8%, ensuring that the thermal comfort threshold is met (Figure 8). These findings indicate that careful temperature regulation is necessary to maintain an optimal indoor environment throughout the year.

### Cost Analysis

Following the completion of the energy retrofits, the initial investment costs and payback periods of the applied measures were calculated to evaluate their feasibility within the scope of the project. In addition, the total costs were determined by incorporating both initial investment costs and 30-year operating expenses.

For accurate cost assessment, foreign exchange transactions for Euro (€) to Turkish Lira (₺) were based on the Indicative Exchange Rates of the Central Bank of the Republic of Türkiye as of 24.07.2024 at 15:30 (Table 8). This ensures that cost evaluations reflect real-time currency values, enhancing the reliability of the economic analysis.

After calculating the costs, the annual energy savings were determined by comparing the baseline annual energy consumption with the total annual energy consumption of retrofitted case. This corresponds to a total energy saving of 142,000 kWh per year.

As a result of the calculations, it was determined that:

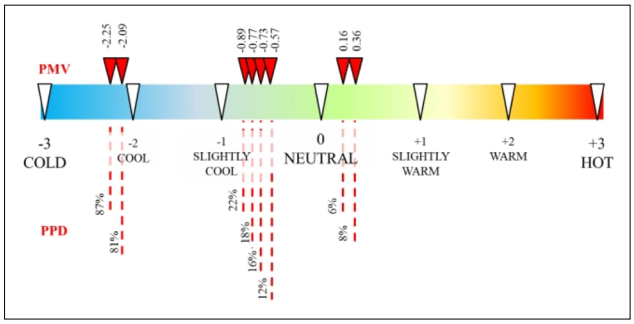



**Figure 8**. PMV/PPD results and thermal comfort assessment.

**Table 8.** Total quantity and price calculation of the applications proposed for the project

| Scenarios | Total amount | Total cost |
|---|---|---|
| VRF-HR | 20 high static pressure concealed ceiling type indoor units (ducting, copper piping and installation) | 200,000 €+18% VAT =8,413,400 ₺ |
| Insulation | 3310 $m^2$ 24 cm | 47,664 €+18% VAT =2,005,062 ₺ |
| Window (with argon gas) | 50.26 $m^2$ | 73,336 ₺+18% VAT =86,536 ₺ |
| | | 2,261 ₺+18% VAT =2,668 ₺ |
| Total | | 10,507,666 ₺ |

- Window replacement costs (86,536₺) can be fully recovered within the first year.
- Insulation costs (2,005,062₺) can be covered within the first three years.
- VRF-HR costs (8,413,400₺) will be recouped within seven years.

The findings indicate that the proposed energy retrofitting measures are financially viable, with relatively short payback periods, making them a cost-effective solution for improving building energy efficiency.

Finally, the additional investment costs and 30-year operating costs were evaluated together to determine the overall economic feasibility of the proposed retrofitting measures. The annual primary energy demand in the final scenario was calculated by accounting for inflation-driven increases in energy costs and compared with the operating costs of the baseline case.

According to the results, the total initial investment and 30-year operating costs of the proposed passive building were found to be 43.4% more economical compared to the operating costs of the baseline case alone (Table 9).

**Table 9.** Calculation of operating and investment costs

| Years (2024-2053) | Baseline | Passive building |
|---|---|---|
| Operational cost (₺) | 12,957,131,748 | 7,316,688,130 |
| Additional cost (₺) | - | 10,507,666 |
| Total cost (₺) | 12,957,131,748 | 7,327,195,796 |
| Saving (%) | - | 43.45 |

These findings highlight that, despite the initial capital investment, transitioning to a Passive Building Standard yields significant long-term financial benefits, making it a cost-effective and energy-efficient solution.

**Environmental Impact**

Both embodied carbon emissions and operational carbon emissions were assessed to evaluate the overall environmental impact of the proposed energy retrofits. The total embodied carbon emissions resulting from the retrofits were calculated based on Environmental Product Declaration (EPD) data sheets. According to these calculations:

- VRF-HR system contributed 10,860 kg $CO_2$-e,
- Insulation accounted for 34,689 kg $CO_2$-e,
- Windows contributed 2,412 kg $CO_2$-e,
- Leading to a total embodied carbon footprint of 47,961 kg $CO_2$-e.

The total annual operational carbon emissions were calculated based on annual energy consumption. The energy-to-carbon conversion factor from the Ministry of Energy and Natural Resources (n.d.) was used, where 1 MWh of energy consumption corresponds to 0.445 tons of $CO_2$-e.

In the baseline case, with an annual energy consumption of 163.1 kWh/m²/year, the corresponding operational carbon emissions were 72.6 tons $CO_2$-e per square meter per year. After implementing the retrofits, with an annual energy consumption of 92.1 kWh/m²/year, the operational carbon emissions were reduced to 41 tons $CO_2$-e per square meter per year. As in the cost analysis, the operational period for environmental analysis was considered as 30 years. Over this period, the total operational greenhouse gas (GHG) emissions would have been 2,177 tons per square meter in the baseline case. After the retrofits, this value decreased to 1,230 tons per square meter. When embodied carbon emissions from the production stage (A1-A3) were included, the total emissions after retrofits amounted to 1,277 tons per square meter.

As a result, the GHG emissions from operational energy consumption were reduced by 43.5%, while the total carbon emissions decreased by 41.3% compared to the baseline scenario, demonstrating the significant environmental benefits of the energy-efficient retrofits (Figure 9).

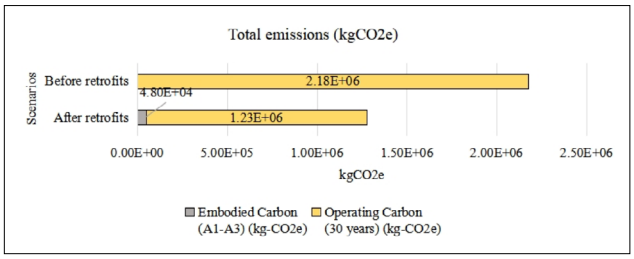



**Figure 9**. Environmental impact of the energy retrofits.

**Assessment of the Results**

This study aimed to promote sustainability in the architectural domain by retrofitting Yenişehir Cinema in accordance with Passive Building Standard requirements. Additionally, the project envisions reintegrating Yenişehir Cinema into urban life as a passive building, ensuring both economic and environmental sustainability. Economic sustainability is achieved through applicable energy-efficient solutions, while environmental sustainability is targeted by reducing the building's carbon footprint. To accomplish these goals, passive building strategies were systematically implemented, fulfilling all required conditions.

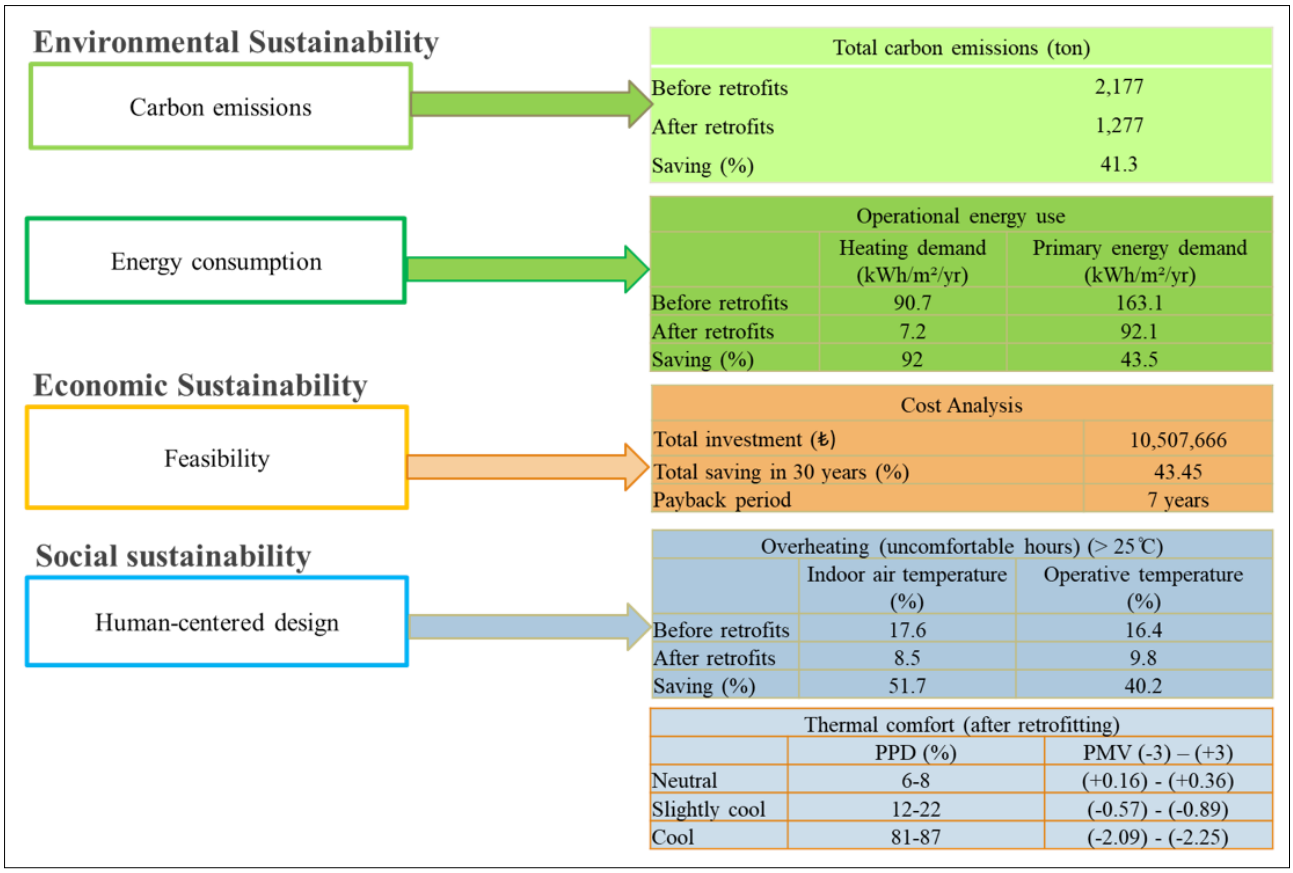
The desired thermal transmittance values for walls, doors, and windows were successfully achieved, and a heat recovery ventilation unit was integrated into the building. As a result, the heating, cooling, and primary energy demands were reduced to below threshold values, and the overheating level of the building was significantly minimized.

Comparing the baseline case with the retrofitted case, the results indicate a 43.5% reduction in annual primary energy demand, while heating demand decreased by 92%. Although the overheating issue was reduced by 40%, further improvements are required to ensure optimal thermal comfort for users.

The proposed retrofits are financially feasible, with a total payback period of 7 years. Furthermore, the total carbon emissions of the building were reduced by 41.3%, demonstrating the environmental benefits of energy-efficient interventions. Consequently, the study has successfully achieved ecological, economic, and social improvements, paving the way for Yenişehir Cinema to be reintroduced into urban life as a retrofitted passive building (Figure 10).

## CONCLUSION AND RECOMMENDATIONS

The depletion of non-renewable resources and the ongoing challenges posed by climate change present significant obstacles to the sustainability of existing buildings. As a result, it is crucial to enhance the energy performance of such buildings to ensure their continued viability. The Passive Building Standard provides a comprehensive range of solutions to address this challenge. According to the




| Total carbon emissions (ton) | |
|---|---|
| Before retrofits | 2,177 |
| After retrofits | 1,277 |
| Saving (%) | 41.3 |

| Operational energy use | | |
|---|---|---|
| | Heating demand (kWh/m²/yr) | Primary energy demand (kWh/m²/yr) |
| Before retrofits | 90.7 | 163.1 |
| After retrofits | 7.2 | 92.1 |
| Saving (%) | 92 | 43.5 |

| Cost Analysis | |
|---|---|
| Total investment (₺) | 10,507,666 |
| Total saving in 30 years (%) | 43.45 |
| Payback period | 7 years |

| Overheating (uncomfortable hours) (> 25℃) | | |
|---|---|---|
| | Indoor air temperature (%) | Operative temperature (%) |
| Before retrofits | 17.6 | 16.4 |
| After retrofits | 8.5 | 9.8 |
| Saving (%) | 51.7 | 40.2 |

| Thermal comfort (after retrofitting) | | |
|---|---|---|
| | PPD (%) | PMV (-3) – (+3) |
| Neutral | 6-8 | (+0.16) - (+0.36) |
| Slightly cool | 12-22 | (-0.57) - (-0.89) |
| Cool | 81-87 | (-2.09) - (-2.25) |

**Figure 10**. Interpretation of the results in the perspective of sustainable architecture.

standard, energy demands should be balanced to maintain user comfort throughout the year, and the integration of hybrid systems is recommended to optimize performance.

Yenişehir Cinema, a notable modern architectural building, holds significant value in the collective memory of the community. Currently, the building is vacant, but it is believed that the structure can be successfully retrofitted using the principles of the Passive Building Standard and reintegrated into urban life. In alignment with the EnerPHit certification system, the thermal performance of the building envelope was enhanced by incorporating active air conditioning systems, adding insulation, and improving transparent surfaces. One of the major barriers to energy efficiency and comfort was the lack of insulation in the building envelope. Consequently, 35.1% of energy savings in primary energy consumption were achieved solely through improvements to insulation and airtightness. Additionally, the installation of a heat recovery ventilation system prevented heat losses, resulting in a 10.8% reduction in energy consumption. However, due to the building's low transparency, the improvements to windows and doors contributed the least to energy performance, accounting for only 2.3% of the total energy savings. As a result, all requirements to achieve the EnerPHit certification system have been completed.

From an economic standpoint, the window improvements can be covered within the first year, insulation applications within three years, and the VRF-HR system within seven years.

By ensuring thermal comfort, it is possible to create a user-oriented interior space, fostering an environment where social interactions can thrive. The study found that while overheating can be prevented according to the Passive Building Standard, this alone is insufficient to ensure the required thermal comfort. The PMV/PPD method demonstrated that additional measures are necessary to achieve and maintain optimal thermal comfort. While implementing these measures, passive approaches, such as Trombe walls and innovative insulation materials, should be considered to prevent the building from consuming excessive energy during the use phase while ensuring thermal comfort.

Although the proposed improvements led to an increase of 48 tons in the embodied carbon of the building, the overall total carbon emissions decreased by approximately 41% due to the reduction in carbon emissions during the operational phase. This indicates that the retrofitting measures yield positive environmental sustainability outcomes.

Increasing legal regulations and financial support mechanisms that encourage passive building conversions in Türkiye will contribute to the sustainable transformation of the existing building stock. Projects promoted through public-private partnerships would help similar practices to become widespread and YES-TR certificates to be obtained.

Future research can focus on advanced technologies and innovative materials that can be applied to heritage buildings. A comprehensive approach that addresses the energy-carbon-cost triangle is essential for achieving long-term sustainability. Similar passive building transitions can be tested in different climate zones to assess the applicability of passive building strategies in various climatic conditions in Türkiye. Further research can be conducted on how to optimize energy efficiency strategies in different geographical regions. Furthermore, in addition to thermal comfort, visual comfort, acoustic comfort, and the indoor air quality should be considered to ensure the creation of a truly sustainable built environment.

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# OVACIK (KARABÜK) İLÇESİNDEKİ GELENEKSEL KONUTLARIN KIRSAL MİMARİ BAĞLAMINDA İNCELENMESİ

# EXAMINATION OF TRADITIONAL HOUSES IN OVACIK (KARABÜK) DISTRICT IN THE CONTEXT OF RURAL ARCHITECTURE

Elif ÇETİN*

Mehmet MUTLU**

**ÖZ**

Kırsal yerleşimler, içinde bulunduğu coğrafyanın iklimsel ve topografik özellikleri ile sosyal ve kültürel yaşam biçimlerinin etkisiyle şekillenmiştir. Çok sayıda mimari miras değer barındıran kırsal yerleşimler, değişen yaşam koşullarının etkisiyle terk edilmektedir. Terk edilen kırsal yerleşimlerde sosyokültürel ve ekonomik yapı değişmekte buna bağlı olarak da kırsal mimari doku da değişime uğramaktadır. Bu çalışma kapsamında çalışma alanı olarak seçilen Ovacık kırsal yerleşimleri, verilen göçlerin etkisiyle yok olma tehlikesiyle karşı karşıyadır. Ovacık kırsalında bulunan 137 yerleşimden dokuzu tamamen terk edilmiş durumdadır. Çoğu yerleşimde devamlı olarak ikamet eden hane oldukça az sayıdadır. Terk edilen yerleşimlerdeki geleneksel yapılar yok olma sürecine girmiştir. Bu çalışmada Ovacık kırsalında bulunan geleneksel yapım teknikleri ve malzemeler kullanılarak inşa edilen konutların plan özellikleri, cephe biçimlenişleri, yapım tekniği, malzeme ve süsleme özellikleri irdelenmiştir. Çalışma yöntemi olarak literatür çalışması yapılmış ardından alan çalışması yapılarak 137 yerleşimin tamamı yerinde incelenmiştir. İçerisine girme imkânı bulunan konutların içine girilerek plan şemaları çıkartılmış ve detaylı fotoğrafları çekilmiştir. Köy halkıyla sözlü görüşmeler yapılarak yerleşim ve yapılar hakkında bilgiler edinilmiştir. Ayrıca Ovacık ilçesinin komşu olduğu altı ilçede bulunan gelenek konutların özellikleri incelenmiş ve Ovacık kırsalındaki konutlarla benzer ve farklı özellikleri saptanmıştır. Bu çalışma ile Ovacık kırsal mimarisinin temelini oluşturan geleneksel konutların literatüre kazandırılması ve kırsal mimari dokusunun kaybolmadan belgelendirilmesi amaçlanmıştır.

***Anahtar Kelimeler:*** *Karabük, Ovacık, Kırsal Mimari, Geleneksel Mimari, Geleneksel Konut*

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**ABSTRACT**

Rural settlements have been shaped by the climatic and topographical features of their geographical context, as well as by the social and cultural lifestyles of their inhabitants. Containing numerous architectural heritage assets, these settlements are increasingly being abandoned due to changing living conditions. In abandoned rural areas, socio-cultural and economic structures undergo transformation, and consequently, the rural architectural fabric also experiences significant alteration. The rural settlements of Ovacık, selected as the study area, have been subjected to a rapid migration process since the 1980s, leading to the gradual disappearance of many of these settlements. Today, out of the 137 rural settlements in Ovacık, 9 have been completely abandoned. In most of the remaining villages, the number of permanently inhabited households is very limited. Traditional buildings in the abandoned settlements are in the process of decay. The structures that continue to be used are often repaired in an unplanned manner or replaced with new constructions employing modern materials and techniques, as they no longer meet contemporary needs. This situation damages the authenticity of the buildings and contributes to the deterioration of the rural architectural texture. This study examines the plan typologies, façade compositions, construction techniques, materials, and ornamental features of traditional houses constructed with local materials and vernacular building methods in rural Ovacık. The research methodology consisted of a literature review followed by extensive fieldwork. All 137 settlements were visited and documented in situ. For the accessible houses, interior plans were drawn and detailed photographs were taken. Oral interviews were conducted with local residents to gather information about the settlements and their buildings. Traditional houses in the Ovacık countryside generally consist of two stories: the ground floor serves as service areas, while the upper floor accommodates living spaces. Similar to the traditional Turkish house, each room in Ovacık houses is designed to meet the needs of an individual family unit, with particular attention paid to privacy. The plan typologies observed in Ovacık houses include external sofa, corner sofa, internal sofa, and central sofa plans, with the internal sofa type being the most prevalent. The sofa, locally referred to as the çardak, serves as the central hall from which rooms are accessed. Typically, the ground floors of the houses are built of rubble stone masonry, while the upper floors are constructed with a timber-frame infill (hımış) system. In some examples, çantı (a log construction technique) and hımış systems are used together. Functionality was prioritized in these dwellings, resulting in simple façades and interior elements. In the comparative analysis section, the architectural characteristics of traditional houses in six neighboring districts were examined to identify the similarities and differences with those of Ovacık. The aim of this study is to contribute to the architectural literature by documenting the traditional houses that form the basis of Ovacık's rural architecture and to preserve the rural architectural heritage before it disappears.

***Key Words:*** *Karabük, Ovacık, Rural Architecture, Traditional Architecture, Traditional House*

## Giriş

Kırsal yerleşimler bulundukları çevrenin iklim ve coğrafik özelliklerine göre şekillenmektedir. Ayrıca kırsal yerleşimler, o bölgede yaşayanların somut ve somut olmayan kültürel değerlerini yansıtmaktadır. Bölgeden bölgeye köyden köye farklılık gösteren kültürel değerlerin etkisiyle kırsal mimari de zenginleşmektedir. Kırsal yerleşimlerin sosyal, ekonomik ve kültürel değerlerinde zaman içinde meydana gelen değişimler, her yörenin kendine özgü bir mimari kimliğe sahip olmasına neden olmaktadır[1].

Kırsal yerleşimler, zamanla değişen yaşam koşulları, teknolojik gelişmeler, sanayileşme ve aile yapılarında meydana gelen değişimler gibi nedenlerin de etkisiyle nüfuslarını hızla kaybetmektedir. TÜİK verilerine göre kent-kır nüfus istatistiklerine bakıldığında 1950'li yıllarda kent nüfusu %25, kır nüfusu %75 oranındadır. Yıllar geçtikçe kent nüfusu sürekli artmakla beraber 1990'lı yıllarda kentte yaşayan nüfus oranı %60 olmuştur. Günümüzde ise kentte yaşayan nüfus toplam nüfusun %93,4'ünü oluşturmaktadır. Kırsal alanlarda yaşayan nüfus, toplam nüfusun sadece %6.6'sını meydana getirmektedir[2].

Kırdan kente göçün etkisiyle kırsal alanlar, kendilerine özgü mimari dokularını zamanla kaybetmektedir[3]. Kendi kaderine bırakılan geleneksel konutlar da gerekli bakım ve onarımları yapılamadığından yıkılmakta ya da yıkılma tehlikesiyle karşı karşıya kalmaktadır. Kırsal yaşamın devam ettiği bazı yerleşimlerde ise geleneksel konutlar yetersiz gelmekte ve onarıma ihtiyaç duyulmaktadır. Yapı sahipleri onarım yaparken yapıların özgünlüğüne dikkat etmemekte, uzman restoratör ve mimardan destek almadan gelişigüzel onarım yapmaktadır. Ayrıca geleneksel konutların yıkılıp yerine yeni yapı inşa edildiği de sıklıkla görülmektedir. Yeni yapılar inşa edilirken kırsal mimari doku arka plana atılmakta, yeni yapım sistemleriyle yerel malzeme kullanımından uzak yapılar üretilmektedir. Köy ölçeği dikkate alınmadan, şehir merkezinde yer alan yapılara benzer örnekler inşa edilmektedir. Bu durum da kırsal mimari dokunun yok olmasına sebep olmaktadır.

Bu çalışmada, kırsal yaşamın giderek yok olduğu ancak özgün mimariye sahip yerleşimlerin varlığını halen daha koruduğu Ovacık kırsal mimarisinin en önemli unsurlarının başında gelen geleneksel konutların tespiti ve belgelendirilmesi yapılarak bu konutlar kırsal mimari disiplini içerisinde değerlendirmeye tabi tutulmuştur. Ayrıca, Ovacık kırsal mimarisinin oluşmasında etkili olan yerleşim bölgesinin tarihi, coğrafi yapısı, iklimsel özellikleri ve nüfus özellikleri de çalışma kapsamında irdelenmiştir. Son beş yıldır yapılan arazi çalışmalarında elde edilen veriler kullanılarak Ovacık kırsal mimarisinin genel özelliklerinin ortaya konulması amaçlanmıştır. Arazi çalışmaları sırasında içerisine girilebilen konutların rölöveleri alınmış ve plan şemaları çıkartılmıştır. Çalışma kapsamında geleneksel yapım teknikleri ve malzemeler kullanılarak inşa edilen ve özgünlüğünü koruyan konutlar incelenmiştir.

1 Akgün, 2013, 7.

2 Bu veriler TUİK internet sayfasından alınmıştır. (Bk. TÜİK, 2025)

3 Eres, 2016, 9.

Yapı sahipleriyle ve geleneksel yapı ustalarıyla görüşmeler yapılarak bölgede kullanılan özgün yapı terimleri hakkında bilgilere ulaşılmıştır. Elde edilen veriler, fotoğraflar ve çizimlerle desteklenerek geleneksel konutların mimari özellikleri belirlenmiştir. Ayrıca Ovacık çevresindeki geleneksel konutlarla Ovacık kırsalındaki konutlar karşılaştırılarak benzerlikleri ve farklılıkları ortaya konmuştur.

## 1. Ovacık ve Ovacık Kırsal Mimarisinin Genel Özellikleri

### 1.1. Ovacık

Batı Karadeniz bölgesinin iç kesimlerinde bulunan Ovacık, Karabük ilinin doğusunda yer alan, Karabük iline bağlı küçük bir ilçedir. Batısında Karabük il merkezi ve Eskipazar ilçesi, doğusunda Kastamonu ilinin Araç ilçesi, güneyinde Çankırı ilinin Bayramören ve Çerkeş ilçeleri, kuzeyinde ise Karabük ilinin Safranbolu ilçesi bulunmaktadır (Şek. 1).

Ovacık ilçesinin tarihiyle ilgili yapılan araştırmalar ilk yerleşimlerin M.Ö. 3000-2000 yıllarında başladığını göstermektedir. Ovacık'ın yer aldığı Kuzeybatı Karadeniz bölgesine tarihsel süreç içerisinde Paphlagonialılar yerleşmiş olup, bölge Paflagonya olarak isimlendirilmiştir. Paflagonya sınırları günümüzde Karabük, Kastamonu, Sinop, Çankırı, Bartın illerini kapsamaktadır[4]. 1071 Malazgirt Zaferi'nden sonra Anadolu'ya yayılmaya başlayan Türkler, Paflagonya bölgesinde de varlık göstermiştir. 1082 yılında Çankırı, Eflani, Ulus, Bartın, Kastamonu ve Safranbolu'yu fetheden Emir Karatekin bölgede bir Türk Emirliği kurmuştur[5]. Daha sonraki dönemlerde ise bölgede; Danişmentliler, Çobanoğulları Beyliği, Umuroğulları ve Candaroğlu Beyliği hâkimiyet göstermiştir. 1389 yılında ise bölge toprakları Osmanlı hâkimiyetine geçmiştir. Osmanlı döneminde Karabük, Bolu sancağına bağlı olup, bugünkü il sınırlarında, Taraklı-Borlu (Safranbolu), Viran-Şehir (Eskipazar-Ovacık çevresi)




**Şek. 1:** Ovacık ilçesinin konumu (Karabük İl Özel İdaresi Arşivinden işlenmiştir)

4 Gökoğlu, 1952, 33.

5 Sakaoğlu, 1987, 57.

ve Yenice kazaları bulunmaktaydı. 17. yüzyılda Bolu Sancağının kaza sayısı artırılarak 36 kazaya sahip bir sancak durumuna getirilmiştir. Bu düzenlemede Ovacık bölgesinde Viran-Şehir, Şehabeddin ve Ulakderesi (Avlak) kazaları yer almıştır. Bu kazalar 19. yüzyıla kadar varlığını devam ettirmiştir[6]. 1869'da yapılan düzenlemelerle Ovacık; Ulak, Şehabeddin ve Oğlakdere kazalarından oluşan bir nahiye haline getirilmiştir. Ovacık nahiyesi, Çankırı (Kengiri) Sancağının Çerkeş kazasına bağlanmıştır. 1869 yılında Ovacık nahiyesinde 25 köy ve bu köylerde yaşayan 2145 hane bulunmaktadır[7].

Çankırı ilinin Çerkeş kazasına bağlı nahiye olan Ovacık, 1959 yılında ilçe olarak Çankırı'ya bağlanmıştır. 1995 yılında Karabük'ün il olmasıyla Ovacık, Karabük iline bağlı bir ilçe olmuştur[8]. Günümüzde Ovacık'a bağlı 42 köy ve bir Merkez mahalle bulunmaktadır. 42 köy, 137 mahalleden oluşmaktadır[9].

Ovacık ilçesinin nüfusu 1960'lı yıllarda köyleriyle birlikte yaklaşık 10.000'den fazla iken, yıllar içerisinde giderek azalarak 5000'nin altına inmiştir[10]. İlçe merkezinin nüfusu 600 civarındadır[11]. Nüfusun hızla azalmasında iş imkânlarının kısıtlı olması, gelişen teknolojilerle birlikte tarımda insan gücüne duyulan ihtiyacın azalması, hayvancılığa gerekli önemin verilmemesi ve sosyal imkânların yetersizliği etkili olmuştur.

İlçe merkezinde ve köylerinde yaşanan göçle birlikte yerleşim yerleri sahipsiz kalmıştır. Kırsal alanlarda tamamen terkedilen yerleşimlerin sayısı hızla artmaktadır. Pek çok yerleşim yerinde kış aylarında kimse yaşamazken, yaz aylarında nüfus kısmen artmaktadır. Kırsal alanlarda yerleşimin devamlı olarak sürdürüldüğü köy sayısı oldukça sınırlıdır.

### 1.2. Ovacık Kırsal Mimarisi

Ovacık kırsal mimarisi; çok sayıda konutun yanı sıra, 71 köy odası, 67 cami, 22 okul ile konutların bağımsız müştemilatları olarak inşa edilmiş samanlıklar, ahırlar, ambarlar ve çeşme yapılarından meydana gelmektedir. İlçe merkezinde geleneksel mimari doku çok fazla korunamamıştır. Merkezde bulunan geleneksel yapılar kendi kaderlerine terk edilmiştir ve bu yapıları kullanmak yerine betonarme teknikte geleneksel dokuyu bozacak yapılar inşa edilmiştir. Köylerinde ise geleneksel mimari dokunun korunmuşluğu daha iyi durumdadır. Tamamen özgün dokusunu koruyan köyler bulunsa da bazı yerleşimlerde dokuya zarar verecek nitelikte yapılar inşa edilmiştir. Bu çalışma kapsamında Ovacık kırsal mimarisinin temelini oluşturan geleneksel konutların plan şemaları, yapım teknikleri, kullanılan malzemeler ve iç mekân düzenlemeleri kapsamlı bir şekilde ele alınmıştır.

6 Ersoy, 2011, 106.

7 Ersoy, 2011, 158.

8 Ağaoğlu [vd.], 2015, 16.

9 Çetin, 2019, 10.

10 Yiğit, 2011, 527.

11 Bu veriler TÜİK internet sayfasından alınmıştır (Bk. TÜİK,2025)

Geleneksel konutların bazılarında samanlık, ahır ve ambar gibi eklentiler yapıyla aynı parselde olabiliyorken, bazı konutlarda bu tamamlayıcı yapılar bulunmamaktadır. Ahır genellikle konutun giriş katında yer almaktadır. Konutun içerisinde olmayıp konutla aynı parsel içerisinde bağımsız olarak kullanılan ahırlar da görülmektedir. Samanlıklar, köyün ekin yapılabilen "harman" olarak bilinen düzlük alanlarda yer almaktadır. Samanlık yapıları genellikle yığma taş olarak inşa edilmiş olup üst örtüleri beşik çatı biçimindedir (Fot. 1).



**Fot. 1:** Samanlık örneği (Sarılarsonya köyü, Sarılar mahallesi)

Ambarlar ise bazı köylerde yapıdan bağımsız bazı köylerde ise yapıya bitişik şekilde bulunmaktadır. Yapıya bitişik şekilde ve yapı yüksekliği ile aynı yükseklikte yapılan ambarlar, yörede "boy ambarı" olarak isimlendirilmektedir. Boy ambarları, çantı yapım tekniği sayesinde dışarıdan algılanabilmektedir (Fot. 2a). Koltuk ve Anbarözü köyünde ise ambarlar ayrı bir yapı şeklinde çantı tekniği kullanılarak inşa edilmiştir (Fot. 2b). Birçok evde ise ambarlar sandık şeklinde konutun çardak mekânında bulunmaktadır. Bu tür ambarlar yörede "herkil" olarak isimlendirilmektedir.



**Fot. 2:** Yapıdan bağımsız ve yapıya bitişik ambar örnekleri; **a)** Avlağıkaya köyü Karşı mahalle; **b)** Anbarözü köyü Merkez mahalle



**Fot. 3.** Ovacık kırsalında bulunan tarihi cami örnekleri (Çukur köyü ve Boyalı köyü)

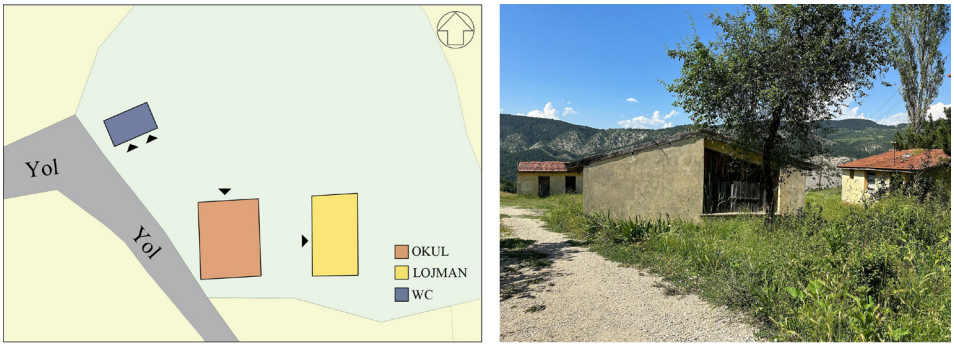
Ovacık kırsal mimarisini oluşturan bir diğer yapı türü, köy odalarıdır. Ovacık kırsalında, hemen hemen bütün yerleşimlerde köy odası bulunmaktadır. Bu köy odalarının tamamı geleneksel yapım teknikleri ve malzemeler kullanılarak inşa edilmekle beraber zaman içerisinde yıpranan köy odalarının bazılarının yıkılıp yeniden inşa edildiği, bazılarının ise kapsamlı bir onarımdan geçirilerek özgünlüğünü kaybettiği görülmektedir. Köy odaları da konutlarla benzer mimari tipolojiye sahip olup genellikle iki katlı inşa edilmiştir. Köylerde yaşamın aktif olduğu yıllarda köy odaları köy halkının günlük yaşamında önemli bir role sahip olmuştur[12]. Akşamları köyün erkekleri bir araya toplanarak sohbetlerini köy odalarında gerçekleştirmiştir. Ramazan ayında toplu iftarlar köy odalarında verilmektedir. Bayramdan önce arife günü ziyrat[13] için köy odasında toplanılmaktadır. Bayramlaşmalar köy odalarında yapılmaktadır. Ayrıca köy odalarında cenaze işlemleri ve taziyeler gerçekleştirilmektedir. Ovacık'ta camisi olmayan yerleşim yerlerinde köy odaları aynı zamanda ibadet amacıyla da kullanılmaktadır. Bazı yerleşimlerde ise cami ve caminin içerisinde bulunan bir bölüm köy odası olarak işlevlendirilmiştir[14].

Ovacık köylerinin neredeyse tamamında cami bulunmaktadır. Bazı camiler Cuma camisi niteliğinde olup birkaç köye hizmet vermektedir. Özgün cami yapıları yığma taş olarak inşa edilmiştir. Özgün minareleri ise ahşap malzemeden yapılmıştır. Taşoğlu, Anbarözü, Başboyunduruk, Çatak ve Boyalı köylerindeki camiler tescillenerek koruma altına alınmış ve restore edilmiştir (Fot. 3). Bazı köylerde ise zamanla yıpranan cami yapıları yıkılarak yerine modern teknikler kullanılarak yenisi inşa edilmiştir.

12 Çetin, 2019, 16.

13 Ziyrat: Ovacık kırsalında arife günleri yapılan mezarlık ziyaretine ziyrat denilmektedir. Ziyrat için köy odasında toplanılır ve köy halkı evlerinden helva ve ekmek getirir. Getirilen yiyecekler birleştirilip köy halkına ikram edilir ardından da mezarlığa gidilir ve dualar okunurdu.

14 Mutlu, 2024, 12.




**Şek. 2:** Sülük köyü Göcek mahallesinde bulunan okul ve lojmanı

Ovacık köylerinin çoğuna 1960'lı yıllarda okul inşa edilmeye başlanmıştır. 1990'lı yıllardan sonra köylerde nüfusun azalmasıyla okullar da işlevini sürdürememiştir. Lojman, tek katlı ve yığma teknikte inşa edilen okul yapılarının yanına inşa edilmiştir. Tuvaletler de okul bahçesinde ayrı bir yapı olarak bulunmaktadır. Günümüzde Ovacık köylerinin hiçbirinde aktif olarak kullanılan okul bulunmamaktadır.

## 2. Ovacık Geleneksel Konutları

Ovacık kırsalında konutlar bir, iki veya üç kattan meydana gelmekte olup, en yaygın görüleni zemin+1 kat şeklindedir. Genellikle eğimli arazi yapısına sahip Ovacık kırsalında, konutlar da eğimli araziye konumlanmıştır. Konutların yer aldığı parsel sınırları genellikle bahçe duvarlarıyla ayrılmamıştır. Çoğu geleneksel konuta giriş, doğrudan sokak üzerinden sağlanmaktadır (Şek. 3a). Bazı örneklerde ise bahçenin yola komşu duvarına yapılan ahşap kapıyla önce bahçeye, sonra konuta girilmektedir (Şek. 3b). Eğimli araziye oturan konutlarda, farklı kottan ulaşılan birden fazla giriş bulunmaktadır.

Konutların zemin katında genellikle ahır bulunup, ahırla konut girişi ayrılmıştır. Zemin katlarda biri tek kanatlı biri çift iki ayrı kapı bulunmaktadır. Çift kanatlı kapı hayvanlar için olup doğrudan ahıra açılmaktadır. Tek kanatlı kapıyla "avlu" olarak isimlendirilen alana girildikten sonra burada yer alan merdivenle üst kattaki yaşama birimlerine çıkılmaktadır (Fot. 4a). Zemin katın ahır olarak kullanıldığı bazı konutlarda, zemin katla üst kat arasında bağlantı olmayıp katların girişleri tamamen ayrılmıştır. Eğimli arazi üzerine inşa edilen konutlarda eğimin yukarı kotundan üst katta bulunan yaşama birimlerine girilirken, alt kotta bulunan bahçeden doğrudan ahıra giriş sağlanmaktadır (Fot. 4c). Bazı konutlarda ise yapının dışında bulunan merdivenle üst kata ulaşılırken, aynı cephede zemin katta bulunan kapıyla ise ahıra giriş sağlanmaktadır (Fot. 4b). Ayrıca iki farklı cepheden ve farklı kotlardan birden çok girişin olduğu örnekler de görülmektedir (Fot. 4d).



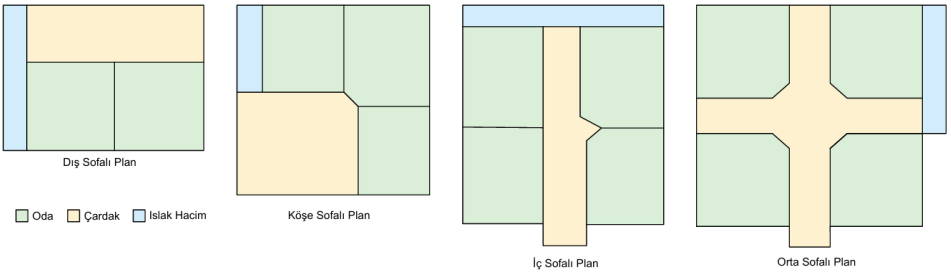

**Şek. 3:** Konutların giriş düzenleri. **a)** Doğrudan sokaktan giriş sağlanan konut örneği (Koltuk köyü); **b)** Bahçeden giriş sağlanan konut örneği (Kavaklar köyü)




**Fot. 4:** Konutlara giriş şekilleri. **a)** Aynı cepheden iki farklı giriş **b)** Aynı cephede farklı kottan merdivenle giriş **c)** Aynı cephede farklı kotlardan giriş **d)** Farklı cephelerden farklı kotlardan giriş

### 2.1. Plan Özellikleri

Geleneksel Türk evinin temel özelliklerini barındıran Ovacık kırsalındaki konutlarda farklı plan şemaları görülmektedir. Geleneksel Türk evinde gördüğümüz sofa etrafında sıralanan odalar Ovacık'taki geleneksel konutlarda da görülmektedir. Ovacık yöresinde sofa, "çardak" olarak bilinmektedir. Geleneksel Türk evlerinde plan şeması sofasız, dış sofalı, iç sofalı ve orta sofalı olarak gruplandırılmaktadır[15]. Bu plan tiplerinden dış sofalı, iç sofalı ve orta sofalı plan tipleri Ovacık kırsalındaki konutlarda da görülmektedir (Şek. 4). Ayrıca bölgede köşe sofalı plan şemasına sahip konutlar da bulunmaktadır. İncelenen konutlarda iç sofalı plan şemasının daha yaygın olduğu tespit edilmiştir.




**Şek. 4:** Ovacık kırsal mimarisinde konutlarında yaşam katı olan 1. kat plan şemaları

Ovacık kırsalındaki evler iki, üç veya dört odalıdır. Dış sofalı plan tipine sahip konutlarda iki oda bulunmaktadır. Dış sofalı plan şemasına sahip konutlarda odalar yan yana dizilmekte ve sofanın sonunda ıslak hacim yer almaktadır (Şek. 5). Sofanın çevresi duvarlarla kapatılmış olup ışık alması için bir veya iki pencere açılmıştır.

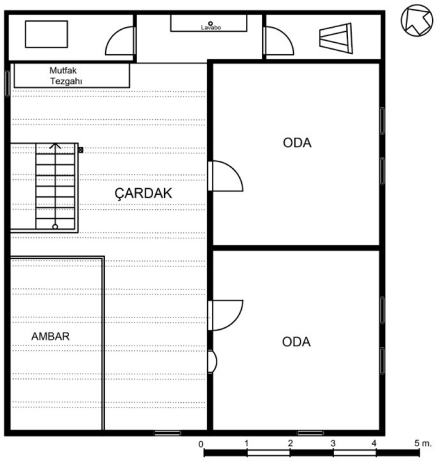
Ovacık kırsalında görülen bir diğer sofa tipi köşe sofadır. İç ve orta sofalı plan tipine geçiş özelliği gösteren köşe sofalı plan tipi, üç odadan oluşmaktadır[16]. Köşe sofalı plan şemasında çardak köşede olup odalara buradan geçilmektedir. Merdiven de çardak mekânında bulunmaktadır. Dış sofalı plan şemasında da olduğu gibi uç kısımda ıslak hacim yer almaktadır (Şek. 6).

Ovacık kırsalındaki konutlarda en yaygın görülen plan şeması tipi iç sofalı plan tipidir (Şek. 7). İç sofalı konutlarda dikdörtgen şeklindeki çardak mekânı konutu simetrik olarak ikiye bölmektedir. Çardağın iki yanında genellikle ikişer oda yer almaktadır. Sofanın en ucunda ve arkaya bakan cephesinde ise "abdestlik" olarak tanımlanan bir lavabo bulunmakta ve buradaki koridorla helaya ulaşılmaktadır. Konutlara giriş genellikle çardaktan sağlanmaktadır. Konutun içerisinde zemin katla bağlantısını sağlayan bir merdiven varsa bu merdiven çardakta bulunmaktadır. Bazı örneklerde çardak mekânı genişletilerek buraya bir de boy ambarı yerleştirilmiştir (Şek. 7).

15 Eldem, 1968, 24.

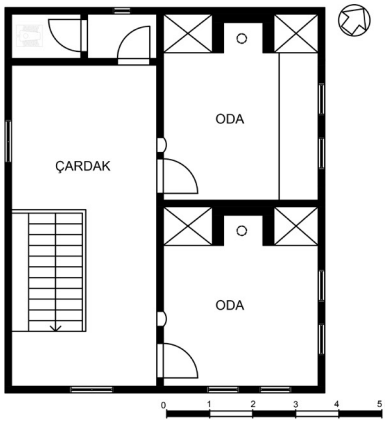
16 Günay, 1981, 69.

Abdullah Aksu Evi planı ve çardaktan iç mekân görünümü (Belen Köyü)



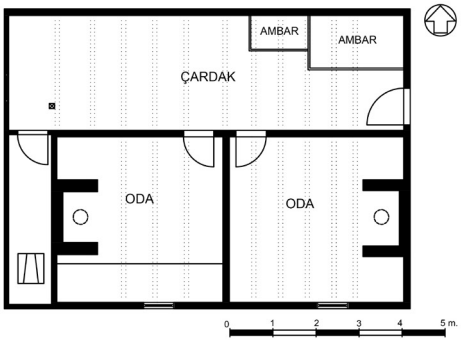



Gülşen Akar Evi ve çardaktan iç mekân görünümü (Yeniören Köyü)






Kazım Karaçam Evi ve çardaktan iç mekân görünümü (Sülük köyü)



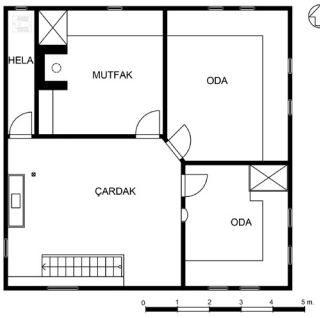



**Şek. 5:** Dış (kapalı) sofalı plan şemasına örnek konutlar






Mustafa Atılgan Evi ve çardaktan iç mekân görünümü (Çukur köyü)






Hasan Kutluca Evi ve çardaktan iç mekân görünümü (Abdullar köyü)

**Şek. 6:** Köşe sofalı plan şemasına sahip örnek konutlar

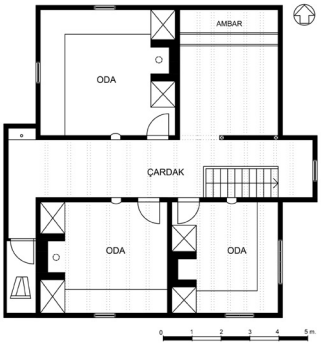
Ovacık kırsalında görülen bir diğer plan tipi orta sofalı plan tipidir (Şek. 8). Orta sofalı plan şemasına sahip olan konutlar diğer plan şemasına sahip konutlara göre daha büyük ölçülerdedir. Orta bölümde bulunan çardağın köşelerine odalar yerleştirilmiştir. Odaların, çardağa bakan duvarları pahlanmıştır. Ayrıca oda duvarları birbirine bitişik değildir. Genellikle oda duvarları arasındaki boşlukta katlar arasında ulaşımı sağlayan merdiven, sütlük, depo veya ıslak hacim gibi birimler yerleştirilerek odaların birbirine temas etmesi engellenmiştir. Çardağın sokağa bakan ön cephesinde çıkma uygulaması yaygın bir şekilde görülmektedir. Genellikle buraya sedir yerleştirilmekte ve üç cephesinde bulunan pencereler sayesinde dışarıya açılmaktadır.

### 2.2. Konut Bölümleri

#### Odalar

Geleneksel Türk evinde odalar çekirdek bir ailenin ihtiyaçlarını karşılayacak şekilde donatılmıştır. Oda içerisinde yatma, oturma, yıkanma ve yemek yeme için gerekli her şey bulunmaktadır[17]. Ovacık kırsalındaki geleneksel konutlar da Türk evindeki oda düzenlemelerine benzer özellikler göstermektedir. Odalarda oturmak için sedir, ısınma ve

17 Bektaş, 2007, 158.






Arif Balıkçı Evi ve çardaktan iç mekân görünümü (Sarılarsonya köyü)






Şükrü Doğan Evi ve çardaktan iç mekân görünümü (Yeniören köyü)

**Şek. 7:** İç sofalı plan şemasına örnek konutlar

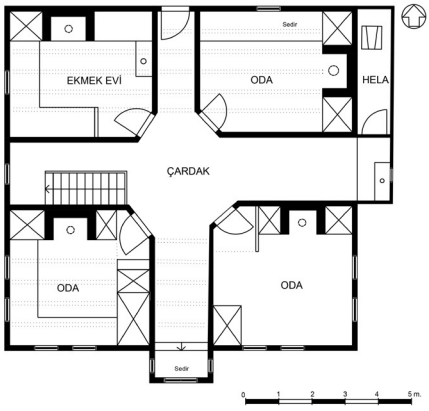
yemek pişirme işlevini yerine getirebilmek için ocak, uyumak için kullanılan yorgan ve yastıkların muhafaza edilebilmesi için yüklük, eşyaların depolanması için dolap, yıkanma işlevini yerine getirmek için gusülhane, tabak ve çanakları koymak için raf veya sergen ve gaz lambası koymak için "gözgöre" adı verilen raflar yer almaktadır[18]. Odalar kare ya da kareye yakın dikdörtgen planlıdır.

Odaya giriş 70-80 cm genişliğinde ahşap eşikli kapılarla sağlanmaktadır. Oda kapıları, içeri girildiğinde içerinin tamamının görülmesini engelleyecek şekilde pahlı köşelere yerleştirilmiştir (Fot. 5a). Ayrıca kapının yanında bulunan dolap ve ocakta görüş açısını daraltmaktadır. Genellikle orta sofalı plan şemasına sahip olan konutlarda bu durum görülmektedir. Bu şekilde pahlı köşelere yapılan kapılara yörede "farsa kapı" denilmektedir[19]. Bazı konutlarda mahremiyeti sağlamak için kapının açıldığı doğrultuda bulunan dolap uzatılarak paravan görevi görmektedir. Mahremiyet, geleneksel Türk evinin plan şemasının oluşmasında etkili olduğu gibi Ovacık kırsal mimarisinin şekillenmesinde de önemli bir rol oynamıştır. Çardakla doğrudan bağlantılı olan odalarda kullanılan dolap ve raflar, oda içinin çardaktan doğrudan görünmesini engellemektedir (Fot. 5b).

18 Çetin ve Mutlu, 2021a,28.

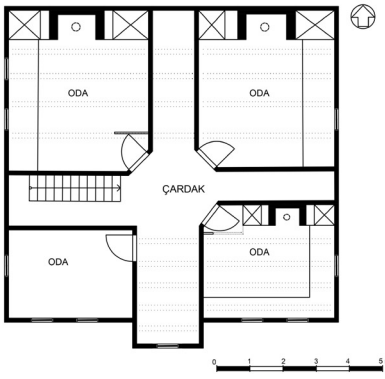
19 Çetin, 2019, 96.

Hasan Ağar Evi ve çardaktan iç mekân görünümü (Ahmetler köyü)



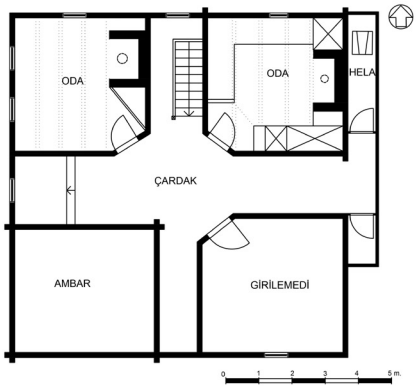



Hidayet Kırımtay Evi ve çardaktan iç mekân görünümü (Gümelik köyü)






Aziz Batı Evi ve çardaktan iç mekân görünümü (Alınca köyü)






**Şek. 8:** Orta sofalı plan şemasına örnek konutlar



**Fot. 5:** Odalara giriş. **a)** Pahlı köşeden giriş **b)** Oda girişinde paravan

Odalarda yüklük, gusülhane ve ocak aynı duvarda yer almaktadır. Ocak, gusülhane ve yüklük dolaplarının ortasına konumlandırılmıştır (Fot. 6). Ocak ve gusülhanenin yan yana olması sayesinde gusülhanenin ocak yandığı sürece sıcak kalması sağlanmıştır. Genellikle gusülhane önünde sedir yer almaktadır bu sayede gusülhane dolabına daha rahat ulaşılmaktadır (Fot. 6).

**Fot. 6:** Yüklük, ocak ve gusülhane dolabı



Odalarda bulunan sedir hem oturma hem de yatma eylemini yerine getirmek için kullanılmaktadır. Sedir genişliği 80-100 cm arasındadır. Sedir genellikle odanın iki duvarını çevrelemektedir (Fot. 7). Bazı örneklerde ocağın bulunduğu duvar boyunca

da sedir devam etmektedir. Ancak ocak önünde sedirin genişliği 40-50 cm'ye kadar düşmektedir. Ayrıca sedir, konutun çardak mekânında dışarıya doğru çıkma yapan bölümünde de bulunmaktadır.



**Fot. 7:** Sedir örneği

Odalarda bulunan bir diğer eleman yörede "göz göre" olarak bilinen gaz lambası koymaya yarayan nişlerdir (Fot. 8). Göz göre genellikle odaların çardağa bakan duvarında ya da bitişiğindeki odaya komşu duvarda bulunmaktadır. Burada yanan gaz lambasıyla hem çardak hem de bitişiğindeki odanın aydınlatılması sağlanmaktadır. Ahşap malzemeden yapılan göz görelerin üst kısmı ışık geçirmesi için camdan yapılmıştır. Göz göreler tek ya da çok gözden oluşacak şekilde farklı biçimlerde tasarlanmıştır.



**Fot. 8:** Göz göre örnekleri

**Mutfak**

Ovacık geleneksel konutlarında genellikle mutfak işlevi gören ve "ekmek evi" olarak adlandırılan bir oda bulunmaktadır. Ekmek evinde mutlaka ocak bulunmaktadır (Fot. 9). Oda duvarlarında mutfak eşyalarını koymak için "terek" denilen raflar yer almaktadır. Ocağın iki yanında yüklük gibi ahşap kapaklı dolaplar bulunmaktadır. Konutlara su tesisatının gelmesiyle birlikte bu dolaplardan bir tanesi kaldırılarak bu bölüm evye şeklinde düzenlenmiştir.



**Fot. 9:** Mutfakta bulunan ocak ve tezgâh olarak kullanılan bölüm

Mutfak olarak düzenlenen bir odası bulunmayan bazı geleneksel konutlarda, mutfak sonradan çardak mekânına eklenen tezgâh ve dolaplarla oluşturulmuştur. Bu uygulama daha çok iç sofalı plan şemasına sahip konutlarda görülmektedir. Bazı örneklerde de ıslak hacim çıkmasının bir tarafına eklenen tezgahla mutfak ihtiyacı karşılanmıştır.

**Hela-Abdestlik**

Ovacık kırsalında bulunan geleneksel konutlarda helaların tamamı konutun içerisinde ve yaşama birimlerinin bulunduğu katta yer almaktadır. Çardak mekânının sonunda abdestlik bulunmakta olup, abdestliğin bitiminde konuta ek çıkma şeklinde hela yer almaktadır. Abdestlik ve helanın dış duvarları daraba tahtalarıyla kapatılmıştır. Genellikle konsol olarak inşa edilen hela, bazı konutlarda dikmelerle veya payandalarla desteklenerek taşıtılmıştır.

Abdestliğin olduğu bölümde, suyun uzaklaştırılmasını sağlamak için zemin tahtaları hafif eğimli olacak şekilde çakılmıştır. Işık girmesi için daraba tahtalarında küçük dikdörtgen veya üçgen şeklinde boşluklar açıldığı ya da daraba tahtaları arasında boşluk bırakılarak çakıldığı görülmektedir.

Abdestlik olarak tanımlanan yerde abdest almak ve el yıkamak için ahşap lavabo bulunmaktadır (Fot. 10). Genellikle lavabonun gideri dışarı verilmiştir. Abdestlikten ince tahta kapıyla ayrılmış helaya geçilmektedir. Ahşap tahtaların zeminden bir miktar yükseltilerek çakılmasıyla hela taşı oluşturulmuştur (Fot. 10). Tuvaletin gideri evin arka bahçesinde açılan kuyuya verilmiştir.




**Fot. 10:** Ahşap lavabo ve hela

**Merdivenler**

Geleneksel Ovacık konutlarında merdivenler genellikle ahşap malzemeden ve tek kollu olarak yapılmıştır. İki ya da üç kattan oluşan konutlarda üst kata ulaşım zemin katta bulunan ahşap merdivenle sağlanmaktadır (Fot. 11). Bazı konutlarda ise birinci kata ulaşım sağlayan merdiven konutun dışında bulunmaktadır. Arazi çalışmaları sırasında genellikle tek kollu merdiven görülmekle beraber L şeklinde ve çeyrek döner merdivene sahip örneklere de rastlanmıştır. Merdivenlerin genellikle bir tarafında duvar, bir tarafında korkuluk yer almaktadır. Merdiven korkulukları oldukça sade yapılmıştır. Korkuluk bulunmayan merdiven örnekleri de görülmüştür.

Ovacık kırsalında az sayıda da olsa taş malzemeyle yapılmış merdivenlere de rastlanmıştır. Bu merdivenler dış merdiven şeklinde konuta giriş sağlayan bölümlerde kullanılmış olup, genellikle 3-4 rıhttan meydana gelmektedir. Taş merdivenlerin basamak genişliği ve rıht yüksekliği ahşap merdivenlere göre daha fazladır.

**Ambarlar**

Tahıl ve kuru yiyecekleri depolamak için ambarlar kullanılmıştır. Geleneksel konutların içerisinde bulunan ambarlar, boy ambarı ya da herkil olmak üzere iki farklı şekilde görülmektedir. Boy ambarına yörede "taban hambarı" da denilmektedir. Boy ambarı çantı sisteminde inşa edilmiş olup iki kat boyunca devam eden yüksekliğe sahiptir. İçerisine hiçbir şekilde hava, nem ve böcek girmeyecek şekilde yapılan ambarlar, yiyeceklerin uzun bir süre depolanmasını sağlamaktadır. Boy ambarına kilitli bir kapıdan girilmektedir ve içerisi oda şeklinde düzenlenmiş çok sayıda herkilden oluşmaktadır (Fot. 12). Gemici merdivenine benzer bir merdivenle alt kota inilmektedir. Bu merdivene döşemede bulunan tahtalar kaldırılarak ulaşılmaktadır. Boy ambarına genellikle çardaktan ulaşılmaktadır.



**Fot. 11:** Ovacık geleneksel konutlarında görülen merdiven örnekleri



**Fot. 12:** Boy ambarı örneği, giriş kapısı ve merdiven

Herkil, genellikle çardakta ya da giriş katta bulunmaktadır. Herkil tek, iki ya da üç bölümden meydana gelmektedir (Fot. 13). İki bölümden meydana gelen herkiller büyük ve küçük bölümden oluşmaktadır. Büyük bölümü genellikle insan boyunda, küçük bölümü ise 60-70 cm yüksekliğindedir. Küçük bölüm önde, büyük bölüm arkada olacak şekilde yerleştirilmiştir. Küçük bölüme basılarak herkilin büyük bölümüne ulaşılmaktadır. Üç bölümlü herkiller ise üç kademeden oluşmaktadır.



**Fot. 13:** Herkil örnekleri

### 2.3. Cephe Özellikleri

Ovacık geleneksel konutlarının cephe düzenlemesi konutun konumuna ve büyüklüğüne göre değişiklik göstermektedir. Konutlar genellikle sade, süslemeden uzak cephe düzenine sahiptir[20]. Cephe karakterini belirleyen en önemli elemanlar açık ve kapalı çıkmalar, pencere ve kapı oranlarıdır. Çıkmalar, plan özelliklerini dış cepheye yansıtmaktadır. Odalarda yapılan çıkmalar odanın genişlemesini, daha iyi ışık almasını ve manzaraya açılmasını sağlamaktadır. Çardak mekânında yapılan çıkmalar, genellikle giriş kapısının üst hizasında olmakta ve böylelikle girişi tanımlamaktadır. Bu sayede giriş, yağmurdan korunmaktadır.

Giriş katın tamamı ahır veya depolama olarak kullanılan konutlarda zemin katta pencere bulunmamaktadır. Ahırın havalandırılması ve hayvan gübrelerinin dışarı atılmasını sağlamak için "temek" adı verilen camsız küçük pencereler bulunmaktadır. Temek, mazgal pencere şeklinde olup içeriye doğru genişlemektedir. Giriş katında oda bulunan konutlarda mahremiyet ve güvenliği sağlamak için giyotin pencerelere ahşap kapak ya da korkuluk yapılmıştır.

Birinci ve ikinci katta bulunan oda pencereleri genellikle ahşap giyotin ya da kanatlı pencere şeklindedir. Giyotin pencereler 65-75 cm genişliğinde, 125-140 cm yüksekliğindedir. Kanatlı pencereler iki, üç veya dört kanattan oluşmakta olup, en yaygın görülen türü dört kanatlıdır. Dört kanatlı pencerelerin ortadaki iki kanadı açılmaktadır. Pencerelerin çevresinde genellikle sade bir pervaz bulunurken, bazı pencerelerin alt pervazlarında farklı formlar görülmektedir. Odaların genellikle iki duvarında pencere bulunmaktadır. Çantı tekniğinde inşa edilen odaların genellikle bir cephesinde pencere

20 Çetin ve Mutlu, 2021b, 226.



**Fot. 14:** Ahşap pencere örnekleri

bulunur ve bu pencere diğer pencerelere göre daha küçük boyutlardadır. Yapım tarihi daha eski olan geleneksel konutlarda pencereler camsız olarak yapılmış olup, ahşap kapakla kapatılmıştır (Fot. 14).

Çardak mekânında da aydınlatma ve havalandırma için pencere bulunmaktadır. Çardakta çıkma yapılmışsa bu çıkmanın dışarı bakan üç yüzüne de pencere yerleştirilerek sokağa farklı açılardan bakma imkânı sağlanmıştır.

Konutların giriş kapıları bazı konutlarda çift kanatlı bazı konutlarda tek kanatlı bazılarında da hem çift hem de tek kanatlıdır. Arazi eğiminden dolayı birinci kata girişle zemin kata giriş farklı cepheden ya da kottan yapıldıysa, ahır olarak kullanılan zemin kata giriş genellikle çift kanatlı kapıdan sağlanmaktadır.

Ovacık kırsalında konutların özgün giriş kapılarının tamamı ahşap malzemeden yapılmıştır. Ahşap kapılar çakma veya tablalı olarak oluşturulmuştur. Ahşap çift kanatlı kapılarda kanat genişliği 75-80 cm, yüksekliği ise 180-220 cm arasındadır. Bazı konutlarda giriş kapılarının üzerine, farklı geometrik şekillerde küçük havalandırma boşlukları oluşturulmuştur. Bu sayede içeriye az da olsa ışık girmesi ve mekânın hava alması sağlanmıştır. Bazı giriş kapılarının üst kısmında ise, Safranbolu geleneksel mimarisinde "muşabak" olarak adlandırılan[21] ahşap kafeslerle içerinin havalandırılması ve aydınlatılması sağlanmıştır (Fot. 15). Boduroğlu köyünün Deveci mahallesinde ahşap kapılar farklı renklerde boyanarak üzerine desenler işlenmiştir. Bu yerleşim haricinde diğer yerleşimlerde kapılar, sade ve süslemeden uzaktır.

İç ve orta sofalı plan şemasına sahip konutlarda çardağın dışarı taşması ile cephelere hareketlilik kazandırılmıştır (Fot. 16a). Bu çıkmaların yan yüzlerine ve ön yüzüne pencereler açılarak konutun dışarıyla olan teması artırılmıştır. Çıkma miktarının arttığı durumlarda çıkmaların eliböğründeler ya da dikmeler ile desteklendiği görülmektedir. Sınırlı sayıdaki konutta çıkmanın cephe boyunca devam ettiği tespit edilmiştir (Fot. 16b).

Ovacık kırsalında görülen bir diğer çıkma ise balkonlardır (Fot. 16c). Balkonların üzeri çatıyla örtülmüştür. Bazı örneklerde balkonun dikmelerle ya da eliböğründeler ile desteklendiği görülmektedir (Fot. 16d). Balkon korkulukları oldukça sade yapılmıştır.

21 Günay, 1998, 359.



**Fot. 15:** Ahşap kapı örnekleri




**Fot. 16:** Açık ve kapalı çıkma türleri. **a)** Çardağın orta bölümünde kapalı çıkma **b)** Cephe boyunca çıkma **c)** Balkon şeklinde açık çıkma **d)** Dikmelerle desteklenen açık çıkma

Ovacık geleneksel konutlarında ıslak hacimler konutun arka ya da yan cephesinde yer almaktadır. Özgün ıslak hacimler konutun üst katında yer almakta olup, çıkma şeklindedir (Fot. 17). Bu bölüm, yörede "daraba" olarak isimlendirilen ahşap kaplama tahtalarıyla kapatılmıştır. Ahşap kaplamalar dikey olarak yapılmış ve bazılarının aralarında küçük açıklıklar bırakılmak suretiyle çakılmıştır. Bu sayede hem içeriye ışık girmekte hem de ıslak hacmin havalandırılması sağlanmaktadır. Birçok örnekte kaplama tahtalarının alt tarafı uzunlu kısalı bırakılmış olup, aynı hizada bitirilmemiştir (Fot. 17).



**Fot. 17:** Daraba tahtlarıyla kapatılan ıslak hacim çıkması

Ovacık kırsalında bulunan konutların çatıları kırma, beşik veya üç omuz şeklindedir. Özgün çatı örtü malzemesi alaturka kiremittir. Daha yakın tarihte inşa edilen geleneksel konutlarda Marsilya tipi kiremit kullanılmıştır. Günümüzde çatılarda yapılan onarımlarda alaturka ve Marsilya tipi kiremit kaldırılarak sac malzemelerle çatıların kaplandığı görülmektedir. Sac malzeme kullanımı yapının özgünlüğüne zarar vermektedir.

Çatıların hemen hemen hepsinde saçak bulunmaktadır. Saçaklar çıkmaların oluşturduğu girinti çıkıntılara göre kimi örnekte kademe yapmış, kimi örnekte ise düz bir biçimde cephe boyunca dolanmıştır. Saçakların altı genellikle kaplanmadan bırakılmıştır. Saçak altların kaplandığı durumda ise kaplama malzemesi olarak ahşap tercih edilmiştir.

### 2.4. Yapım Tekniği ve Malzeme

Ovacık kırsal mimarisinde geleneksel yapılar; yığma, karkas veya karma teknik kullanılarak inşa edilmiştir. Yığma sistemde inşa edilen yapı türleri genellikle samanlık, ahır ve ambar yapılarıdır. Ambarlar ahşap yığma teknikte çantı olarak inşa edilmiştir. Çantı olarak inşa edilen ambarlar, taş kullanılarak yerden bir miktar yükseltilmiştir. Samanlık ve ahır yapıları ise genellikle yığma taş tekniğinde olmakla beraber hem yığma taş hem de çantı tekniğinin beraber kullanıldığı örnekler de tespit edilmiştir (Fot. 18). Taş duvarlarda, belirli yüksekliklerde ahşap hatıllar kullanılmıştır.



**Fot. 18:**
Yığma sistemle inşa edilen ahır örneği

Ovacık kırsalındaki geleneksel konutların inşasında genellikle karma sistem kullanılmıştır. Konutların zemin katları yığma taş, üst katı ise ahşap karkas sistemde inşa edilmiştir (Fot. 19). Genellikle zemin kattaki yığma taş duvarlarda ahşap dikme ve payandalar kullanılmıştır. Zemin kattaki taş duvarın üzerine ahşap taban kirişi yerleştirilerek taban kirişinin üzerine konulan ana dikmelerle üst katın duvarları inşa edilmiştir. Ana dikmeler yörede "alay direği" olarak isimlendirilmektedir. Alay direklerinin arasına daha ince kesite sahip yörede "yeydane" olarak bilinen ara dikmeler 35-50 cm aralıklarla yerleştirilmiştir. Ana ve ara dikmelerin üstleri üst taban kirişi kullanılarak birleştirilmiştir. Alt ve üst taban kirişleri ise payandalar kullanılarak bağlanmış ve bu sayede yatay yüklere karşı koyabilmesi amaçlanmıştır. Pencere boşluklarında, dikme ve payandalar arasına hem yatayda hem de düşeyde kuşaklar yerleştirilmiştir. Bu kuşaklar yörede "başboyunduruk" olarak isimlendirilmektedir. Dikmelerin arasındaki boşluklar taş, kerpiç, ahşap ya da tuğla malzemelerle doldurulmuştur. Hımış sistemde inşa edilen duvarlar toprak esaslı sıva ile sıvanmıştır. Bazı örneklerde sıvanın duvar yüzeyine daha sağlam tutması için gazoz kapakları kullanıldığı görülmektedir.

Ovacık ilçesinin %67'si ormanlarla kaplı olduğundan en yaygın kullanılan yapı malzemesi de ahşaptır. Geleneksel yapıların karkas ya da yığma teknik kullanılarak inşa edilmesinde esas taşıyıcı eleman olarak ahşap kullanılmıştır. Yığma taş duvarlarda hatıl olarak ahşap malzeme kullanımı yaygındır. Geleneksel yapıların döşeme, tavan, çatı, kapı, pencere, merdiven, sedir, yüklük, gusülhane, raf ve dolap gibi çoğu elemanlarında ahşap malzeme karşımıza çıkmaktadır.

Ovacık kırsalında bir diğer yaygın kullanılan yapı malzemesi ise taştır. Yapıların temelleri taş malzemeyle inşa edilmiştir. Temelden başlayan taş örgü, subasman seviyesine kadar çıkmaktadır. Bazı yapılarda yapının kullanım amacına da bağlı olarak zemin kat duvarları da taş malzemeyle örülmüştür. Zemin katta kullanılan ahşap dikmelerin zeminle temas ettiği noktada büyük taşlar kullanılmıştır (Fot. 20).

Ayrıca taş malzeme, ahşap karkas sistemde inşa edilen dikmelerin aralarındaki boşlukların doldurulmasında kullanılmıştır. Dolgu malzemesi olarak kullanılan taşlar küçük boyutlu iken, temel ve zemin kat duvarlarının örülmesinde daha büyük boyutlu taşlar



**Fot. 19:** Hımış sistemde inşa edilen konut örnekleri



**Fot. 20:** Dikmelerin altında bulunan taş

tercih edilmiştir. Yapıların özellikle köşe noktalarında kullanılan taşlar daha büyük boyutlu ve düzgün biçimli seçilmiştir. Abdullar, Yeniören ve Boyalı köylerinde kesme taş kullanımı yaygınken diğer yerleşimlerde ise daha çok kaba yonu ve moloz taş kullanılmıştır.



**Fot. 21:** Ahşap karkas sistemde dolgu malzemesi olarak kullanılan ateş tuğlası

Ovacık kırsalında kerpiç, yardımcı yapı malzemesi olarak karşımıza çıkmaktadır. Tamamen kerpiç malzemeyle inşa edilen bir yapıyla karşılaşılmamıştır. Kerpiç genellikle hımış sistemde inşa edilen yapılarda ahşap dikmelerin arasında dolgu malzemesi olarak kullanılmıştır. Ocakların "çığlık" olarak isimlendirilen temel kısmının oluşturulmasında ve ocak duvarlarının örülmesinde kerpiç malzeme kullanılmıştır. Ayrıca kerpicin hammaddesi olan toprağın, hımış sistemde inşa edilen yapılarda sıva malzemesi olarak da kullanıldığı görülmektedir.

Ovacık kırsal yerleşimlerinde kullanılan bir diğer yapı malzemesi ise tuğladır. Ahşap karkas sistemde dolgu malzemesi olarak kullanılan tuğla malzeme yörede "Hanköy tuğlası", "ateş tuğlası" ya da "harman tuğlası" olarak bilinmektedir (Fot. 21). Ayrıca konutların baca duvarlarının örülmesinde de harman tuğlası kullanımı yaygın bir şekilde görülmektedir.

### 2.5. Süsleme Özellikleri

Ovacık kırsalında bulunan geleneksel konutlar genellikle süslemeden uzak, sade bir şekilde inşa edilmiştir. Konutlarda süslemeden çok işleve önem verilmiştir. Cephelerde, pencere alt pervazlarında ve giriş kapılarının üzerinde bulunan ışıklıklarda süsleme görülmektedir. Işıklıklar, genellikle kafes şeklinde yapılırken bazı konutlarda ay yıldız ya da farklı geometrik desenlerin işlendiği görülmektedir (Fot. 22). Giriş kapılarının üzerinde metal malzemeden yapılmış kapı tokmakları ve kilitleri dikkat çekmektedir. Ahşap kapı ve pencerelerin beyaz, yeşil ya da mavi renge boyandığı örnekler mevcuttur (Fot. 22).

Konutların cephelerinde olduğu gibi iç mekânlarında da işlev ön planda tutulmuştur. Pencerelerin alt ve üst pervazları oda duvarları boyunca devam etmiştir. Odalarda ocak, yüklük, gusülhane ve sedir bulunmaktadır. Bu elemanlara ek olarak odaların hemen hemen hepsinde niş veya dolap da yer almaktadır. Dolabın yanında şerbetlik veya lambalık olarak bilinen iki ya da üç sıralı ahşap raflar bulunmaktadır. Bu raflar kapaklı veya kapaksız olabilmektedir. Kapaksız raflarda nişler oymalı şekilde çeşitlilik göstermektedir. Kagir malzemeden inşa edilen ocakların, kemerlerinde de farklı formların kullanıldığı



**Fot. 22:** Bezeme detayları içeren kapı örnekleri



**Fot. 23:** Süsleme amacıyla boyanmış oda dolapları

görülmektedir. Ayrıca bazı konutlarda oda içerisinde bulunan ahşap elemanlar yeşil, mavi ya da beyaz renge boyanarak süsleme elemanına dönüşmüştür (Fot. 23).

Ovacık kırsalında bulunan konutların oda tavan ve döşemeleri, yapı sahibinin ekonomik durumuna göre değişkenlik göstermektedir. Zemin katta bulunan mekânlar genellikle ahır veya depolama olarak kullanıldığı için, bu bölümlerde tavanlar kaplamasız şekilde bırakılmıştır. Birinci katta bulunan oda tavanları ise ters kiriş şeklinde ya da düz kiriş şeklinde kaplanmıştır. Ters kiriş kaplamalı tavanlarda kirişler oda içerisinden görülüyorken, düz kiriş tavanlarda kaplama tahtası kirişlerin altını kapattığı için düz bir tavan görüntüsü elde edilmektedir. Ovacık kırsalında az sayıda konutta bezemeli tavan örneğine rastlanılmıştır (Fot. 24). Bazı konutlarda oda tavanlarında çıtalardan geometrik desenler oluşturulduğu görülmektedir.

Ovacık kırsalında bazı konutlarda yapının inşa tarihi, yapının zemin kat taş duvarı üzerine işlenmiştir (Fot. 25). Bu uygulama her yerleşimde görülmeyip en çok



**Fot. 24:** İşlemeli ahşap tavan örnekleri




**Fot. 25:** Taş duvar üzerine işlenilen yapım tarihi

Pürçükören köyünün Karakoyunlu mahallesinde ve Küçüksu köyünde karşımıza çıkmaktadır. Küçüksu köyündeki konutların duvarlarında 1944 depremine gönderme yapılarak, o dönemde yıkılıp yeniden yapıldığı belirtilmektedir (Fot. 25).

### 3. Karşılaştırma ve Değerlendirme

Çevre koşullarına göre şekillenen kırsal mimari; bitki örtüsü, iklim ve coğrafya olarak yakın olan yerleşimlerde birbirine benzer özellikler göstermektedir. Çalışma alanını oluşturan Ovacık ilçesi, idari olarak Karabük ili ve Karabük iline bağlı Eskipazar ile Safranbolu ilçeleri, Çankırı ili Çerkeş ve Bayramören ilçeleri ve Kastamonu ili Araç ilçeleriyle komşudur. Ovacık ilçesinin komşu olduğu yerleşimlerdeki geleneksel konutlarla ilgili yapılan çalışmalardan elde edilen veriler doğrultusunda Ovacık geleneksel konutlarıyla benzeyen ve farklılaşan özellikleri belirlenmiştir. Ovacık ve kırsalındaki konutların temel mimari özellikleri ile ilçe çevresindeki yerleşimlerde bulunan geleneksel konutların temel özellikleri ulaşılabilen yayınlardan elde edilen bilgiler Tablo 1'de gösterilmiştir.

Karabük iline bağlı Eskipazar kırsal yerleşimlerinde bulunan geleneksel konutlar tek veya iki kattan oluşmakta olup iki katlı konutların zemin katları genellikle ahır ola-

**Tablo 1:** Ovacık ve çevre yerleşimlerindeki konutların genel özellikleri

| Yerleşim Yeri | Kat Sayısı | Yaygın Plan Tipi | Yapım Sistemi | Cephe Özelliği | Çatı Tipi |
|---|---|---|---|---|---|
| Ovacık | 2 | Dış ve İç Sofalı | Hımış, Çantı | Sade | Kırma, Beşik, Üç omuz |
| Eskipazar | 2 | İç ve Orta Sofalı | Hımış | Sade | Kırma ve Beşik |
| Çerkeş | 2 ve 3 | İç Sofalı | Hımış | Sade | Kırma ve Beşik |
| Bayramören | 2 | İç Sofalı | Hımış | Sade | Kırma ve Beşik |
| Araç | 2 | İç ve Orta Sofalı | Hımış, Çantı | Sade | Kırma ve Beşik |
| Safranbolu | 2 ve 3 | İç ve Orta Sofalı | Hımış, Çantı | Sade | Kırma, Beşik, Üç omuz |
| Karabük | 2 | İç Sofalı | Hımış | Sade | Kırma ve Beşik |

rak kullanılmaktadır. Az sayıda örnekte ise zemin katta yaşama birimi olarak kullanılan oda bulunmaktadır[22]. Eğimli arazide bulunan konutlara farklı kotlarda giriş sağlanmaktadır. Sofaların konumlanışı plan şemasını şekillendirmiş olup, sofanın durumuna göre orta sofalı, iç sofalı, ön sofalı plan tipleri yer almaktadır. Orta sofalı plan şemasında simetri hakim olup dört cepheye uzanan eyvanlar oluşturulmuştur. Eskipazar konutlarında odalar bir ailenin ihtiyacını karşılayacak şekilde donatılmıştır. Lavabo ve hela bölümleri daraba tahtalarıyla kapatılmıştır[23]. Geleneksel konut mimarisinde ahşap yaygın bir şekilde kullanılmıştır. Yerel yapı malzemesi olan ve adını imal edildiği köyden alan Hanköy tuğlası ile bölgede bulunan sarı traverten ve kireç taşı kagir sistemde sıklıkla kullanılmıştır[24]. Geleneksel konutların zemin katları kagir yığma sistem ile üst katları ise hımış sistemde inşa edilmiştir. Bazı örneklerde antik dönemden kalan mimari ögeler devşirme olarak yapının çeşitli yerlerinde kullanılmıştır. Yapıların çatıları kırma ya da beşik çatı şeklinde örtülmüş olup özgün kiremit malzemesi olarak alaturka kiremit kullanılmıştır[25].

Çankırı iline bağlı Çerkeş ilçesinde bulunan geleneksel konutlar genellikle düz arazilere inşa edilmiştir. Bu bölgedeki konutlar iki veya üç kattan oluşmaktadır[26]. Zemin katları yığma taş, üst katları ise ahşap karkas sistem arası kerpiç dolgu şeklinde inşa edilmiştir. Genellikle konutların üst katlarında düz çıkma yapılmıştır ve bu çıkmaların alt kısımları kıvrımlı ahşap payandalar ile desteklenmiştir. Bazı geleneksel konutlarda cihannüma bulunmaktadır. Konutların giriş kapıları ahşap çift kanatlı kapılardan oluşmaktadır. Özgün pencereler ise giyotin şeklinde ve ahşap malzemedendir. Çatılar beşik veya kırma çatı biçimindedir. Konutlarda bezemeler iç mekânda yoğunlaşmış olup, daha çok ahşap tavanlarda bezemeler görülmektedir. Ayrıca bazı konutların giriş kapılarının çevrelerinde bitkisel bezemeler yer almaktadır[27].

Çankırı ili Bayramören ilçesi geleneksel konutları genellikle iç sofalı plan şemasına sahip olup iki kattan oluşmaktadır. Zemin katları yığma taş, üst katları ahşap karkas

22 Özyürek, 2024, 97.

23 Özyürek, 2024, 99.

24 Özyürek, 2024, 119.

25 Özyürek, 2024, 118.

26 Demirbağ, 2021, 481.

27 Demirbağ, 2021, 483.

arası kerpiç dolgu şeklinde inşa edilmiştir. Üst katlarda genellikle cephe ortasında düz çıkma yapılmıştır. Bazı örneklerde çıkmalar ahşap payandalarla desteklenmiştir. Giriş kapıları ahşap çift kanatlı, pencereler ise ahşap giyotin şeklindedir. Konutların çatıları beşik veya kırma çatı biçimindedir[28].

Kastamonu ili Araç ilçesi kırsalında bulunan konutlar genellikle iki kattan oluşmakta olup eğimli araziye yerleşmiştir. Konutların alt katları ahşap ve taş malzemenin birlikte kullanımıyla inşa edilmiştir. Üst kat ise ahşap çatkı sistem arası tuğla, taş, kerpiç veya ahşap ile doldurulmasıyla oluşturulmuştur. Bazı geleneksel konutlarda konutun bir bölümü çantı tekniğiyle inşa edilmiştir. Bu teknikte inşa edilen bölüm "taban oda" olarak isimlendirilmektedir[29]. Araç yayla evlerinde çantı sistem daha yaygın görülmektedir[30]. Konutlarda genellikle iç veya yörede çardaklı sofa olarak tanımlanan orta sofa plan şeması yaygın olarak kullanılmaktadır. Odalar bir ailenin yaşayabileceği şekilde düzenlenmiş olup en az bir odada yüklük, ocak ve gusülhane bulunmaktadır. Sofanın en ucunda abdestlik ve hela yer almaktadır. Bu bölümün duvarları daraba şeklindedir. Konutlara giriş ahşap çift kanatlı kapı ile sağlanmaktadır. Farklı kotlardan birden fazla girişin sağlandığı örneklerde tek kanatlı ahşap kapı da kullanılmıştır. Araç kırsalında bulunan konutların bazılarında ara kat uygulaması görülmektedir. Ara kata bölgede "kış odası" da denilmektedir. Bu bölüm genellikle kış aylarında kullanılmaktadır[31]. Yazın ise serme, kurutma veya depolama gibi ihtiyaçları karşılamaktadır Konutların üst örtüleri kırma çatı olup, alaturka veya Marsilya tipi kiremitle kaplanmıştır.

Karabük ili Safranbolu ilçesi kırsal yerleşimlerinde bulunan konutlar dış, iç veya orta sofalı plan şemasına sahiptir[32]. Genellikle iki kattan oluşan konutların zemin katları ahşap yığma sistemle veya yığma taş ile inşa edilmiştir. Birinci katlarda ise ahşap karkas ve ahşap yığma yapım sistemleri kullanılmıştır. Ahşap karkas sistemde dolgu malzemesi olarak taş, kerpiç, tuğla, ahşap veya karma malzeme kullanılmıştır[33]. Çantı sistemde inşa edilmiş konutlarda balkona benzeyen ve "günlük" olarak isimlendirilen açık çıkma bulunmaktadır. Yaklaşık 1 metre genişliğindeki bu çıkmada kışlık için hazırlanan yiyecekler kurutulmaktadır. Safranbolu kırsalındaki geleneksel evlerin odaları bir ailenin yaşamını sürdürebileceği gerekli donanıma sahiptir. Daraba tahtalarıyla kapatılan helalara çardağın bir köşesinden, bir aralıktan ya da abdestlikten geçilerek ulaşılmaktadır[34]. Konutlara giriş kapısı genellikle iki kanatlı olup, ahşap malzemeden yapılmıştır. Pencereler ise ahşap malzemeden kareye yakın biçimde çift kanatlı ya da giyotin şeklindedir. Konutların çatıları beşik, üç ya da dört yöne kırma biçimindedir. Çatı kaplama malzemesi eski evlerde pedavra tahtası şeklinde iken 1960-1970 sonrasında

28 Demirbağ, 2021, 480.

29 Esen, 2023,189.

30 Soydan, 2024, 111.

31 Esen, 2023, 205.

32 Karataş, 2019, 27.

33 Özköse, 2022, 116.

34 Karataş, 2019, 145.

yapılan evlerde ise Marsilya kiremittir[35].

Karabük kırsalında bulunan konutlar iki veya üç kattan oluşmaktadır. Zemin katları yığma taş, üst katlar ise hımış sistemde inşa edilmiştir. Hımış sistemde dolgu malzemesi olarak taş, tuğla ve kerpiç kullanılmıştır. Konutların üst katlarında genellikle çıkma yapılmıştır. Çoğu örnekte çıkmalar payandalarla desteklenmiştir. Balkon şeklinde açık çıkmalar da görülmektedir. Geleneksel konutların çatıları beşik ya da kırma çatı biçiminde olup, kaplama malzemesi olarak alaturka ve Marsilya tipi kiremit kullanılmıştır.

Ovacık kırsalındaki geleneksel konutlar genellikle iki katlıdır. Benzer şekilde, komşu yerleşimlerde de iki katlı konutlar yaygındır. Ancak, Çerkeş ve Safranbolu ilçelerinde üç katlı geleneksel konut örneklerine de rastlanmaktadır. Ovacık'taki geleneksel konutlar çoğunlukla eğimli araziler üzerine kurulmuştur. Bu yerleşim biçimi, Safranbolu, Eskipazar ve Araç ilçelerindeki geleneksel konutlarda da sıkça görülmektedir.

Ovacık kırsalındaki konutlarda görülen plan şemaları dış sofa, köşe sofa, iç sofa ve orta sofadır. Bayramören ve Çerkeş konutları genellikle iç sofalı plan şemasına göre inşa edilmiştir. Safranbolu ve Eskipazar konutlarında ise iç veya orta sofalı plan şeması görülmektedir. Ovacık ve komşu yerleşimlerinde odalar, sofanın etrafına konumlanmıştır. Odalar bir ailenin ihtiyaçlarını karşılayacak şekilde donatılmıştır. Odalarda; yüklük, ocak, gusülhane ve sedir bulunmaktadır. Islak hacimler, sofanın en ucunda ve genellikle arka cephede yer almaktadır. Ovacık ve çevre yerleşimlerinde cephe düzeni birbirine benzemektedir. Geleneksel konutlar, süsleme özellikleri bakımından da oldukça sade yapılar olup, işlev ön plana çıkmıştır.

Yapım tekniği ve malzeme özellikleri komşu yerleşimlerle kıyaslandığında benzer ve farklılıklar bulunmaktadır. Ovacık konutlarının büyük bir çoğunluğunda zemin kat yığma, üst kat ise hımış sistemle inşa edilmiştir. Bayramören, Çerkeş ve Karabük kırsalındaki konutlarda benzer şekilde inşa edilmiştir. Ovacık kırsalında az sayıda konutta çantı tekniği görülmektedir. Safranbolu ve Araç kırsalında çantı tekniği daha yoğun kullanılmıştır. Ovacık ve komşu yerleşimlerindeki geleneksel konutların inşasında taş, ahşap ve kerpiç ortak kullanılan malzemelerdir. Hanköy tuğlası olarak bilinen tuğla türü Eskipazar, Ovacık ve Safranbolu evlerinde de görülmektedir. Ayrıca Eskipazar'da bulunan Hadrianapolis antik kentinden dolayı devşirme malzeme kullanımı Eskipazar kırsalında yaygındır.

Ovacık ve çevre yerleşimlerindeki konutların çatıları genellikle kırma çatı biçimindedir. Kırma çatı tipine ek olarak beşik ve üç omuz çatı tipi Ovacık ve Safranbolu kırsalında yaygındır. Yerleşimlerde özgün çatı örtü malzemesi alaturka kiremittir. Safranbolu kırsalında diğer yerleşimlerden farklı olarak pedavra adı verilen tahtalarla çatının örtüldüğü örnekler görülmektedir.

**Sonuç**

Ovacık ilçesine bağlı kırsal yerleşimlerdeki geleneksel konutlar, yerleşim biçimi, plan şemaları, yapı malzemeleri ve inşa teknikleri açısından, yakın çevredeki diğer kırsal

35 Karataş, 2019, 150.

yerleşimlerle önemli benzerlikler taşımaktadır. Bu benzerlikler, coğrafi konum, iklim koşulları ve yerel yapı kültürünün ortaklığıyla şekillenmiş olup, geleneksel Ovacık konutlarının bölgesel kırsal mimari içindeki yerine dair önemli ipuçları sunmaktadır.

Ovacık kırsalındaki konutlar genellikle iki katlı olup zemin katları ahır veya depolama amacıyla kullanılırken, yaşam mekânlarını oluşturan odalar birinci katta yer almaktadır. Birinci katlarda dış sofalı, iç sofalı ve orta sofalı plan şeması görülmektedir. Geleneksel konutlarda yapı malzemesi olarak Anadolu'nun çoğu bölgesinde kullanılan ahşap ve taş, Ovacık kırsalında da temel yapı malzemesi olmuştur. Ovacık kırsal konutlarının zemin katı genellikle yığma taş olarak inşa edilmiştir. Birinci katın inşasında ise hımış sistem kullanılmıştır. Hımış ve çantı sistemin bir arada kullanıldığı örneklerde görülmektedir.

Konutların giriş kapıları tek veya çift kanatlı ahşap kapılardan oluşmaktadır. Bazı giriş kapılarının üzerinde ışıklık görevi gören ahşap kafesler bulunmaktadır. Konutların özgün pencereleri giyotin veya ahşap kanatlı pencere türündedir. Bazı konutların giyotin pencerelerinde ahşap kapak uygulaması görülmektedir. Konutların çatılarında özgün örtü malzemesi olarak alaturka kiremit kullanılmıştır. Ancak bazı konutların çatılarında yapılan tadilatlarda, alaturka kiremitler kaldırılarak Marsilya tipi kiremit veya sac malzemeyle örtülmektedir.

Ovacık kırsal konutlarında da geleneksel Türk evinin en önemli unsuru olarak karşımıza çıkan bir özellik olarak her bir oda, bir ailenin yaşamını sürdürebileceği şekilde gerekli elemanlarla donatılmıştır. Odaların hemen hemen tamamında yüklük, ocak, gusülhane, dolap ve sedir bulunmaktadır. Bu elemanlara ek olarak gözgöre ve nişler de odalarda yer almaktadır. Odaların girişi, kapı açıldığında içerinin doğrudan görülmesini engelleyecek şekilde düzenlenmiştir.

Ovacık kırsalındaki geleneksel konutların çoğu terkedildiği için her geçen gün yok olma tehlikesiyle karşı karşıyadır. Kullanılan konutlarda ise bilinçsiz müdahaleler söz konusudur. Konutlarda yapılan tadilatlarda ahşap kapı ve pencereler kaldırılarak pvc ya da metal malzemeli kapı ve pencereler takılmaktadır. Yapı duvarları, çimento esaslı malzemeyle sıvanıp boyanmaktadır. Çatılar sac malzemeyle kaplanmaktadır. Odalarda yapılan onarımlarda ocak, yüklük, sedir gibi elemanlar kaldırılarak yeni mobilyalar kullanılmaktadır. Bu müdahaleler konutların özgünlüğüne zarar vermektedir. Ayrıca betonarme olarak inşa edilen yeni konutlar da geleneksel dokunun bozulmasına sebep olmaktadır.

Ovacık kırsalındaki geleneksel konutların birçoğu 19. yüzyıl sonu ile 20. yüzyıl ortaları arasında inşa edilmiştir. 1944 yılında yaşanan büyük depremin ardından konutlar zarar görmüş ve kapsamlı bir onarımdan geçirilmiştir. Deprem sonrası yapılan onarımlar yerel yapı ustaları tarafından gerçekleştirildiği için konutlar kırsal mimari özelliklerini kaybetmemiş ve özgünlüğünü korumuştur. Bölge halkından edinilen bilgilere göre, geleneksel yöntemlerle konut inşası 1980'li yılların başından itibaren sona ermiştir.

Sonuç olarak, Ovacık kırsalındaki geleneksel konutlar; plan tipolojileri, malzeme kullanımı, yapım teknikleri ve iç mekân donatılarıyla Anadolu kırsal

mimarisinin temel özelliklerini yansıtmaktadır. Aynı zamanda komşu yerleşimlerle olan benzerlik ve farklılıklarıyla, kırsal mimarinin kendine özgü özelliklerini ortaya koyması açısından önemli bir örnek niteliği taşımaktadır. Çalışma, Ovacık kırsalındaki geleneksel konutların bölgesel mimari içindeki konumunu belirlemeye ve yerel mimari karakterin tanımlanmasına katkı sağlamaktadır.

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# Art-Sanat

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## Osmanlı Taşrasında Bir Derebey Ailesinin İzleri: Eskipazar'da (Karabük), Hasan Çavuşzade Ailesi'nin Yaptırdığı Üç Konağın Mimari İncelemesi

Traces of a Derebey Family in the Ottoman Countryside: An Architectural Analysis of Three Mansions Built by Hasan Çavuşzade Family in Eskipazar (Karabük/Türkiye)

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**Öz**

19. yüzyılda, günümüzdeki Karabük il sınırlarının da büyük bir bölümünü kapsayan Viranşehir sancağı, ekonomik açıdan parlak bir dönem yaşamıştır. Bölgedeki ticaret ve üretim faaliyetleri sonucunda çeşitli kişi ve aileler varlık sahibi olmuştur. Aynı dönemde, iltizam sisteminin yaygınlaştırılmasıyla, Osmanlı merkezi otoritesi, yetkilerinin bir bölümünü sancaklara devretmiş, bu sayede bazı zengin kişi ve aileler siyasi ve askerî güç elde etmiştir. O dönem, bu kişilerden bazıları *"derebey"* olarak da anılmıştır.

Bu çalışma kapsamında, 19. yüzyılın başlarında, Osmanlı Devleti'nde, Viranşehir sancağı mütesellimi olarak görev yaparken, siyasi, askerî ve ekonomik açıdan güç kazanan ve sonunda Sultan II. Mahmud ile çatışma yaşayan, Derebey Hasan Çavuşzade Hüseyin Ağa ve ailesinin Viranşehir sancağında inşa veya tamir ettirdikleri yapılar araştırılmıştır. Araştırmada konak, han, hamam, camii, değirmen, çeşme, ahır, ambar, samanlık, fabrika ve askerî tahkimat gibi çeşitli işlevlere sahip, bir kısmı günümüze ulaşmış, toplam yirmi beş adet yapı tespit edilmiştir. Makale, bu yapılar içerisinden, Karabük'ün Eskipazar ilçesine bağlı iki kırsal yerleşimde, özgünlüğünü muhafaza etmiş üç konağa odaklanmaktadır. Arşiv ve kaynak taramaları, kişisel görüşmeler, soyağacı ve alan araştırmaları yapılmış, rölöve ve fotoğraflarla eserler belgelenmiştir. Hasan Çavuşzadeler siyasi ve askerî güçlerini kaybettikten sonra inşa ettirilen bu üç yapıda, ailenin kimliğine uygun olarak Batı ve İstanbul etkisiyle şekillenmiş şehirli bir tarzın kullanıldığı görülmektedir. Bölgede, öncelikli olarak, incelenen yapılara benzer, tarihî belge niteliği olan kültürel mirasın sürdürülebilirliği için bilimsel araştırmaların, bilinçlendirme faaliyetlerinin ve uygulanabilir projelerin geliştirilmesi önerilmektedir.

**Abstract**

Despite the decline of the Ottoman Empire during the 19th century, the Viranşehir Sanjak, which encompassed a large portion of the present-day Karabük province in Türkiye, experienced a period of economic prosperity. Because of trade and production activities in the region, various individuals and families accumulated wealth and power. During the same period, with the expansion of the iltizam system, the Ottoman central authority transferred some of its powers to the sanjaks, allowing some wealthy individuals and families to gain political and military power. At that time, some of these individuals were also called *"derebeys"* (feudal lords). Derebey Hasan Çavuşzade Hüseyin Ağa served as the mütesellim of the sanjak in the early 19th century, gained political, military and economic power, and ultimately came into conflict with Sultan Mahmud II.

This study investigates the structures built or restored by Hasan Çavuşzade Hüseyin Ağa and his family in the Viranşehir Sanjak. The research identified 25 structures with various functions -for instance, mansion, khan, Turkish bath, mosque, water mill, fountain, barn, granary, hayloft, factory, and fortification- some of which have survived to the present day. This study focuses on three mansions that have preserved their authenticity in two rural

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settlements in the Eskipazar district. Archival and literature reviews, genealogical research, personal interviews, and field studies were conducted, and the structures were documented and evaluated through measured drawings and photographs. We have determined that in these three structures commissioned by the Hasan Çavuşzades after losing their political and military power, they used an urban style shaped by Western and Istanbul influences in accordance with the family's identity. In the region, we recommend that scientific research, awareness-raising activities, and feasible projects be developed for the sustainability of cultural heritage with historical document value, similar to the structures being studied.

**Anahtar Kelimeler** Osmanlı-Türk Evi · İltizam Sistemi · Derebey · Eskipazar · Safranbolu

**Keywords** Ottoman-Turkish Houses · Iltizam System · Ottoman Derebey · Eskipazar · Safranbolu

**Yazar Notu** Bu makale, Karabük Üniversitesi, Lisansüstü Eğitim Enstitüsü, Mimarlık Ana Bilim Dalı'nda, Prof. Dr. Aysun Özköse danışmanlığında, Emre Karataş tarafından hazırlanan "Kültürel Rotaların Tasarımı İçin Entegre Bir Yöntem Önerisi: Safranbolu'dan Geçen Seyyah Güzergâhlarının Yeniden Canlanması" başlıklı doktora tezinden üretilmiştir. Etik kurul izni, Karabük Üniversitesi Sosyal ve Beşeri Bilimler Araştırmaları Etik Kurulunun 18.05.2023 tarih ve 2023/04-32 kararı ile alınmıştır.

**Author Note** This article is based on the doctoral thesis titled "An Integrated Methodology Proposal For The Design Of Cultural Routes: The Revitalization Of Historical Travelers' Itineraries Passing Through Safranbolu", written by Emre Karataş under the supervision of Prof. Dr. Aysun Özköse at the Department of Architecture, Institute of Graduate Education, Karabük University. Ethics committee approval was obtained from Karabük University (meeting no: 2023/04-32, date: 18.05.2023).

## Extended Summary

During the final years of the Ottoman Empire, the state expanded the Iltizam System in agriculturally productive lands to solve the cash shortage of the central treasury. This system was based on the principle of the government leasing the right to collect taxes on individuals for a specific time. In this manner, the state received cash payments from the lessee, referred to as the mültezim. On the other hand, mültezims appointed mütesellims to represent them. This system led to the emergence of many derebeys (feudal lords) who attempted to collect excessive taxes by exerting pressure on the people. Especially in the late 18th century and the first half of the 19th century, these derebeys played an important role in domestic politics with the weakening of central authority in the Ottoman Empire. Sultan Mahmud II, in order to reestablish central authority, struggled in politics and the military against threatening derebeys.

The Viranşehir Sanjak, which included Eskipazar and Safranbolu, covered a large part of today's Karabük province in Türkiye in the 19th century. Viranşehir Sanjak experienced its most prosperous period economically in the 18th and 19th centuries. The source of this wealth was trade and production activities. Because of these activities, various individuals and families became excessively rich and gained power in the region. With the central authority transferring its political and military powers to the provinces, some of these lords and families claimed to be *"derebeys"*. During that time, Ottoman derebeys and their families built various structures in the region.

By the order of Sultan Mahmud II, Viranşehir Mutesellim Derebey Hasan Çavuşzade Hüseyin Ağa and his son Musa Bey played significant roles in suppressing the Tahmisçioğlu rebellion in Kastamonu, which was part of the wave of uprisings that started in Anatolia under the influence of Ibrahim Pasha, the commander of the Egyptian army. It is alleged that Hasan Çavuşzade Hüseyin Ağa and his son Musa Bey, taking advantage of the trust they gained from this situation, exerted various forms of pressure on the people and built armories and fortifications against the Sultan. Complaints were made to Istanbul with these claims. In 1835, because of these complaints, Hüseyin Ağa and Musa Bey were dismissed from their positions and arrested by the Istanbul government. During that period, the Ottoman army destroyed some buildings belonging to the Hasan Çavuşzade family.

Field studies have revealed that family-owned structures or traces of structures from the 19th century are located in various areas of Viranşehir Sanjak. The regions where these structures are found include the Safranbolu city center, the valleys formed by the Eskipazar (Viranşehir) Stream, and the village of Tamışlar. The city of Safranbolu served as the administrative center of the Viranşehir district, and Hasan Çavuşzade Hüseyin Ağa commissioned the construction of a large mansion featuring a pool in its selamlık (men's reception hall). The valleys shaped by the Eskipazar Stream were used both as a military center along caravan routes and for agricultural production by Hasan Çavuşzade Hüseyin Ağa and his son, Musa Bey. In this region, which includes the Eskipazar district center (Viranşehir),

Kıranköy neighborhood, and Çakmakoğlu Valley, we determined that mansions, Turkish baths, khans, mosques, and military fortifications, as well as production facilities such as a lumber mill and a watermill, were either constructed or repaired. The village of Tamışlar, on the other hand, is a high-altitude forest settlement. In addition to serving as the family's summer residence, it was used for agricultural production. In Tamışlar, mansions, stables, and granaries commissioned by Hasan Çavuşzade Hüseyin Ağa's two sons, İsmail and Halil Bey, have been identified. Within this scope, 25 structures have been documented.

This study focuses on three mansions that have preserved their authenticity in two rural settlements in the Eskipazar district (Karabük). The Halim Bey Mansion in the Kıranköy neighborhood and the İsmail Bey and Halil Bey Mansions in the village of Tamışlar. Archival and source research, genealogical studies, personal interviews, and field surveys have been conducted. Additionally, the structures were documented through measured drawings and photographs, and their architectural features were analyzed.

The Halim Bey Mansion, located in the Kıranköy neighborhood, is estimated to have been built in the second half of the 19th century by Hasan Bey (born in 1855), the father of Halim Bey and the grandson of Musa Bey. The mansion has three floors: a basement, a lower floor, and an upper floor. The basement is made of rubble stone, while the lower and upper floors are constructed using a timber frame and a stone-filling construction system. The interior design solutions for the basement and lower floor, which serve as the living spaces for the servants, were designed using different elevations by the slope of the land. The upper floor, which is the main living space of the owners, is arranged on a single level and has a plan with an octagonal central sofa (hall). Most of the rooms reflect the traditional room layout of Ottoman-Turkish houses. The façade and interior design of the mansion are well-crafted and modest. Overall, the mansion maintains its structural integrity both externally and internally. However, due to a lack of maintenance, the building faces threats from water and moisture from the ground and roof.

The İsmail Bey Mansion is located in the village of Tamışlar. Ismail Bey, the son of Hasan Çavuşzade Hüseyin Ağa, had this structure built in 1871-1872 as a guesthouse and an annex. The mansion consists of three floors. The basement and lower floor walls are made of rubble stone, while the upper floor is constructed with a timber frame system and stone filling. The basement contains storage, the lower floor includes a taşlık (entrance) and servant section, while the upper floor houses the guest rooms and the main room. The upper floor is designed on a single level, while the other floors are designed at different elevations based on the slope of the land. The upper floor, built with careful craftsmanship and design, comprises an octagonal central sofa and the surrounding spaces. All rooms on this floor reflect the classical room layout of Ottoman-Turkish houses. The walls and wooden ceilings of the sofa and the two rooms on the upper floor feature unique decorative elements and embellishments. Structural cracks are present in the corner regions of the building's rubble stone walls. Additionally, there are losses in the bonding material, particularly in areas close to the ground.

The Halil Bey Mansion is located in Tamışlar village, near İsmail Bey Mansion. We estimate that this three-story mansion was built by Hasan Çavuşzade Hüseyin Ağa's another son, Halil Bey, in the late 19th century. The basement walls, along with the northern façade walls of the lower floor and specific interior partitions, were built using stone masonry, while the remaining walls of the lower floor and the entire upper floor were constructed with a timber-frame system. The structure was designed in accordance with the sloped topography, featuring an exposed southern façade at the basement level. The basement floor includes a stable, whereas the lower floor accommodates both service and storage areas, as well as living spaces such as rooms and a sofa. The upper floor, designed as the residential level for the mansion's owners, features an octagonal central sofa surrounded by various rooms, consistent with other examined examples. This floor includes rooms at each of its four corners, with iwans and other spaces situated in between. The spatial organization follows the traditional layout of Ottoman-Turkish houses. The mansion, which exhibits a simple architectural style both on its façade and interior design, does not have any major structural problems.

The three mansions under study, in terms of form, plan scheme, façade arrangement, ornamentation and details, exhibit significant similarities with the architectural style of wealthy families in Ottoman cities during the 19th century, influenced by Europe and Istanbul. The mansions, designed in accordance with the geographical and climatic characteristics of the region, reference the social, economic, and political power once held by the Hasan Çavuşzade Family. These structures enrich the local values in terms of their cultural and architectural aspects. Notably, the Hasan Çavuşzade Family reflected their identity in the details of these buildings (such as ornamentation, façade arrangement, plan scheme, and floor heights).

The family, seeking a safe place away from the chaos of the city, chose to settle in rural areas along riverbanks and on caravan routes, which geographically justified the use of the term "derebey" for Hüseyin Ağa and his son Musa Bey. Thanks to their choice of location, the family benefited from fertile lands and gained control over trade. There is also evidence indicating that they established and managed strategic structures, such as khans, for intelligence gathering. While the Hasan Çavuşzade Family held political power, they commissioned the construction of large-scale public buildings. However, after losing political power, the three mansions that were built had more modest dimensions and architectural styles.

Because of the architectural heritage preservation activities in Safranbolu that began in the 1970s, the city's architectural heritage gained prominence with its inclusion in the UNESCO World Heritage List in 1994. However, the measures taken to preserve the cultural heritage in the areas surrounding the city have proven insufficient, especially in rural regions. The lack of sufficient interest from property owners, residents, and authorities and the scarcity of resources have led to the destruction of the cultural heritage. In the region, we recommend promoting scientific research and awareness-raising activities focused on making such historical document-like cultural heritage sustainable and increasing the feasibility of related projects through public participation.

## Giriş

Osmanlı Devleti'nin son dönemlerinde, coğrafi keşiflerle değişen ticaret yolları, uzun süren savaşlar, kapitülasyonlar, yönetim sorunları ve toprak sisteminin bozulması gibi çeşitli sebeplerden dolayı devlet, ekonomik sorunlarla karşı karşıya kalmıştır. Merkezî hazinenin nakit bulma sorununu çözmek amacıyla, tarımsal açıdan verimli devlet topraklarında iltizam sistemi yaygınlaştırılmıştır. Bu sistem, *devletin belirli bir süre için vergi toplama hakkını kiraya vermesi* prensibine dayanmaktaydı. Bu şekilde, devlet, *mültezim* olarak adlandırılan kiracıdan nakit para almıştır. Diğer taraftan, mültezimler kendilerini temsil etmek için *mütesellim* adı verilen vekiller atamışlardır. Bu sistem, halk üzerinde baskı uygulayarak ağır vergiler toplamaya çalışan derebeylerin[1] ortaya çıkmasına yol açmıştır[2]. Özellikle 18. yüzyılın ikinci yarısı ve 19. yüzyılın ilk yarısında, bu derebeyler, Osmanlı Devleti'ndeki merkezî otoritenin zayıflamasıyla birlikte, iç siyasette önemli rol oynamışlardır. Sultan II. Mahmud, devlet yönetiminde merkezî otoriteyi yeniden tesis etmek için, tehdit oluşturan derebeyler ile siyasi ve askerî olarak mücadele etmiştir. II. Mahmud döneminde, bu mücadeleye karşı çıkan birçok derebeyi tutuklanmış, idam edilmiş, kaleleri ve konakları yıkılmış ve mallarına el konulmuştur[3].

İçerisinde Eskipazar'ın da yer aldığı Viranşehir sancağı, 19. yüzyılda bugünkü Karabük ve Bartın illerinin büyük bölümünü, Zonguldak, Bolu ve Çankırı illerinin ise bir kısmını kapsamaktaydı. Sancağın merkez kazası Safranbolu şehriydi[4]. Viranşehir sancağı ve Safranbolu'da ekonominin en parlak olduğu dönem 18. ve 19. yüzyıllardır. Bu zenginleşmenin kaynağı ticaret ile kereste, deri ve tarım ürünlerinin üretim faaliyetleridir. Bu dönem aynı zamanda Osmanlı Devleti'nde, iltizam sisteminin genişletilerek taşradaki etkili kişi ve ailelere siyasi ve askerî güç vermek zorunda kaldığı bir döneme denk gelmektedir. Bu sebeple bölgedeki bazı kişiler ve çeşitli aileler aşırı zenginleşmiş ve güç kazanmıştır[5]. Bu beylerden bir kısmı *"derebeylik"* iddiasında bulunmuştur[6].

Bölgede bu tür kişiler ve aileler tarafından çeşitli yapılar inşa ettirilmiştir. 1836 yılında, Hamamlı (Eskipazar), Konak (Afşar/Eflani), Esencik (Eflani) ve Dursanlı (Nebioğlu/Safranbolu) köylerinden geçen Seyyah Ainsworth, bu köylerde âyanların ve derebeylerin konaklarının bulunduğundan bahsetmektedir[7]. Safranbolu'da bulunan Kazdağlıoğlu Camii ve Hamamlı köyünde (Eskipazar) bulunan hamamlar, zindan ve kiler yapıları bu tür yapıların günümüze ulaşan bazı örnekleridir[8] (Görsel 1). Bir zamanlar taşrada oldukça etkili olan bu ailelerin yaşadıkları dönem ve yapıları hakkında yeterli düzeyde araştırma bulunmamaktadır.

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[1] "Derebey" sıfatı Osmanlı Devleti'nde resmî bir ünvan olmayıp 17. yüzyıl sonlarından itibaren, o dönemde devletin yetki ve toprak verdiği kişiler veya onların vekilleri için yaygın olarak kullanılan bir ifadedir. Bu kişiler ve aileleri daha sonra devlet gücüne karşı gelen güç odakları hâlini almıştır. "Derebey" tabiri genellikle halkın gözünde despot bir imaja sahip beyler için kullanılmıştır. Dolayısıyla bu tanımlama makaleye konu olan ailenin ve aile bireylerinin halkın gözündeki yerini göstermek açısından önem arz etmektedir. "Derebey" Türkçe literatürde kısıtlı kullanılmasına rağmen İngilizce literatürde "Ottoman derebey" ifadesi daha sık görülmektedir. Bu çalışmanın "kendi döneminde derebey olarak bilinen" bireylere sahip bir aileyi ve yapılarını ele alması bakımından, literatürde özgün bir yere sahip olacağı düşünülmektedir. "Derebey" ifadesi, Hasan Çavuşzade Hüseyin Ağa ve Musa Bey için günümüzde halk arasında kullanılmaktadır. Bunun yanı sıra bu ifadenin bu kişiler için kendi dönemlerinde de kullanıldığı, bu çalışmada kullanılan arşiv belgelerinden ve dönemin kaynaklarından anlaşılmaktadır. Bk. Ülkü Oğuzhan Börekçi, Gülcan Işık ve Filiz Erdemir Göze, "Ağalık Düzeninin Kültürel Ürünlerde Eleştirisi," *Gazi Türkiyat* 30 (Haziran 2022), 13-26, 10.34189/gtd.30.002; Robert W. Zens, "The Ayanlik and Pasvanoğlu Osman Paşa of Vidin in the age of Ottoman Social Change, 1791-1815" (Doktora tezi, Wisconsin-Madison Üniversitesi, 2004), 46.

[2] Eftal Batmaz, "İltizam Sisteminin XVIII. Yüzyıldaki Boyutları," *Tarih Araştırmaları Dergisi* 18/29 (1996), 39-44.

[3] Özcan Mert, "Âyan," *TDV İslam Ansiklopedisi*, c. 4 (Ankara: Türkiye Diyanet Vakfı Yayınları, 1991), 195, erişim 12 Mart 2023, https://islamansiklopedisi.org.tr/ayan.

[4] Hüseyin Lütfi Ersoy, *Karabük'ün Köyden Kente Dönüş Öyküsü Karabük Tarihi* (İstanbul: Kurtiş Matbaacılık, 2011), 106-107.

[5] Abdülkadir Atar, "Osmanlı Döneminde Safranbolu'nun İktisat Tarihi," *İktisadi ve İdari Bilimlerde Teori ve Araştırmalar II,* ed. Mustafa Mete (Ankara: Gece Kitaplığı, 2020), 462-484.

[6] Hulusi Yazıcıoğlu, *Küçük Osmanlı'nın Öyküsü Safranbolu Tarihi* (İstanbul: Şa-To Türkiyat, 2001), 246-252.

[7] William Francis Ainsworth, *Travels and Researches in Asia Minor, Mesopotamia, Chaldea and Armenia* (Londra: John W. Parker, 1842), 39, 61, 71.

[8] Ünsal Tunçözgür, *Dünü ve Bugünü ile Safranbolu* (Safranbolu: Işıl Yayıncılık, 2002), 50; "Hamamlı Köyü Tarihi Hamamları," T.C. Eskipazar Kaymakamlığı, erişim 29 Mayıs 2023, http://eskipazar.gov.tr/hamamli-koyu-tarihi-hamamlari.



Kaynak: E. Karataş, 2023.

**Görsel 1:** *Kazdağlıoğlu Camii (solda) ve Hamamlı hamamları (ortada ve sağda).*

Derebey Hasan Çavuşzade Hüseyin Ağa'nın mensubu olduğu aşiretin, Viranşehir sancağına Kemah'tan (Erzincan) geldiği belirtilmektedir[9]. Bir aşirete mensubiyeti sebebiyle, ailenin Osmanlı Devleti'nde resmî pozisyonunu almadan önce de varlıklı ve yaşadığı bölgede etkili olması muhtemeldir. Ancak, Hasan Çavuşzade Ailesi'nin zenginliğinin kaynağı veya Viranşehir sancağındaki mülklerini başlangıçta nasıl edindiği konusunda kesin bir bilgi bulunmamaktadır.

Hasan Çavuşzade Ailesi hakkında geniş bilgi veren kaynaklardan birisi İtalyan Prenses Cristina Trivulzio Belgiojoso'nun yazılarıdır[10]. Daha önce Hasan Çavuşzade Ailesi hakkında yapılan az sayıdaki araştırmada[11] pek dikkate alınmayan bu kaynaklar bu makale kapsamında incelenmiştir.

1848'deki İtalyan ayaklanmaları sırasında Prenses Belgiojoso'nun Avusturya yönetimine karşı çıkması, Avusturya Hükümeti'ni rahatsız etmiştir. Prenses, hükümetin baskısından rahatsız olarak 1850'de Osmanlı Devleti'ne sığınmıştır. Prenses aynı sene, kızı ve maiyetiyle birlikte, Hasan Çavuşzadeler'den devraldığı, Viranşehir sancağında bulunan bir çiftliğe yerleşmiştir[12]. Prenses, çiftliği satın aldığı kişilerin babalarını şu şekilde anlatmaktadır:

> "(...) Artık iki-üç vilayet arasında bölünmüş olan Viranşehir'in iyi surları vardı. Burası güçlü bir paşanın gözdesi idi. Bolu, Ankara, Çerkeş, Heraklee (Ereğli) gibi şehirler bu paşanın idaresindeydi. Ancak bu büyük şehirlerin hükümdarı, dinlenmek için Viranşehir'i çevreleyen yemyeşil vadiyi, güzel bahçeleri sulayan nehir kıyısını bu şehirlere tercih etti. Bu paşanın adı Osman idi. Ne yazık ki Viranşehir kısa ömürlü refahını bu tercihe borçluydu."[13]

Prenses'e göre Osman Paşa'nın (Hasan Çavuşzade Hüseyin) oğlu Musa, babasının idaresi altındaki topraklarda vergi toplayarak ve asker yetiştirerek babasına ve Osmanlı Padişahı II. Mahmud'a karşı isyan etmiş ve İstanbul'dan gönderilen askerlerle savaşmıştır[13]. Prenses Belgiojoso bu savaştan da bahsetmektedir:

[9] Yazıcıoğlu, *Küçük Osmanlı'nın Öyküsü Safranbolu Tarihi,* 111, 249; Hamdi Özkök ile kişisel görüşme, Karabük, 12 Haziran 2023.

[10] Prenses Belgiojoso, seyahatnamesinin başlangıcında aileden bahsetmiş ve *"Scenes de la vie Turque"* isimli kitabında Hasan Çavuşzade Hüseyin Ağa'nın oğlu İsmail Bey hakkında *"Les Deux Femmes D'Ismail-Bey"* (İsmail Bey'in İki Karısı) başlıklı bir yazı kaleme almıştır. Princesse Belgiojoso, *Asie Mineure et Syrie Souvenirs de Voyages* (Paris: Michel Levy Freres, 1858), 1-13; Princesse Belgiojoso, *Scenes de la vie Turque* (Paris: Michel Levy Freres, 1858), 277-377.

[11] Bilgi için bk. İsmail Hakkı Uzunçarşılıoğlu, "Kastamonu'da Tahmiscioğlu Vak'ası," *Tarih Semineri Dergisi* 1/2 (1937), 138-152; Yazıcıoğlu, *Küçük Osmanlı'nın Öyküsü Safranbolu Tarihi*, 246-252.

[12] Cumhurbaşkanlığı Devlet Arşivleri Başkanlığı Osmanlı Arşivi (BOA), Hariciye Nezareti Mektubi Kalemi (HR. MKT.) 38/9, 19 Cemazeyilahir 1267 [21 Nisan 1851].

[13] Birçok kaynakta Musa Bey'in babasının adı Hasan Çavuşzade Hüseyin olarak geçse de prenses, Musa Bey'in babasının adının Osman olduğunu belirtmiştir. Bu isim, Osmanlı arşivinde bulunan ve prensese satılan Çakmakoğlu Çiftliği ile ilgili bir belgede de *"Ceyavuzoğlu Osman"* olarak yer almaktadır. Cumhurbaşkanlığı Devlet Arşivleri Başkanlığı Osmanlı Arşivi (BOA), Sadaret Divan Kalemi Evrakı (A. DVN.) 103/39, 29 Recep 1271 [17 Nisan 1855]. Princesse Belgiojoso, Asie Mineure et Syrie Souvenirs de Voyages, 7-8.

> "(...) Genç bey kararlılıkla Mahmud'a karşı uzun ve korkunç bir savaşa girişti. Musa'nın askerleri kendi yurtlarında savaştıkları için iyi savaştı. Küçük Asya'nın bu taşralıları, kendilerini yabancı bir orduya karşı ulusal bağımsızlık davasını savunuyormuş gibi gördüler. Zaten bu Konstantinopolis Türkleri Avrupai üniformaları ve silahlarıyla onlar için yabancı değil miydi!"[14]

Aynı kaynağa göre daha sonra topçu birliklerinin kuşatması sebebiyle Musa Bey teslim olmak zorunda kalmıştır. Sonunda İstanbul'da hapsedilmiş ve idam edilmiştir[14].

Mısır ordusu komutanı İbrahim Paşa'nın etkisiyle Anadolu'da başlayan isyan dalgasının bir parçası olan Kastamonu'daki Tahmisçioğlu isyanının Sultan II. Mahmud'un emriyle bastırılmasında, Viranşehir Müteselimi Hasan Çavuşzade Hüseyin Ağa ile onun oğlu ve vekili Musa Bey önemli bir rol üstlenmişlerdir[15]. Bu durumdan kazandıkları güveni kullanarak halka çeşitli şekillerde baskı uyguladıkları ve sultanın aleyhine cephaneler ve istihkâmlar yaptıkları gerekçesiyle İstanbul'a şikâyet edilmişlerdir[16]. 1835 yılında, bu şikâyetler sebebiyle Hüseyin Ağa ve Musa Bey görevden alınmış ve tutuklanmıştır[17]. O dönemde Hasan Çavuşzade Ailesi'ne ait birçok binanın Osmanlı ordusu tarafından tahrip edildiği anlaşılmaktadır[18].

Viranşehir sancağının çeşitli bölgelerinde Hasan Çavuşzade Hüseyin Ağa ve oğullarına ait çok sayıda yapının ve geniş arazilerin bulunduğu tespit edilmiştir. Bu yapıların birçoğu günümüze ulaşmamıştır. Günümüze ulaşan kalıntıların ve yapıların boyutları, işlevi, mimarisi, süslemeleri ve detayları, o dönemde Anadolu'daki aristokrasinin kültürel arka planı ve yaşam tarzı hakkında bilgiler vermektedir.

Çalışma kapsamında arşiv, kaynak ve soyağacı araştırmaları, kişisel görüşmeler ve alan çalışmaları, rölöve ve fotoğraflarla Hasan Çavuşzade Ailesi ve 19. yüzyılda yaptırdıkları mimari eserler hakkında detaylı olarak bilgi toplanmıştır. Makale, bu mimari eserler arasından, özgünlüğünü koruyan, Karabük ilinin Eskipazar ilçesine bağlı iki kırsal yerleşimdeki üç yapı olan Kıranköy mahallesindeki Halim Bey, Tamışlar köyündeki İsmail Bey ve Halil Bey konaklarına odaklanarak yapıların mimari özelliklerini incelemektedir.

## 1. Hasan Çavuşzade Ailesi'nin İzleri ve Mimari Eserleri

19. yüzyılda Hasan Çavuşzadeler tarafından yaptırıldığı ya da tamir ettirildiği tespit edilen yapıların bulunduğu bölgeler: Safranbolu şehir merkezi, Eskipazar Çayı'nın oluşturduğu vadiler ve Tamışlar köyüdür. Safranbolu şehri, Viranşehir sancağının idari merkezi olarak kullanılmış ve Hasan Çavuşzade Hüseyin Ağa burada havuzlu, büyük bir konak inşa ettirmiştir[19]. Eskipazar Çayı'nın oluşturduğu vadiler hem kervan yolları üzerinde yer alan askerî bir merkez olarak hem de tarımsal üretim için Hasan Çavuşzade Hüseyin Ağa ve oğulları tarafından kullanılmıştır. Bu bölgede yer alan Eskipazar ilçe merkezi, Kıranköy Mahallesi ve Çakmakoğlu Vadisi'nde konaklar, hamamlar, hanlar, camiler ve askerî tahkimatların yanı sıra kereste fabrikası ve değirmen gibi üretim yapılarının da inşa ya da tamir ettirildiği anlaşılmıştır. Tamışlar köyü, diğer yerleşimlerden daha yüksek rakımda yer alan bir orman köyüdür. Burası, ailenin yazlık yerleşimi olmasının yanı sıra tarımsal üretim için de kullanılmıştır. Burada konaklar, ahırlar ve bir ambar bulunmaktadır.

[14] Princesse Belgiojoso, *Asie Mineure et Syrie Souvenirs de Voyages,* 7-8.

[15] Tahmisçioğlu isyanı, Mısır valisi Kavalalı Mehmet Ali Paşa'nın oğlu İbrahim Paşa'nın Anadolu'yu işgali sırasında, onun kışkırtmasıyla başlayan iç isyanlardan biridir. Bu isyan, Tahmiscioğlu Hacı Mustafa ve Hacı Ahmed tarafından çıkartılmış, Kastamonu ve çevresinde etkili olmuştur. Sultan II. Mahmud'un emriyle, Viranşehir Müteselimi Hasan Çavuşzade Hüseyin Ağa'nın oğlu Musa Bey'in emrindeki askerler tarafından 1833 yılında bastırılmıştır. Uzunçarşılıoğlu, "Kastamonu'da Tahmiscioğlu Vak'ası," 149-150.

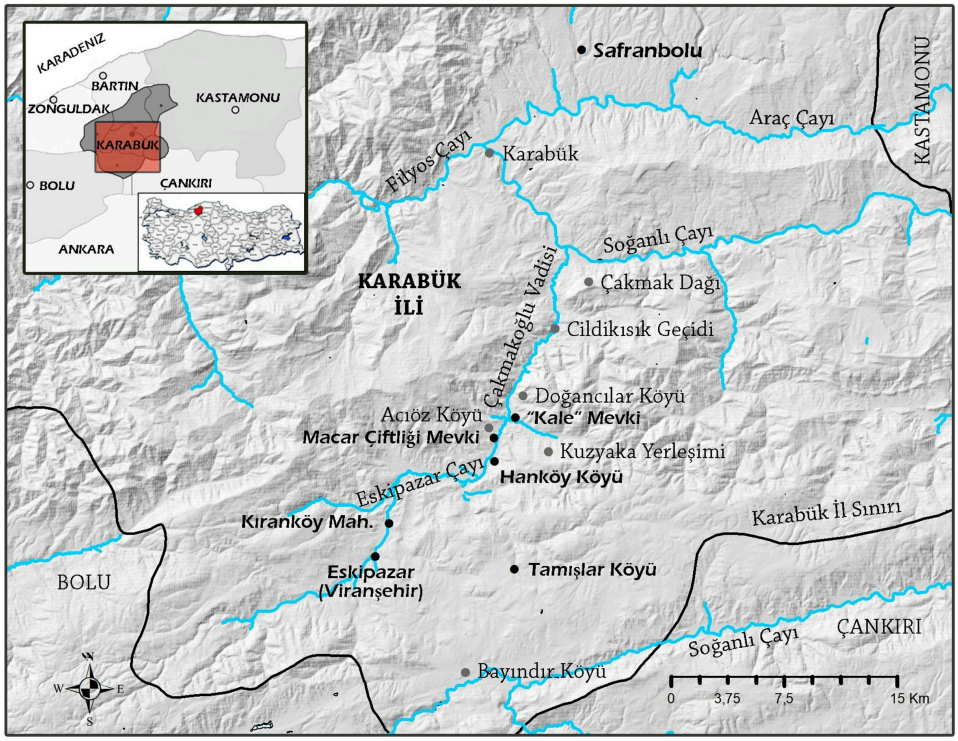
[16] Cumhurbaşkanlığı Devlet Arşivleri Başkanlığı Osmanlı Arşivi (BOA), Hatt-ı Hümayun (HAT.) 698/33702, 29 Zilhicce 1249 [9 Mayıs 1834]; Cumhurbaşkanlığı Devlet Arşivleri Başkanlığı Osmanlı Arşivi (BOA), Hatt-ı Hümayun (HAT.) 1324/51669-3, 29 Zilhicce 1250 [28 Nisan 1835].

[17] Cumhurbaşkanlığı Devlet Arşivleri Başkanlığı Osmanlı Arşivi (BOA), Hatt-ı Hümayun (HAT.) 1324/51669-4, 29 Zilhicce 1250 [28 Nisan 1835].

[18] Andreas David Mordtmann, *Anatolien: Skizzen und Reisebriefe aus Kleinasien (1850-1859)* (Hannover: Orienbuchhandlung Heinz Lafaire, 1925), 246, 259; Princesse Belgiojoso, *Asie Mineure et Syrie Souvenirs de Voyages,* 1-13.

[19] Aytekin Kuş, *Safranbolu Evleri ve Yaşam Biçimi* (Karabük: Safranbolu Hizmet Birliği ve Kültür Yayınları, 2010), 19-26.

Araştırmalarda, Hasan Çavuşzadeler tarafından yaptırılan ya da tamir ettirilen yirmi beş adet yapı tespit edilmiş olup Görsel 2'de bu yapıların konumları, işlevleri ve mevcut durumları gösterilmiştir.




| Konumu | Yapı adı/işlevi | Durumu | Y/X |
|---|---|---|---|
| 1 Safranbolu İlçe Merkezi | Havuzlu Asmazlar Konağı | Özgün | 41,249 32,693 |
| | Ahır ve samanlık | Yok olmuş | 41,249 32,693 |
| 2 Kıranköy Mah. (Eskipazar) | Musa Bey Konağı (hamamlı) | Konak yıkılmış, hamam özgün | 40,965 32,540 |
| | Musa Bey Hamamı (Doruk mevki) | Özgün | 40,967 32,543 |
| | Tahkimat | İzi var | 40,965 32,541 |
| | Halim Bey Konağı* | Özgün | 40,965 32,542 |
| | Halim Bey Müştemilatı | Özgün | 40,965 32,542 |
| | Hüseyin Bey Konağı (hamamlı) | Konak bozulmuş, hamamın izi var | 40,965 32,542 |
| | Kıranköy Cami | Özgün | 40,965 32,542 |
| 3 Eskipazar İlçe Merkezi | Hasan Çavuşzade Hanı | Yok olmuş | 40,945 32,531 |
| | Hasan Çavuşzade Konağı | Yok olmuş | 40,944 32,530 |
| | Çeşme | Yok olmuş | ? |
| ? | Kereste fabrikası | Yok olmuş | ? |

| Konumu | Yapı adı/işlevi | Durumu | Y/X |
|---|---|---|---|
| 4 Tamışlar Köyü (Eskipazar) | İsmail Bey Ağa Konağı | Bozulmuş | 40,937 32,640 |
| | İsmail Bey Konağı* | Özgün | 40,937 32,640 |
| | Halil Bey Konağı* | Özgün | 40,937 32,640 |
| | Ambar | Bozulmuş | 40,937 32,641 |
| | Ahırlar | Bozulmuş | 40,937 32,641 |
| | Cami ? | Özgün | 40,954 32,641 |
| 5 Çakmakoğlu Vadisi Acıöz, Doğancılar, Hanköy | Konak | İzi var | 41,016 32,625 |
| | Değirmen | Bozulmuş | 41,014 32,625 |
| | Tahkimat | İzi var | 41,028 32,641 |
| | Ambarlar ? | Yok olmuş | 41,028 32,639 |
| | Han | Yok olmuş | ? |
| | Cami | Yok olmuş | ? |

* Çalışma kapsamında detaylı olarak incelenen eserler.

Kaynak: E. Karataş, 2023 (Harita ArcGIS ArcMap 10.8'de hazırlanmıştır).

**Görsel 2:** *Hasan Çavuşzadeler tarafından yaptırılan veya onarılan yapılar ve konumları.*

## 1.1. Safranbolu'daki Yapılar

Hasan Çavuşzade Hüseyin Ağa, mütesellim olarak sancağın mali ve askerî işlerinin yanı sıra idari işlerden

de sorumluydu. Bu sebeple o dönem, sancağın idari merkezi olan Safranbolu şehrinde görevliydi[20].

Safranbolu tarihî şehir merkezinde (Çukur) bulunan Havuzlu Asmazlar Konağı'nın 1830 yılında, eskiden yakınında bulunan ahır ve samanlık yapılarının ise 1830-1835 yılları arasında, Hasan Çavuşzade Hüseyin Ağa tarafından yaptırıldığı belirtilmektedir[21]. Samanlık ve ahır günümüze ulaşmamıştır. Konak ise Hasan Çavuşzade Ailesi'nin gücünü kaybetmesiyle birlikte Asmazlar Ailesi'nin mülkiyetine geçmiştir. Bu konakla birlikte, konağın da içerisinde bulunduğu "Beybağı" olarak bilinen geniş bir araziye de Asmazlar Ailesi sahip olmuştur. "Beybağı" ifadesi halk arasında, bu mevkinin Hasan Çavuşzade Hüseyin Ağa'nın mülkü olmasına atfen kullanılmıştır[22].

Beybağı'nın Safranbolu'da "Paşa Suyu" olarak bilinen tarihî su kaynağının, camilere, çeşmelere ve hamamlara dağıtıldığı taksim yerinin hemen yakınında bulunması dikkat çekmektedir. Seçilen konumun Hasan Çavuşzade Ailesi'nin diğer yerleşim tercihleri gibi bilinçli ve stratejik olduğu anlaşılmaktadır. Buna karşılık Safranbolu halkı arasında yaygın olarak bilinen bir deyiş, Beybağı'nın ve Havuzlu Asmazlar Konağı'nın halk arasında nasıl bir imaja sahip olduğunu ve dönemin "beylik" algısını gözler önüne sermektedir: "Beybağı'ndan aşma, Asmazlar'a yanaşma, akşamdan kalan aş ile, canını çıkartırlar iş ile."[23]

Osmanlı sivil mimarisinin en önemli örneklerinden birisi olan Havuzlu Asmazlar Konağı, orta sofalı plan şemasında, bodrum, alt ve üst kat olmak üzere 3 katlı olarak inşa edilmiştir. Konakta odalar, havuz başı selamlık köşkü, geniş sofalar ve eyvanlar yer almaktadır. Yapının güneydoğu ve güneybatı bölümü, II. Mahmud dönemi kışla yapılarında sıkça rastlanan köşe kulelerini anımsatacak bir şekilde, cephe hizasından dışarı taşırılarak tasarlanmıştır. Bina, 1976 yılında bir kurum tarafından Asmazlar Ailesi'nden satın alınmış ve daha sonra restorasyonu yapılmıştır[24]. Günümüzde butik otel olarak kullanılmaktadır (Görsel 3).



Kaynak: E. Karataş, 2023.

**Görsel 3:** *Havuzlu Asmazlar Konağı'nın güneydoğu perspektifi (solda) ve havuzlu selamlık köşkü (sağda).*

## 1.2. Kıranköy Mahallesindeki Yapılar

Kıranköy, Eskipazar Çayı'nın hemen kenarında yer almaktadır ve günümüzde Karabük ilinin Eskipazar ilçesine bağlı kırsal bir mahalledir. Kıranköy'de bulunan caminin kitabesinde bu yapının tamiratının Hasan Çavuşzade Hüseyin Ağa tarafından yaptırıldığı yazmaktadır. Yapılan incelemelerde cami haricinde Hasan Çavuşzade Hüseyin Ağa veya torunu Hüseyin Bey (Musa Bey'in oğlu) tarafından yaptırıldığı düşünülen bir adet hamamlı konak, Hasan Çavuşzade Hüseyin Ağa'nın oğlu Musa Bey tarafından yaptırıldığı düşünülen bir

[20] Yazıcıoğlu, *Küçük Osmanlı'nın Öyküsü Safranbolu Tarihi*, 221-225.

[21] Kuş, *Safranbolu Evleri ve Yaşam Biçimi*, 19-26; Hakkı Asmaz ile kişisel görüşme, Safranbolu, 6 Haziran 2023.

[22] Hakkı Asmaz ile kişisel görüşme, Safranbolu, 6 Haziran 2023; Ünsal Tunçözgür ile kişisel görüşme, Safranbolu, 7 Haziran 2023.

[23] Hakkı Asmaz ile kişisel görüşme, Safranbolu, 6 Haziran 2023.

[24] Detaylı inceleme için bk. Ş. Sena Kaya, "1994 Yılı Dünya Miras Kararı Öncesi ve Sonrasında Safranbolu Yerleşmesi, Kentsel ve Mimari Dönüşümü" (Yüksek Lisans Tezi, Yıldız Teknik Üniversitesi, 2019), 77-84.

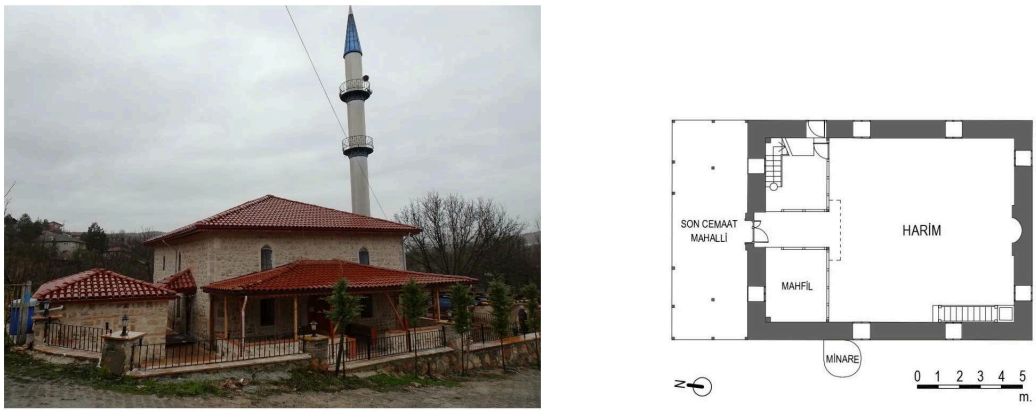
adet hamamlı konak, bir adet hamam, duvar (tahkimat) izleri ve Musa Bey'in torununun oğlu Halim Bey'in adıyla anılan bir adet konak ve müştemilat bulunduğu anlaşılmıştır[25] (Görsel 4).




Kaynak: E. Karataş, 2023.

**Görsel 4:** *Kıranköy'e kuzeyden bakış ve Hasan Çavuşza Ailesi'nin yapıları.*

Kıranköy Camii'nin kitabesinden yapının 1783-1784 (Hicri 1198) yılında Mehmet Hayri Efendi tarafından yaptırıldığı ve Viranşehir Mütesellimi Hasan Çavuşzade Hüseyin Ağa tarafından 1813-1814 (Hicri 1229) yılında tamir ettirildiği anlaşılmaktadır. Taş yığma sistemle yapılmış caminin son dönemde gördüğü bir tadilatta dış cephedeki muhdes sıvalar temizlenmiş, çatısı yenilenmiş, yakınına şadırvan yapılmış, metal malzemeden yapılmış bir minare ve son cemaat mahallinin üzerini kapatan bir sundurma eklenmiştir (Görsel 5). İç duvarlardaki özgün kalem işi süslemelerin boya ile kapatıldığı tespit edilmiştir.




a) b)

Kaynak: A. Özköse, 2023.

**Görsel 5:** *Hasan Çavuşzade Hüseyin Ağa tarafından tamir ettirilen Kıranköy Camii.*
*a) Kuzey perspektifi.*
*b) Rölöve çizimi.*

Hasan Çavuşzade Hüseyin Ağa veya torunu Hüseyin Bey'in yaptırdığı tahmin edilen konak ise yerleşimin kuzeybatısında, Kıranköy Camii'ne yakın bir konumda bulunmaktadır. Konağın ilk yapıldığında 3 katlı olduğu ve 1944 yılında gerçekleşen Gerede-Çerkeş depreminde üst katının hasar aldığı için yıkıldığı belirtilmiştir[26].

[25] İhsan Özkök, Dursun Eken, Mithat Uyanık ve Hüseyin Eken, Kıranköy'de Hasan Çavuşzadeler'e ait olarak bilinen yapıların mirasçılarıdır. Kendilerinin Musa Bey'in torunları olduğunu belirtmektedirler. Soyağacı araştırmasında Musa Bey'in adına rastlanamamıştır. Bunun sebebinin kayıtların 1830'lu yıllara kadar ulaşmamasından kaynaklandığı düşünülmektedir. İhsan Özkök ile kişisel görüşme, Eskipazar, 31 Mayıs 2023; Dursun Eken ile kişisel görüşme, Eskipazar, 30 Mayıs 2023; Mithat Uyanık ile kişisel görüşme, Eskipazar, 31 Mayıs 2023; Hüseyin Eken ile kişisel görüşme, Karabük, 30 Mayıs 2023.

[26] İhsan Özkök ile kişisel görüşme, Eskipazar, 31 Mayıs 2023.

Hatalı uygulamalar sebebiyle, Hüseyin Bey Konağı'nın iç mekânı ve cepheleri büyük oranda özgünlüğünü yitirmiştir. Yapının ahır bölümünün yer aldığı bodrum kat yığma taş; üst kat ise ahşap iskelet arası taş ve kerpiç dolgu (yeğdane/hımış) yapım tekniği ile inşa edilmiştir. Ayrıca yapının güney cephesine bitişik olarak bulunan taş yığma sistemle yapılmış küçük ölçekli bir yapı izi bulunmaktadır. Diğer örnekler incelendiğinde bu yapının da bir hamam kalıntısı olduğu tahmin edilmektedir (Görsel 6).



Kaynak: E. Karataş, 2023.

**Görsel 6:** *Hüseyin Bey Konağı'nın güney cephesi (solda) ve doğu cephesi (sağda).*

Camii'nin batısında, tapu kayıtlarında *"Taş Kapı"* olarak geçen mevkiide hamamlı bir konak izi ve kalın çevre duvarı izleri bulunmaktadır[27]. Buradaki yapıların Hasan Çavuşzade Hüseyin Ağa'nın oğlu Musa Bey'e ait olduğu, buranın aynı zamanda askerî bir merkez olarak kullanıldığı belirtilmektedir[28]. Osmanlı Arşivinde bulunan 1835 tarihli bir belgeye göre Kastamonu Mütesellimi, Musa Bey'i konağının etrafına yaptırdığı büyük duvarlar, mazgallar (atış delikleri), kapının üzerindeki kule, mahzendeki silahlar ve diğer tahkimatlar sebebiyle İstanbul'a şikâyet etmiştir[29]. Arşiv belgesinde konum tam olarak verilmemiş olsa da bu yerin "Taş Kapı" olarak anılması ve askerî merkez olarak bilinmesi sebebiyle, belgedeki şikâyetlere konu olan konağın burası olabileceği düşünülmektedir.

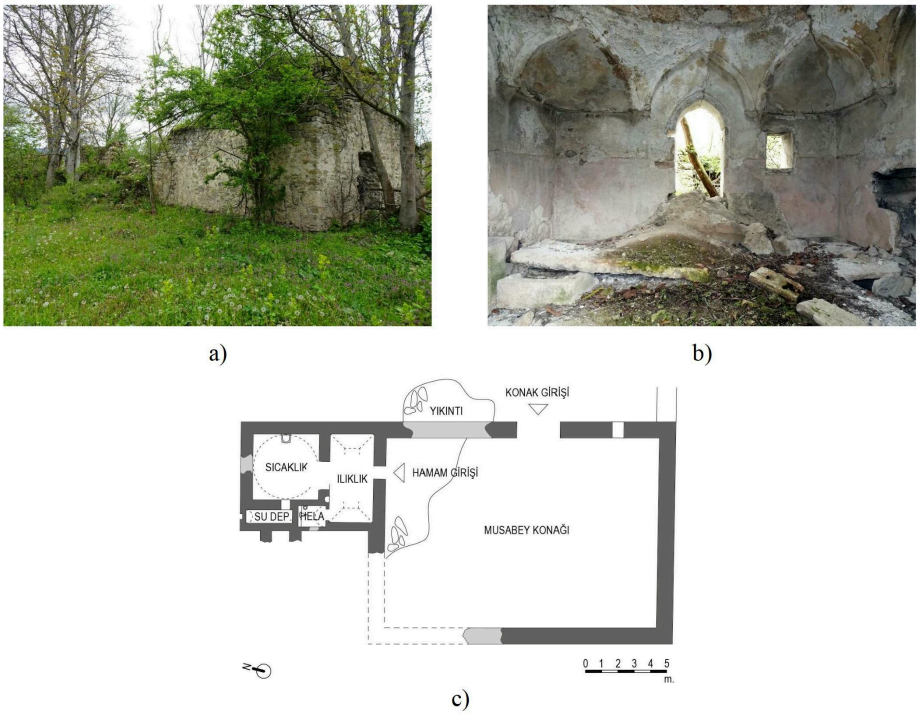
Musa Bey'in adıyla anılan bu konağın da 1944 yılında gerçekleşen Gerede-Çerkeş depreminde yıkıldığı belirtilmektedir[30]. Günümüze konağın sadece yığma taş yapım sistemi ile yapılmış alt kat duvarlarından bir kısmı ulaşmıştır. Yıkıntılardan büyük boyutlara sahip olduğu anlaşılan bu konakla birlikte bir özel hamam yapısı da inşa edilmiştir. Hamamın sıcaklık mekânı büyük ölçüde korunmuş, ılıklık mekânının ise üst örtüsü yıkılmıştır. Yıkılan üst örtünün özgün hâlinde aynalı tonoz olduğu anlaşılmaktadır. Ilıklık mekânına konağın zemin katından girilmektedir. Ilıklıkta bulunan bir kapı sıcaklığa, diğer kapı ise helaya açılmaktadır. Helada bir adet hela kurnası ve hela taşı bulunmaktadır. Sıcaklık mekânının üstü, ince yonulu taş malzemeden yapılmış bir kubbe ile örtülmüştür. Kubbeye geçiş elemanı olarak sivri kemerli tromplar kullanılmıştır. Kubbenin en üst kısmında çiçek biçimini oluşturan 10 adet aydınlık açıklığı bulunmaktadır. Hamamın özgün hâlinde sıcaklığın batı ve doğu duvarlarında karşılıklı olarak 2 kurnanın bulunduğu anlaşılmaktadır. Günümüze sadece doğudaki kurna ulaşmıştır. Yapının batı cephesinde külhan bölümünün izleri görülmektedir. Yapının iç mekânı, define avcıları tarafından tahrip edilmiştir (Görsel 7).

[27] "Öznitelik Bilgisi," Tapu Kadastro Genel Müdürlüğü Parsel Sorgu Uygulaması, erişim 21 Mayıs 2023, https://parselsorgu.tkgm.gov.tr/#ara/cografi/40.964998768892414/32.54105597734452.

[28] İhsan Özkök ile kişisel görüşme, Eskipazar, 31 Mayıs 2023; Mithat Uyanık ile kişisel görüşme, Eskipazar, 31 Mayıs 2023; Ahmet Bostan ile kişisel görüşme, Eskipazar, 29 Mayıs 2023.

[29] BOA., HAT. 1324/51669-3.

[30] İhsan Özkök ile kişisel görüşme, Eskipazar, 31 Mayıs 2023; Mithat Uyanık ile kişisel görüşme, Eskipazar, 31 Mayıs 2023.




Kaynak: E. Karataş, 2023.

**Görsel 7:** *Musa Bey Konağı (Taş Kapı mevkii).*
*a) Kuzeydoğu perspektifi,*
*b) Sıcaklık mekânı,*
*c) Rölöve çizimi.*

Kıranköy'de bulunan ve yine Musa Bey tarafından yaptırıldığı belirtilen diğer hamam yapısı ise köyün kuzeyindeki "Doruk" mevkiindedir[31]. Bu yapı küçük ölçekli özel hamam yapısıdır. Bu hamama bitişik başka herhangi bir yapı izine rastlanılmamıştır. Yapının sadece sıcaklık bölümü özgün hâliyle günümüze ulaşmıştır. Sıcaklık mekânının kuzeyinde bulunan bölüm ise özgünlüğünü yitirmiştir. Hamamın sıcaklık bölümünün *Taş Kapı* mevkiinde yer alan hamam yapısına benzer bir mimari üslupla inşa edildiği görülmektedir. Bu mekânda da ince yonulu taş kullanılarak yapılan kubbe, sivri kemerli tromplarla desteklenmiştir ve içerisi, kubbenin üst kısmında bulunan, çiçek biçimini oluşturan on adet açıklıkla aydınlatılmıştır. Yapı, günümüzde depo olarak kullanılmaktadır (Görsel 8).



Kaynak: E. Karataş, 2023.

**Görsel 8:** *Doruk mevkiindeki Musa Bey Hamamı'nın batı cephesi (solda) ve kubbesi (sağda).*

[31] İhsan Özkök ile kişisel görüşme, Eskipazar, 31 Mayıs 2023; Mithat Uyanık ile kişisel görüşme, Eskipazar, 31 Mayıs 2023.

Hüseyin Bey Konağı'nın kuzeybatısında Hasan Çavuşzade Ailesi'ne mensup olan Halim Bey'in ismiyle anılan bir konak daha bulunmaktadır (Bu konak 2. bölümde detaylı olarak incelenmiştir).

Halim Bey Konağı'nın kuzeyinde bulunan müştemilat ve misafir evinin üst kattaki başodasının duvarlarında bitkisel motifli kalem işi süslemeler bulunmaktadır. Yapının çatı örtüsü harap durumdadır ve özellikle üst katta su maruziyeti sebebiyle ciddi yapısal sorunlar mevcuttur (Görsel 9).



Kaynak: A. Özköse, 2020

**Görsel 9:** *Halim Bey Müştemilatı'nın başodası.*

## 1.3. Eskipazar'daki (Viranşehir) Yapılar

Eskipazar yerleşiminin eski adı *Viranşehir* olarak bilinmektedir. Bu tabirin antik bir yerleşim yeri olan Hadrianapolis kentini (halk ağzında *Eski Viranşehir*) kastettiği düşünülmektedir. Bu isim Osmanlı döneminde hem Viranşehir sancağının hem de Viranşehir kazasının idari sınırlarını ifade etmek için kullanılmıştır[32]. Bu tabir halk arasında Eskipazar yerleşimini kasteden "Viranşehir Pazarı" hâlini almıştır. Özellikle Osmanlı Devleti'nin son döneminde Viranşehir'in (Eskipazar) küçük fakat kervan yolları üzerinde ticari olarak önem taşıyan bir yer olduğu anlaşılmaktadır[33].

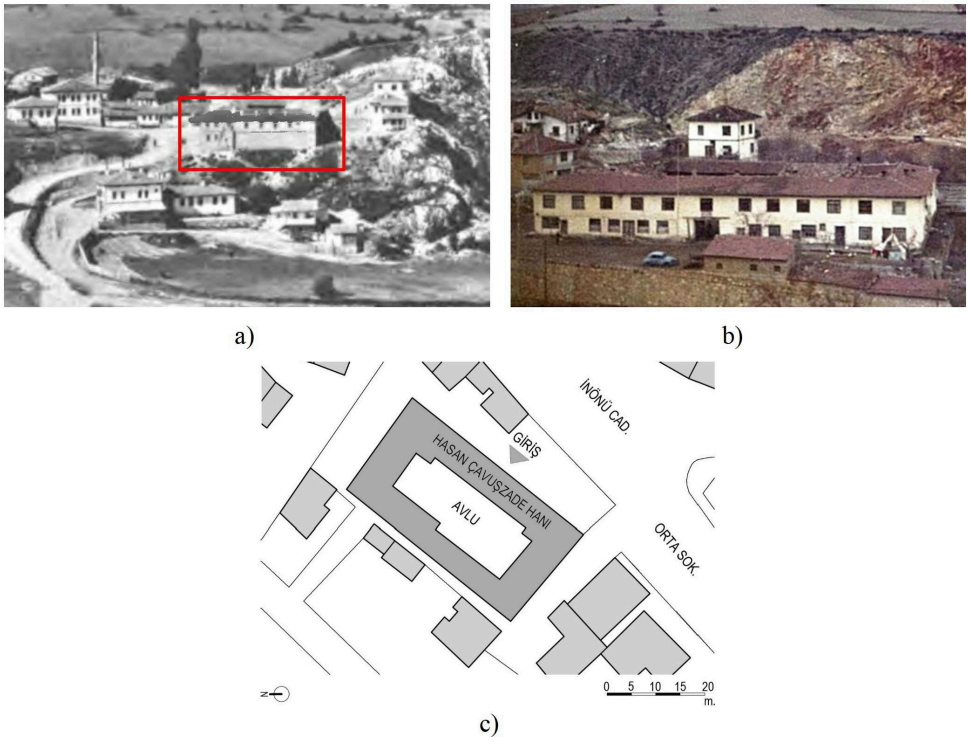
Seyyah Mordtmann, 1856 yılında yöreden geçmiş ve Viranşehir'de Hasan Çavuşzade Ailesi'nin yaptırdığı bir çeşmenin ve bir hanın bulunduğunu yazmıştır. Mordtmann'a göre han, Hasan Çavuşzade Ailesi'ne ait olduğu için yakılmıştır. Seyyah bölgeye geldiğinde, han derme çatma bir şekilde onarılarak kullanılmaktaydı. Çeşme ise o dönemde hâlâ sağlam olup kitabesi 1829-1830 yılında yapıldığını göstermekteydi[34]. Hanın hissedarlarından olan Hüseyin Özkök, yapının yakınında tarihî bir çeşmenin bulunduğunu doğrulamıştır. Fakat çeşme hakkında daha fazla bilgiye ulaşılamamıştır.

[32] Ersoy, *Karabük'ün Köyden Kente Dönüş Öyküsü Karabük Tarihi*, 106-107.

[33] Franz Taeschner, *Osmanlı Kaynaklarına Göre Anadolu Yol Ağı*, çev. Nilüfer Epçeli (İstanbul: Bilge Kültür Sanat, 2010), 258; Mordtmann, *Anatolien: Skizzen und Reisebriefe aus Kleinasien (1850-1859)*, 260.

[34] Mordtmann, *Anatolien: Skizzen und Reisebriefe aus Kleinasien (1850-1859)*, 259.

Hanın 20. yüzyılın başlarında çekilmiş fotoğrafından yapının Mordtmann'ın ziyaretinden sonra onarıldığı ya da yeniden inşa edildiği anlaşılmaktadır. Hüseyin Özkök'e göre han, zemin katında ahırlar ve kahvehane; üst katında odaları bulunan iki katlı avlulu bir binaydı. Daha sonra bu yapı, hapishane ve kasabanın idari merkezi olarak kullanılmıştır. İşlev değişikliği sebebiyle handaki kapsamlı tadilatın cephede yol açtığı bozulmalar, yapının fotoğrafında gözlenmektedir. Yaklaşık 45 m x 23 m boyutlarındaki Hasan Çavuşzade Hanı, mirasçıları tarafından satılmış ve 1996 yılında yıkılarak yerine yeni binalar inşa edilmiştir[35] Ailenin varislerinden birine göre hanın güneydoğu görünüşünde, arkasında bulunan iki katlı konak da Hasan Çavuşzade Ailesi'ne ait bir yapıydı[36] (Görsel 10).




Kaynak a: Groupe Suedo-Danois, *Construction Des Lignes De Chemins De Fer Irmak-Filyos & Fevzipaşa-Diyarbakır*, 32.
Kaynak b: Dursun Küçükyılmaz fotoğraf arşivi.
Kaynak c: Eskipazar Belediyesi Arşivi, Eskipazar Kasabasına ait 1/1000 Ölçekli Halihazır Harita, 1975 (rev. 1988) referans alınarak düzenlenmiştir.

**Görsel 10:** *Hasan Çavuşzade Hanı fotoğrafları ve yerleşim planı.*
*a) Kuzeybatıdan görünüş (20. yüzyıl başları).*
*b) Güneydoğudan görünüş (20. yüzyılın ikinci yarısı).*
*c) Yerleşim planı.*

## 1.4. Tamışlar Köyündeki Yapılar

Tamışlar köyü, Eskipazar ilçe merkezinin yaklaşık 9,5 km doğusunda, 1050 m rakımında bulunmaktadır. Prenses Belgiojoso Viranşehir sancağındaki evinden Kudüs'e yaptığı seyahatin başlangıcında, kendi evinin bulunduğu yerden Bayındır köyüne kadar, Musa Bey'in en küçük kardeşinin kendisine eşlik ettiğini belirtmektedir. Prenses, Musa Bey'in kardeşinin yaşadığı yerden şu şekilde bahsetmiştir: *"(...) Genç arkadaşım*

[35]Hüseyin Özkök, Hasan Çavuşzade Hüseyin Ağa'nın oğlu Halil Bey'in 4. kuşaktan torunudur. Hüseyin Özkök ile kişisel görüşme, Eskipazar, 17 Haziran 2023; "Alt-Üst Soy Bilgisi Sorgulama," e-Devlet Kapısı Uygulaması, erişim 17 Haziran 2023, https://www.turkiye.gov.tr/nvi-alt-ust-soy-bilgisi-sorgulama.

[36]Dursun Küçükyılmaz ile kişisel görüşme, Eskipazar, 19 Haziran 2025.

*bana veda ediyor. Yırtıcı bir kuş gibi, yüksek bir dağın eteğindeki küçük köyüne dönüyordu. Uzun bir süre, dövüş için doğmuş ancak vaktinden önce aylak bir hayata mahkûm olmuş bu genç adamı izledim."*[37]

Prensesin İsmail Bey'in hayat hikayesini yazdığı eserden kendisinden bahsedilen kişinin Halil Bey olduğu anlaşılmaktadır[38]. Bahsedilen köyün ise Tamışlar köyü olduğu çıkarımı yapılabilir çünkü hem Tamışlar köyü prensesin tarifine uymakta hem de Hüseyin Özkök'e göre bu köy, Hasan Çavuşzade Hüseyin Ağa'nın yazlık (yaylak) yerleşimidir[39]. Köyde yapılan incelemede Hasan Çavuşzadeler'in yaptırdığı 3 adet konak, ahırlar ve bir ambar bulunduğu tespit edilmiştir (Görsel 11). Mirasçıların soyağacı kayıtlarına göre, bu konaklardan ikisi Hasan Çavuşzade Hüseyin Ağa'nın büyük oğlu İsmail Bey, diğeri ise kardeşi Halil Bey tarafından yaptırılmıştır[40].




Kaynak: E. Karataş, 2023.

**Görsel 11:** *Tamışlar'a güneybatıdan bakış ve Hasan Çavuşzadeler'in yapıları.*

İsmail Bey tarafından yaptırılan konaklar köyün güneybatısında birbirine yakın konumlarda bulunmaktadır. İsmail Bey Ağa Konağı'nda yapılan incelemede hatalı uygulamalar ve onarımlar sebebiyle konağın özgün mimarisinin tamamen bozulduğu tespit edilmiştir. İsmail Bey Konağı ve Halil Bey Konağı ise özgünlüklerini büyük oranda muhafaza etmektedir. Halil Bey Konağı'na hizmet eden ahırlar ve ambarın ise tabiat şartları sebebiyle büyük oranda bozulduğu gözlemlenmiştir (İsmail Bey Konağı ve Halil Bey Konağı Bölüm 2'de detaylı olarak incelenmiştir).

Diğer yapıların yanı sıra, Tamışlar köyünde bulunan taş yığma sistemle yapılmış bir cami ile Kıranköy Camii'nin mimarileri ve ahşap işçilikleri arasındaki benzerlik dikkat çekmektedir (Görsel 12). Bu sebeple, bu caminin de Hasan Çavuşzade Hüseyin Ağa tarafından Kıranköy Camii ile aynı dönemde tamir ettirildiği tahmin edilmektedir. Fakat yapının kitabesinin yerinde bulunmamasından dolayı konu hakkında kesin bir bilgi elde edilememiştir. Camide yarı açık olarak tasarlanmış son cemaat mahalli ve harim içerisinde kadınlar mahfili yer almaktadır. Caminin kesme taştan yapılmış minberi özgünlüğünü korumaktadır. Yapı bakıma muhtaç durumdadır ve hâlihazırda kullanılmamaktadır. page

[37] Princesse Belgiojoso, *Asie Mineure et Syrie Souvenirs de Voyages*, 11-12.

[38] Prenses'e göre Halil Bey, Hasan Çavuşzade Hüseyin Ağa'nın dört oğlu arasında en küçük olandır. Princesse Belgiojoso, *Scenes de la vie Turque*, 283-284.

[39] Hüseyin Özkök ile kişisel görüşme, Eskipazar, 17 Haziran 2023.

[40] Halil İbrahim Özkök, İsmail Bey'in 4. kuşak torunudur. Halil İbrahim Özkök ile kişisel görüşme, Eskipazar, 29 Mayıs 2023; Hüseyin Özkök ile kişisel görüşme, Eskipazar, 17 Haziran 2023; "Alt-Üst Soy Bilgisi Sorgulama," e-Devlet Kapısı Uygulaması, erişim 17 Haziran 2023, https://www.turkiye.gov.tr/nvi-alt-ust-soy-bilgisi-sorgulama.



Kaynak: E. Karataş, 2020.

**Görsel 12:** *Tamışlar Köyü Camii kuzey perspektifi (solda) ve harim bölümü (sağda).*

## 1.5. Çakmakoğlu Vadisi'ndeki Yapılar

Eskipazar ve Merkez (Karabük) ilçeleri arasında kalan ve kaynaklarda "Çakmakoğlu Çiftliği" olarak anılan bölgede, Hasan Çavuşzade Ailesi'ne ait geniş arazilerin ve çoğu günümüze ulaşamamış olan bazı yapıların varlığı tespit edilmiştir. 1853 yılında bu arazilerin büyük bir bölümü, İtalyan coğrafyasında Avusturya birlikleriyle özgürlükçüler arasında çıkan çatışmalar sebebiyle Osmanlı Devleti'ne sığınan Prenses Belgiojoso'nun kızı Maria Belgiojoso Torotti (1838-1913) tarafından satın alınmıştır[41]. Arazileri satan kişiler ise Hasan Çavuşzade Hüseyin Ağa'nın oğlu İsmail Bey ve kardeşleridir[42].

Çeşitli yayınlarda, uzun bir süre çiftliğin yeri tartışma konusu olmuştur[43]. Fakat belgelerde geçen yer isimleri çiftliğin "Kuz köyü" (Kuzyaka ünitesi/ Doğancılar/ Eskipazar), "Han nâm karye" (Hanköy/Eskipazar/ Karabük) ve "Büyük Tarla" (Büyük Tarla Mevkii/ Doğancılar/ Eskipazar/ Karabük) yakınlarında bulunduğunu göstermektedir[44]. Canbolat'ın çalışması da bu konumu doğrulamaktadır[45]. Prensesin anlatımına göre satın alınan arazi, yaklaşık 8 km uzunluğunda ve 1,33 km genişliğindedir. Prensesin açıklamaları ve coğrafya incelendiğinde arazinin Acıöz köyünde (Merkez/ Karabük) bulunan "Macar Çiftliği" mevkiinden başlayarak Cildıkısık geçidine kadar ulaştığı anlaşılmaktadır[46]. Prenses Belgiojoso, Çakmakoğlu Çiftliği'ndeki binalar hakkında şunları söylemektedir: "(...) Vadi bir nehir tarafından kesilir ve ormanlık alanlarla çevrilidir. Bir ev, bir değirmen ve bir kereste fabrikasını barındırır."[47] Belgiojoso, çiftlik arazisi üzerindeki konağını ise şu şekilde anlatmaktadır: "(...) Kulübem vadinin ortasında, doğuya eğimli bir yamaçta, güney ve kuzey arasında, ovayı, nehri çevreleyen alüvyonlu alandan ayıran arazide duruyor. Kulübeden başka bir adı hak etmeyecek kadar küçük ve mütevazi bir ev..."[48] Alman seyyah Mordtmann, 1856 yılında gördüğü konağın konumunu da

[41] 1848'de İtalyan coğrafyasında, Avusturya birlikleri ile özgürlükçüler arasında çatışmalar sırasında Osmanlı Devleti, Avusturya Hükümeti'nin baskısından kurtularak kendisine sığınmak isteyen mültecilerden birçoğunun iltica taleplerini kabul etmiştir. Bk. Abdullah Saydam, "Osmanlıların Siyasi İlticalara Bakışı ya da 1849 Macar-Leh Mültecileri Meselesi," *Belleten* 61/231 (1991), 339-341. Cumhurbaşkanlığı Devlet Arşivleri Başkanlığı Osmanlı Arşivi (BOA), İrade Meclis-i Vala (İ. MVL.) 284/11213-11, 19 Zilhicce 1269 [23 Eylül 1853]; Sandro Fortunati, "The Life of Cristina Trivulzio Di Belgiojoso," *Cristina Trivulzio di Belgiojoso an Italian Princess in the 19th c. Turkish Countryside,* ed. Antonio Fabris (Venedik: Filippi Editore Venezia, 2010), 9-18.

[42] BOA., A. DVN. 103/39.

[43] Mehmet Yavuz Erler, "An Italian Princess In The Ottoman Empire," *Cristina Trivulzio di Belgiojoso an Italian Princess in the 19th c. Turkish Countryside,* ed. Antonio Fabris (Venedik: Filippi Editore Venezia, 2010), 41; Murat Babuçoğlu ve Orhan Özdil, *Safranbolu'da bir İtalyan Prensesi Cristina Trivulzio Belgiojoso* (Ankara: Altiva Yayınları, 2022), 25-26, 62-64.

[44] BOA., A. DVN. 103/39.

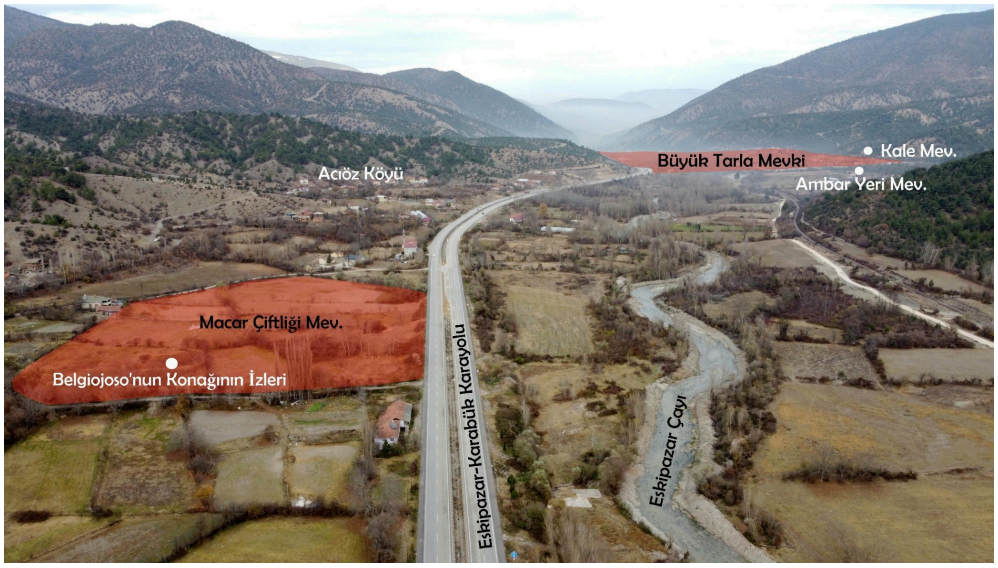
[45] Durmuş Gür ve İbrahim Canbolat, "Türkiye'de Cristina Trivulzio di Belgiojoso'nun Kızı Maria'ya Ait Arazi, Çiftlik ve Mülkler," *Journal of Humanities and Tourism Research* 13/1 (Mart 2023), 125-129, erişim 13 Haziran 2023, 10.14230/johut1344

[46] Princesse Belgiojoso, *Asie Mineure et Syrie Souvenirs de Voyages,* 10; Erler, "An Italian Princess In The Ottoman Empire," 45.

[47] Princesse Belgiojoso, *Asie Mineure et Syrie Souvenirs de Voyages,* 10.

[48] Erler, "An Italian Princess In The Ottoman Empire," 45.

tarif etmiştir[49]. Tarife göre, bu yerin şu anda Merkez ilçesine bağlı olan Acıöz köyü sınırları içerisindeki Macar Çiftliği mevkii olduğu anlaşılmaktadır[50]. Bu alanda yer alan tarlanın hissedarlarından birine göre, 1975 yılına kadar burada, araziyi tarıma açmak için yıkılan bir konak vardı. Ayrıca bu konak ve çevresindeki arazinin "Macar Marya" isimli gayrimüslim bir kadın tarafından idare edildiği öğrenilmiştir[51]. Bu kadın, Osmanlı vatandaşı olduktan sonra çiftliği resmen satın alan Prenses Belgiojoso'nun kızı Maria Belgiojoso Torotti olmalıdır[52]. Yapılan araştırmalarda Macar Çiftliği mevkiinde bir ev ve bahçe duvarı kalıntısı tespit edilmiştir Görsel 13). Arazi sahibine göre konak "İki katlı, geniş bir alana sahip, etrafı yüksek duvarlarla çevrili, sütunlu girişine birkaç basamakla çıkılan, bodrum katında mahzeni olan taş bir yapı"dır[53].




Kaynak: A. Özköse, 2023.

**Görsel 13:** *Çakmakoğlu Çiftliği hava fotoğrafı.*

Konağın güneyinde, eski bir su değirmeni bulunmaktadır. Değirmen genel olarak, zamanın etkisiyle gördüğü hasarlar ve onarımlar sebebiyle mimari özgünlüğünü kaybetmiştir. Ancak günümüze kadar değişmeden kalan batı cephesinden yola çıkarak değirmenin 19. yüzyılın başlarında yapıldığı düşünülmektedir. Dolayısıyla, Prensesin arsa içerisinde yer aldığını belirttiği değirmenin bu yapı olduğu söylenebilir[54].

1893 yılında bölgeye gelen Seyyah Anton, haritasında "kaleh" (kale) adlı bir yeri işaretlemiştir. Burası Büyük Tarla mevkii ile doğuya doğru uzanan vadinin birleştiği bölgenin kuzeyinde yer almaktadır[55]. 1903 yılında aynı yerden geçen Leonhard, Anton'un haritasına atıfta bulunarak buranın daha önce yaşamış bir derebeye ait olduğundan bahsetmektedir[56]. Yöre halkı ise burayı "Macar Maria'nın çiftliğini gözetlediği yer" olarak tarif etmektedir. Bu sebeple, "kale" olarak adlandırılan bu yerin Hasan Çavuşzade Hüseyin Ağa ya da Musa Bey tarafından yaptırıldığı ve daha sonra bir kısmının çiftliği satın alanlar tarafından kullanıldığı tahmin edilmektedir. Burada son dönemde su deposu inşa edilmesi için kazı çalışması yapıldığı, bir mezar

[49] Mordtmann, *Anatolien: Skizzen und Reisebriefe aus Kleinasien (1850-1859)*, 247-248.

[50] "Öznitelik Bilgisi," Tapu Kadastro Genel Müdürlüğü Parsel Sorgu Uygulaması, erişim 20 Mart 2023, https://parselsorgu.tkgm.gov.tr/#ara/cografi/41.01750936794304/32.624169588088996.

[51] Mustafa Ünal ile kişisel görüşme, Karabük, 11 Haziran 2023.

[52] "Maria Belgiojoso Trotti," Cristina Trivulzio di Belgiojoso, erişim 20 Mart 2023, https://www.cristinabelgiojoso.it/wp/maria-belgiojoso-trotti/,

[53] Mustafa Ünal ile kişisel görüşme, Karabük, 11 Haziran 2023.

[54] BOA., A. DVN. 103/39.

[55] Walter Von Diest ve Max Anton, *Neue Forschungen im Nordwestlichen Kleinasien* (Gotha: Justus Perthes, 1895).

[56] Richard Leonhard, *Paphlagonia Reisen und Forschungen im Nördlichen Kleinasien* (Berlin: Dietrich Reimer, 1915), 145.

ve bazı izlerin ise bu çalışma sırasında tahrip olduğu bildirilmiştir[57].

Alan araştırması sırasında Doğancılar köyü sakinleri tarafından çiftlik ambarlarının bulunduğu yer işaret edilmiştir. Bu ambarların yörede özellikle ambar mimarisinde sıklıkla kullanılan çantı (ahşap geçme) sistemiyle yapılmış olduğu belirtilmektedir. Bu yapılar bakıma muhtaç hâle gelince köylüler tarafından sökülmüştür[58]. Bu yer Tapu Kadastro Genel Müdürlüğü'nün kayıtlarında "Ambar Yeri" mevkii olarak geçmektedir[59]. Ancak burada bulunan yapıların prenses zamanında mı yoksa çiftlik Hasan Çavuşzadeler'e aitken mi inşa edildiğine dair bir bilgi bulunmamaktadır. Tespit edilebilen resmî yazışmalara göre, Hasan Çavuşzade İsmail Bey 1875 yılına kadar çiftliğin mülkiyeti üzerinde hak iddia etmeye devam etmiştir[60].

Çakmakoğlu Çiftliği yakınlarında Hasan Çavuşzade Ailesi'ne ait olmasına rağmen Prenses Belgiojoso tarafından satın alınmayan yapıların da olduğu düşünülmektedir. Seyyah Mordtmann'ın bahsettiği bu yapılar Hanköy köyünün batısında, Eskipazar Çayı kıyısında yer almaktadır. Mordtmann, bu yapılar hakkında şunları söylemiştir: *"Nehrin sağ kıyısında, eskiden büyük bir han ve camii olan ancak yaklaşık 30 yıl önce çıkan yangında kül olan yapıların sadece dış duvarları ve minaresi var."*[61]. Mordtmann, hanın sahibinden veya yangının sebebinden bahsetmemiştir. Ancak buranın hemen yakınında Hasan Çavuşzade Ailesi'ne ait Çakmakoğlu Çiftliği'nin bulunduğu ve Hasan Çavuşzade İsmail Bey'in eşi (Musa Bey'in eski eşi) Besime Hanım'ın Hanköy yakınlarında 60 dönümlük arazisi olduğu bilinmektedir[62]. Mordtmann, binaların 19. yüzyılın ikinci çeyreğinde yandığını vurgulamaktadır. Dolayısıyla bu yapıların da Hasan Çavuşzade Ailesi'ne ait olduğu ve Eskipazar'da bulunan han gibi tahrip edildiği düşünülmektedir.

## 2. Hasan Çavuşzade Ailesi'nin Eskipazar'da Bulunan Üç Konağının İncelenmesi

### 2.1. Halim Bey Konağı

*Konumu ve tarihi:* Konak, Karabük'ün Eskipazar ilçesinin Kıranköy mahallesinde, Doğa caddesinin kuzeyinde, Hüseyin Bey Konağı ve Kıranköy Camii'ne yakın bir konumda bulunmaktadır (Görsel 4, Görsel 14).



Kaynak: E. Karataş, 2023.

**Görsel 14:** *Halim Bey Konağı'nın kuzeybatı (solda) ve güneybatı perspektifi (sağda).*

[57] Turgut Doğan ile kişisel görüşme, Eskipazar, 11 Haziran 2023; Ali Doğan ile kişisel görüşme, Eskipazar, 11 Haziran 2023.

[58] Turgut Doğan ile kişisel görüşme, Eskipazar, 11 Haziran 2023; Ali Doğan ile kişisel görüşme, Eskipazar, 11 Haziran 2023.

[59] "Öznitelik Bilgisi," Tapu Kadastro Genel Müdürlüğü Parsel Sorgu Uygulaması, erişim 20 Mart 2023, https://parselsorgu.tkgm.gov.tr/#ara/cografi/41.02790086224752/32.63882517814637.

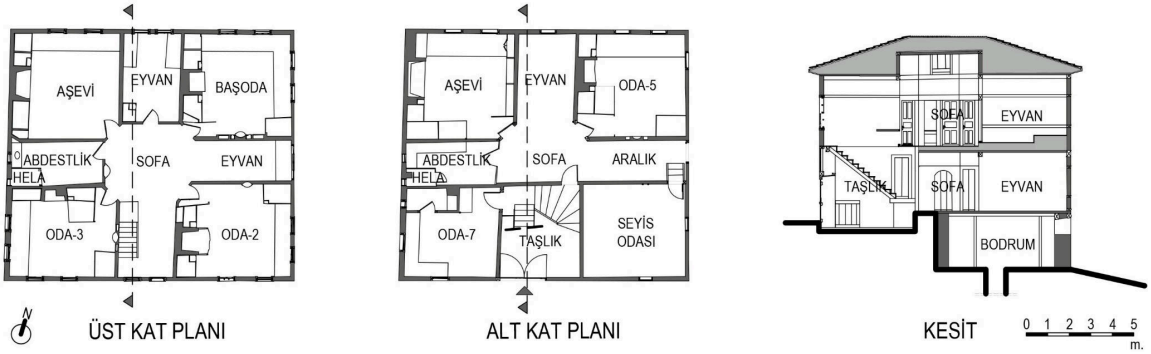
[60] Cumhurbaşkanlığı Devlet Arşivleri Başkanlığı Osmanlı Arşivi (BOA), Hariciye Nezareti Mektubi Kalemi (HR. MKT.) 886/60, 2 Recep 1292 [4 Ağustos 1875].

[61] Mordtmann, *Anatolien: Skizzen und Reisebriefe aus Kleinasien (1850-1859)*, 247.

[62] Gür ve Canbolat, "Türkiye'de Cristina Trivulzio di Belgiojoso'nun Kızı Maria'ya Ait Arazi, Çiftlik ve Mülkler," 131.

Mimari üslubu ve malzeme yıpranmaları dikkate alınarak konağın 19. yüzyılın ikinci yarısında yapıldığı tahmin edilmektedir. Buna göre konağın Musa Bey'in torunu, Halim Bey'in babası, Hasan Bey (doğ. 1855) tarafından yaptırıldığı düşünülmektedir. Konağın hissedarlarından Hüseyin Eken, Musa Bey zamanından kalan 200 kadar tüfek ve silahın uzun süre bu konağın çatı arasında muhafaza edildiğini ve bu silahların daha sonra yetkililere teslim edildiğini belirtmiştir[63].

*a. Mekân organizasyonu:* Konak, bodrum, alt ve üst kat olmak üzere 3 kattan oluşmaktadır. Yapı, yaklaşık 158,50 m²'lik bir zemin oturumuna sahiptir. Konak, kuzey-güney doğrultusunda yaklaşık 20/100 eğimli bir arsa üzerinde yer almaktadır. Yapının bodrum ve alt katlarındaki iç mekân çözümleri, farklı kotlandırmalarla, arazi eğimine uygun bir biçimde yapılmıştır. Üst kat ise konak sahiplerinin yaşam katıdır ve tek bir kot düzenine sahiptir (Görsel 15).




Kaynak: A. Özköse, 2020.

**Görsel 15:** *Halim Bey Konağı rölöve çizimleri.*

Bodrum kat, yapının kuzey bölümünün alt kısmına, kısmi ve tek mekân olarak inşa edilmiştir. Bu bölümün girişi doğu cephesinden, –2,20 kotundan sağlanmaktadır. Mekânın içerisinde 1 adet su kuyusu mevcuttur. Kat yüksekliği (döşeme üstünden döşeme üstüne) yaklaşık 2,70 metredir.

Binanın ana girişi, alt kattan, doğrudan caddeye açılan ve güney cephede yer alan bir kapıyla sağlanmaktadır. Giriş mekânında (taşlık), üst kata çıkan, bir kolu dengelenmiş, L şeklinde bir merdiven bulunmaktadır. Taşlığın doğu ve batısında giriş ile aynı kotta yer alan depolar mevcuttur. Bu depoların kat yüksekliği yaklaşık 1,50 metredir.

Taşlığın kuzeyinde, merdiven sahanlığından ulaşılan, orta sofalı bir bölüm bulunmaktadır. Burası müstahdemlerin yaşadığı kat olarak bilinmektedir[64]. Orta sofanın dört köşesinde dört adet oda, kuzeyinde eyvan, doğusunda aralık ve batısında abdestlik ve hela mekânları mevcuttur. Güneybatıda yer alan odanın girişi, sofadan bağımsız olarak doğrudan merdiven sahanlığından (taşlıktan) sağlanmıştır. Kuzeydeki odalara sofanın pahlı köşelerinden (farsi) girilmektedir. Bu katta sadece bu iki odada ocak mevcuttur. Kazan ocağının bulunmasından ve oda düzeninden, kuzeybatıdaki odanın aşevi (mutfak) olarak tasarlandığı anlaşılmaktadır. Bu bölümün kat yüksekliği yaklaşık 3,05 metredir.

Üst kat, konak sahiplerinin yaşama katıdır. Sekiz köşeli bir plana sahip orta sofanın dört köşesinde dört adet oda, güneyinde merdiven ve merdiven aralığı, kuzeyinde ve doğusunda iki adet eyvan, batısında abdestlik ve hela mevcuttur. Odalara sofanın pahlı köşelerinden girilmektedir. İçerisinde kazan ocağı bulunan kuzeybatıdaki oda, alt katta olduğu gibi bu katta da aşevi olarak tasarlanmıştır. Aşevi haricindeki odaların girişlerinde içerinin görünmesini engelleyen ahşap paravanlar bulunmaktadır. Dört odada da ocak, gusülhane ve yüklükler mevcuttur. Süsleme ve oda düzenden, kuzeydoğuda yer alan mekânın başoda olarak

[63] Hüseyin Eken ile kişisel görüşme, Karabük, 30 Mayıs 2023.

[64] Hüseyin Eken ile kişisel görüşme, Karabük, 30 Mayıs 2023.

tasarlandığı anlaşılmaktadır. Odalarda kat yüksekliği yaklaşık 3,30 metreyken, sofada 4,30 metredir. Bu katta sofanın yüksekliği diğer mekânlara göre artırılarak daha ferah bir merkezî mekân elde edilmiştir (Görsel 15).

*b. Yapım sistemi ve malzeme:* Yapının bodrum katı yığma taş, alt ve üst katı ise ahşap iskelet arası taş dolgu (yeğdane/hımış) yapım sistemiyle inşa edilmiştir. Özellikle alt kat duvarlarında yapının köşeleri çift ahşap çaprazlarla güçlendirilmiştir (Görsel 14). Döşemelerin taşıyıcı malzemesi olarak çeşitli boyutlarda ahşap kirişler kullanılmıştır. Bodrum katta tavan tahtası bulunmazken, alt ve üst katlarda tavanların büyük bir bölümü tavan tahtaları ile kaplanmıştır. Yapının kapı-pencere doğramaları, dolap ve sedir gibi donatıları ahşap malzemeyle imal edilmiştir. Cephelerde özgün çamur sıva ve beyaz badana izleri bulunmaktadır.

Konak Kuzey Anadolu fay hattına oldukça yakın bir konumdadır. Bu fay üzerinde 1944 yılında, 7,3 büyüklüğünde, Gerede-Çerkeş depremi meydana gelmiştir[65]. Pek çok yapı bu deprem sırasında yıkıldığı ya da ağır hasar aldığı için Eskipazar çevresinde korunmuş geleneksel yapı sayısı oldukça azdır. Yapının depreme rağmen bütünlüğünü muhafaza etmiş olması, yapım sistemi ve malzeme kullanımları açısından akademik incelemelere konu olabilecek potansiyeli barındırmaktadır.

*c. Cephe Özellikleri:* Yapı kuzey-güney doğrultusunda yaklaşık 11,75 metre, doğu-batı doğrultusunda ise yaklaşık 13,50 metre cephe uzunluğuna sahiptir. Hiçbir cephede cumba ya da çıkma bulunmamaktadır. Bodrum ve alt kat cepheleri dışa daha kapalı olarak (az ve küçük açıklıklı), üst kat cepheleri ise daha fazla sayıda ve nispeten büyük açıklıklarla tasarlanmıştır.

Oda ve eyvanların pencereleri yaklaşık 1/2 oranında, ahşap kapaklı ve parmaklıklıdır. Giriş kapısının üzerinde, hela ve depo gibi mekanlardaki açıklıklarda muşabaklar kullanılırken, bodrum kat küçük penceresiz açıklıklarla (tömek) aydınlatılmıştır. Cephe üzerindeki izlerden, yapının ahşap çatkı ile yapılmış bölümlerinin (bodrum kat üst hizasından itibaren) daha önce çamur sıvalı ve beyaz badanalı olduğu anlaşılmaktadır (Görsel 14).

*d. Detaylar:* Konak genel olarak sade ve süslemesizdir. Fakat yapıdaki ahşap ve taş işçiliklerinin özenli olduğu görülmektedir. Aşevi olarak tasarlanmış mekânlar hariç olmak üzere, ocağı bulunan bütün odalarda klasik Osmanlı-Türk evi oda düzeninin uygulandığı görülmektedir.

Odalarda pencerelerin önlerinde sedirler, ocakların yanlarında ve giriş kapılarının karşısında yüklük ve gusülhaneler, pabuçluk (odanın giriş bölümü) duvarlarında kemerli çiçeklikler ve çeşitli yerlerde ahşap dolaplarla birlikte tasarlanmış kemerli oyma raflar (gözgöreler) bulunmaktadır. Oda kapıları çatkı; dış kapılar, servis ve depo mekânlarının kapıları ise çakma tekniğiyle yapılmıştır. Alt kattaki dolaplarda çakma; üst kattakilerde ise genellikle çatkı yapım tekniği kullanılmıştır.

Tavanlar, farklı biçimlerde yapılmış çıtakari detaylara sahiptir. Çıtalar, bazı tavanlarda düz, bazılarında ise 45 derece açılarla çakılmıştır. Başoda olarak kullanılan mekânda tavan süslemelidir. Tavanın merkezinde ise dairesel bir çerçevenin içerisinde yer alan yıldız motifli göbek mevcuttur. Bu odadaki çıtalar baklava dilimi deseni oluşturacak şekilde çakılmıştır. Tavanın bütün kenarlarında 40-70 cm'lik dışa çıkıntılı bir bordür bulunmaktadır (Görsel 16).

[65] Celal Şenol, "Türkiye'de Meydana Gelen Büyük Depremlerin Yerleşme ve Demografik Yapı Üzerindeki Etkileri (1927-2020)," *USBAD Uluslararası Sosyal Bilimler Akademi Dergisi* 2/2 (2020), 620-644, https://doi.org/10.47994/usbad.808881



Kaynak: A. Özköse, 2020.

**Görsel 16:** *Halim Bey Konağı'nın başodasında ocak, giriş ve dolaplar (solda) ve çiçeklik, dolap ve oyma raflar (sağda).*

*e. Korunmuşluk durumu:* Konak genel olarak dış ve iç yapısal bütünlüğünü muhafaza etmektedir. Ancak özellikle yapının güney ve batı cephesinde tabiat şartları (termal etki ve yağış) sebebiyle yıpranma oranının yüksek olduğu tespit edilmiştir. Yapının çevresinde su ve nem maruziyetini engelleyecek herhangi bir tedbir bulunmamaktadır. Dolayısıyla yapı, zemininden sürekli suya ve neme (kapiler yükselme) maruz kalmaktadır. Zemine yakın olan duvarlarda parça kayıpları ve kısmi bozulmalar gözlemlenmiştir. Yapının özgün hâlinde bulunan cephe sıvalarının büyük ölçüde dökülmüş olması sebebiyle, ahşap çatkılar ve duvar harçları doğrudan açık hava şartlarına maruz kalmaktadır. Çatı örtüsü önceden gördüğü bir tadilatla özgünlüğünü yitirmiştir. Fakat hâlihazırda yapıyı açık hava şartlarına karşı muhafaza etmektedir. Konağın iç yapısı daha iyi korunmuştur ancak açık olan pencere vb. açıklıklar içerideki yıpranma oranını artırmaktadır. Bunun yanı sıra bacalarda gözlemlenen yıpranmalar ileride iç mekânda büyük bozulmalara sebebiyet verebilecek niteliktedir.

## 2.2. İsmail Bey Konağı

*a. Konumu ve tarihi:* Konak, Karabük'ün Eskipazar ilçesinin Tamışlar köyünde, köyün güneybatısında, İsmail Bey Ağa Konağı'nın güneydoğusunda bulunmaktadır (Görsel 11). Köy halkı tarafından Ömer Bey Konağı olarak bilinmektedir. Bu konağın İsmail Bey Ağa Konağı'ndan altı yıl sonra yapıldığı belirtilmektedir ve kapısının üzerinde hicri 1288 [miladi 1871-1872] tarihi yazılıdır. İsmail Bey zamanında, İsmail Bey Konağı'nın misafir evi ve müştemilat olarak kullanıldığı belirtilmiştir[66] (Görsel 17).



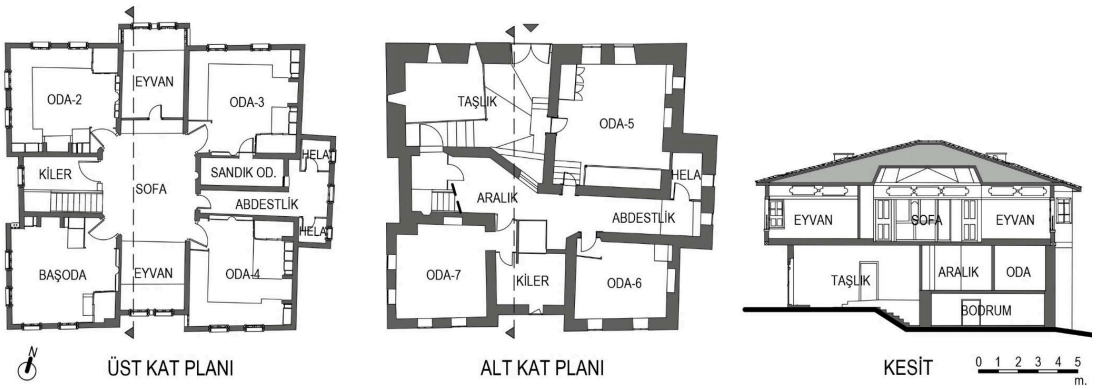
Kaynak: E. Karataş, 2023.

**Görsel 17:** *İsmail Bey Konağı'nın güney cephesi (solda) ve kuzey cephesi (sağda).*

*b. Mekân organizasyonu:* Bodrum, alt ve üst kattan oluşan yapı, yaklaşık 219 m² zemin oturumuna sahiptir. Konağın bodrum katında ardiye, alt katında taşlık ve müstahdem bölümü, üst katında ise misafir odaları

[66] Halil İbrahim Özkök ile kişisel görüşme, Eskipazar, 29 Mayıs 2023.

ve başoda bulunmaktadır. Üst kat bütünüyle tek bir kotta bulunurken, diğer katlar yaklaşık 20/100 (kuzey-güney) olan arsa eğimine uygun bir biçimde kotlandırılarak tasarlanmıştır (Görsel 18).




Kaynak: A. Özköse, 2021.

**Görsel 18:** *İsmail Bey Konağı rölöve çizimleri.*

Binanın giriş kapısı, alt katta bulunan taşlık mekânının kuzey duvarında yer almaktadır. Taşlıktan diğer mekânlara merdivenlerle geçiş yapılmaktadır. Taşlığın doğusunda ocağı da bulunan bir oda, batısında geç dönemde yapıldığı düşünülen büyük, ahşap bir ambar ve güneyinde ise müstahdem bölümü bulunmaktadır. Müstahdem bölümü, girişten yaklaşık 90 cm yüksek bir kotta yer almaktadır. Burada mekânlar arasında geçişi sağlayan bir aralık, güneyden cephe alan, ocaklı iki adet oda, odalar arasında kiler ve doğudan cephe alan hela ve abdestlik bölümleri mevcuttur. Bu bölümün kat yüksekliği yaklaşık olarak 2,45 metredir.

Bodrum kat, müstahdem bölümünün altındaki hacimden (kat yüksekliği yaklaşık 1,75 metre) oluşturulmuştur. Odunluk ve ardiye mekânlarına sahip olan bu kata taşlıktan inen 3 basamaklı bir merdiven ile ulaşılmaktadır.

Üst kat, sekiz köşeli plan şemasında tasarlanmış bir orta sofa ve etrafındaki mekânlardan oluşmaktadır. Sofanın dört köşesinde, pahlı köşelerden giriş yapılan odalar bulunmaktadır. Sofanın kuzeyinde ve güneyinde, iki adet eyvan yer almaktadır. Sofanın batısında, müstahdem bölümü girişinin hemen yanından bu kata ulaşan merdiven evi ve küçük bir oda bulunmaktadır. Sofanın doğusunda ise kuzeydoğudaki odayla bağlantılı bir sandık odası, sofa ile bağlantılı abdestlik ve abdestlikten girilen iki adet hela yer almaktadır. Bu kattaki dört odada ocak, gusülhane ve yüklükler mevcuttur. Manzara, süsleme-bezeme ve iç mekân düzeni, güneybatıda yer alan odanın başoda olarak kullanıldığını göstermektedir. Diğer mekânlarda kat yüksekliği yaklaşık 3,25 metreyken, sofada 4,10 metredir. Yapının üst katında, sofanın diğer mekânlara göre daha yüksek ve köşeleri pahlanmış tavanlı inşa edilmesi, ferah bir merkezî mekân sağlamıştır (Görsel 18).

*c. Yapım sistemi ve malzeme:* Yapının, bodrum ve alt kat duvarları yığma taş, üst kat ise ahşap iskelet sistem arası taş dolgu (yeğdane) olarak inşa edilmiştir (Görsel 17). Bodrum katın tavanını oluşturan ahşap kirişli döşemelerde tavan tahtası bulunmazken, diğer katlarda ahşap kirişler tavan tahtaları ile örtülmüştür. Kapı-pencere ve iç donatılar ahşap malzemeden imal edilmiştir.

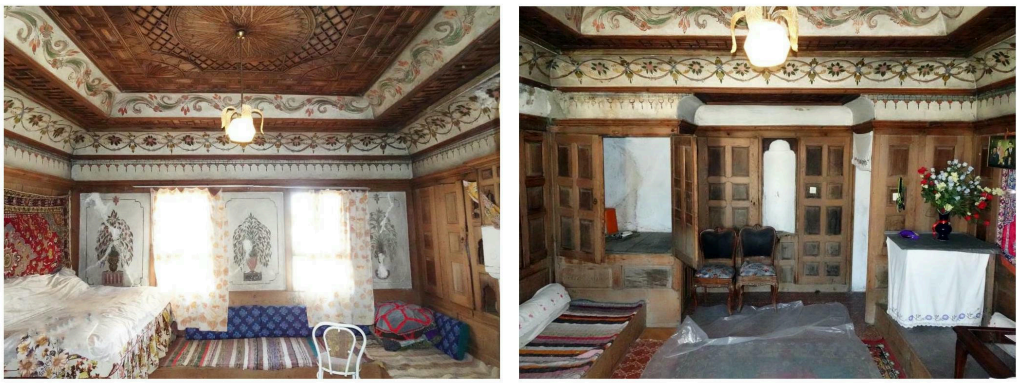
*d. Cephe Özellikleri:* Konağın cephe uzunluğu kuzey-güney doğrultusunda yaklaşık 15,55 metre, doğu-batı doğrultusunda ise yaklaşık 16,40 metredir. Kuzeyde yer alan giriş kapısının önü, yapıdaki tek çıkma unsuru olan, üst katta eyvan bölümünün oluşturduğu cumba ile örtülmektedir. Doğu cephesinde abdestlik ve helaların yer aldığı bölüm, bina yüksekliği boyunca, bu cephede bulunan odaların cephe hizasından öne çıkmaktadır. Batı ve güney cephesinde ise odalar, cephe hizasından taşırılarak vurgulanmıştır. Yapıda taş yığma olan bölümlerin cepheleri (bodrum ve alt kat) dışa daha kapalı, az ve küçük açıklıklı olarak tasarlanırken ahşap çatkılı bölümler (üst kat) daha fazla sayıda ve nispeten büyük açıklıklara sahiptir.

Oda ve eyvanların pencereleri yaklaşık 1/2 (en/boy) oranına sahiptir. Yapının özgün hâlinde, pencerelerde ahşap kapaklar olduğu anlaşılmaktadır. Bazı açıklıklarda lokmalı parmaklık ve muşabaklar kullanıldığı görülmektedir. Bodrum kattaki mekânlar ve alt kattaki taşlık mazgallarla (tömek) aydınlatılmaktadır. Yapının cephesinde, özgün olarak, sadece üst kat duvarlarının sıvalı olduğu tahmin edilmektedir (Görsel 17).

İsmail Bey Konağı ve Hasan Çavuşzade Hüseyin Ağa tarafından yaptırılan Havuzlu Asmazlar Konağı'nın plan şemasının yanı sıra köşe kulesine benzer biçimdeki cephe elemanları arasındaki benzerlik dikkat çekmektedir. İsmail Bey, Havuzlu Asmazlar Konağı'ndaki tasarımın bir benzerinin bu yapıda uygulanmasını istemiş olabilir (Görsel 3, Görsel 17).

*e. Detaylar:* Konağın cepheleri ile bodrum ve alt katta bulunan iç mekânlar sade ve süslemesizdir. Alt katta bulunan üç odada ocaklar mevcuttur. Bu odalarda ahşap donatı daha az, işçilik ise daha basittir.

Üst kat, özenli işçilik ve tasarım ile inşa edilmiştir. Buradaki tüm odalarda klasik Osmanlı-Türk evi oda düzeni hâkimdir. Odalarda L biçiminde sedirler, ocakların yanlarında dolap ve yüklükler, çeşitli yerlerde ahşap oyma raflar (gözgöreler) bulunmaktadır. Bütün oda tavanlarında tekne tavan yapım tekniği uygulanmıştır. En üst kotta yer alan tavan ana zemini, kenarlarında bulunan iki kademeli C kıvrımlı, bağdadi tekniğiyle yapılmış pervazlarla, odanın duvarlarına doğru açılan bir görünüm almaktadır. Odalarda pabuçluk bölümleri bulunmaktadır. Bu bölümünün tavanı daha alçak olarak tasarlanmış, kapı önlerine içerinin sofadan görülmesini engelleyen ahşap paravanlar yerleştirilmiş, kapının karşısında konumlandırılan gusülhane ve yüklükler ile mekân ve görüş alanı sınırlandırılmış, pabuçluk duvarlarında yer alan kemerli çiçeklikler ile bu bölüm vurgulanmıştır. Bu kattaki özgün dolap, kapı ve donatılar ahşap çatkı tekniği ile yapılmıştır (Görsel 19).



Kaynak: E. Karataş, 2023.

**Görsel 19:** *İsmail Bey Konağı Oda-2'de tekne tavan ve kalem işi süslemeler (solda) ve kapı duvarı, paravan ve yüklük (sağda).*

Üst kattaki sofa ve odalarda eşsiz süsleme ve bezeme elemanları bulunmaktadır. Başoda, Oda-2 ve Oda-3'te bulunan tavanlarda kündekâri ve çıtakari teknikleri birlikte kullanılmıştır. Oda-4, sofa ve eyvanların tavanlarında sadece çıtakari tekniğinin kullanıldığı görülmektedir. Başoda, Oda-2 ve sofanın tavan pervazları ile oda duvarlarında özenle yapılmış bitkisel motifli kalem işi süslemelere yer verilmiştir. Başoda ve sofa tavanlarının ahşap yüzeyleri boyalıdır ve kalem işi süslemeler içermektedir (Görsel 19, Görsel 20).



Kaynak: E. Karataş, 2023.

**Görsel 20:** *İsmail Bey Konağı'nın başodasının tekne tavanı ve bezemeleri (solda) ve sofa tavanı ve bezemeleri (sağda).*

*f. Korunmuşluk durumu:* Konak özgünlüğünü ve yapısal bütünlüğünü genel olarak muhafaza etmektedir. Ancak yapının taş yığma olan alt ve bodrum kat duvarlarının köşe bölgelerinde tehlike arz eden yapısal çatlaklar bulunmaktadır. Yapının özellikle zemine yakın bölgelerinde nem, su maruziyeti (kapiler yükselme ve yağış) ve termal genleşme-büzülme sebebiyle bağlayıcı malzemede kayıp olduğu görülmektedir. Yapı cephelerinde pencerelerin büyütülmesi, küçültülmesi ve doğramaların değiştirilmesi gibi özgünlüğe zarar veren bazı işlemler uygulanmıştır. Ayrıca cephelerde özgün olmayan çimento esaslı sıva izleri görülmektedir (Görsel 17). Yapının üst kat tavanlarında, özellikle Oda-4 ve eyvanda, geçmişte su alması sebebiyle, ahşap malzemede ve sıvalarda ciddi bozulmaların olduğu gözlemlenmiştir. Çatı örtüsü gördüğü hatalı onarım sebebiyle özgünlüğünü yitirmiştir fakat hâlihazırda iç mekânı korumaktadır.

## 2.3. Halil Bey Konağı

*a. Konumu ve tarihi:* Konak, Karabük'ün Eskipazar ilçesinin Tamışlar köyünde, köyün güneybatısında, İsmail Bey Konağı'nın yakınında (güneydoğusunda), ondan daha alt kotta yer almaktadır (Görsel 11). Konağın günümüzdeki hissedarları, Hasan Çavuşzade Hüseyin Ağa'nın oğlu Halil Bey'in torunlarıdır. Hissedarlardan birinin soyağacı bilgilerine ve yapıdan elde edilen verilere dayanarak konağın Halil Bey tarafından, 19. yüzyılın ikinci yarısında yaptırılmış olduğu tahmin edilmektedir[67] (Görsel 21).



Kaynak: E. Karataş, 2023.

**Görsel 21:** *Halil Bey Konağı'nın kuzeydoğu perspektifi (solda) ve doğu cephesi (sağda).*

*b. Mekân organizasyonu:* Konak, bodrum, alt ve üst kat olmak üzere üç kattan oluşmaktadır. Yapının zemin oturumu yaklaşık 160 m²'dir. Bina, kuzey-güney doğrultusunda 23/100 olan arazi eğimine uygun olarak

[67] "Alt-Üst Soy Bilgisi Sorgulama," e-Devlet Kapısı Uygulaması, erişim 17 Haziran 2023, https://www.turkiye.gov.tr/nvi-alt-ust-soy-bilgisi-sorgulama.

arsanın kademeli şekilde kazılmasıyla inşa edilmiştir. Bodrum kat ahır olarak kullanılırken, alt kat hem servis ve depolama mekânlarını hem de yaşama mekânlarını içermektedir. Üst kat ise, incelenen diğer iki konakta olduğu gibi, konak sahiplerinin yaşama katı olarak tasarlanmıştır (Görsel 22).




Kaynak: A. Özköse, 2023.

**Görsel 22:** *Halil Bey Konağı rölöve çizimleri.*

Konağın ana girişi alt katta bulunan taşlık mekânının kuzeyinden sağlanmaktadır. Taşlıktan sadece ardiyeye ve sofaya doğrudan geçilebilmektedir. Bu katta taşlığın güneyindeki orta sofanın etrafını, ocağı olan bir oda ve aşevinin yanı sıra kiler, abdestlik, ardiye, ambar, aralık ve merdiven evi çevrelemektedir. Kiler bölümüne aşevinden, helaya abdestlikten, üst kata çıkan merdivenlere ise aralıktan geçiş yapılmaktadır. Bu katın kat yüksekliği yaklaşık 2,75 metre olarak ölçülmüştür.

Bodrum kat, kot farkından yararlanılarak yapının güney bölümünde bulunan yaklaşık 90 m² alana, güney cephesi açığa çıkacak şekilde konumlandırılmıştır. Bu katta, ahır ve ahırdan geçilerek ulaşılan daha küçük bir mekân (gümelik) bulunmaktadır. Kat yüksekliği 1,85-2,45 metre arasında değişkenlik arz etmektedir.

Üst kat, incelenen diğer iki yapıya benzer biçimde farsi köşeleri olan (sekizgen) bir orta sofa ve etrafındaki mekânlardan oluşmaktadır. Dört köşede odalar, sofanın kuzey ve güneyinde eyvanlar, batısında sandık odası ve abdestlik, doğusunda ise merdiven evi ve aralık bulunmaktadır. Bu katta bulunan sandık odasına doğrudan sofadan, helaya ise abdestlik mekânından ulaşılmaktadır. Odaların dördünde de ocaklar mevcuttur. Manzara, oda düzeni ve detaylardan güneydoğudaki odanın başoda olarak tasarlandığı anlaşılmaktadır. Sofanın tavanı, incelenen diğer konaklarda olduğu gibi odalar ve diğer mekânlara göre daha yüksek inşa edilmiştir (Görsel 22).

*c. Yapım sistemi ve malzeme:* Konağın duvarları, bodrum kat duvarlarının iç mekânlara bakan bölümü hariç olmak üzere, tamamen sıvalıdır. Ancak yapı tipolojisinden ve duvar kalınlıklarından bodrum kat ile alt katın kuzeyinde kalan cephe duvarları ve bazı iç duvarların taş yığma; alt katın diğer duvarları ile üst katın ise ahşap iskelet sistem ile inşa edildiği anlaşılmaktadır. Döşemeler ahşap malzemeden imal edilmiştir. Genellikle servis ve depo mekânları haricinde kalan mekânların tavanları tavan tahtaları ile kaplanmıştır. Kapı-pencere ve diğer iç donatılar ahşap malzemeden imal edilmiştir.

*d. Cephe Özellikleri:* Yapı kuzey-güney doğrultusunda yaklaşık 11,90 metre, doğu-batı doğrultusunda ise yaklaşık 14,25 metre cephe uzunluğuna sahiptir. Bu konakta, Halim Bey Konağı'na benzer bir biçimde, hiçbir cephede çıkma bulunmamaktadır. Batı cephesindeki hela ve abdestlik bölümü, bina yüksekliği boyunca dışarı taşırılmıştır. Taş yığma sistem ile yapılan duvarlar büyük ölçüde sağırdır. Buradaki mekânlar küçük açıklıklarla (tömek) aydınlatılmıştır. Üst kat daha fazla sayıda pencereye sahip ve daha aydınlıktır. Oda ve eyvanların pencereleri yaklaşık 1/2 oranında, ahşap kapaklı ve ahşap parmaklıklıdır. Servis ve geçiş mekânlarındaki küçük boyutlu açıklıklarda muşabaklar kullanılmıştır. Bütün cephe sıvalı ve beyaz badanalıdır (Görsel 21).

*e. Detaylar:* Konağa genel olarak sade ve süslemesiz bir tasarım hâkimdir. Yapıdaki ahşap işçiliklerin özenli olduğu görülmektedir. Odalarda klasik Osmanlı-Türk evi oda düzeni uygulanmıştır. Oda tasarımında ocaklar önemli bir öge olarak, çiçeklikler ise odaların pabuçluk duvarını öne çıkartan bir unsur olarak vurgulanmaktadır. Bunların yanı sıra iç donatı olarak ahşap malzemeden imal edilmiş sedirler, gusülhaneler, yüklükler, dolaplar, oyma raflar (gözgöreler) ve paravanlar kullanılmıştır.

Ahşap detaylarda çakma ve çatkı sisteminin kullanıldığı görülmektedir. Dış kapılar, taşlık-sofa kapısı ve hela kapıları çakma, diğer kapılar çatkı sistemle imal edilmiştir. Alt katta ve üst katta Oda-3'te bulunan dolapların yapımında ahşap çakma, diğer odalarda bulunan dolapların yapımında ise ahşap çatkı tekniği kullanılmıştır. Tavanlar düz ve çıtalı tavan olarak inşa edilmiştir. Üst katta bulunan sofa ve başodada çıtakâri teknikle yapılmış, dairesel tavan göbekleri mevcuttur (Görsel 23).



Kaynak: E. Karataş, 2023.

**Görsel 23:** *Halil Bey Konağı'nın üst katında bulunan başodanın ocak, dolap, sedir ve pencere düzeni (solda) ve sofadan kuzeydeki eyvana bakış (sağda).*

*f. Korunmuşluk durumu:* Yapının bütün duvarlarının sıvalı olması sebebiyle düşey taşıyıcılarda detaylı inceleme yapılamamakla birlikte, büyük bir yapısal sorun tespit edilmemiştir.

Yapı zemininde su ve nem için yeterli tedbirler bulunmamaktadır. Bu sebeple zemin-duvar birleşimleri sürekli olarak suya ve neme maruz kalmaktadır (Görsel 21). Ayrıca çatı örtüsünün bazı bölgelerinde görülen sorunlar sebebiyle üst kat iç mekânlarının yer yer su aldığı görülmektedir (Görsel 23). Bu durumun ahşap işçilikleri için ilerleyen süreçte daha büyük sorunlara yol açabileceği değerlendirilmektedir.

## 3. Karşılaştırma ve Değerlendirme

Anadolu Selçuklu Dönemi'nde, Anadolu'daki göçebe Türkler, boylar, oymaklar ve obalar hâlinde yaşıyorlardı. Birimlerin her birisinin başında bir bey bulunmakta ve bu beylik babadan oğula geçmekteydi[68]. Kırsal alanlardaki Türk yerleşimlerinin oluşumunun başlangıcındaki bu yapı ve Osmanlı'nın son dönemde uygulanan devlet politikası, toprak ve vergi sistemi (iltizam sistemi), Viranşehir sancağındaki kırsal alanlarda ekonomik gücün belirli kişi ve ailelerde toplanması sonucunu doğurmuştur. Bölgedeki ailelerin, Osmanlı Devleti'nin merkezi yönetimi ve saray ile olan ilişkileri sayesinde zenginleştikleri, güç sahibi oldukları ve bu ailelerin yaptırdıkları mimari eserlerin de aynı derecede zengin unsurlar içerdikleri gözlemlenmektedir. Kahvecizadeler, Hazinedaroğulları ve Hasan Çavuşzadeler, bölgedeki kırsal alanlarda yaşamayı tercih eden, bu zengin ve güçlü ailelere örnek olarak verilebilir[69]. Zenginleşen aileler yörenin kırsal alanlarında, şehirdekilerle yarışacak kadar zengin mimari unsurlara sahip, büyük konaklar yaptırmışlardır. Viranşehir sancağının kırsal alanları bu tarihî ve kültürel mirasın bir kısmını hâlâ barındırmaktadır. Safranbolu şehri yakınların-

[68] M. Çağatay Uluçay, *İlk Müslüman Türk Devletleri* (İstanbul: Ötüken Neşriyat, 2020), 189, 342.

[69] Erler, "An Italian Princess In The Ottoman Empire," 34.

daki bir Türkmen yerleşimi olan Yörük köyü, eskiden Rum halkın da yaşadığı Bulak ve Yazıköy köyleri ve günümüzde Karabük'ün Merkez ilçesine bağlı köylerden olan Güneşli ve Ödemiş bu zengin mimari örneklere sahiptir (Görsel 24).



Kaynak: E. Karataş, 2022.

**Görsel 24:** *Viranşehir sancağının kırsalında varlıklı ailelere ait Bulak köyündeki Âyanlar Konağı (solda), Güneşli köyündeki Bakıbeyoğlu Konağı (ortada) ve Ödemiş köyündeki Yusuf Ağa Konağı (sağda).*

Karabük ilinin Eskipazar ilçesi kırsalında yer alan ve Hasan Çavuşzadeler tarafından 19. yüzyılın ikinci yarısında yaptırılan Halim Bey, İsmail Bey ve Halil Bey konaklarının birbirlerine benzer mimari biçim ve üsluplara sahip olduğu görülmektedir. Üç katlı olarak inşa edilmiş olan yapılar, topografik verilere uygun olarak tasarlanmıştır. Yapım sistemleri, yığma taş üzerine ahşap iskelet sistemidir. Yapıların bodrum ve alt katları, arazi kotlarına uyumlu olacak şekilde, çevresel etkenler (yol, yön, giriş kotu vb.) göz önüne alınarak tasarlanmıştır. Esas yaşam katı olan üst kat ise, üç yapıda da benzer bir plan şemasına sahiptir. Üst katlar, sekiz köşeli haçvâri orta sofalı plan tipinin yapılara uyarlanması ile elde edilmiştir. Bu kat sofanın dört köşesinde bulunan odalar, odaların arasındaki eyvan, kiler, sandık odası, merdiven evi, aralık ve abdestlik gibi mekânlardan oluşmaktadır. Sofalar diğer mekânlardan yüksek olarak tasarlanmıştır. Sofaların tavan-duvar birleşimleri İsmail Bey ve Halil Bey konaklarında yuvarlatılarak pahlanmıştır. Odalarda, Osmanlı-Türk evi oda düzeninde kurgulanmış, mimari bir eleman olarak öne çıkartılmış ocaklar, pencerelerin önünde bulunan sedirler, ahşap detaylar içeren dolaplar ve oyma raflar (gözgöreler), odaların pabuçluk (giriş) bölümünde mahremiyeti sağlayacak şekilde konumlandırılmış paravan ve gusülhane-yüklükler ve pabuçluk duvarını vurgulayan çiçeklikler bulunmaktadır. Yapıların cepheleri sade, çıkmasız ya da tek cumbalıdır. Her üç konağın da kapı ve dolaplarında ahşap çakma ve çatkı; tavanlarında ise çıtakâri tekniğinin kullanıldığı görülmektedir. Diğer taraftan İsmail Bey Konağı, üst katta bulunan odalarında ve sofasındaki kündekâri tekne tavan detayları ve kalemişi süslemeleri bakımından diğer iki yapıdan ayrılmaktadır (Tablo 1).

**Tablo 1:** *Halim Bey, İsmail Bey ve Halil Bey konaklarının karşılaştırılması*

| Özellikler | Halim Bey Konağı | İsmail Bey Konağı | Halil Bey Konağı |
|---|---|---|---|
| **Konum** | Kıranköy Mah. (Eskipazar) | Tamışlar köyü (Eskipazar) | Tamışlar köyü (Eskipazar) |
| **Yapım tarihi** | 19. yüzyılın ikinci yarısı | 1871-72 (miladi) | 19. yüzyılın ikinci yarısı |
| **İşlevi** | Konut | Misafir evi ve müştemilat | Konut |
| **Yaptıran** | Hasan Bey (Hüseyin Ağa'nın torununun oğlu) | İsmail Bey (Hüseyin Ağa'nın oğlu) | Halil Bey (Hüseyin Ağa'nın oğlu) |
| **Kat sayısı** | 3 kat (bodrum, alt ve üst) | 3 kat (bodrum, alt ve üst) | 3 kat (bodrum, alt ve üst) |
| **Arsa eğimi** | 20 /100 (yüzde yirmi) | 20 /100 (yüzde yirmi) | 23 /100 (yüzde yirmi üç) |
| **Zemin oturumu** | 158,50 m² | 219 m² | 160 m² |
| **Toplam alanı** | 396,50 m² | 559 m² | 416,50 m² |
| **Yapım sistemi** | Yığma taş üzeri ahşap çatkı (yeğdane) | Yığma taş üzeri ahşap çatkı (yeğdane) | Yığma taş üzeri ahşap çatkı (yeğdane) |
| **Plan şeması** | Sekiz köşeli orta sofa | Sekiz köşeli orta sofa | Sekiz köşeli orta sofa |

| Özellikler | Halim Bey Konağı | İsmail Bey Konağı | Halil Bey Konağı |
|---|---|---|---|
| **Bölümleri** | Başoda, oda, aşevi, sofa, eyvan, abdestlik-hela, taşlık, depo | Başoda, oda, sandık odası, kiler, sofa, eyvan, abdestlik-hela, taşlık, depo | Başoda, oda, aşevi, sofa, eyvan, abdestlik-hela, taşlık, depo-ambar, ahır |
| **Oda düzeni** | Osmanlı-Türk evi oda düzeni | Osmanlı-Türk evi oda düzeni | Osmanlı-Türk evi oda düzeni |
| **Cepheleri** | Sade ve çıkmasız | Sade ve tek cumbalı | Sade ve çıkmasız |
| **Detaylar** | Sade tasarım, kapı ve dolaplarda çakma ve çatkı ahşap işçiliği, tavanlarda çıtakari detaylar | Sofa ve odalarda kalem işleri, kapı ve dolaplarda çakma ve çatkı işçilik, tekne tavanlarda kündekari ve çıtakari detaylar | Sade tasarım, kapı ve dolaplarda çakma ve çatkı ahşap işçiliği, sofa ve başodada çıtakari detaylar |
| **Korunmuşluk** | Cephe: orta<br>İç mekân: orta<br>Çatı: orta (muhdes) | Cephe: orta<br>İç mekân: iyi<br>Çatı: iyi (muhdes) | Cephe: iyi<br>İç mekân: iyi<br>Çatı: orta (muhdes) |
| **Tehditler** | Duvarlarda parça kayıpları, zemin kaynaklı su ve nem, tabiat şartları, bacalardaki yıpranmalar | Yapısal çatlaklar, zeminden kaynaklanan su ve nem, tabiat şartları (termal etki, yağış vb.) | Zeminden kaynaklanan su ve nem, çatı örtüsündeki yıpranmalar |

**Kaynak:** E. Karataş ve A. Özköse, 2025.

Kuban'a göre Osmanlı-Türk evinin 19. yüzyılda inşa edilen örneklerinde, giriş kat servis mekânlarının bulunduğu yer olarak serbestçe tasarlanmıştır. Aynı dönemde üst katlarda uygulanan haç biçimli orta sofalı plan tipi, simgesel özelliklerinden dolayı şehirli ve zengin ailelerin konaklarında kullanılmıştır[70]. Bu tür örneklerin yaygınlığı İstanbul tarzının etkisiyle açıklanmaktadır[71]. Akın, Osmanlı-Türk evinde uygulanan yükseltilmiş ve köşeleri pahlanmış tavanlı, sekiz köşeli orta sofalı plan şemasının batı etkisiyle ortaya çıkan eliptik sofadan bir önceki aşama olduğunu belirtmektedir[72].

Günay'a göre, 19. yüzyılda, Osmanlı mimarisindeki batı etkisi sebebiyle ve ekonomik gerekçelerle, Osmanlı-Türk evinin cephe düzeni daha sade bir hâl almıştır. Bu dönemde çatkılar sıvalı, saçaklar küçük, çıkmalar daha azdır ve cephelerde kâgir (yığma) mimari taklit edilmiştir[73]. Aynı dönemde, konakların iç mekânında, tavan şekillerinde barok motifler ve odalarda bitkisel bezemeler ön plandadır. Batı etkisiyle yaygınlaşan vazolu panolar ve bitkisel motiflerin iç mekânda kullanılması, III. Ahmed'in Topkapı Sarayı'ndaki Yemiş Odası'na dayandırılmaktadır. Gültekin, Anadolu'nun batısında sıklıkla görülen bu tarz süslemelerin, İstanbul'daki hayata özenen taşradaki ayan ve eşraf tarafından yaygınlaştırıldığını belirtmektedir[74].

Eskipazar'ın iki farklı kırsal yerleşiminde incelenen üç konak, biçimleniş, mekân kurgusu, cephe düzeni, süsleme ve detaylar bakımından, 19. yüzyılda batı etkisiyle gelişmiş ve şehir mimarisinde varlıklı aileler tarafından uygulanan yapı tarzıyla büyük oranda benzerlik göstermektedir. Konaklar, bölgenin coğrafi ve iklimsel özelliklerine uygun bir tasarım içerisinde, Hasan Çavuşzade Ailesi'nin geçmişte elde ettiği sosyal, ekonomik ve siyasal güce atıf yapmaktadır. Bu yapıların kültürel ve mimari açıdan bölgedeki geleneği zenginleştirdiği ve ailenin yapılarda bulunan ayrıntılarda (süslemeler, cephe düzeni, plan şeması, kat yükseklikleri vb.) kendi şahsiyetlerini hissettirdikleri dikkate değerdir.

[70] Doğan Kuban, *Türk Ahşap Konut Mimarisi 17.-19. Yüzyıllar* (İstanbul: Türkiye İş Bankası Kültür Yayınları, 2020), 78-84.

[71] Doğan Kuban, *Osmanlı Mimarisi* (İstanbul: YEM Yayın, 2007), 484.

[72] Nur Akın, *Balkanlarda Osmanlı Dönemi Konutları* (İstanbul: Literatür Yayıncılık, Dağıtım, 2001), 53.

[73] Reha Günay, *Türk Ev Geleneği ve Safranbolu Evleri* (İstanbul: YEM Yayın, 1998), 43-44.

[74] R. Eser Gültekin, "Türklerde Bereket Sembolü Olarak Kullanılan Meyve Motifleri ve Mimaride Değerlendirilmesi," *Turkish Studies* 3/5 (2008), 9-31.

Aile siyasal gücünü kaybetmeden önce yaptırılan eserlerin, incelenen konaklara oranla daha görkemli ve kamusal nitelikte olduğu görülmektedir. Örneğin, Safranbolu'daki bazı konakların selamlıklarında rastlanan havuz ögesi, Hasan Çavuşzade Hüseyin Ağa'nın yaptırdığı Havuzlu Asmazlar Konağı'nda bir derebeyine yakışır boyutlardadır. Eskipazar Kıranköy'deki Musa Bey ve Hüseyin Bey konakları seçkin ve varlıklı ailelerin konaklarında olduğu gibi hamamlı olarak tasarlanmıştır. Eskipazar Merkez ve Hanköy köyünde bulunan hanlar ise yörede sadece şehir içi hanlarda görülen büyük bir orta avluya sahiptir.

Korumanın ilk aşamasında, Eskipazar'ın yakınında bulunan Safranbolu şehir merkezindeki geleneksel konutlar, Osmanlı-Türk evlerinin en iyi örnekleri olarak genelleştirilmiş, kasabalar ve kırsal alanlar daha az dikkate alınmıştır[75]. Safranbolu, 1994 yılında, UNESCO Dünya Miras Listesi'ne ise sadece tarihî şehir merkezi dikkate alınarak dahil edilmiştir. Ancak son yıllarda yapılan araştırmalar, bölgedeki tarihî ve kültürel bağlamı keşfetmeyi hedeflemektedir. Bu çalışmalarla Osmanlı Devleti'nin siyasal, sosyal ve kültürel yapısının fiziksel mekâna yansımaları daha detaylı olarak ortaya çıkarılmaya başlanmıştır. Yapılan araştırmalar, Osmanlı'nın gözde taşra kasabalarından olan Safranbolu kadar, Safranbolu'nun yakınlarındaki kırsal yerleşimler ve kasabaların da benzer zenginlikteki mimari değerlere sahip olduğunu göstermektedir. Bu eserlerin önemli bir bölümü Türk-Müslüman, bir bölümü de Rum-Hristiyan halkın sosyokültürel, ekonomik ve siyasal durumunu yansıtmaktadır[76].

## Sonuç

1831 yılında İstanbul'da âyan ve kapucubaşı olarak görevler üstlenen Hasan Çavuşzade Hüseyin Ağa[77] ve ailesinin dönemin başkenti İstanbul ve saray ile köklü ilişkileri olduğu anlaşılmaktadır[78]. Kendilerine şehrin karmaşasından uzakta güvenli bir yer arayan ailenin yerleşmek için tercih ettiği yerlerin kırsal alanlardaki dere boylarında ve kervan yollarının üzerinde olması, Hüseyin Ağa ve oğlu Musa Bey için kullanılan "derebey" ifadesinin coğrafi olarak da haklılığını göstermektedir. Aile, konum tercihleri sayesinde verimli arazilerden yararlanmış ve ticareti kontrol altına almıştır. Ayrıca hanlar gibi stratejik yapılar inşa edip işleterek istihbarat elde etmiş oldukları da düşünülmektedir.

Hasan Çavuşzadeler siyasal güce sahipken, büyük ölçekli ve kamusal yapılar inşa ettirmiştir. Siyasal gücün kaybedilmesinden sonra inşa edilen ve bu çalışma kapsamında detaylı olarak incelenen üç konağın ise daha mütevazi boyutlara ve mimari tarza sahip olduğu görülmektedir. Fakat bu yapılarda ailenin karakterine uygun olarak dönemin varlıklı aileleri tarafından bölgede de benimsenen Batı ve İstanbul etkisiyle şekillenmiş şehirli bir tarzın kullanıldığı tespit edilmiştir.

Bu çalışma kapsamında araştırılan yapılardan Havuzlu Asmazlar Konağı (Tarih/No: 27.11.1990/1500), Musa Bey Konağı'nın sadece hamam kısmı (Tarih/No: 5.4.2013/823), Musa Bey Hamamı (Tarih/No: 7.6.2013/956), İsmail Bey Konağı (Tarih/No: 7.6.2013/954) ve Tamışlar köyündeki camii (Tarih/No: 7.6.2013/954), Karabük Kültür Varlıklarını Koruma Bölge Kurulu'nun kararlarıyla "Korunması Gerekli Taşınmaz Kültür Varlığı" olarak tescil edilmiştir. Ancak yapılan araştırmada Hasan Çavuşzadeler tarafından yaptırılan ya da onarılan diğer yapıların henüz yasal koruma altında olmadığı anlaşılmıştır.

[75] Reha Günay, *Geleneksel Safranbolu Evleri ve Oluşumu* (Ankara: Kültür Bakanlığı Yayınları, 1989); M. Bilgi Denel, "Safranbolu: Roots of Urban Form in an Anatolian Town," *Traditional Dwellings and Settlements Review* 1/1 (1989), 49-63.

[76] Aysun Özköse, *Safranbolu Köylerinin Yöresel Mimarisi* (İstanbul: YEM Yayın, 2022); Büşra Karadeniz, "Vernacular and Traditional Architecture in Yörük Village, Safranbolu" (Yüksek lisans tezi, Yeditepe Üniversitesi, 2023); Tuğba Ballıoğlu, "Principles for the Conservation of the Rural Heritage of Hacılarobası (Safranbolu)" (Yüksek lisans tezi, Orta Doğu Teknik Üniversitesi, 2023); A. Nazlı Soykan ve Durmuş Gür, "Safranbolu, Yazıköy Kilise (Mimari, Süsleme, Liturjik Elemanlar)," *Karabük Üniversitesi Sosyal Bilimler Enstitüsü Dergisi,* Özel Sayı 1 (2015), 103-129. https://doi.org/10.14230/joiss98

[77] Yazıcıoğlu, *Küçük Osmanlı'nın Öyküsü Safranbolu Tarihi,* 249.

[78] Princesse Belgiojoso, *Scenes de la vie Turque*, 277-377.

1970'lerde başlayan, Safranbolu'daki mimari mirası koruma faaliyetleri sonucunda, 1994'te şehrin UNESCO Dünya Miras Listesi'ne dahil edilmesiyle, şehirdeki mimari miras öne çıkmıştır. Ancak şehrin çevresindeki dar alanda kültürel mirasın korunması için alınan önlemler kırsal alanlar için oldukça yetersizdir. Gerek mülk sahipleri, yerel halk ve yetkililerin bu değerlere yeterli ilgiyi göstermemesi gerekse kaynakların yetersizliği, kültürel mirasın hızla yok olmasına sebep olmaktadır. Bölgede, öncelikle bu tür tarihî belge niteliğindeki kültürel mirasın sürdürülebilir kılınmasına odaklanan bilimsel araştırmaların ve bilinçlendirme faaliyetlerinin teşvik edilmesi, buna yönelik geliştirilen projelerin uygulanabilirliğinin halkın da katılımıyla artırılması önerilmektedir.

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**Kişisel Görüşmeler**

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Ahmet Bostan (araştırmacı yazar) ile kişisel görüşme, Eskipazar, 29 Mayıs 2023.

Dursun Eken (Hasan Çavuşzade Ailesi üyesi) ile kişisel görüşme, Eskipazar, 30 Mayıs 2023.

Dursun Küçükyılmaz (Hasan Çavuşzade Ailesi üyesi) fotoğraf arşivi, Eskipazar, 30 Mayıs 2023.

Dursun Küçükyılmaz (Hasan Çavuşzade Ailesi üyesi) ile kişisel görüşme, Eskipazar, 19 Haziran 2025.

Hakkı Asmaz (Asmazlar Ailesi üyesi) ile kişisel görüşme, Safranbolu, 6 Haziran 2023.

Halil İbrahim Özkök (Hasan Çavuşzade Ailesi üyesi) ile kişisel görüşme, Eskipazar, 29 Mayıs 2023.

Hamdi Özkök (Hasan Çavuşzade Ailesi üyesi) ile kişisel görüşme, Karabük, 12 Haziran 2023.

Hüseyin Eken (Hasan Çavuşzade Ailesi üyesi) ile kişisel görüşme, Karabük, 30 Mayıs 2023.

Hüseyin Özkök (Hasan Çavuşzade Ailesi üyesi) ile kişisel görüşme, Karabük, 17 Haziran 2023.

İhsan Özkök (Hasan Çavuşzade Ailesi üyesi) ile kişisel görüşme, Eskipazar, 31 Mayıs 2023.

Mithat Uyanık (Hasan Çavuşzade Ailesi üyesi) ile kişisel görüşme, Eskipazar, 31 Mayıs 2023.

Mustafa Ünal (yerel halk) ile kişisel görüşme, Karabük, 11 Haziran 2023.

Turgut Doğan (yerel halk) ile kişisel görüşme, Eskipazar, 11 Haziran 2023.

Ünsal Tunçözgür (araştırmacı yazar) ile kişisel görüşme, Safranbolu, 7 Haziran 2023.

# Mitigating fit-out waste in rentable offices: The role of flexible design strategies

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## Abstract

Fit-out waste generated during building refurbishments has significant environmental consequences, accounting for substantial portions of construction and demolition waste. Over a 50-year lifespan, the total waste generated by a rentable office was found to be approximately four times higher than that of a standard office, while implementing open-plan layouts and movable partitions reduced embodied energy by up to 61.3% and embodied energy loss by 84.3%, respectively.This study investigates the effectiveness of flexible interior strategies—open-plan layouts and movable partition systems—in mitigating the environmental impacts associated with fit-out waste in rentable offices. The analysis, structured around three hypotheses and four office typologies, covers the production, replacement, and refurbishment stages of the building life cycle and evaluates total waste, life cycle embodied energy (LCEE), and embodied carbon (EC).The findings highlight that flexibility-oriented design strategies can significantly reduce material turnover and resource inefficiency in the building sector. However, strategies such as recycling, reuse, and the economic aspects of the interventions are excluded from the scope of this study.

## 1. Introduction

The emergence of high-rise office buildings can be traced back to the post-Industrial Revolution era, when the accumulation of capital and increasing urban employment created a demand for new typologies of office space. The earliest examples of high-rise offices appeared in the late 19th century, particularly in the urban centers of New York and Chicago, where land scarcity and population density necessitated vertical construction [1]. Throughout the 20th century, as high-rise buildings proliferated, design strategies prioritizing daylight access, open-plan layouts, high ceilings, and compact service cores were adopted to enhance rentability [2].

In the contemporary era, high-rise offices are widely categorized under terms such as ‘flexible office’ [3] and ‘rental office’ [4], reflecting changing work styles and user expectations. These buildings now dominate the skylines of metropolitan cities. According to a recent study of 54 high-rise buildings in Istanbul, Ankara, and Izmir, approximately 24% of them function as office spaces [5].

Notably, in rental buildings, spatial modifications may occur not only during occupancy but also in the pre-occupancy phase.

These interventions often generate considerable volumes of construction and demolition (C&D) waste and accelerate material consumption [6, 7]. C&D waste results from construction, renovation, and demolition phases and accounts for 10–30% of global landfill waste [8, 9]. Within this category, fit-out waste—originating from tenant-specific interior alterations—constitutes 10–20% of C&D waste and has disproportionately high embodied environmental impacts [10, 11]. In this context, the life cycle of rental offices exerts considerable pressure on ecological systems, contributing to air, water, and soil pollution, and exacerbating climate change [12].

A Swedish study reported that refurbishment-related waste in office spaces amounts to 31–38 kg/m², with an associated embodied carbon footprint of 93–96 kg $CO_2e/m^2$ [13]. Likewise, Eberhardt et al. [14] found that building materials in long-lifespan office buildings (80+ years) were responsible for 72% of total greenhouse gas emissions and 50% of primary energy use. During tenant transitions, walls and ceilings account for over 70% of the generated waste [15], and material production was identified as the leading contributor to embodied carbon, surpassing impacts from construction or end-of-life phases [16].

Addressing waste at its source has gained momentum in sustainable construction discourse. The waste management hierarchy emphasizes reduction, reuse, and recycling, with minimization regarded as the most effective strategy [17, 18]. Researchers argue that minimizing waste during the design stage is crucial to reducing life-cycle emissions [9].

Flexible building design has been proposed as a viable strategy, allowing spatial adaptability without demolition and thereby reducing material turnover and fit-out waste. Li & Yang [19] emphasized the need for innovative design strategies for waste reduction in office interiors. Forsythe and Fini [20] quantified that up to 55% of fit-out waste in Australian office refurbishment projects ends up in landfills, primarily due to rigid space planning and materials that are difficult to disassemble.

Salgın et al. [6], in a study on a multifunctional public building in Kayseri, demonstrated the value of maximizing vertical and horizontal openings to allow different spatial uses over time. Similarly, Mateus et al. [21] found that movable partitions enhance both flexibility and sustainability by minimizing waste generation. Modular components such as raised floors, suspended ceilings, and demountable panels are seen as essential features of adaptable office interiors [22, 23].

Although the environmental implications of tenant changes have been examined in terms of waste quantification [20], life-cycle cost assessment [24], and flexible interior systems [14], few studies have addressed the embodied energy and carbon impacts of such transformations, particularly in the context of megacities. Moreover, the environmental impact of interior flexibility have rarely been quantified through life cycle assessment (LCA) methods. To address this research gap, the present study evaluates how flexible interior strategies in rentable offices can mitigate fit-out waste, embodied energy (EE), and embodied carbon (EC). “Embodied energy loss” is also introduced to highlight the resource inefficiencies associated with premature removal of building components. As waste prevention is the primary step in the waste management hierarchy, this study contributes to the environmental sustainability agenda of urban office design. This study was conducted to guide designers, office owners, and material manufacturers toward more durable and resource-efficient building applications. While the scope of this study focuses on environmental indicators such as embodied energy, carbon emissions, and waste production, the results may also form a basis for future research integrating the economic and investment aspects of sustainable office design. Economic aspects, reuse and recycling strategies are excluded from the scope of this study.

## 2. Material and Methodology

This section outlines the materials and methodological framework employed in the study. The methodology is structured around the testing of

three core hypotheses concerning the environmental implications of flexible interior design strategies in rentable office buildings.

## 2.1. Objective, assumptions, and delimitations

The primary objective of the study is to evaluate how flexible design strategies—specifically open-plan layouts and movable partition walls—affect environmental outcomes in rentable offices. The analysis focuses on four office types located in Ankara, Türkiye's capital city, assessing parameters such as waste generation, total embodied energy (LCEE), energy losses, and global warming potential (GWP) across the building life cycle.

Three hypotheses were formulated and tested across four office typologies. In defining these hypotheses, multiple user and material change scenarios were established. The study is limited to the GWP category; other environmental impact indicators (e.g., acidification, eutrophication), strategies such as recycling, reuse and economic aspect of the strategies are excluded from scope.

The study examines four office configurations to evaluate the influence of flexibility strategies on material consumption and environmental impact:

Office 01: S – Standard office with a closed-plan layout and fixed partitions (no tenant change assumed)

Office 02: RCF – Rentable office with closed-plan layout and fixed partitions

Office 03: ROF – Rentable office with open-plan layout and fixed partitions

Office 04: RCM – Rentable office with closed-plan layout and movable partitions

In the standard office, material replacement occurs only upon reaching the end of service life (B4 phase), whereas in rentable types, material changes are triggered by tenant transitions.

The assumed service life of the office unit is 50 years, consistent with similar studies [14, 25]. Lease duration is defined as five years, based on real estate consultant interviews and literature, indicating typical tenant turnover for office spaces under 1000 m² [10]. It is assumed that the initial tenant is a non-health-related business, followed by a health sector occupant—triggering interior modifications—repeating every five years. Two sensitivity analyses were conducted to determine the influence of these parameters.

Interior wall material, floor and ceiling coverings were considered as having the largest area and are the most frequently replaced materials. The building materials of the offices were selected as carpet tiles and linoleum on the floor, gypsum panels and glass on the walls, paint for open ceilings and gypsum panels for suspended ceilings to match the types of companies. Paint and rock wool applied with gypsum board/panel also taken into consideration. In addition, a movable partition wall made of medium density board (MDF) was applied as a separate scenario for both health-related and non-health-related office types.

Material properties (density, unit mass, service life, unit embodied energy) were collected from Environmental Product Declarations (EPDs). The One Click LCA software was employed to calculate GWP using EN 15978 methodology [26]. This platform is widely used in LCA-based research in the building sector due to its comprehensive material database [27, 28].

Environmental impacts were evaluated over the life cycle stages A1–A3 (production), B4 (replacement), and B5 (refurbishment). Following Moisio et al. [29], B4 encompasses replacements due to end-of-life; B5 covers changes due to user needs (e.g., tenant changes). Obrecht et al. [30] emphasize the importance of distinguishing between these cycles in environmental assessments.

Three hypotheses were tested:

- Hyp. A: Rentable offices generate greater amounts of fit-out waste (kg/m²) and higher life-cycle embodied energy (LCEE, MJ/m²) than standard offices.
- Hyp. B: Among rentable offices, those with closed-plan configurations produce more fit-out waste (kg/m²) and exhibit higher LCEE (MJ/m²) than open-plan equivalents.
- Hyp. C: Incorporating movable partitions instead of fixed ones in rentable offices reduces total fit-out waste generation (kg/m²) and improves LCEE (MJ/m²) performance.

These hypotheses were tested through a comparative LCA of four office typologies, where fit-out waste, LCEE, and EC were used as the main quantitative indicators. These indicators were examined by modeling four office types in Autodesk Revit, extracting material quantities through BIM schedules, and computing environmental data via One Click LCA. Material and occupancy scenarios were based on real estate data and tenant change patterns. A summary of the office typologies, service life, replacement cycles, simulation tools, databases, and core research themes is presented in Fig. 1.

To provide a clear overview of the research workflow, Fig. 1 summarizes the methodological steps followed in this study. Step 1 presents the selection of the case building and the context. Step 2 outlines the formulation of hypotheses and their relationship with office types. Step 3 illustrates the BIM-based modeling and data collection process. Step 4 shows the evaluation of the scenarios using One Click LCA and Excel. Finally, Step 5 presents the comparative analysis the results. These five stages collectively represent the methodological framework applied throughout the study.

## 2.2. Case study

The case study was selected based on representativeness and accessibility criteria. Ankara, the capital of Turkey, was chosen because it is a metropolis with a high concentration of office buildings and high-rise commercial structures, reflecting the country's contemporary building practices. The selected high-rise office building represents the modern office structures commonly found in metropolitan areas, featuring a central core and flexible office units suitable for various usage models. Further reasons for selecting the building include the availability of accessible data and architectural plans that facilitate embodied energy analysis. The building comprises 18 floors, each containing four separate office units measuring 234 m².

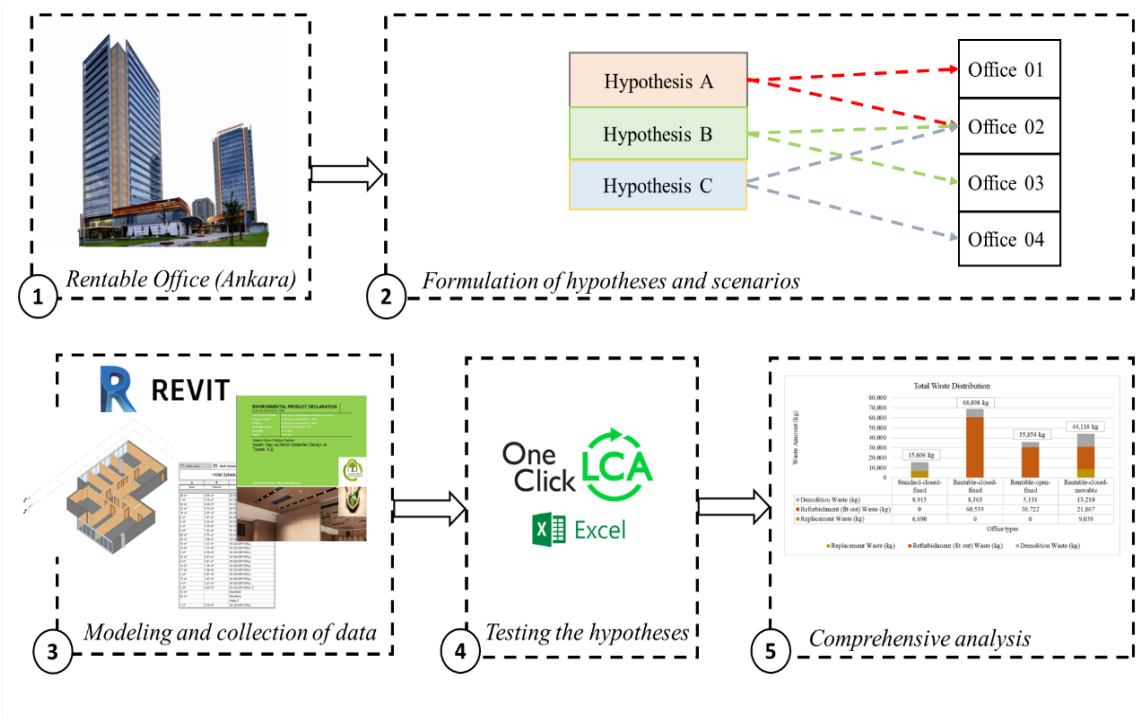


Fig. 1. Workflow of the study

For the purposes of this study, a single office unit was analyzed. The layout of the selected unit includes an entrance, six enclosed offices, a kitchen, a meeting room, and two restrooms. To develop an alternative office type based on spatial flexibility, an open-plan layout was also modeled by merging the individual office spaces with the entrance area (Fig. 2).

To obtain detailed and up-to-date information on rentable office practices, a semi-structured interview was conducted with the building's sales consultant. The interview aimed to gather qualitative data related to tenant behaviors, interior material choices, and the building's functional configuration. The key findings obtained from the interview, which form the empirical basis of this study, are summarized below:

- The average lease renewal or tenant turnover cycle is approximately every five years.
- Tenants generally belong to either the healthcare or non-healthcare sectors.
- Standard material finishes currently in use include:
  - ✧ Carpet tiles for flooring
  - ✧ Drywall for partition walls
  - ✧ Paint applied directly to open ceilings
- For tenants in the healthcare sector, alternative materials are often preferred for functional and hygienic reasons. These include linoleum flooring, glass partition walls, and plasterboard ceilings to facilitate natural lighting and maintain sanitary conditions.

## 2.3. Embodied energy and embodied carbon

Embodied energy (EE) refers to the total energy consumed throughout the life cycle of building materials, including their production, transportation, installation, maintenance, replacement, and eventual demolition [31]. Embodied carbon (EC), on the other hand, represents the amount of greenhouse gas emissions associated with these processes [32]. Both EE and EC are calculated by multiplying the unit value of a material (MJ/kg for EE or $kgCO_2e/kg$ for EC) by the material's total mass (kg).

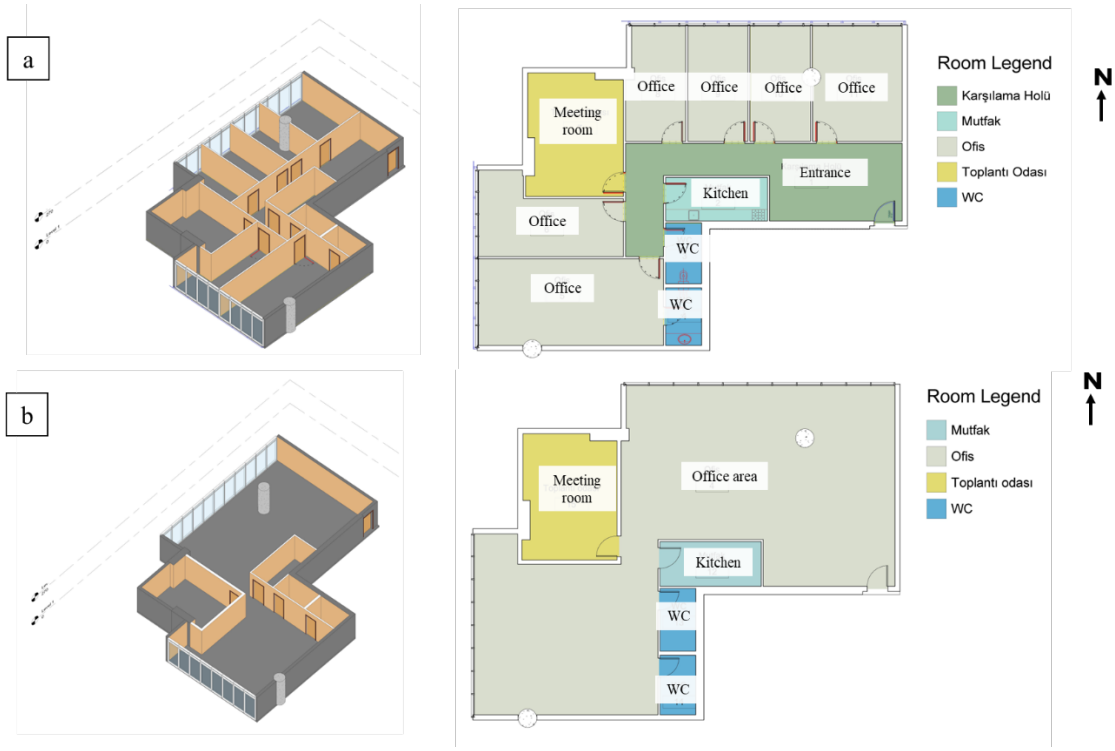


Fig. 2. The office unit with closed-plan (standard office) (a) and open-plan (b)

This study evaluates the lifecycle embodied energy (LCEE) and embodied carbon (EC) of an office unit over a 50-year service period. Calculations were performed manually using Microsoft Excel. The manual calculation method was selected because the Environmental Product Declarations (EPDs) for the analyzed materials were obtained directly from the manufacturers. Each EPD provides standardized environmental impact indicators per functional unit (e.g., 1 kg or 1 $m^2$). No LCA software was used in the study because it was not deemed necessary to re-enter the standardized values already available in the EPDs into a database. Since the scope of the study focused solely on the embodied carbon calculation (A1-A3, B4-B5 phases) of specific materials, there was no need for the modules of a comprehensive process-based LCA software. Manual calculations were obtained directly from EPD data in accordance with international standards (EN 15804 and ISO 14044).

The selection of building materials is based on the type of tenant sector—healthcare or non-healthcare. As detailed in Table 1, offices occupied by companies outside the health sector use gypsum board (including rock wool insulation and paint) for interior walls, carpet for flooring, and painted open ceilings. In contrast, healthcare offices use glass partition walls, linoleum flooring, and suspended gypsum panel ceilings to meet hygiene and lighting needs. Paint is assumed to be renewed with each tenant change, regardless of sector.

Service lives for materials exceeding 20 years in Environmental Product Declarations (EPDs) are standardized as 25 years to match evenly with the 50-year service life of the building. While most interior materials are assumed to be replaced at every tenant change (i.e., every 5 years), movable partition walls are assigned a replacement cycle of 25 years due to their reusability and spatial adaptability.

Both renewable and non-renewable resource consumption is included in the calculations. Building materials were selected based on proximity to the case study location and the availability of reliable EPDs from manufacturers (Table 2). For the movable and glass partition walls, material specifications were obtained through direct communication with a representative from Aspen.

This study introduces a concept termed "Embodied Energy Loss" (EEloss), which quantifies the energy wasted due to the disposal of a building material prior to the end of its expected service life. EEloss serves as an indicator of inefficiency in material utilization, particularly relevant in rentable office buildings where frequent interior refurbishments are common.

Table 1. Office types, plan layout and building materials

| Office type | Company type | Plan scheme | Partition type | Floor | Wall | Ceiling | Frequency of tenant change |
|---|---|---|---|---|---|---|---|
| Standard | Non-health | Closed | Fixed | Carpet | Gypsum board | Paint | - |
| Rentable | Non-health | Closed | Fixed | Carpet | Gypsum board | Paint | 5 years |
| Rentable | Health | Closed | Fixed | Linoleum | Glass | Gypsum board | 5 years |
| Rentable | Non-health | Open | Fixed | Carpet | Gypsum board | Paint | 5 years |
| Rentable | Health | Open | Fixed | Linoleum | Glass | Gypsum board | 5 years |
| Rentable | Non-health | Closed | Movable | Carpet | MDF system | Paint | 5 years |
| Rentable | Health | Closed | Movable | Linoleum | MDF system | Gypsum board | 5 years |

Table 2. Database of the selected building materials

| Material | EE (MJ/kg) | EC (kgCO2e) (A1-A3) | Source |
|---|---|---|---|
| Gypsum board | 4.2 | 1.72 | [33] |
| Rock wool | 32.12 | 19.6 | [34] |
| Paint | 25.7 | 1.72 | [35] |
| Glass panel | 75.2 | 115 | Personel communication |
| MDF panel | 50.2 | 73.2 | Personel communication |
| Carpet tile | 36.9 | 5.03 | [36] |
| Linoleum | 54.4 | 6.51 | [37] |

In the scope of this research, it is assumed that all waste is directed to landfills at the end-of-life stage. Therefore, tracking EEloss provides valuable insight into energy losses embedded in materials that are prematurely removed and discarded.

$$EE_{loss} = EE_m - [EE_m * (t_p / t_s)] * t \quad (1)$$

where:

$EE_{loss}$ is the embodied energy loss (MJ),

$EEm$ is the embodied energy required for manufacturing the material (MJ),

$t_p$ is the actual time the material is used in the building (years),

$t_s$ is the nominal service life of the material (years).

$t$ represents the number of times the material is replaced or used over the building's 50-year lifecycle.

By incorporating $EE_{loss}$ into the assessment, this study emphasizes the importance of material longevity and design strategies that reduce premature replacement, thereby supporting more sustainable construction practices.

## 2.4. Office utilization and material change scenarios

Tenant turnover in rentable office spaces typically results in the replacement of interior finishes—particularly wall partitions, flooring, and ceiling materials—leading to significant amounts of fit-out waste. In this study, it is assumed that each tenant occupies the office for a 5-year period, with alternating tenant types representing non-health-related sectors (e.g., software, architecture, law) and health-related sectors (e.g., medicine, chemistry, sports).

This tenant alternation cycle continues over the 50-year service life of the office unit, with interior materials being replaced at the end of each lease period. These recurring modifications simulate real-world refurbishment patterns that contribute to embodied energy losses and carbon emissions. The material change scenarios for each office type over the service life are detailed in Table 3, illustrating how different interior layouts and material strategies affect overall environmental performance.

Additionally, the waste generated throughout the life cycle of the office units was categorized under three main stages: refurbishment, replacement, and demolition. Waste resulting from the scheduled replacement of materials that have reached the end of their designated service life is classified under Stage B4 (Replacement). In contrast, premature removal of materials due to tenant changes—before the materials reach their end-of-life—is classified under Stage B5 (Refurbishment).

Based on the material usage sequence outlined in Table 3, materials installed by the final tenant and remaining in place at the end of the 50-year service life of the office unit are considered demolition waste, and are accounted for under Stage C1 (End-of-Life), as summarized in Table 4.

## 2.5. Effect of parameter variations on results

Due to the variability of input parameters, reliance on assumptions, and incomplete information, it is important to identify uncertainties through sensitivity analysis in LCA [38].

Table 3. Scenarios for material changes during the service life of the office

| Years | Wall | Floor | Ceiling |
|---|---|---|---|
| 1-5 | Gypsum board | Carpet tile | Paint |
| 6-10 | Glass panel | Linoleum | Gypsum board |
| 11-15 | Gypsum board | Carpet tile | Paint |
| 16-20 | Glass panel | Linoleum | Gypsum board |
| 21-25 | Gypsum board | Carpet tile | Paint |
| 26-30 | Glass panel | Linoleum | Gypsum board |
| 31-35 | Gypsum board | Carpet tile | Paint |
| 36-40 | Glass panel | Linoleum | Gypsum board |
| 41-45 | Gypsum board | Carpet tile | Paint |
| 46-50 | Glass panel | Linoleum | Gypsum board |

Table 4. Service life and frequency of change of building materials due to office type

| Material | Service life | Replacement (B4) cycle | Refurbishment (B5) cycle |
|---|---|---|---|
| G. board | 50 | 0 | 4 (rentable) |
| R. wool | 50 | 0 | 4 (rentable) |
| Glass | 25 | 0 | 4 (rentable) |
| Carpet | 10 | 4 (standard) | 4 (rentable) |
| Linoleum | 25 | 0 | 4 (rentable) |
| Paint | 5 | 9 (standard) | 4 (rentable) |
| M.partition | 25 | 1 (rentable) | 0 |

*(G.board: gypsum board; R.wool: rockwool; M.partition: movable partition)

To assess the robustness of the results, a deterministic one-at-a-time (OAT) sensitivity analysis was performed by varying two key parameters (tenant turnover rate and building service life) by ±20% from its base value. The reason for selecting a ±20% variation range is that this is a standard value often accepted as the margin of uncertainty in material properties or model parameters [39]. The environmental impacts include total waste generation and embodied energy over the building's lifetime.

## 2.6. Data adjustment for benchmark comparison

To validate the findings, the waste quantities calculated in this study were compared with existing benchmarks in the literature. Since previous studies present waste amounts on a per square meter basis for single refurbishment events, the current results were normalized accordingly. The study assumes a 50-year service life for each office unit, with nine refurbishment cases and one demolition over this period. Accordingly, one-time refurbishment waste has been calculated using the following equation to make it comparable with other studies.

$$O_W = {}^{T_w}/_{n} \quad (2)$$

where:

$O_w$ indicates waste amount per one-time refurbishment (kg/m²); Tw represents total refurbishment waste amount over 50 years (kg/m²); and n is the number of refurbishment cycles in 50 years. n is taken as 9.

## 3. Results and Discussion

This section presents the outcomes of the hypothesis testing outlined previously. The validity of Hypotheses A, B, and C is evaluated in sequence, followed by an analysis of the embodied environmental impacts of the applied flexible design strategies.

### 3.1. Hypothesis testing

Hypothesis A compares LCEE (MJ/m²) and total waste generation (kg/m²) of a standard office and a rentable office with a closed-plan layout and fixed partitions across life cycle stages A1–A3, B4, and B5. The findings reveal that the rentable office has a 7.3-fold increase in LCEE and a 4.4-fold increase in total waste compared to the standard office. Because all material service lives are multiples of the building's 50-year service life (5, 10, 25 years), the standard office incurs no EE loss, whereas the rentable office incurs more EE loss due to premature material replacements. Given that both LCEE and waste generation are lower in the standard office, Hypothesis A is validated.

To test Hypothesis B, two rentable office types with fixed partitions—one with a closed-plan and the other with an open-plan scheme—were compared. Results show that the open-plan layout reduces LCEE by 61.3%, EE loss by 64%, and total waste by 48% relative to the closed-plan layout. These findings confirm the validity of Hypothesis B.

Hypothesis C was evaluated by comparing rentable offices with closed plans utilizing either fixed or movable partitions. The use of movable partitions reduced LCEE by 38.1%, EE loss by 84.3%, and total waste by approximately 36% compared to fixed partitions. Thus, Hypothesis C is supported.

Overall, the open-plan layout proves to be most effective in minimizing total waste, whereas movable partitions are more efficient in reducing embodied energy loss (Fig. 3). In terms of overall life cycle embodied energy (LCEE) performance, the ranking from most to least favorable scenario for rentable offices is open-plan layout with fixed partitions, closed plan with movable partitions and closed-plan with fixed partitions.

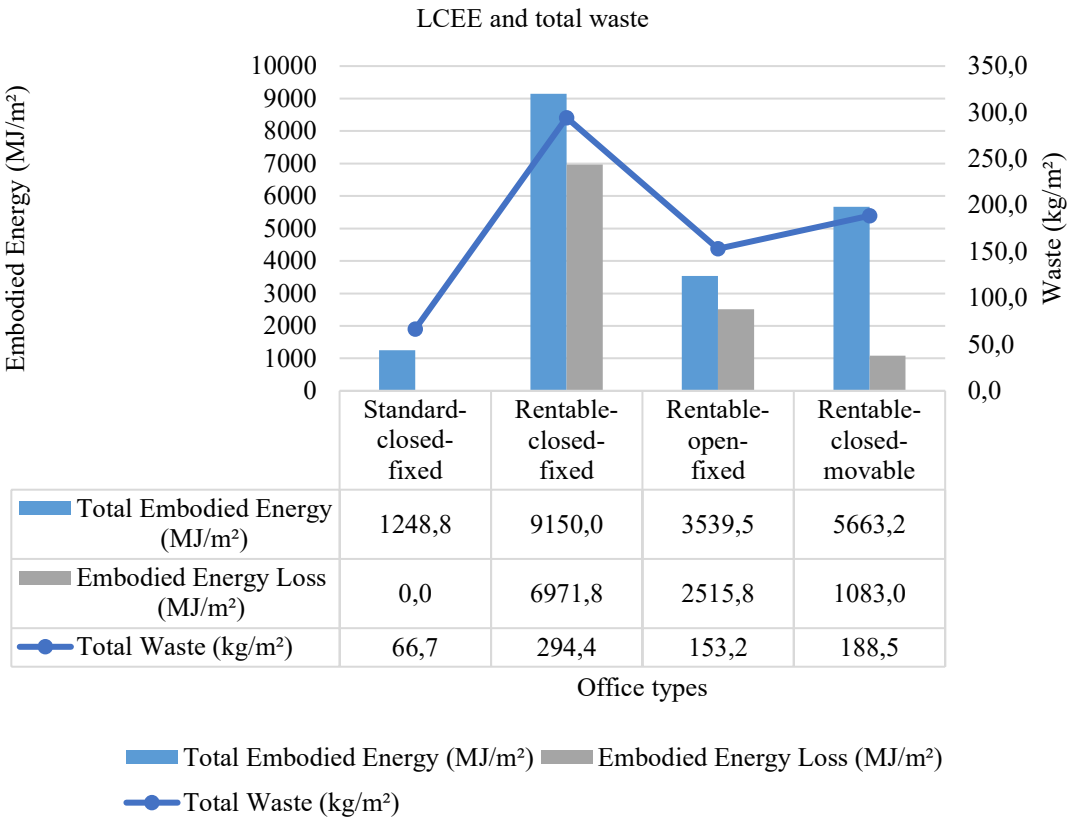


Fig. 3. Comparison of four office types in terms of total embodied energy, embodied energy loss and total waste

When examining the life cycle stages of the office types individually, it becomes evident that rentable offices consume more than five times the embodied energy of standard offices during the production phase (A1–A3). This is primarily due to the frequent use of varied materials, with each material's first application being assessed within the production scope. However, implementing an open-plan layout in rentable offices reduces the embodied energy consumed during this phase by approximately 61%. Conversely, the introduction of movable partitions increases the embodied energy in the production phase.

In the replacement phase (B4), no embodied energy was recorded for the standard or rentable offices with fixed partitions. This is because materials in rentable offices are seldom used for their overall service life due to tenant changes every five years. However, in rentable offices with movable panels, the embodied energy associated with replacements is approximately twice as high as in standard offices, owing to the continued material changes throughout the building's lifecycle.

Tenant turnover also necessitates the introduction of new materials, particularly during the refurbishment phase (B5). Fig. 4 illustrates the EE comparison between different stages. In this comparison, the total embodied energy (EE) of each scenario is normalized to 100%, and the contribution of each lifecycle stage (A1–A3 Product, B4 Replacement, and B5 Refurbishment) is presented as a percentage of the total. The most remarkable improvement is observed in the rentable-closed-movable case. Thus, the comparison reveals that employing movable partition systems can effectively redistribute and reduce embodied energy demand across the building life cycle (Fig. 4).

## 3.2. Total waste distribution

A detailed assessment of total waste generation reveals that rentable offices produce four times more waste than standard offices, even when both share identical plan schemes and fixed partition walls. This increase is solely attributed to tenant turnover, which leads to frequent interior alterations. In contrast, demolition waste levels are comparable between the two office types.

When the plan scheme of the rentable office is modified to an open-plan layout, the total waste amount is reduced by 48%, primarily due to a 50% decrease in fit-out waste. Additionally, open-plan configurations lead to lower end-of-life waste compared to closed-plan schemes, reflecting their more efficient material use.

The integration of movable partition walls further reduces the total waste by approximately 36% compared to fixed partition walls. This is because movable partitions provide spatial flexibility and are retained for longer periods despite frequent tenant changes. Notably, fit-out waste is lowest in the office type employing movable partitions among all rentable office models.

However, replacement and demolition waste are slightly higher in these configurations. This is explained by the completion of the movable partition’s service life, which necessitates a one-time replacement during the office's 50-year life span (Fig. 5).

## 3.3. Embodied carbon

Embodied carbon across the different life cycle stages of each office typology were calculated using the One Click LCA tool, following the EN 15978 methodology. Results indicate that adopting an open-plan layout has the most significant effect in reducing greenhouse gas emissions, particularly during the production stage (A1–A3).

By contrast, the highest emissions from material exchange activities (stages B4–B5) were observed in the rentable office with a closed plan scheme and fixed partitions, where frequent tenant turnover necessitates repeated material replacement and refurbishment.

Overall, the implementation of an open-plan configuration in rentable offices results in a 61% reduction in total embodied carbon emissions. Similarly, the use of movable partition systems contributes to a 45.2% reduction in total global warming potential (GWP) when compared to standard fixed-partition office layouts (Fig. 6).

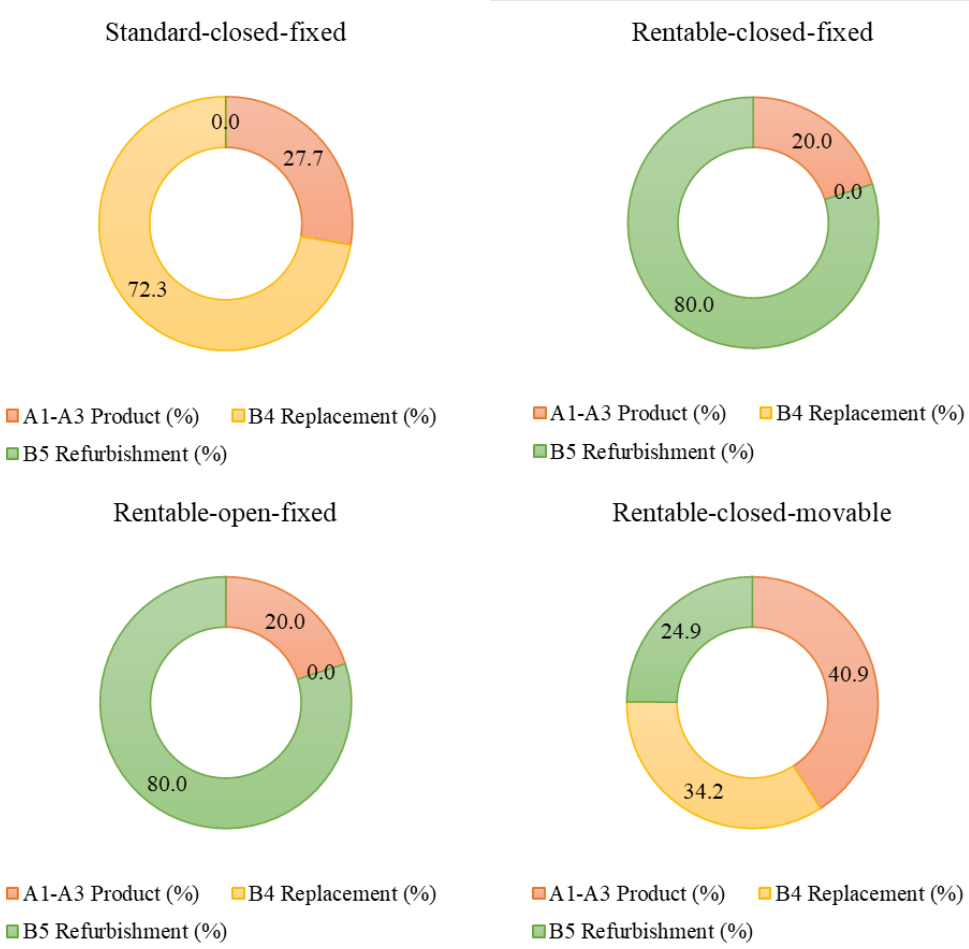


Fig. 4. Comparison of embodied energy of the lifecycle stages (%)

These findings demonstrate that spatial flexibility strategies—specifically open-plan design and movable partitions—not only minimize material waste but also substantially mitigate embodied carbon emissions over the building's lifecycle.

### 3.4. Building components and materials

A more granular evaluation of the embodied environmental impacts associated with specific building components and materials provides critical insight into the sustainability performance of different office configurations. To this end, the study analyzes the types of waste, total embodied energy (EE), and embodied energy losses ($EE_{loss}$) generated by material changes over a 50-year lifecycle of the rentable office typologies.

For ceilings, the analysis includes gypsum board, rock wool, and paint in the case of suspended systems, and only paint for open ceiling configurations. Carpet tiles and linoleum are considered for flooring, while wall assemblies incorporate gypsum panels, glass partitions, rock wool, paint, and movable medium-density fiberboard (MDF) partitions, depending on the office type and function.

Among these, the flooring contributes the least to both material waste and embodied energy, owing to its limited material diversity. In contrast, ceilings exhibit the lowest lifecycle embodied energy (LCEE) due to the relatively low energy intensity of gypsum board and minor quantities of paint and insulation.

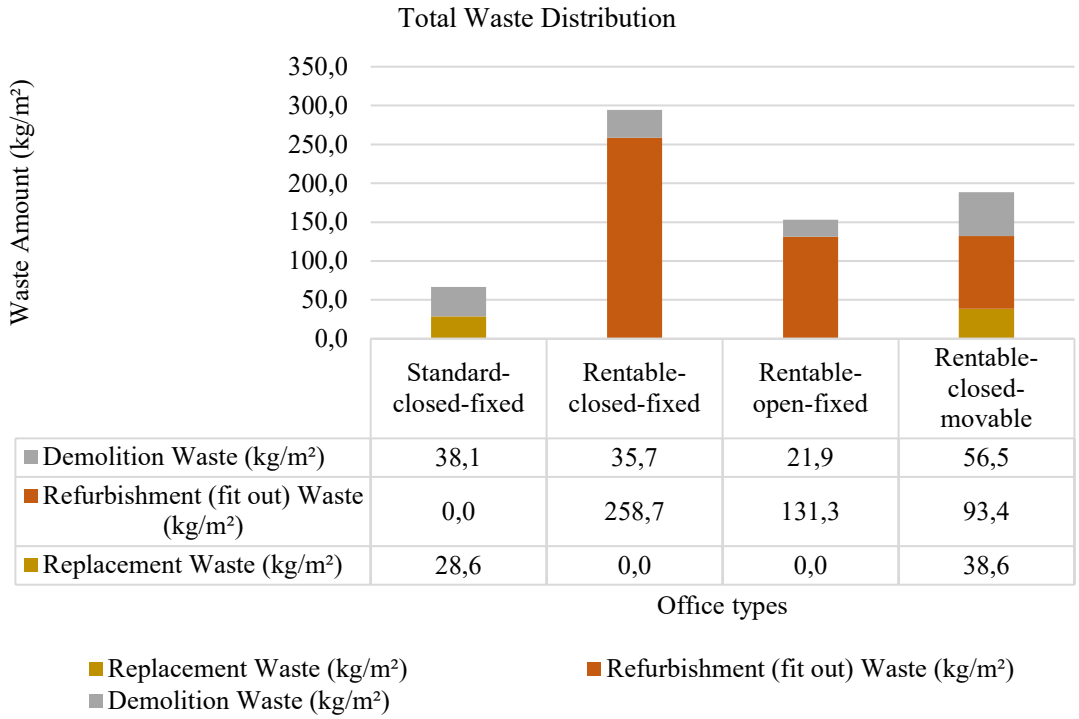


Fig. 5. Waste generation due to plan layout and partition type

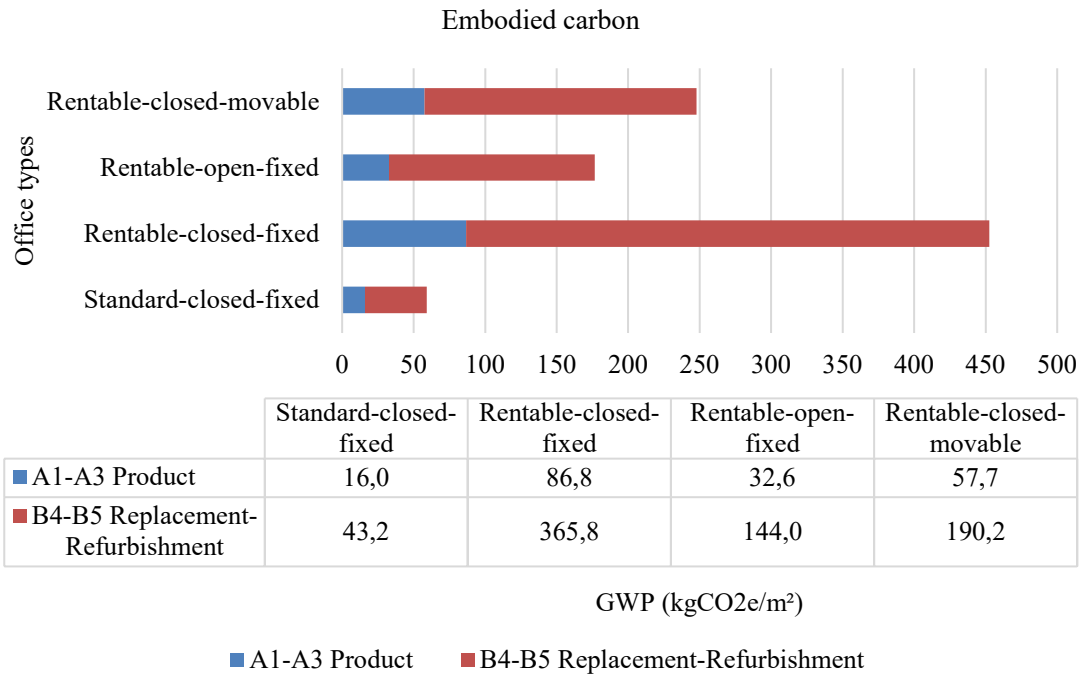


Fig. 6. Comparison of embodied carbon of the lifecycle stages ($kgCO_2e/m^2$)

For all rentable office scenarios, the embodied energy and waste associated with floor and ceiling components remain constant: approximately 1289 MJ/m² and 30 kg/m² for flooring, and 584 MJ/m² and 82 kg/m² for ceilings, respectively.

The walls, however, display substantial variation across scenarios, primarily because wall components are directly affected by the plan layout and partitioning strategy. Walls represent the dominant source of material waste, largely due to their expansive surface area and higher turnover rates. For instance, in the rentable office with a closed plan and fixed partitions, wall-related waste reaches 183 kg/m², while this figure is significantly reduced in the open-plan scenario (42 kg/m²) and the movable partition scenario (77 kg/m²).

In terms of embodied energy loss, walls again constitute the most significant contributor. The closed-plan, fixed-partition office exhibits the highest EEloss at 5779 MJ/m², while the movable partition scenario eliminates EE losses entirely (0 MJ/m²), as the panels are reused throughout the building's life without premature removal (Fig. 7).

These results reinforce the importance of flexibility in wall systems—particularly the use of demountable partitions—in minimizing both material waste and energy losses, thereby supporting environmental sustainability goals in office design and refurbishment practices.

### 3.5. Material-based embodied energy and waste analysis

Building materials are among the primary determinants of embodied energy (EE) demand in buildings. In addition to their unit EE intensities and physical quantities, other critical factors such as replacement/refurbishment frequency and material service life substantially influence the lifecycle embodied energy (LCEE). To evaluate these effects, key interior materials—gypsum board, rock wool, paint, glass panels, carpet tiles, linoleum, and medium-density fiberboard (MDF) used for movable partitions—were compared across rentable office types in terms of both waste generation and embodied environmental impact.

As the flooring system remains constant across all office configurations, carpet tiles and linoleum perform identically in each scenario and are therefore represented only once in Fig. 6. In contrast, materials used in interior wall assemblies (gypsum board, rock wool, paint, and glass) are highly influenced by flexible design strategies, particularly those involving layout and partition modifications.

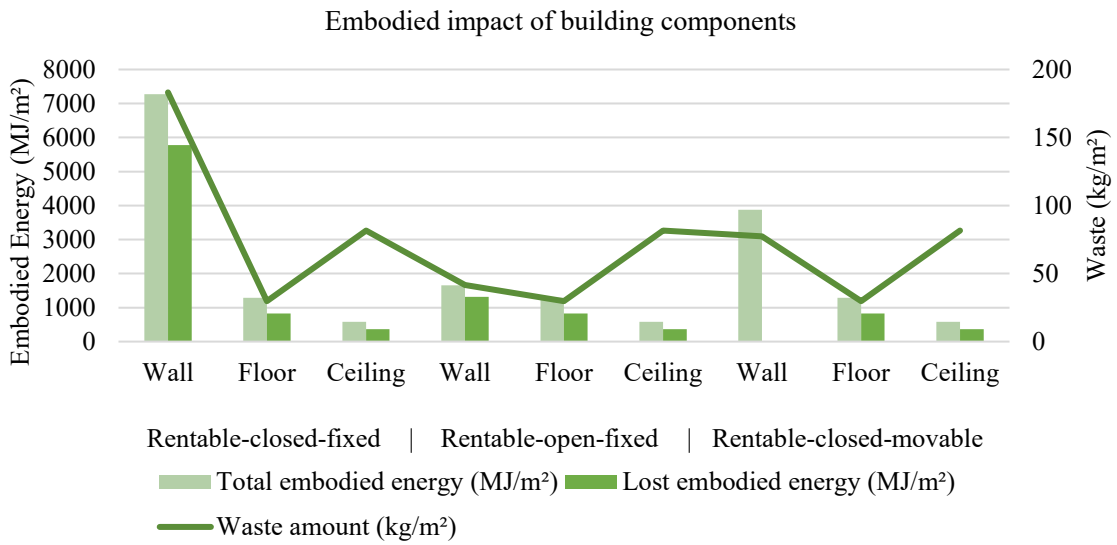


Fig. 7. Embodied energy and waste amount of building components for rentable offices

In rentable offices with movable partitions (RCM), only MDF is utilized for wall divisions, whereas gypsum board, rock wool, and paint are still present in ceiling components and thus retained in the analysis. Performance comparisons are organized by office type: rentable–closed plan with fixed partitions (RCF), rentable–open plan with fixed partitions (ROF), and rentable–closed plan with movable partitions (RCM).

Among all materials, glass panels exhibit the highest LCEE, reaching 6736 MJ/m² in RCF, followed by MDF at 3878 MJ/m². This is primarily due to their high EE intensities: glass at 75.2 MJ/kg and MDF at 50.2 MJ/kg. Although linoleum also has a high unit EE (54.4 MJ/kg), its relatively low quantity results in a modest overall LCEE. Notably, paint and MDF showed zero EE loss, attributed to the synchronization of their service lives with the 50-year building lifespan, eliminating premature material disposal.

In terms of waste generation, results further confirm that flexible design strategies contribute to material conservation. Over the building's life cycle, gypsum board waste decreased from 158.7 kg/m² in RCF to 91.3 kg/m² in ROF, and further to 71.3 kg/m² in RCM. Rock wool waste showed a similar trend: 5.5 kg/m² in RCF, 3.9 kg/m² in ROF, and 3.4 kg/m² in RCM. For glass panels, waste was significant in fixed-wall offices—approximately 89.6 kg/m² in RCF—but dropped to 20.5 kg/m² in ROF, reflecting reduced material usage due to open-plan configurations (Fig. 8).

These findings emphasize that adopting flexible spatial configurations, particularly movable partitions and open-plan layouts, can play a critical role in minimizing both material waste and embodied energy across the building life cycle.

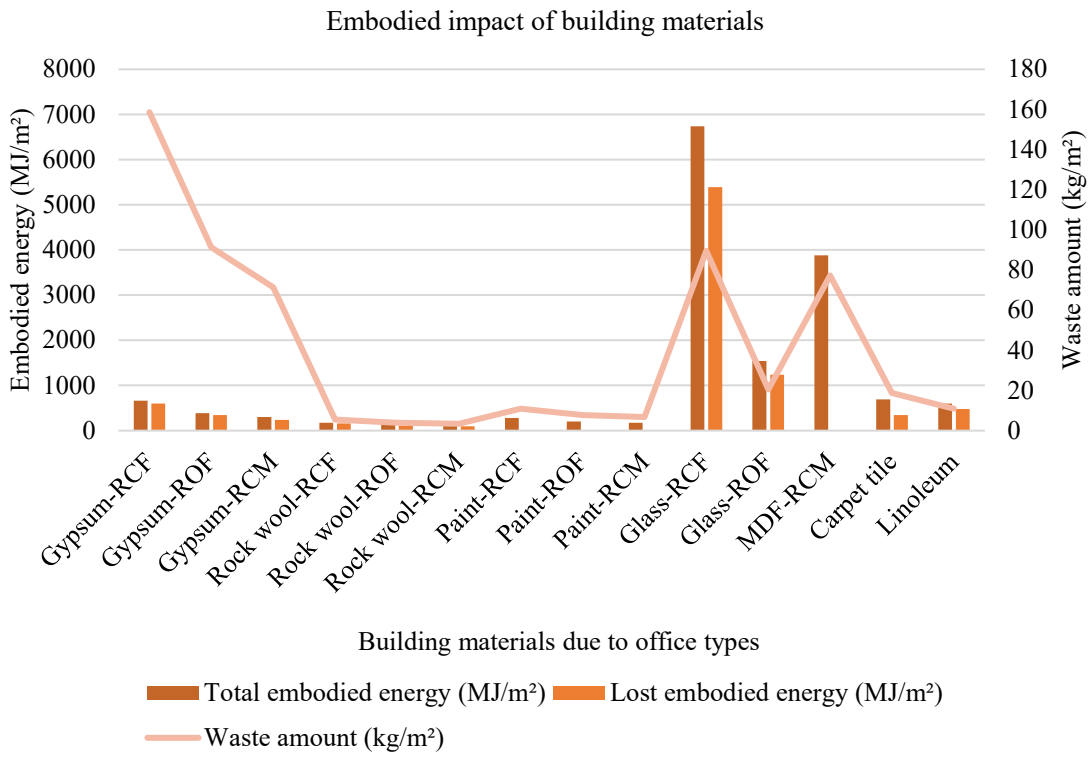


Fig. 8. Embodied energy (MJ/m²) and waste amount (kg/m²) of building materials for rentable offices

### 3.6. Sensitivity analysis

The sensitivity analysis shows that the tenant turnover rate has a significant impact on both total material waste and life cycle embodied energy (LCEE). For instance, increasing the tenant turnover rate by 20% leads to an increase of up to 32.9% in total waste and up to 23.8% in LCEE in the RCF scenario. Conversely, a 20% decrease in the turnover rate reduces waste and LCEE by reasonable amounts. Among the scenarios, the ROF scenario shows the highest sensitivity to tenant turnover; a ±20% change leads to the largest changes in total waste and LCEE, at 34.4% and 27.4%, respectively. The RCM scenario shows relatively lower sensitivity, indicating that design choices such as movable partitions can mitigate the environmental impact of frequent tenant turnover.

±20% changes in building service life had a minimal impact on total waste and LCEE across all scenarios, indicating that the results are relatively insensitive to reasonable assumptions regarding service life (Fig. 9). Overall, these findings emphasize that tenant turnover rate is a critical factor affecting total building material waste and embodied energy, whereas changes in building service life within the range considered have a limited impact. This highlights the importance of flexible interior strategies in managing environmental impacts under changing usage conditions.

To assess the reliability of the parameters, the ranking stability of office types was examined through the variable variation range. Considering that the main objective of the study was to compare office types, it was observed that the results did not change when the office rankings were checked for each scenario. Although uncertainty analysis requires the assignment of probability distributions and the execution of Monte Carlo simulations, the focus of this study was to evaluate the relative impact of the fundamental assumptions that constitute the study. Therefore, sensitivity testing was deemed sufficient at this stage. Probabilistic uncertainty analysis is recommended for future research.

### 3.7. Comparison with literature values

To ensure comparability with literature values, which typically report waste generation from a single refurbishment event ($kg \cdot m^{-2}$ per refurbishment), the model outputs were converted accordingly. In this study, the 50-year total refurbishment waste ($kg \cdot m^{-2}$) was divided by the assumed number of refurbishment cycles (nine times over 50 years, based on the tenant turnover of 5 years). This conversion yielded the waste generated in a single refurbishment cycle, allowing direct comparison with published benchmarks. One-time refurbishment waste occurring in this study was calculated using Equation 2. The results obtained are as follows:

- The rentable-closed-fixed (RCF) office scenario generates 28.7 $kg/m^2$ of waste per refurbishment cycle.
- The rentable-open-fixed (ROF) scenario results in 14.6 $kg/m^2$ per cycle.
- The rentable-closed-movable (RCM) alternative yields 10.4 $kg/m^2$ per cycle.

These figures were then benchmarked against literature values. Budiyani [13] reported waste values for four office refurbishment projects in Sweden, while Forsythe and Fini [20] conducted an extensive study across 23 office fit-out projects in Australia. Only case studies where one floor had been stripped out were considered from the data in the study by Forsythe and Fini. This is to ensure that consistent results are obtained with this study. The ranges of waste generated as a result of one-time refurbishment are given in Table 5.

As shown in Table 5, the estimated renovation waste values in this study are generally consistent with the range of 24–52 $kg \cdot m^{-2}$ [20] and 31–38 $kg \cdot m^{-2}$ [13] reported in previous studies. The rentable-closed-fixed configuration, representing the conventional rentable office layout without flexible design solutions, produced 28.7 $kg \cdot m^{-2}$ of refurbishment waste; this value is within the mid-range of values in the literature. Even if the number of the studies is limited, this consistency supports the reliability of the modeling approach and demonstrates that the study's assumptions are based on empirical findings.

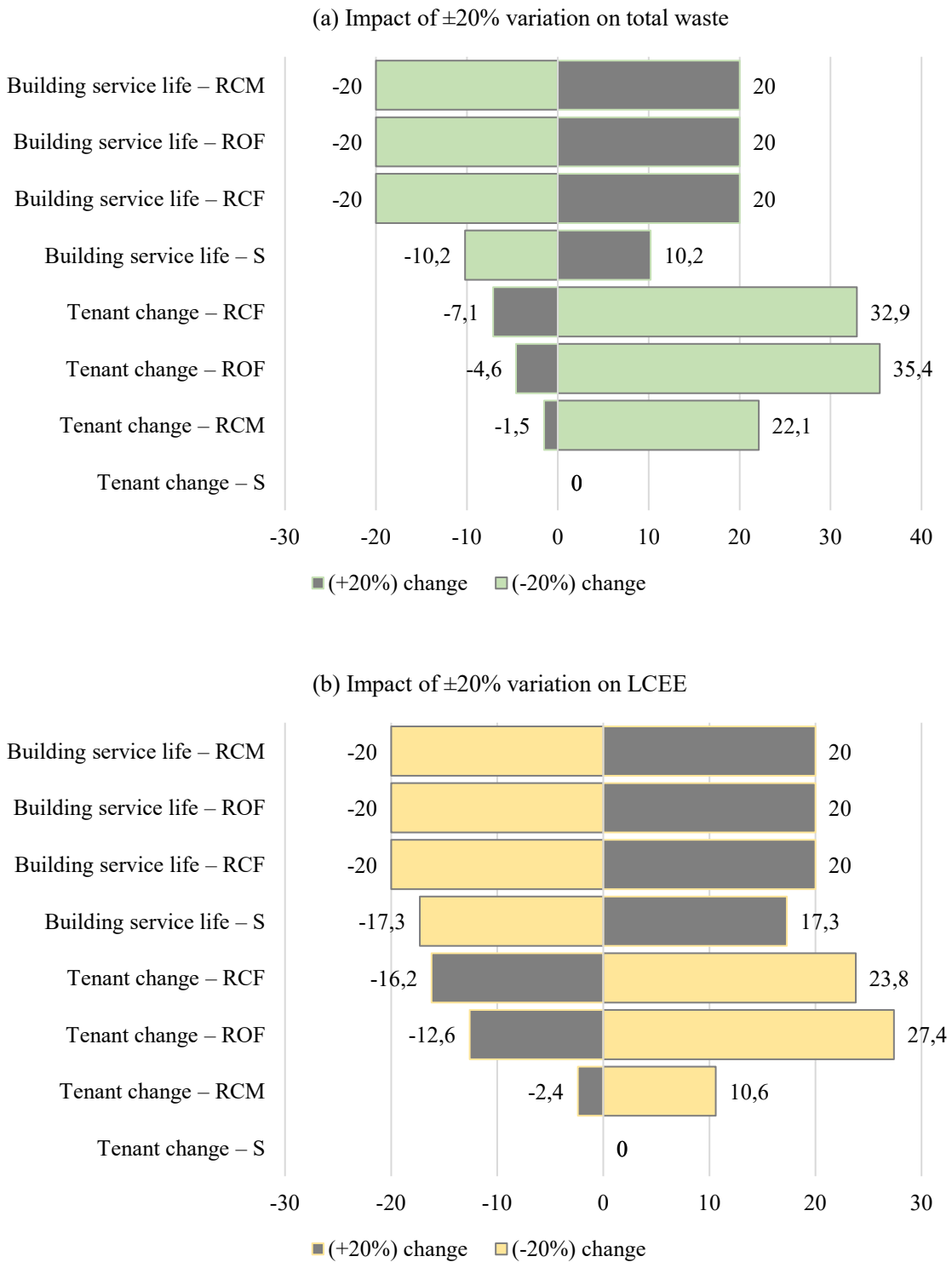


Fig. 9. Sensitivity analysis using the OAT approach (±20% variation) showing the influence of parameters on total waste (a) and total embodied energy (b)

Table 5. Comparison of refurbishment waste with literature findings (temporally normalized per single refurbishment cycle, kg·m⁻²)

| Source | Fit-out waste generated in a one-time refurbishment project (kg/m²) |
|---|---|
| [20] | 24.1 – 52.1 kg/ m² |
| [13] | 31-38 kg/m² |
| Rentable-closed-fixed (this study) | 28.7 kg/m² |
| Rentable-open-fixed (this study) | 14.6 kg/m² |
| Rentable-closed-movable (this study) | 10.4 kg/m² |

In contrast, layouts incorporating spatial flexibility, such as rentable-open-fixed and rentable-closed-movable types, showed significantly lower waste production (14.6 and 10.4 kg·m⁻², respectively). These reductions can be attributed to the minimization of demolition and material replacement needs through open-plan and modular design strategies. The results confirm that flexible and demountable interior systems can significantly reduce renovation-related waste and are consistent with previous studies emphasizing design for adaptability and reuse.

Overall, the findings indicate that spatial configuration and partition type are decisive factors in concrete resource performance. The close alignment between the rentable-closed-fixed scenario and established reference values enhances the model's reliability, while the lower waste intensities observed in flexible configurations highlight the environmental potential of adaptable design strategies in the rentable office sector. These insights provide strong evidence that integrating flexibility principles into rentable buildings can significantly reduce refurbishment waste and contribute to circular economy goals.

## 3.8. Limitations of the study

This study presents a series of scenarios based on a selected high-rise office building, focusing on different material types, office configurations, and refurbishment cycles in relation to tenant changes. While these scenarios offer useful insights into the embodied impacts of rentable office configurations, they are shaped by a number of assumptions that inherently limit the generalizability of the findings. Moreover, this study is based on the analysis of a single office building; therefore, the findings cannot be generalized to all office buildings. Variations in building design, occupancy patterns, and refurbishment practices may lead to different outcomes in other contexts.

A primary limitation stems from the scarcity of empirical data and prior research specifically addressing waste generation and embodied impacts in rentable office buildings. Due to this gap, the study's assumptions—particularly regarding tenant change frequency and refurbishment cycles—were informed by limited literature and stakeholder interviews. Consequently, the comparison of waste quantities is constrained by the small number of relevant studies available, limiting the scope for broader benchmarking.

Additionally, although materials with verified Environmental Product Declarations (EPDs) were selected to ensure data reliability and consistency, it is acknowledged that a wide variety of alternative materials may be used in office fit-outs. This could result in variability in embodied energy (EE) and waste profiles not captured within the selected material set. Moreover, this study introduces a reinterpretation of the replacement (B4) and refurbishment (B5) stages as defined by EN 15978. The distinction between these two stages—though essential to accurately calculate EE and waste over a building's lifecycle—is not consistently addressed in the existing literature. Thus, the methodology developed here is based on a rational framework informed by material life cycles, but future research is needed to further validate and standardize these classifications across building types and geographies.

Although this study includes sensitivity analyses related to tenant turnover cycles and the assumed building service life, it does not incorporate a dedicated uncertainty or sensitivity analysis of the embodied carbon values. As embodied carbon assessments can be influenced by variations in input data, methodological

assumptions, and emission factors, the absence of such an analysis represents a limitation. Future research should therefore explore uncertainty quantification and sensitivity analysis to enhance the robustness and generalizability of embodied carbon results.

### 3.9. Discussion

The results of this study emphasize that design flexibility can substantially reduce fit-out waste, embodied energy, and embodied carbon emissions in rentable office buildings. In the context of Türkiye, where the office market is concentrated in metropolitan areas such as Ankara and İstanbul, frequent tenant turnover intensifies material replacement cycles and resource depletion. The finding that flexible interior strategies can reduce embodied energy loss by over 80% suggests that waste prevention through design could play a critical role in achieving national resource efficiency goals.

Türkiye's Zero Waste Strategic Plan (2019–2023) and the National Climate Change Mitigation and Adaptation Strategy and Action Plan (2024–2030) both highlight the importance of circular economy practices in the construction sector. However, current regulatory frameworks primarily address waste management at the post-generation stage—through collection, recycling, and disposal—rather than prevention at the design phase. The outcomes of this study reveal that integrating spatial flexibility into design guidelines for rentable offices could complement these national policies by reducing refurbishment frequency and minimizing embodied carbon at the source.

Moreover, while international frameworks such as the European Green Deal and the United Nations Sustainable Development Goals (SDG 12: Responsible Consumption and Production) promote life-cycle thinking, there remains limited alignment between policy intent and design practice in emerging economies. By quantifying the environmental benefits of open-plan and modular partition systems, this study provides empirical support for shifting national building regulations from static performance metrics toward adaptable, circular design principles.

Overall, these results reinforce that environmental sustainability in the building sector cannot be achieved solely through material efficiency or end-of-life recycling. Instead, policies must recognize flexibility as a preventive strategy that reduces embodied impacts before they occur, thereby bridging the gap between design practice, building regulation, and circular economy goals.

## 4. Conclusion

High tenant turnover in rentable office buildings often necessitates frequent interior refurbishments, leading to substantial fit-out waste and increased raw material demand. These repeated changes exacerbate environmental impacts throughout the building's life cycle. Particularly in Türkiye, where waste management infrastructure is limited, implementing design-stage strategies is critical for mitigation.

This study compared standard and rentable office models to quantify waste generation and assess embodied environmental impacts. It also evaluated the effectiveness of two flexible design strategies—open plan layouts and movable partition walls—in reducing EE, embodied carbon (EC), and total waste. Results showed that open plan layouts reduced LCEE by 61.3%, EE loss by 64% and embodied carbon (EC) by 61%, primarily due to minimized use of interior partitions. Although movable partitions require higher initial EE, they achieved an 38.1% in LCEE, 84.3% reduction in EE loss, and 45.2% in EC by allowing reconfiguration without complete replacement of material.

A comprehensive assessment of total waste, LCEE, EE loss, EC, and component-specific impacts revealed that each design strategy offered distinct environmental advantages. Open plans were more effective in reducing overall LCEE, total and demolition waste, and EC across all life cycle stages. Movable partitions, on the other hand, excelled in minimizing fit-out waste and refurbishment-phase (B5) energy consumption.

At the component level, interior walls contributed the most to environmental impacts due to their extensive surface area and frequent alteration. Among wall materials, glass and MDF exhibited the highest embodied energy values, while gypsum board and glass contributed most to waste. However, MDF showed significant potential in minimizing EE loss due to its durability and reusability, aligning well with circular design principles.

In light of these findings, it is recommended that architects and designers prioritize materials based on their service life, reusability, and adaptability to evolving functional needs within office spaces. Emphasizing design strategies that minimize material replacement and support longevity can significantly reduce environmental impacts over the building's life cycle. Building owners and tenants should be made aware of the long-term operational and ecological benefits associated with flexible interior layouts and component choices. Furthermore, material manufacturers are encouraged to focus on the development of modular, demountable, and lightweight systems that facilitate disassembly and reuse, thereby supporting circular economy principles in the construction sector.

Future studies should delve into the performance of advanced flexible systems, such as dynamic walls, raised floors, and adaptive ceiling systems, within the life cycle context of commercial buildings. In addition:

- Empirical data collection through user surveys and interviews could provide grounded insights into material change patterns and tenant needs.
- Cost-benefit analyses integrating carbon and energy metrics can offer a holistic understanding of the trade-offs between initial investment and life cycle performance.
- Policy-level recommendations should focus on regulatory frameworks and incentives that promote material efficiency and low-waste interior design practices in rentable office markets.

By expanding awareness and applying informed design strategies, stakeholders can significantly reduce the environmental impact of the built environment, especially in high-density urban contexts.

## Declaration

### Funding

This research received no external funding.

### Author Contributions

E.K. Bakırhan: Conceptualization, Methodology, Software, Data curation, Writing- Original draft preparation, Visualization, Investigation, Validation. M.T. Kayılı: Project administration, Methodology, Supervision, Writing- Reviewing and Editing.

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### Data Availability Statement

No new data were created or analyzed in this study.

### Ethics Committee Permission

Not applicable.

### Conflict of Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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# Evaluating the potential of passive design measures for energy efficiency in retrofitting an educational building towards net-zero energy goals

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## Abstract

Achieving Net-Zero Energy Building (NZEB) performance requires a comprehensive approach that integrates both passive and active energy strategies. This study investigates the standalone impact of various passive design measures on reducing heating and lighting energy demands in an existing educational facility located in Safranbolu, Türkiye, a region characterized by a continental climate with mild summers and cold winters. Utilizing dynamic energy simulations conducted via DesignBuilder and the EnergyPlus engine, the research evaluates a range of envelope retrofit strategies, including optimized window-to-wall ratios (WWR), high-performance glazing systems, double-skin façades (DSFs), and advanced insulation materials. The results indicate that while passive envelope enhancements can significantly improve thermal performance, the most effective configuration identified in this case study, combining a cavity wall with aerogel insulation and triple-pane argon-filled low-emissivity glazing, achieved a 34.9% reduction in heating demand under the specific conditions of the building and climate analyzed. While passive strategies effectively reduce energy losses, they are insufficient on their own to eliminate dependence on external energy sources. To overcome this limitation, the integration of active renewable energy systems, such as photovoltaic (PV) panels and solar thermal collectors, is essential. Furthermore, incorporating energy storage technologies and smart energy management systems can enhance system reliability and efficiency. This study underscores that a hybrid approach, combining passive design with active solar technologies, offers the most viable path to NZEB achievement. Notably, the research provides an original and detailed multi-scenario evaluation of passive-only retrofit strategies, quantifying their individual and combined potential prior to the introduction of active energy systems.

## 1. Introduction

As global energy demand continues to rise, the building sector remains one of the largest contributors to both primary energy consumption and greenhouse gas emissions, accounting for nearly 40% of global energy use and over 30% of $CO_2$ emissions [1]. In response to mounting environmental pressures, the concept of Net-Zero Energy Buildings (NZEBs) has emerged as a cornerstone of sustainable building practices.

NZEBs aim to balance annual operational energy use with on-site renewable energy generation, thereby minimizing their environmental impact and reliance on external energy sources [2]. Driven by regulatory frameworks such as the European Union's Energy Performance of Buildings Directive (EPBD), which mandates that all new buildings must be nearly zero-energy by 2030, NZEBs are becoming an increasingly important benchmark for both new construction and building retrofits [3].

While the design and performance of newly constructed NZEBs have been widely studied, the retrofit of existing buildings to NZEB standards presents a more complex challenge, especially for older structures with limited insulation, inefficient glazing systems, and suboptimal envelope design [4].

Passive design strategies, such as enhanced insulation, high-performance glazing, optimized window-to-wall ratios (WWR), and natural ventilation, are considered the most cost-effective first step in reducing building energy demand [5, 6]. These strategies utilize architectural form, material properties, and environmental conditions to enhance thermal performance while minimizing reliance on mechanical systems. However, the effectiveness of passive measures is highly dependent on local climate conditions, building use patterns, and spatial constraints, making climate-responsive design a fundamental requirement [7]. However, their effectiveness is highly dependent on climate conditions, building orientation, and material availability, making climate-responsive design a key necessity [8].

The window-to-wall ratio (WWR) is an essential design variable that significantly influences a building's energy performance, with its optimal value varying widely based on climate and building orientation [9]. Studies conducted in cold climates, such as the "severe cold area of Shenyang city" [10] shows that the most energy-efficient WWR is between 10-15% for east and west facades and 10-22.5% for southern facades. This is due to the need to balance passive solar gains with minimizing heat loss through the less insulated glazed surfaces [11]. Conversely, in hot and semi-arid climates, the primary concern is managing heat gain. A study in Tripoli, Libya [12], found that increasing the WWR generally led to higher cooling consumption. Although heating demand could decrease to zero on southern walls due to passive solar heating. Similarly, a study in Iran, characterized by a semi-arid climate [13], showed that while the lowest energy consumption was achieved with a WWR of just 5%, a much higher ratio of 45-55% was often considered optimal to balance thermal performance with essential daylighting needs. In Mediterranean climates, where both heating and cooling are relevant, research in Italy Marino et al. [14] identifies the window system as a crucial element for managing solar gains, influencing overall energy consumption. These findings are further supported by a broader analysis of US office buildings, where Troup et al. [15] found that increasing WWR is a significant predictor of increased cooling and lighting energy use. In a broader context, Arshad et al. [16] emphasized that optimizing building envelope parameters like WWR is among the critical energy retrofit strategies aligned with the Sustainable Development Goals (SDGs) for achieving Net Zero Energy Building (NZEB) targets. Similarly, Aloshan [17] identifies building envelope optimization, including façade orientation, glazing type, and WWR, as fundamental to achieving near-zero energy performance in hot climates. The literature collectively demonstrates that while the impact of WWR is not universal, its proper optimization is a fundamental first step in significantly reducing energy loads and moving a building closer to Net-Zero Energy performance.

The other crucial static window technology is Low-emissivity (Low-E) glazing, designed to improve a window's thermal and optical performance. These coatings work by reducing heat transfer through the window, thereby minimizing energy consumption [18]. The energy-saving potential of double-glazed windows is well-established and widely adopted in cold climates to reduce heating energy [19]. Conversely, in hot and

humid climates, Low-E glazing is primarily used to reduce heat gain and lower the air-conditioning load [20]. The study by Somasundaram et al. [21] on a retrofit solution in Singapore found that combining a solar film with a retrofit double-glazing unit could reduce annual HVAC energy consumption by up to 20%. Another related study by Somasundaram, et al. [20] observed that installing a hard-coat Low-E double glazing unit could lead to annual energy savings of 3% for a clear glass facade and up to 7.5% for an existing tinted grey glass facade in a tropical climate with a 20% WWR. Harmati and Magyar [11] also investigated the influence of glazing properties on heating and cooling demand, emphasizing its importance in different climatic conditions. Xiaoxiang et al. [22] further highlight glazing material and light transmission as key performance indicators in NZEB retrofits across diverse climate zones, supported by bibliometric trend analyses. The literature highlights that upgrading glazing is a critical measure for a building's envelope and is a fundamental step toward achieving NZEB state [23].

Another advanced architectural strategy for improving a building's envelope performance is the use of double-skin facades (DSFs). This building technology consists of two layers of facade separated by a ventilated air gap, which can significantly improve a building's thermal and daylight performance when properly designed [24]. The performance of DSFs highly depends on climate and specific design parameters such as glazing type and cavity depth [25]. In hot arid climates, DSFs can be beneficial, with research demonstrating their ability to reduce cooling loads compared to conventional single-skin facades [26]. Similarly, in Mediterranean climates, studies show that DSFs can improve energy consumption in high-rise office buildings, with optimization of the facade being critical to achieving the desired energy performance [27]. For subtropical and temperate climates, the energy performance of DSFs has also been extensively investigated. A study on a typical office building in Hong Kong showed that, while DSFs could provide some energy benefits, their financial payback period might be long depending on the specific configuration [28]. Research conducted in Seoul confirmed that the glazing type of the inner layer significantly impacts energy consumption, highlighting the importance of a detailed, quantitative analysis in the design phase [29]. More recently, a study focusing on Turkey investigated the potential of integrating DSFs with nanotechnological materials to further enhance energy efficiency in office buildings [30]. These studies confirm that the effectiveness of DSFs is not universal and that their proper implementation requires sophisticated, climate-specific design and optimization, making them a key, albeit complex, strategy in the pursuit of a NZEB.

Moving beyond facade design, the use of advanced materials offers a complementary approach to enhancing thermal performance. Thermal insulation is one of the most effective methods for reducing a building's energy consumption where it helps lower the overall energy load from heating and air conditioning systems and meet thermal comfort needs [31]. A study by Shahee et al. [32] focuses on assessing thermal insulation and shading to optimize energy efficiency, save expenses, and foster environmental sustainability in residential buildings. The use of insulation is a fundamental first step toward achieving the high energy performance required for a NZEB. In addition to conventional insulation materials, advanced "superinsulation" materials, such as aerogels, are being developed due to their superior thermal performance and potential for significant energy savings [33, 34]. Aerogel insulating panels exhibits ultra-low thermal conductivity, making them excellent thermal insulators for building energy efficiency. Research by Cuce et al. [35] highlights that optimizing the thickness of aerogel insulation can make a significant contribution to energy savings and greenhouse gas abatement, especially in colder climates and for investments with a longer lifetime. The literature collectively demonstrates that the proper selection and optimization of insulation, including both conventional and advanced materials, is a critical component of a building's envelope design, directly influencing its energy

performance and helping to achieve net-zero energy goals.

The transformation of existing buildings into NZEBs has emerged as a central focus in contemporary energy research. While a substantial body of literature has explored the design principles and operational performance of newly constructed NZEBs, comparatively limited attention has been devoted to the retrofitting of existing buildings using exclusively passive design strategies. This study seeks to address this gap by adopting a passive-only approach to NZEB retrofitting, applied to an existing educational facility. Through the use of a real-world case study and advanced simulation tools, the research evaluates the feasibility and effectiveness of passive retrofit measures in achieving significant energy performance improvements, without the integration of active mechanical or renewable energy systems. In doing so, it offers a distinct contribution to the broader discourse on sustainable retrofitting and NZEB compliance in educational building typologies.

Most NZEB research has focused on residential or office buildings, often neglecting the unique spatial, functional, and operational characteristics of educational buildings [8-36]. These facilities pose distinct energy challenges due to high occupancy densities, variable schedules, and strict daylighting requirements. Many NZEB case studies are set within temperate or Mediterranean climates [37, 38], limiting the generalizability of their findings to cold or transitional climate zones. In addition, existing studies tend to evaluate passive strategies in isolation or as part of hybrid systems that also include active renewable technologies, making it difficult to assess the standalone potential of passive retrofitting.

This research addresses these gaps by evaluating passive retrofit strategies applied to an existing higher education facility located in Safranbolu, Türkiye, a UNESCO World Heritage city characterized by a continental climate with cold winters. According to the Turkish State Meteorological Service, Safranbolu experiences average winter temperatures below 0°C, making heating demand dominant in annual energy use.

The case study building is representative of the regional building stock, with limited thermal insulation, high window-to-wall ratios, and outdated glazing systems. These features make it an ideal subject for assessing the impact of envelope-level passive interventions.

This study investigates whether passive retrofit measures alone can bring an educational building closer to NZEB performance without integrating active systems such as solar photovoltaics or mechanical HVAC upgrades. Specifically, it aims to:

- Assess the baseline energy performance (heating and lighting) of the existing building;
- Simulate and compare the effect of various passive retrofit scenarios, including:
- Quantify the energy savings potential of each measure under a heating-dominant climate condition;
- Identify the most effective passive combination strategy in terms of thermal efficiency and visual comfort.

In this study, by adopting a passive-only approach, the study aims to isolate and quantify the maximum achievable energy reduction prior to integrating active renewable systems. This also enables future cost-benefit analyses to determine the required scale and feasibility of active measures to close the NZEB performance gap.

This research contributes original insights to the field of sustainable retrofitting by:

- Providing one of the few comprehensive, scenario-based simulations of passive-only NZEB retrofits in educational buildings;
- Applying a parametric modeling approach using EnergyPlus and DesignBuilder for high-fidelity hourly energy simulations;
- Generating design guidance specific to continental climates and educational typologies, where data is currently sparse.

The findings are expected to inform architects, policymakers, and facility managers engaged in the retrofit of public educational infrastructure, particularly in climate zones where heating energy

dominates and space for renewable installations may be limited.

## 2. Material and Method

### 2.1. Case study

#### 2.1.1. Overview of the selected educational buildings

This case study investigates the S.Ş.D. Vocational School of Higher Education Building, an educational facility located in Safranbolu, Türkiye (Fig. 1). The building was selected due to its representative characteristics of educational institutions, which possess distinct energy consumption profiles when compared to residential or commercial structures. Educational buildings typically exhibit variable occupancy patterns, elevated internal heat gains resulting from occupants and electronic equipment, and specific ventilation and lighting requirements. These attributes make such facilities particularly suitable for evaluating the effectiveness of passive design strategies aimed at enhancing energy efficiency and indoor thermal comfort.

The building under study is a multi-story educational facility with an approximate gross floor area of 4,712 m², oriented along the cardinal directions, with its principal façades facing north and south (Fig. 2). Located in Safranbolu, the building is subject to a cold climate, characterized by cold winters, necessitating the implementation of heating strategies throughout the year. Under these climatic conditions, optimizing the building's thermal envelope, glazing systems, and ventilation strategies plays a critical role in reducing overall energy consumption while enhancing indoor environmental quality.

#### 2.1.2. Baseline energy performance assessment

Prior to the implementation of any passive design strategies, a baseline energy performance analysis was conducted using DesignBuilder, a dynamic building simulation tool that incorporates the EnergyPlus engine. The baseline model was developed to accurately reflect the building's existing operational conditions and thermal performance under current use patterns (Fig. 3).

The simulation was configured to reflect realistic operational conditions, assuming a 24-hour usage schedule to account for extended occupancy beyond standard working hours due to academic and administrative activities.




Fig. 1. Building of Safranbolu Şefik Dizdar (S.Ş.D.) Vocational School of Higher Education

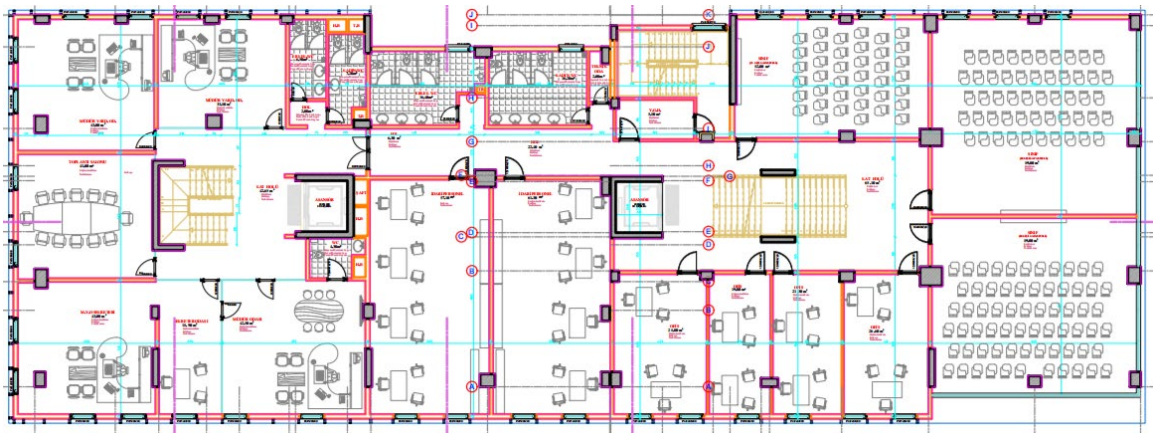

Fig. 2. The ground floor plan



Fig. 3. Building model in design builder

Indoor thermal comfort parameters were maintained in accordance with ASHRAE Standard 55, with heating and cooling setpoints set at 18°C and 24°C, respectively. The existing glazing system consisted of 6+12+6 mm reflective double glazing, offering moderate thermal insulation but limited solar control capabilities. Exterior walls included 5 cm of insulation, which falls below recommended standards for cold climate regions and contributes to elevated heating loads during winter. An air tightness value of 1 Air Change per Hour (ACH) was applied, representing a moderate level of air infiltration consistent with prevailing construction practices. The thermal properties of all building envelope components are detailed in Table 1.

The results of the baseline simulation revealed that the building experiences substantial heating loads, primarily driven by excessive heat loss during winter. The inadequate thermal performance of the building envelope, particularly the insufficient wall insulation and significant air infiltration, contributed to elevated heating demand in colder months. Furthermore, the simulation identified uneven indoor temperature distribution across different zones, highlighting the need for improved thermal comfort and energy performance. These findings confirm that targeted modifications to the building envelope, window-to-wall ratio, glazing specifications can substantially enhance thermal performance and contribute to significant reductions in overall energy consumption.

Table 1. Thermal properties of layers in existing model

| | Layers | Thermal Conductivity (W/mK) | Thickness (m) |
|---|---|---|---|
| Wall | Brick cladding | 0.54 | 0.015 |
| | XPS thermal insulation | 0.034 | 0.05 |
| | Exterior plaster | 0.21 | 0.02 |
| | Bims+Brick | 0.16 | 0.2 |
| | Interior plaster | 0.21 | 0.02 |
| Floor | Leveling Screed | 0.87 | 0.035 |
| | Concrete Slab | 2.5 | 0.15 |
| | XPS Insulation | 0.035 | 0.05 |
| | Artificial Marble | 1.3 | 0.02 |
| | Plaster | 0.21 | 0.02 |
| Roof | Trapezoidal Aluminum Sheet | 230 | 0.003 |
| | Elastomeric Resin-Based Waterproofing | 0.4 | 0.001 |
| | Bituminous Sheet | 0.19 | 0.002 |
| | Glass Wool Insulation | 0.045 | 0.006 |
| | Roof Construction (Concrete) | 2.5 | 0.15 |
| | Plaster | 0.21 | 0.02 |
| Window | Aluminum Framed Reflective Glass (6+12+6 mm) | 3.7 | 0.024 |
| WWR | E:0.38 W:0.70 N:0.58 S:0.43 | | |
| *Source: TS 825 | | | |

### 2.1.3. Assumptions for energy modeling

To ensure the accuracy and reliability of the energy performance simulations, several key assumptions were established concerning building operation, occupant behavior, and environmental conditions. The simulation incorporated historical climate data specific to Safranbolu, obtained from the EnergyPlus Weather Data (EPW) database, to reflect local climatic conditions with fidelity. Occupancy patterns were modeled based on actual usage profiles of various functional spaces within the building, including classrooms, laboratories, and administrative offices, each assigned distinct operational schedules to represent real-world activity levels.

The lighting and HVAC systems were assumed to operate according to scheduled demand rather than continuous operation, thereby simulating more realistic control strategies aimed at optimizing energy consumption while maintaining indoor environmental quality. An air infiltration rate of 1 Air Change per Hour (ACH) was applied to represent typical air leakage through windows, doors, and construction joints, in accordance with existing building conditions. These assumptions were critical in constructing a simulation model that closely reflects the actual energy performance of the building under current operational circumstances. It is important to acknowledge that, in line with conventional practices in building energy simulation, this study primarily concentrates on the internal performance of the building and its interaction with macroclimatic conditions derived from historical weather data. External contextual factors, such as the presence of adjacent buildings, shading effects from surrounding topography or vegetation, and localized urban heat island phenomena, were not explicitly incorporated into the simulation model. While these elements can exert a meaningful influence on actual energy performance, their detailed modeling was beyond the scope of this preliminary assessment. Future research should consider integrating these external variables to enhance the accuracy and contextual relevance of simulation outcomes.

## 2.2. Development of retrofit scenarios

To improve the energy efficiency of the S.Ş.D. Vocational School of Higher Education Building, a

series of passive retrofit scenarios were developed, with a primary focus on modifications to the building envelope and the optimization of glazing systems. These scenarios were systematically designed to assess the impact of various passive design strategies on the building's overall energy performance. The analysis specifically examined changes in heating and daylighting demand, and thermal comfort, providing a comprehensive evaluation of the effectiveness of each intervention under the building's existing climatic and operational conditions.

### 2.2.1. Scenarios 1-2: Modifying the window-to-wall ratio (WWR)

The window-to-wall ratio (WWR) is a critical design parameter that significantly influences the quantity of natural daylight entering indoor spaces, thereby impacting both visual comfort and energy consumption. Higher WWR values enhance daylight penetration, potentially reducing reliance on artificial lighting; however, they can also lead to increased cooling loads due to greater solar heat gains. In contrast, lower WWR values contribute to improved thermal insulation and reduced heat loss during winter but may necessitate increased artificial lighting due to limited daylight access. Two retrofit scenarios were developed to evaluate the energy performance implications of WWR modifications:

*Scenario 1:* In this scenario, the Window-to-Wall Ratio (WWR) on the south-facing façades was increased by 10% to enhance daylight penetration within interior spaces (S-WWR: 0.43+0.10).

*Scenario 2:* The WWR was reduced by 10% on south façade to enhance thermal insulation and minimize both heating losses in winter (S-WWR:0.43-0.10).

### 2.2.2. Scenarios 3-5: Upgrading glazing systems

In this study, glazing systems were selected with careful consideration of Safranbolu's predominantly heating-dominated climate, where the primary objective was to minimize winter heat losses while maintaining sufficient visible light transmittance. The existing 6+12+6 mm reflective double glazing offers only moderate thermal insulation and, due to its limited solar control, contributes to high heating loads. To address this, Low-E coated glazing systems, known for reducing conductive heat loss by reflecting infrared radiation while largely preserving visible light transmission, were evaluated. These glazing types were chosen not only for their proven high performance in heating-dominated climates but also for their wide market availability, ensuring the proposed solutions are both technically effective and practically applicable. For Scenarios 3-5, the Low-E coating is applied to surface 3 (the inner surface of the outer pane) of the double-glazing units. In line with the study's aim of "reducing heat losses through passive measures," these systems were comparatively tested to identify the most efficient retrofit options. The retrofit scenarios were designed to assess improvements in insulation, solar control, and condensation resistance, as outlined below:

*Scenario 3:* Replacement with Low-E double-glazed windows with a U-value of 2.4 W/m²·K, designed to minimize heat loss during winter through enhanced infrared reflectivity.

*Scenario 4:* Upgrading to Low-E triple-glazed windows (6+12+6+12+6 mm) with a U-value of 1.9 W/m²·K, designed to improve thermal insulation, enhance resistance to condensation, and reduce overall U-values.

*Scenario 5:* Incorporating argon gas-filled Low-E triple-glazed windows (6+12+6+12+6 mm) with a U-value of 1.6 W/m²·K, designed to achieve superior thermal performance by reducing convective heat transfer within the glazing layers, while maintaining visible light transmission and preventing condensation.

### 2.2.3. Scenario 6: Implementing a double-skin façade (dsf) system with Low-E glazing

A double-skin façade (DSF) system integrates an additional glazed layer to create an intermediate air cavity between the exterior and interior façade surfaces. This cavity serves as a thermal buffer zone, enhancing the building's overall insulation performance, reducing cooling loads, and, when

properly designed, improving the effectiveness of natural ventilation. As a passive design strategy, DSFs offer considerable potential for moderating indoor thermal conditions across different seasons.

*Scenario 6:* This scenario involves the implementation of a non-ventilated double-skin façade system on the south-facing façade, incorporating Low-E double glazing to enhance thermal efficiency. An 80 cm-wide air cavity was introduced between the glazing layers to retain heat during the winter months and to limit solar heat gain in the summer. The cavity functions as a static insulation layer, contributing to overall energy savings and promoting seasonal thermal balance without reliance on mechanical systems.

### 2.2.4. Scenarios 7-9: Cavity wall and enhancing wall insulation

Minimizing heat transfer through the building envelope is essential for reducing heating demand in winter and cooling loads in summer. This study investigates the performance implications of employing a cavity wall configuration supplemented with mineral wool insulation, in combination with different triple Low-E glazing systems. Mineral wool was selected due to its proven fire resistance, acoustic performance, and stability under varying moisture conditions. On the fenestration side, triple Low-E units with either air or argon gas fill were evaluated to determine the incremental thermal performance gains achievable within the same wall construction.

*Scenario 7* incorporates a cavity wall with the addition of 7.5 cm of mineral wool insulation. This arrangement enhances the thermal resistance of the wall assembly while providing improved fire safety and acoustic comfort. In this scenario, standard glazing is retained, thereby isolating the effects of wall insulation enhancement from fenestration upgrades.

*Scenario 8* builds upon the configuration in Scenario 7 by replacing the existing windows with triple Low-E air-filled glazing units. This modification is expected to significantly reduce radiative heat transfer through the glazing, while the air fill introduces additional thermal resistance. The combined improvements in wall and window performance aim to achieve notable reductions in winter heating demand.

*Scenario 9* maintains the same cavity wall and mineral wool insulation configuration as Scenario 8 but replaces the air fill in the glazing units with argon gas. Due to its lower thermal conductivity compared to air, argon filling further reduces the U-value of the glazing assembly. This enables a higher level of thermal performance with minimal increases in assembly thickness, thereby minimizing both heating and cooling loads relative to the other scenarios.

The comparative analysis of these three scenarios allows for a clear assessment of the contribution of cavity wall insulation alone, as well as the incremental benefits of upgrading to triple Low-E glazing with air or argon gas fill. This integrated approach provides an evidence-based framework for optimizing wall and fenestration design in passive retrofit strategies for energy-efficient buildings

### 2.2.5. Scenario 10: Integrating aerogel insulation with triple-pane argon-filled glazing

*Scenario 10* examines an advanced, fully integrated envelope retrofit strategy that combines a cavity wall with aerogel-based insulation and high-performance triple-pane, argon-filled Low-E glazing. Aerogel was selected due to its exceptionally low thermal conductivity, among the lowest of any commercially available insulation material, enabling significant thermal resistance within minimal thickness. This characteristic makes it particularly advantageous in retrofit applications where increasing wall thickness is constrained by architectural or spatial limitations. Additionally, aerogel offers hydrophobic properties, long-term stability, and resistance to compression, ensuring consistent insulating performance over the building's service life.

In this configuration, the cavity wall serves as the base structural assembly, while the aerogel layer minimizes conductive heat transfer through the opaque portions of the envelope. The triple-pane, argon-filled Low-E glazing further reduces heat losses through fenestration by combining low-

emissivity coatings, multiple insulating layers, and an inert gas fill with lower thermal conductivity than air. By addressing both opaque and transparent elements of the building envelope with state-of-the-art passive technologies, Scenario 10 aims to achieve maximum reductions in heating demand, while improving indoor thermal comfort and overall energy efficiency.

## 2.3. Energy performance simulation and analysis

In this study, the DesignBuilder software was used to evaluate the building's energy performance. DesignBuilder integrates the EnergyPlus simulation engine and enables dynamic, hourly-based energy modeling. Its selection was motivated by its ability to deliver high-resolution analysis of heating loads and daylighting performance under a variety of climatic and operational scenarios.

While several commercially available tools, such as Autodesk Insight, Tally, and Sefaira, are widely used for comparing passive and active design strategies, they often rely on static or semi-dynamic assumptions. These simplified methods may overlook complex thermal interactions, internal heat gains, and environmental variability. In contrast, the EnergyPlus-based approach employed in this study allows for a more precise and detailed assessment of both the individual and combined impacts of passive design strategies on energy consumption and thermal comfort.

### 2.3.1. Simulation setup

Each retrofit scenario was simulated under consistent boundary conditions, with variations applied exclusively to the building envelope, glazing configurations, and insulation strategies. To ensure climatic accuracy, all simulations utilized historical weather data specific to Safranbolu, obtained from the EnergyPlus Weather Data (EPW) database. This approach enhances the reliability of the results by grounding them in real-world environmental conditions. The simulation setup incorporated the following key parameters:

*Building Operation:* A 24-hour usage schedule was applied to reflect both academic and administrative functions, accounting for extended occupancy beyond standard working hours.

*Indoor Thermal Comfort Standards:* Heating and cooling setpoints were maintained between 18°C and 24°C, in accordance with ASHRAE Standard 55, to ensure occupant comfort.

*Occupancy Patterns:* Distinct occupancy schedules were defined for classrooms, laboratories, and administrative offices to reflect actual usage trends and space utilization.

*Internal Heat Gains:* Thermal contributions from lighting systems, electronic equipment, and occupant activities were incorporated to represent internal loads accurately.

*Air Tightness Factor:* An air infiltration rate of 1 Air Change per Hour (ACH) was assumed, reflecting the current construction quality and envelope sealing characteristics of the existing building.

### 2.3.2. Performance metrics for analysis

Each retrofit scenario was evaluated using a set of defined Key Performance Indicators (KPIs) to quantify the effectiveness of passive design strategies in improving building energy performance. The primary KPIs included:

*Heating Loads:* Seasonal variations in heating demand were analyzed to identify potential energy savings achieved through modifications to the building envelope, glazing systems, and insulation. These values provide insights into the improvements in thermal efficiency resulting from each passive intervention.

*Daylighting Energy Load:* The extent of natural daylight penetration was assessed to ensure that changes to the window-to-wall ratio (WWR) and glazing specifications did not compromise visual comfort or increase reliance on artificial lighting. This KPI was critical in evaluating the balance between daylight utilization and thermal performance.

A defining characteristic of Safranbolu's climate is its relatively mild summer season, during which ambient temperatures rarely necessitate substantial active cooling. Consequently, space heating represents the predominant energy demand throughout the year. Within this climatic context,

the primary objective of the study, and the central focus of the detailed performance analysis, was to assess the extent to which passive design strategies could effectively reduce heating and lighting energy loads, which constitute the major components of the baseline building's overall energy consumption.

Although cooling demand was included in the comprehensive energy simulations performed using DesignBuilder and EnergyPlus, detailed analysis and scenario-specific reporting of cooling loads were excluded from the core scope of this study, as cooling was determined to be a relatively minor contributor to the building's annual energy profile in this regional context.

## 3. Results

This section presents the outcomes of the simulation-based energy performance analysis for the existing building and examines the effectiveness of a range of passive retrofit strategies. The findings reveal baseline inefficiencies in the current building configuration and quantify the potential energy savings achievable through targeted interventions. The analysis includes a comparative evaluation of key passive design measures, such as adjustments to the window-to-wall ratio (WWR), upgrades to glazing systems, the implementation of a double-skin façade (DSF), and the application of advanced insulation materials. Each scenario is assessed in terms of its impact on heating loads, daylighting performance, and overall thermal efficiency, providing critical insights for the development of low-energy retrofit solutions in educational buildings located in cold climate regions.

### 3.1. Baseline energy performance of the existing building

Prior to the implementation of any retrofit strategies, the baseline energy performance of the existing S.Ş.D. Vocational School of Higher Education building was evaluated to identify inefficiencies related to heating and cooling. Simulation results indicated an annual heating demand of 61.22 kWh/m² and an annual lighting demand of 34.36 kWh/m². The building exhibited elevated heating loads during the winter months, primarily due to significant heat loss through the building envelope and uncontrolled air infiltration.

The principal sources of energy loss were identified as follows; the existing 6+12+6 mm reflective double glazing provides moderate thermal insulation but lacks effective solar control, leading to substantial heat loss during the heating season. The wall assembly, incorporating only 5 cm of insulation, was determined to be insufficient for achieving adequate thermal resistance, resulting in excessive heat transfer. An air exchange rate of 1 Air Change per Hour (ACH) further exacerbates heating and cooling demand by increasing the load on HVAC systems to maintain indoor comfort conditions.

These findings underscore the potential for significant energy savings through passive retrofit interventions, including the installation of high-performance glazing, enhanced thermal insulation, and optimized window-to-wall ratios (WWR). Such improvements are expected to reduce both heating and cooling loads, while also contributing to improved indoor thermal comfort and overall energy efficiency.

### 3.2. Energy performance of the scenarios 1-2

The Window-to-Wall Ratio (WWR) is a critical design parameter that significantly influences the balance between natural daylight availability, solar heat gains, and overall energy consumption in buildings. Adjusting WWR values allows for the optimization of either daylight penetration or thermal performance, depending on the building's specific energy efficiency goals. In this study, two alternative WWR adjustment scenarios were developed and analyzed to assess their impact on lighting and heating energy demands. The comparative energy performance results of the baseline model, along with those of Scenario 1 and Scenario 2, are presented in Table 2.

In Scenario 1, the Window-to-Wall Ratio (WWR) on the south-facing façade was increased with the aim of enhancing daylight penetration into interior spaces.

Table 2. The energy performance results of the baseline model and Scenarios 1 and 2

| | Annual Lighting Demand | Annual Heating Demand |
|---|---|---|
| Baseline | 34.36 kWh/m$^2$ | 61.22 kWh/m$^2$ |
| Scenario 1 | 34.56 kWh/m$^2$ | 62.39 kWh/m$^2$ |
| Scenario 2 | 34.02 kWh/m$^2$ | 60.08 kWh/m$^2$ |

Consequently, the annual lighting energy demand exhibited a slight increase, rising from 34.36 kWh/m² to 34.56 kWh/m².

The annual heating demand increased from 61.22 kWh/m² to 62.39 kWh/m², primarily due to elevated thermal losses through the enlarged glazed surfaces, particularly during the winter season. While improved daylighting performance contributes positively to visual comfort and indoor environmental quality, the expanded window area introduces the potential for increased cooling loads during the summer months due to greater solar heat gains. Although cooling performance was not within the primary scope of this analysis, this emerging risk underscores the need for further investigation.

Overall, the results suggest that increasing WWR on the south façade can be advantageous in terms of daylight utilization but comes at the cost of higher heating energy consumption. Therefore, this approach may be more suitable for buildings located in milder winter climates.

It is also important to note that, although Scenario 1 aimed to improve daylight performance through a higher WWR, the design and optimization of external shading devices, such as overhangs or vertical fins, were not integrated into this phase of the analysis. As a result, the strategy's full energy-saving potential remains underutilized. Incorporating climate-responsive external shading solutions in future design iterations could not only enhance daylighting efficiency but also play a critical role in limiting undesired solar heat gain, particularly during warmer seasons. This presents a valuable direction for future research and refinement of passive design strategies.

In Scenario 2, the Window-to-Wall Ratio (WWR) was reduced in order to decrease the total glazed surface area, thereby enhancing the building envelope's thermal insulation and minimizing heat loss during the winter season. This intervention led to a slight reduction in lighting energy demand, from 34.36 kWh/m² to 34.02 kWh/m², as the diminished daylight penetration necessitated greater reliance on artificial lighting in certain interior spaces.

More significantly, the annual heating demand decreased from 61.22 kWh/m² to 60.08 kWh/m², reflecting improved thermal performance attributable to reduced conductive heat transfer and air infiltration through the façade. Although the reduction in WWR limited the potential for passive solar heat gain, an element typically advantageous during winter months, the overall outcome yielded a net decrease in heating load.

However, the effectiveness of this approach depends on the implementation of complementary daylighting strategies. Without optimized interior lighting design or daylight-responsive control systems, the increased reliance on artificial lighting could partially offset the energy savings achieved through improved thermal insulation.

Overall, Scenario 2 demonstrates superior performance in reducing heating energy demand and is particularly well-suited for cold climate regions where winter heat retention is critical. Nonetheless, an integrative approach, combining façade optimization with advanced lighting design, is essential to maximize energy efficiency without compromising visual comfort.

The selection of glazing systems is a critical determinant in achieving an optimal balance between thermal insulation, daylighting efficiency, and overall energy performance in buildings. Variations in glazing properties, specifically the U-value, Solar Heat Gain Coefficient (SHGC), and Visible Light Transmittance (VLT), substantially influence the building's energy profile. These parameters govern the extent of solar heat gain, the effectiveness of thermal insulation, and the quality

and quantity of daylight admitted into interior spaces. Consequently, they have a direct impact on both heating and lighting energy demands, underscoring the importance of precise glazing selection in passive design strategies.

### 3.3. Energy performance of the scenarios 3-5

To evaluate the impact of glazing system upgrades on building energy performance, three alternative low-emissivity (Low-E) glazing configurations were assessed in comparison to the baseline reflective double-glazing system. The primary objective was to determine the most effective glazing solution for minimizing heating energy demand while ensuring sufficient daylight availability. The corresponding lighting and heating energy demands for each scenario are summarized in Table 3.

The selection of glazing systems is a critical determinant in achieving an optimal balance between thermal insulation, daylighting efficiency, and overall energy performance in buildings. Variations in glazing properties, specifically the U-value, Solar Heat Gain Coefficient (SHGC), and Visible Light Transmittance (VLT), substantially influence the building's energy profile. These parameters govern the extent of solar heat gain, the effectiveness of thermal insulation, and the quality and quantity of daylight admitted into interior spaces. Consequently, they have a direct impact on both heating and lighting energy demands, underscoring the importance of precise glazing selection in passive design strategies.

In Scenario 3, Low-E double-glazed windows with air-filled cavities were introduced. This configuration resulted in a substantial reduction in annual lighting energy demand, decreasing from 34.36 kWh/m² to 31.62 kWh/m², indicating enhanced visible light transmittance and, consequently, reduced reliance on artificial lighting. In parallel, the annual heating demand decreased significantly, from 61.22 kWh/m² to 54.86 kWh/m², demonstrating a considerable improvement in thermal insulation compared to the baseline glazing system.

These outcomes confirm that Low-E coatings effectively mitigate conductive heat loss while allowing sufficient solar gain to support passive heating strategies. Thus, Scenario 3 presents a favorable balance between daylight utilization and thermal performance. However, it is important to note that while this glazing type performs well under moderate winter conditions, its insulation capacity may be inadequate for buildings located in severe cold climate zones, where more advanced glazing technologies, such as triple-glazing systems, may be necessary to achieve the desired energy savings.

In Scenario 4, Low-E triple-glazed windows with air-filled cavities were implemented. This configuration led to a slight increase in annual lighting energy demand, rising from 31.62 kWh/m² (Scenario 3) to 33.75 kWh/m², corresponding to a 6.73% increase. The reduction in visible light transmittance is attributed to the additional glazing layer, which diminishes daylight penetration. However, this trade-off was offset by a notable improvement in thermal insulation, as annual heating demand declined from 54.86 kWh/m² to 50.64 kWh/m², representing a 7.70% reduction relative to Scenario 3, and a 17.3% decrease when compared to the baseline condition (61.22 kWh/m²).

These findings suggest that while triple glazing with air-filled cavities enhances insulation performance in winter, it slightly compromises daylight availability.

Table 3. The energy performance results of the baseline model and Scenarios 3, 4 and 5

| | Annual Lighting Demand | Annual Heating Demand |
|---|---|---|
| Baseline | 34.36 kWh/m$^2$ | 61.22 kWh/m$^2$ |
| Scenario 3 | 31.62 kWh/m$^2$ | 54.86 kWh/m$^2$ |
| Scenario 4 | 33.75 kWh/m$^2$ | 50.64 kWh/m$^2$ |
| Scenario 5 | 33.75 kWh/m$^2$ | 48.73 kWh/m$^2$ |

Therefore, the integration of daylight-responsive control systems and climate-adaptive shading strategies becomes critical to mitigate increased lighting energy consumption.

In Scenario 5, Low-E triple-glazed windows with argon gas filling were tested. Lighting demand remained constant at 33.75 kWh/m², confirming that the substitution of air with argon gas does not influence visible light transmission. However, annual heating demand was further reduced to 48.73 kWh/m², yielding a 3.77% improvement compared to Scenario 4, and a 20.38% reduction compared to the baseline model.

The enhanced performance is attributed to argon's lower thermal conductivity (~0.016 W/m·K) relative to air (~0.024 W/m·K), which significantly reduces conductive heat losses through the glazing units. Among all glazing scenarios analyzed, Scenario 5 demonstrated the greatest reduction in heating energy demand, making it the most thermally efficient solution, particularly for buildings located in heating-dominant climates.

### 3.4. Energy performance of the scenario 6

The double-skin façade (DSF) system constitutes an advanced passive architectural strategy designed to enhance thermal insulation, facilitate natural ventilation, and enable effective solar control. By incorporating an additional layer of glazing, the DSF forms an intermediate ventilated air cavity between the interior and exterior façades. This buffer zone plays a crucial role in reducing heat loss during winter and mitigating solar heat gains in summer, thereby contributing to seasonal thermal stability.

In Scenario 6, a Low-E double-glazed DSF system was implemented on the south-facing façade to evaluate its effectiveness in improving the building's thermal performance and overall energy efficiency. The DSF in this configuration included an 80 cm non-ventilated cavity, designed to trap air and enhance thermal resistance.

Table 4 presents a comparative analysis of lighting and heating energy demand between the baseline model and the DSF-enhanced configuration in Scenario 6. The results provide insight into the trade-offs between enhanced insulation and potential reductions in daylight penetration associated with DSF systems.

In Scenario 6, the application of a Low-E double-glazed double-skin façade (DSF) system led to a measurable shift in both lighting and heating energy performance indicators. Specifically, annual lighting energy demand increased by approximately 4.3%, rising from 34.36 kWh/m² to 35.82 kWh/m². This increase is attributed to the reduced daylight transmittance resulting from the additional glazing layer, which, while beneficial for thermal buffering, introduced shading effects that diminished natural daylight penetration and subsequently heightened reliance on artificial lighting.

In contrast, annual heating energy demand was significantly reduced by 25.9%, decreasing from 61.22 kWh/m² to 45.38 kWh/m². This substantial improvement is primarily attributed to the thermal buffer created by the 80 cm non-ventilated air cavity between the two glazing layers, which effectively mitigated conductive and convective heat losses through the façade during colder periods. Moreover, the incorporation of Low-E coatings further enhanced thermal performance by minimizing long-wave radiative heat transfer.

These results highlight the efficacy of DSF systems with Low-E glazing in heating-dominant climates, where reducing winter heat loss is a key energy performance objective.

Table 4. The energy performance results of the baseline model and Scenario 6

| | Annual Lighting Demand | Annual Heating Demand |
|---|---|---|
| Baseline | 34.36 kWh/m$^2$ | 61.22 kWh/m$^2$ |
| Scenario 6 | 35.82 kWh/m$^2$ | 45.38 kWh/m$^2$ |

However, the increase in lighting energy consumption also emphasizes the need for integrated daylighting strategies, such as light shelves or smart shading systems, to compensate for diminished daylight availability and ensure visual comfort.

Future research is recommended to explore the comparative benefits of ventilated versus non-ventilated DSF configurations, as well as their dynamic interactions with solar orientation and seasonal variations. Such investigations will be critical in optimizing the balance between thermal insulation and daylight utilization within high-performance façade systems.

### 3.5. Energy performance of the scenarios 7, 8 and 9

The building envelope plays a pivotal role in regulating thermal performance, directly influencing heating energy demand and indoor environmental quality. Achieving Net-Zero Energy Building (NZEB) standards requires a highly insulated envelope capable of minimizing heat losses while ensuring occupant comfort. This section evaluates the impact of retrofitting the envelope through the use of cavity wall construction supplemented with mineral wool insulation, as well as the integration of high-performance triple Low-E glazing systems, under cold-climate conditions.

Scenario 7 involves the implementation of a cavity wall supplemented with 7.5 cm of mineral wool insulation. This intervention resulted in a modest increase in lighting energy demand to 34.67 kWh/m² (0.9% above the baseline of 34.36 kWh/m²), likely due to slight changes in interior surface reflectance affecting daylight distribution. In contrast, annual heating demand decreased by 18.7%, from 61.22 kWh/m² to 49.74 kWh/m², indicating a marked improvement in thermal resistance. The reduction in thermal conductivity of the modified wall assembly effectively limited heat transfer through the opaque façade, improving indoor comfort and lowering winter heating loads.

Scenario 8 builds upon Scenario 7 by integrating triple-pane, Low-E air-filled glazing. Lighting demand remained constant at 34.67 kWh/m², demonstrating that the glazing upgrade did not compromise daylight availability. Annual heating demand was reduced to 42.48 kWh/m², representing a 30.6% decrease relative to the baseline. This improvement can be attributed to the synergistic effect of combining cavity wall insulation with advanced glazing technology. The Low-E coatings minimized long-wave radiative heat losses while allowing high visible light transmission, thereby enhancing both energy efficiency and daylight performance.

Scenario 9 retains the same cavity wall and mineral wool insulation configuration but replaces the air-filled glazing with triple-pane, Low-E argon-filled units. Lighting demand again remained stable at 34.67 kWh/m², confirming that the type of inert gas fill has no measurable impact on daylight transmittance (Table 5). Heating demand, however, decreased further to 41.59 kWh/m², corresponding to a 32.1% reduction from the baseline. The enhanced performance of argon-filled glazing is attributed to argon's lower thermal conductivity compared to air, which further suppresses convective heat transfer through the transparent envelope components.

Among the configurations examined, Scenario 9, combining cavity wall insulation with triple-pane, Low-E argon-filled glazing, yielded the greatest reduction in annual heating demand while maintaining acceptable lighting energy levels.

Table 5. The energy performance results of the baseline model and Scenarios 7, 8 and 9

| | Annual Lighting Demand | Annual Heating Demand |
|---|---|---|
| Baseline | 34.36 kWh/m$^2$ | 61.22 kWh/m$^2$ |
| Scenario 7 | 34.67 kWh/m$^2$ | 49.74 kWh/m$^2$ |
| Scenario 8 | 34.67 kWh/m$^2$ | 42.48 kWh/m$^2$ |
| Scenario 9 | 34.67 kWh/m$^2$ | 41.59 kWh/m$^2$ |

These results confirm its suitability for cold-climate retrofit applications, where heating demand dominates the overall energy profile.

In cold-climate regions, where heating demand constitutes the dominant share of building energy consumption, the integration of a cavity wall with 7.5 cm mineral wool insulation and argon-filled triple-pane Low-E glazing emerges as the most effective passive retrofit strategy for improving both energy efficiency and thermal performance. This combined configuration substantially reduces heat loss through both opaque and transparent elements of the building envelope, while preserving adequate daylight availability and avoiding increased dependence on artificial lighting. To promote large-scale adoption, future research should incorporate comprehensive cost–benefit assessments and evaluate long-term payback periods, with particular emphasis on applications in educational facilities, which often present complex operational schedules and variable thermal behavior.

### 3.6. Energy performance of the scenario 10

Scenario 10 investigates an advanced passive retrofit configuration in which aerogel insulation is incorporated into a cavity wall assembly and combined with triple-pane, argon-filled Low-E glazing. Aerogel was selected for its exceptionally low thermal conductivity, among the lowest of any commercially available insulation material, allowing substantial thermal resistance to be achieved within a minimal thickness. Its slim profile makes it particularly advantageous for retrofit applications where increasing wall thickness is constrained by architectural or spatial limitations. In this scenario, the integration of high-performance glazing further enhances the thermal barrier by reducing radiative and conductive heat losses through fenestration.

Table 6 presents the comparative results for annual lighting and heating energy demands between the baseline condition and Scenario 10. Lighting demand increased slightly from 34.36 kWh/m² to 34.67 kWh/m², consistent with other scenarios employing cavity wall construction. This marginal change is likely due to subtle alterations in interior surface reflectance and wall composition, which may slightly reduce daylight penetration. In contrast, annual heating demand dropped markedly from 61.22 kWh/m² to 39.84 kWh/m², corresponding to a 34.9% reduction. This significant improvement is primarily attributable to the exceptional insulating capacity of the aerogel layer, which despite a thickness of only 2 cm, substantially limited conductive heat transfer through the opaque envelope components.

The addition of triple-pane, argon-filled Low-E glazing provided a further reduction in heat losses through the transparent envelope by lowering both long-wave radiative transfer and convective heat flow within the glazing unit. This combination achieved one of the highest thermal performance levels among all retrofit configurations assessed, particularly benefiting heating-dominant climates. While the modest increase in lighting energy demand represents a minor trade-off, the overall energy savings from reduced heating requirements substantially outweigh this effect.

These findings reinforce the potential of aerogel-based insulation, when paired with high-performance glazing, as one of the most effective passive retrofit solutions for reducing heating energy demand in existing buildings. However, even such high-performing envelope strategies alone may not suffice to meet Net-Zero Energy Building (NZEB) targets.

Table 6. The energy performance results of the baseline model and Scenario 10

| | Annual Lighting Demand | Annual Heating Demand |
|---|---|---|
| Baseline | 34.36 kWh/m$^2$ | 61.22 kWh/m$^2$ |
| Scenario 10 | 34.67 kWh/m$^2$ | 39.84 kWh/m$^2$ |

For broader implementation, future research should include comprehensive cost–benefit assessments, life cycle analyses, and evaluations of the long-term durability and economic feasibility of aerogel-based systems across diverse building typologies.

## 4. Discussion

Each retrofit scenario was developed to assess targeted modifications involving the window-to-wall ratio (WWR), glazing configurations, façade systems, and insulation strategies. Table 7 and Fig. 3 present the resulting annual lighting and heating energy consumption for each scenario, benchmarked against the baseline model to determine their relative effectiveness in reducing energy demand.

The simulation results for WWR adjustments reveal the expected trade-off between daylight access and thermal performance.

Table 7. The energy performance results of all scenarios

| | Annual Lighting Demand | Change (%) | Annual Heating Demand | Change (%) |
|---|---|---|---|---|
| Baseline | 34.36 kWh/m$^2$ | 0 | 61.22 kWh/m$^2$ | 0 |
| Scenario 1 | 34.56 kWh/m$^2$ | 0.58 | 62.39 kWh/m$^2$ | 1.91 |
| Scenario 2 | 34.02 kWh/m$^2$ | -0.99 | 60.08 kWh/m$^2$ | -1.86 |
| Scenario 3 | 31.62 kWh/m$^2$ | -7.97 | 54.86 kWh/m$^2$ | -10.38 |
| Scenario 4 | 33.75 kWh/m$^2$ | -1.78 | 50.64 kWh/m$^2$ | -17.28 |
| Scenario 5 | 33.75 kWh/m$^2$ | -1.78 | 48.73 kWh/m$^2$ | -20.4 |
| Scenario 6 | 35.82 kWh/m$^2$ | 4.25 | 45.38 kWh/m$^2$ | -25.87 |
| Scenario 7 | 34.67 kWh/m$^2$ | 0.9 | 49.74 kWh/m$^2$ | -18.75 |
| Scenario 8 | 34.67 kWh/m$^2$ | 0.9 | 42.48 kWh/m$^2$ | -30.61 |
| Scenario 9 | 34.67 kWh/m$^2$ | 0.9 | 41.59 kWh/m$^2$ | -32.06 |
| Scenario 10 | 34.67 kWh/m$^2$ | 0.9 | 39.84 kWh/m$^2$ | -34.92 |

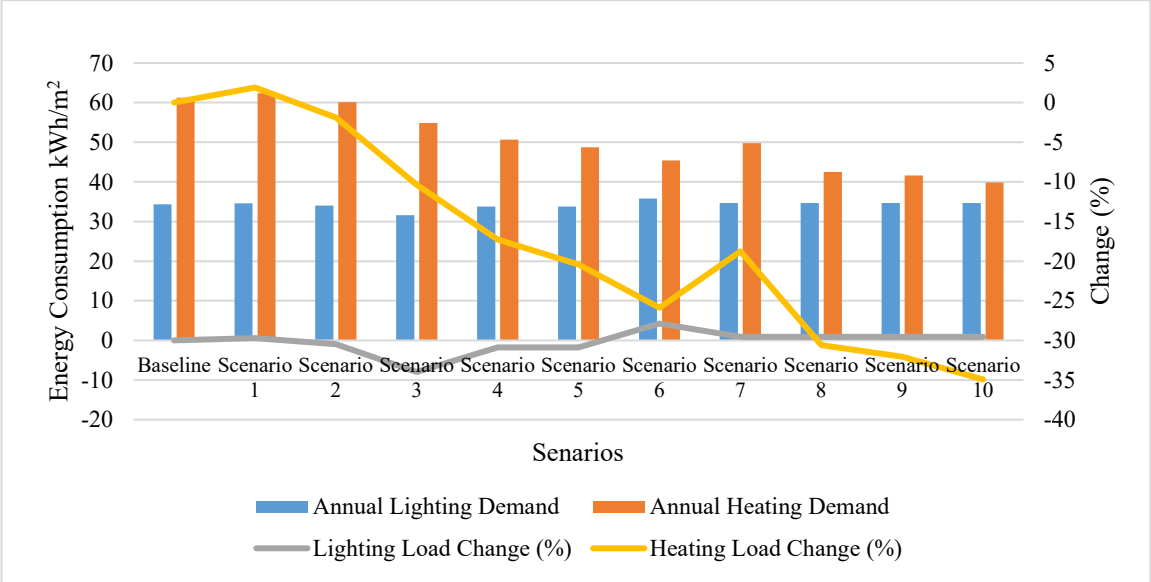


Fig. 3. Energy consumption analysis: Baseline vs. improved scenarios

Increasing the WWR on south-facing façades (Scenario 1) resulted in a 1.9% increase in annual heating demand, whereas reducing the WWR (Scenario 2) yielded a 1.9% decrease. These findings are consistent with the observations of Tzempelikos and Athienitis [39], who reported that higher WWR values in cold climates increase conductive heat losses through glazing, and with Goia [40], who demonstrated that lower WWRs improve insulation performance but may marginally increase reliance on artificial lighting. In this study, Scenario 2 exhibited only a minimal change in lighting demand, suggesting that daylight availability remained adequate even with reduced glazing area, consistent with Konis [41], who highlighted the role of daylight-responsive lighting controls in mitigating such effects.

Upgrading glazing systems produced more substantial energy savings. Transitioning from Low-E double glazing (Scenario 3) to Low-E triple glazing (Scenario 4) reduced heating demand from 61.22 kWh/m² to 50.64 kWh/m², a 17.3% improvement. The addition of argon gas in Scenario 5 further lowered heating demand to 48.73 kWh/m², corresponding to a 20.4% reduction relative to the baseline. These results align with previous research by Arasteh et al. [42] and Cuce & Riffat [43], which demonstrated that Low-E coatings reduce long-wave radiative heat transfer, and that argon-filled glazing suppresses convective heat transfer within glazing cavities. The additional 3.1% improvement from Scenario 4 to Scenario 5 supports the findings of Cuce & Riffat [43], who noted the enhanced insulating effect of inert gas fills in multi-pane systems.

Scenario 6 employed a double-skin façade (DSF) system, achieving a 25.9% reduction in heating demand. This outcome is consistent with Saelens et al. [44], who reported 20–30% energy savings with DSF systems depending on design and ventilation strategies. However, lighting demand increased to 35.82 kWh/m² (a 4.2% rise from baseline), reflecting the self-shading effect commonly observed in DSFs, as also documented by Gratia and De Herde [45]. To mitigate this, Loonen et al. [46] recommended integrating adaptive shading or dynamic glazing to balance solar gains with daylight availability.

Scenario 7 introduced a cavity wall with 7.5 cm mineral wool insulation, resulting in an 18.7% reduction in annual heating demand (from 61.22 kWh/m² to 49.74 kWh/m²). This confirms the significant role of improving wall thermal resistance in cold climates, in line with the findings of Rosas Flores [47], who reported up to 20% heating load reductions with higher R-value wall assemblies.

Scenario 8 combined the same cavity wall and mineral wool insulation with triple-pane Low-E air-filled glazing. This configuration achieved a 30.6% reduction in heating demand (to 42.48 kWh/m²), while lighting demand remained stable at 34.67 kWh/m², indicating that the glazing upgrade did not compromise daylight availability.

Scenario 9 retained the cavity wall and mineral wool insulation but incorporated triple-pane Low-E argon-filled glazing. Heating demand decreased further to 41.59 kWh/m², a 32.1% reduction compared to the baseline,while lighting demand again remained unchanged. The superior thermal performance of this configuration is attributed to argon's lower thermal conductivity compared to air, which reduces convective heat transfer within the glazing cavities.

The results for Scenarios 8 and 9 validate the synergistic benefits of integrating high-performance glazing with enhanced wall insulation, supporting the conclusion of Asdrubali et al. [48] that combined passive strategies offer superior energy savings compared to isolated measures.

Scenario 10 integrates a cavity wall with aerogel insulation and triple-pane, Low-E argon-filled glazing, achieving the greatest reduction in annual heating demand among all configurations, a 34.9% decrease relative to the baseline. This result confirms the exceptional thermal performance of aerogel, consistent with the findings of Baetens et al. [49] and Jelle [50], who reported thermal conductivities as low as 0.013 W/m·K, placing aerogel among the most efficient insulation materials commercially available [33, 34]. While this configuration resulted in a slight increase in

lighting energy demand due to marginal reductions in daylight transmittance, the overall net energy savings highlight its effectiveness as a high-performance passive retrofit strategy.

In cold-climate regions, where space heating accounts for the majority of annual building energy consumption, Scenario 10 offers one of the most balanced solutions in terms of thermal resistance, energy efficiency, and occupant comfort. However, despite the significant reductions in heating loads, the residual energy demand still exceeds Net-Zero Energy Building (NZEB) thresholds. This finding underscores that passive measures alone are insufficient to achieve full NZEB compliance and should be complemented with renewable energy systems or hybrid passive–active solutions.

Despite these significant improvements, the results reveal a critical limitation: passive design strategies alone are insufficient to achieve Net-Zero Energy Building (NZEB) performance. While they substantially improve thermal resistance and reduce energy losses, passive measures cannot fully eliminate dependence on external energy sources. Bridging this gap requires integrating active renewable energy systems, such as photovoltaic (PV) panels, solar thermal collectors, and hybrid renewable solutions. Deng et al. (2014) emphasize that a hybrid approach,combining passive and active measures,is essential to meeting NZEB targets [51].

The incorporation of solar PV systems offers a practical means of enhancing energy self-sufficiency. Whether installed as rooftop arrays, façade-mounted systems, or integrated into the building envelope as building-integrated photovoltaics (BIPV), PV technology can meet 60–100% of a building's total electricity demand, depending on system capacity, efficiency, and climatic conditions. Similarly, solar thermal systems for domestic hot water production and HVAC support can further reduce heating loads; Hernández and Kenny [52] report that when coupled with passive envelope improvements, solar thermal collectors can deliver up to an additional 30% energy savings.

Although the present study primarily addresses operational energy savings, it is important to account for the embodied energy and carbon emissions associated with material production, transportation, and installation. High-performance materials such as aerogel, despite their superior insulating properties, may have a higher embodied environmental cost than conventional insulation alternatives. To ensure that retrofit strategies are both energy-efficient and environmentally responsible, future research should incorporate a comprehensive Life Cycle Assessment (LCA) that evaluates operational and embodied energy, as well as the carbon footprint of each scenario. Such an integrative approach is essential for informing sustainable retrofit design and policymaking.

## 5. Conclusion

This study has demonstrated the effectiveness of a range of passive design strategies, including optimized window-to-wall ratios (WWR), advanced glazing systems, double-skin façades (DSFs), and high-performance insulation materials, in reducing heating and lighting energy demands in existing educational buildings. The results highlight that improvements to envelope insulation and glazing performance can yield substantial reductions in heating loads, with Scenario 10 (cavity wall + aerogel insulation + triple-pane Low-E argon-filled glazing) achieving the greatest decrease in annual heating demand (34.9%). These findings are consistent with previous research that underscores the exceptional thermal properties of aerogel insulation and the energy-saving potential of triple-glazed, inert gas-filled windows.

Energy storage systems and smart energy management technologies are critical enablers of NZEB performance. Battery storage allows surplus PV-generated electricity to be used during periods of low generation or peak demand, improving energy reliability. Intelligent monitoring and control systems can further optimize building operations by adjusting lighting, heating, and cooling in real time based on occupancy patterns and environmental conditions.

A hybrid strategy that integrates both passive and active measures provides a robust and scalable pathway toward NZEB achievement. Emerging technologies such as adaptive façades, combining PV panels, phase change materials (PCMs), and daylight-responsive shading, offer dynamic energy optimization beyond the capabilities of conventional static systems. To fully exploit the potential of such integrated solutions, holistic energy modeling and scenario-based optimization are essential to determine the most cost-effective retrofit strategies for various building typologies and climatic contexts.

A limitation of the present study is its focus on heating and lighting energy demand, which reflects the heating-dominant climate profile of Safranbolu. In warmer regions or during summer periods, passive measures that enhance solar gain or reduce heat loss may inadvertently increase cooling loads. Therefore, future research should evaluate these retrofit strategies in hot and mixed-humid climates to provide a balanced assessment of both heating and cooling performance.

In conclusion, while passive design principles form the foundation for improving building energy efficiency, achieving NZEB performance requires a comprehensive approach that incorporates renewable energy generation, energy storage, and intelligent control systems. Future work should investigate the economic feasibility of such hybrid retrofits through detailed cost–benefit analyses, accounting for capital investment, operational savings, payback periods, and long-term environmental impacts. Such insights are critical for policymakers, designers, and facility managers aiming to transform existing building stock into high-performance, net-zero energy assets.

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### Author Contributions

M. Tuna Kayılı: Conceptualization, Methodology, Writing, Review & Editing. B. Sultan Qurraie: Simulation.

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No new data were created or analyzed in this study.

### Ethics Committee Permission

Not applicable.

### Conflict of Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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# The Effects of Waste-Based and Thermal Energy-Storing Building Materials on Sustainable Architecture: A Review

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## ABSTRACT

The utilization of waste-based thermal energy-storing building materials in construction is a significant advancement in the reduction of the environmental impact of human activities. Such materials provide thermal comfort, reduce energy consumption, and promote the use of renewable resources. Phase change materials (PCM) have been the subject of these achievements in recent years regarding their heat storage potentials. On the other hand, the utilization of waste is of significant consequence with regard to the sustenance of a circular economy and the alleviation of waste-related environmental concerns. However, the majority of studies on PCM in the literature tend to concentrate on the thermal, physical, chemical, and mechanical properties of the materials, and thus fails to provide a comprehensive perspective on the sustainability of these materials. In this study, 11 articles selected from a total of 178 studies aiming to produce building materials with waste-PCM combinations are analyzed according to five categories related to sustainable built environment, which are resource use, environmental impact, health, comfort, and cost. As a result, it is proved that composite building materials that contain waste and store thermal energy have the potential to contribute significantly to sustainable architecture.

## 1 | Introduction

The construction of buildings necessitates the utilization of a plethora of building materials throughout the entirety of their life cycle and the construction sector is responsible for 25% to 45% of the total energy during extraction of raw materials and transporting processes [1]. Moreover, around 12% of global emissions are caused by building materials such as cement and steel [2]. As indicated by the Energy Information Administration (EIA), the projected increase in carbon emissions from energy consumption by 2023 is 37.2 Gt [3]. Consequently, the objective of the European Union (EU) countries is to reduce greenhouse gas emissions by 40% between 1990 and 2030 [4]. Furthermore, the EU aims to decarbonize the building stock by 2050 [5]. The twin challenges of resource depletion and climate change require a fundamental rethink of the built environment [6]. In order to address this situation, it is necessary to implement measures that will ensure the efficient use of resources, facilitate a shift towards renewable energy sources [7]. It is of the utmost importance that such decisions are made in order to construct a sustainable built environment.

One of the reasons for the observed increase in energy consumption for space cooling in buildings is the transition from the use of traditional materials with thermal mass properties, such as stone and brick, to the adoption of lightweight structural materials, including wood and composites [8]. The utilization of thermal mass is of significance in the context of space cooling, as it serves

**Abbreviations:** DSC, Differential Scanning Calorimetry; EAFD, Electrical Arc Furnace Dust; EDS, Energy-Dispersive Spectroscopy; EIA, Energy Information Administration; EPS, Expanded Polystyrene; EU, European Union; FTIR, Fourier Transform Infrared Spectroscopy; Gt, Gigatonne; IAQ, Indoor Air Quality; IRT, Infrared Thermography; LA, Lauryl Alcohol; LCA, Life Cycle Assessment; MDF, Medium-Density Fibreboard; n.a., Not Available; nZEB, Nearly Zero-Energy Buildings; PCM, Phase Change Material; SEM, Scanning Electron Microscopy; SSPCM, Shape-Stabilized PCM; TGA, Thermogravimetric Analysis; XRD, X-ray Diffraction.

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to retain heat and enhance thermal comfort [9]. The advantages of thermal energy storage have been acknowledged and incorporated into environmental policies at the international level. In accordance with Directive 2023/2413 of the European Parliament and of the Council, the integration of thermal energy storage is to be made mandatory in order to achieve greater energy efficiency and cost-effectiveness. In this context, it is of paramount importance that EU Member States promote interoperability for heating and cooling systems and thermal energy storage units [10]. It is imperative that all EU policies on energy efficiency in buildings address the potential of thermal mass in conjunction with other solutions, including insulation, heating and cooling systems, and renewable energy. Moreover, sustainability policies in the construction sector should encompass social aspects such as well-being and comfort [11].

While there are no specific measures for thermal energy storage in Turkey's national energy policies, various strategies have been proposed to reduce energy consumption. The 2017–2023 National Energy Efficiency Action Plan aims to reduce Turkey's primary energy consumption by 14%. In accordance with the EU Energy Efficiency Directive, the report anticipates a 50% surge in residential heating demand by 2040 and mandates that all edifices exceeding 2000 $m^2$ must attain the status of nearly zero-energy buildings (nZEB) by 1 January 2025 [12]. The action plan, which covers the period from 2024 to 2030, aims to reduce total emissions by 100 million tons [13].

In light of the prevailing patterns of energy consumption, the significance of renewable resources is further underscored. In light of the aforementioned considerations, the capacity of building materials to store thermal energy and provide passive heating and cooling functions within buildings has constituted a significant research focus in recent years. Phase change materials (PCM), which offer the potential for the utilization of solar energy, can also be employed in the creation of highly effective composites in the field of thermal energy storage.

The utilization of PCM and heavy thermal masses has the potential to reduce the intensity of mechanical air conditioning systems, as they are capable of storing excess heat [14]. PCM constitutes a subgroup of thermal energy storage systems, functioning on the principles of latent heat storage and sensible heat. They are capable of storing considerable quantities of heat energy within narrow temperature ranges. In order to utilize PCM in a building, it is necessary for the materials in question to possess a number of different physical, chemical, environmental and economic properties. Nevertheless, no PCM product currently available on the market exhibits all of these properties simultaneously. The greater the number of these properties that a PCM exhibits, the more significant its contribution to the building users, the environment, the budget and the lifetime of the structure [15].

PCMs are classified into three categories: organic, inorganic, and eutectic [16–18]. The organic group comprises paraffins, alcohols and fatty acids, whereas the inorganic group includes salt hydrates and metallic species. The eutectic group comprises combinations of at least two distinct organic and/or inorganic species [19–22]. Each type of PCM has inherent advantages and disadvantages; therefore, it is essential to implement appropriate measures to mitigate the disadvantages. It is recommended that paraffins, fatty acids, salt hydrates and their eutectic mixtures be employed in order to achieve optimal energy efficiency and thermal comfort in buildings [23–25]. A variety of techniques have been developed to apply thermal energy storage in building materials, including direct mixing, impregnation, encapsulation, and shape and form stabilization [26, 27].

A substantial body of research on PCM has been published in recent years. Jouhara et al. [28] investigated the active and passive applications of PCM types with latent heat storage in a variety of sectors, including food, automotive and construction. Some papers concentrated on a single type of PCM. For instance, Purohit and Sistla [29] underscored the attributes of salt hydrates, including their high thermal heat storage capacity, cost-effectiveness, and non-flammability. Furthermore, a number of methods have been put forth with the aim of addressing the negative properties of PCMs, including corrosiveness, supercooling and phase separation. Other research on PCM has concentrated on their behavior in accordance with climatic conditions [30], cooling-only [31] or heating-only applications. A limited number of comprehensive review articles have been published that examine the materials used in waste-derived PCM production [32]. Additionally, studies have addressed the economic and environmental properties of waste-based PCM composites [33]. The aforementioned study provides a comprehensive examination of active and passive systems and applications according to waste types.

Furthermore, numerous studies in the literature examine PCM products derived from waste materials within the context of laboratory analyzes and experimental studies [34–36]. Nevertheless, the number of articles that synthesize these studies in a comprehensive framework is relatively limited. The development of an approach, particularly within the context of the architectural field, is of significant importance with regard to the integration of waste into the circular economy and the provision of sustainable architectural solutions through the utilization of innovative building materials. It is therefore essential that the evaluation of studies be conducted with a multidisciplinary approach.

The novel aspect of this study is the evaluation of the waste-based thermal energy storage systems in buildings within the context of sustainable architectural principles. The study investigates examples from the last decade. In addition to technical features, this study considers the holistic implications for the human being, the social subject of architectural design, the natural environment in which architecture comes to life, and the economic investments that make architecture feasible. This study focuses exclusively on the waste-based, thermal energy-storing building materials for passive applications in buildings. The target audience includes architects, building material manufacturers, environmental, civil and material engineers, and academics engaged in research in this field.

## 2 | Materials and Methods

A search of the Web of Science database was conducted using the following keywords: "waste*," "reuse*," "recycl*," "reclaim*," "thermal energy," "material*," and "building*." The language



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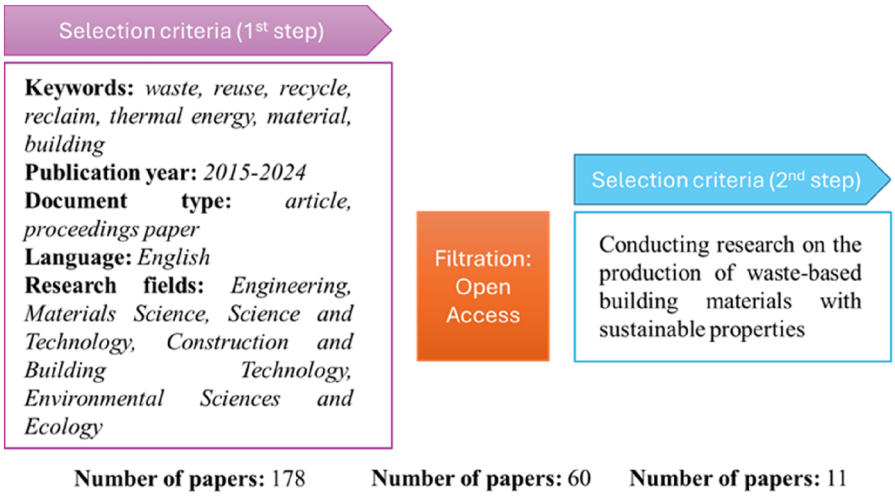


**FIGURE 1** | Selection methodology.

was set to English, and the search was limited to articles and proceedings papers published between 2015 and 2024. The studies identified were confined to the disciplines of engineering, materials science, science and technology, construction and building technology, and environmental sciences and ecology. In accordance with the aforementioned criteria, 60 of the 178 documents retrieved were identified as being available via open access (Figure 1).

All 11 studies exhibit common characteristics, including the utilization of waste materials, the development of PCMs that can be integrated into the composition of building materials, and the utilization of thermal storage systems that can operate within temperature ranges aligned with thermal comfort standards for indoor environments. Furthermore, the studies were selected on the basis of their presentation of data pertaining to at least one of the following categories: resource use including energy, raw material and water, environmental impact analysis, cost analysis, occupant comfort and health.

## 3 | Research Status

### 3.1 | Waste Utilization

The requisite characteristics of a PCM for utilization in a structural context are elucidated in Chapter 1. In the event that these properties are not satisfied, a number of issues may arise within the structure. Such issues may manifest as insufficient thermal and chemical stability, elevated supercooling temperatures, reduced thermal conductivity, leakage problems, and low viscosity. The utilization of various waste materials serves to prevent such problems.

A review of the literature reveals that a considerable number of waste materials derived from biological, agricultural, industrial and construction sources are employed in the manufacture of thermal energy storage building materials. The principal reasons for the preference of these wastes are their low environmental impact, accessibility, cost advantages and biodegradability. However, it is also observed that wastes that are not biodegradable (such as tire rubber) or that may contain harmful components (such as electrical arc furnace dust) are also employed in the production of PCM (Figure 2).

In selecting waste materials for use in PCM, it is essential to consider their porosity and water absorbency, as these properties can prevent potential leaks that may occur during the phase change of the material. In addition to enhancing thermal performance, some wastes are also employed to improve acoustic performance, augment structural strength and regulate viscosity. For instance, the high porosity and absorbency characteristics of waste materials permit their effective utilization in form stabilization applications. Furthermore, waste cooking oils have been identified as a viable thermal energy storage agent in direct applications.

The utilization of waste materials in the construction industry plays a pivotal role in advancing environmental sustainability. Furthermore, the incorporation of waste into the circular economy and the production of energy-efficient materials derived from it also influences the embodied and operational energy consumption of buildings. It has been demonstrated that the incorporation of appropriately selected waste materials can enhance not only the energy performance but also the overall strength, fluidity, water absorbency and acoustic properties of materials.

In this context, waste materials and PCM are employed in the production of building materials designed to enhance energy efficiency and thermal comfort in buildings. These building materials are typically in the form of composites, panels, concrete, and mortar (Table 1).

### 3.2 | Laboratory Analysis and Experiments

The tests and analyses employed during the production of building materials are typically conducted within a laboratory setting. The objective of these studies is to evaluate the chemical, thermal and physical characteristics of materials, as well as to ascertain their structural strength. Given that PCM-waste-based building materials are predominantly composite, it is of paramount importance that the components of these materials function in unison.



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**FIGURE 2** | Waste types used in the production of composite building materials.

**TABLE 1** | Characteristics of the wastes used and their intended use in material production.

| Ref. | Waste | Waste properties | Waste as . . . | Building material |
|---|---|---|---|---|
| {1} [4] | Cuttlebone and pomelo peel | Porous, biodegradable, renewable, safe to use, cheap, abundant | Shape stabilizer | Composite material |
| {2} [37] | Coconut peat | Oil absorber, causing environmental pollution by dumping, abundant, cheap, biodegradable | Shape stabilizer | Composite material |
| {3} [38] | Hemp shives | Improves thermal properties, biodegradable, renewable | Shape stabilizer | Composite wall panel |
| {4} [39] | Apricot kernel shells | Abundant, cheap, low ash content, cellulosic | Shape stabilizer and thermal conductivity agent | Activated carbon |
| {5} [40] | Waste cooking oil (glycerine, fatty acid) | Low environmental impact | PCM | Cement-based composite panel |
| {6} [41] | Fly ash | Abundant, cheap, low environmental impact | Viscosity modifier | Geopolymer paste |
| {7} [42] | Electrical arc furnace dust | Acoustic insulation, hazardous | Shape stabilizer and insulation | PCM dense sheet |
| {8} [43] | Tire rubber | Non-biodegradable, abundant, hazardous when it burns | Shape stabilizer and thermal conductivity agent | Composite material |
| {9} [44] | Recycled expanded glass | Heat resistive, low embodied energy, rigid surface, recyclable, high absorption, good thermal and structural performance | Heat resistive shape stabilizer with low embodied energy and rigid surface | Concrete panel |
| {10} [45] | Recycled concrete powder | High porosity | Shape stabilizer | Foam concrete |
| {11} [46] | Recycled expanded glass aggregate | High porosity and adsorption | Shape stabilizer | Cement mortar |

The principal analytical techniques employed in the various studies, together with their intended applications, are set out below.

X-ray diffraction (XRD) is a technique used to analyze the crystal structure of a material. It generates pattern graphs that illustrate the chemical interactions and crystal structure of the components that constitute the material's structure. This analysis is employed for the identification of crystalline phases within the microstructure of the building material [4].

Scanning electron microscopy (SEM) and energy-dispersive spectroscopy (EDS) are further analytical techniques that can be employed in this context. SEM provides microscopic images that can be used to determine the pore structure, homogeneity and



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physical compatibility of the components. The EDS method is employed to ascertain the chemical distribution of elements on the surface of the material, with this analysis conducted on the basis of the aforementioned images [39].

Fourier transform infrared spectroscopy (FTIR) is a technique used to analyze the molecular structure of materials. This technique is employed to examine the chemical constitution of composite materials and the compatibility of chemical bonds between their constituent components. This method is particularly well-suited to the analysis of the chemical structure of PCM-based materials. This method is typically employed to assess the chemical stability of a material subjected to prolonged thermal cycling [43].

DSC (differential scanning calorimetry) is employed to ascertain the thermal properties and thermal strength of materials. This analysis provides insight into the phase change temperatures of materials and their thermal behavior, including melting and freezing. The analysis is typically repeated after more than 100 thermal cycles to ensure the reliability of the results [41].

Thermogravimetric analysis (TGA) is a technique used to determine the thermal stability of materials. The technique is employed to quantify the loss of material and assess thermal stability as a function of temperature. This analysis examines the mass loss and degradation behavior of the material over a given temperature range, thereby providing information on its thermal stability [38].

Infrared thermography (IRT) is a technique that employs thermal imaging to analyze the infrared radiation emitted by objects. This technique is employed to ascertain the heat storage performance of materials. The distribution of temperatures across the sample surfaces is illustrated through the use of infrared thermal imaging. This method enables the analysis of heat transfer properties through the visual presentation of temperature differences on the surface of the material [46].

These analytical techniques are fundamental to ascertain the compatibility of the components employed in the manufacture of building materials and their thermal, chemical and physical properties. The repetition of such analyzes, particularly in the context of PCM-waste-based materials, is beneficial for the evaluation of the long-term performance and durability of the materials (Figure 3).

It can be observed that experimental studies are conducted within a laboratory setting in the majority of cases. Nevertheless, experimental setups designed to assess the performance of the materials under actual temperature conditions were incorporated into only half of the studies examined. The two distinct methodological approaches, namely theoretical and practical, yield results encompassing a multitude of parameters, including thermal, physical, chemical, acoustic, mechanical, and environmental properties of the materials under investigation (Table 2).

## 4 | Results

This section addresses the impacts of waste-PCM composites in the field of sustainable architecture, as examined in the 11 studies reviewed. The aforementioned impacts are evaluated in terms of energy, water and material utilization, as well as environmental impacts and user health, economic impacts and comfort parameters.

### 4.1 | Energy Efficiency

The utilization of building materials that are capable of storing energy and facilitating its subsequent utilization represents an effective strategy for the reduction of non-renewable energy resource consumption. A review of the numerical data reveals that a single gram of the building materials produced within the scope of the studies examined can store a range of energy between 10 and 193 J during a phase change. The number of thermal cycles tested ranged from 100 to 1200. It is possible that chemical interactions between PCM and waste materials may have an adverse effect on the thermal performance of the material, even if the interaction is weak. It is therefore crucial to ensure that the selected waste materials do not induce chemical incompatibility or instability during the thermal cycles of PCM [4]. In related studies, it has been demonstrated that the energy storage capacity of building materials exhibits minimal reduction during thermal cycling periods. Based on a phase change rate of 300 times per year [47], these findings indicate that waste-based PCM may have a functional lifespan of approximately 4 years.

The phase change temperatures of PCM are situated in proximity to indoor comfort ranges, thereby performing an efficacious function in ensuring thermal comfort. However, it is also necessary to consider the climatic characteristics when selecting or adjusting the phase change temperature. A review of the literature reveals that all of the PCM types under examination are organic in nature. It has been documented that the thermal conductivity of alcohol derivatives is less than that of fatty acid derivatives, whereas paraffin exhibits a thermal conductivity value that falls between these two categories.

The low thermal conductivity of PCM impedes effective heat transfer, thereby limiting the material's potential for heat storage [48]. The addition of certain waste materials has been shown to significantly enhance the thermal conductivity of the resulting material. For instance, the thermal conductivity of a material can be enhanced by incorporating apricot kernel shell or tire rubber. As illustrated in Table 3, the thermal conductivity of the material can be increased by up to 2.61 and 2.3 times, respectively.

The utilization of waste materials enables the storage of energy without the loss of material that would otherwise occur during a change of state. The composite building material produced by impregnation method using bio-based waste materials, including cuttlebone and pomelo peel, demonstrated a 70% increase in thermal energy storage capacity compared to the reference case, where only PCM obtained from oil was utilized [4]. Similarly, it was demonstrated that the composite material obtained from coconut peat by vacuum impregnation has the potential to be



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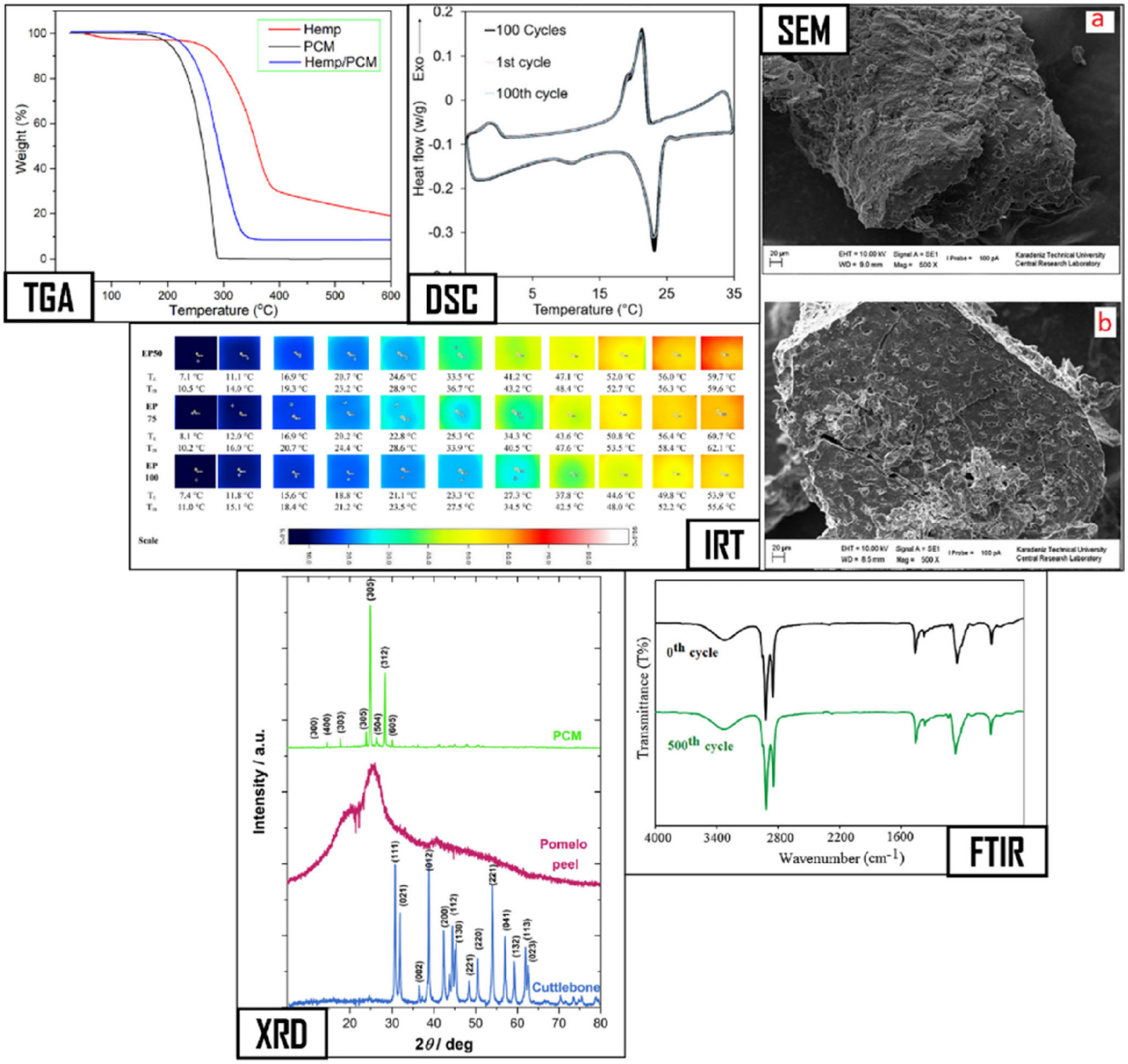


**FIGURE 3** | Laboratory analysis methods used in the measurement of material properties [4, 39–46].

employed as a wall panel that provides passive cooling in buildings, due to its energy storage capacity of over 100 J/g [37]. The heat storage capacity of another composite material produced by vacuum impregnation of alcohol into rubber was found to be 181 J/g, and a 2.3-fold increase in the thermal conductivity of the material was observed as a result of the waste material used [43].

The contribution of waste to the reduction of energy consumption is as significant in the production of building materials as it is in the operational phase of the building. Kumar et al. [44] asserted that the recycled expanded glass panels they produced in their study exhibited reduced embodied energy and carbon compared to the gypsum board panels currently available on the market. Furthermore, the energy consumption of active and passive houses during their respective use phases was calculated through the utilization of the EnergyPlus program for building energy simulation. In the study in which the life cycle energy and carbon emissions were calculated together, it was determined that the panel produced provided a 4.5% reduction in total energy and a 12% reduction in total carbon emissions in comparison to the reference. The aforementioned studies demonstrate that waste has yielded significant outcomes in the domain of thermal energy storage.

## 4.2 | Effective Water Use

The efficient utilization of water in buildings is of paramount importance in order to avert the looming threat of water scarcity, which is one of the most significant challenges of our time. In this study, the water efficiency of the wastes incorporated into the



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**TABLE 2** | Tests used in the production of building materials and the properties examined.

| Article ID | Test method | Laboratory analyzes | Investigated properties |
|---|---|---|---|
| {1} | — | XRD, FTIR, SEM, DSC | Thermal stability, latent heat storage, heat flux, melting point |
| {2} | — | TG, DSC, SEM, FTIR, leakage, thermal cycle | Latent heat storage, melting point |
| {3} | Experimental setup: MDF cubicles | SEM, DSC, TGA | Thermal conductivity, compressive strength, dry unit weight, thermal stability, melting point, latent heat capacity |
| {4} | — | Leakage, XRD, FTIR, SEM, DSC, TGA | Thermal conductivity |
| {5} | Dynamic simulation, environmental impact categories | — | Environmental impact |
| {6} | Experimental setup: 3D printed miniature houses | XRD, FTIR, DSC, TGA | Thermal conductivity, microstructure, thermal heat storage capacity, melting point |
| {7} | Experimental setup: dense sheet | Leaching | Acoustic performance, thermal performance |
| {8} | — | SEM, XRD, FTIR, DSC | Thermal stability, chemical stability, thermal degradation, thermal conductivity |
| {9} | Experimental setup: wooden panel | SEM, XRD, FTIR, DSC | Lifecycle energy, carbon emission, latent heat storage capacity, microstructure, thermal comfort, operational energy, embodied energy, thermal conductivity |
| {10} | Experimental setup: MDF cubicles | DSC, XRD, SEM, EDS | Thermal energy storage capacity, unit weight, porosity, water absorption, compressive strength, flexural strength, thermal conductivity, microstructure, chemical composition |
| {11} | Case study | TGA, DSC, SEM, IRT | Water absorption, leakage, density, flexural strength, compressive strength |

**TABLE 3** | PCM types and thermophysical properties.

| Article ID | PCM | Thermal conductivity (W/mK) | Thermal energy storage | Tested thermal stability (cycles) | Phase change temperature (°C) |
|---|---|---|---|---|---|
| {1} | Alcohol | n.a. | 145 J/g | 100 | 29.5–29.7 |
| {2} | Polyethylene glycol (PEG) | n.a. | 108.5 J/g | 100 | 19.6–28.3 |
| {3} | Lauryl alcohol (LA) | 0.18–0.40 | 99.5 J/g | 750 | 20.2 |
| {4} | Capric-Myristic acid, lauryl alcohol, n-octadecane, polyethylene glycol | 0.47, 0.48, 0.50, 0.58 | 193.7 J/g | 1200 | 20.2–26.6 |
| {5} | Glycerine and fatty acids | n.a. | 149–200 J/g | 500+ | 17.9–31.6 |
| {6} | Paraffin | 0.5 | 10 J/g | 100 | 21.2 |
| {7} | Paraffin | n.a. | n.a. | n.a. | n.a. |
| {8} | Alcohol | 0.43 | 181 J/g | 500 | 21.1 |
| {9} | Capric acid | 0.64 | 628 kJ/m$^3$ | n.a. | 30–32 |
| {10} | Capric-Palmitic acid | 0.347 | 34 J/g | 300 | 21.6 |
| {11} | Paraffin | n.a. | 92.7 J/g | n.a. | 18–27 |



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**TABLE 4** | Water retention and utilization properties of the waste types used.

| Article ID | Waste | Explanation |
|---|---|---|
| {1} | Cuttlebone | Water absorption, prevention of leakage up to 100 cycles. |
| {2} | Coconut peat | Hydrophilic, resistant to evaporation, prevention of leakage. |
| {3} | Hemp-shives | Cellulosic, prevention of leakage. |
| {4} | Apricot kernel shells | Cellulosic, prevention of leakage. |
| {5} | Waste cooking oil | There is a need to improve the water and energy consumption used in the waste treatment process. |
| {6} | Fly ash | Desired viscosity is ensured up to 100 thermal cycles. |
| {7} | Electrical arc furnace dust | Prevention of leakage. |
| {8} | Tire rubber | Prevention of leakage up to 500 thermal cycles. |
| {9} | Recycled expanded glass | High water absorption, prevention of leakage. |
| {10} | Recycled concrete powder | Prevention of leakage up to 300 thermal cycles when used at 20% by weight. |
| {11} | Recycled expanded glass aggregate | High water absorption (80%), prevention of leakage. |

structure of PCM was evaluated through an assessment of their water retention properties. The majority of the waste materials employed in the studies were observed to have the capacity to trap water due to their porous structures. As a result of these characteristics, they are capable of providing impermeability to the material and preventing the necessity for water supplementation by ensuring the continuous utilization of water.

The use of shape stabilizers is frequently employed to avert leakage issues that may arise when PCM transitions to the liquid phase. The primary characteristics of the stabilizers employed include high porosity, recyclability, innocuousness, and economic viability [4]. It is feasible to employ a range of waste materials as shape stabilizers in the production of composite PCM. The aforementioned materials include hemp-shive, coconut peat, cuttlebone, and pomelo peel, which are biologically based wastes. Furthermore, fly ash and concrete powder, which are industrial by-products, can also be employed to impart sealing properties to the material.

Despite undergoing a drying process, coconut peat's hydrophilic structure enables it to resist evaporation, thereby allowing its incorporation into the PCM structure as a shape stabilizer [37]. Cuttlefish are renowned for their capacity to regulate the volume of water within their bones, enabling them to maintain a vertical position in aqueous environments. The capacity of this bone structure to retain water endows the PCM with a leak-proof quality, which can benefit up to 100 thermal cycles [4].

Conversely, the processing of waste materials entails the consumption of energy and water. Baldassarri et al. [40] posit that improvements can be made to the water, electricity, and natural gas consumption during the waste oil treatment process in order to facilitate the incorporation of waste oil into building materials and utilize it as thermal energy storage. Moreover, the utilization of waste materials in PCM production is of significant importance in ensuring the fluidity of materials processed by 3D printing. In a study where fly ash was incorporated into microencapsulated paraffin wax, it was observed that thermal stability and the desired viscosity were achieved over 100 thermal cycles in the production of miniature 3D-printed houses [41] (Table 4).

### 4.3 | Raw Material Conservation

PCM optimizes the utilization of materials in the construction industry, thereby contributing to sustainability. The utilization of waste and recycled materials in the production of PCM serves to reduce the consumption of natural resources. The findings of studies conducted by Sarı et al. [43] and Baldassarri et al. [40] indicate that PCM produced from recycled materials exhibits enhanced energy storage capabilities while necessitating a reduced reliance on new materials. This constitutes a notable contribution to the conservation of natural resources. As materials with energy storage capacity, PCM reduces the necessity for insulation of buildings, thereby reducing the quantity of material utilized in construction projects. In a similar vein, Gencel et al. [38] posit that hemp-shive and PCM-based building materials can provide the same thermal performance with less material than conventional building materials. This contributes to environmental sustainability while reducing costs. The incorporation of PCM into building materials enhances their durability, thereby reducing the necessity for renovation. Kumar et al. [44] asserted that building materials incorporating PCM demonstrate prolonged performance, thereby reducing the necessity for the periodic replacement of building components. Consequently, the utilization of materials is also made more efficient.

In all of the studies reviewed, the utilization of waste material as a substitute for raw materials serves to reduce the necessity for raw materials and to guarantee the continuity of resources. Nevertheless, in certain studies, the characteristics of waste materials that enhance thermal performance also diminish the necessity for supplementary insulation. To illustrate, the utilization of carbonized waste rubber derived from tires to enhance thermal conductivity and serve as a PCM support represents a valuable contribution to the circular economy [43].

### 4.4 | Environmental Impacts and User Health

A significant proportion of waste is generated by sectors such as agriculture, construction, and industry. In the construction sector alone, millions of tons of waste are generated worldwide every



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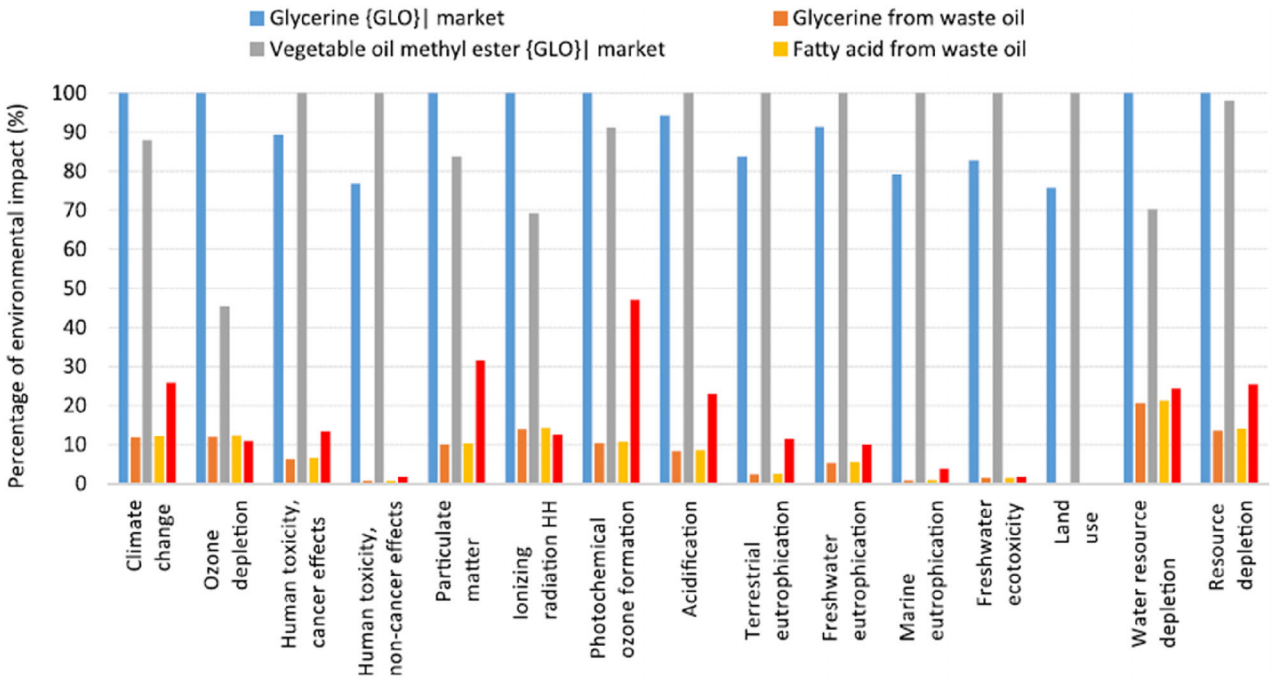


**FIGURE 4** | Comparison of the environmental impact of waste oil used as PCM with the same type of oil on the market [40].

year as a consequence of the utilization of building materials [49]. The term "embodied energy" is used to describe the energy consumed during the production, use, and lifetime of building materials. This energy can be 20 to 50 times the annual operational energy consumption of a building [50]. It is therefore of great importance to consider the energy consumption and greenhouse gas emissions associated with the materials to be used in the construction of the building.

The utilization of waste materials can yield both beneficial and detrimental consequences for the natural environment. The incorporation of waste into the system can facilitate resource continuity, reduce the necessity for raw materials, and mitigate the burden on landfills. The negative effects of waste include the potential presence of harmful compounds, lack of biodegradability, and the release of volatile organic compounds into the environment. These factors, which also impact indoor air quality, are addressed in section 4.6 on comfort parameters. This section will examine the behaviors that fall within the scope of environmental impact classes as defined in international standards.

Kumar et al. [44] found that using waste can reduce lifecycle energy by 4.5%. Therefore, energy-related carbon emissions decreased 12%. In another study employing vegetable oils derived from waste cooking oil as phase-change materials (PCMs), wall panels were subjected to energy simulation in 50 distinct countries and four different climate zones [40]. In the study in which the environmental impacts of PCM-containing panels designed as single and double layers were tested, it was observed that the utilization of waste oils had a mitigating effect on the negative impacts, particularly in regard to poisoning, non-cancer health threats, eutrophication, clean water and land use. The study highlighted the potential for glycerin derived from waste oils to serve as a substitute for paraffin, a material currently prevalent in the market. It is hypothesized that the elevated levels of toxicity and non-cancer health risks associated with oil derivatives in the market are attributable to the nitrogen and phosphate fertilizers employed in the cultivation of the seeds from which the oil is derived. Furthermore, other activities, such as soil cultivation and irrigation, can result in eutrophication and significantly impact the availability of clean water and land use (Figure 4). In this regard, the selection of waste materials can be regarded as an environmentally benign decision.

Moreover, the utilization of waste as building materials within the context of circular economy principles confers environmental benefits, including a reduction in resource consumption and the circumvention of raw material processing. The recycling of waste materials and their utilization as building materials serves to reduce energy consumption and contribute to the conservation of natural resources and the advancement of environmental sustainability. Conversely, the disposal of waste materials in the natural environment can result in environmental contamination. Given their low economic value, coconut shells are discarded in considerable quantities on an annual basis, which can result in adverse environmental consequences. However, its cellulosic structure, biodegradability, ease of accessibility, and low cost make it a potentially viable bio-based PCM supporter [37].

No health analysis was conducted in the selected studies. However, Barreneche et al. [42] conducted a leaching test to find out if industrial waste used as wall material contained any hazardous substances.

### 4.5 | Economic Perspective

One of the principal criteria for the utilization of PCM in construction projects is its economic viability. In the event that



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solutions designed to enhance the energy performance of buildings have a payback period that exceeds the lifespan of the building in question, the aforementioned solutions will effectively become devoid of any meaningful purpose. It is therefore of great importance to develop cost-effective solutions. Inorganic PCM types are typically less expensive than organic and eutectic types. However, the application method of PCM can also have a significant impact on the total cost [28]. For instance, while encapsulation techniques can assist in preventing leakage, they are typically not the preferred option due to the high initial costs involved [42, 44].

Consequently, more cost-effective techniques have been devised that can prevent leakage without the utilization of capsules in PCM production. One such method is the form-stabilization technique, whereby the PCM is impregnated into a porous matrix. An alternative approach is the shape-fixing method, whereby the PCM is melted and mixed with a supporting matrix [51]. Nevertheless, these techniques may result in a reduction in the heat transfer performance of the composite materials produced. Accordingly, the incorporation of fillers with high thermal conductivity may prove an effective means of enhancing heat transfer. Due to their low cost, these fillers are typically selected from waste materials [43].

Waste materials can be employed not only as filler material but also, on occasion, as PCM itself. For example, Baldassarri et al. [40] produced cement-based composite panels using waste cooking oil and employed this waste oil as a PCM. Such applications result in reduced material costs and contribute to environmental sustainability. Furthermore, the utilization of recyclable waste materials in PCM production renders these materials a more economically viable option. In conclusion, in order to achieve cost-effectiveness in PCM production, the utilization of waste materials, non-encapsulated fixation methods, and low-cost filler materials represents a significant contribution to the overall cost-effectiveness of the process.

### 4.6 | Comfort Parameters

In the context of sustainable architecture, social sustainability is concerned with enhancing the quality of human life. Consequently, it is closely associated with human necessities pertaining to health and well-being, as well as cultural and psychological aspects [52]. The provision of thermal, acoustic, visual comfort and indoor air quality enables the design of comfortable buildings. A deficiency in thermal comfort can impede physical and mental work, whereas poor indoor air quality can endanger human health by precipitating a range of illnesses.

The quality of the air within buildings is of great importance. The utilization of waste materials in the production of building materials has the potential to negatively impact indoor air quality. It is therefore essential to ascertain whether the waste in question contains any harmful substances, and if so, to what extent, and whether such substances are released into the indoor or outdoor environment. In accordance with the European Directive, the heavy metal content of waste is categorized as inert, harmless, or harmful. In light of the aforementioned considerations, the present study was designed to assess the ability of heavy metals to be filtered through the use of a leaching test. A leaching test is a chemical analysis method that is used to detect the presence of hazardous substances in waste. In the study in which electrical arc furnace dust (EAFD), an industrial waste, was employed in the production of PCM, it was asserted that this material is hazardous and should be deposited in landfills with caution [42]. In order for such hazardous waste materials to be employed in construction projects, a number of remediation techniques can be proposed. One such method is encapsulation. Nevertheless, this approach represents a provisional solution, given its high cost and lack of specificity in addressing the issue of heavy metal removal [42]. While fixation and solidification techniques are relatively inexpensive, the elevated pH value of the leachate can potentially give rise to certain issues. It is therefore imperative that professionals from a range of disciplines, including environmental and materials engineers, collaborate to develop remediation methods that are tailored to the specific characteristics of the waste in question. Despite the utilization of waste in all of the reviewed studies, no supplementary studies were identified.

The concept of thermal comfort is defined as the condition of mind that expresses satisfaction with the thermal environment. The test cabinets produced in the studies allow for the determination of the temperature values and time delays reached in comparison to the reference situation. In a study conducted by Gencel et al. [38], two $20 \times 20 \times 20$ cm modules were designed using hemp shive and lauryl alcohol (LA). The modules were equipped with skylights and examined under real atmospheric conditions to analyze the temperature behavior of the wall panels produced. One of the modules serves as a reference cube, devoid of PCM but containing solely hemp shive and encased in an outer layer of 5 cm-thick expanded polystyrene (EPS). The second comprises a cabin with 45% PCM (LA) and hemp shive. The experiment {3} was conducted over a four-day period in August in Bartın, Turkey. The temperature data obtained from the temperature meters placed on the inner surface of the prepared cabin revealed a temperature difference of 6°C between the two cabinets [38].

The configuration of {6}, comprising miniature test chambers produced via 3D printing, was evaluated within a temperature range of 15°C–30°C, reflecting typical diurnal fluctuations. The temperature transitions were conducted over a 12-h period. Among the tested cabinets, the GPP-0% model does not contain macroencapsulated PCM, whereas the GPP-20% model contains 20% PCM. The temperature differential between the two chambers was 1.2°C [41].

In a separate study {7}, the temperature differential between two cabinets, one equipped with PCM and the other without, tested at a temperature differential of 18°C–28°C was found to be 3°C [42]. In the experimental setup {9} consisting of a wood panel and insulation material, tested in a simulated environment in Australia, it was found that extreme temperatures were reduced by 12.4% and carbon emissions from cooling could be reduced by 14% thanks to the concrete panel with PCM [44]. Finally, in {10}, which was constructed with material comprising MDF, EPS, and recycled concrete powder, a 5°C decrease in the highest daily temperatures and a 3.6°C increase in the lowest temperatures were



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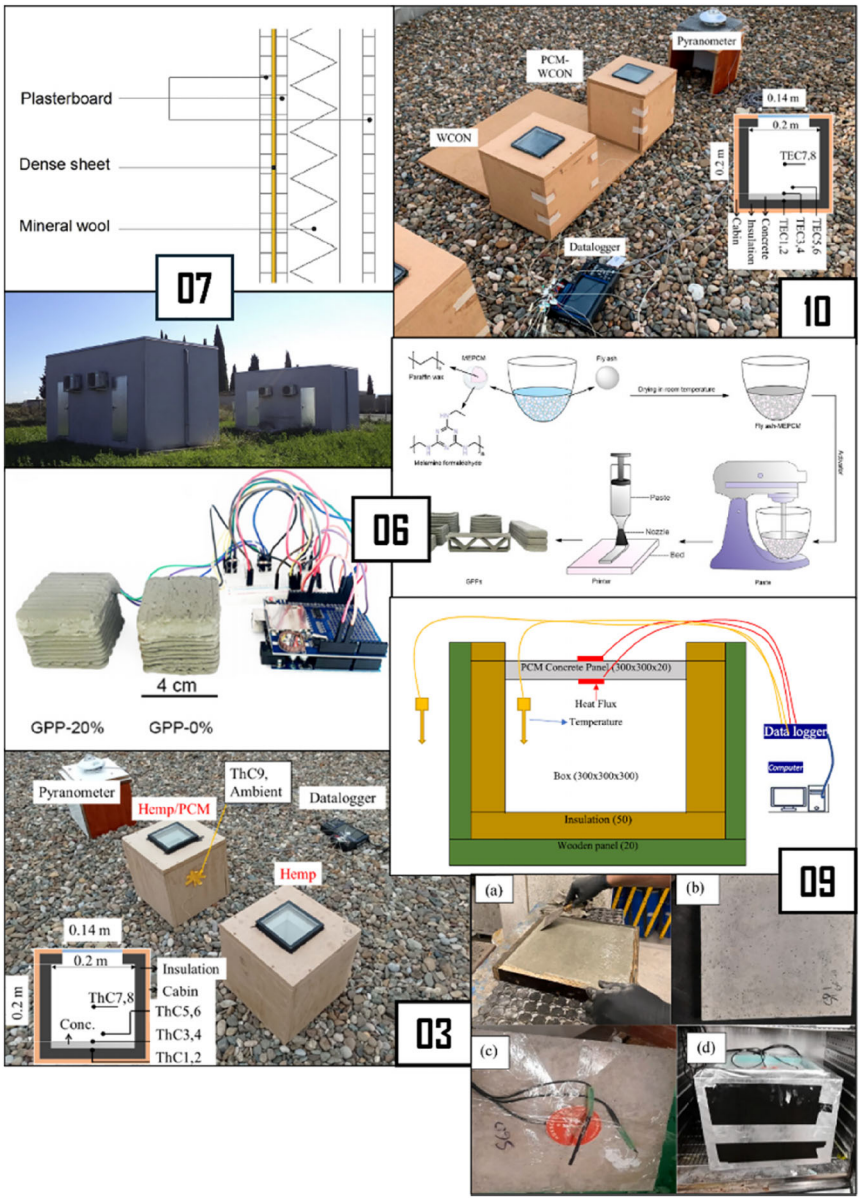


**FIGURE 5** | Experimental setups of the selected studies ([38] {3}; [41] {6}; ([42] {7}; [44] {9}; [45] {10}).

observed in the PCM-containing cabinet in comparison to the reference cabinet without thermal storage [45]. The manufactured experimental cabinets are illustrated in Figure 5.

The acoustic comfort of the environment is a key consideration in the design of any acoustic space. In their 2016 study, Barreneche and colleagues observed that the industrial waste (EAFD) utilized in their investigation provided 4 dB of acoustic insulation in the PCM-containing cabin when compared to the reference cabin. The high density of heavy metal oxides present in the material has an effect on the improvement of the acoustic performance of the waste material.

## 5 | Discussion of the Results

The results and evaluations of the 11 studies on PCM present disparate findings with regard to energy storage capacities, thermal comfort, environmental impact, and cost analysis. The studies encompass both bio-based and industrial waste-derived materials.

In the initial investigation, the researchers observed a 70% increase in thermal energy storage capacity relative to the baseline PCM, accompanied by a volumetric efficiency of 90%. The material was demonstrated to remain stable for 100 thermal cycles. Nevertheless, cost analysis, environmental impact assessment, and health risk analysis have yet to be conducted. In the study employing coconut peat (2), the latent heat storage capacity was determined to be 108.5 J/g. It was established that a material suitable for passive cooling with minimal leakage was produced and could be utilized as a building slab. No leakage was observed in the bio-based PCM produced with 45% weighted shape-stabilized PCM (SSPCM). In terms of thermal comfort, when the external temperature exceeded 50°C, the experimental chamber remained 4°C cooler than the reference chamber.



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Conversely, when the external temperature was 20°C, the internal temperature of the chamber was 2°C higher than that of the reference chamber. Industrial and bio-based phase-change materials. The material demonstrated a latent heat storage capacity of 193.7 J/g. Nevertheless, cost analysis, an environmental impact assessment and a health risk assessment were not conducted.

The potential of heat storage materials derived from bio-based waste was assessed across 15 distinct environmental impact categories, with climate-based evaluations conducted for 50 cities. The present study offers a significant contribution to the environmental analysis of sustainable heat storage systems. The product, comprising 20% by volume of PCM, exhibits a latent heat storage capacity of 10 J/g. The substance in question has a melting temperature of 21.2°C and a thermal conductivity of 0.5 W/mK. The material has demonstrated thermal stability over 100 cycles.

In the study (7), which examined the use of industrial PCM and acoustic insulation, a reduction in indoor temperature of 3°C was observed. Furthermore, the results of the leakage test indicated that the material was not hazardous. Furthermore, the EAFD was observed to provide 4 dB of sound insulation due to its heavy metal content. In the study (8), which is notable for its high heat storage capacity, a latent heat capacity of 181 J/g was obtained. The thermal conductivity of this PCM was found to be 2.3 times higher than that of conventional materials and remained stable for 500 cycles. Furthermore, it did not leak until the weight of alcohol reached 78%.

The PCM derived from construction waste was evaluated for use in the building sector and was found to result in a 4.5% reduction in the life cycle energy. The application of the material resulted in a reduction of carbon emissions by 12% and a reduction in the incidence of summer overheating by 12.4%. The cost of the panel containing the PCM is 11% higher than that of the base panel. Another PCM under investigation exhibits a latent heat capacity of 34 J/g and no leakage when utilizing 20% PCM. The material has demonstrated stability over 300 cycles, exhibiting a decrease of 5°C at the highest temperatures and an increase of 3.6°C at the lowest temperatures. The economic analysis revealed that the payback period of the PCM obtained from construction waste {11} was 25 years. The findings of the studies that contribute to architectural sustainability are summarized in Table 5.

Summarizing the above findings in terms of sustainable architecture, the following points stand out:

1. *Energy*: Waste-based building materials can absorb thermal energy between 10 and 193 J per gram. The phase change temperature should be within the comfort range.
2. *Water*: Utilization of porous waste helps to keep the water within the material. Thus, less water is consumed. Thermal cycles range from 100 to 1200 without any leakage.
3. *Raw material*: The use of biobased and industrial-based waste reduces the need for raw materials. This ensures circular economy and resource sustainability.
4. *Environment and user health*: There is not enough study on the health effects of waste-based materials. However, production and use stages of the waste-based building materials have been studied. It is proved that in most of the environmental impact category, using waste is more environmentally friendly than buying raw materials from the market.
5. *Economy*: Wastes are effective in minimizing the economic burden of building materials both in the production and the use stages. However, methods such as encapsulation may require high initial costs.
6. *Comfort*: Waste-based building thermal energy-storing building materials can be beneficial in ensuring thermal and acoustic comfort. However, studies examining the effects on indoor air quality should be diversified.

Among these sustainability criteria, energy is the most studied subject, followed by water absorption, and comfort. Biobased wastes are popular, especially in the production of composite materials. It is known that industrial-based wastes are used in various fields such as composite, adhesive, and panel production. On the other hand, construction waste can improve the thermal properties of concrete, by incorporating it into the structure (Figure 6).

## 6 | Conclusions and Recommendations

This comprehensive study illuminates the potential of integrating waste-based PCM into building materials for sustainable architectural design. The findings of the 11 studies demonstrate the considerable environmental, social, and economic advantages of these materials in construction applications. The waste-based PCM demonstrated effective thermal energy storage capabilities, with latent heat storage capacities within the range of 10 to 193 J/g. The utilization of these materials facilitates the storage and subsequent release of excess heat, thereby reducing the necessity for mechanical heating and cooling systems. As evidenced by multiple studies, PCM has the capacity to reduce indoor temperatures by up to 5°C during periods of high external temperature and increase them by up to 3.6°C during periods of low external temperature.

The incorporation of waste materials into PCM has been demonstrated to markedly diminish the carbon emissions and embodied energy associated with structural components. The utilization of biodegradable, renewable, and recycled waste materials (e.g., hemp shive, coconut peat, apricot kernel shell) serves to mitigate environmental degradation by facilitating the reuse of industrial and organic waste.

Although economic analysis of waste-based PCM is scarce, the potential for long-term savings in energy consumption and building maintenance has been identified. While the utilization of waste materials may result in cost savings, the economic implications of the selected PCM can be a significant consideration, particularly in relation to the specific materials employed. The incorporation of waste-based PCM into construction materials is aligned with the global sustainability objectives of reducing the environmental impact of the construction industry. By enhancing energy efficiency, curbing carbon emissions, and leveraging waste materials, these materials facilitate the transition towards greener and more sustainable construction practices.



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**TABLE 5** | Evaluation of the analyzed studies within the scope of sustainable architecture principles.

| Article ID | Proposed material features (Waste type) | Findings and evaluation |
|---|---|---|
| {1} | Environmentally friendly, cost-effective, efficient (biobased) | *Energy storage*: Biodegradable and renewable composite production. 70% of thermal energy storage capacity and 90% of volumetric efficiency compared to base PCM. *Water efficiency*: Stabilization is ensured for 100 thermal cycles. PCM ratio is 80% by weight. |
| {2} | Less environmental pollution (biobased) | *Energy storage*: Latent heat storage is 108.5 J/g. Potential material for passive cooling in buildings. Can be used as a wallboard. *Water efficiency*: Minimal leakage when waste-PCM ratio is 3:7. |
| {3} | High thermal energy storage (biobased) | *Water efficiency*: No leakage at 45% weight SSPCM. *Thermal comfort*: When the outside temperature is more than 50°C, inside of the experimental cabin is 4°C cooler than the reference cabin. When outside is 20°C, inside temperature is 2°C higher than the reference cabin. |
| {4} | No leakage and high thermal conductivity (industrial-biobased) | *Energy storage*: Latent heat storage is 193.7 J/g. *Water efficiency*: No leakage at 70%–75% PCM ratio. |
| {5} | Climate-sensitive, spatially and environmentally efficient (biobased) | *Environmental analysis*: Waste oil can be a counterpart of paraffin in terms of environmental performance. *Raw material use*: Insulation thickness can be reduced 25% without reducing thermal performance. |
| {6} | Ensures thermal comfort, energy efficiency and sustainability (industrial) | *Energy storage*: The latent heat of the product with PCM at 20% by volume is about 10 J/g. *Thermal comfort*: Melting temperature is 21.2°C, thermal conductivity is 0.5 W/mK. *Water efficiency*: Stability is achieved for more than 100 cycles. |
| {7} | High acoustic and thermal performance (industrial) | *Thermal comfort*: Indoor air temperature decreased 3°C. *Health analysis*: According to leaching test, this material is not hazardous. *Acoustic comfort*: EAFD can insulate sound up to 4 Db due to its heavy metal content. |
| {8} | No leakage (industrial) | *Energy storage*: Latent heat capacity is 181 J/g. Thermal conductivity is 2.3 times higher. *Water efficiency*: Stable for 500 cycles. No leakage until alcohol weight reached 78%. |
| {9} | Low embodied energy, low $CO_2$ emission and high thermal performance (constructional) | *Environmental analysis*: Lifecycle energy is found to be 4.5% lower than the base case. Carbon emission is reduced by 12%. *Thermal comfort*: Summer overheating is decreased 12.4%. *Cost analysis*: The proposed precast panel has 11% more initial cost than the reference panel. |
| {10} | High energy efficiency and thermal performance (constructional) | *Energy storage*: The composite has approximately 34 J/g of latent heat capacity. *Water efficiency*: No leaks when waste-PCM ratio is 20% by weight. Stable for more than 300 cycles. *Thermal comfort*: Highest temperature is reduced 5°C and lowest temperature is increased 3.6°C. |
| {11} | No leakage and high thermal storage capacity (constructional) | *Cost analysis*: Payback period of the produced PCM is 25 years. |

It would be beneficial for future projects to investigate the thermal stability and mechanical durability of PCM in different climatic conditions and over an extended period of time. In particular, studies examining the durability of PCM subjected to environmental conditions over 1000 cycles are becoming increasingly significant. A number of existing studies provide only limited information on the costs and life cycle analysis. In future research, a more comprehensive analysis of the costs associated with the production, application, and recycling of PCM is required. Furthermore, life cycle assessments of PCM should be conducted, incorporating a greater number of cities and climatic conditions. It is of great importance for sustainability that efforts to utilize recyclable and bio-based wastes in PCM production are increased. In particular, it would be beneficial to investigate whether new waste types and industrial by-products can be integrated into PCM.

There is a paucity of information regarding the effects of PCM on indoor air quality (IAQ) and human health. It would be beneficial for future research to analyze the potential long-term health risks associated with building materials containing PCM, as well as examining whether these materials release toxic substances. Further life cycle assessments (LCA) are required to gain a full understanding of the environmental impacts of PCM-containing building materials. It is recommended that future assessments include parameters such as recycling processes, the amount of energy and water used in the production processes of materials, and carbon footprint.



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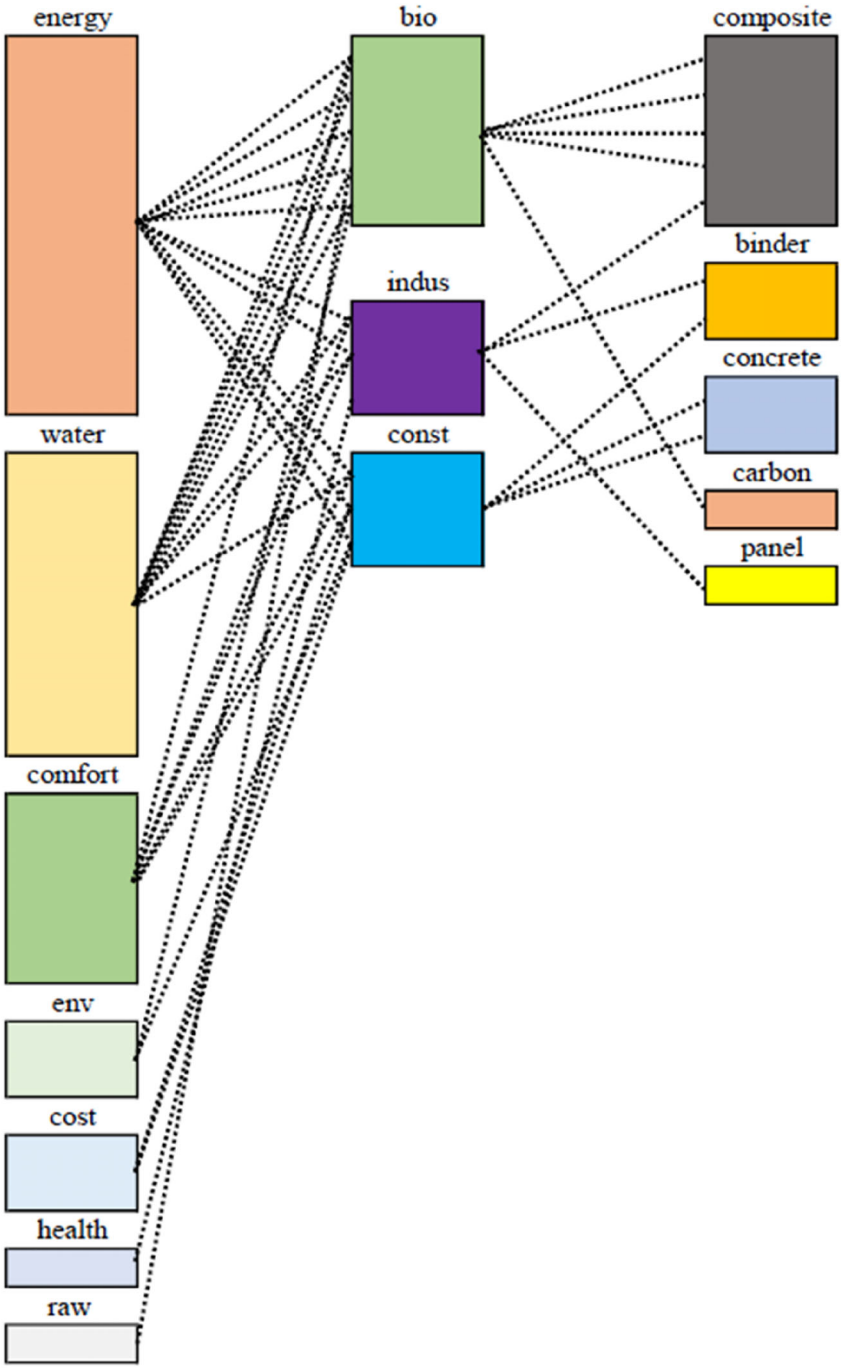


**FIGURE 6** | Three-field plot showing the relation between sustainability aspects (left), waste type (middle), and produced building material (right).

In order to enhance the contribution of PCM to sustainable architecture, it is essential to establish global collaborations between researchers, industry partners, and governments. Such collaborations can facilitate the exchange of knowledge across different regions, thereby promoting the wider adoption of PCM. It would be beneficial for local and international regulatory bodies to provide incentives for the wider use of waste-based PCM in the construction sector. It is within the power of governments and environmental agencies to offer financial support programs and tax benefits with the intention of increasing the use of sustainable construction materials. In order to ascertain the suitability of PCM for different climatic and regional conditions, it is essential to develop application guidelines based on local climatic characteristics. The objective of these guidelines is to optimize the thermal and environmental impacts of PCM in the context of building material selection. It would be beneficial to implement training and awareness-raising programs for architects, civil engineers, and professionals in the building industry, with a focus on PCM technologies and their advantages.

### Author Contributions

**Ebru Kılıç Bakırhan:** conceptualization, investigation, writing – original draft, visualization, methodology, writing – review



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and editing, data curation. **Merve Tuna Kayılı:** writing – review and editing, methodology, project administration, writing – original draft.

### Conflicts of Interest

The authors declare no conflicts of interest.

### Data Availability Statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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# Evaluation of architecture and engineering students' attitudes towards online education in Türkiye with technology acceptance model

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## Abstract

**Purpose** – This study examines the influence of disciplinary differences and applied practices between architecture and engineering on students' cognitive and affective responses to online education systems by employing the Technology Acceptance Model (TAM).

**Design/methodology/approach** – A questionnaire addressing the aimed TAM constructs is conducted with 483 architecture and engineering students. Partial least square structural equation modeling (PLS-SEM) is used to test the direct and indirect relationships between students' attitudes towards using (ATU), perceived usefulness (PU), perceived ease of use (PEOU) and system quality (SQ) based on disciplines' diverse learning methods and approaches.

**Findings** – This research shows that online education systems' quality (SQ) influences students' attitudes toward using (ATU) directly and indirectly. The strongest relationship is observed between system quality (SQ) and perceived ease of use (PEOU), proving that online education adoption is strongly linked to the environment's quality where applied practices are conducted. Architecture students' attitude is significantly shaped by the system's visual and interactional attributes parallel to constructivist and experiential learning. Oriented towards multidimensional problem-solving, engineering students' attitude is mainly influenced by their efficiency and productivity.

**Originality/value** – This research contributes to the knowledge of technology acceptance in online education by exploring students' attitudes and the less-examined differences between architecture and engineering disciplines. Emphasizing the impact of system quality on online education concerning applied practices, the study also underlines the possible shortcomings of the generalization of approaches. The findings offer insights into tailoring online education more inclusively and effectively by considering discipline-specific applied learning methods.

**Keywords** Online education, Architecture, Engineering, Technology acceptance model

**Paper type** Research paper

## 1. Introduction

Education is a fundamental human right and should be accessible to all regardless of the conditions (UN, 1948, Article 27). However, in periods of emergencies and disasters that result in the destruction of educational facilities and displacement of students and instructors, access to education can be seriously disrupted. For example, in the 2005 earthquake in Pakistan, 853 teachers and 18,095 students lost their lives, and more than 7,500 schools were destroyed (World Bank, 2005). Similarly, according to UNESCO (2020), the Covid-19 pandemic has affected 91% of students worldwide. In Türkiye, following the earthquakes in 2023, approximately one in five students were affected negatively. The emergencies could severely affect the continuing provision of education, which results in further adverse effects on society as a whole, socially and economically (Almaiah *et al.*, 2020). In these situations where

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adequate provision of educational services in conventional ways is not possible, alternative online education methods are adopted (Torani *et al.*, 2019). Online education has become a rapid and beneficial answer to emergencies, especially in higher education, and the applications have significantly increased since the COVID-19 pandemic (Salas-Pilco *et al.*, 2022). It is also adopted by Turkish educational institutes following the earthquake in 2023 (Ozer, 2023).

Online education is an educational approach in which learning methods and information within the scope of the course are provided remotely via the internet, and students can access educational materials at any time and from anywhere (Alassafi, 2022). Through digital platforms, online education encourages student engagement and interactive learning experiences (Zhang and Zhou, 2003; Lee, 2008). Due to these advantages, online education has become a highly applicable method beyond emergencies. However, for the effective use of online education, it is necessary to improve adaptation to the use of technology (Bojović *et al.*, 2020; Rajabalee and Santally, 2021). This involves the selection of appropriate technology for the specific needs of students, the variety of interaction opportunities provided to students and the appropriate use of technology by the instructors (Crawford-Ferre and Wiest, 2012). In this respect, the system quality of the technology has become an essential determinant for the effective use of technology and its acceptance among students concerning their satisfaction and quality perception. Considering this, the effective adoption of online education significantly varies among disciplines due to their internal differences in teaching methods, particularly between theory- and practice-oriented programs.

While theory-oriented programs have maintained a certain level of effectiveness in the adoption of online education, the necessary use in practice-oriented programs has brought several challenges to ensure the development of skills suitable for applied fields of learning (Coman *et al.*, 2020; Dayagbil *et al.*, 2021). Contrary to instructor-centered teaching methods in theory-oriented programs, where the students remain passive receivers of knowledge through listening, the learning process occurs more reflexively and engagingly in applied fields. The students are required to utilize acquired knowledge in practice. The form and level of interaction resulting from this applied nature diversify to a great extent, even among the practice-oriented programs. In Türkiye and similar developing countries, it is observed that many higher education institutions approach online education with a more generalized perspective, adopting the same formula for many practice-based disciplines. Therefore, it is important to inquire about how online education can be effectively implemented in a particular applied field, how students' learning processes are influenced and how they respond to adopting new education methods.

In light of these issues, the paper aims to evaluate how students from different disciplines perceive transitions to online education methods and how their perception is shaped by the quality of the technologies and platforms provided for online education concerning the discipline-specific applied learning methods and tools. Accordingly, the study focuses on architecture and civil engineering as distinct fields serving a similar sector. The post-pandemic period has been a challenge and opportunity simultaneously to enhance education concerning the use of information technologies in both fields. However, despite the diverging applied nature of these fields, a more generalized approach is adopted in most institutions of Turkiye as part of online education practices. Moreover, providing online education in these applied fields necessitates further evaluation of the software qualities and interaction opportunities online technologies serve. These aspects can be identified as the system quality of the online technology. Thus, the study also addresses the relationship between system quality and students' perceptions and attitudes toward using online technologies. In the study, the Technology Acceptance Model (TAM) is used to measure the effectiveness of online education and students' acceptance levels of technologies within the framework of applied educational practices in architecture and civil engineering. The model allows for evaluating the correlations between the students' perceived ease of use, perceived usefulness, attitudes towards using and external variables in each discipline and drawing comparative results

regarding the use of online education in applied practices (Sinha and Bag, 2022; Thi *et al.*, 2022). Structural Equation Modelling (SEM) is utilized as an advanced multivariable analysis method in the data analysis process. SEM allows several constructs of TAM to be simultaneously expressed by the system quality construct, which ensures strong validity, conclusion and verifiable reliabilities in the findings (Nachtigall *et al.*, 2003).

## 2. Architectural and engineering education

The basic need for shelter that emerged since the beginning of humanity was the foundation for architecture as a profession, which was identified as a whole with engineering. In the first known written source in this field from antiquity, Vitruvius pointed out that the person who will perform this profession should benefit from the theory and practical knowledge acquired through regular practice (Vitruvius, 1960). The disciplinary separation of these practice-based professions began in the seventeenth century with the Age of Enlightenment when rationalism and scientific approaches brought different methods to the foreground. Especially in the academies established under the leadership of France in Europe, a new educational method based on the knowledge of structure, form and art and progressed through mentorship has emerged under the Ecole de Beaux Arts Institute of Architecture (Benhamou, 1989; Griffin, 2020). The Ecole Polytechnique, founded in the same period, focused on teaching engineering as a distinct discipline by systematically integrating the previously disconnected fields of knowledge developed with military applications using mathematics and science. During that period, the foundations of today's civil engineering, which focuses on industrial development and construction applications, were formed in England (Chrimes and Bhogal, 2012). Since this separation, the two disciplines serving the same sector have benefitted from various theories, methods and tools in their educational approaches (Soyluk and Harmankaya, 2012). Thus, the applied practices in their education have evolved into distinct characters.

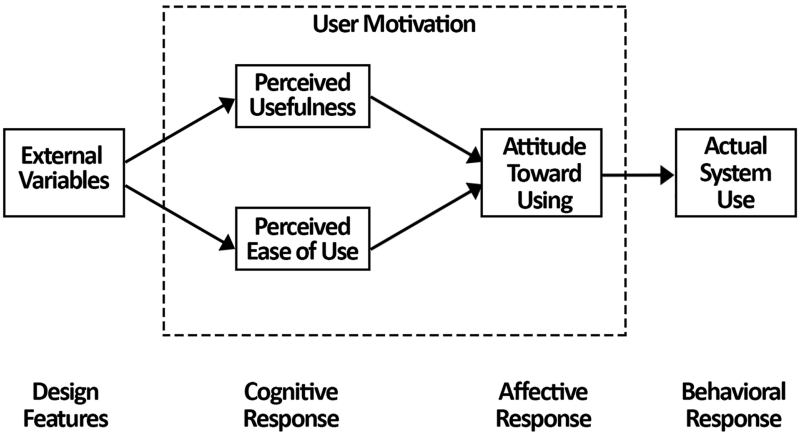
The design studio tradition is the most dominant aspect of applied practice in architectural education. In the design studio, students apply their theoretical and technical knowledge to exercises that help with multi-skill development, including students' problem-solving, critical reflection and communication abilities (Ceylan *et al.*, 2020; Ilerisoy *et al.*, 2021; Mosier *et al.*, 2023). The current approaches to the studio following Schon's conceptualization of its reflexive nature direct to an intertwined and layered learning and competency-based assessment process involving continuous reviewing (Schon, 1985, 1987; Salama, 1995). The studio environment incorporates various forms of review and feedback called "critique": table critiques (individual and/or group), peer reviews, panel discussions and public critiques in the form of juries (Elrawy and Abouelmagd, 2021). Thus, the applied practice of the studio is fundamentally constructed through co-occurring interactions and communication between the actors – the student and the tutor. The object of the studio practice also gains a representational quality to cater to such reflexive action; so, students also design and structure their communication as part of the applied process. Contrastingly, traditional engineering education is defined as content-centered and design-oriented, and it encapsulates the problem-solving processes and development of students' skills accordingly (Bourne *et al.*, 2013). Deductive thinking structures based on trusted laws are utilized to resolve cause-effect relations in a demand-oriented manner (Kersten, 2018). As a result of these qualities, the applied practices in engineering denote another strong environment for the discipline, similar to the design studio for architecture, the laboratories. Engineering education involves multiple levels of applied engagement in many kinds of laboratories through the design and conduct of experiments, the analysis and interpretation of acquired data and the design and development of tools and systems that address the studied problems through appropriate techniques and technologies.

Although some institutions approach with an integrated and unified disciplinary notion to both fields and provide education in the department of "architectural engineering," most institutions in the Anglo-American context, including Türkiye, tend to differentiate both disciplines in terms of educational tools, instructional bodies, teaching and learning

approaches as explained (Parasonis and Jodko, 2013). Parallelly, they benefit from technology and digital tools in their applied practices differently. This has become more evident in the post-pandemic period with the rise of online education. The traditional studio environment of architectural education is moved into the virtual realm, which is perceived as positive in several studies regarding the easy access to several practitioners, critiques through screen sharing and better time and organization management (Ceylan *et al.*, 2020; Mosier *et al.*, 2023; Zairul *et al.*, 2023). However, it is also considered challenging due to less experiential learning and limited interaction opportunities. For engineering education where there is a need for a common working environment and equipment use in laboratories, the emphasis has been put on the challenges of providing a virtual laboratory environment online that could serve similarly to its physical form (Bourne *et al.*, 2013). To summarize, although online education brings to the table diverging challenges and opportunities for both disciplines, a common discussion is formed around the systemic qualities in technology provision in the post-pandemic period of online education, which necessitates further analysis.

## 3. Theoretical background and hypotheses

Predicting the users' level of acceptance as early as possible is highly essential for many fields. Considering the user's response to technology, the Technology Acceptance Model (TAM) is a commonly utilized framework to examine the relationship between several factors influencing the level of acceptance. The theoretical foundation of the model developed by Davis (1986) is based on Ajzen and Fishbein (1977) Reasoned Behavior Theory, and it brings a psychological perspective to the examination of the users' cognitive and affective responses to digital systems (Davis, 1989). The fundamental constructs of the model are identified as perceived ease of use and perceived usefulness based on the prior empirical literature on human behavior (Davis, 1989; Marikyan and Papagiannidis, 2023). Perceived usefulness refers to an individual's subjective assessment of the possible benefits of employing a particular system, whereas perceived ease of use refers to the extent to which an individual believes that using a particular system would require a minimum effort. According to TAM (Figure 1), technology acceptance occurs through three consecutive and interrelated stages: the users' engagement with the external factors (the system features) prompts cognitive responses (perceived usefulness and perceived ease of use), which creates an affective response (attitude towards




**Source(s):** Davis (1986)

**Figure 1.** Technology acceptance model (TAM)

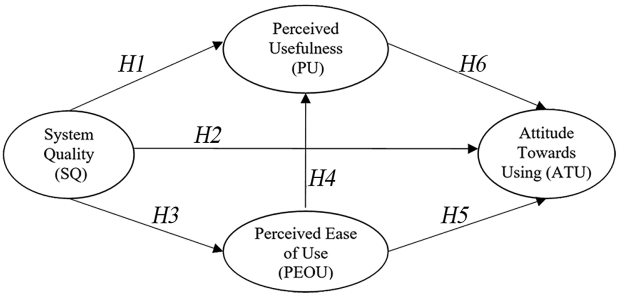
using) (Davis *et al.*, 1989; Davis, 1993). As a result of this process, the users' behavioral intentions are shaped.

Due to its limited number of variables and strong explanatory power, TAM has gained popularity quickly and has been the focus of numerous research studies. It is seen that many recent studies about online education mainly rely on TAM since it allows identifying and measuring the influence of specified constructs on learners' adoption of the technology – the environment for online education. In this respect, the particular research areas about learning are determined through various definitions of "external variables" in TAM. In their systematic review of recent studies using TAM in investigating students' acceptance of online education, Mustafa and Garcia (2021) point out that TAM is combined with many other theoretical models, and several predictor variables are shown to be influential. Other studies also indicate the importance of other variables like student stability, student resilience, academic performance, system quality, student self-efficacy, subjective norm and attitude on students' acceptance of online education (Huang *et al.*, 2006; Park, 2009; Lai *et al.*, 2012; Salloum *et al.*, 2019; Sinha and Bag, 2022; Thi *et al.*, 2022). A significant variable in this respect to be emphasized is "System Quality." System quality refers to the information system processing quality involving software and data components, and it assesses the extent to which the system is technically reliable (Gorla *et al.*, 2010). In the context of online education, system quality is related to the performance and attributes of the utilized technology that impact students' experience. It involves the availability and reliability of platforms, how students navigate within, how the environment is organized and offers various possible fields for interaction and assessment, how it responds to synchronous or asynchronous activities and how technical qualities of the technology like sound and visual qualities facilitate learning. Although not including system quality as another construct, several studies investigate the students' acceptance of an online platform, which implicitly relates to the qualities provided by the system (Al-Maroof and Al Emran, 2018; Bag *et al.*, 2020). Similarly, Ohanu *et al.* (2022) examine system quality as an external variable for developing and accepting online education environments. Considering the variety of educational contexts and disciplines where online education practices are conducted, it is essential to understand the importance of the system as an external variable influencing the implementation success.

### *3.1 Hypotheses of the study*

As mentioned above, this study argues that system quality is a crucial external variable in the TAM for online education, particularly in applied disciplines. While a higher quality IT system can support users' approach and affective response to use positively in online education, an inadequate level of system quality can reduce the efficiency and longevity of technology adoption in the education processes (Ohanu *et al.*, 2022). Because of the limitations in the technology access and the variability of students' attitudes and predispositions, measuring and understanding the impact of system quality on students' acceptance is highly significant, especially in developing geographies like Türkiye, to improve future implementations of online education towards more accessible and inclusive forms.

Considering the great diversity of educational methods, tools and techniques among disciplines, it is also essential to identify how system quality influences students' technology acceptance and attitude diversification. Particularly in the applied practices of architecture and engineering, system quality is crucial since it directly defines the medium for necessary interaction for knowledge transition between students and instructors and implicitly facilitates efficiency and accuracy during the application processes (Ceylan *et al.*, 2020). Therefore, the influence of the system quality should be approached comparatively between these two disciplines to unfold common necessities and diverse qualities that should be addressed in information technology provision to these disciplines for online education. In light of these, the proposed model of technology acceptance for online education in two disciplines based on Davis (1986, 1989) and the hypotheses put forward in the study are presented in Figure 2.




| | |
|---|---|
| *H1* | The system quality has a positive and significant impact on the perceived usefulness. |
| *H2* | The system quality has a positive and significant impact on the attitude towards use. |
| *H3* | The system quality has a positive and significant impact on the perceived ease of use. |
| *H4* | The perceived ease of use has a positive and significant impact on the perceived usefulness. |
| *H5* | The perceived ease of use has a positive and significant impact on the attitude towards use. |
| *H6* | The perceived usefulness has a positive and significant impact on the attitude towards use. |

**Source(s):** Authors' own work

**Figure 2.** Proposed theoretical framework and hypotheses

Accordingly, this study examines the influence of system quality (SQ) in the two disciplines on the students' attitudes towards using (ATU) online education systems directly (H2) and indirectly through its influence on their perceived usefulness (PU) and perceived ease of use (PEOU) (H1, H3). Moreover, the study tests whether students' perceived usefulness and perceived ease of use enhance their affective response to using online education systems (H5, H6). Lastly, since the online education systems and/or platforms are not only a mere interface for knowledge transition but an environment in which students interact and produce, the research also investigates to what extent perceived ease of use mediates perceived usefulness and if there is a disciplinary change in their cognitive responses (H4). In the existing literature on the use of TAM for online education, many different predictor variables are used as mentioned (Mustafa and Garcia, 2021). While this study is built on the already discussed relationship between system quality and attitude toward online education, a two-level exploratory analysis is conducted, which enhances the existing approaches: While the variables are tested regarding students' acceptance of online education, a simultaneous and discipline-based comparison is conducted to interpret the changing hierarchical relations among the variables and their impact.

## 4. Methodology

### *4.1 Participants and data collection*

The questionnaire designed to measure the relationships stated in the hypotheses is divided into five sections. The first section includes demographic information, and the other sections include questions related to TAM constructs to measure the acceptance of online education by students in the faculty of architecture and engineering, including system quality (SQ), perceived usefulness (PU), perceived ease of use (PEOU) and attitude towards using (ATU). The TAM scales, which were taken from Davis *et al.* (1989) and Venkatesh *et al.* (2003), served as the basis for the questions, which were modified to match the unique context of the factors influencing online learning in particular disciplines (Table 1). All the elements in the study model were operationalized by utilizing common scales from earlier works of literature that have demonstrated their reliability and validity. In Figure 1, the suggested model is displayed. The survey instruments were adapted from previous research studies that have

**Table 1.** List of measurement indicators

| Construct | Definition | Survey item code | Survey item | Adapted source |
|---|---|---|---|---|
| System Quality | refers to the technical soundness of the information system processing, including software and data components | SQ1 | The sound quality of the online education platforms is sufficient | Roca and Gagné (2008), Al-Fraihat *et al.* (2020), Yavuz and Akkılıç (2021) |
| | | SQ2 | The visual quality of the online education platforms is at a sufficient level | Roca and Gagné (2008), Al-Fraihat *et al.* (2020), Yavuz and Akkılıç (2021) |
| | | SQ3 | Online education platforms perform efficiently, even during peak hours of usage | Kurt (2015) |
| | | SQ4 | Online education platforms enable interaction with the course instructor | Sedera and Gable (2004), Dorobăţ *et al.* (2019), Al-Fraihat *et al.* (2020) |
| Perceived Usefulness | refers to an individual's subjective assessment of the possible benefits of employing a particular system | PU1 | Using online education platforms enabled me to complete tasks faster | Selim (2003), Al-Fraihat *et al.* (2020), Ahmed (2021) |
| | | PU2 | Using online education platforms increased my learning proficiency | Selim (2003), Ahmed (2021) |
| | | PU3 | Using online education platforms increased my efficiency and productivity | Selim (2003), Ramkumar *et al.* (2019) |
| | | PU4 | Using online education platforms increased my proficiency in my study | Selim (2003), Chang *et al.* (2017), Al-Fraihat *et al.* (2020) |
| | | PU5 | Using online education platforms enhances the quality of my learning | Zhou *et al.* (2022), Al-Adwan *et al.* (2023) |
| | | PU6 | Using online education platforms helped me acquire knowledge | Selim (2003), Al-Fraihat *et al.* (2020), Haji (2022) |
| | | PU7 | Using online education platforms helpful check homework assignments | Al-Fraihat *et al.* (2020), Haji (2022) |

(*continued*)

**Table 1.** Continued

| Construct | Definition | Survey item code | Survey item | Adapted source |
|---|---|---|---|---|
| Perceived Ease of Use | refers to the extent to which an individual believes that using a particular system would require a minimum effort | PEOU1 | It is easy for me to learn how to use online education platforms in my courses | Davis and Venkatesh (1996), Kurt (2015), Al-Fraihat *et al.* (2020), Al-Dokhny *et al.* (2021) |
| | | PEOU2 | I can easily find what I want to do on online education platforms | Sedera and Gable (2004), Ibrahim *et al.* (2018) |
| | | PEOU3 | It is easy for me to interact, and it only takes a small amount of my mental effort on online education platforms | Davis and Venkatesh (1996), Al-Dokhny *et al.* (2021) |
| | | PEOU4 | It is easy for me to become proficient in online education platforms | Selim (2003), Ibrahim *et al.* (2018) |
| | | PEOU5 | It is easy for me to find information on online education platforms | Selim (2003), Sedera and Gable (2004), Ibrahim *et al.* (2018) |
| Attitudes towards Using | refers to an individual's positive or negative feelings towards performing a particular behavior | ATU1 | Online education platforms are beneficial | Fathema (2013), Haji (2022) |
| | | ATU2 | Online education platforms meet my expectations | Hassanzadeh *et al.* (2012), Fathema (2013) |
| | | ATU3 | The online education platforms are easy to use | Selim (2003), Al-Fraihat *et al.* (2020), Ahmed (2021) |
| | | ATU4 | I intend to visit online education platforms frequently | Al-Fraihat *et al.* (2020), Ahmed (2021) |

**Source(s):** Authors' own work

demonstrated their reliability and validity. The students were asked to evaluate survey items adapted for technology acceptance in online education using a 5-point Likert Scale (1 = Strongly disagree, 5 = Strongly agree) to assess their participation and opinions towards the established TAM models.

The study utilized the survey technique to collect data, and the sample was chosen using the criteria sampling approach. The state institutions in various locations were selected to establish a uniform sampling group through Türkiye. Faculty of architecture and engineering students from six major universities in Türkiye's metropolitan and nonmetropolitan cities (Ankara, Istanbul, Samsun, Mardin, Karabuk, Bolu and others) have been included in the study. To eliminate any potential geographical misinterpretations due to a dominant institution, the students are selected from diverse regions representing the overall geography of Türkiye. Before further analysis, the data is evaluated comparatively to ensure reliability regarding the homogeneity of institution and student profiles. Since most institutions of Türkiye are part of the same higher education infrastructural network and similar systems are adopted during online education, the data is revealed to be meaningful to analyze the results further concerning disciplinary differences for technology acceptance. A total of 550 senior students were informed of the study's objectives, and 520 participated in the survey. Following the review of

questionnaire forms, 37 were excluded because of inaccurate or missing answers. A total of 483 students' answers were statistically investigated, and the following findings were reached.

Based on the results of the data set collected from 483 participants, the primary demographic data are presented in Table 2. As illustrated, of the 483 students participating in this research, 344 (71.2%) are studying architecture and 139 (28.8%) are studying engineering. A total of 272 (56.3%) participants are female and 211 (43.7%) are male. A total of participants (53.6%) used Teams, 123 (25.5%) used Perculus and 79 (16.4%) used Zoom. Most participants (391; 81%) reported using laptops as their device of choice for online education platforms. The participants' age distribution shows that most of them are between the ages of 20–23, as expected.

### *4.2 Explanatory factor analysis*

An exploratory factor analysis (EFA) is conducted to understand the underlying conceptual structure of the data and the extent to which the factors obtained from the literature correspond to each other (Fabrigar *et al.*, 1999). With the Varimax rotation of the principle component analysis, four components with eigenvalues greater than 1 were obtained, and it was seen that the cumulative variance explanation ratios of these components were satisfactory and overlapped with the fictional structure created (Table 3).

### *4.3 Measurement model assessment*

For this study, the researchers employed the Partial Least Squares (PLS) algorithm, a specific approach within structural equation modeling (Fornell and Larcker, 1981). PLS-SEM is a statistical technique to model complex multivariate relationships involving observed and latent variables. Unlike other statistical analyses, PLS-SEM offers more flexibility as it does not rely on strict assumptions in multivariate statistics (Fornell and Bookstein, 1982). It is particularly advantageous for analyzing small data structures and can yield satisfactory results even when dealing with missing observations (Hair *et al.*, 2013).

Before PLS modeling is conducted, the correlation matrix of the observed variables related to the latent variables is examined, and the agreement between the observed variables, the high correlation, is questioned. In this regard, the correlation analysis reveals the desired relationships between the relevant variables. For this purpose, the Pearson correlation coefficient is utilized. When examined in SEM, a minimum correlation of 0.5 is sought between the variables. The correlation matrix of the latent variables for implementing the model designed in line with the study in two different disciplines is given in Table 4. According

**Table 2.** Profile of students

| Measure | Items | Frequency | Percentage |
|---|---|---|---|
| Study | Architecture | 344 | 71.2 |
| | Engineering | 139 | 28.8 |
| Gender | Female | 272 | 56.3 |
| | Male | 211 | 43.7 |
| Age | 20–23 | 340 | 70.4 |
| | 24–30 | 138 | 28.6 |
| | 31–40 | 5 | 1.0 |
| Online education platform | Teams | 259 | 53.6 |
| | Perculus | 143 | 29.6 |
| | Zoom | 81 | 16.8 |
| Device | Phone | 59 | 12.2 |
| | Laptop | 391 | 81.0 |
| | Desktop | 31 | 6.4 |
| | Tablet | 2 | 0.4 |

**Source(s):** Authors' own work

**Table 3.** Explanatory factor analysis results

| Architecture *COMP* | ATU | PEOU | PU | SQ | Engineering *COMP* | ATU | PEOU | PU | SQ |
|---|---|---|---|---|---|---|---|---|---|
| ATU1 | 0.612 | | | | ATU1 | 0.683 | | | |
| ATU2 | 0.718 | | | | ATU2 | 0.663 | | | |
| ATU3 | 0.801 | | | | ATU3 | 0.675 | | | |
| ATU4 | 0.724 | | | | ATU4 | 0.673 | | | |
| PEOU1 | | 0.795 | | | PEOU1 | | 0.868 | | |
| PEOU2 | | 0.799 | | | PEOU2 | | 0.863 | | |
| PEOU3 | | 0.672 | | | PEOU3 | | 0.728 | | |
| PEOU4 | | 0.812 | | | PEOU4 | | 0.849 | | |
| PEOU5 | | 0.744 | | | PEOU5 | | 0.845 | | |
| PU1 | | | 0.756 | | PU1 | | | 0.802 | |
| PU2 | | | 0.852 | | PU2 | | | 0.876 | |
| PU3 | | | 0.865 | | PU3 | | | 0.878 | |
| PU4 | | | 0.861 | | PU4 | | | 0.862 | |
| PU5 | | | 0.740 | | PU5 | | | 0.890 | |
| PU6 | | | 0.713 | | PU6 | | | 0.841 | |
| PU7 | | | 0.724 | | PU7 | | | 0.879 | |
| SQ1 | | | | 0.800 | SQ1 | | | | 0.824 |
| SQ2 | | | | 0.824 | SQ2 | | | | 0.835 |
| SQ3 | | | | 0.740 | SQ3 | | | | 0.588 |
| SQ4 | | | | 0.646 | SQ4 | | | | 0.675 |
| Cumulative of Eigen values | 10.023 | 2.113 | 1.508 | 1.01 | Cumulative of Eigen values | 11.75 | 2.72 | 1.116 | 1.04 |
| %of variance | 50.11 | 10.564 | 7.53 | 5.44 | %of variance | 58.773 | 13.63 | 5.82 | 3.96 |

**Source(s):** Authors' own work

**Table 4.** Correlations among the variables

| | Architecture ATU | PEOU | PU | SQ | Engineering ATU | PEOU | PU | SQ |
|---|---|---|---|---|---|---|---|---|
| ATU | 1 | | | | 1 | | | |
| PEOU | 0.635 | 1 | | | 0.720 | 1 | | |
| PU | 0.699 | 0.483 | 1 | | 0.777 | 0.423 | 1 | |
| SQ | 0.718 | 0.533 | 0.509 | 1 | 0.723 | 0.637 | 0.617 | 1 |

**Source(s):** Authors' own work

to the correlations among the latent variables, ATU, PEOU, PU and SQ have a substantial positive connection with all other factors in architecture and engineering.

*4.4 Confirmative Factor Analysis*

PLS-SEM application typically begins with Confirmative Factor Analysis (CFA), and the results are interpreted by referring to validity and reliability benchmarks. Because of the benefits of the PLS algorithm, this technique was chosen for the investigation, and the SMART (PLS version 3) software was employed. The adequacy of the designed model is determined by various criteria gathered under three main headings. Internal consistency, convergent validity and divergent validity are obtained through CFA. Variables observed to be problematic regarding validity and reliability in the preliminary study were excluded from the model. The manifest variables significant in the altered models are PU5, PU6, PU7 and PEOU3. Cronbach's Alpha, CR and Rho_A references for the internal consistency of the models, AVE for convergent validity and finally, factor loadings for divergent validity were considered.

Table 5 shows the relevant validity and reliability indexes, and the reference values of these indexes are considered sufficient in the literature.

Previous research has advocated the goodness of fit indices; standardized root means square residual (SRMR), and norm fit index (NFI) for evaluating model fit. Model fit is attained when the SRMR is less than 0.10 or 0.08, and the NFI is between 0 and 1, closer to one (Bentler and Bonnet, 1980; Hu and Bentler, 1999). In this study, the SRMR for the architecture and engineering students are, respectively, 0.061 and 0.060. NFI for the architecture model is 0.852, and for the Engineering model is 0.860. Models are deemed sufficiently compatible based on these findings.

An experimental distribution is formed by randomly selecting a sample from the original sample and producing a new sample of the same size. This experimental distribution allows for hypothesis testing and the creation of confidence intervals for path coefficients. The study established an experimental distribution by completing 1,000 re-sampling, and the significance of road coefficients was examined at the 0.05 significance level. The path coefficients between the latent variables are positive, as shown in Table 6. According to these findings, the PEOU path coefficient for the design engineering model is not statistically significant. In other words, PU does not explain the change in PEOU (Table 7). Other independent latent factors considerably influence path coefficients depending on latent variables.

**Table 5.** Reliability and convergent validity indexes

| | Architecture | | | | Engineering | | | |
|---|---|---|---|---|---|---|---|---|
| | ATU | PEOU | PU | SQ | ATU | PEOU | PU | SQ |
| MVs | 4 | 4 | 7 | 4 | 4 | 5 | 5 | 4 |
| Cronbach's Alpha | 0.851 | 0.891 | 0.925 | 0.844 | 0.915 | 0.934 | 0.945 | 0.885 |
| Rho_A | 0.856 | 0.895 | 0.925 | 0.844 | 0.919 | 0.935 | 0.947 | 0.887 |
| Composite reliability | 0.900 | 0.924 | 0.947 | 0.896 | 0.941 | 0.953 | 0.961 | 0.921 |
| Average variance extracted (ave) | 0.694 | 0.753 | 0.816 | 0.682 | 0.800 | 0.835 | 0.859 | 0.745 |

**Source(s):** Authors' own work

**Table 6.** The outer model estimation for architecture and engineering

| Latent variable | Manifest variable | Architecture Outer loading | Engineering Outer loading |
|---|---|---|---|
| Attitude towards using | *ATU1* | 0.885 | 0.931 |
| | *ATU2* | 0.874 | 0.928 |
| | *ATU3* | 0.743 | 0.800 |
| | *ATU4* | 0.823 | 0.912 |
| Perceived ease of use | *PEOU1* | 0.839 | 0.905 |
| | *PEOU2* | 0.891 | 0.914 |
| | *PEOU3* | – | 0.832 |
| | *PEOU4* | 0.874 | 0.903 |
| | *PEOU5* | 0.866 | 0.889 |
| Perceived usefulness | *PU1* | 0.838 | 0.882 |
| | *PU2* | 0.870 | 0.897 |
| | *PU3* | 0.875 | – |
| | *PU4* | 0.876 | 0.924 |
| | *PU5* | 0.837 | 0.920 |
| | *PU6* | 0.844 | 0.893 |
| | *PU7* | 0.838 | – |

**Source(s):** Authors' own work

**Table 7.** The inner model estimation for architecture, engineering

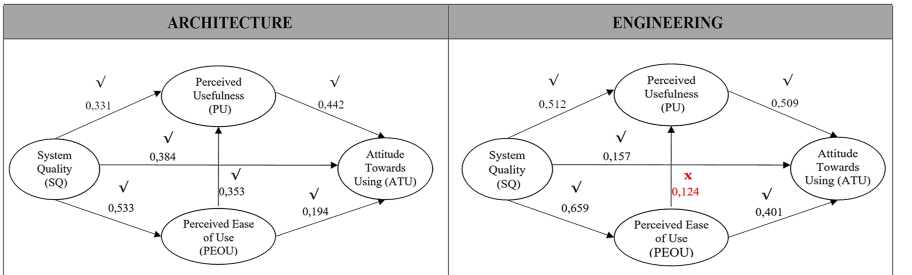
| Latent variable | | Original sample (O) | Sample mean (M) (Boot) | Std. Dev (Error) | Perc 0.025 | Perc 0.975 | *p* value |
|---|---|---|---|---|---|---|---|
| Architecture | SQ > PU | 0.331 | 0.332 | 0.056 | 0.221 | 0.440 | 0.000 |
| | SQ > ATU | 0.384 | 0.384 | 0.048 | 0.287 | 0.478 | 0.000 |
| | SQ > PEOU | 0.533 | 0.535 | 0.048 | 0.438 | 0.624 | 0.000 |
| | PEOU > PU | 0.353 | 0.352 | 0.053 | 0.247 | 0.457 | 0.000 |
| | PEOU > ATU | 0.194 | 0.195 | 0.042 | 0.113 | 0.279 | 0.000 |
| | PU > ATU | 0.442 | 0.442 | 0.048 | 0.348 | 0.536 | 0.000 |
| Engineering | SQ > PU | 0.512 | 0.518 | 0.094 | 0.332 | 0.701 | 0.000 |
| | SQ > ATU | 0.157 | 0.155 | 0.060 | 0.039 | 0.275 | 0.009 |
| | SQ > PEOU | 0.659 | 0.662 | 0.051 | 0.556 | 0.756 | 0.000 |
| | PEOU > PU | 0.124 | 0.120 | 0.114 | *−0,110* | 0.338 | 0.276 |
| | PEOU > ATU | 0.401 | 0.397 | 0.081 | 0.238 | 0.547 | 0.000 |
| | PU > ATU | 0.509 | 0.515 | 0.065 | 0.387 | 0.642 | 0.000 |

**Source(s):** Authors' own work

## 5. Findings

When the technology acceptance of students from architecture and engineering departments in the context of online education is evaluated, it is observed that system quality (SQ) had a direct effect on students' attitude (ATU) and an indirect effect through perceived usefulness (PU) and ease of use (PEOU). Since applied education methods are utilized in both disciplines, the quality of the online education system becomes a primary determinant for perceived ease of use (PEOU), which significantly influences the students' attitudes. However, the comparative evaluation of the latent factors that influence students' technology acceptance shows significant changes in the two disciplines as seen in Figure 3, necessitating further discussion over the diverse educational tools and approaches specific to both areas.

System quality (SQ) directly influences architecture students' attitudes toward technology use (ATU), whereas, for engineering students, it has a more indirect effect through usefulness (PU) and ease of use (PEOU). The root of this differentiation can be associated with the change in learning approaches within the scope of both disciplines' applied education. Since




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SQ | PEOU | 0, 533 | √ | | SQ | PEOU | 0, 659 | √ |
| PU | ATU | 0, 442 | √ | | SQ | PU | 0, 512 | √ |
| SQ | ATU | 0, 384 | √ | | PU | ATU | 0, 509 | √ |
| PEOU | PU | 0, 353 | √ | | PEOU | ATU | 0, 401 | √ |
| SQ | PU | 0, 331 | √ | | SQ | ATU | 0, 157 | √ |
| PEOU | ATU | 0, 194 | √ | | PEOU | PU | 0, 124 | X |

**Source(s):** Authors' own work

**Figure 3.** Path analyses for architecture and engineering students (hierarchical correlations are represented with gradient coloring)

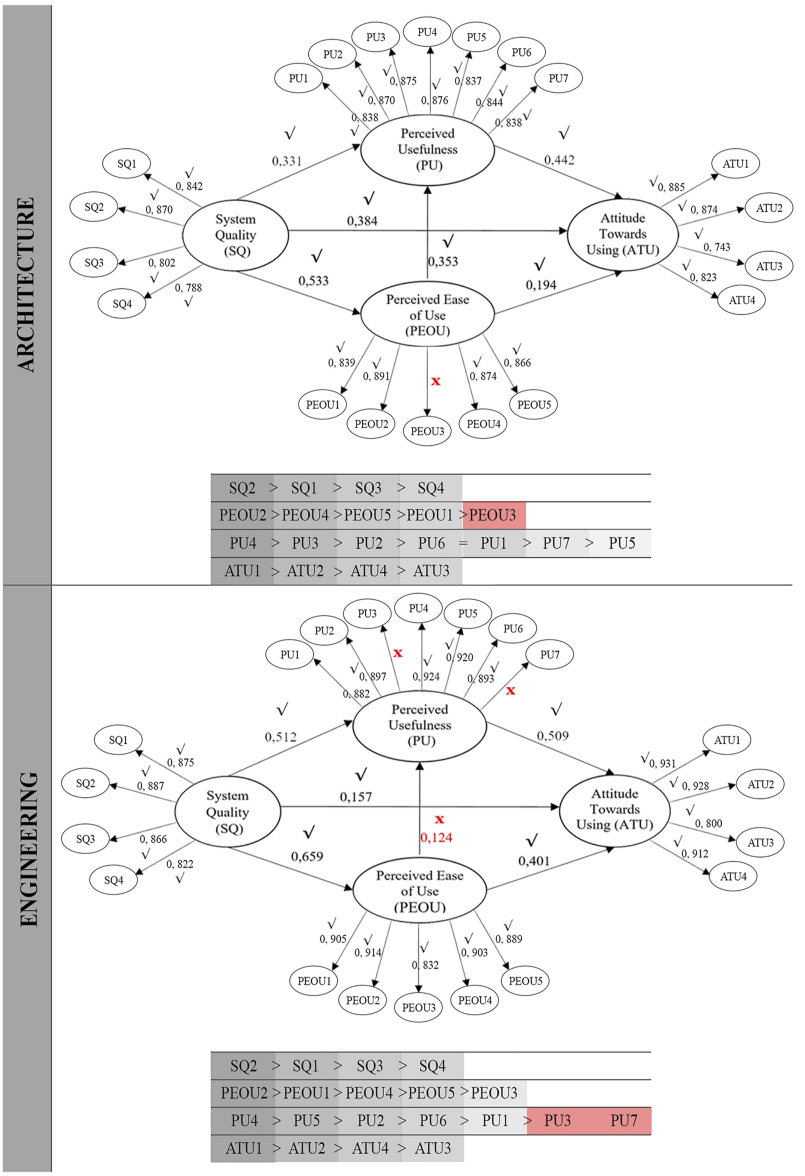
constructivist and experiential understandings are at the forefront of architectural education, the learning process occurs more engaging and transformative. Learning is seen as constructing meaning through experience, involving both the comprehension and the reshaping of experience (Kolb, 1984; Duffy and Cunningham, 1996). Therefore, the extent to which the environment is immersive has become an essential determinant in the student's development, whether in a physical or digital environment. Thus, the system's auditory and visual interaction quality becomes highly critical. Additionally, architectural education prioritizes both instructor-student and peer interaction as part of constructivist learning within the tradition of design studio, which is utilized as a distinctive instructional approach to applied practices as expressed by Schön. The design knowledge is co-constructed and produced in an interactive social and physical environment that allows for coaching and scaffolding based on the principle of reflection-on-action (Schon, 1987; Kurt, 2011).

In contrast to the situation among the architecture students, the results show that civil engineering students' attitudes (ATU) are related more to the correlations between system quality (SQ), perceived usefulness (PU) and perceived ease of use (PEOU), which is due to the particular applied character of education and related assessment methods in the discipline. Despite having constructivist aspects, engineering education diversifies in its problem-solving approach, in which the problem is handled multidimensionally in a more processual and scientific form (Kolmos and Graaff, 2015). In contrast, the applied problem-solving in architecture is more form-oriented, subjective and open to interpretation. In this regard, the fact that the perceived usefulness (PU) factor is relatively more dominant in engineering students indicates that their technology acceptance is shaped by the efficiency and productivity they achieve through online learning tools and environments.

A distinctive difference among architecture and engineering students' attitudes toward online education is seen in the latent correlation between perceived ease of use (PEOU) and perceived usefulness (PU). While architecture students' perception of educational technologies in terms of easiness determines their perception of usefulness (PU), a significant path coefficient cannot be found for engineering students. TAM presumes that there is a positive relationship between PU and PEOU; however, the results show otherwise for engineering students. This implies that for engineering students the easiness provided during the applied practice process is not a determinant of their perception of the technology's usefulness. From an educational perspective, these results can be interpreted as that since engineering education is mostly outcome-oriented, online education technologies need to cater to students' applications in terms of concrete or observable ways. The definition of "usefulness" changes for architecture students, which will be explained further in the following discussion about the outer model estimation results.

The results derived from the hierarchical relations of items leading to latent correlations derived from outer model estimations are presented in Figure 4. For architecture and engineering students, the loading of survey items concerning the system quality (SQ) and attitudes towards using (ATU) are precisely the same. Although all the items are valid regarding students' responses to online education, the overall benefit provided by the platform is seen as the primary determinant of students' attitudes (ATU1). In contrast, the platform's ease of use is seen as the least impactful (ATU4). Regarding the system quality, it is observed that SQ2 –"The visual quality of the online education platforms is at a sufficient level" is dominant for both disciplines, which emphasizes the fact that applied practices in architecture and engineering necessitate a certain level of visual quality and interaction and this influences students acceptance of online education technologies.

Despite the exact hierarchical impact of survey items in variables of system quality (SQ) and attitudes toward using (ATU), it is seen that there are drastic differences in the hierarchical ordering of the items and some invalid ones in perceived usefulness (PU) and perceived ease of use (PEOU) due to the disciplinary specificities. PU3 is identified as a significant determinant among architecture students but not a valid item for engineering students. The fact that the statement "*Using online education platforms increased my efficiency and productivity*" is




**Source(s):** Authors' own work

**Figure 4.** PLS structural model and hypotheses results for architecture and engineering students (hierarchical correlations are represented with gradient coloring)

more indicative in defining the benefits of online learning platforms for architecture students is interpreted as a result of constructivist education, as emphasized above. The design studio's more iterative and changing processes lead to critical reflections and constant reproduction of practices: it is an experiential process involving students' active participation, creation and critical reflection (Salama, 2008). Thus, the efficiency provided by online education platforms

concerning the ongoing production practices of architecture students' becomes influential in forming their attitudes. Parallelly, PU7 –"Using online education platforms helpful in my study" – was found effective in architecture students' perceived usefulness (PU), but it was not valid for engineering students.

Looking at the item hierarchy concerning the perceived ease of use, the results indicate that PEOU1 is comparably higher among engineering students. This shows that although the perceived ease of use does not necessarily mean usefulness for engineering students, the easiness of a platform is highly determinant of their positive attitudes towards accepting online education. Following this, the item PEOU3 – "It is easy for me to interact and does not take much of my mental effort on online education platforms" – is invalid for architecture students. This shows that interaction through the program has an immense influence on the usability perception of architecture students in the learning process. The use of platforms and the opportunities they offer require an intense mental effort and interaction for architecture students.

## 6. Conclusion

Online education has become a highly adopted approach for necessary conditions where adequate physical conditions cannot be provided, thanks to technological developments and the proliferation of digital tools and environments. The educational implementations realized during such periods are supported by further research, which directs to the potential use of online environments within the scope of regular formal education. In the higher education context, the quality of education provided with such an approach and its benefits on students' learning process should be examined more critically through specific cases on diverse disciplines and contextual changes. In developing geographies like Turkiye, it is especially essential to consider how the varying degrees of access to technology, adequate infrastructural organization in general and familiarity with technology at the individual level influence online applications. The quality of the system appears critical in this regard. Moreover, the existing unique disciplinary approaches of higher education institutions developed over the years should be considered concerning the quality of the online education systems and the desired learning processes and conditions. With this study, the authors have shown to what extent disciplinary differences, particularly in applied fields, influence students' cognitive and affective responses to the systems used for online education and how the system's quality determines students' attitudes explicitly and implicitly. The results show that it is highly crucial to choose online education environments where the system quality is sound and adequate to continue applied practices in architecture and engineering. Because of the constructivist and experiential learning approach in architectural education, students' perceived usefulness and ease of use of the online education environments are related to the extent to which the system facilitates their interaction with each other and the instructors – also related to various forms of critiques occurring in the design studio. Therefore, it is important to select appropriate technologies that can simultaneously support dialogue between the studio actors and increase their agency to intervene and transform the online interfaces. On the other hand, it is seen that engineering students' cognitive and affective responses are shaped according to productivity since their education necessitates a problem-solving approach based on scientifically methodological methods and controlled processes toward an outcome beyond subjective perspectives.

In Türkiye and other countries with similar Ecole, architecture and engineering are often structured as related fields in the same faculties or a close organizational order. Therefore, online education implementations are realized through shared systems. Compared to current approaches, this study showed how students' needs and expectations from the systems vary significantly due to different applied practices adopted in architecture and engineering disciplines, necessitating further consideration from the higher institutions' perspective. Therefore, even if there are conditions in which a more general online education system can be

adopted, it is of great importance to develop online environments and systems to satisfy the requirements of architecture and engineering simultaneously. Accordingly, it is more suitable to adopt an online education system that fosters a constructivist and experiential learning environment of architecture and the methodological processes of engineering involving identifying problems, conducting tests and analyzing and consequently reaching results. Although this study focuses directly on the influence of system quality on students' attitudes, the model can be expanded for each discipline in further studies to include new indicators specific to architecture or engineering. Considering the gradually developing skills of architectural students in their applications, a separate study focusing on how students from different levels respond to online education can provide valuable insights to expand system requirements. Within the scope of the study, students' attitude toward online education is analyzed also concerning the diverse platforms but it is seen that there is no significant differentiation. In future studies, the particular features of these platforms can also be addressed to understand how they affect the conduct of applied practices to guide educators and institutions to appropriate platform selection.

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# Mezar Taşlarında Ebcetle Tarihlendirme: Kastamonu Şeyh Şaban-ı Velî Haziresi Örnekleri

*Dating Tombstones with Abjad: Examples from the Tomb of Şeyh Şaban-ı Velî in Kastamonu*

**Mehmet Mutlu***

**Öz**

Türk-İslam sanatındaki kitabeler, diğer sanat formlarıyla birlikte zaman içinde gelişim ve değişim göstermiştir. Başlangıçta daha basit ifadelerle ortaya çıkan kitabeler, özellikle Osmanlı döneminde edebi metinlerin eklenmesiyle zenginleşmiş ve edebi bir platform haline gelmiştir. Ayrıca, edebiyatta ustalık göstergesi olarak kabul edilen ebcedin mezar taşlarında kullanılması, hayranlık uyandıran örneklerin de ortaya çıkmasını sağlamıştır. Kastamonu'daki Şeyh Şaban-ı Velî Külliyesi haziresi, az ama oldukça nitelikli mezar taşlarının bulunduğu bir mezarlık alanıdır. Bu alan, seçkin kişilerin defnedildiği bir yer olup, mezar taşları malzeme, işçilik, kitabe ve yazı gibi özelliklerde oldukça nitelikli örnekler sunmaktadır. Bu özelliklerin yanı sıra, kitabelerinde Türk sanatının önemli ve ilgi çekici bir alanını oluşturan ebcetle tarih düşürme tekniğinin kullanıldığı örnekler de bulunmaktadır. Bu çalışmada, hazirede tespit edilmiş olan dört adet ebcet kitabeli mezar taşında kullanılan ebcet tekniğinin çözümlenmesi ve değerlendirilmesi yapılacaktır. Bu konu üzerine daha önce benzer bir çalışma yapılmamış olup, bu açıdan araştırma özgündür ve mezar taşları bu yönüyle ilk kez değerlendirilecektir. Bu araştırma, Kastamonu Şeyh Şaban-ı Velî Külliyesi haziresinde bulunan ebcetle tarih düşülmüş mezar taşlarını tespit ve analiz etmek amacıyla gerçekleştirilmiştir.

**Anahtar Kelimeler:** Ebcet, Kitabe, Tarih düşürme, Mezar taşları, Kastamonu.

**Abstract**

In Turkish-Islamic art, inscriptions have evolved alongside other art forms over time. Initially emerging with simpler expressions, these inscriptions became enriched during the Ottoman period with the addition of literary texts, transforming them into a literary platform. Moreover, the use of Abjad, regarded as a mark of literary mastery, on tombstones has led to the creation of remarkable examples. The cemetery of the Şeyh Şaban-ı Velî Complex in Kastamonu is a burial ground with a few but highly distinguished tombstones. This area, where prominent individuals are buried, presents high-quality examples of material, craftsmanship, inscription, and calligraphy. Additionally, some examples employ the Abjad dating technique, an essential and intriguing aspect of Turkish art, in their inscriptions. This study will analyze and evaluate the Abjad technique used on four identified tombstones in the cemetery. No similar study has been conducted on this topic, making this research original in its field and offering a new perspective on evaluating tombstones. This research was conducted to identify and analyze tombstones inscribed with dates using the Abjad numerical system in the cemetery of the Şeyh Şaban-ı Velî Complex in Kastamonu.

**Keywords**: Abjad, Inscription, Dating, Tombstones, Kastamonu.

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## Giriş

Ebcet, Arap alfabesindeki harfleri yan yana getirerek alfabenin kolayca ezberlenebilmesini sağlayan, kendi başına anlamı olmayan altı kelimenin ilkidir.[1] Bu kelime aynı zamanda Arap alfabesinin genel adı, yani Arapçanın alfabesidir.[2] Ebcet, çok eskiden beri kullanılmakta olan bir tekniktir. Tekniğin bir sanat olarak ilk defa kim tarafından geliştirildiği belli olmamakla beraber, 12. yüzyılda, önce Fars edebiyatında ortaya çıktığı, sonra İslâm kültürünün etkisiyle Arap harflerini kullanmaya başlayan İranlılardan Türklere ve Türkler'den de Araplara geçtiği değerlendirilmektedir.[3] Ebcet hesabının kuralları hemen hemen her kültürde aynıdır. Alfabede ilk 10 harf 1'den 10'a kadar birer birer, 10'dan sonra gelen 10 harf 10'dan 100'e kadar onar onar, kalan harfler ise tamamı bitene kadar yüzer yüzer değer alırlar.[4] (Tablo 1).

**Tablo 1.** Ebcet Sistemine Göre Harflerin Sayısal Karşılıkları

| Birlik Değerliler | | | Onluk Değerliler | | | Yüzlük ve Binlik Değerliler | | |
|---|---|---|---|---|---|---|---|---|
| Harfler | Türkçe Okunuşu | Sayısal Değeri | Harfler | Türkçe Okunuşu | Sayısal Değeri | Harfler | Türkçe Okunuşu | Sayısal Değeri |
| ء - ا | Elif | 1 | ي - ى | Ye | 10 | ق | Kaf | 100 |
| پ - ب | Pe / Be | 2 | ڭ - گ - ک | Gef / Kef | 20 | ر | Re | 200 |
| چ - ج | Çe / Cim | 3 | ل | Lâm | 30 | ش | Şın | 300 |
| د | Dal | 4 | م | Mim | 40 | ة - ت | Te | 400 |
| ه | He | 5 | ن | Nun | 50 | ث | Se | 500 |
| و | Vav | 6 | س | Sin | 60 | خ | Hı | 600 |
| ڑ - ز | Je / Ze | 7 | ع | Ayn | 70 | ذ | Zel | 700 |
| ح | Ha | 8 | ف | Fe | 80 | ض | Dad | 800 |
| ط | Tı | 9 | ص | Sad | 90 | ظ | Zı | 900 |
| | | | | | | غ | Ğayn | 1000 |

28 harfli Arap alfabesi, yüzyıllar öncesinde (harflerin aynı zamanda rakam olarak da kullanılması sebebiyle) harf dizilişi açısından bugünkünden farklıydı. "et-tertîbü'l-ebcedî" denilen[5] bu dizilişe göre harfler, alfabede rakamsal değerlerine göre sıralanmıştı. Bu sıralamada 1'den 9'a (9 harf); 10'dan 90'a (9 harf) ve 100'den 1000'e (10 harf) kadar olan 28 sayı, Arap alfabesinde bir harfe karşılık gelmekteydi. Alfabenin bu kullanımına göre dizilimindeki ilk 4 harf (Elif, Be, Cim, Dâl), bu sisteme (Ebcet) ismini vermiştir.

Türkler, 10. yüzyılda İslamiyet'i kabul ettikten sonra Arap alfabesini kullanmaya başlamışlardır. Bu durum, ebcetin Türk kültür ve medeniyetinde çok yoğun uygulama

[1] Eyüp Nefes, "Samsun Merkez Kökçüoğlu Mezarlığı'ndaki Ebced Hesaplı Mezar Taşları", *EKEV Akademi Dergisi*, 23 (2005): 240.
[2] Muharrem Mercanlıgil, *Ebced Hesabı*, (Ankara: Kendi Yayını, 1960), 15; İsmail Yakıt, *Türk İslâm Kültüründe Ebced Hesabı ve Tarih Düşürme*, (İstanbul: Ötüken Neşriyat, 1992), 25; vd.
[3] Turgut Karabey, "Tarih Düşürme", *TDV. İslâm Ansiklopedisi,* XL (İstanbul: 2011), s. 80.
[4] Atilla Arpat, *Dini Mimaride Gizli Tasarım Yöntemleri,* (İstanbul: Birsen Yayınevi, 2006), 22.
[5] Mustafa İsmet Uzun. "Ebced", *TDV. İslâm Ansiklopedisi,* X (İstanbul: 2011), s. 68.

alanı bulmasında en önemli başlangıç noktasıdır. Tarih düşürme tekniği, Türk edebiyatında 14. yüzyılla beraber hızla gelişmeye başlamış ve özellikle 18. yüzyılda en parlak dönemine ulaşmıştır. Osmanlılarda Kanuni Sultan Süleyman dönemine kadar çoğunlukla Arapça ve Farsça ile yazılan tarih kitabeleri, 16. yüzyıldan itibaren daha çok Türkçe olarak yazılmaya başlanmıştır.[6]

Ebcet, edebiyatla yakından ilişkili olmasının yanı sıra, sayısal faktörlerin doğrudan etkisi nedeniyle matematiği de kapsayan bir tekniktir. Başlangıçta sadece edebi eserlerde kullanılmakla beraber, zamanla yapı kitabeleri ve mezar taşlarında da güzel örnekler vermiş ve bu sayede daha fazla insana ulaşarak daha çok dikkat çekmiştir. Ebcedin mezar taşlarında da kullanılması, edebiyatın estetik tarafı ile mezar taşlarının kaynaşmasını sağlamıştır. Ebcetle ifade edilen manzum tarihlerin (tarih düşülmüş şiirler) mezar taşlarında kullanılması, onu sadece ifade ettiği sayı değeri olarak değil, aynı zamanda ona yeni bir anlam ve değer kazandırarak onun sanat, estetik ve tarih arasında bağ kuran bir sanat eseri haline gelmesini sağlamıştır.

Tarih manzumesi yazan şairler "müverrih" olarak tanımlanmaktadırlar.[7] Bu tanımlama, şiirlerinde ebcet tekniğini kullanan şairler tarafından da benimsenmiş bir sıfattır. Birçok şair yazdığı şiirde kendini müverrih olarak nitelendirmiştir.[8] Müverrihler genellikle tarih veren mısranın hemen öncesinde "tarih" kelimesini ve kendi isim ya da mahlaslarını (eserlerinde kullandıkları takma adlarını) zikrederler. Ebcet kullanılmış bir şiirde "tarih" kelimesinin anılmadığı manzumeler, ebcedin tespitinde güçlüklere yol açtığı için makbul sayılmamıştır.[9]

Türk edebiyatında tarih düşürme, özellikle 18. yüzyıldan sonra bir nevi hüner sergileme sahasına dönüşmüş ve bu yüzden şairler ebcedin çok fazla çeşidini ortaya koymuşlardır. Bilmeceli biçiminde, kinayeli (dolaylı), taklîb (döndürme) veya tashîf (bilerek yanlış yazma) yoluyla, akrostiş veya vefk tarzında anlaşılması çok zor ve derin edebî sanatlar içeren tarihler söylemişlerdir.[10]

Ebcet, Türk kültür ve sanatında çok farklı alanlarda kullanılmıştır. Bazı günlük ihtiyaçların karşılanmasında, isim sembolü olarak, yeni doğmuş çocuklara isim vermede, resmi devlet kayıtlarında, büyü ve muska gibi kendine has bilgilerde, tasavvuf ve din ilimlerinde ve önemli görülen herhangi bir olayla ilgili tarih düşürmede ebcet hesabının kullanıldığı çok fazla örnek bulmak mümkündür. Buna rağmen ebcet denildiğinde akla ilk önce tarih düşürme gelmektedir.

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[6] Karabey, *a.g.e.*, 80.

[7] Ferit Devellioğlu, *Osmanlıca Türkçe Ansiklopedik Lügat,* (Ankara: Aydın Kitabevi, 1970), 945.

[8] Mehmet Nuri Çınarcı, "Osmanlı Şuara Tezkirelerinde Tarih Düşürme Geleneği". *Akademik Dil ve Edebiyat Dergisi*, 5 (2021): 2122 (erişim: 28.07.2024); Rıdvan Canım, "Klâsik Türk Edebiyatında Tarih Düşürme Sanatı ve Bir Ebced Ustası: Adanalı Sürûrî". *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 13 (2009): 110. (erişim: 28.07.2024)

[9] Karabey, *a.g.e.*, 80.

[10] Karabey, *a.g.e.*, 81.

Türk sanatında kullanılmış olan ebcet örnekleri üzerinde yapılan çalışmalar, ebcet kullanımının çok fazla türünün olduğunu göstermektedir. Yakıt'ın, on binlerce metin ve kitabe örneğini inceleyerek yaptığı tipoloji, bugüne kadar yapılan en kapsamlı çalışma olarak dikkati çekmektedir.[11] Yakıt, çalışmasında edebiyatta kullanılan ebcet türlerini yedi ana başlık altında toplamıştır. İsmail Yakıt'ın yaptığı bu çalışma dışında, ebcet türleriyle ilgili yapılan bir diğer önemli çalışma da Turgut Karabey'e aittir.[12] Karabey, çalışmasında ebcedi üç ana başlık altında gruplandırmaktadır. Bu iki çalışmayı referans kabul ederek, ebcet türlerini söyleniş bakımından, hesaplanış bakımından ve harflerin kullanılışı bakımından üç ana başlık altında toplamak mümkündür.

Söyleniş bakımından ebcet, mânen tarih, lafzen tarih ve her ikisinin bir arada kullanıldığı manen ve lafzen tarih olarak üç başlıkta değerlendirilmektedir. İfade edilmek istenen tarihin, manzum metinde kullanılan harflerin sayı değerlerinin toplamıyla ortaya çıkartılması "manen tarihlendirme" olarak isimlendirilmektedir. Ebcedin, hesaplama tekniği kullanılmadan, rakamla değil de metinle verildiği tarihlendirme biçimi ise "lafzen tarihlendirme" olarak tarif edilir. Bu ikisinin bir arada kullanıldığı teknik ise "lafzen ve mânen tarihlendirme tekniği" yöntemi olarak tanımlanır.

Hesaplanması bakımından ebcet çeşitleri ise, "tam tarih", "ta'miyeli tarih" ve "dütâ tarih" olarak üç grupta toplanabilir. Mânen tarih tekniği kullanılmak suretiyle, hesaplandığında ifade edilmek istenen sayının (yılın) tam olarak ortaya çıktığı tarihlendirme tekniğine "tam tarih tekniği" adı verilir. Bu teknik en zor ve dolayısıyla da en makbul sayılan tarihlendirme çeşididir. Ebcet tarihini veren metin içinde belirtilen sayıları, verilen ebcet cümlesine eklemek ya da çıkartmak suretiyle söylenen tarih düşme tekniği ise "ta'miyeli tarih" olarak isimlendirilir. Bu teknik eksiltme ya da ekleme durumuna göre "eksik ta'miyeli" ve "fazla ta'miyeli" olmak üzere iki farklı şekilde kullanılmaktadır. Tarihi ortaya çıkartan mısra harflerinin, söylenmek istenen yılın iki katını verdiği tarihlendirme biçimine "dütâ tarih" denmektedir. Dütâ tarihlerin en çok beğenileni, tarih veren mısra iki bölüme ayrıldığında her bölümün ayrı ayrı istenen tarihi gösterdiği ebcet şekildir. Bu, aynı zamanda en zor söylenen, dolayısıyla en başarılı sayılan tarih çeşididir. Genelde yazma eserlerde karşımıza çıkan bir tarihlendirme biçimidir.

Harflerin kullanılışı bakımından ebcet çeşitleri ise yine üç grupta incelenebilir. Bunlardan ilki, mevcut bütün harflerin kullanılmasıyla verilen tarih tekniğidir. Tarihe işaret eden metin içinde, yalnız noktalı harflerin hesaba dahil edilmesiyle ortaya konan tarih, bu grubun ikinci çeşidini oluşturur. Buna münakkat, menkūt, mücevher, cevher, cevherî, cevherdâr, cevherîn, gevher, güher gibi farklı isimler de verilebilir. Metin içinde bu tarihlendirme tekniğinin kullanılmış olduğuna dair mutlaka bir işaret bulunur. Noktalı harflerle tarihlendirme, hesaplanması bakımından ebcet türleri ile kombinasyon halinde de (ta'miyeli-noktalı tarih gibi) kullanılabilir. Sonuncu grup ise, noktasız (mühmel) harflerle yapılan tarihlendirmedir. Noktalı tarihlendirme tekniğinin tam tersi olarak, tarih veren metin içinde sadece noktasız harflerin hesaba dahil edilmesiyle ortaya

[11] Bu gruplandırma için bkz: Yakıt, *a.g.e*, 301-391.
[12] Bu gruplandırma için bkz: Karabey, *a.g.e.*, 80-82.

çıkan tarihlendirme tekniğidir. Bu teknik, "bî-nukat", "bî-cevher" ve "sâde tarih" vs. gibi isimlerle de anılır. Noktasız harflerin ebcet sayı değeri büyük olmadığından, özellikle büyük rakamların ortaya konmasında bu teknik zor bir teknik olarak dikkati çeker.

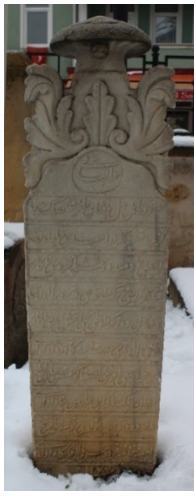
Kastamonu'da yer alan Şeyh Şaban-ı Velî Külliyesi, Türkiye'nin önemli tasavvuf merkezlerinden biridir. Külliye, cami, kütüphane, dergâh konutları, şadırvan, Şeyh Şaban-ı Velî'nin türbesi ve küçük bir hazireden oluşmaktadır.[13] Külliye, Osmanlı İmparatorluğu döneminde, özellikle 16. yüzyılda yaşamış ünlü bir sufi olan Şeyh Şaban-ı Velî'nin adıyla anılmaktadır.

Halvetiye tarikatının, Şabaniye kolunun kurucusu olan, Şeyh Şaban-ı Velî, 1481 yılında Kastamonu'nun Taşköprü ilçesinde dünyaya gelmiştir. Kastamonu'daki ilk eğitiminin sonrasında İstanbul'a gitmiş ve eğitimine orada devam etmiştir. İstanbul'da ilk eğitiminin ardından, Fatih Sahnı Semen medreselerinde tahsilini tamamlamıştır. Müderris olarak belirli bir süre İstanbul'da hizmet verdikten sonra, memleketi olan Kastamonu'ya dönüş yolundayken, öncesinde ismini duymuş olduğu, Hayreddin-i Tokadî Hazretlerini, Bolu'daki dergâhında 1508 yılında ziyaret etmiş ve dergâhta 12 sene kalarak Hayreddin-i Tokadî Hazretleri'nin ilminden faydalanmış ve tasavvuf ilminde olgunluğa erişmiştir. Daha sonra döndüğü Kastamonu'da 4 Mayıs 1569 tarihinde vefat etmiştir.[14] Şeyh Şaban-ı Velî, Osmanlı toplumunun ilim ve kültür mimarları arasında da seçkin bir mevki kazanmıştır.[15]

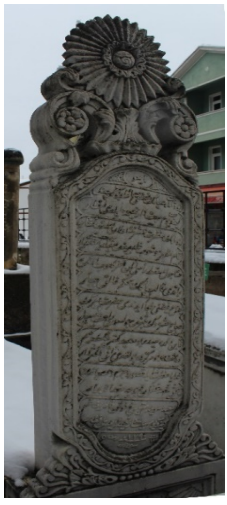
Külliye unsurlarından caminin olduğu yerde daha önce bir mescit bulunmaktaydı. Bu mescidin banisi Halveti Şeyhi Seyyid Sünneti Efendi, caminin kıble duvarının hemen önünde medfundur.[16] Buradan, külliye içindeki hazirenin Şeyh Şaban-ı Velî'den çok önce oluşmaya başladığı anlaşılmaktadır. Şeyh Şaban-ı Velî'nin türbesinin yapımına, vefatının 43. yılında Şabaniye kolunun postnişinlerinden Şeyh Ömer Fuadî tarafından başlanmış, ancak eser halkın yardımlarıyla 1611 senesinde tamamlanabilmiştir.[17] Hazirede, Şeyh Şaban-ı Velî'nin yanı sıra onun takipçileri, dervişler, alimler ve farklı dönemlerin önemli isimleri yatmaktadır. Haziredeki mezar taşları, Osmanlı döneminin mezar taşı özelliklerini taşıyan, süsleme sanatının ve hat sanatının güzel örneklerini sergileyen örnekler olarak dikkati çekmektedir (Resim 1-2).

[13] Fazıl Çiftçi, *Kastamonu Camileri-Türbeleri ve Diğer Tarihi Eserler I,* (Kastamonu: Özeller Matbaacılık, 2018), 59.
[14] Muharrem Avcı, *Vuslatının 450.Yıldönümünde Hazreti Pir Şeyh Şaban-ı Velî Yılı*. (Kastamonu: Ses Reklam ve Matbaacılık, 1019), 34-40.
[15] İhsan Ozanoğlu, *Kastamonu'nun Yetiştirdiği Meşhur Adamlar: Candaroğulları (İsmail Bey)*. (Kastamonu: Doğrusöz Matbaası, 1959), 15.
[16] Çiftçi, *a.g.e., 72.*
[17] Avcı, *a.g.e.,* 40.

**Resim 1.** Hazireden Ebcet Tarihlendirmeli Mezar Taşlarının Baş Şahideleri (Hazel Vural arşivi)



Emine Hanım'a Ait Mezarın Baş Şahidesi Dış Yüzü



Fatma Hanım'a Ait Mezarın Baş Şahidesi Dış Yüzü



Mehmet Ağa'ya Ait Mezarın Baş Şahidesi Dış Yüzü



Hasan Fehmi Efendi'ye Ait Mezarın Baş Şahidesi Dış Yüzü

**Resim 2.** Hazireden Ebcet Tarihlendirmeli Mezar Taşlarının Ayak Şahideleri (Hazel Vural arşivi)



Fatma Hanım'a Ait Mezarın Ayak Şahidesi Dış Yüzü



Mehmet Ağa'ya Ait Mezarın Ayak Şahidesi Dış Yüzü



Hasan Fehmi Efendi'ye Ait Mezarın Ayak Şahidesi Dış Yüzü

Kastamonu Şeyh Şaban-ı Velî cami haziresinde 64 adet mezar bulunmaktadır. Bunların 16 tanesi sadece baş şahidesine sahip iken, 48 tanesinin ise hem baş ve hem de ayak şahidesi bulunmaktadır. Türbenin içinde ise 16 adet sandukalı mezar bulunmaktadır.

## 2. Kastamonu Şeyh Şaban-ı Velî Haziresi Örnekleri

### 2. 1. Emine Hanım'a Ait Mezar Taşı

Toprak mezar tipolojisindeki mezar, baş şahidelidir.[18] Şahidenin dış yüzü kuzeye dönük durumdadır. Şahide, 105x30x10 cm. ölçülerinde olup, yukarıya doğru hafifçe genişleyerek yükselmektedir. Şahidenin üst bölümde yüksek kabartma tekniği ile yapılmış gösterişli akantus yaprakları bulunmaktadır. Boyun kısmı tepeliğe doğru daralarak yükselirken başlık kısmı ise hotoz şeklinde sonlanmaktadır (Resim 1).

Kitabesinden, mezarın H.1277/M.1860-61 tarihli olduğu anlaşılmaktadır. Mermer malzemeli şahidenin dış yüzeyinde bulunan Osmanlıca kitabe, kabartma tekniğinde ve sülüs hat ile yazılmıştır. Cetvellerle ayrılmış zemine yazılmış olan kitabe 12 satırdan meydana gelmektedir. Kitabenin metni, transkripsiyonu[19] ve anlamı[20] şöyledir:

| Metni | Transkripsiyonu |
|---|---|
| ١- هو الباقی | *1- Hüve'l Bâkî* |
| ٢- ستوده اهل دل پاشای رامز مخلصک حیفا | *2- Sütûde ehl-i dil pâşâ-yı ramiz muhlisin hayfâ'* |
| ٣- گزیده غنچه گلزار امیدی تباه اولدی | *3- Güzîde gonca-ı gül-zâr ümîd tebâh oldu* |
| ٤- که یعنی نو دمیده دختر پاکیزه سی ناگاه | *4- ki yâni nev-demîde dühter-i pâkizesi nâ-gâh* |
| ٥- فنا گلزارینی ترک ایتدی عدنه روبراه اولدی | *5- Fenâ gülzârını terk etti 'adna Rû-be-râh oldu* |
| ٦- هنوز دل دوزمگه طوطی گبی ایتمیش ایدی آغاز | *6- Henüz dil düzmeye tûtî gibi etmiş idi âgâz* |
| ٧- اجل لال ایتدی حسرت دیده گانه ورد آه اولدی | *7- Ecel lâl etti hasret dîdegâne verd-i ah oldu* |
| ٨ - ایدینجه ارجعی امرینی اصغا گوش جان ایله | *8- Edince erci'î emrini ısğa' gûş-i cân ile* |
| ٩ - روان پاکنه مأوای علیین پناه اولدی | *9- Revân-ı pâkine me'vâ-yı illiyyîn penâh oldu* |
| **١٠- مداد دود آه ایله یازلدی فوتنه تاریخ** | ***10- Midâd dûd-i âh ile yazıldı fevtine târîh*** |
| **١١- امینه خانمه فردوس بالا جایگاه اولدی** | ***11- Emine Hanım'a Firdevs-i bâlâ cây-gâh oldu*** |
| ١٢- سنه ١٢٧٧ | *12- Sene 1277* |

**Anlamı:** *O, Baki'dir (sonsuzdur). Gönül ehli Ramiz Paşa'nın muhlisine yazık oldu. Gül bahçesinin seçkin goncası, umutları boşa çıktı. Yani, yeni açmış temiz kız çocuğu aniden Fani gül bahçesini terk etti, cennete doğru yol aldı. Henüz gönül süslemeye papağan gibi başlamıştı. Ölüm onu susturdu, hasret gözlerine ah oldu. "Dön" emrini ruhuyla işitince temiz ruhu, yüce cennette sığınak buldu. Ah dumanıyla yazıldı ölüm tarihi: "Emine Hanım, yüce cennette yer buldu". Sene 1277 (1860-61)*

[18] Mezarların tipolojik gruplandırılmalarında Halit Çal'ın tipoloji çalışmasından faydalanılmıştır. (Detaylı tipoloji için bakınız: (Halit Çal, "Türklerde Mezar-Mezar Taşları," *Aile Yazıları*, 8 (2015): 295-332.

[19] Çalışmada bulunan kitabelerin metnini okuyarak yazımı yapan Dr. Öğr. Üyesi Bahar Sultan Quarrie'ye teşekkür ederim.

[20] Çalışmada bulunan kitabeleri günümüz Türkçe'sine çeviren Tarihçi Halis Talha Özcan'a teşekkür ederim.

**Tablo 2.** Emine Hanım'a Ait Mezar Taşı Kitabesinin Ebcet Çözümlemesi

| امینه خانمه فردوس بالا جایگاه اولدی *(Emine Hanım'a Firdevs-i bala cây-gâh oldu)* | | |

**Anlamı:** *Ey Allah'ım! Bu zat, Ramazan ayının ortasında oruçlu olarak göçtü. Cumartesi günü cennet yurdunda iftar etti. Ramazan'ın ortasında olan mağfirete lütuf olsun. Tam anlamıyla cennette yerini buldu. İstanbul doğum yeri iken, temiz bedenini yüce yaratıcının emriyle bıraktı. Hazret-i Pir'in feyz kanadını sığınak edindi. Mahşer sabahına kadar kabrinde çok rahat bulsun. Bu, bu mütevazı kişinin kayınvalidesidir ki vefatında burada defterdarın annesi bulundu. Allah'ım, kusur, suç ve isyandan mağfiret eyle. günahları affedilmiş şehitlerin hakkı için Saîda, Fatıma Hanım'ın ölüm tarihini söyledim: "Cumartesi günü cennet yurdunda iftar etti". 1290 senesi Ramazan'ın 18'i. (9 Kasım 1873)*

Ayak taşı 195x45x16 cm. ölçülerinde olup, kadın mezar taşlarında sıkça görülen gelin başı şeklinde bir buket ile sonlanmaktadır (Resim 2). Buketin ortasında üç adet gül motifi yer almakta ve etrafında akantus yaprakları bulunmaktadır. Gövdede ise ayaklı, iki kulplu bir vazo içinden çıkan dallar, dallara bitişik yapraklar ve bu dalların ucunda bulunan beş adet gül motifinin yer aldığı bir kompozisyon görülmektedir[21].

Sandık kısmının her cephesinde birer şemse motifi bulunmaktadır. Köşelere ise şemse motifini tamamlayan köşebentler işlenmiştir. Sandık kısmının uzun kenarlara sahip yüzeyinde bulunan şemseler, kısa kenarlı yüzeydekilere göre daha büyük tutulmuştur.[22]

**Tablo 3.** Fâtıma Hanım'a Ait Mezar Taşı Kitabesinin Ebcet Çözümlemesi

| گیدوب یوم سبت دار نعیمده ایلدی افطار *(Gidip yevm-i sebt dar-ı naîmde eyledi iftâr)* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| گ | ي | د | و | ب | ي | و | م | س | ب | ت | د | ا | ر | ن | ع | ي | م | د | ه | ا | ي | ل | د | ي | ا | ف | ط | ا | ر |
| 20 | 10 | 4 | 6 | 2 | 10 | 6 | 40 | 60 | 2 | 400 | 4 | 1 | 200 | 50 | 70 | 10 | 40 | 4 | 5 | 1 | 10 | 30 | 4 | 10 | 1 | 80 | 9 | 1 | 200 | |
| 1290 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Kitabenin 14. satırında verilen "*Saîda söyledim târih-i fevtin Fâtıma Hanım*" cümlesi ile, takip eden satırda ebcet tekniği ile tarih verileceğine işaret edilmektedir. Buna göre 15. satırda yer alan "*Gidip yevm-i sebt dar-ı naîmde eyledi iftâr*" cümlesi ise, ebcet hesabıyla Fâtıma Hanım'ın ölüm tarihini veren 1290 sayısını vermektedir (Tablo 3). Ebcet tekniği olarak, "mânen tarihlendirme tekniği" kullanılmıştır.

### 2. 3. Mahzer-zâde Hacı Mehmet Ağa'ya Ait Mezar Taşı

Hazireye girilen güney kapısının batı tarafındaki alanda, duvarın hemen yanında bulunmaktadır. Mezar baş ve ayak şahideli, sandık mezar tipolojisindedir. Yapım malzemesi, mermerdir. Baş şahidesi 150x35x9 cm. ölçülerindedir. Şahidenin gövdesi bir sarıkla sonlanmaktadır. Baş şahidesinin dış yüzeyinde, 16 satırdan oluşan sülüs yazı ile kabartma tekniğiyle, Osmanlı Türkçesi kullanılarak yazılmış kitabesi bulunmaktadır. Satırlar eğik olarak düzenlenmiş kartuşlar içerisine yazılmıştır. Kitabenin etrafı, kıvrık dal ve yapraklardan oluşan bitkisel bezemeli ince bir bordür çevrelemektedir (Resim 1).

[21] Hazel Vural, "Şeyh Şaban-ı Velî Külliyesi Haziresinde Bulunan Mezar Taşları" (Lisans tezi, Karabük Üniversitesi, 2017), 31

[22] Vural, a.g.e., 31.

14 Rebiül-ahir 1309 (M.17 Ekim 1891) tarihini veren kitabenin metni, transkripsiyonu ve anlamı şöyledir:

| Metni | Transkripsiyonu |
|---|---|
| ١- هو الباقی | *1) Hüvel Bâkî* |
| ٢- ای اولانلار دور اقبال و شرفله خندان | *2) Ey olanlar devr-i ikbâl ü şerefle handân* |
| ٣- صانمایک کیم ترک ایدر سیزی بو حال اورزه جهان | *3) Sanmayın kim terk eder sizi bu hâl üzre cihân* |
| ٤- پرتو ایمان ایله تنویر ایدیکز قلبکزی | *4) Pertev-i imân ile tenvîr ediniz kalbinizi* |
| ٥- بودر انجق شو جهانده شرف و سعد جنان | *5) Budur ancak şu cihânda şeref ü sa'd-ı cenân* |
| ٦- فکر ایدک که بو گنرگاه ایچون اولمش منزل | *6) Fikr edin ki bu güzergâh için olmuş menzil* |
| ٧- زیر خاک اوف نه یمان یر نه قرانلق میدان | *7) Zîr-i hâk of ne yaman yer ne karanlık meydân* |
| ٨- کیم گلیرسه گیدر البت بوله مز کیمسه بقا | *8) Kim gelirse gider elbet bulamaz kimse bekâ* |
| ٩- ازلیدر، ابدیدر یالکز بر اولو یزدان | *9) Ezelîdir, ebedîdir yalnız bir ulu Yezdân* |
| ١٠- ای گچنلر شو مزاره یوقمی بر عطف نگاه | *10) Ey geçenler şu mezara yok mu bir 'atf-ı nigâh* |
| ١١- گلکز لطف ایدیکز سز اولکز فاتحه خوان | *11) Geliniz lutfediniz siz olunuz fâtiha-hân* |
| **١٢- فضله در بر نقطه ی حرفلر ایله سال وفات** | *12) **Fazladır bir Nokta-ı harfler ile Sâl-ı vefât*** |
| **١٣- مرغ روح محمّده وار قفس فردوسده مکان** | *13) **Murğ-i rûh-i Mehmed'e var kafes-i firdevste mekân*** |
| ١٤- تجار معتبراندان محضرزاده الحاج | *14) Tüccâr mu'teberândan Mahzer-zâde el-hâc* |
| ١٥- محمد آغانک روحیچون الفاتحه | *15) Mehmed Ağa'nın rûhiçün el-fâtiha* |
| ١٦- فی ١٤ ربیع الاخر سنه ١٣٠٩ | *16) Sene 1309 14 rebiü'l-ahir* |

**Anlamı**: *O, Baki'dir (sonsuzdur). Ey ikbal ve şeref devrinde olanlar, dünyanın sizi bu halde bırakacağını sanmayın. İman ışığıyla kalbinizi aydınlatınız. Bu dünyada gerçek şeref ve saadet ancak budur. Düşünün ki bu yolculuk için bir menzil yeri olmuştur. Toprak altı ne kötü bir yer ne karanlık bir meydan. Kim gelirse gelsin, elbet gider, kimse ebedilik bulamaz. Yalnızca yüce Allah ezeli ve ebedidir. Ey bu mezarın yanından geçenler, hiç mi bir bakış atmazsınız? Lütfen geliniz ve bir Fatiha okuyunuz. Yıl ve ölüm tarihi noktalı harflerle bir fazladır: "Mehmed'in ruhunun kuşu cennet kafesinde bir mekân buldu". Saygın tüccarlardan Mahzerzâde el-Hac Mehmed Ağa'nın ruhu için Fatiha. 1309 senesi rebiü'l-ahir'in 14'ü. (17 Kasım 1891)*

Ayak şahidesi 135x30x8 cm. ölçülerindedir. Ayak şahidesinin üst bölümü bir sarıkla sonlanmaktadır (Resim 2). Şahidenin dış yüzeyinde ayaklı ve iki kulplu bir vazo içinden çıkan sarmaşık dalları ve bu dallara bitişik yaprakların olduğu bir kompozisyon bulunmaktadır. Ayrıca dalların aralarında gül goncaları ve kıvrım yapan bölümlerinde de iki adet gül motifi bulunmaktadır.[23]

Mezarın sandık kısmı da mermer malzemeden yapılmış ve üst bölümü de yine mermer malzemeli bir kapakla örtülmüştür. Sandığın her yüzüne birer adet şemse motifi yerleştirilmiştir[24].

Kitabenin 12. satırında bulunan *"Fazladır bir nokta-ı harfler ile Sâl-ı vefât"* ifadesi, ebcedle ilgili çok önemi ipuçları vermektedir. Bu cümlede öncelikle verilecek ebcet metninin değerinin, ifade edilmek istenen değerden bir fazla çıkacağı ifade edilmektedir. Cümlede dikkati çeken önemli bir husus da cümle içinde geçen "*…nokta-ı harfler…*" vurgusudur. Bu vurgu ile hem ebcete ve hem de kullanılan ebcet tekniğine işaret edilmekte olup, açıkça noktalı harflerle tarih verildiği ifade edilmektedir. Sonraki mısrayı oluşturan *"Murğ-i rûh-i Mehmed'e var kafes-i firdevste mekân"* cümlesi, ebcet

[23] Vural, a.g.e., 39-40.
[24] Vural, a.g.e., 40.

tekniğiyle tarih vermektedir. Bu cümle içinde kullanılan harflerden noktalı olanların ebcet değerleri hesaplandığında bulunan 1310 değerinden "1" rakamı çıkarıldığında Mehmet Ağa'nın ölüm tarihi olan 1309 rakamına ulaşılmaktadır (Tablo 4).

Tarih veren bir mısranın sayı değerleri toplamı, ifade edilmek istenen sayıyı tam olarak vermezse, o zaman sonuca ne kadar sayı ilave edileceği veya çıkarılacağı bir önceki mısrada ya üstü kapalı olarak ya da açık bir üslupla belirtilir. Bu tür tarihlere "ta'miyeli tarih" denir. Ta'miyeli tarih, eksik ya da fazla ta'miye olarak iki farklı şekilde kullanılabilir. Eksik ta'miyeli tarih tekniği, tarih mısrasının toplamının ulaşılmak istenen sayıdan eksik gelmesi halinde, ebcetin verdiği rakama kaç sayısının eklenmesi gerektiğini, müverrihin bir önceki mısrada açık veya imalı bir şeklide belirttiği tekniktir. Bu tür ebcetlere "tarh" usulü veya "tenzil" yoluyla tarihlendirme adı da verilmektedir[25].

**Tablo 4.** Mahzer-zâde el-Hac Mehmet Ağa'ya Ait Mezar Taşı Kitabesinin Ebcet Çözümlemesi

| مرغ روح محمّده وار قفس فردوسده مکان *(Murğ-i rûh-i Mehmed'e var kafes-i firdevste mekân)* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ن** | ا | ک | م | ه | د | س | و | د | ر | **ف** | س | **ق** | **ف** | ر | ا | و | ه | د | م | ح | م | ح | و | ر | **غ** | ر | م | | | |
| **50** | 1 | 20 | 40 | 5 | 4 | 60 | 6 | 4 | 200 | **80** | 60 | **100** | **80** | 200 | 1 | 6 | 5 | 4 | 40 | 8 | 40 | 8 | 6 | 200 | **1000** | 200 | 40 | | | |
| 1309 (1310-1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Bu örnekte, üst satırdaki cümlede yer alan, "*Fazladır bir nokta-ı harfler...*" ifadesinden, hesaplanan tarihten 1 rakamının çıkartılmasının gerektiği işaret edilmiş ve bu şekliyle de "fazla ta'miyeli tarih" tekniği kullanılmıştır.

### 2. 4. Hasan Fehmi Efendi'ye Ait Mezar Taşı

Mezar, hazire içinde Şeyh Şaban-ı Velî Türbesi'nin batısında bulunmaktadır. Hem baş hem de ayak şahidesi üzerinde kitabesi bulunmakla beraber, ebcet kullanılan kitabe metni ayak şahidesindedir. Mezar baş ve ayak şahideli, sandık mezar tipolojisindedir. Yapım malzemesi, şahidelerde mermer, sandık kısmında ise taştır. Şahideler yukarıya doğru genişleyen silindirik formdadır. Hasan Fehmi Efendi'nin ölüm tarihi ayak şahidesinin kitabesinde Muharrem 1328 (M. Ocak-Şubat 1910) olarak verilmiştir.

Baş şahidesi 150 cm. yüksekliğinde ve ortalama 17 cm çapındadır. Yukarıya doğru genişleyerek devam eden şahidenin alt bölümü, akantus yapraklarıyla düzenlenmiş silmeli bir kürsü biçiminde düzenlenmiştir (Resim 1). Silindirik gövdenin dışarıya bakan yüzünde sülüs hat ile kabartma tekniğinde ve Osmanlı Türkçesiyle yazılmış kitabesi bulunmaktadır. 9 satırdan oluşan kitabe, 9 bölüm meydana getiren kartuşların içerisine yerleştirilmiştir[26]. Kitabenin metni, transkripsiyonu ve anlamı şöyledir:

[25] Yakıt, *a.g.e.*, 315.
[26] Vural, a.g.e., 59.

**Baş Şahidesi**

| Metni | Transkripsiyonu |
|---|---|
| ١- هو الباقى | *1- Hüvel Bâkî* |
| ٢- عن اصل ويزه لى | *2- ‘An asl Vizeli* |
| ٣- اولوب قسطمونى | *3- Olup Kastamonu* |
| ٤- بدايت حقوق | *4- Bidâyet-i hukuk* |
| ٥- محكمه سى رياستنده | *5- Mahkemesi riyâsetinde* |
| ٦- ايكن ارتحال دار بقا | *6- İken irtihâl-i dâr-ı bekâ* |
| ٧- ايليان مرحوم حسن | *7- Eyleyen merhûm Hasan* |
| ٨- فهمى افندينك | *8- Fehmi Efendinin* |
| ٩- روحيچون لله الفاتحه | *9- Rûhiçün lillâh-il-fatiha* |

**Anlamı**: *O, Baki’dir (sonsuzdur). Aslen Vizeli olup, Kastamonu’da Hukuk Mahkemesi başkanlığında bulunurken ebedi aleme göç eden Merhum Hasan Fehmi Efendi’nin Ruhu için, Allah rızası için Fatiha.*

Silindirik gövdeli ayak taşı 130 cm. yüksekliğinde ve yaklaşık olarak 14 cm. çapındadır. Gövde, aşağıdan yukarıya doğru genişlemektedir. Şahidenin alt bölümü, baş şahidesinde görülen düzenlemeyle aynı şekilde, akantus yapraklarıyla düzenlenmiş silmeli bir kürsü biçiminde düzenlenmiştir. Ayak taşının dış yüzünde 13 satırlık sülüs yazı, 12 bölüm olarak düzenlenen kartuşların içerisine yerleştirilmiştir (Resim 2). Kitabe kabartma tekniğinde, sülüs hatlı ve Osmanlı Türkçesi kullanılarak yazılmıştır. Kitabenin metni, transkripsiyonu ve anlamı şöyledir:

**Ayak Şahidesi**

| Metni | Transkripsiyonu |
|---|---|
| ١- رحمة الله تعالى | *1- Rahmetullâh-i Te’âlâ* |
| ٢- آه بر ذات فضائل، شيم طبع اديب | *2- Âh bir zât-ı fezâ’il-şiyem-i tab’ edib* |
| ٣- نظر عامه ده محبوب ايدى اخلاق حبيب | *3- Nazar-ı âmmede mahbûb idi ahlâk-ı habîb* |
| ٤- مبتلا اولديغى تضييق نفسدن حر | *4- Mübtelâ olduğu tazyîk-i nefesten hür* |
| ٥- رحم الله خلاص اولمدى بو نجل نجيب | *5- Rahimallâh halâs olmadı bu necl-i necîb* |
| ٦- وار حديث نبوى صنف شهيد زمره سنه | *6- Var hadîs-i nebevî sınıf-ı şehîd zümresine* |
| ٧- التحاق ايلدى بو فاضل فرخنده غريب | *7- İltihâk eyledi bu fâzıl-ı Ferhunde garîb* |
| ٨- دختر پاكيزة زوجه غم ديده سنه | *8- Dühter-i Pâkîze-i zevce-i gam dîdesine* |
| ٩- ويره الله عظيم اجر و مثوبات شكيب | *9- Vere Allâh-ı azîm ecr ü mesûbât-ı şekîb* |
| **١٠- بالتأسف ديدى تاريخ وفاتن فوزى** | ***10- Bi’t-te’essüf dedi târîh-i vefâtın Fevzî*** |
| **١١- اولدى ضايع حسن فهمئ ممدوح لبيب** | ***11- Oldu zâyi’ Hasan Fehmî-i memdûh-ı Lebîb*** |
| ١٢- لله الفاتحه | *12- Lillâh-il-fâtihâ* |
| ١٣- سنه ١٣٢٨ محرم | *13- Sene 1328 Muharrem* |

**Anlamı**: *Allah’ın rahmeti üzerine olsun. Ah, faziletli ve edepli bir zat idi. Halkın nazarında sevgiliydi, güzel ahlak sahibiydi. Müptelâ olduğu nefes darlığından kurtuldu. Allah’ın rahmeti üzerine olsun, bu asil kişi kurtulamadı. Nebevi hadislerde şehit sınıfına katıldı bu faziletli ve bahtiyar garip. Temiz kızı ve kederli eşine Allah büyük ecir ve sabır versin. Fevzi, vefat tarihini üzülerek söyledi: “Zeki olarak övülen güzel Fehmi zayi oldu”. Allah rızası için Fatiha. 1328 senesi Muharrem ayı. (Ocak-Şubat 1910)*

Mezarın sandık kısmının, baş ve ayak şahideleriyle karşılaştırıldığında daha niteliksiz bir taş malzemeyle yapıldığı görülmektedir.

Kitabenin 10. satırında verilen *“Bi’t-te’essüf dedi târîh-i vefâtın Fevzî”* cümlesi ile, takip eden satırda ebcet tekniği ile tarih verileceğine işaret edilmektedir. Buna göre 11. satırda yer alan *“Hasan Fehmî-i memdûh-ı Lebîb”* cümlesi, ebcet hesabıyla Hasan Fehmi Efendi’nin ölüm tarihini olan 1328 yılını vermektedir (Tablo 5). Ebcet tekniği olarak ise, “mânen tarihlendirme tekniği” kullanılmıştır.

**Tablo 5.** Hasan Fehmi Efendi'ye Ait Mezar Taşı Kitabesinin Ebcet Çözümlemesi

| اولدی ضایع حسن فهمئ ممدوح لبیب *(Oldu zayi' Hasan Fehmi memdûh lebîb)* | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ب | ي | ب | ل | ح | و | د | م | م | ء | ي | م | ه | ف | ن | س | ح | ع | ي | ا | ض | ي | د | ل | و | ا |
| 2 | 10 | 2 | 30 | 8 | 6 | 4 | 40 | 40 | 1 | 10 | 40 | 5 | 80 | 50 | 60 | 8 | 70 | 10 | 1 | 800 | 10 | 4 | 30 | 6 | 1 |
| 1328 | | | | | | | | | | | | | | | | | | | | | | | | | |

Ebcet, zaman içinde kendi kullanım kurallarını ortaya koymuş bir sanat dalıdır. Bu kurallardan en önemlilerinden birisi de metnin okunuşuna değil yazılışına itibar edilmesidir[27]. Çünkü zaman zaman ebcet hesabının tutturulabilmesi için bilinçli olarak küçük imlâ hataları yapılabilmektedir. Nitekim bu örnekte, kitabede *Hasan Fehmi* isminin yazılışında, ismin sonunda hemze (ء) gerekmediği halde, metnin müverrihi Fevzî, ebcet hesabını tutturabilmek için kitabe yazımında "ye" harfini hemzeli olarak (ئ) kullanmıştır.

[27]Yakıt, *a.g.e.*, 70.

## Değerlendirme ve Sonuç

Bu çalışmada Şeyh Şaban-ı Velî Külliyesinin haziresinde bulunan mezar taşlarından ebcet tarihlendirmesine sahip örnekler ve kullanılan ebcet teknikleri incelenmiştir. İncelenen örneklerden en erken tarihli olanı 1227 (M.1860-61) tarihini veren Emine Hanım'ın mezarıdır. En geç tarihli örnek ise Muharrem 1328 (Ocak-Şubat 1910) tarihinde vefat ettiği bilgisi verilen Hasan Fehmi Efendi'ye ait mezardır (Tablo 6).

Çalışma kapsamında detaylı olarak incelediğimiz dört adet ebcetli kitabe örneğinde, üç farklı ebcet türünün kullanıldığı görülmüştür. Örneklerin tamamı söyleniş bakımından manen ebcet örneği olup, incelenen mezar taşlarında lafzen ebcede rastlanmamıştır. Hesaplama açısından ise üç örnek tam tarih, bir örnek ise fazla ta'miyeli ebcet örneği olarak karşımıza çıkmaktadır. Harflerin kullanılışı bakımından ise üç örnekte tüm harfler kullanılmışken, bir örnekte ise noktalı harflerle ebcet düşme tekniği tercih edilmiştir (Tablo 6).

**Tablo 6.** Hazirede bulunan Ebcedli Mezar Taşı Kitabelerine Ait Özellikler

| Sahibi | Tarihi | | Ebcet Kitabesinin Yeri | Ebcet Türü | | |
|---|---|---|---|---|---|---|
| | Hicri | Miladi | | Söyleniş | Hesaplama | Kullanış |
| **Emine Hanım** | 1227 | 1860-61 | Baş şahidesi dış yüzü | Manen | Tam Tarih | Tüm Harfler |
| **Fatıma Hanım** | 18 Ramazan 1290 | 9 Kasım 1873 | Baş şahidesi dış yüzü | Manen | Tam Tarih | Tüm Harfler |
| **Mehmet Ağa** | 14 Rebiül-ahir 1309 | 17 Ekim 1891 | Baş şahidesi dış yüzü | Manen | Fazla Ta'miyeli | Noktalı Harfler |
| **Hasan Fehmi** | Muharrem 1328 | Ocak/Şubat 1910 | Ayak şahidesi dış yüzü | Manen | Tam Tarih | Tüm Harfler |

Emine Hanım'ın mezar taşında *"Emine Hanım'a Firdevs-i bâlâ cây-gâh oldu"*; Fatıma Hanım'ın mezar taşında *"Gidip yevm-i Sebt-dâr-ı Na'îmde eyledi iftâr"* ve Hasan Fehmi Efendi'nin mezar taşında da *"Oldu zâyi' Hasan Fehmî-i memdûh-ı Lebîb"* cümleleri tam tarih tekniği ile ölüm tarihlerini doğrudan vermektedir.

İncelediğimiz örneklerden birinde (Mansurzâde el-Hac Mehmet Ağa'nın mezar taşında) ta'miyeli ebcet tekniği kullanılmış olup, bu örnek fazla ta'miyeli olarak kullanılmıştır. Kitabenin 12. satırında bulunan *"Fazladır bir nokta-ı harfler ile Sâl-ı vefât"* ifadesi, ebcedin istenen değerden bir fazla çıkacağını bildirmektedir. Bu cümle içinde kullanılan harflerden noktalı olanların ebcet değerleri hesaplandığında bulunan 1310 değerinden "1" rakamı çıkarıldığında Mehmet Ağa'nın ölüm tarihi olan 1309 rakamına ulaşılmaktadır (Tablo 4).

Tarihi veren mısrayı oluşturan harflerden sadece noktalı olanların hesaba katılmasıyla ortaya çıkan tarihlere "noktalı harflerle tarih" denir. Bu tür tarihlere "Mu'cem", "mu'accem", "cevher", "cevheri", "cevherdâr", "gevher", "güher", "mücevher", "menkut" ve "noktadar" gibi adlandırmalar yapılmıştır. Sadece cümlede geçen noktalı harflerin hesaplanmasıyla bulunabilen tarihler ise "asıl noktalı harflerle tarihlendirme" olarak isimlendirilir[28]. Müverrihler, metin içinde

[28] Yakıt, *a.g.e.,* 324.

yaptıkları bazı göndermelerle[29] bu eş anlamlı tabirleri genellikle ebcet mısrasından önceki mısrada belirtirler. Zor bir teknik olarak kabul edilen bu tarihlendirme, bir örnekte, yine Mansurzâde el-Hac Mehmet Ağa'nın mezar taşında karşımıza çıkmaktadır. Kitabenin 12. satırında bulunan *"Fazladır bir nokta-ı harfler ile Sâl-ı vefât"* ifadesindeki, "*…nokta-ı harfler…*"göndermesi, ebcet hesabında sadece noktalı harflerin dikkate alınması gerektiğini bildirmektedir. Nitekim, ebcet cümlesi olan sonraki mısrayı oluşturan *"Murğ-i rûh-i Mehmed'e var kafes-i fırdevste mekân"* cümlesini oluşturan noktalı harflerin (غ / ق / ف / ف) ebcet değerleri toplamı tarih vermektedir. Bu cümle içinde kullanılan harflerden noktalı olanların ebcet değerleri hesaplandığında bulunan 1310 değerinden "1" rakamı çıkarıldığında Mehmet Ağa'nın ölüm senesi olan 1309 rakamına ulaşılmaktadır (Tablo 4).

Görüleceği gibi ebcet hesabıyla tarih düşürme, mezar taşları da dahil olmak üzere her türden eserin kitabesinde sıklıkla kendine yer bularak şairlerin veya tarihçilerin ilgisini çeken bir konu olmaktan çıkıp görsel sanatların örneklerinde de varlığını hissettirmiştir. Bu yöntem, sadece kelime oyunları veya tarihsel kayıtlarla sınırlı kalmayıp, eserlerin tasarımında ve estetiğinde de derin etkiler yaratmıştır. Mezar taşlarında ebcet hesabının matematiksel ve sembolik boyutu kullanılarak bu eserlerin anlam dünyasını zenginleştirmiş, bir nevi taşıdığı tarihi ve manevi mesajları harfler aracılığıyla ifade etmiştir. Ebcet hesabı sadece yazılı kaynaklarda değil, aynı zamanda mezar taşlarının da anlam katmanlarını zenginleştirerek estetik bir derinlik sunmuştur.

Bu çalışma, mezar taşlarında ebcet kullanımının hem estetik hem de kültürel boyutlarını inceleyerek, bu geleneksel uygulamanın Osmanlı dönemi mezar taşlarına nasıl derin anlamlar kazandırdığını ortaya koymaktadır. Elde edilen bulgular, ebcet tekniklerinin sadece bir süsleme unsuru olarak değil, aynı zamanda dönemin matematiksel ve mistik düşünce yapısının bir yansıması olarak da kullanıldığını göstermektedir.

[29] Noktalı tarihlendirmeye işaret eden çok sayıda tabir bulunmaktadır. Bu tekniğin kullanıldığı ebcet örneklerinde,genellikle ebcet tarihini veren cümlenin öncesinde bulunan cümlenin içerisinde geçen "gevher-i bahr-i remel", "târih-i menkûtum...", "cevherin târih...", "noktadâriyle dedim...", "mücevher harf ile..", "tarih-i cevherdârın", "tebşir idüb...", "olsa gevher-pâş-ı teşrifat", "menkuta hurûf...", "dürdâne...", "dürr-i yektâ...", "dürr-i ferid...", "dâne-dârından...", "tar-si'a...", "hurde-i yakut...", "süreyya-rütbet...", "gevher-nazir...", "süreyya reşkeder...", "encüm-dârına...", "encüm-tabına...", "ilm-i nücûm...", "le'âli...", "kilk-i gevherdar...", "cevâhirle müzeyyen...", "katre-i eşkim- le...", "katre-i rahmetle...", gibi tabirlerle sadece noktalı harfleri hesaplamak suretiyle tarih bulunacağına işaret edilir (Yakıt, *a.g.e.,* 324).

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# Consumption of Historical Space: Spatial Transformation of Safranbolu Historical Bazaar

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**Abstract**

Under the influence of the consumer culture that dominates the relationship between cultural heritage and tourism, competing cities have begun to resemble each other and their identities have been damaged. It is thought that the Safranbolu Historical Bazaar is an example of the process described due to its constant marketing by the tourism industry and the danger of its unique culture being commodified and collapsing. In this study, it is aimed to first examine and reveal the threats to the sustainability of cultural heritage through the relations established by the space with the concepts of production-consumption and tourism, and then to create a framework that will ensure the sustainable development of the transformation that the space undergoes throughout the production process in historical cities. Based on this, the study aims to contribute to the development of alternative conservation approaches for the Historical Bazaar by producing information that will strengthen and transfer the unique value of the space. The study was designed with qualitative research methods and multiple data collection tools were used together. Observations and in-depth interviews were conducted in order to reveal spatial practices. As a result of the evaluations in the Historical Bazaar, it was seen that the transformation of the city was shaped around a heritage discourse that emphasised consumption, and suggestions were presented to contribute to the sustainability of cultural heritage.

**Keywords**

production of space, consumption, historical city, Safranbolu historical bazaar, transformation of space

## 1 Transformation and Consumption in the Production of Space in Historical Cities

Time and space are subject to social, historical, and political transformation. In other words, time and space cannot merely be treated as abstract concepts; instead, their qualities—which are embedded directly within life itself and ultimately constitute life in its broadest sense—must be comprehended holistically across disciplines. Time and space are neither empty, formal molds lacking content nor categories that independently provide knowledge of an external reality removed from human existence. Although time and space are distinct formations, they are interdependent; the existence of one necessitates the other. Therefore, a comprehensive and profound understanding of time and space must be reconsidered to include bodily experience alongside social formations and historical conditions. Lefebvre, who acknowledges the mutual interaction between time and space, argues that all historical conditions are essentially related to the production of space (Kurtar, 2013).

According to Lefebvre (2015), understanding space as a social product requires a deeper analysis of production, the product, and the interrelations between them. Spatial and social components must be evaluated dialectically as parts of a whole. Societies produce their own spaces and cultures through their specific modes of production. In the social structure, social space is redefined in every era through its tendency to transform society alongside the prevailing mode of production. Moreover, although space both influences and is influenced by the mode of production, it transforms along with it (Lefebvre, 2015). Through Lefebvre's spatial analysis, a new framework emerges for reevaluating space not just as a physical reality but in terms of social relations.

In traditional social production modes, the maintenance and reproduction of production relations occurred within space, without space itself posing a problem for sustaining these relationships. Today, however, the spread of new forces of production within the framework of capitalist modes and relations of production is evident (Ghulyan, 2017). At its current stage, capitalism's emerging global dominance increasingly manifests itself through the transformation of cities and architecture (Çoban, 2015)

The transition from one mode of production to another—fragmenting space and shaped by the contradictions embedded in social production relations—holds significant theoretical value. Each mode of production generates a new space suitable to itself during this transition. Conversely, these transitions necessitate the transformation of space and the reorganization of its structure (Lefebvre, 2015). This process began with modernism.

How the city inherits previous production forms and how new production relations are integrated and become dominant within the city has been the focus of numerous urban studies. The subsequent transformation of this inherited structure by capitalism, the positions it assumes to meet changing needs, its interaction with the city, and how it reconstructs urban form in accordance with political and economic imperatives should be viewed through the structural and dialectical lens of Marxism. In the process of self-reproduction, capitalism transforms everything it interacts with—especially nature and social life—including environment, objects, and human relations. This transformation inevitably includes the geography, region, and space in which production relations occur. In this accumulation process, particularly today, the city occupies a pivotal place both as the locus of production and as a resource commodified by capitalism (Şahin, 2020). The reorganization of production enables capitalism's geographic mobility and facilitates the use of distinctive local features, while also contributing to changes in spatial organization through new work arrangements (Durukan, 2020).

In traditional societies, space was produced by everyday life, enriched with historical and social relationships and values that generated authentic experiential qualities. However, under the influence of capital, the historical production and social significance of space are often disregarded unless they contribute to its exchange value. This process suppresses the unique experiential qualities of social space, leading to the loss of its cultural and social values (Ayşin and Turhanoğlu, 2014). The transformation of traditional production relations has caused the breakdown of certain everyday life practices. Newly acquired behaviours have contributed to the spread of consumer culture. Hence, studies concerning cities often begin by examining the modes of production and forms of spatial organization that influence urban space (Öztürk and Yamaçlı, 2023).

Over the past two decades, geographers have increasingly focused on how space is socially produced. Notably, Lefebvre (2015) and Soja (2019) argue that space is a product of human imagination and activity, emphasizing that the concept of space is more closely related to how we experience, value, and develop our surroundings than to intrinsic physical characteristics. These structures evolve over time and reflect our cultural understanding of the world. Harvey (2006) highlights the economic forces that shape places, especially the dominant role of capital. Following Urry (2018), studies have explored consumption cultures and the social construction of consumption, deepening our understanding of places as objects of consumption. One of Urry's conceptualizations—the visual consumption of places—refers to how tourists consume local lifestyles and, through their actions, contribute to reshaping those spaces. These ideas have provided fertile ground for geographers and scholars studying consumption (Overton, 2010).

As one of globalization's most powerful tools, the consumption economy has led to significant functional and formal changes in urban physical spaces. Global capital demands the creation of new spaces that stimulate consumption (Görgülü and Koca, 2009). Urban space is increasingly being produced as a consumption object, and repeated spaces shaped by consumption patterns now resemble products rather than architectural works.

Furthermore, another outcome of capitalism's consumption-driven spatial organization is the aestheticization of urban spaces through reinterpretation and representation, aiming to transform them into centres of culture, art, tourism, and entertainment. In this process, cities are defined in diverse ways to appeal to different types of tourists.

This study examines consumption in historical cities as a complex phenomenon, not limited to organizing places for specific uses or opening adjacent areas to economic use. Rather, places are increasingly consumed visually, their inherent qualities transformed into perceivable images. This transformation of space and its reproduction for consumption purposes are closely tied to advancements in transportation and communication, as well as the organization of social time. The growth of the tourism industry, enabled by the planning of leisure time and expanding travel opportunities following industrialization, has accelerated this in historical cities (Koçyiğit, 2007).

Tourism holds significant economic and social value by offering the opportunity to experience a place's unique qualities. However, space now often functions as a tool that guides visitors toward consumption. This goes beyond the

consumption of objects within a space to include the consumption of space itself as a commodity. Urry (2018) notes that tourism is an alternative form of consumption in which space is at least visually consumed. Central to tourist consumption is the viewing of landscapes or urban scenery that contrast with everyday life and offer new experiences. In this way, space becomes an image, leading to a shallow, placeless transformation that erases distinctions between places.

Post-globalization shifts in production and consumption dynamics have altered perceptions of historical cities. As cities lose many of their former functions, social and economic balance has become difficult to maintain. Cities, under the pressure of economic development, have been reorganized as tourism areas, placing the preservation of cultural heritage—beyond the physical—at risk. Influenced by consumer culture, competition among cities has caused them to resemble one another, damaging their identities. Thus, there is a growing need to develop strategies for the creative and sustainable transformation of historical cities' social, cultural, and economic values. The danger of space being consumed in historical cities corresponds to capitalism's powerful, restructuring-driven transformation. In-depth analyses of this process can help identify potential threats to urban sustainability. Within this framework, a critical and creative perspective is essential to developing governance tools that respond to evolving community needs (Öztürk and Yamaçlı, 2024).

In historic city centres, visually consumption-oriented approaches weaken experiential and communicative aspects that define a sense of place. The new communication system driven by capital transforms historical cities into visual consumption centres, reducing their identity to commodities. In this global system, the lack of balance between development and conservation leads to the erosion of place attachment, urban integrity, and social identity. The physical pressure of tourism—necessary for urban continuity and economic development—manifests in the increasing identification of places with consumption. This is also evident in Safranbolu's historical bazaar, where shifts in production relations and economically driven policies have placed space at risk of being consumed (Öztürk and Yamaçlı, 2023). The city's economy heavily depends on successfully presenting and interpreting its historical character (Strange, 1996). This may result in a transformation that undermines the historical identity of the city. The failure to sustain the unique experiences embedded in daily life, despite preserving physical elements for economic reasons, is one of the key drivers of this negative transformation (Öztürk and Yamaçlı, 2023).

Efforts to protect historical city centres and ensure their socio-economic development today have largely cantered on transforming them into tourism-focused spaces, often sidelining their social and cultural foundations. The transformation of historical spaces into objects of tourist consumption contradicts sustainable urban development. Practices that overlook the needs and expectations of local residents lead to the consumption of space, both physically and symbolically, through the erasure of local uses and meanings.

## 2 Purpose and Significance of the Research

This study primarily aims to identify the threats to the sustainability of cultural heritage by examining the interrelations between the production and consumption of space and the phenomenon of tourism. Subsequently, the objective is to propose a framework that will enable the sustainable development of spaces undergoing transformation in historical cities. In this context, the study intends to contribute to the development of alternative conservation approaches for the Safranbolu Historical Bazaar, alongside principles, strategies, and recommendations that will reinforce the original value of space and ensure its transmission to future generations.

Focusing on this objective, the research explores the relationship between the transformation of historical cities under the influence of consumer culture and strategies developed for their sustainable development.

The study employs qualitative research methods to examine the spatial transformation of historical cities under the impact of capitalism. Within the scope of the case study, multiple qualitative data collection tools were utilised. To uncover spatial practices, observation and in-depth interview techniques were employed. Physical traces of spatial transformation were mapped through spatial analyses, which were enriched using archival sources and recent academic studies relevant to the research area.

In this sense, this research, unlike previous studies on this topic, examines the area not only through its tangible values but also through social, cultural, and economic perspectives. Another key distinguishing feature of this study is its use of MAXQDA software to systematically analyze verbal, visual, and textual data.

## 3 Research Methodology

The methodology of the study is structured around three stages: defining the problem, conducting the analysis, and

developing recommendations (Fig. 1). This method was developed in light of the fact that the research topic has occurred or is still occurring in the selected region and that the majority of the data to be assessed is qualitative in nature.

The first step towards generating sustainable proposals for historical city centres influenced by consumer culture is to understand spatial transformation through the lens of changing production relations. By analysing the transformation of space in historical cities, it becomes possible to reveal the values of social space, assess the risks of its commodification, and thereby contribute to the sustainability of cultural heritage.

To identify the nature of spatial transformation, it is essential to understand how capitalist reproduction processes reposition human activities and modes of production in the city according to the needs of each era. This perspective informs the second stage of the methodology—analysis—which involves defining the areas of investigation and the spatial aspects to be explored. These areas, when examined in line with the initial conceptual framework, will form the basis for the broader analysis of the city.

Within daily life, communities experience the formation of space through diverse functions. Historical cities are shaped not only by physical elements but also by the social values they embody and the historical relations they reflect. These relationships are manifested within spaces where economic and social life unfolds. Urban spaces where the fundamental functions of city life occur include public spaces for social interaction, private spaces for living and domestic life, places of worship, and recreational areas.

To reveal the transformation of these identified spaces, field observations were conducted, and data gathered from in-depth interviews with users who actively experience these spaces were analysed thematically through a coded, section-based approach. The results were interpreted alongside the findings from observational data. The spatial representation of the collected data was supported through mapping techniques.

The MAXQDA program was used in the analysis of the transcripts obtained from the in-depth interviews. MAXQDA is a software designed for computer-assisted qualitative and mixed-method data, text, and multimedia analysis in academic and commercial institutions. The program is a qualitative software that can be used to analyze data and quantitative findings in all fields, suitable for explanation and theoretical analysis of social and cultural phenomena (Marjaei et al., 2019). Maxqda is the preferred software for researchers who want to work with quantitative and qualitative data in many fields, such as interview research, focus group analysis, internet-based surveys, and the analysis of audiovisual documents.

In the final stage, based on the findings obtained through analysis, general recommendations and principles were developed concerning the intensity and nature of changes affecting the original value of space. The purpose of this phase was to generate knowledge that could inform and support alternative conservation decisions in the future.

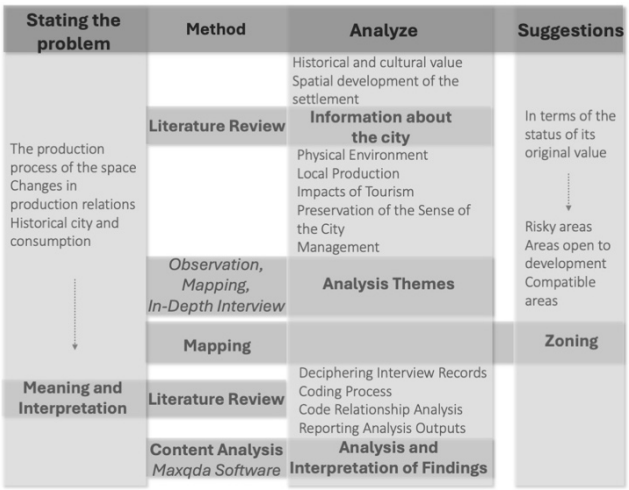


**Fig. 1** Method of the study

### 3.1 Data Collection

To understand the relationship between consumption and space, it is essential to employ multiple data collection methods. Since the formation of social space is a process, and given the need to identify rupture points that affect the production of space, a combination of methods was used in the fieldwork—including in-depth interviews, archival research, literature reviews, and direct observation.

Archival research was conducted to enhance the validity of the study by incorporating written and visual materials relevant to the subject, alongside the spatial analysis. Before the fieldwork, relevant literature was reviewed, and the area's maps and satellite images were analysed.

The sample group for the in-depth interviews was selected from among actors who were both influential in the transformation of the region and simultaneously affected by it. The sample consisted of participants from various professional backgrounds residing in Safranbolu. The interviews aimed to collect participants' experiences and insights regarding the variables that have turned cities into spaces of consumption, without imposing constraints on

their responses. The combination of visual and textual data helped contextualise the relationship between social, cultural, spatial, and economic variables and consumption within the broader social reality—a reality that, as Lefebvre (2015) suggests, cannot be divorced from urban space and spatial practices.

Interviews were conducted in May, June, and August of 2024. A total of 21 individuals participated in the in-depth interviews. Audio recordings, ranging from 25 to 72 minutes, were transcribed for analysis.

To access everyday spatial practices, observation was also conducted. These observations were used to characterise the physical conditions of the space, its usage, and general patterns of use by the local community. Photographic documentation was employed to record observations. Observational data were particularly important in supporting the interview findings. To test the reliability of the data, documents obtained from literature reviews and institutional sources (such as statistics, journals, and maps) were also reviewed and included in the study.

### 3.2 Data Analysis

The MAXQDA software programme was used to analyse the transcriptions from the in-depth interviews. This programme was chosen for its ability to efficiently organise and assess large volumes of qualitative data, thereby facilitating the development of a conceptual model in line with the qualitative research design of the study.

Interview transcripts were interpreted within the conceptual framework established at the beginning of the research. During the coding process, a list of codes—derived from both the theoretical framework and research questions—was used, along with new codes and themes that emerged organically from the interviews and observations. These transcripts were then coded using MAXQDA, allowing for a quantitative reflection of frequently mentioned concepts and helping to clarify the central findings.

## 4 Investigating the Sustainable Transformation of Space in Safranbolu

In this section, based on the theoretical framework of spatial theory, the study discusses the transformative influence of global capitalism on the Safranbolu Historical Bazaar and proposes ideas for responding to the evolving needs of the local community while preserving the city's unique qualities.

Urry (2018) argues that many localities in contemporary societies are being transformed by various forms of rapid economic restructuring. At the heart of these restructurings lies consumer culture, which manifests itself spatially (Ölmezses Şentürk, 2023). Places are shaped through consumption, and different consumption cultures lead to the emergence of various consumption-oriented spaces (Overton, 2010). In the case of Safranbolu, the change in user demographics in the city centre and the tourism-focused approach to economic development are the primary drivers behind both spatial and cultural transformation.

The concern that forms the foundation of this study arises from the observation that conservation efforts in Safranbolu, once focused on tangible heritage, are now entering a phase of commodification and representation of history tailored to a growing consumer market (Öztürk and Yamaçlı, 2023).

### 4.1 Safranbolu's Historical and Cultural Value

The settlement of Safranbolu developed following the Turkish conquest in the 11th century, evolving into a prominent trade centre. By the 13th century, it had become a major caravan station on the east-west trade route (Canbulat, 2016). Economic developments driven by the region's geographical position and characteristics enabled the city to reach a certain level of prosperity (Aktüre and Şenyapılı, 1976).

Following the decline of traditional caravan routes, the socio-economic structure shifted. Vineyards, originally worked for agricultural purposes, were transformed into summer houses. By the 19th century, two distinct residential zones emerged: the summer district known as Bağlar, and the winter settlement, referred to as the City or Bazaar (Çarşı). Additionally, separated from the Çarşı by a deep valley to the west lies Kıranköy, which was predominantly inhabited by Greek Orthodox residents until the population exchange of 1923. Thus, Safranbolu comprises three main areas—Çarşı, Kıranköy, and Bağlar—each with distinct spatial characteristics (Böke, 2020) (Fig. 2).

These three settlements—Safranbolu City (Historical Bazaar), Kıranköy, and Bağlar—were inscribed on the UNESCO World Heritage List in 1994 by the World Heritage Committee. The present study focuses specifically on the Historical Bazaar, which today is the primary site of tourism activities.

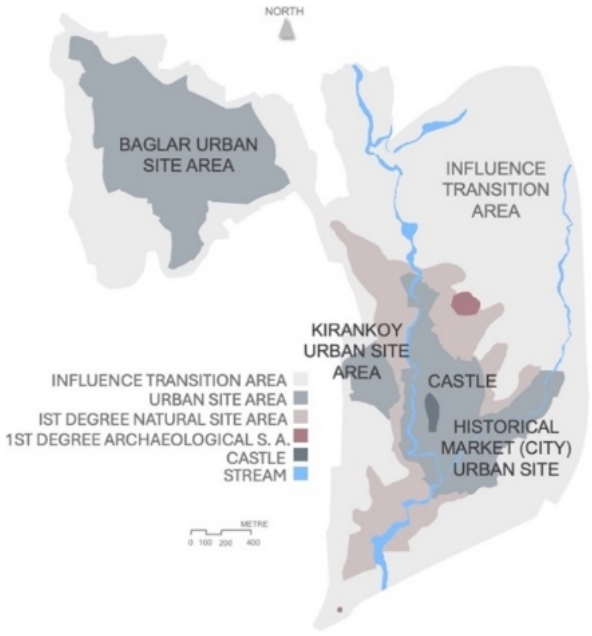


**Fig.2** Safranbolu city protected areas

### 4.2 Spatial Transformation of Production and Settlement in Safranbolu

Safranbolu maintained its position as a significant commercial centre until the first half of the 20th century. However, with the construction of railway lines in the 19th century, trade routes shifted, diminishing the strategic importance of Safranbolu, which lay on one of the now-defunct routes. The successive wars that followed led to nationwide economic hardship, which was also reflected in the town, resulting in the deterioration of its socio-economic structure. Production declined, labour shortages emerged, and out-migration increased (Böke, 2020).

The core driver of this transformation of space was the shift in the town's fundamental production relations. Traditional leather manufacturing, unable to keep up with technological advancements and further weakened by the establishment of the Karabük Iron and Steel Factory, lost its economic viability. Likewise, handicrafts based on the master-apprentice model faced extinction due to the labour gap. A leather factory established in the early 20th century also closed due to lack of skilled workers and operational difficulties.

As the historical bazaar lost its primary functions, local residents began to abandon their mansions, which they could no longer maintain. The town's new residents were largely composed of incoming industrial workers (Aktüre and Şenyapılı, 1976, p.83; Doğanalp Votzi, 2022). This demographic shift brought with it changes that also influenced the town's cultural fabric.

From the 1970s onward, preservation initiatives began, and in 1994, Safranbolu was inscribed on the UNESCO World Heritage List. Interest in the region grew significantly thereafter, and tourism initiatives gained momentum. While the factory had previously positioned industry as a major economic sector, by the 1990s, tourism began to dominate the local economy. Today, tourism ranks among the town's most vital sectors (Türker, 2022), prompting the urban space to reorganise itself increasingly around the service industry.

### 4.3 Findings

This section explores the lived experiences of participants with different professional backgrounds residing in Safranbolu, specifically within the Historical Bazaar—the designated area of focus. Data obtained through semi-structured in-depth interviews were analysed using the content analysis method, a widely applied qualitative technique.

The findings from these interviews were categorised under five main themes: the physical environment, local production, the impacts of tourism, preservation of the sense of the city, and governance (Table 1). Upon reviewing these codes, the recurring themes of commercial concern and authenticity emerged prominently—aligning with previous research on the Safranbolu Historical Bazaar (Somuncu and Yiğit, 2009; Böke, 2020; Doğanalp Votzi, 2022; Türker, 2022).

The relationships between overlapping or closely related codes in the text were identified using MAXQDA's Code Relations Browser. The concept map representing intersections among the created codes was generated using MAXQDA's code model and is presented in Fig. 3 as a code co-occurrence model. The thickness of connecting lines indicates frequency, with thicker lines denoting stronger correlations.

The relationship between each main theme and the associated codes was tabulated using MAXQDA's code relations table and is presented in two tables under Table 2.

**Table 1** The codes extracted from the interviews and the order of the themes they combine with their frequency values.

| Themes | Codes | Subcodes |
|---|---|---|
| Physical Environment (60) | Places needed in the city (26) | Pharmacy (3)<br>Workshop- training center (3)<br>Museum (3)<br>Places for young people (5)<br>Quality place(6)<br>Public space (6) |
| | Purpose of use (34) | To explore (2)<br>Technical trip - research(3)<br>Working-living (5)<br>Food and drink (7)<br>Showing guests around (7)<br>Walking - sightseeing(10) |
| Local Production (77) | Lack of production (8)<br>Lack of quality in products (12)<br>Ongoing original production (16)<br>Extinction of local crafts (16)<br>Lack of originality of products (25) | |
| Impact of Tourism (58) | Negative effects of tourism (51) | Crowd (4)<br>Physical wear (9)<br>Inability to experience the city center (10)<br>Traffic problem (10)<br>Exceeding the city's capacity (14) |
| | Positive effects of tourism (7) | |
| Preserving the Sense of the City (104) | Identity change (4)<br>Being seen as a potential customer (7)<br>Transforming into a museum city (9)<br>Changing demographic structure (13)<br>Interruption of authentic daily life (17)<br>Decline of the originality of the city (21)<br>Trade-oriented approach (33) | |
| Management (174) | Misjudgment of tourism (4)<br>Need for control (7)<br>Lack of communication between stakeholders (8)<br>Failure of the work to achieve its purpose (9)<br>Need for public support (9)<br>Successful conservation (11)<br>Innovative work (11) | |
| | Extension of information period (25) | Ineffective use of social media (4)<br>Inability to access cultural activities (10) |
| | Problems related to the use of space(46) | Inter-regional disconnect (5)<br>Bringing vehicles inside (10)<br>Presentation and interpretation techniques (14)<br>Limited space usage (17) |
| | Education and research(44) | Lack of dialogue with local people(6)<br>Lack of Awereness (27) |

When examining the code relations tables that visualise the intensity of intersections between participants' statements within the coding system, the strongest intersection is observed between the theme of governance and the sub-code decline of local crafts. In parallel, a notable overlap is identified between the theme preservation of the sense of the city and the sub-code presentation and interpretation techniques.

In the second tier of frequency, the theme local production intersects with innovative and positive initiatives, while preservation of the sense of the city intersects with demographic shifts and interruption of authentic daily life. The governance theme also prominently intersects with the sub-code loss of authenticity.

In the third tier of intersection frequency, the governance theme overlaps with lack of awareness, commerce-oriented approach, innovative initiatives, presentation and interpretation techniques, and traffic problems. Similarly, preservation of the sense of the city co-occurs with lack of awareness and commerce-driven approach, while the impacts of tourism theme intersects notably with physical deterioration and vehicular access to pedestrian areas (Table 2)

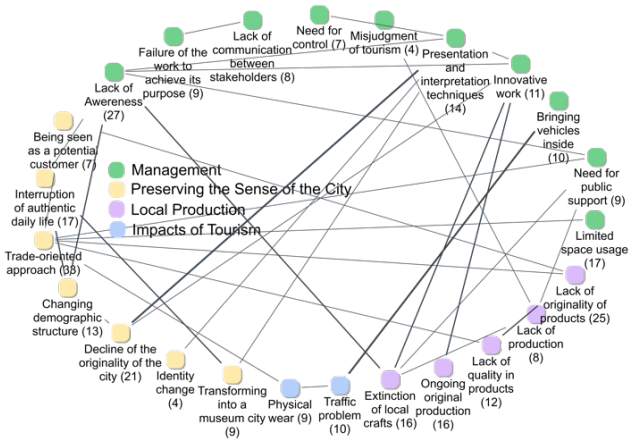


**Fig.3** Code co-occurrence model

**Table 2** Code relations browser data

| Code System | Lack ... | Trade... | Chan... | Transf... | Extinc... | Ongoi... | Traffi... | Innov... |
|---|---|---|---|---|---|---|---|---|
| Physical Environment | | | | | | | | |
| Local Production | | | | | | | | |
| Impact of Tourism | | | | | | | | |
| Preserving the Sense of the City | | | | | | | | |
| Management | | | | | | | | |
| SUM | 8 | 9 | 7 | 5 | 7 | 5 | 5 | 8 |

| Code System | Lack ... | Need ... | Interr... | Lack ... | Lack ... | Physi... | Prese... | Declin... |
|---|---|---|---|---|---|---|---|---|
| Physical Environment | | | | | | | | |
| Local Production | | | | | | | | |
| Impact of Tourism | | | | | | | | |
| Preserving the Sense of the City | | | | | | | | |
| Management | | | | | | | | |
| SUM | 5 | 4 | 6 | 3 | 3 | 3 | 7 | 5 |

## 5 Discussion

As a result of transformations in production relations, it is evident that traditional professions no longer survive in the town. Primary livelihoods such as leatherworking, forestry, and livestock farming have been largely replaced by tourism. Doğanalp Votzi (2022, p. 325), in her fieldwork conducted in 1982, observed that traditional trades were still active within the Historical Bazaar, with its shops, workshops, mosques, baths, inns, and weekly grain and vegetable markets, serving as the town's economic and social hub. However, she also noted that as traditional crafts diminished, the bazaar began to lose its productive function and gradually transformed into a museum-like display catering to tourist consumption.

As shown by earlier studies (Köse, 2019; Dağı and Çelik, 2020; Deniz and Çelik, 2020; Yaman, 2022; Öztürk and Yamaçlı, 2023) and field-based analyses, traditional crafts have not been adequately preserved in the Bazaar, and commercial functions serving tourism have intensified as part of an economic development strategy. According to the code co-occurrence model, the disappearance of local crafts

is closely related to a lack of awareness among the local population.

While the Historical Bazaar has garnered attention for its tangible heritage preservation, the failure to protect traditional crafts and production techniques poses a risk to the intangible heritage. As tourism's influence grows, craftspeople striving to continue their work have shifted their product lines from everyday items to goods tailored for tourists. Today, these crafts—used in restoration work—are performed and reinterpreted as touristic spectacles, gaining new meanings through stylised presentations (Köse, 2019). Currently, only a few coppersmiths and blacksmiths continue traditional production, alongside a single yemenici (traditional shoemaker). Outside these few, most of the products in the Bazaar are mass-produced souvenirs lacking authenticity.

Historically, Safranbolu was also a prominent agricultural production area and settlement (Türker and Gür, 2024). During fieldwork, participants highlighted the insufficiency of locally produced goods. Safranbolu Delight remains one of the few original products still in production. Yet, with the increasing number of shops, concerns regarding quality and discomfort caused to visitors during aggressive sampling practices have been raised by participants.

Kaya (2019) identifies one of the major conservation issues in urban heritage areas like Safranbolu as the inability to maintain the social fabric of the town. The departure of original inhabitants, alongside the repurposing of buildings for different functions, causes the historical environment to lose its essence as a "city" and instead turn into a visually appealing but experientially empty museum. This scenario is seen as a potential risk for Safranbolu as well. With the pressures of modern living, the traditional lifestyle is no longer observable in its original form. Today's local residents largely consist of families who settled in vacant houses following the establishment of the iron and steel factory, as well as investors who moved in for commercial purposes.

The presence of multiple social groups in the region has led to changes in senses of belonging and identity, resulting in the disruption of traditional daily practices (Çırak, 2019; Kaya, 2019). The fundamental elements that give meaning to space—through shared societal interactions—are now at risk. The use of historical character for economic strategies has gradually diminished residential functions and, in turn, reduced the density of the local population. Many mansions located near commercial areas in the centre of the Bazaar have been converted into tourist accommodations (Fig. 4).

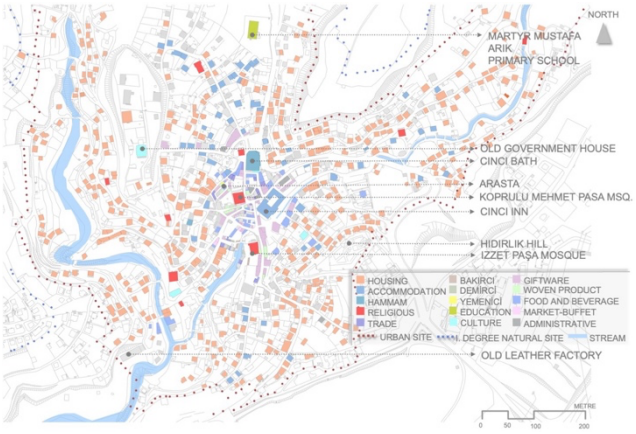


**Fig.4** Transformation of the functional status of the Old Bazaar centre

In the Safranbolu Bazaar area, the gradual withdrawal of the local population from the space—alongside the erosion of original uses and values in a physically preserved yet socially disconnected environment—brings with it the looming threat of spatial consumption. The data obtained from the field study support this concern, revealing that the loss of values contributing to the sense of the town is closely linked to demographic changes, the interruption of authentic daily life, and a general lack of awareness.

New residents, who are often unfamiliar with the nuances of traditional life in the area, struggle to fully grasp the meaning and significance of heritage. One of the key findings that emerged from the study is the tendency of these newcomers, who engage in production with a commercially driven mindset and lack a strong connection to the sense of the place, to reduce heritage to its economic utility. As a result, spaces undergoing transformation are increasingly commodified through newly assigned, market-oriented functions.

Sevgi (2024) stresses that in the Historical Bazaar, the failure to adhere to the principle of designing new functions in relation to former uses results in spaces becoming commodified entities, disconnected from their historical context. This loss of continuity effectively transforms once-vital urban places into consumable objects devoid of cultural memory. UNESCO's 2006 Periodic Reporting also highlights several threats and risks, including development pressure, visitor/tourism pressure, lack of infrastructure, renewal trends focused on tourist accommodation, and serious traffic/parking problems (UNESCO, 2025). As outlined in the monitoring report, Safranbolu presents a visible example of the tension between tourism and conservation. While tourism is undeniably instrumental in generating urban and regional economic value, if managed

solely with a consumption-oriented development perspective, it may lead to several adverse effects on the transformation of historic towns.

Recent research indicates that the Historical Bazaar is particularly prone to overcrowding during holidays, which results in the physical overcapacity of the site being breached (Sevgi, 2024; Türker et al., 2024). Both direct observations and participant statements from the field confirm that the Bazaar is undergoing physical wear and tear due to excessive use—effectively becoming consumed in a literal sense. Combined with increased vehicular traffic, this situation impairs the perceptibility of the historical fabric, thereby negatively affecting visitors' and locals' spatial experience (Fig. 5).

Let me know if you'd like a [summary of Fig. 5](f), [policy suggestions to mitigate over-tourism](f), or [examples of adaptive reuse done right](f).

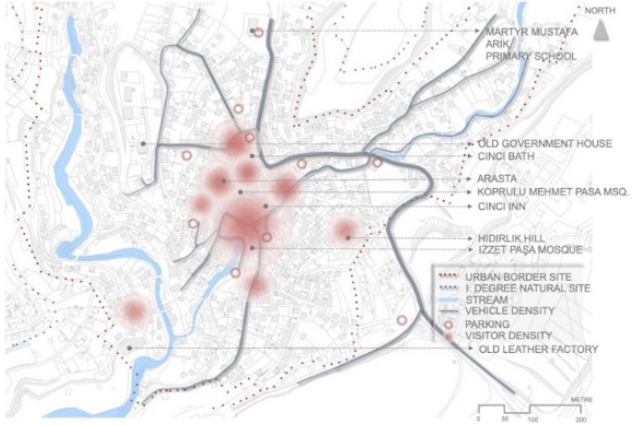


**Fig.5** Areas of the centre that are exposed to heavy use in the Bazaar

In addition to the issue of capacity overload within the Historic Bazaar, spatial usage patterns reveal broader concerns stemming from the unplanned management of tourism. The over-concentration of visitors in certain zones, while peripheral areas such as Kıranköy and Bağlar remain underutilised, indicates a lack of balanced spatial planning. Furthermore, vehicular access into the narrowest streets of the Bazaar creates significant pressure on both the physical fabric and the spatial experience. Field data confirm that traffic congestion—particularly during peak periods—is one of the town's most pressing issues. The unrestricted entry of vehicles at all times has led to visible wear and tear on the urban texture (Fig. 6), underscoring the urgent need for alternative, locality-specific traffic solutions.




**Fig.6** The density of people in the Historical Bazaar centre at different dates, the congestion caused by vehicles in narrow streets and the restriction of pedestrian movement.

Since Safranbolu's inscription on the UNESCO World Heritage List in 1994, there has been a notable increase in tourist activity. However, due to insufficient visitor management strategies, tourist flows remain highly concentrated in specific commercialised areas of the town. This concentrated usage not only exacerbates physical degradation but also undermines equitable visitor distribution. Participants in the study affirm that while the central Bazaar remains overwhelmed, moving toward its peripheries reveals spaces where more authentic daily life can still be observed—albeit sporadically (Fig. 7).

Görmüş et al. (2018) support these findings by noting that the streets associated with shopping and heritage façades form a visible tourist axis, where photographic evidence lacks details of everyday life. This suggests that either such everyday scenes have vanished or that the architectural aesthetic has overridden the lived experience in the tourist gaze.

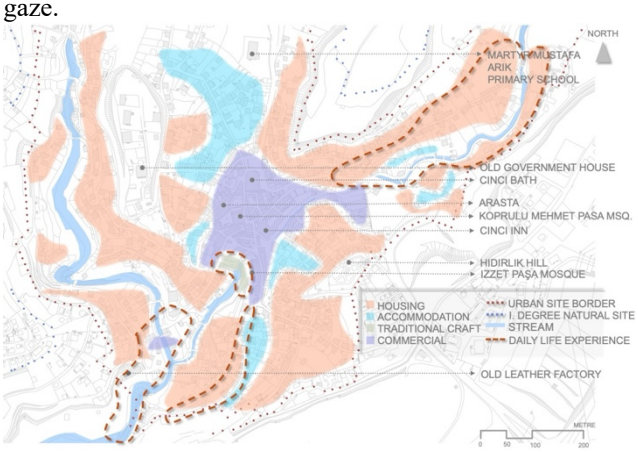


**Fig.7** The general area uses of the market centre and the areas where participants enjoy experiencing the city and daily life are experienced.

While participants largely acknowledged the success of tangible heritage conservation in the Historic Bazaar, they

also criticised the overemphasis on aesthetic restoration aimed solely at tourism. This selective transformation disrupts the relationship between space and community, rendering such places incapable of delivering genuine experiential value. Detached from their social context, towns undergoing similar transformations often risk becoming homogenised—losing their unique character and drifting toward placelessness. In such settings, heritage itself becomes endangered by the very tourism it is meant to sustain.

At the heart of this issue is image-based consumption: the selection and re-presentation of spatial elements that are visually appealing to tourists. This process reduces place to a set of curated images, fostering visual rather than meaningful engagement. The Historic Bazaar appears to follow this trajectory, as conservation efforts prioritise the aesthetic dimensions of tangible heritage. Ölçer Özünel (2011) notes that in such artificially reconstituted spaces, not only is the setting commodified, but culture itself is reconstructed through consumption.

One of the study's most striking findings was the frequent co-occurrence of presentation and interpretation techniques with concerns over the loss of authenticity. The reinterpretation of Safranbolu's historic character to fit within a competitive tourist market, while effective in attracting visitors, has contributed to a shallow, image-driven representation of place.

Among all coded themes, "management" emerged with the highest frequency. This theme encompasses vital areas such as the importance of continuous education and research, the need to reconsider how intensely used spaces are evaluated, and the critical role of knowledge transfer in shaping the urban experience. These elements are essential for developing resilient strategies that protect the integrity of place while allowing it to evolve meaningfully.

**6 Conclusions and Recommendations**

Cultural heritage sites serve as sources of knowledge not only locally but also internationally. Due to the impact of globalization, heritage sites that possess particular local significance—especially those that represent a unique and exceptional testimony to history and are inscribed on the UNESCO World Heritage List as part of humanity's common heritage—have attracted increasing attention. This interest has significantly contributed to the growth of cultural tourism, which is considered a major type of tourism (Sevgi, 2024). However, while historic cities are increasingly highlighted for their unique characteristics, they are simultaneously undergoing transformation under the influence of new spatial reorganization dynamics.

Everyday life, as the true centre of human production, encompasses a multitude of complex relationships and lived practices (Lefebvre, 2015). In this context, the preservation of authentic daily life in historical environments—reimagined through new modes of spatial organization in a changing world—is critical. Research should explore how traditional living practices, which shape historical environments, can be sustained by integrating modern needs. In the case of Safranbolu's Historical Bazaar (Çarşı), a sustainable model is needed—one that both serves multiple functions and maintains the site's authenticity. Strategies should be developed to allow tourism and everyday life practices to coexist and remain experienceable.

This study, based on in-depth interviews conducted in Safranbolu's Historical Bazaar, foregrounds participants' spatial experiences to identify not only the threats to the sustainability of the city's qualities but also the areas with potential for improvement. Through the fieldwork and interviews, the study proposes actionable steps for the creative and sustainable transformation of historic urban spaces.

- A primary step for the Historical Bazaar—which bears the traces of a consumption-driven transformation—is to reassess the heritage awareness of the user groups, which have changed due to socioeconomic factors, and to collaboratively rediscover distinctive natural, cultural, and social resources with all stakeholders. It is essential to evaluate the features that reflect the "sense of place" through appropriate thematic frameworks (Öztürk and Yamaçlı, 2023).
- For crafts under threat of extinction, institutional collaboration becomes paramount. In Safranbolu, there are already institutions with the capacity to support such efforts. Through workshops where visitors can experience local production practices, cultural transmission can be enhanced via hands-on engagement. Experiencing local production not only deepens tourist encounters but also fosters direct communication with the local population. Art faculties and cultural education centres in the city hold potential to offer design support, thereby enhancing the originality of local production. Creative workshops that raise local awareness and allow visitors to participate in production could be

realized using existing but currently unused buildings in the city centre (Köse, 2019).

- Supporting traditional production is crucial for sustaining the region's unique commercial functions. This requires both the preservation and the creative reinterpretation of traditional crafts.
- With the growth of tourism, local products like vinegar and molasses have gained prominence. New varieties based on grape production, for example, can be developed to create tourism-related value (Türker and Gür, 2024). Awareness-raising among producers is also essential to ensure that these traditional practices are maintained despite increased demand.
- Safranbolu must avoid becoming a static, museum-like city visited only during certain hours. It must instead remain a vibrant, living city where daily life continues alongside its historical character (Kaya, 2019). Accordingly, research should place greater emphasis on the relationship between cultural activities and everyday practices.
- To enable daily life to persist in the Historical Bazaar, communities must be able to engage with the space through diverse functions. According to participants, in addition to core urban amenities such as banks, pharmacies, and open public spaces, there is a need for museums, youth- and child-oriented venues, and especially quality gastronomic establishments. In a place where users are constantly changing in short cycles, developing an awareness of local values will require sustained effort. Thus, ensuring the continued presence of the local population and attracting younger residents to the area is essential. This can be supported through long-term awareness initiatives beginning in childhood, and by planning dedicated activity spaces for children.
- Tourism strategies in the Bazaar should be more discerning in terms of content, quality, and the target visitor groups. To elevate the quality of what is currently a rapid, consumption-based form of tourism, the link between authentic cultural characteristics and spatial experiences must be emphasised. Enhancing the quality of on-site experiences will help leverage local knowledge and transmit historical narratives. Beyond basic signage and wayfinding, interactive and engaging environments should be created where local residents can share their creativity and stories directly with visitors.
- Safranbolu's overreliance on tourism limits its ability to preserve and enhance its physical heritage in alignment with the needs of the local community. Therefore, ways must be explored to support the continued presence of locals in the area. Creative tourism practices—usually aligned with cultural tourism—offer promising alternatives. These approaches prioritize understanding and experiencing the city through its unique values. By adopting creative tourism as a strategy, the city can maintain the functionality of its residential fabric, encourage the return of younger populations, and support their long-term residence. Creating spaces that highlight local values, fostering institutional collaborations, and establishing creative networks are vital steps.
- Continuity in heritage conservation requires raising heritage awareness and ensuring the transmission of local knowledge. Participants consistently highlighted the inadequacy of information sharing in the Historical Bazaar. Tourism should therefore focus not just on visitor numbers but on fostering interaction and shared experiences.
- To address new community needs, and to manage their impact on the city, a political framework is necessary. The city's physical, social, economic, and administrative challenges, needs, and potentials must be assessed. Prioritized strategies for preservation and development should be identified. New governance policies that utilize tools aligned with sustainable development principles will reinforce the long-term success of local heritage management. (Öztürk and Yamaçlı, 2023). In this sense, the management models implemented by cities such as Regensburg and Edinburgh, which are on the UNESCO World Heritage List and have both old and new urban fabrics, like Safranbolu, can be taken as examples in terms of their holistic approaches (Ripp, 2012; Ripp and Rodwell, 2016). In Safranbolu, the absence of an implemented management plan is a critical gap. A well-structured plan that highlights both tangible and intangible heritage values can pave the way for a process of heritage-based spatial production.

This study focuses on capitalist modes of production and organization that affect historic urban centres. Based on spatial theories and a specific research approach, the study does not aim to generalize about space. Rather, it acknowledges the transformative influence of capitalist production on space, aiming to interpret new modes of spatial production shaped by redefined social practices in historic cities. The relationship between space and production processes, as well as the nature of spatial transformations, are critical for the conservation and sustainability of cultural heritage. A holistic understanding of both tangible and intangible heritage values depends on properly identifying the components of authenticity. In this context, analysing the transformation of space through various forms of consumption is essential for developing a creative perspective on sustainability. This study offers a space-experience-based analytical framework that can be adapted to different historical cities. The proposed method can be employed to investigate consumption-driven transformations and the processes underlying them, grounded in the lived social and cultural experiences of historic urban centres.

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# TARİHSEL SÜREÇTE KARABÜK'TEKİ TİCARET YAPILARI ÜZERİNE BİR ARAŞTIRMA

**Öz:**
Kent merkezlerinde yer alan ticaret yapıları, yalnızca ekonomik faaliyetlerin yürütüldüğü fiziksel alanlar olmanın ötesinde; sosyal etkileşimlerin geliştiği, kültürel sürekliliğin sağlandığı ve kentsel kimliğin biçimlendiği önemli kamusal mekânlar olarak öne çıkmaktadır. Özellikle yaya hareketliliğinin yoğun olduğu akslar üzerinde konumlanan iş hanları ve pasaj yapıları, geçirgen plan organizasyonları sayesinde hem kamusal bir nitelik kazanmakta hem de ticari işlevlerin daha geniş kullanıcı gruplarına ulaşmasına olanak tanımaktadır. Bu tür yapılar, iç avlu veya iç sokak gibi kamusal kullanıma açık kurgularla hem çevresiyle bütünleşmekte hem de sosyal etkileşimleri destekleyerek kent yaşamına katkı sunmaktadır.
Bu çalışma, Türkiye'nin önemli sanayi kentlerinden biri olan Karabük'teki ticaret yapılarının tarihsel gelişimini inceleyerek, kentsel mekânda ticaretin dönüşümünü anlamayı amaçlamaktadır. Özellikle Karabük kent merkezinin tek yaya aksı olan Kemal Güneş Caddesi üzerinde yer alan üç ayrı pasaj – Mako Çarşısı, Beyaz Saray Pasajı ve Bedesten – mekânsal özellikleri bağlamında ele alınmıştır. Bu kapsamda, söz konusu yapıların kentle kurduğu bağ, yaya sirkülasyonuna katkıları ve ticari işlevlerin dönüşüm sürecindeki rolleri analiz edilmiştir. Çalışma, geleneksel çarşı anlayışından modern alışveriş yapıları tipolojisine geçiş sürecini Karabük özelinde ortaya koyarak, bu dönüşümün kentsel yaşam ve mekân organizasyonu üzerindeki etkilerini değerlendirmeyi hedeflemektedir. Söz konusu cadde üzerinde pasaj özelliği gösteren bu yapılardan başka yapının bulunmaması ve Karabük'e ilişkin araştırmalar kapsamında ticari yapılara ilişkin çalışmaların kısıtlılığı çalışmanın özgün yanını ortaya koymaktadır.

**Anahtar Kelimeler:** Karabük, Kent Merkezi, Ticaret Yapıları

## A RESEARCH ON TRADE STRUCTURES IN KARABÜK IN HISTORICAL PROCESS

**Abstract:**
Commercial buildings located in city centers are not only physical areas where economic activities are carried out; they also stand out as important public spaces where social interactions develop, cultural continuity is ensured and urban identity is shaped. Especially, commercial buildings and arcades located on axes with intense pedestrian mobility gain a public character thanks to their permeable plan organizations and allow commercial functions to reach wider user groups. Such buildings both integrate with their surroundings with open-to-public structures such as inner courtyards or inner streets and contribute to urban life by supporting social interactions. This study aims to understand the transformation of trade in urban space by examining the historical development of commercial buildings in Karabük, one of the important industrial cities of Türkiye. In particular, three types of commercial buildings located on Kemal Güneş Street, the main pedestrian axis of Karabük city center – Mako Bazaar, Beyaz Saray Arcade and Bedesten – are discussed in the context of their historical, spatial and typological characteristics. In this context, the historical connection established by these structures with the city, their contribution to pedestrian circulation and the roles of commercial functions in the transformation process were analyzed. The study aims to reveal the transition process from the traditional bazaar concept to the modern shopping structures typology in Karabük and to evaluate the effects of this transformation on urban life and spatial organization.

**Keywords:** Karabük, City Center, Commercial Buildings

**Giriş**

Kent merkezlerinde bulunan iş hanları, pasajlar ve alışveriş merkezleri gibi mekanlar, kentlerin ekonomik, sosyal ve kültürel hayatında önemli işlevler üstlenen, kentsel dokunun ayrılmaz unsurlarıdır. Hem fiziksel hem de işlevsel açıdan farklılıklar göstererek kent kimliğinin oluşumuna ve gelişimine katkıda bulunmaktadırlar. Zamanla değişen ticaret anlayışına karşılık ticaret yapılarında da dönüşüm yaşansa da merkezi iş alanları (MİA) olarak tanımlanan ve şehrin ana finans hareketliliğinin gerçekleştiği bölgeler her zaman yüksek arazi değerine sahip mekanlardır.

İlk olarak antik çağdaki agoralar ve Roma dönemindeki forumlar gibi kamusal alanlarda başlayan ticari faaliyetler, Orta Çağ Avrupası'nda çarşı ve kapalı pazarlar biçiminde örgütlü olarak varlığını sürdürmüştür (Odabaş, 2018; 2053). 12. Yüzyılda ticaretin gelişmesiyle birlikte iş ve ev ortamını birleştiren, aynı çatı altında toplayan 'şehirli evi' anlamına gelen *burgher's house* yapı tipi ortaya çıkmıştır. Bu yapılarda zemin katlar ticaret, üst katlar yaşam mekanı olarak planlanmış, usta evlerine ek olarak çıraklar için de odalar ayrılmıştır. Avrupa'da sanayi devriminden sonra üretime dayanmayan iş kollarının (muhasebe, sigorta, avukatlık, banka vb.) ortaya çıkmasıyla da büro binaları gelişmiştir[1] (Gülenaz, 2011; 71-78). Latince kökenli olan sözcük, şık yazı masalarının içinde bulunduğu mekanları tanımlamaktadır. Büro ve ofis[2] kelimelerinin eş anlamlı olarak aynı özellikleri içeren mekanları nitelediği anlaşılmaktadır.

Anadolu'da erken dönemde (Selçuklu ve Beylikler dönemi) pazar yerleri ya da kervansaraylar etrafındaki ticari yapılanma, Osmanlı döneminde bedesten, arasta, kapalı çarşı ve şehir içi hanı gibi farklı ticari anlayışla sahip ve ticareti kendi üretim iç yapılanmasının gerektirdiği şekilde devam ettiren yapı türleri ile devam etmiştir. Bu yapılar, aynı zamanda ticari ve sosyal hayatın merkezlerini oluşturmaktadır (Kejanlı, 2010; 292). Bedestenler, diğer ticari yapılar arasında esnafının bilirkişi olması veya bir malın birim fiyatının belirlenmesinde etkin rol oynaması sebebiyle öne çıkmaktadır. Arastalar, aynı işi yapan zanaatkarların bir arada olduğu, üretim ve satışının aynı ürün üzerinden gerçekleştirildiği ticari yapılardır. Kapalı çarşılar, üzeri örtülü ve sokaklara yayılmış bir bütünün içinde aynı ürünün satışını gerçekleştiren esnafın belli sokaklarda yoğunlaştığı düzene dayanan ticaret alanlarıdır. Şehir içi hanları ise, belli bir malın satışının yapıldığı ve o malın adıyla anılan ticari yapılar olarak Osmanlı döneminin ticari yapılanmasının bileşenlerini oluşturmaktadır.

Sanayi Devrimi sonrasında, ticaret yapıları içerisinde yeni bir yapı türü olarak pasajlar Avrupa kentlerinde yoğunlaşarak modern ticaret mekânlarına dönüşmüş ve özellikle 19. yüzyılda mimari açıdan özgün pasaj örnekleri ortaya çıkmıştır (Öncel, 2022; 319). 19. yüzyılda Avrupa'daki gelişmelere bağlı olarak, Latince'de adım anlamına gelen passus kelimesinden türeyen pasajlar, özellikle başkent İstanbul'da inşa edilmiştir. Başı ve sonu olmayan bir mekana işaret eden pasaj, her iki yanında dükkanların sıralandığı, cam çatılı bir geçidi tanımlayan bir kavram olarak da kullanılmıştır. Bunun yanında daha çok sanayi bölgelerinde olan ve zanaatkârların kendilerine yer bulunduğu, örtü sistemi olmayan açık pasajlar da bulunmaktadır (Gülenaz, 2011; 78). 20. yüzyılda ise iş hanları, farklı disiplinlerdeki serbest meslek çalışanlarının üretim ve ticaretini aynı noktaya toplayan, çok katlı yapılar olarak modern kentlerin simgeleri haline gelmiştir (Aktürk Çetin, 2018; 4-6). Özellikle ekonomik büyüme ve kentleşme süreçleri bu yapıların sayısı hızla artmıştır. Günümüzde, teknolojik yeniliklerle donatılarak dükkan, mağaza, atölye, ofis fonksiyonlarını barındırmakta ve kentsel yaşamın merkezinde konumlanmaktadır.

19. yüzyılın ikinci yarısında *department store* ya da *bon marche* olarak adlandırılan ticaret yapıları büyük şehirlerde alternatif ticaret yapıları olarak görülmektedir (Gülenaz, 2011; 82).

[1] İngilizce' de counting-house veya office buildings, Almanca' da Kontorhaeuser veya bürogebaeude.

[2] Ofis, Latince opus kökünden gelerek yapıt, iş anlamını ifade etmektedir.

MİA'ların belirlenmesinde ekonomik faaliyetlerin yoğunluğu, ulaşım altyapısının gelişmişliği, erişilebilirlik düzeyi ve nüfus hareketleri gibi kriterler temel alınmaktadır. Bu bölgeler genellikle kentlerin en işlek ve merkezi konumlarında yer alır ve yoğun yaya trafiği ile toplu taşıma bağlantılarının odak noktasını oluşturur. Geçmişte de merkezi iş alanlarına eşdeğer olabilecek ticaret mekanları, ticaret yollarının kesişme noktaları olarak doğal bir şekilde gelişmiştir.

Alışveriş mekânları günümüz kent yaşamında sosyal etkileşimin de gerçekleştiği kamusal alanlar olarak değerlendirilmektedir (Erdönmez ve Akı, 2005; 74). Merkezi iş alanlarında yer alan bu tür mekânlar, ticari faaliyetlerin yanı sıra sosyal buluşma noktaları olarak da önem kazanmakta ve kentsel yaşamın sürekliliğini sağlamaktadır. Yaya odaklı tasarımlar ile donatılmış alışveriş mekânları, kent merkezlerinin yaşanabilirliğini artırmakta ve sürdürülebilir kentsel kalkınmaya da katkıda bulunmaktadır. Özellikle yayalaştırılmış güzergâhlar üzerinde yer alan iş hanları, pasajlar ve alışveriş mekânları, kentsel yaşamın dinamizmini besleyen, ekonomik canlılığı sürdüren ve kent kimliğinin şekillenmesine katkıda bulunan kritik unsurlardır. Bu yapıların işlevselliği ve mimari özellikleri, kentin sosyal ve ekonomik sürekliliği açısından büyük önem taşımaktadır.

Pasajlar, ticari işlevlerinin yanı sıra, kamusal alan niteliği taşıyan mekânlar olarak ön plana çıkmaktadır. Pasajların kapalı veya yarı kapalı mekânsal kurguları, kullanıcılarına güvenli ve konforlu bir alışveriş ortamı sunmakta, aynı zamanda farklı ticari ve sosyal fonksiyonların bir arada bulunmasını sağlamaktadır. Mekânsal örgütlenme açısından pasajlar, genellikle lineer bir düzen içinde tasarlanarak iki sokak arasında doğrudan bağlantı sağlamaktadır. Bu düzenleme, yaya sirkülasyonunun ve alışveriş odaklı hareketin mekân içinde birlikteliğine olanak tanır. Bu tasarım sayesinde kapalı veya yarı kapalı yapı formunda olan pasajlar, sadece transit geçiş noktaları olmaktan çıkarak, küçük ölçekli ticari birimler ve yiyecek-içecek mekanlarıyla sosyal etkileşim alanları haline gelmektedir. Özellikle tarihi pasajlar, kültürel miras açısından da önemli olup, kent merkezlerinin cazibesini artıran özgün mimari örneklerdir (Hızlı ve Ulubay, 2017 ;115-116).

2000'li yıllardan sonra yaygınlaşan alışveriş merkezleri ise (AVM), tarihsel süreçte kent yaşamının dönüşümü ile paralel olarak gelişmiş, çok fonksiyonlu, her mevsim ve günün büyük bir bölümünde kullanılabilir mekânlar olarak ortaya çıkmıştır. Farklı yaş gruplarına hitap eden mağazalar ve hizmetlerle donatılarak alışveriş deneyimine yeni bir tarz getirmiştir (Aytar Sever, 2020; 113-115). AVM'ler sosyal, kültürel ve eğlence fonksiyonlarının bir arada sunulduğu, içerisinde sinemalar, restoranlar, çocuk oyun alanları, spor salonları ve kültürel etkinlik alanları gibi çok çeşitli fonksiyonları barındıran mekanlar haline dönüşerek, her yaştan kullanıcı için çekim merkezi haline gelmiştir.

Karabük ili, tarihsel gelişimi ve ekonomik yapısıyla Türkiye'nin önemli sanayi merkezlerinden biridir. Özellikle demir-çelik sektörünün kentin ekonomik hayatına yön vermesi, ticaret alanlarının da buna bağlı olarak şekillenmesini sağlamıştır. Kentteki ticari mekanlar, genellikle merkezi konumda yer alarak ekonomik faaliyetlerin yoğunluğunu artırmakta ve sosyal yaşamın da önemli noktalarını oluşturmaktadır.

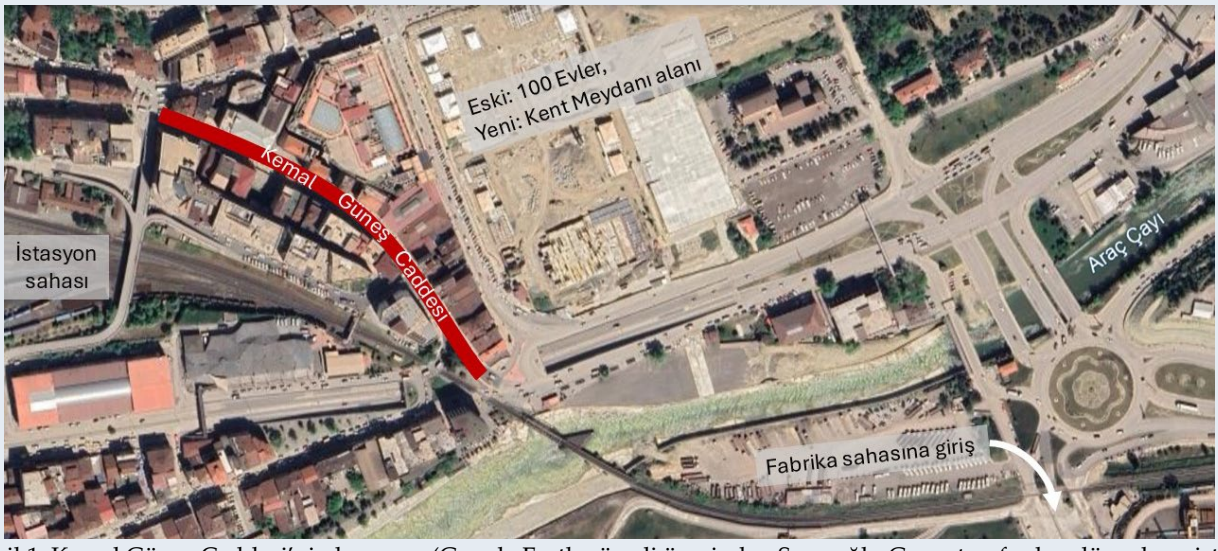
Karabük merkezindeki ticaret mekânları, genellikle iş hanları, alışveriş merkezleri ve çeşitli pasajlardan oluşmaktadır. Erken Cumhuriyet Dönemi'nden bu yana varlığını sürdüren, kent sosyolojisinin de bir parçası olan ve Karabük'ün kent ticaret kültürünü ortaya koyan küçük ölçekli dükkânlar da halen faaliyetlerine devam etmektedirler. Bu alanlar, esnaf kültürünü ve geleneksel ticari anlayışı sürdürerek kentsel yaşamın özünü oluşturmaktadır. Pasajlar, özellikle Karabük kent merkezinde küçük ölçekli işletmeleri barındıran, ticaret ve sosyal etkileşimin iç içe geçtiği mekânlar olarak göze çarpmaktadır. Bu pasajlar, ticari hayatın canlılığını sürdürürken, aynı zamanda kenti sosyo-ekonomik açıdan da geliştirmektedirler. Aynı zamanda kentte ticaretin hakim olduğu kamusal alan olarak ticari odak oluşturmaktadırlar. Diğer yandan modern alışveriş merkezleri ise son yıllarda hızla gelişen kentleşme süreciyle birlikte Karabük'te de yaygınlaşmıştır. Ulusal ve uluslararası markaları kent sakinleriyle buluşturarak, kent merkezinin ekonomik cazibesini artırmaktadır. Alışveriş merkezlerinin içinde yer alan sosyal tesisler, sinemalar ve restoranlar da kentte yaşayanların sosyal ihtiyaçlarını karşılayan önemli mekânlar haline gelmiştir.

Karabük ilindeki ticaret mekânları, gelenekselden moderne doğru genişleyen bir yelpazede kent ekonomisinin canlanmasında ve sosyal hayatın şekillenmesinde önemli roller üstlenmektedir. Bu mekânların çeşitliliği ve dinamik yapısı, Karabük'ün ekonomik ve kültürel sürdürülebilirliğine katkıda bulunan temel unsurlardır. Bu çalışmada Karabük ili Merkez ilçede, şehrin ticaret merkezinde yer alan Kemal Güneş Caddesi üzerindeki ticaret mekanlarından üç örnek incelenecektir. Bu cadde günümüzde yayalaştırılmış olmasıyla tektir ve kent için bir cazibe noktasıdır. Diğer caddelerle karşılaştırıldığında bu cadde üzerindeki yaya sirkülasyonunun daha yoğun olması nedeniyle dükkan ve mağaza gibi ticaret mekanlarıyla yeme-içme birimleri de sayıca daha fazladır.

## 1. Kemal Güneş Caddesi ve Ticaret Yapıları

Cumhuriyet'in sanayileşme hamlelerinden olan ve kuruluşu 1937 yılına tarihlenen Karabük Demir Çelik Fabrikası (günümüzde Kardemir), 1939 yılında faaliyete geçmiştir. "Fabrikalar Kuran Fabrika" ünvanıyla anılan (Kardemir, 2025) fabrika, 2024 yılı verilerine göre Türkiye'nin en büyük 28. sanayi kuruluşudur (İstanbul Sanayi Odası, 2025). Kurulduğu günden bugüne endüstrisiyle ve fabrikaya bağlı konut üretimleriyle bulunduğu kentin ve çevresinin gelişimine olanak sağlamış ve 6 Haziran1995 yılında yayınlanan, 22305 sayılı Resmi Gazetedeki, 550 sayılı Kanun Hükmünde Kararnameyle Karabük'ün il statüsü kazanmasına da vesile olmuştur (KHK/550, 1995; 1-2).

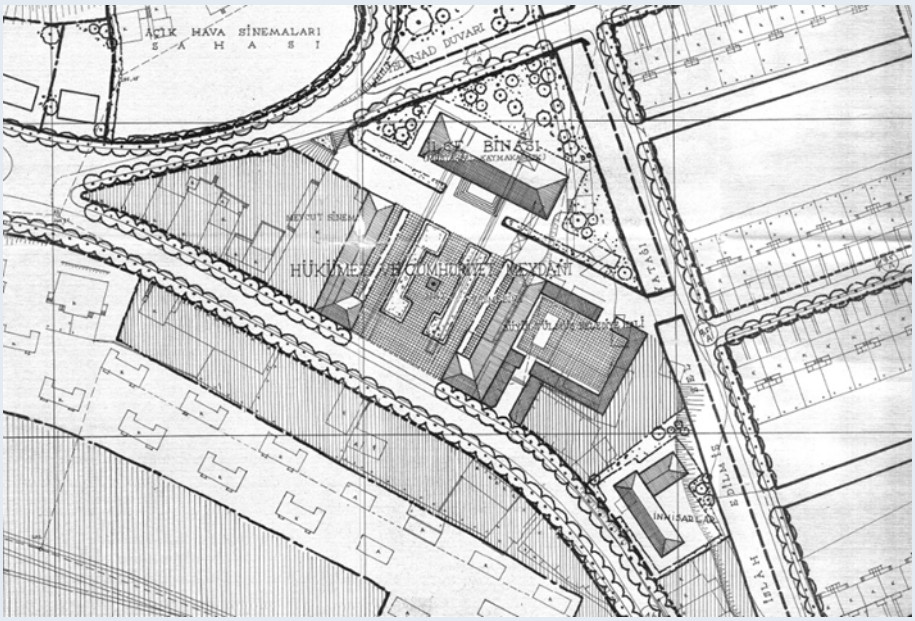
Kemal Güneş Caddesi de Kardemir'in fabrika saha girişinin kuzeyinde bulunan ve günümüzde birçok ticaret yapısına ev sahipliği yapan, yayalaştırılmış bir caddedir (Şekil 1). Karabük Ticaret ve Sanayi Odası da bu cadde üzerinde yer almakta olup; Karabük Belediyesi, PTT, İl Halk Kütüphanesi, Defterdar, Karabük Adliyesi, Karabük Müftülüğü, Karabük İl Özel İdaresi gibi kamu binaları da bu caddeye çıkan diğer caddeler üzerindedir. Kemal Güneş Caddesi üzerinde otuz yapı bulunmaktadır. İşlev itibariyle tamamı ticaret yapısı olan bu yapılar konaklama fonksiyonu içermemektedir. Cadde üzerinde 2 AVM (Kares ve Onel), 4 banka (Albaraka Türk, Yapı Kredi, Halkbank, Denizbank) ve çeşitli dükkanlar bulunmaktadır. Yayalaştırılmış bir yol olması nedeniyle yaya sirkülasyonuna hitap edecek çeşitlilikte zemin katlarda yeme- içme, giyim, kuyumcu, döviz bürosu, iletişim, eczane, mobilya gibi birçok dükkana rastlanabilmektedir. Cadde üzerinde yer alan binaların üst katları da muayenehane, sigortacı, muhasebeci, serbest çalışan mimarlık ve mühendislik büroları, terzi, petshop gibi hizmet sektöründen sayılan iş yerlerine ayrılmıştır.




Şekil 1. Kemal Güneş Caddesi'nin konumu (Google Earth görseli üzerinden Saraçoğlu Gezer tarafından düzenlenmiştir).

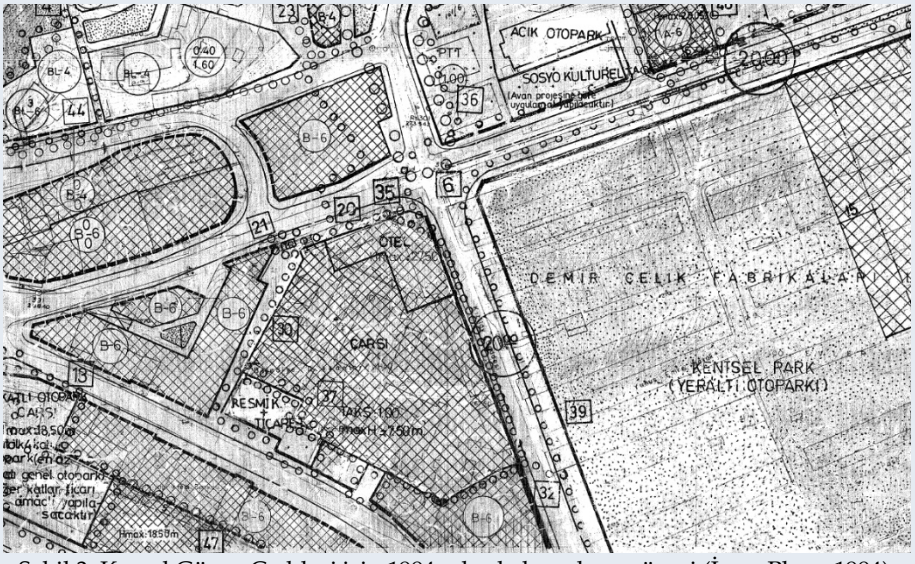
Caddenin bulunduğu konum her zaman cazibe merkezi olarak görülmüş, parsel değeri yüksek bir bölgedir. Hızla büyüyen fabrika, çevresini etkilemiş ve gelişimi de hızlandırmıştır. Karabük için hazırlanan

imar planlarında da fabrika sahasına yakın olan mahalleler hep ilgi çekici olmuş ve değerlendirmeye alınmıştır. 1948 yılında Nezihe ve Pertev Taner tarafından hazırlanan imar planında şehir merkezinin genişletilmesi ve küçük esnafın tren istasyonunun kuzeyine açılacak paralel caddeye alınması önerisi sunulmuştur. Şehir merkezi diye anılan bölgenin de Hükümet ve Cumhuriyet Meydanı olarak tanımlanarak resmi binaların bu bölgede olması planlanmıştır (Şekil 2). O dönem için henüz ilçe statüsünde olmayan Karabük için 'Müstakbel Kaymakamlık' binasının yeri de belirlenmiştir (Kesin imar planı izah notu, 1948; 3-4).



Şekil 2. Kemal Güneş Caddesi için 1948 yılında hazırlanan öneri (İmar Planı, 1948).

Karabük'ün il statüsüne yükselme kararından önce 1994 yılında hazırlatılan planda da çalışmaya konu olan bölge yine yoğun ticaret bölgesi olarak belirlenmiş, ayrıca bir otel alanı da planlanmıştır. Alana komşu parselde bulunan 100 Evler bölgesi Demir Çelik Fabrikaları Lojmanları olarak işaretlenmiş ve bu bölge için kentsel park ve yeraltı otopark önerisi sunulmuştur (Şekil 3). Günümüzde otel olarak işaretlenen konumda Kares isimli AVM yer almakta olup, 100 Evler yıkılmış, yerine yapılacak olan kent meydanı inşası halen devam etmektedir. Caddenin il statüsü kazandığı dönemde araç trafiğine açık olduğu ve 'Çarşı' bölgesinin içinden geçtiği görülmektedir. Otel alanı için 27,50 m'ye kadar maksimum yüksekliğin verildiği harita üzerinden okunmakla birlikte, mevcut durumda bölgede hala 9 kata ulaşan bir yapı bulunmamaktadır.



Şekil 3. Kemal Güneş Caddesi için 1994 yılında hazırlanan öneri (İmar Planı, 1994).

**2. Mako Çarşısı, Beyaz Saray ve Bedesten**

Demir-Çelik Fabrikasının 1937 yılında kurulmasıyla beraber kısa sürede kente çalışmak için aileleriyle birlikte gelen kişilerin Karabük'ün ticaret hayatının etkilediği görülmektedir. Örgütsel olarak DÇİ'nin kurulması ve bu şehre yerleşen nüfusun ihtiyaçlarını karşılamak üzere çarşı bölgesinin gelişmeye başladığı anlaşılmaktadır. Fabrika öncesi küçük bir yerleşim yeri olan Karabük'te, günlük ihtiyaçların tedarik edildiği küçük dükkanların varlığından söz etmek mümkündür. Fabrikaya bağlı gelişen konut üretiminin gerçekleştiği, sosyal ve kültürel bir merkez halinde gelişen Yenişehir bölgesinin yanı sıra Kemal Güneş Caddesi'nin içinde bulunduğu çarşı olarak nitelendirilen bölge ticari merkez olarak gelişme göstermiştir. Bu çalışma kapsamında cadde üzerinde yer alan ticaret yapılarından Mako Çarşısı, Beyaz Saray ve Bedesten olarak üç örnek incelenecektir. Yapıların tespitinde cadde üzerinde iki sokağı birbirine bağlayan pasaj özellikli ticaret yapıları olmaları dikkate alınmıştır.

**2.1. Mako Çarşısı**

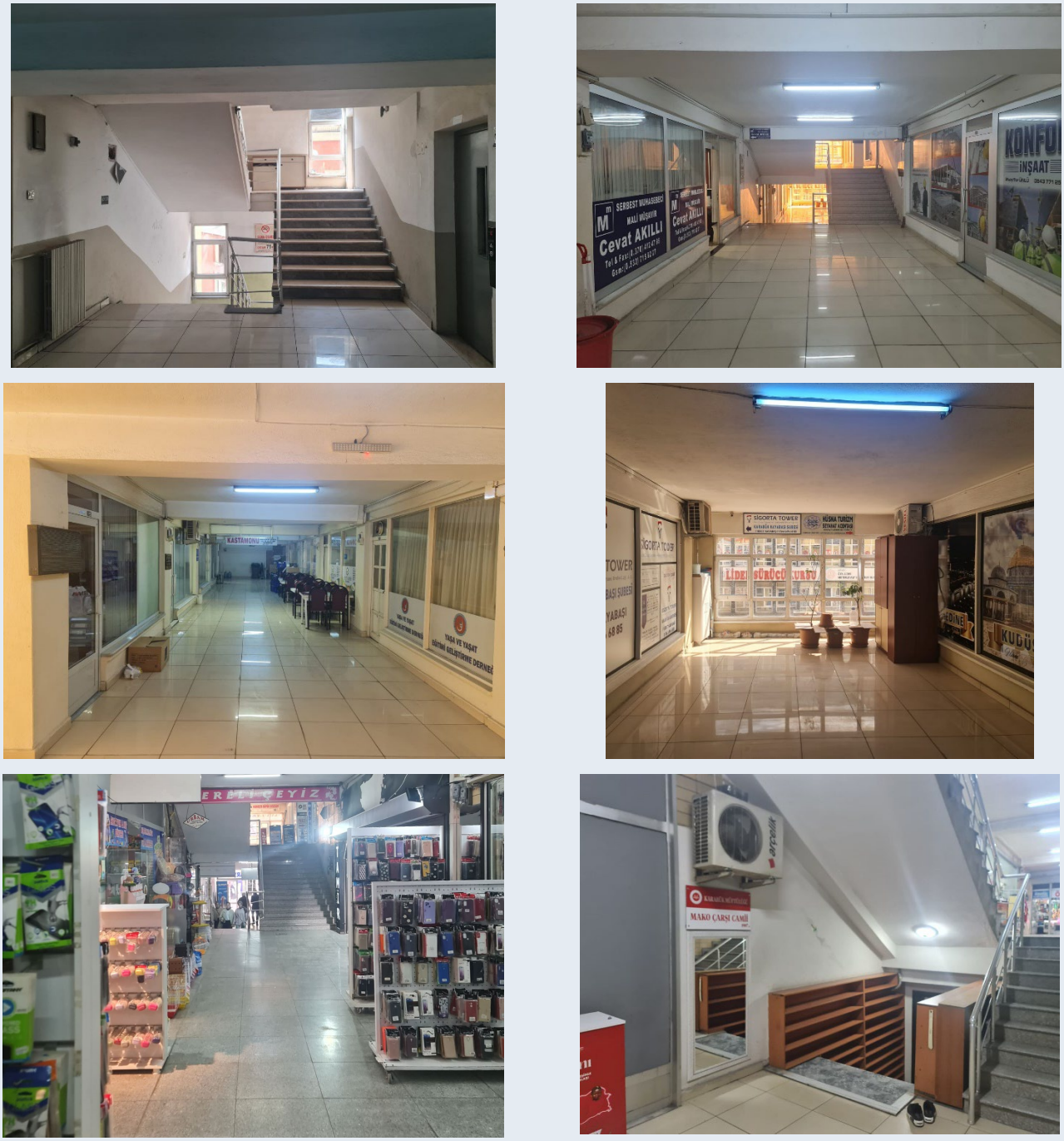
Mako Çarşısı olarak bilinen yapı, esnaftan alınan bilgi doğrultusunda manifaturacılar ve konfeksiyoncuların bir araya gelerek kurmuş oldukları bir ticari merkezdir. İki bloktan oluşan çarşıda, bloklar arasındaki kot farkı merdivenlerle bağlanarak çözülmüştür. Yapının, Kemal Güneş Caddesi üzerinden iki girişi ve ayrıca Kemal Güneş ile Kıbrıs Şehitleri Caddelerini birbirine bağlayan yaya yolu üzerinden de bir girişiyle, toplamda üç girişi bulunmaktadır (Şekil 4). Yapıyla ilgili ulaşılabilen en eski ruhsat belgesi 29.04.1969 yılına tarihlenmekte ve bu ruhsatla 3 kat, 6 dairelik bir yapı olduğu bilgisi edinilmiştir. Yapının 26.08.1981 tarihli bir ruhsatına da ulaşılmış, ruhsata ek tadilat projesindeki bilgilerde ise yapının 2 blok, 8 kat, 115 işyerinden oluştuğu bilgisi yer almaktadır.[3]

[3] Mako Çarşısı yönetiminden elde edilen veriler doğrultusunda aktarılmıştır.




Şekil 4. Mako iş hanına ait giriş kapıları (Söylemez, 2025).

İşhanı, 4 metre genişliğinde bir koridor etrafında yerleştirilmiş dükkanlardan oluşmaktadır. Dükkanlar yaklaşık olarak 30 $m^2$ ve 50 $m^2$ arasında değişen büyüklüğe sahiptir. A blokta 2 ve B blokta 1 merdiven olmak üzere 3 ana düşey sirkülasyon hattı kurgulanmıştır (Şekil 5). Farklı kotlardaki zemine oturan yapıda A blokta 1 kat bodrum, B blokta ise 2 kat bodrum bulunmaktadır. Yapının zemin katında Kemal Güneş Caddesi'ne açılan dükkanlar yer almaktadır. Diğer tüm dükkanlar yapı içindeki sirkülasyon alanı olan koridorlara açılan girişlere sahiptir. Bu girişlerin olduğu yüzeyler camla kaplıdır, mağaza olanlarda vitrin olarak değerlendirilmektedir. Zemin katta teknolojik ürün satışı, kuyumcu, halıcı, aktar, mağaza ve milli piyango bayisi bulunmaktadır. Üst katlar; noter, özel dikim giyim mağazaları, inşaat, muhasebe, sigortacı, emlak büroları, kurs gibi çeşitli işlevlerde ticari oluşumlar içermektedir. Çarşı içindeki basit onarımların genel dolaşım alanlarında yapıldığı, iş yerlerindeki değişimlerin de lokal olarak yapıldığı görülmektedir. Mako Çarşısı müstakil ve içe dönük yapısıyla kompakt bir kompleks olarak tanımlanabilmektedir. Yapıda ayrıca müftülüğe bağlı Mako Çarşı Camii de yer almaktadır (Şekil 5).

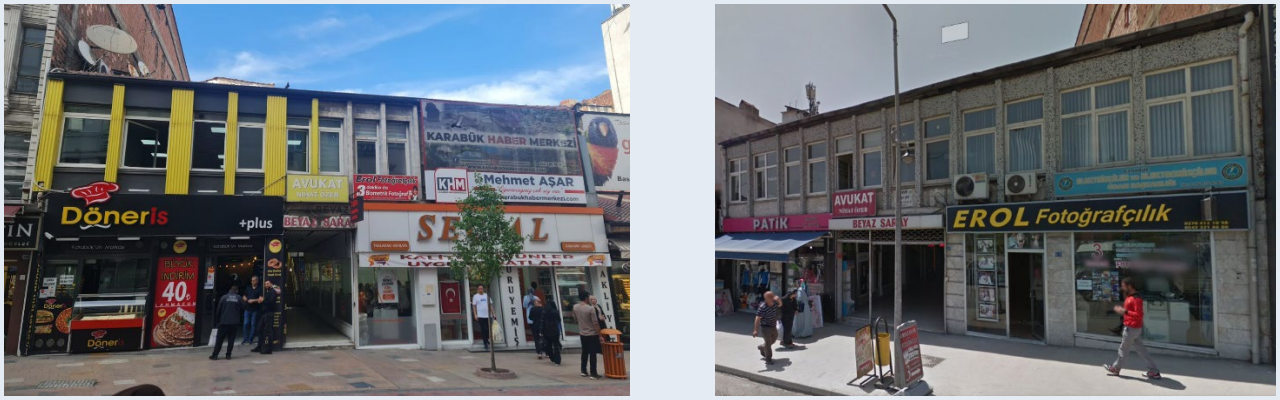



Şekil 5. Mako içerisinde yer alan merdivenler ve Mako Çarşısı iç mekan görüntüleri (Söylemez, 2025).

**2.2. Beyaz Saray**

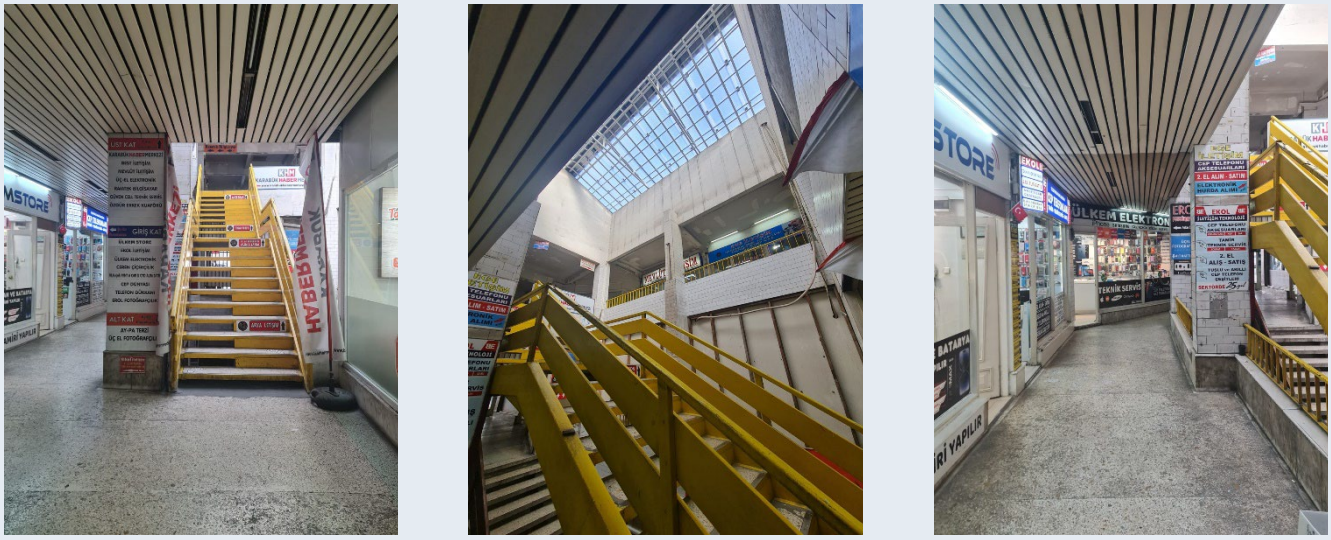
Beyaz Saray Pasajı, yapının Kemal Güneş ve Albay Karaoğlanoğlu Caddelerine cephesi olan ve her iki cepheden de giriş tasarlanmıştır. Yapı bodrum katla birlikte üç kattan oluşmaktadır. Binanın çatı seviyesinde binaya homojen olarak ışıklık sağlayan şeffaf örtüyle aydınlatılması sağlanmıştır. Dükkanlar her iki giriş arasındaki koridorun her iki yanına yerleştirilmiştir. Bu mekan kurgusu yapının pasaj halini almasını sağlamıştır. Bina, Kemal Güneş Caddesi'ndeki cephede tabela kirliliği nedeniyle okunamaz haldedir ancak tabelayla kaplanmayan alandan dış cephede mermer kaplama kullanıldığı anlaşılmaktadır. Dar ve yüksek pencerelerin aralarında ise dikey güneş kırıcılar kullanılarak cephe hareketlendirilmiştir. Binanın Albay

Karaoğlanoğlu Caddesi'ne bakan yöndeki dış cephe özellikleri daha iyi okunabilmekle birlikte burada mermerin yanı sıra beton mozaik kaplama kullanılmıştır (Şekil 6).




Şekil 6. Beyaz Saray İşhanı'nın cepheleri (Söylemez, 2025).

Pasajın ortasındaki avlu hem uzun olan koridorun aydınlanması hem de katlar arasında görsel ilişki kurulmasını sağlamıştır Buradaki metal merdiven düşey sirkülasyonu oluşan tek ögedir (Şekil 7).



Şekil 7. Çelik merdiven, iki caddeyi birbirine bağlayan koridor ve ışıklık (Söylemez, 2025).

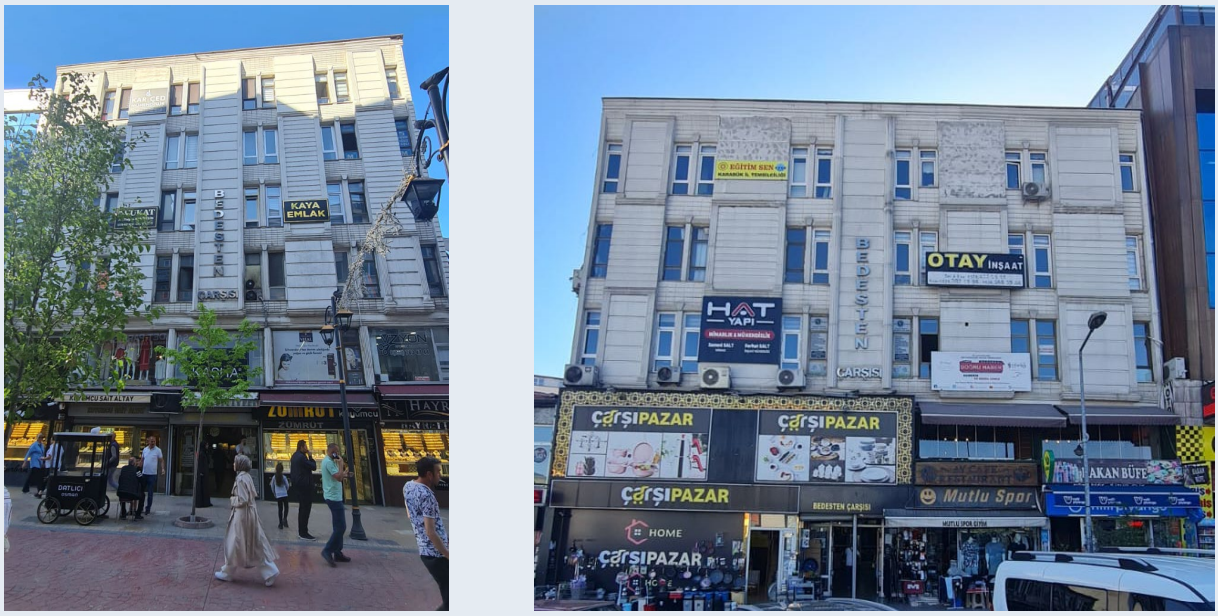
**2.3. Bedesten**

Kemal Güneş ve Albay Karaoğlanoğlu Caddelerinden giriş alan ve pasaj özelliği gösteren yapı, halk arasında "Bedesten Çarşısı" olarak anılmaktadır. Beyaz Saray Pasajı'nın bitişik parselinde bulunmaktadır (Şekil 9). Yapının ruhsat tarihi olarak 27.12.1983 görülmektedir. 1988 yılında ruhsat yenilenmiştir.[4] Yapıda düşey sirkülasyon avluda yer alan merdiven ve asansörün haricinde rampalarla sağlanmaktadır (Şekil 8). Tüm katlar eğimli yüzey üzerinde tasarlandığından birbirleri arasında merdivensiz bağlantı kurulabilmektedir. İç avlunun ortasında asansör ve merdivenin olması aynı zamanda avlunun parçalı algılanmasına neden olmaktadır. Avlunun üzeri çelik taşıyıcılar ve yarı geçirgen bir malzemeyle kapatılmıştır. Dükkanlar, rampaların gerisinde tasarlanmıştır.

[4] Bedesten yönetiminden elde edilen veriler doğrultusunda aktarılmıştır.



Şekil 8. Bedesten'de rampalarla sağlanan sirkülasyon (Söylemez, 2025).




Şekil 9. Bedesten Çarşısı'nın cepheleri (Söylemez, 2025).

**Değerlendirme ve Sonuç**

Karabük'te sosyo-kültürel gelişim gösteren Yenişehir bölgesinin aksine, ekonomik ve ticari odaklı gelişen bir alanın parçası olan Kemal Güneş Caddesi üzerindeki üç pasaj örneği; Mako Çarşısı, Beyaz Saray ve Bedesten bu çalışmanın temelini oluşturmaktadır. Çalışma kapsamında her üç yapı için de gerekli kurumlardan tapu, plan vb. arşiv belgesine ulaşılamamış, sadece çarşı esnafı ve yapı yönetimleriyle görüşmeler çerçevesinde bilgi edinilmiştir.

Sanayileşmenin etkisiyle 1940'lardan sonra hızla gelişen Karabük, bu süreçte ticaret yapılarının gelişimini de doğrudan etkilemiştir. Kemal Güneş Caddesi, geçmişten günümüze kentin ekonomik ve sosyal yaşamının merkezi haline gelmiştir. Söz konusu yapılar, yalnızca alışveriş yapılan mekânlar değil, aynı zamanda sosyal etkileşim alanları olarak da kentsel yaşamın önemli bileşenleri haline gelmiştir.

Çalışma kapsamında ele alınan ve pasaj niteliği taşıyan yapıların her birinin öne çıkan özellikleri bir diğerine göre ayrıştırıcıdır. Elde edilen ruhsatlara göre Mako Çarşısı 1969'daki ilk ruhsatından sonra 1981'deki ruhsata ek tadilat projesinde genişletilmiştir. Bu durum nüfus artışına bağlı ticaret hacminin genişlemesi nedeniyle gerçekleşmiştir. Birbirini dik kesen iki bloktan oluşan ve L şeklini alan koridora sahip olması nedeniyle, Mako Çarşısı'nda mekanda görsel süreklilik sağlanamamaktadır. Bu durum bütüncül bir mekan algısının bulunduğu diğer iki pasajda görülmemektedir.

Mako Çarşı'nda avlu bulunmamaktadır. Bedesten'de iki parça halinde olan avlu, Beyaz Saray'da merdiveni de içine alan tek parça şeklinde görülmektedir. Bu da pasaj imajının en fazla Beyaz Saray'da hissedilmesine neden olmaktadır. Ayrıca iç sokak formunda dükkanların köşeli yerleştirilmesiyle, merkezinde çokgen şeklinde boşluk tasarlanan Beyaz Saray, yapı içinde duraklama olanağına da imkan sağlamaktadır.

Tasarım kriteri olarak rampalarla tüm yapı içinde dolaşıma olanak sağlayacak şekilde planlanan Bedesten'de iç mekan daha bütüncül şekilde algılanmakta ve düşey hareketlilikte kullanıcıyı yormadan alışveriş birimleri arasında geçişler sağlanmaktadır. Talep edenler için katlar arası merdivene ve asansöre de sahiptir. Bu yönüyle Bedesten, diğer iki yapıdan öne çıkmaktadır.

Tarihsel süreçte arasta, çarşı ve bedesten gibi geleneksel ticaret yapılarından modern iş hanları ve alışveriş merkezlerine evrilen ticaretin mekânsal kurgusu, sadece mimari biçimlenişte değil, toplumsal işlevlerde ve kullanım biçimlerinde de dönüşüm geçirmiştir. Bu bağlamda, Kemal Güneş Caddesi'nin yayalaştırılmış yapısı ve merkezi konumu hem kent ekonomisinin hem de sosyal yaşamın odak noktası olmasını sağlamıştır. İncelenen yapılar, fonksiyonel çeşitliliği ve pasaj karakterleri sayesinde yaya dolaşımını destekleyen, iç mekânlarında farklı sektörleri bir araya getiren çok işlevli alanlardır. Özellikle Bedesten ve Beyaz Saray gibi örneklerde, farklı caddeleri birbirine bağlayan geçişli mekânlar sayesinde kullanıcı hareketliliği artmakta ve mekânsal süreklilik sağlanmaktadır. Bu ticaret yapıları, ekonomik katkılarının yanı sıra sosyal sürdürülebilirlik açısından da kent yaşamına değer katmakta; kullanıcı odaklı tasarımları, iç sokak karakteri, küçük ölçekli dükkânları ve kamuya açık sirkülasyon alanları ile klasik iş merkezlerinden ayrışmaktadır. Sonuç olarak, bu yapıların yapısal ve işlevsel özellikleri, kent belleğinde önemli bir yer tutarak kentsel kimliğin oluşumuna katkı sağlamakta; yerel ekonomik canlılığı sürdürmekte ve geleneksel ticaret anlayışını modern ihtiyaçlarla bütünleştiren mekânsal organizasyonlarıyla hem fiziksel çevrenin niteliğini hem de toplumsal etkileşimi güçlendirmektedir. Kent planlaması ve tasarımında bu yapıların korunması, işlevlerinin güncellenerek yaşatılması ve kamusal niteliğinin desteklenmesi, tarihsel sürekliliğin sağlanması ve kullanıcı deneyiminin zenginleştirilmesi açısından büyük önem taşımaktadır.

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# Endüstri Devrimi Sonrası İdeal Kent Ütopyası ve Heterotopya Bağlamında Sürdürülebilir Kent: Karabük Örneğinde Heterotopya ve Dönüşüm*

# Sustainable City in the Context of Ideal City Utopia and Heterotopia after the Industrial Revolution: Heterotopia and Transformation in the Example of Karabük

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## Özet

Faydalı bir kalıcılığı merkezine alan sürdürülebilirlik kavramı; birçok geleneksel kültürden izler taşıyan, mimari, şehircilik, iktisat ve sosyoloji gibi akademik disiplinin çalışma konusudur. Sürdürülebilirlik kavramı; insan neslinin devamlılığını sağlamak, artan endüstrileşmenin negatif etkilerini önlemek, gelecek önermeleri getirmek gibi konuların tartışıldığı bir platform oluşturmaktadır. Rönesans, Fransız Devrimi ve Endüstri Devrimi; düşüncenin özgürleşmesini, ideolojilerin değişmesini, bilimin ilerlemesini, buluşların yaygınlaşmasını sağlamıştır. Tarihsel süreçte gerçekleşen önemli olaylar, şehirleşme pratiklerini de etkilemektedir. Bu etkiler, şehirleşme tarihi ve kent tipolojisinin değişimi konusunda, önemli birer kırılma noktası oluşturur. Endüstri devrimi, seri üretim yöntemini yaygınlaştırarak, bilinen gündelik hayatı değiştiren tarihi bir kırılma noktası oluşturmaktadır. Buna bağlı olarak sosyo-ekonomik yapı değişmiş, alışılagelen fiziki mekânların yeniden üretilmesi ve dolayısıyla kentsel mekânın yeniden üretimi söz konusu olmuştur.18. yüzyılda başlayan endüstrileşme hareketi, günümüz dünyasıda; artan nüfüs, azalan kaynaklar, çevre kirliği, iklim değişikliği, kuraklık, kıtlık, savaşlar, bölgesel ve kitlesel göçler gibi pek çok unsuru beraberinde getirmiştir. Bu sorunlara çözüm arayışında, sürdürülebilirlik çalışmalarının rolü oldukça önemlidir. Araştırmada sürdürülebilir endüstri kenti araştırması; ütopya ve heterotopya kavramları bağlamında yapılmıştır. Araştırmada, bir endüstri kenti olan Karabük'te, demir çelik fabrikasının kuruluşundan sonra, kentin planlama süreci, ütopya ve heterotopya yaklaşımları açısından araştırılmış, batılı modern kent tasarım anlayışı ile karşılaştırılmıştır. Böylelikle sürdürülebilir bir endüstri kenti yaklaşımında, ütopya ve heterotopya kavramlarının önemi tartışılmıştır.

**Anahtar Kelimeler:** Sürdürülebilirlik, Sürdürülebilir Kent, Ütopya, Heterotopya.

## Abstract

The concept of sustainability, centered on the notion of beneficial permanence, is rooted in various traditional cultures and constitutes a subject of study within academic disciplines such as architecture, urbanism, economics, and sociology. Sustainability provides a platform for discussing issues such as the continuity of the human species, the mitigation of the adverse effects of increasing industrialization, and the development of prospective strategies. Major historical events, including

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the Renaissance, the French Revolution, and the Industrial Revolution, have facilitated the liberation of thought, shifts in ideologies, advancements in scientific knowledge, and the dissemination of inventions. These pivotal moments have also significantly influenced urbanization practices, marking critical turning points in the history of city development and typology. The Industrial Revolution, by popularizing mass production techniques, represented a notable rupture that transformed daily life and subsequently altered socio-economic structures, necessitating the re-production of physical and urban spaces. Since the inception of industrialization in the 18th century, numerous challenges such as population growth, resource depletion, environmental pollution, climate change, drought, famine, warfare, and regional and mass migrations have emerged. Addressing these issues underscores the vital role of sustainability initiatives. This research examines the concept of sustainable industrial cities within the frameworks of utopia and heterotopia. Specifically, in Karabük, where a steel factory was established, the city's planning process across four distinct periods has been analyzed through these paradigms and compared with Western modern urban design principles, thereby highlighting the significance of utopia and heterotopia in the pursuit of sustainable industrial urban development.

**Keywords:** Sustainability, Sustainable City, Utopia, Heterotopia.

## 1. Giriş

İnsanlık tarihinde, iklime bağlı gerçekleşen göç hareketleri sonucu uygun coğrafyalarda yerleşik hayata geçilmiştir. Göçebe toplulukların ilk yerleşke izleri, arkalarında bıraktığı mezar yerleri olan nekropollerken, yerleşik hayata geçişle birlikte artan nüfus şehirleşmenin hızını artırmıştır. Şehirleşme hareketi, 19.yüzyıla kadar temel anlamda, yaşamsal faaliyetler olan tarım ve ticareti çevreleyen, barınma alanları ile gerçekleşmiştir. Endüstri Devrimi öncesi şehirleşme hareketi, yerleşkelerin coğrafi konumu ve erkin konumuna bağlı üretim ve tüketim politikaları ile şekillenmektedir (Lampard, 1955; Mumford, 1961).

Avrupa'da Rönesans etkisi ile gerçekleşen reformlar, endüstrileşmenin çarpan etkisi ile siyasal, ekonomik ve toplumsal değişimlere neden olarak şehirleşme pratiklerini etkilemiştir. Siyasal yapının değişimi mevcut otoritenin güç kaybetmesine neden olmuştur. Erkin temsil mekânları olan saraylar ve katedraller işlev değiştirerek sembolik yapılar haline gelmiş, kamuya açılmıştır. Tarım ekonomisinden endüstri ekonomisine geçiş, kapitalist sistemi güçlendirmiştir. Toplumsal sınıfsallık değişmiştir. Avam kabul edilen halkın alt tabakası işçi sınıfına kayarken, ekonomik gücü elinde bulunduran burjuva sınıfı reformların yaygınlaşmasında etkin olmuştur. Şehir merkezlerinde yeni işlevler ortaya çıkmıştır. Saray ve katedrallerin yanında yükselmeye başlayan iş kuleleri ve gökdelenlerle yeniden şekillenen kamusal alanlar, şehir merkezlerinin biçimselliğini etkilemiştir. (Roberts, Erman, ve Akgün, 2016; Stearns, 2021; Yavan, 2023). Bu değişim süreci gündelik hayatın yeniden inşasını ve bu inşaya bağlı olarak da mimari ve şehircilik bağlamında süregelen kuralları değiştirerek, mekânın yeniden üretilmesini sağlamıştır (Lefebvre, 2014).

Endüstri Devrimi'nin etkisi ile 18. yüzyılın sonlarından 20. yüzyılın başlarına kadar, Avrupa ve Amerika Birleşik Devletleri'nde üretim ve tüketim pratiklerinde yaşanan değişim, tarım ekonomilerinden sanayileşmiş ekonomilere doğru geçişi hızlandırırken, tarihsel süreçte önemli bir kırılma noktası oluşturmaktadır (Kartal ve Kartal, 2020; Stearns, 2021; Weber, 2022). Bu durum şehir tanımının yeniden ele alınmasına neden olmuştur. Literatürde zaman, mekân ve coğrafi bağlamsallıklarla ilişkilendirilen şehirlerin yanına yeni kurulan modern endüstri kentleri eklenmiştir (Katznelson, 1992; Spreiregen, 1981; Thorns, 2004; Yücel, 2020). Endüstri devrimi sonrası yükselen kapitalizm ideolojisi; modernizasyon hareketininin gündelik hayata yayılabilmesi için mimari ve şehir planlamayı bir enstrüman gibi kullanmış ve sermaye merkezli, üretim-tüketim pratiklerinin en verimli hale getirilmesini sağlamayı hedeflemiştir.

Modern mimarlık hareketinin ortaya çıkışıyla birlikte, geleneksel mekân anlayışı dönüşüme uğramış; geleneksel malzemelerin sınırlılıklarını aşmak amacıyla betonarme gibi yeni yapı teknolojileri kullanılmaya başlanmıştır. Yeni yapım teknikleri kolay, pratik ve hızlı yapılaşmanın önünü açarken, artan kontrolsüz yapılaşma, mevcut şehir hayatının sürdürülebilirliğini tartışmaya açmıştır. Endüstrileşme, modernizm ile kente nüfus ederek zaman ve mekân arasındaki bağlamsal ilişkinin içi boşaltılmıştır. Moderniteyle birlikte ortaya çıkan yeni bağlam, makineleşmiş bir işlevsellik anlayışıdır. Bu dönemde gündelik yaşamın yeni rutinleri, hümanist değerlerle süslenerek bireyin emek-sermaye döngüsüne uyum sağlaması hedeflenmiştir. Estetik öğelerden sıyrılmış biçimlerin, yeniden konstrükte edildiği modern mimari ve planlama hareketi, soyut mekânın üretimini örgütlemektedir. 18. yüzyılda şehirlerin endüstriyel mekân pratiklerince ele geçirilmeye başlaması; 19. yüzyılın sonu ve 20. yüzyılın başında ilk olarak Ebenezer Howard'ın bahçe-kent ütopyası ile başlayan ekolojik sürdürülebilir kentleşme yaklaşımından, günümüze kadar gelen süreçte mimari ve kentleşmenin gidişatına karşın yükselen eleştirel gündemler sürdürülebilirlik bağlamında tartışmaya açmıştır. Kapitalist sermayenin endüstriyelleşme hamlesi ile fabrika çeperlerinde yığılarak artan nüfus, mevcut şehirlerin geçmişten gelen toplumsal sınıfsallığa bağlı mekânsal dağılımı üzerinde katmanlaşarak heterojen bir biçimsellik

oluşturmuştur. Tarihsel süreç boyunca artarak devam eden bu durum, mevcut şehirleri giderek yaşanmaz hale getirirken, şehir yaşamının sürdürülebilirliği için modernizmin normları ile deneysel ütopya modelleri tasarlanmıştır. Endüstri Devrimi sonrası yeni dünya düzeni kuralcı bir planlama anlayışı ile tasarlanan bu ütopik modeller örnek alınarak inşa edilmeye çalışılmaktadır.Kentlerin kaçınılmaz büyümesi ile artan karmaşık ve katmanlı yapısı, ütopik modellerin sürdürülebilirlik konusunda etkinliğini kaybetmesine neden olmaktadır. Bu durumda ütopyaların kimi zaman karşıtlığında duran kimi zaman da tamamlayıcısı olan heterotopyalar ortaya çıkmaktadır. Avrupa'da başlayan Amerika'da hızla ilerleyen ve dünya genelinde yaygınlaşan Endüstri Devriminin etki alanında kalan şehirlerde kırdan kente göçlerle birlikte toplumsal modernleşmenin mekânsal pratiklerle sağlanması gereği ortaya çıkmıştır. Toplumun modern hayatın gündelik rutinlerine uyumlanabilmesi için mekân kavramı her ölçekte yeniden ele alınarak modern mekân ve dolayısıyla modern kentler tasarlanmıştır.

Çalışmada, endüstrileşme etkisi ile mimari ve şehircilik kurallarının modernleşme süreci; ideal kent ütopyası ve modern kuralların dışında kalan, öteki ve farklı olanın kentsel mekânı olarak heterotopya kavramı aracılığıyla sürdürülebilirlik bağlamında değerlendirilmiştir.

## 2. Materyal ve Yöntem

Çalışma erken Cumhuriyet döneminin sanayileşme hamlesi olarak kurulan fabrikalardan biri olan Kardemir Demir Çelik Fabrikası'nın konumlandırıldığı coğrafyada bir endüstri kenti olarak kurulan Karabük kentinin planlama süreci ütopya ve heterotopya bağlamında irdelenmiştir. Endüstri mekân pratiği olan fabrikanın çekim etkisi ile yoğun göç alan ve hızla sınırları genişleyen Karabük kentinin planlama sürecinin deşifre edildiği çalışmada, ideal kent ütopyası ve heterotopya araştırması yapılmıştır. Karabük örneği üzerinden kentsel sürdürülebilirlik bağlamında ütopyaların ve heterotopyanın önemi değerlendirilmiştir.

Çalışmanın yönteminde tarihsel retrospektif analiz ile ideal kent ütopyası tipolojik olarak araştırılmıştır. Ütopya kavramının devamı olarak heterotopya kavramı Michel Foucault'nun altı ilkesi ve oluşturduğu örneklem alanı üzerinden değerlendirilmiş ve güncel örneklem alanı yorumlanmıştır. Literatür kapsamında elde edilen bilgiler, örnek bir endüstri kenti olan Karabük üzerinde karşılaştırmalı araştırılmıştır. Karabük kentinin, planlama süreci ile oluşan kentsel tipolojisi içinde ütopya ve heterotopya izleri, güncel örnekler ile karşılaştırılarak yorumlanmıştır. Çalışma kapsamında, Karabük kentinin şehir planlaması; 'Yıldız Mimar-Şehirci (Starchitect)'olarak bilinen; Henri Prost, Nezihe-Pertev Taner, Gündüz Özdeş ve Baran İdil'in dört farklı dönemde yaptıkları çalışmalar; tasarım üslubu, plan kararları, planlama yaklaşımları açısından araştırılmıştır. Böylelikle çalışma kapsamında, Karabük kentindeki ütopya ve heterotopya oluşumları ortaya çıkartılmış, sürdürülebilir endüstri kenti bağlamında değerlendirme yapılmıştır. Çalışmada Karabük ile ilgili, kentin haritalarından, imar planlarından, plan raporlarından, bilimsel yayınlardan yararlanılmıştır.

## 3. Sürdürülebilirlik Bağlamında İdeal Kent Ütopyası ve Heterotopya

Kent; şehirden farklı olarak, bir topluluğun güç ve kültürünün en yoğun olduğu, sosyal kuvvetlerin somut bir oluşumu olarak oraya ait olanlara özel bir barınma alanı, endüstirleşme ile değişen üretim ve tüketim faaliyetlerinin eş zamanlı gerçekleştiği, depolama ve takas için tesisleri barındıran, emeğin sosyal olarak bölüşüldüğü ve yeni sınıfsal ayrımların ortaya çıktığı, coğrafik bir sinir ağı ve planlı yerleşim alanlarını barındıran yerdir (Lampard, 1955; Mumford, 1961; Katznelson, 1992).

Sürdürülebilirlik kavramı ilk kez 1987 yılında yayımlanan Brundtland Raporunda tanımlanmıştır. Bourdeau (1999), "Fransa'da Sürdürülebilir Kalkınma ve İnşaatın Geleceği" isimli raporunda, sürdürülebilirlik kavramının inşaat sektörü bağlamındaki uygulamalarını incelemiştir. Bourdeau'nun raporunda sürdürülebilirlik kavramı "bugünün ihtiyaçlarını gelecek nesillerin

ihtiyaçlarını karşılama yeteneğinden ödün vermeden karşılayan kalkınma" olarak açıklanmaktadır (Bourdeau, 1999). Raporda, Fransa'daki sürdürülebilir inşaat uygulamalarının geleceği, 1970'lerde belirlenen enerji standartları ve 1989 yılında yürürlüğe giren enerji kullanımı düzenlemeleri bağlamında ele alınmaktadır. Çalışma, inşaat sektörünün çevresel etkilerini azaltmaya yönelik sürdürülebilir çevre yönetimi yöntemlerine odaklanmaktadır. Modern şehirler, hızla artan dünya nüfusu, yoğunlaşan şehirleşme, doğal kaynakların tükenmesi, iklim değişikliği ve çevresel kirlilik gibi önemli ekolojik sorunlarla karşı karşıyadır. Sürdürülebilir kentleşme yaklaşımı, bu tür sorunların çözümünü hedeflemektedir (Ahmed vd.,2020). Her ne kadar sürdürülebilirlik kavramı literatüre 20. yüzyılın sonlarına doğru girmiş olsa da, endüstrileşmenin yol açtığı çevresel ve toplumsal sorunlar, son üç yüzyıldır ideal kent ütopyaları aracılığıyla çözüm arayışlarını canlı tutmaktadır.

Aydınlanma Çağı'na kadar geçen süreçte, şehirleşmenin morfolojik yapısı merkezden halkalar halinde dışa doğru büyüyen bölgelenme ile biçimlenmiştir. Bu bölgelenme işlevsellik ve sınıfsallığa göre yapılmıştır. İnanç sistemi ile desteklenen siyasal erkin, kent içindeki mekânsallığı merkezdedir. Merkezin çeperleri ticari faaliyetlerin gerçekleştiği mekânsal pratikler ile şekillenmektedir. Konut alanları, ticaret alanlarının dış çeperinde konumlanarak, en dış çeper olan kır alanlanları ile etkileşim içinde biçimlenmiştir. Üretim pratikleri tarıma dayalıdır. Bu nedenle tarımsal üretimin yapıldığı kırsal alanlar şehirlerin en dış çeperinde bölgelenmiştir. (Lampard, 1955; Mumford, 1961; Spreiregen, 1981). Toplumsal sınıfsallıkları oluşturan soylu, tüccar ve yerel halk bu bölgelenme içinde merkezden dışa doğru mekânsal karşılık bulmaktadır. Aydınlanma Çağında; ruhban sınıf tarafından baskılanan düşünce özgürleşmiştir.Bu durum felsefe ve bilim alanında yeni bakış açılarının önünü açmıştır. Bu yaklaşım Antik Çağ'ın yaygın "özgür düşünce" ideolojisine öykünen bir retro hareketidir (Burckhardt, 1960; Setton, 1970; Gribbin, 2009). Rönesans hareketi ile başlayan ve Fransız Devrimine kadar geçen süreçte, ticaret ve takas ekonomisini yürüten ve literatürde burjuva olarak geçen sınıf, bilimi ve teknolojiyi finanse etmiştir. Böylelikle bilinen inanç sistemi ve yönetimin mutlak gücü sarsılmıştır. Bu durum toplumsal yapının sınıfsallığında gerçekleşen değişimi tetiklemiştir (Burckhardt, 1960; Moughtin, 2003; Spreiregen, 1981).

Dönemin yükselen değeri olan kapitalizm; Karl Mannheim'e göre (1893-1947), var olan bir toplumsal düzen içindeki bir sınıf veya grubun çıkarlarını kollamaya çalışan ideolojidir (Jameson, 2008; Fishman vd., 2016; Yetiş, 2015). Modernizm, toplumu çağdaşlaştırmış böylelikle endüstrileşme yaygınlaşmıştır. Aydınlanma ile başlayan reform hareketi endüstrileşme ile birleşerek, Avrupa'ya hakim siyasal erk ve dini otoritenin geleneksel yapısını sarsmış ve zamanla bu yapıyı yıkıma uğratmıştır. (Katznelson, 1992; Weber ve Coşar, 2022). Rönesans dönemi, Antik Yunan kültürüne öykünmüştür. Özellikle Platon'un ütopyacı düşüncesine dayanan "Devlet" adlı eserindeki ideal şehir arayışı bu dönemde yeniden canlanmıştır. Bu ütopyacı yaklaşım, hem edebiyat alanında hem de şehircilik anlanında önemli bir yer tutmaktadır.

### 3.1. Sürdürülebilirlik Bağlamında Sanayi Devrimi ve İdeal Kent Ütopyası

Ütopya kavramı, "Topia" (yer) anlamına gelen sözcük, yok anlamındaki "ou" (veya "u") ile birleşerek oluşan Yunan dil kökenine sahiptir. Eş sesli bir yapıya sahip olan kavram "yok yer", "iyi yer" ve ya "şanslı yer" gibi anlamları barındırmaktadır (Şenses, 2016; Uçan ve Nişancı, 2019). Tarihsel süreçte edebiyat eserlerinde; ideal olanın hayalini betimlemek için kullanılan kavram, zamanla mekânsal bir betimleme ile kentsel literatürde araştırılan ve tartışılan bir konu olmuştur. Edebi tür ütopyalar, mimari ütopyalara değinmez, ancak bu türlerin içeriği mimari ve mekânsal model betimlemeleriyle şekillenir. Bilinmez bir diyar, bir ada, bir ülkenin en ideal hali mekânsal kodlarla betimlenir. Mimari ütopyalar ise bir tasarım ürünüdür ve edebi türden farklı olarak, mutlak suretle toplumsal bir model önermesi ile var edilir (Corbusier, 2022).

18. yüzyılın tarihsel sürecinde burjuva sınıfı güç kazanırken, soyluluk ve dinin sembolizmi yerini bilim, teknoloji ve endüstri devrimine bırakmıştır.Düşünce yapısında çok hızlı bir biçimde gerçekleşen devrim; zihinlerde sarayların, katedrallerin yıkılışını temsil etsede, pratik anlamda şehirleşmenin değişimi yüzyıllar sürecek bir zamana yayılmaktadır. Bilinen şehirleşme pratikleri, zamanın ruhuna göre yeniden şekillenmekte, süregelen geleneksel şehirleşme tipoloji ve morfoloji anlayışında yapısal çözülmeler ve dönüşümlere neden olmaktadır. Rasyonalist düşünceyi fiziki mekâna büründüren, değişimin en belirgin dönemsel mimari örneği, Etienne Louis Boulle'nin (1728-1799), bilime atfedilmiş eseri olan Newton Kenotafıdır. Kenotaf, anıtsal yapı semboliziminde kilise ve katedrallerin yerini alan kentsel anlamda tarihi bir landmarktır, (Şekil 1), (Rona, 1997; Sekman, 2017).Kenotaf, Etienne Louis Boullée tarafından Isaac Newton'un bilimsel dehasını anmak amacıyla tasarlanmış bir anıtsal yapıdır. Geleneksel dini mimarinin biçimlerinden farklı olarak, büyük bir küresel formda tasarlanmış olan bu kenotaf, bilimsel aklın ve evrensel düzenin simgesi olarak öne çıkan önemli bir örnektir.

**Şekil 1. Etienne Louis Boulle'nin Newton Kenotafı, 1784**



**Kaynak:** (Hasol, 2000)

19. yüzyılın mimari ve şehircilik gündemi, modern mekân, modern endüstri kenti ve ideal kent ütopyalardır. Endüstri devrimi ile bir çekim merkezi haline gelen şehirler artan nüfus karşısında yetersiz alt yapıları nedeniyle yaşanmaz hale gelmiştir. Şehirleşmenin sürdürülemez olan bu durumuna bir çözüm önerisi olarak üretilen bu ideal kent ütopyaları, modern hayatı ve modern mekânı kurgulayan modellerdir. Bu modeller endüstri temalı mimari konseptler altında geliştirilen, kentsel plan şemalarından oşulmaktadır (Sekman, 2017; Türkmen ve Tekkanat, 2018; Baba, 2022). Bu dönemde; Robert Owen'ın (1771-1858) New Lanark, Charles Fourier'in (1772-1837) Falenster, J.B. Andre Godin'in (1817-1888) Familistere, isimli kent dışına kurulmuş endüstri yerleşkeleri, ideal kent ütopyası olarak ön plana çıkmaktadır (Baba, 2022; Mattelart, 2000).

Dönemin ütopya tasarımcılarının ortak kaygısı ütopik sosyalizmdir. "World-Menders" (dünyayı onaranlar) olarak adlandırılan dönem ütopistleri; sosyal adaletin sağlandığı eşit ve adil bir yaşamı tasarlamayı amaçlamıştır (Mattelart, 2000). Mevcut kentlerin artan nüfus karşısında uğradığı yıkıcı bozum, insanı doğadan koparmaktadır. Avrupa şehirlerinin yaşam kalitesi ve sürdürülebilirliğinin güvence altına alınması hedeflenen bu ütopyaların ortak amacı; mevcut kentlerin sağlıksız şartlarından kurtarılmış topluluklara, yeni çalışma ve barınma olanakları sunmaktır. İnsan ve doğa arasındaki ilişkinin yeniden inşa edildiği, herkesin mutlu olduğu, ortak bir yaşamın sürdürüldüğü, yeni üretim modelleri ile hayat standartlarının yükseltildiği, yüksek düzeyde yaşam kalitesi hedeflenen endüstri yerleşkeleri, şehir dışındaki alanlara kurulmuştur (Sekman, 2017; Türkmen ve Tekkanat, 2018).

20. yüzyıl, kentsel biçim, kapitalist sanayi ekonomisi ve kentsel reform hareketlerinden oluşan iki bileşenin yükselmesi ile değişim göstermektedir (Baba, 2022). Kentler, üretim odaklı işlevlerin

yoğunlaştığı, endüstriyel merkezlere dönüşmeye başlamıştır. 1920'lerin Almanya'sında yükselen modernistler, Walter Gropius öncülüğünde kurulan Bauhaus ekolü aracılığıyla modernizmin tüm dünyaya yayılmasında etkili olmuştur. Avrupa kentlerini bir çekim merkezi haline getirmiştir. Çalışmak için kente gelerek yerleşik hayata geçen nüfusun ihtiyaçlarını karşılamaya yetecek barınma kapasitesi aşılmıştır. Hızlı yapım tekniği ile inşa edilen toplu konutlar, başlangıçta modernizasyon hareketinin barınma konusunda önemli hamlesi olsa da zamanla insanları doğadan uzaklaştırmıştır. Henüz bu yüzyılın başlarında yaygınlaşan ulaşım sistemleri, demiryolu ağları, elektrikli tramvaylar, otobüsler ve artan özel otomobil sayısı, kentlerin kırsal alanlara doğru yayılmasına yol açmıştır (Fishman vd., 2016; Baba, 2022).

Amerika'da yaygınlaşan Fordizm, bant üretimin sürdürülebilirliği için çalışma koşullarını iyileştirmiştir. Bu durum şehirleri daha kalabalık hale getirmiştir. Londra'nın şehirleşmesindeki keşmekeş, büyük Amerikan kentlerinin yaşanmaz hale gelmesi, kentsel yoğunluğun azaltılması fikrini zorunlu kılmıştır. Modern kentlere dair iki eleştirel söylemden ilki bu dönemde ortaya çıkmıştır. İkinci söylem ise 1969'larda postmodernizm etkisi ile gündeme gelecektir.

Bu dönemde ortaya çıkan ilk eleştirel söyleme göre şekillenen ütopyacı anlayış, tasarım konsepti olarak, kentsel yoğunluğu seyreltmek için konut alanlarını kent dışında kırsal alanlara taşımayı benimsemiştir. Tony Garnier, Ebenezer Howard ve Raymond Unwin'in temsil ettiği şehircilik ekolü, banliyöleşme ve uydu kent gibi ütopyacı yaklaşım konusunda öncülük etmektedir. Kentsel literatüre bu dönemde giren uydu kent ve banliyö kavramları; kent dışına kurulan, betonlaşma yerine doğaya uzamlanan, insani yaşam koşullarını sağlayan yerleşim alanlarıdır. Ulaşım vasıtalarının yaygınlaşması ve bireysel taşıt edinim kültürünün yerleşmesi, banliyö ve uydu kent yaklaşımlarını güçlendirmiştir. Banliyöler ve uydu kentler; kentsel yoğunluğu seyretlmenin yanında, insanları kalabalık şehirlerden özlem duyulan kırlara kaçıran bir vaha gibi kentsel tarihteki rolünü almıştır.

II. Dünya Savaşı öncesinde Avrupa'da modernleşme hız kazanırken, mimarlık ve şehircilik alanında, dönemin en kapsamlı eleştirel yaklaşımı, 1928 yılında toplanan Uluslararası Modern Mimarlık Kongresi (CIAM) ile ortaya çıkmıştır. Le Corbusier ve ekibinin öncülük ettiği bu kongrelerde, dönemin düzensiz, sağlıksız ve plansız kentleşme biçimleri eleştirilmiş; sanayi toplumunun ihtiyaçlarına uygun, rasyonel temellere dayanan bir şehircilik anlayışı geliştirilmesi önerilmiştir (Corbusier, 2009; Aras, 2016). CIAM'ın önerileri; sanayi sonrası kentsel sorunlara teknik çözümler üretmeyi amaçlamıştır.

II. Dünya Savaşı ve Atina Anlaşması 20. Yüzyıl içinde yaşanan önemli bir kırılma sürecidir. Hem savaşın yıkımı hem de barınma ihtiyacının acilen karşılanması, bütün Avrupayı etkisi altına almıştır. Avrupa ile paralel olarak, Amerika merkezli sürdürülebilir kentsel ekoloji söylemleri, bu dönemde ön plana çıkmaktadır. 1892'de Chicago Üniversitesi'nde Sosyal Bilimler ve Antropoloji bilim dallarına bağlı olarak kurulan, 'Chicago Okulu' olarak da bilinen Ekoloji okulunda, 1920'li yıllarda kent sosyolojisi alanında başlayan araştırmalar, kentsel bağlamda sürdülebilir, ekolojik söylemler üretmektedir. Kentsel ekoloji okulunun kurucularından sosyolog Robert Park, Ernest Burges, Homer Hoyt; Avrupa ve ABD'de sanayileşmeye bağlı artan şehirleşmenin meydana getirdiği negatif etkileri mercek altına alarak, yeni kent modeli önermelerinde bulunmuştur (Hall, 2012; Türkmen ve Tekkanat, 2018).

Uydu kent ve banliyöler, ilk etapta kent içi nüfusu seyreltmiş olsa da kentin bu alanlara doğru saçaklanarak büyüme eğilimi devam etmektedir. Bu nedenle ikinci eleştirel söylem ilk söylemin karşıtlığı olarak ortaya çıkmıştır. Kentten kaçışın bir çözüm olmadığını öne süren bu yaklaşım, aynı zamanda kentsel belleğin kültürel devamlılık için önemine dikkat çekerek, tarihin katmanlandığı kent merkezlerinin korunması gerektiği savunmuştur. İkinci yaklaşıma göre kent dışına taşınması gereken unsurlar; zamanla kent içine sızmış endüstri mekân pratikleridir. İlk eleştirel yaklaşımda kır kent, bahçe

kent gibi temalarla ortaya çıkan ütopya modelleri önerilirken, ikinci eleştirel yaklaşımda endüstri alanlarının kent dışına alınması önerilmiştir.

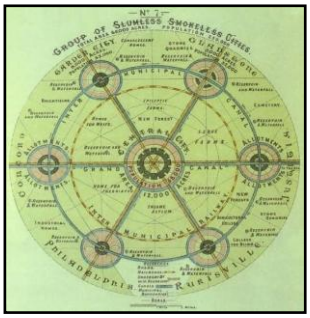
Cherry (1979) ve Lehman (2011); bu model önerilerine Ebenezer Howard'ın "Bahçe Şehir" (Şekil 2) ve Roymond Unwin'in "Uydu Kent" tasarımlarını örnek olarak göstermiştir. Ebenezer Howard'ın ve Raymond Unwin'in banliyöleşme konusunda farklı fikirler içeren kitapları, modern şehir planlama klasikleri arasında yer almaktadır. 20. yüzyılın başlarından itibaren Howard'ın İngiliz bahçe şehir yaklaşımı; şehirlerin dışında, insan yaşamı ve sağlığı için faydalı, bahçeleri ve güneş ışığı olan ideal evleri, yeşil alanlarda planlamayı önermektedir (Lehmann ve Lehmann, 2011; Miller, 1992).

Howard, bahçe-şehir fikrini oluştururken dönemsel eleştirilerden yola çıkmıştır. Endüstrileşme ile değişen gündelik hayatın getirdiği toplumsal sorunlara değinmiştir. Bu sorunları aşırılık, aşırı çalışma, sürekli endişe ve ezici yoksulluk olarak sıralamakta ve sorun tespitini yapmaktadır.

> *"İnsanları şehirlere çekecek şekilde etkisini gösteren, halen de göstermeye devam eden nedenler her neyse hepsini çekimler olarak özetleyebiliriz; dolayısıyla, insanlara ya da hiç olmazsa hatırı sayılır bir kısmına, bugün şehirlerimizin sahip olduğundan daha büyük çekimler yaratılmadıkça soruna etkin bir çare getirilemeyeceği apaçık ortadadır. Her kente bir mıknatıs, her insana da bir iğne olarak bakabiliriz; böyle baktığımızda da hemen görürüz ki, kentlerimizin sahip olduğundan daha kuvvetli mıknatıslar inşa etmenin bir yöntemi bulunmadığı sürece, nüfusu kendiliğinden ve sağlıklı bir şekilde yeniden tanzim etmek için ne yapsak fayda etmez." Howard, 2019, s:30-31.*

'Yarının Bahçe Kentleri' kitabından yapılan alıntıda Howard, dönemsel sorun tespiti ile bahçe-şehir tasarımının "Üçlü Mıknatıs" konseptini oluşturmuştur.

**Şekil 2. Bahçe Kent, Ebenezer Howard**



**Kaynak: (**Howard, 2019)

Le Corbusier'in "Işıyan Kent" ve Frank Llyod Wright "Broadacre Kent" tasarımları 20.yüzyılın, ikonik ütopya önermeleridir (Spreiregen, 1981; Sekman, 2017; Howard, 2019). Corbusier, "Işıyan Şehir" (Villa Radieuse) tasarımı; şehirlerin kurtarılmasının, eski şehirlerin yıkılması ile mümkün olabileceğini savununan ideolojisi ile mevcut kentlerin sürdürülebilirliğini reddetmiştir. Bu tasarım önerisinde; gelenekselliği kabul etmeyen, rasyonalist bir tasarım anlayışı ön plandadır (Fishman vd., 2016; Wakeman, 2019; Corbusier, 2022). Corbusier'in tasarım yaklaşımı, Fransız Devrimcilerin modernist siyaset anlayışı ile paralellik göstermektedir. Corbusier; artan irrasyonel şehirleşmenin Ortaçağ kentlerini hasta ettiğini ve modern gündelik hayatta işlevsizleşen geçmiş yapıların şehir planından kaldırılması gerektiğini savunmuştur (Corbusier, 2010; D Morgan, 2014; Baba, 2022). Le Corbusier'in 1925 'de "Çağdaş Bir Şehir" ütopyası ve 1935'de "Işıyan Şehir " ütopyası; hem geometrik ütopyadır hem de bütüncül bir şehircilik anlayışına sahiptir. Simetri, Le Corbusier tasarımlarının en belirleyici özelliğidir (Corbusier, 2022).

Frank Llyod Wrigt'ın 1932 yılında yayımladığı "Kaybolan Şehir" (The Disappearing City) kitabında önerdiği "Broadacre City" ütopyası, Howard'cı bir yaklaşıma benzer bir biçimde kır kenti ön plana çıkarmıştır. Broadacre, sürdürülebir kentleşme bağlamında Courbuiser'in geçmişi reddeden yıkıcı fikirlerinin karşısında duran radikal bir tasarım örneğidir. Wright'a göre kendi tasarımı olan Broadacre'nin sınırlarındaki belirsizlik, kenti yok etmiştir (2015), (Mehta, 2012; Wright, 2015). Bu bağlamda Wright, tasarımında kent dışı tekil bir banliyö tasarlamak yerine, mevcut kentle birleşerek ekolojik yaklaşımı tüm şehirde yaygınlaştırmayı hedeflemiştir. Ancak sınırları net olmayan tasarım önerisi, mevcut kentin dinamikleri arasında temel konseptini yitirmiştir.

1960'lar modern mimari ile postmodernizm söylemlerinin ve avangard mimarinin yükselişte olduğu dönemdir. Artan teknoloji geleceğin şehirleri için fütürist ütopya önermelerini ortaya çıkarmıştır. Mevcut şehirlerin endüstrileşme etkisi ile kaybolan unsurları, eleştirel gündemlerin odağındadır. Peter Cook öncülüğünde bir grup mimar tarafından kurulan Arcigram (Achitectural Telegram) oluşumu, modernitenin ortaya koyduğu statükoyu sorgulamıştır. Geleceğin kentleri konusunda; teknoloji tabanlı, Plug-in City ve Walking City gibi kinetik kabiliyetlere sahip, ütopyalar üretmektedir (Ertan, 2019; Sekman, 2017; Türk, 2015; Yücel, 2020). Kenti parça parça ele alan grup, kentsel mekânları fonksiyonlarına göre bir arada bulunduran mega yapılar tasarlamıştır.Teknoloji konseptli tasarımlar, geleceğin kentlerindeki toplumsal dinamikleri irdelerken, bunlar için en çağdaş çözümleri önermeyi hedeflemiştir (Baba 2022; Özkuş 2006).

Bu dönemde modernitenin ilkelerine bağlı katı yapısı, postmodernite ile yapı söküme uğratılırken, mimari ve kentsel mekân, anlam bakımından, yeniden yorumlanmaktadır. Kentin işlevsel parçaları haline gelen endüstriyel mekân pratiklerinin kentin dışına çıkarılması suretiyle boşaltılan alanlar, yeni çağın işlevlerine yönelik kentsel mekanların tasarlanacağı yerlere dönüşmektedir. Postmodernizm, modernizmin ürettiği ütopya algısını kırmıştır (Fishman vd., 2016; Baba, 2022). Bu dönemde, illüzyon ütopyaları ve ekolojik ütopyalar ön plana çıkmaktadır. Bauldrillard'a göre düş ile gerçek arasındaki farkın kaybolduğu, kenti bir eğlence parkına dönüştüren ütopyalar, illüzyon yaratan yerlerdir (Baba, 2022; Foucault, 2020; Yıldırım, 2017). Bauldrillard'a göre; bu tarz ütopyalarının başında, 1955 te kurulan Disneyland gelmektedir (Baba, 2022). Disneyland gibi illüzyon mekânlar üreten bu ütopya yaklaşımı, Antik dönem ütopya anlayışı ile 1960'lar sonrası ideal kent ütopya anlayışı arasında, büyük bir uçurum oluştuğunu göstermektedir (Baba, 2022).

1970'li yıllar özgürlüklerin yeniden gündeme gelmesi ile liberal görüşün tozlarının alınarak parlatıldığı ve çağa uyarlandığı neoliberalizm ile canlanmaktadır. Neoliberal politikalar, modernitenin katı kurallarının; dönemin ekonomik, siyasal ve sosyolojik yapısına göre esnetilmesi gerekliliğini savunmaktadır. Özgürlük fikrinin, kendi anlamına tezat oluşturan bir şekilde, modernizmin kalıpları arasına alınması, neoliberal çevrelerce bu konuyu tartışmaya açmıştır. Aynı zamanda sitemin mevcut düzenin de tartışılmıştır. Neoliberalizm, özgürlük ve denetim ikilisi üzerine kurulmuş bir yapı sunar. Bu yapı; bireysel özgürlükleri vurgularken, aynı zamanda piyasa ekonomisi ve sermayenin serbest dolaşımını denetim altında tutmayı amaçlar. Ancak, burada bahsi geçen özgürlük; genellikle sermaye özgürlüğüne hizmet eden, geniş kitleler için adalet ve eşitlikten uzak bir dünya yaratmaktadır. Neoliberalizmin bu ikili yapısı, birey ve toplum arasındaki dengenin bozulmasına yol açmaktadır.

1980'li yıllar, kentsel krizlerin ana başlıklar altında toplandığı yıllardır. Artan nüfusun getirdiği güvenlik sorunu, salgınlara afetlere karşın dayanıksızlık, atıkların bertarafı, ulaşım ve iletişim ağlarının üretim tüketim zinciri ve her türden bilginin aktarımın kesintisiz sağlanabilmesi, kentlerin gerek çevresine ve doğaya gerekse insan doğasına uygun bir biçimde yaşanabilir olması bu başlıkları oluşturmaktadır. Bu başlıkların her biri için, yeni bir ütopya modeli yaparak kentten koparmak artık mümkün değildir. Bu nedenle her bir kriz başlığı, tematik olarak adlandırılabilecek modellerle giderilmeye çalışılmaktadır. 1980'ler sonrası; ekolojik, sürdürülebilir, akıllı, güvenli, dirençli gibi

kavramların temalaştığı görülmektedir. Günümüz dünyasında bu temalar, tek başına veya birbirleri ile kombinlenerek, çağın ruhunu ve kentsel gereklilikleri barındıran, ütopya tasarımlarının konseptini oluşturmaktadır.

21. yüzyılın post endüstriyel iklimi kentleşmeyi, endüstri odağından bilişim odağına doğru çekmektedir. Endüstriyel alanlar az gelişmiş ya da gelişmekte olan coğrafyalara kaymaktadır. 21. yüzyılın en önemli problemi, geçmişte olduğu gibi, kent merkezlerinde artan nüfus nedeniyle sağlıksız kentleşmedir. Kent dışında saçaklanan, banliyö tarzı ütopyaların, kentin zamanla bu yönlere doğru büyümesi sonucu kentle birleştiği görülmüş kentten banliyölerle uzaklaşmanın bir çözüm olmadığı görülmüştür. Günümüz ütopyacı çözüm arayışları, fütürist yaklaşımlar ya da kentlerin belirli bölgelerinde alınan önlemler, yapılan lokal çözümlerdir. Bu önlemler, kentleşme senaryolarının yeniden düşünülmesi ile türetilmiştir. Yeni kentleşme modelleri; sürdürülebilir, ekolojik, kompakt, akıllı, dirençli gibi temalar ile desteklenmektedir. Bu temalar ütopik yaklaşımlar oldukları kadar, ilerleyen teknoloji sayesinde, seçilen lokal bölgelerde denenmektedir.

21. yüzyılda küresel bağlamda kentleşme; kentsel refah, sosyal uyum, sağlık, çevresel verimlilik, iyileştirme ve var olan potansiyellerin öne çıkarılması konularına göre şekillenmektedir (Moir vd., 2014). Ulaşım, iletişim ve etkileşim alanlarında yükselen teknoloji trendleri, dünya tarihinde önemli bir kırılma oluşturmaktadır. 20. yüzyılda inşaat teknolojilerindeki gelişmeler, ortaçağın yükselen ihtişamlı katedrallerine benzeyen, kapitalizmin sembolik yapıları olan, iş merkezleri, ofis binaları ve gökdelen gibi yapıların kent merkezlerinde yükselmesini sağlamıştır. 21. Yüzyılın fütürist ütopyaları, bilgisayar programlarının, yapay zekanın esnekleştirdiği tasarım ortamlarında tasarlanmaktadır. Örneğin; RveSie tasarım stüdyosunun Vertical-Sky City (2005), Studio Lindfors'un Cloud Skippers (2009) ve Matsys Tasarım Stüdyosu'nun Desert City (2009) tasarımları, mimarlık ve teknolojinin birleşiminden ortaya çıkan 21. Yüzyılın fütürist ütopyalarına birer örnek teşkil etmektedir (Şensoy ve Özaslan, 2020).

Geleceğin şehri üzerine düşünebilmek için bugün şehirlerin karşı karşıya olduğu zorluklar irdelenmedilir. Gelecekteki şehirlerin; nüfus artışı, iklim değişikliği, teknolojik gelişmeler, insan hareketliliği, ekonomik ve demografik risklere uyum sağlaması gerekmektedir. Yaşlanan nüfus, eşitsizlik ve toplumsal gerilimler, yetersiz kaynaklar gibi sorunların azaltması için çalışmalar yapılması gerekmektedir. Bu nedenle, günümüz dünyasında ideal kent ütopya tasarım senaryoları; sürdürülebilir, ekolojik, akıllı, dirençli, kompakt gibi tematik bağlamlar ile ilişkili bir şekilde ön plana çıkmaktadır.

### 3.2. Sürdürülebilirlik Bağlamında Heterotopya Değerlendirilmesi

Foucault (2020), heterotopya kavramını verdiği örnekler üzerinden hem tarihsel hem de mekânsal bağlamda analiz etmiştir. Analiz yaparken kullandığı altı ilke ve bu ilkeleri somutlaştıran örnekler aracılığıyla kavramı açıklamıştır. Çalışmada heterotopya kavramı Foucault'nun altı ilkesinin örneklem alanının literatür araştırması ile zenginleştirilerek açıklanmıştır. Böylelikle heterotopyaların sürdürülebilirlik bağlamında önemi ortaya çıkarılmıştır.

Heterotopya kavramının etimolojisi, Yunanca "topos'un (τόπος) 'farklı/başka" kelimesinin ön ek olan "heteros" (ετερός) kelimesi ile birleşiminden oluşur. Türkçe 'de "diğer yer, başka yer, öteki yer, farklı yer" gibi anlamlara gelmektedir. Ütopya kavramının, gerçek dünyada durumsal karşıtlığı olarak ortaya çıkan distopyaların soyut ve gerçek dışı anlatısına göre heterotopya kavramı, kentte bütün gerçekliği ile var olan, somut dokudur. İlk kez tıp alanında kullanılan kavram, bir dokunun olmaması gereken bir yerde belirmesi anlamına gelen, heterotopi sözcüğünden türetilmiştir (Doğan ve Koçyiğit, 2023). Heterotopyalar, egemen otoritenin ve ekonomik yapının ürettiği planlı, öngörülebilir, homojen kent tasarımın karşısında, çeşitliliğin neden olduğu; öngörülemezliğin, kural dışılığın ve ötekinin mekânı olarak tanımlanmaktadır (Doğan ve Koçyiğit, 2023; Kenney, 2011; Topinka, 2010; Yıldırım,

2017) Bu nedenle heterotopya kavramını kapitalizmin modernizm eli ile ürettiği kurallı mekân pratiğinin bir ürünü olarak irdelemek gerekmektedir. Araştırma çalışmasında, heterotopya kavramı, Michel Foucault'nun heterotopya söylemi bağlamında açıkladığı altı ilkesinin yapı söküme uğratılması yolu ile açıklanmaktadır.

Michel Foucault heterotopya kavramını mekâna uyarlayarak, ötekinin mekânına dair düşünsel bir derinlik kazandırmıştır. "Kelimeler ve Şeyler" adlı eserinde ele almıştır. Daha sonra, 1967 yılında Tunus'ta kaleme aldığı ve 1984'te "Architecture, Mouvement, Continuité" dergisinde yayımlanan "Des Espaces Autres" (Başka Mekânlara Dair") adlı makalesinde, heterotopyayı zaman-mekân boyutuyla incelemiştir. Bu çalışmada, 19. yüzyıl zaman boyutuyla, 20. yüzyıl ise mekân boyutuyla heterotopya bağlamında değerlendirilmiştir. Foucault'ya göre heterotopya kavramı altı ilkeye dayanır: evrensellik, süreklilik, yan yanalık, zamansallık, açılma-kapanma ve işlevsellik. Bu ilkeler, Işık Ergüden'in derlediği "Foucault Özne ve İktidar Seçme Yazılar 2" adlı kitabın on yedinci bölümü olan "Başka Mekânlara Dair" konferans metninde aktarılmaktadır. (Foucault, 2020; Şevik ve Çalışkan, 2019; Toprak, 2018; Yıldırım, 2020).

Foucault'ya göre (1966); ütopyalar, "şeyler"in, bilinenin dışında farklı yerlere yerleştirilmesi ve de birbiri ile ortak bir yer tanımlaması olanaksız olan kelimeler aracılığıyla oluşturulmaktadır. Bir teselli aracı olan ütopyalar; olmayan yerleri, büyülü bir mekân tasviri ile geniş caddeleri olan, bakımlı bahçeleri olan kentler gibi hayali yerleri işaret etmektedir. Buna karşılık heterotopyalar is dilin bilinen sentaksını tahrip eden, türdeş olmayan mekânlardır (Foucault, 2001).

Foucault, söylemlerini tarihsel analizler ışığında temellendirerek mekân kavramının tarihsel süreçteki dönüşümüne vurgu yapmaktadır. Foucault'ya göre, Orta çağda mekân, mutlak hiyerarşiyle düzenlenmiş, belirli yerlerin ve bu yerlerin kesişimlerinin, bütüncül bir hiyerarşi ile belirlendiği bir yapıya sahiptir. Rönesans döneminde ise bu statik ve belirli mekân anlayışı sarsılmış, mekâna ilişkin kavramlar sorgulanmıştır. Günümüzde ise mekân, katı sınırların ortadan kalkmasıyla birlikte çok boyutlu, uzamsal çok katmanlı bir yapıya dönüşmüştür. Günlük yaşamda uzamsallık, yerler ve yerler arasındaki ilişkiler aracılığıyla deneyimlenir; yer, algılanabilen ve deneyimlenebilen, ancak birbirine indirgenemeyen mekânsal bir birim olarak tanımlanır. Foucault'a göre, ütopya ve heterotopya kavramları, mevcut mekânlardan farklılaşan, onları yansıtan ve aynı zamanda onların altını üstüne getiren mekânsal alanlar olarak ön plana çıkar. Bu yerler, mevcut yerlerin alternatif ve eleştirel yansımalarıdır (Çavdar, 2018; Shane, 2008; Topinka, 2010; Yıldırım, 2017).

Foucault, ütopyayı gerçek yeri olmayan bir mahal olarak ayna metaforu üzerinden tanımlar. Toplumun gerçek mekânı ile düz ya da ters bir analoji kuran ütopya, tıpkı aynanın yansıttığı mekân gibi gerçek dışı mekândır (Foucault, 2000a, s.10-11). Ayna ütopya gibi yersiz yerdir, fakat aynı zamanda fiziken var olan ve kişinin mekânsal konumunda karmaşa yaratan gerçek bir yerdir (Johnson, 2006).

Foucault'nun tarih çalışmaları tamamen mekânsaldır (Elden, 2001). Foucault'nun çalışmaları; mekânın iktidar kullanımı ve iktidara dair tarihsel araştırmalar için temel olduğunu ortaya çıkarır. Foucult'un mekânı zaman ile okuma anlayışı, günümüz dünyasındaki mekân anlayışının yeniden değerlendirilmesini sağlar (Elden, 2001; Hubbard ve Kitchin, 2018).

Heterotopya kavramı edebi anlamda bozmak, karıştırmak, inkar etmek gibi olumsuz anlam taşıyan kelimeler ile karşılık bulmaktadır fakat mekânsal anlamda kavram ayna tutmak, çelişmek, evirmek, ters yüz etmek, temsil etmek gibi çeşitli anlamlara gelmektedir (Toprak, 2018). Mekânsal bağlamda heterotopya, edebi anlamda heterotopya kavramına göre anlamsal çeşitliliğinden de anlaşılacağı üzere daha karmaşık özellikler barındırmaktadır.

Heterotopya, tarih boyunca her kültürde farklı biçimlerde ortaya çıkmıştır. Zaman içinde dönüşüm geçirebilen, zamansal birikim ya da zamansal kesintileri içeren mekanlardır. Uyumsuz veya

birbiriyle örtüşmeyen, farklı deneyim ve mekânsal özelliklerin tek bir mekânda bir araya geldiği yerlerdir. Dış dünya ile etkileşim kurarken kendi belirlediği kurallar çerçevesinde hareket eden ve kendi dışındaki mekânlar ile işlevsel bir bağ kuran farklılık mekânlarıdır (Çavdar, 2018; Foucault, 2020).

Foucault; heterotopyanın ilk ilkesini evrensellik/ heryerdelik olarak aktarır (Yıldırım, 2020). Bu ilkeyi, 'dünyada heterotopya oluşturmayan tek bir kültür olamaması' ve kendi içinde biçimsel değişimler gösterse de her yerde her kültürde var olmaları şeklinde açıklamaktadır (Foucault, 2020). Bu evrensellik içinde kriz ve sapma heterotopyalarını barındırmaktadır. Kriz heterotopyaları bireyi önceleyen bir yaklaşım ile yaşlıların, kadınların, ergenlerin vb., özel gereksinimlerini karşılamaya yönelik huzur evleri, yatılı okullar, kışlalar, balayı odaları gibi mekânlardır. Kriz heterotopyalarının biçim değiştirmesi sonucu ortaya çıkan sapma heterotopyaları, toplumsal normlara ya da toplumun genel düzenine uyum sağlamayan davranışları gösterenlerin mekânıdır. Akıl hastanesi, hapishane gibi mekânlar bu heterotopyalara örnek verilmiştir (Foucault, 2020; Yıldırım, 2020). Kriz ve sapma heterotopyaları, toplumsal gündelik yaşamın işlevsel ihtiyaçlarına göre şekillenmiştir. Zaman içinde bu işlevlere olan ihtiyaç giderek azalmış ya da tam tersi artmıştır.

"Kriz heterotopyaları" örneklem alanı incelendiğinde dönemsel olarak işleve hizmet ettikleri görülmektedir. Temel işlevlerini korumalarına rağmen zaman içinde işlev erezyonuna uğramışlardır. Örneğin geleneksel aile yapısının mahremiyet normlarına göre erkek ergenliğinin ev dışında geçirilmesi ya da balayınının aile konutunun dışına gerçekleşmesi beklenen olay evreleri günümüz dünyasında eski anlam derinliğine sahip değildir.

"Sapma heterotopyaları" olarak nitelendirilen hapishane, huzurevi, akıl hastanelerine olan ihtiyaç günden güne artmakta ve bunlara ek olarak günümüz sorunlarından biri olan çeşitli bağımlılıklar ile mücadele için rehabilitasyon merkezleri gibi mekânlar bu heterotopya örneklerine eklenmektedir. Bu durumda sapma heterotopyalarının artarak devam ettiğini söylemek mümkündür. Fakat sapma heterotopyaları toplumsal normlara göre belirlendiğinden her toplumda farklılık gösterebilmektedir.

Foucault evrensellik ilkesinin örneklem alanı zamanla çeşitli düşünürler tarafından genişletilmiştir. Sapma heterotopyaları kullanıcıları, toplumdaki pozisyonları bakımından incelendiğinde, toplumsal ayrıştırma-dışlanma gibi nedenlerle bu heterotopyalara gönderildikleri bilinmektedir. Günümüz dünyasında; artan kentsel eşitsizlikler, sosyal ve mekânsal ayrışma, büyük kentlerde artan sınıfsal ve statüsel farklar, mekâna yansımaktadır. Thorns, 20. Yüzyılın sonlarında ortaya çıkan sosyal dışlanma düşüncesinin şehir ve kentin yeniden yapılanırken; kutuplaşma, ayrışma ve dışlanma gibi konulara ilişkin sorunlar doğurduğuna vurgu yapar (Thorns, 2004).

Thorns'a göre dışlanma ve ayrışma modelleri, yoksulluk, evsizlik, sosyo-mekânsal ayrışma ve bu üçünün tam zıttı olarak mevkilenen soylulaştırma olarak dörde ayrılmaktadır. İngilizce'de 'gentrification' olarak kullanılan 'kentsel soylulaştırma'; Türkçe'de mutenalaştırma, seçkinleştirme, burjuvalaştırma gibi anlamlara gelir. Temel olarak, daha önce işçi sınıfı veya düşük gelirli grupların yaşadığı kentsel alanların, üst ve orta sınıf tarafından satın alınması ve yenilenmesi sürecini ifade eder. Bu bağlamda kentsel soylulaştırma yapılan bölgelerde, kentin toplumsal yapısından dışlanan gruplar, Foucault'nun sapma heterotopyası ile paralellik göstermektedir. Bu bağlamda; kentsel suçun arttığı kenar mahalleler, gettolar, kapalı konut yerleşkeleri ve soylulaştırma bölgeleri sapma heterotopyası olarak tanımlanır. Getto, kavramsal olarak belirli ırk, din, etnik kökene bağlı topluluğun bir arada yaşadığı bölgedir (Bilgiç ve Bilgiç, 2019). Kentin dışlanmış bölgeleri olarak tarif edilen gettolar bir sapma heterotopyasıdır.

Foucault'nun belirlediği ikinci ilke, sürekliliktir(Yıldırım, 2020). Foucault'ya göre tarih boyunca bir toplumda var olan ve olmaya devam eden bir heterotopya farklı biçimlerde işletilebilir. Heterotopyanın bulunduğu toplum içinde belirgin bir işlevi vardır ve kültürel eş zamanlılığa göre

işlevleri değişebilir (Foucault 2020). Foucault'nun süreklilik ilkesi ile aktardığı hetetoropya kavramını mezarlıklar ile örneklendirmiştir. Mezarlık örneği gerek Foucult'un yaptığı kabule göre, gerekse günümüz dünyasındaki konumlandırılışına göre süreklilik heterotopyasına bir örnek teşkil etmektedir. Mezarlıkların geçirdiği değişim, işlevselliğini ve uzamsallığını kaybetmesine neden olmuştur. Mezarlık, Endüstri Devrimi öncesi dini otoritenin bir sembolü şeklinde kilisenin uzamı olarak mevkilenen bir heterotopyadır. Endüstri devrimi ve akabinde gerçekleşen modernleşme hareketi gündelik hayatta dini sembolizmin etkisini azaltarak insanı özgürleştirmiştir. Soyutlaşan yaşamda, mezarlıkların kent merkezinde bulunması , anlam bakımından işlevini yitirmiştir. İnanç merkezi olan kiliseler, kent merkezlerinden taşınmasa da kiliselerin arka bahçelerindeki mezarlıkların kent dışına taşınması, modernleşmenin en önemli mekânsal değişimlerinden biridir. Başlangıçta inanç sisteminin hatırlatıcı bir mevkisi olan mezarlık modernite ile işlev değiştirerek soyut bir anlama bürünmüş, kentle uzamsal bağını kaybetmiş bir mekâna dönüşmüştür. Mezarlıklardan kalan yerler bir kentsel boşluk haline gelmiş ve sonrasında bu alanlar yeniden işlevlendirilmiştir. Kentsel boşluklar; heterotopyanın başka bir heterotopyaya dönüşmediği, işe yaramayan, atıl kalmış yerlerdir (Toprak, 2018). Kentsel boşluk, bir işlevin kent içinden tamamen alınması kapsamında da değerlendirilebilir fakat potansiyeli olduğu halde bir belirsizlik durumuna terkedilmiş yerler olarak, yenilenme peyzajının bir parçasını oluştururlar (Toprak, 2018).

Endüstri devrimi ile artan modernitenin kentleşme üzerindeki etkilerin tartışıldığı 1960'lı yıllar; radikal söylemler üreten postmodernitenin yükseliş yıllarıdır. 1964 yılında kabul edilen Venedik Tüzüğü'nün önem verdiği koruma kültürü canlanmıştır. Bu süreçte Endüstri devrimi ve modernitenin eski kentlerde yarattığı kıyımın durudurulması hedeflenmiştir. Venedik tüzüğünün imzalanması, Atina anlaşmasında konuşulmaya başlayan kentsel ekoloji konularının, tekrardan kentleşme, şehircilik, mimari ve sosyoloji disiplinlerinde tartışılmasına neden olmuştur. Endüstri alanlarının kent içinde oluşturdukları heterotopyalar tartışılmaya başlanmıştır. Kent merkezlerindeki endüstri alanlarının ekolojik kaygılarla desantralizasyona (merkezden uzaklaşma) uğratılması ile ortaya çıkan boş alanlar ve bu alanlarda kalan endüstri mekânları tıpkı Foucault'nun mezarlık örneği gibi süreklilik heterotopyalarına bir örnek oluşturmaktadır. Benzer biçimde II. Dünya Savaşı'nın ardından Avrupa kentlerinde oluşan çöküntü alanları temizlenirken bu alanlardan doğan boşluklar da süreklilik heterotopyası bağlamında değerlendirilir. 1960'larda ortaya çıkıp 1970'lerde iyice belirginleşmeye başlayan süreçte, kentsel yenilenmenin işlevi aslında gelecekteki yeniden yapılanma süreçlerine zemin hazırlamak yönünde olmuştur (Smith ve Williams,2015: 48-49). Kentsel korumaya verilen önemin artması, endüstri mirasının korunması için TICCIH, ICOMOS ve UNESCO gibi çeşitli kuruluşların çalışmaları başlatılmıştır (Karadağ ve İncedere, 2020). Örneğin Paris mezbaha alanın boşaltılması ile ortaya çıkan geçici boşluk 1984 yılında Bernard Tschumi tarafından tasarlanan "Parc de la Villette" kent parkı projesi ile değerlendirilmiştir. Bu bağlamda kent parkı kurulmadan önce bir endüstri pratiği olan mezbaha alanın işlev kaybederek şehir merkezinden taşınması ile ortaya çıkan boşluk, Foucault'nun süreklilik ilkesine güncel bir örnek oluşturmaktadır.

Heterotopyanın üçüncü ilkesi yan yanalık olarak kabul edilmektedir (Yıldırım, 2020). Birbiri ile uyuşmayan birçok yer, mevki ve mekânın tek bir yerde toplanması durumu ile açıklanabilir. Mimari anlam bütünlüğü bakımından bir uyum içinde mekânlar bütünüdür. Örneğin tiyatrolar, sinemalar, bahçeler heterotopyanın yan yanalık ilkesi ile açıklanabilir. Bir tiyatro ya da sinema sahnesi mekân içinde bambaşka bir mekân kurgular. Acem bahçesi örneği ise anlamsal bakımdan uyumsuzlukları temsil eder. Tiyatro ve sinema farklı zamanların farklı mekânlarda katmanlı bir biçimde gerçekleştiği heterotopyalara örnektir. Acem Bahçesi ise bir mevkide konumlanan, anlamsal bütünlüğünü dünyanın dört bir tarafından gelen örneklerle tamamlayan bir yeri işaret eder. Bu yönden Acem Bahçesi örneği kendine ait mevkisi bir olan ama bütüncül olarak uyumsuz mekânların birlikteliği ile kurgulanan bir heterotopya örneğidir.

Günümüz kentlerinde 'karma kullanımlı' yapılar, çeşitli işlevleri bir arada barındıran ve son zamanlarda büyük ölçekli kentlerde kapitalist emlak projeleri olarak ortaya çıkan yapılardır. Literatüre 1998 yılında yayımlanan ECTP'nin Yeni Atina Tüzüğü (1998) ile giren, "mixed use" veya "mixed-use urban enclaves" olarak adlandırılan bu mega ölçekli projeler, kentsel planlama stratejilerinin önemli bir parçası olup ve köklü bir tarihe sahiptir (Aslankan, 2019; Rowley, 1996). Bu yapılar, konut, ofis, otel ve eğlence gibi uyumsuz işlevleri içerdiği için heterotopya kavramı açısından tartışmalara neden olmaktadır. Ancak Hoppenbrouwer ve Louw'a göre (2005), karma kullanımlı yapılar kendi içinde uyum sağladıkları için heterotopya olarak değerlendirilmezler.

Shane (2011), kentsel düğüm noktalarının birer heterotopya olduğunu savurunur. Shane'nin heterotopya bahsi içinde geçen kentsel düğüm noktaları, metropolis niteliği taşıyan kentlerde farklı ölçekteki kentsel alanları birleştiren kompozit yapılardır (Shane, 2011). Kentsel düğüm noktaları, kentin merkezi veya belirli noktalarına ulaşım hattı ile uzamlanan nirengi noktalarıdır. Toprak (2018), bu konuda örnek olarak metro istasyonlarını verir. Metro istasyonları, içinde pasajlar bulunduran ve alışveriş merkezleri gibi yapılarla bağlantısı olan kentsel düğüm noktalarıdır. Metropollerin bir parçası olan kentsel düğüm noktaları farklı zamanlarda, farklı ölçeklerde çalışan kentsel mekânları birleştiren, belirsiz yapılardır. Bu bağlamda kentsel düğüm noktaları Foucault'nun yan yanalık ilkesine göre heterotopya olarak kabul edilmektedir.

Shane (2011), din, dil, ırk ve sosyo-kültürel farklılıklar nedeniyle mekânsal uyumsuzluklar gözlemlenen, farklı kültürel yansımaları ve farklı mimarileri bir arada bulunduran mahalleleri yanyanalık ilkesi açısından güncel örnek olarak değerlendirmektedir. Shane (2011), kayıtdışı küçük endüstri, ticaret ve konut yerleşimi gibi mekânları bir arada bulundurması nedeniyle 1994 yılında yıkılan Kowloon Duvarlı Şehri'ni (Kowloon Walled City) heterotopyanın yan yanalık ilkesine örnek olarak vermiştir.

Foucault, heterotopyanın dördüncü ilkesini zamansallık olarak belirtmiş ve üç farklı kategoride açıklamıştır. İlk olarak zamanın bölünmesine bağlı olarak ortaya çıkan heterokroni kavramından bahseder (Foucault, 2020). Heterokroni heterotopyası; zamanı biriktiren mekanları, zamanın kırılganlığını ya da geçiciliğini temsil eder. Zamanın dilimlenmesi ile ortaya çıkan heterokroniler, her dilimin bir diğerinden kopuşuna gösterge olmaktadır. Bu tür mekânlar, zamanın kırılarak kesintiye uğradığı, farklı zamanların bir araya geldiği ya da zaman kavramının kaybolduğu mekânlardır.

Zamansallık ilkesinin bir diğer özelliği de zamanın bir yığın halinde biriktirilmesidir.Foucault (2020), zaman biriktiren heterotopyalara örnek olarak müze ve kütüphaneleri verir. Müze ve kütüphaneler modern dünyada birikimin örgütlediği mekânlarıdır. Foucault (2020), zamansallık ilkesini açıklarken son bir durumdan daha bahseder. Zamanın önemini yitirdiği ya da zamanın herhangi bir dilimine çapalanamayan heterotopyalar olarak açıkladığı bu son duruma fuar yerleri, festival alanları ve tatil köylerini örnek olarak vermiştir.

Foucault'nun zamansallık ilkesini Lefebvre (1974) "yaşayan Mekân" kavramı ile genişletmektedir. Kentsel mekân, fiziksel olarak sınırları konulmuş bir boşluktur. Lefebvre ise bu soyut anlama derinlik katarak 'yaşanan mekân', 'tasarlanan mekân', 'algılanan mekân' tanımları ile mekânı toplumsal bir olgu olarak değerlendirmektedir (Al, 2011; Lefebvre, 2014). Lefebvre'ye göre kentsel mekânlar kent yaşamının kurucusu ve aynı zamanda ürünüdür (Lefebvre, 2014). Tarihsel örüntü; zaman dilimlerinin, yaşanmışlıklarla üst üste düşürülmesi ile simgelenmektedir (Toprak, 2018). Tarihsel örüntü kentsel mekânda; kollektif hafıza, kültürel çeşitlilik ve kişisel deneyimden oluşan bir doku oluşturur. Bu noktada palimpsest kavramından söz etmek gerekir. Yunanca , 'palin' (yeniden) ve 'psestos'(kazınmış) sözcüklerinden oluşan kavram yeniden yazılmış parşömen anlamına gelmektedir. Kağıdın zor bulunduğu dönemlerde el yazması kitapların kazınarak tekrar yazılması nedeniyle üst üste

binen izlerin katmanlaşmasına palimpsest denilmektedir. Palimsest eski ve yeninin iç içe geçtiği, izlerin aradan çekildiği, belleğin yeni bir deneyime dönüştüğü yerlerdir (Apaydın, 2019). Heterokronik heterotopyalar, anlamsal bakımdan sadece zamanı üst üste koyarak biriktirmezler. Bu birikim aynı zamanda birçok belleğin izlerini taşıyan mekânlara dönüşür (Toprak, 2018). Zaman içinde değişerek yeniden oluşan kentsel mekânlar da palimpsest olarak yorumlanmaktadır. Farklı zamanlarda, farklı yaşanmışlıklar biriktirmiş mekânların, bir araya gelmesi ile oluşan kentsel mekân, geçmişten kalma sabitleri ile birleşerek işleyen bir dokuya dönüşür. Bu tür mekânlar, kollektif hafızayı canlı tutan palimpsestler oluşturur. Tüm bu yorumlar eşliğinde palimpsestler heterokroni heterotopyalarıdır yorumunu getirmek mümkündür.

Foucault, heterotopyanın beşinci ilkesini açılma kapanma olarak belirtmektedir (Foucault, 2020). Kapanma heterotopyaları etrafından soyutlanmış, tecrit edilme ve aynı zamanda işlevin içe işlediği yerlerdir. Foucault bu heterotopyanın kapanma halini kriz heterotopyasına verdiği benzer örnekler ile açıklar. Hapishaneler, askeri kışlalar gibi girişin ve çıkışın denetim altında tutulduğu mekânlar kapanma heterotopyalarına da örnek olarak verilmiştir. Kapanma heterotopyalarına bir başka örnek olarak hamamlar, saunalar vermiştir. Bu arınma alanlarına giriş çıkış belli bir grubun üyesi olmaya tabi olmayı gerektirir. Örneğin Müslüman hamamları, İskandinav saunaları görünüşte arınma için olan mekânlar olmasının yanında herkesin giremediği belli giriş kalıpları olan heterotopyalardır. Foucault, açılma kapanma heterotopyalarının ikinci türü olarak, kolaylıkla girilen ama aidiyet barındırmayan mekânları işaret etmiştir. Bu tür heterotopyalarda birey mekâna dahil olur ama aidiyet hissetmeme halini yaşar. Bu tür mekânlar; bulanık sınıra sahip olan, ara mekân, çekişme mekânı olarak da adlandırılır. Foucault (2020), çiftlik evlerindeki konuk odalarını ve yol üstü motelleri bu türe örnek olarak vermiştir.

Foucault'nun açılma kapanma heterotopyaları giriş çıkışı kontrol altında olan ya da bir kurala tabi olan kapalı konut siteleri, dini kompleksler, çeşitli organizasyon ya da gruplara ait külüpler ile genişletmek mümkündür. Bu mekâna girilir ama mekânda nüfuz sahibi olunamaz. Bu nedenle bu mekânlar kolayca nüfuz edilemeyen mekânlar olarak tanımlanır.

Açılma kapanma heterotopyalarına güncel örnek olarak toplumsal düzeyde belirli marjinal grupların sahiplendiği mekânlar da verilebilir. Burada gruplaşma düzeyi; etnik köken, dini köken, siyasal görüş ya da daha genel anlamıyla görüş ayrılığı nedeni ile ortaya çıkabilir. Çatışma mekânları etnik kökenin hakim olduğu bir mahalle olarak kalıcı bir mevkilenme sağlarken, toplumsal dinamiklerle anlık oluşan eylem alanlarıda geçici bir çatışma heterotopyası olarak kabul edilmektedir. Stavrides (2016), "kentsel çatışma" örneğini 2008 yılında Atina'da gerçekleşen gençlik ayaklanması üzerinden vermektedir Stavrides'e göre (2016), kentsel çatışma alanları aynı zamanda birer özgürleşme mekânı olan heterotopyalardır. Kentsel adaletin yalnızca homojen mekânlarla kurgulanmış bir ideal kentte mümkün olması varsayının karşıtlığından doğan kentsel çatışma mekânları; gerçekte kentsel adalet arayanların bir araya geldiği üçüncü bir tür coğrafi mevkilenme canlandıran heterotopik mekânlardır (Stavrides, 2016a). Stavrides bu söylemini, 1960'lı yılların eleştirel düşüncesi savunan Lefebvre'nin gündelik hayat eleştrisi ile kastettiği şekilde, kentin üretim alanı olmaktan öte gündelik hayatın geçtiği, öz-farklılaşma, kişisel ya da kolektif direniş pratiklerini içeren, kentin içine dağılmış ötekilik mekânları olabileceği söyleminden türetir. Örnek olarak Certeau'nun (1984), "bir göçmen ya da metaforik bir kent, planlı ve okunaklı kentin açık metnine sızar" güçlü söylemini verir. Stavrides bu söylemlerini 2016 yılında yayımladığı "Müşterek Mekân, Müşterekler Olarak Şehir " adlı kitabında modernizm eleştrisi bağlamında genişleterek açmaktadır (Stavrides, 2016b).

> *"İdeal toplumu örgütleme sorunu ideal bir şehirdeki farklı mekânları etkili bir şekilde düzenleme sorununa doğru taşımak, bir şehrin ya da yerleşimin orada yerleşmiş insanları yansıtabildiğini örtük olarak varsayar. İdeal bir şehir net sınırlarla ve kentsel 'işlevler' için ayrılmış özel alanlara sahip, planlı ve üzerinde oynanamaz bir kent toprağı olarak tasavvur*

*ediliyorsa o zaman bu şehrin inşasına sebep teşkil eden toplum da eşit derecede 'sonsuz', kendi dışarısından net bir şekilde ayrışmış ve hiç bir zaman tökezlemeyen bir makine olarak tasavvur edilecektir. Kendi kentine yeten ve kendi kendisini idame eden bir bütün olarak bu tür bir kurtarılmış, ahenk içindeki, özgürleşmiş, özerk vs. toplumun hayalini kurmak bahsi geçen ideal şehir imgelerini kullanan herhangi bir özgürleşme mücadelesini doğrudan etkileyecektir. Müşterekleşme, kapalı bir toplumun katı hudutlarıyla sınırlandırıldığından nasıl çitleme pratiklerine dönüşmeye yazgılı ise özgürleşmede sembolik olarak ya da gerçek anlamıyla barikatlarla çevrili herhangi bir mıntıkaya kapanmaya zorlandığında (ya da bunu seçtiğinde) karşıtına dönüşebilir." Stavrides, 2016, s:220*

Stavrides'in yukarıdaki söylemi modernizm hayali olan ideal kent ütopyalarının oluşturduğu sınırların, kısıtların, tarihsel süreçte kentsel çatışmaları tetikleyeceği yönündedir. Bu bağlamda, kentsel çatışma mekânları, Foucault'nun örneklem alanını genişleten güncel örnekler olarak eklenmiştir.

Foucault'nun altıncı ve son ilkesi olan işlevsellik ilkesini, illüzyon mekânları ve ötekileşen mekânlar olarak iki farklı grupta ele almaktadır (Foucault, 2020). İllüzyon heterotopyaları dönemsel toplumsal ihtiyaçlar doğrultusunda ortaya çıkan ve hızla değişime uğrayabilen mekânlardır. Foucault (2020), İllüzyon heterotopyalarına örnek olarak gemi, genelev gibi bağlamsız ve zamanı unutturan mekânları örnek vermiştir. Ötekileşen heterotopyalara örnek olarak tüm işlevleri yerli yerinde olan ve dış dünya ile en az etkileşimde bulunan kolonileri vermiştir.

Shane (2008) illüzyon heterotopyaları kavramını, yanıltıcı olan bir gerçeklik duygusu yaratmak üzere inşa edilmiş yerler veya alanlar olarak ifade etmiştir. İllüzyon heterotopyaları, algı, kimlik, veya sosyal ilişkileri şekillendiren kurgusal, sembolik ortamlar olarak, çoğunlukla gerçek ile hayal edilen arasındaki sınırı bulanıklaştıran mekânlardır (Shane, 2008).

Baudrillard'ın (1997), batı toplumlarının bütün değerleriyle birlikte çöktüğü, hakikat (gerçek) ile sanal olanın arasındaki ayrımın ortadan kalktığı ve toplumun da bundan ayrı düşünülemeyeceği yeni bir döneme girildiğini savunmaktadır. Baudrillard (1998), 'Simularklar ve Simülasyon' adlı eserinde simülarklara örnek olarak Disneyland'ı işaret etmiştir. Shane (2008), Simülasyon Kuramı ile bilinen Baudrillard'ın simülasyon teorisine atıf yaparak; Disneyland gibi tematik parkların birer illüzyon heterotopyası olduğunu belirtmiştir. Disneyland, tüm iç içe geçmiş simülark düzenini anlatan bir modeldir. Bauldrillard'a göre (1997); Disneyland'ın bir illüzyon yaratarak çekim merkezi olmasının altında yatan en önemli neden Amerikan toplumunun minyatürize edilmiş zevkleri, kısıtlamaları ve sevinçlerinin aynı mevkide toplanmasıdır.

Bauldrillard tarafından 'Beauborg Etkisi' olarak literatüre kazandırılan kavram, kentsel dönüşüm ve soylulaştırma bağlamında öteki heterotopyaların güncel örneklem alanını oluşturmak için kullanılmıştır. 19. yüzyılda Beaubourg bölgesi "Paris'in bir numaralı istenmeyen adası" olarak kabul ediliyordu. Bölgede standartların altında kalan yapılaşma ve alt yapı yetersizlikleri nedeniyle sık sık hastalıklar görülmekteydi (Witec, 2014). 20. yüzyılın başlarında Paris'in merkezinde olmasına rağmen terk edilmiş gibi görünen bu alan bir süre otopark olarak kullanılmıştır (Witec, 2014). 1960'larda Başkan Georges Pompidou, Fransız kültürünü ve sanatını geliştirmek için çağdaş sanat mekânı olarak Beaubourg bölgesini seçmiş ve Pompidou Merkezi için büyük bir proje başlatmıştır (Witec, 2014). Proje için açılan yarışmayı 681 öneri arasından Renzo Piano ve Richard Rogers'ın Pompidou Centre projesi seçilmiştir. Projenin yapımı tamamlandığında bölgenin rantı yükselmiş, turizm değeri artmıştır. Bernard Tschumi'nin Paris mezbahasının taşınması ile açılan kentsel boşluğa yaptığı Parc de la Villet tasarımı da benzer etkilere sahiptir. İspanya'nın Bilbao şehrinin durgun ekonomisini kalkındırmak adına Frank Gehry'nin tasarladığı Guggenheim Müzesi'de şehri canlandıran etkisi ile benzer özellikler taşımaktadır.

Shane (2008); Beaubourg müzesi (Centre Pompidou), Bilbao gibi şehirlerdeki sanat ve kültür mekânları gibi örnekler ile canlandırılan kentsel mekânları, öteki heterotopyalarına örnek olarak vermektedir. Bu mekan oluşumlarını; kent içinde, kentin doku ve biçimlenişine aykırı olmaları nedeniyle birer heterotopya olarak nitelendirilmiştir. Fakat mimari üslupları, yapım teknikleri ve malzemeleri ile dikkat çekici özellikleri olan bu örnekler konumlandıkları bölgeleri dönüştüren ve canlandıran örneklerdir. Kentsel dönüşüm ile kentsel soylulaştırma bağlamında, kent içindeki bozulmuş dokuların yerine çağdaş mekânların tasarlanması, ekonomik anlamda kalkınmayı artırıcı etkiye sahiptir. Genellikle dikkat çekmek ya da rant elde etmek için yapılan bu uygulamalar, kendi içlerinde kusursuz örneklerken, kentle kurdukları dışsal ilişki bağlamında, koloni örneğinde olduğu gibi yerleşik tipolojiye aykırı, genel dokuya uyumsuz birer heterotopya örneği oluşturmaktadır.

Çalışmanın bu bölümünde Foucault'nun heterotpya tanımı yaparken kullandığı örneklem alanı, güncel yaklaşımlara göre genişletilmiştir. Günümüz kentlerinde süreklilik heterotopyası olarak mezarlık örneklerinin yanına endüstriyel pratiklerin kent dışına gönderilmesi ile ortaya çıkan kentsel boşluklar eklenmiştir. Yan yanalık ilkesi açıklamakta kullanılan tiyatro, sinema ve acem bahçesi örneklerinin yanına, kentsel düğüm noktaları, azınlık mahalleleri eklenmiştir. Zamansallık ilkesine kalıcılığı temsil eden müze, kütüphane örnekleri ve geçiciliği temsil eden fuar, panayır örnekleri verilirken bu örneklem alanına palimpsestler eklenmiştir. Açılma-kapanma heterotopyaları olan hapishane, kışla, sauna, motel gibi örneklerin yanına, kapalı konut siteleri, toplumsal çatışmanın gerçekleştirdiği sokaklar, meydanlar, parklar gibi kentsel çatışma mekânları eklenmiştir. İşlevsellik ilkesine; illüzyon heterotopyası bağlamında gemi ve koloni örneklerinin yanına günümüz kentlerindeki tema parklar, kentsel dönüşüm, soylulaştırma ve canlandırma alanları eklenmiştir. Böylelikle kentin bir parçası olan heterotopya kavramı genişletilmiştir.

## 3. Sürdürülebilirlik Bağlamında Karabük Kent Planlama Sürecinin Ütopya ve Heterotopya Değerlendirmesi

Araştırma, 20. yüzyıl Türkiye'sinde endüstri devrimin etkisi ile kurulan kentlerinden biri olan Karabük kentinde yapılmaktadır. Karabük kentinin önemi, genç Cumhuriyet Türkiye'sinde endüstrileşme ve modernleşme örneklerinden biri olmasıdır. Fındıkoğlu'na (1963) göre; 1930'lu yılllarda Karabük, Safranbolu İlçesi'nin Öğlebeli Köyü'ne bağlı 13 haneli bir mahalle yerleşimidir (Fındıkoğlu, 1962; Çabuk, 2016). Erken Cumhuriyet döneminin siyasal, sosyal ve ekonomik politikaları, Ankara'dan örgütlenen ulaşım ağının ülkenin her bölgesine ulaşabilmesidir. Bu yaklaşım ile 1923 yılında Cumhuriyet'in ilan edilmesi ile ilk hamlelerden biri demiryolu yatırımlarının 10 yıllık kısa bir zaman diliminde tamamlanması olmuştur. Karabük'ün içinden geçen Ankara- Filyos demiryolu hattı ilerde bölgede bir sanayi kenti kurulmasını sağlayacak önemli bir etkiye sahiptir (Ayten vd., 2010; Kalyoncu, 2010 Çabuk, 2016).

Ekonomik kalkınma, endüstri ile sağlanabilir fakat savaştan çıkmış genç Cumhuriyet Türkiye'sinde, özel sektör kalkınma yatırımı yapacak ekonomik güce sahip değildir. Bu durumun bilincinde olan ülke yönetimi, devletçilik ilkesine göre kalkınma yatırımlarının sistematik ve planlı bir biçimde yapılabilmesi için Sümerbank'ın kurulması ve ilk beş yıllık kalkınma planı hazırlanmasını sağlamıştır (Övgün, 2009; Yücel ve Bürken, 2015; Çabuk, 2016). 1934 yılında hazırlanan "Birinci Beş Yıllık Kalkınma" planındaki önerilen sanayi tesisleri beş yıl içinde tamamlanmıştır. Karabük'ün coğrafi konumu fabrikalaşmanın maliyetini artırıcı yöndedir. Fakat bölge, içinden geçen demir yolu hattı ve jeopolitik konumu ile ham madde taşıyıcılığı açısından ulaşılabilirdir. Bölge coğrafi bakımdan da korunaklı ve güvenli olduğundan demir çelik fabrikasının kuruluş yeri olarak seçilmiştir. 1936 yılında Atatürk'ün izni doğrultusunda, İngiliz sermayesi olan H. A. Brassert ve Co. Ltd. firmasının verdiği kredi, arazi kamulaştırılması ve Karabük Kardemir Demir Çelik Fabrikası (KDÇF) kuruluşunda

kullanılmıştır. 1939 yılında fabrika faaliyete geçmiştir (Ayten vd., 2010; Çabuk vd., 2016). Modernleşme konusunda Atatürk'ün daveti ile İstanbul şehrinin nazım imar planlarını hazırlamak için gelen Henri Prost, Karabük içinde çalışmalar yapmıştır. 1938 yılında Karabük kenti için bir dizi karar alınarak projelendirme süreci başlamıştır. Henri Prost, KDÇF çalışanları için Yenişehir Mahallesi'ni lojman yerleşkesi olarak tasarlamıştır. Henri Prost, Tony Garnier ile şehircilik disiplininin yeni yeni formüle edildiği bir dönemde ortak çalışmalar yapan, Fransız şehircilik ekolü ile yetişmiş bir tasarımcıdır. Bu nedenle Yenişehir Mahallesi bir endüstri kenti öneri modeli olarak önemli bir role sahiptir.

Karabük kentinin büyümesinde etken olan fabrikanın saçaklanma etkisinin kontrol altına alınması için Prost planından sonra 1948'de, 1968'de ve 1980'de üç defa kent için geniş kapsamlı master plan hazırlanmıştır. Ayrıca 1988 yılında Ülkü Barlas'a ve 1996 yılında Güntürkün Bükülmez'e yeni imar planları hazırlatılmıştır. Yenişehir lojman yerleşkesinin plan kararları, ilerleyen dönemde yapılan planlama çalışmalarında kısmen devam ettirilmeye çalışılmıştır. Karabük kentinin planlama sürecinde Prost planında kullanılan temel ilkeler, gerek dünya konjonktürü gerekse Türkiye'nin içsel dinamikleri nedeniyle devam ettirilememiştir. Böylelikle Henri Prost'un modern üslupla hazırladığı plan, zamanla bozuma uğramıştır. Kentleşmenin tarihi süreç içerisindeki gelişimi açısından Karabük kent planlama tipolojisindeki değişimler, Avrupa'da meydana gelen değişimlerden etkilenmiştir.

Çalışmada, Karabük Kentinin planlama süreci, Endüstri Devrimi etkisi ile Avrupa ve Amerika kentsel tipolojilerde değişime neden olan ideal kent ütopyaları üzerinden karşılaştırmalı olarak değerlendirilmektedir. KDÇF'na ait, mahalle ölçeğinde yapılan Yenişehir Lojman Yerleşkesi planlaması, Karabük'ün tarihselliği açısından başlangıç noktası olarak kabul edilmiştir. Yerleşke, Henri Prost tarafından, bahçe-şehir ütopyası olarak tasarlanan bir ideal kent örneğidir. Bu nedenle Yenişehir Mahalle'si Karabük'ün kentleşmesinde ve Türkiye'nin modernleşmesinde bir dönüm noktasıdır. Fabrikanın çekim etkisi, Karabük'ün nüfusunun hızla artmasına neden olmuştur. Endüstrileşme, bölgesel bakımdan bir göç hareketi başlatmış, Karabük'ün gelecek planlamasında önemli bir role sahip olmuştur. Lokal bir bölgenin kamulaştırılması ile hazırlanan lojman yerleşke planı, artan barınma ihtiyacı ve mülkiyet koşulları nedeniyle kentin genelinde uygulanamamıştır. Yenişehir yerleşkesi dışında planlı alanı olmayan bölgede çarpık kentleşme hızla yaygınlaşmıştır.

Çalışma kapsamında, Henri Prost tarafından tasarlanan Yenişehir Mahallesi bir ütopya aynı zamanda palimsest örneği olarak kabul edilmektedir. Yenişehir mahallesi dışında gelişen plansız dokular, heteropya bağlamında irdelenmektedir. Yenişehir mahallesi, Karabük'ün tarihselliğini başlatması açısından başlangıç noktası ve kentin katmanlaşması sırasında, bozulmadan korunması nedeniyle heterokroni başlangıcı olarak kabul edilmiştir. Karabük'ün planlama süreci araştırması, Yenişehir Mahallesi'nin planlaması ile başlatılarak ideal kent ütopyası ve heterotopya bağlamında literatürdeki örnekler ile karşılaştırak değerlendirilmiştir. Böylelikle kentin planlama süreci boyunca değişim gösteren tipoloji, planlama dönemleri üzerinden okunmuş, plan tipolojisini etkileyen değişikliklerin ütopya ve heterotopya kavramları ile ilişkisi ortaya çıkarılmıştır.

Çalışmanın bundan sonraki bölümünde Karabük kentinin şehir planlama süreci, ütopya ve heterotopya söylemleri bakımından literatür örnekleri ile karşılaştırmalı olarak değerlendirilmektedir.

### 3.1. Henri Prost Yenişehir Planı-1938

Karabük kentine dair ilk kentsel plan çalışması KDÇF'nın lojman yerleşkelerine ait kamulaştırılmış alanında mahalle ölçeğinde yapılan çalışmadır. Fabrikanın kuruluşu sırasında ve aktif hale gelmesinin ardından oluşabilecek barınma krizini çözmek amaçlı fabrika yakınında bulunan Kapullu Köyü arazileri, 1936 yılında lojman yerleşkesi kurulmak üzere kamulaştırılmaya başlanmıştır (Bükülmez, 1996; Çabuk vd., 2016; Sarıköse, 2020). Kamulaştırılan alanda; modern üslubun

benimsendiği, kullanıcıya modern hayatı sağlayan; işçi, memur, mühendis, yönetici gibi sınıflardan oluşan bir topluluğun tüm ihtiyaçlarını karşılayan mekânsal pratikleri içeren bir mahalle tasarlanması için Mimar- Şehirci Henri Prost ile anlaşılmıştır. Kentte meydana gelen bir sel felaketinde asıl nüshası kaybedilen Yenişehir planına; Bükülmez'in (1996) Karabük Belediyesi adına derlediği "Yenişehir Koruma Amaçlı İmar Planı Analitik Etütleri" kitabından ulaşılabilmektedir (Şekil 4).

**Şekil 4. Yenişehir Lojman Yerleşkesi, Henri Prost (1938)**



**Kaynak:** (Bükülmez, 1996)

Henri Prost, Paris bölge planını tasarlayan biri olarak, Fransız "Cite – Jarden" modeli ve Almanların 1930'lu yıllarda benimsediği "Siedlung" bahçe kent modellerini sentezleyerek, Yenişehir planını tasarlamıştır (Çabuk vd., 2016).

Planın ekolojik ve hümanist yaklaşımı benimseyen ana kararları, modern üslubun katılığını esnetmektedir. Kamulaştırılan arazisi üzerinde, ada bazında tasarlanan lojman yerleşkesi, bir kent yerleşimini var eden ve sürdürülebilir kılan tüm kentsel donatılar düşünülmüştür. Konut alanları sosyal statülerin temel ihtiyaçlarını karşılayan nitelikte olup sınıfsal ayrım yapılaşma geometrisi ile birleşerek yerleşkenin formu ve karakteri oluşturulmuştur.

Konut alanlarında tercih edilen sınıfsal statü ayrımı sosyal donatılar olan lokallerde, işçi ve mühendis kulüpleri gibi mekân pratiklerinde sürdürülürken; sinema, ibadethane, hastane, spor sahaları, okullar, otel, planlı rekreasyon alanı olan havuzlu bahçe gibi mekân pratiklerinde, bu sınıfsal ayrımdan kaçınılması, planın sosyal sınıflar arası geçirgen gözenekli yapıyı temsil ettiğini göstermektedir.

Planın sınırlı bir bölge ve toplumun sadece fabrika çalışanlarından oluştuğu düşünülerek lokal bir çözüm önerisi getirmesi, başlangıçta kullanıcı açısından bir ütopya yapmakla birlikte şehirleşmenin içsel dinamikleri karşısında bozuma uğrayan her ütopya gibi Yenişehir Mahallesi ütopyası da kentin gelişim sürecini oluşturan dinamikler karşısında yetersiz kalmıştır. Kentin büyüme ekseni okullar bölgesi yönündeki güçlü ama sınırlı bir aks doğrultusundadır. Kentle bağlantısı zayıf olan bu aks fabrika yönünde dik bir yamaçla sonlanmaktadır. Ayrıca mahallenin konumlandığı coğrafyanın kentten ayrışan bir bölgede olması (batı çeperinin yüksek eğimli dik bir yamaçla bitmesi), alanın tasarım ilkelerinin kent geneline yayılmasını sınırlandırmıştır.

Yenişehir modelinin kente yayılamamasının nedenlerinden biri de kamulaştırılmış bir alan üzerine yapılmış olmasıdır. Oysa ki kentin genelinde bireysel mülkiyet hakları söz konusudur. Bir diğer neden ise şehircilik çalışması olmasına rağmen KDÇF özelinde lojman yerleşkesidir. Bu nedenle söz konusu alan tasarlanırken kentin genel büyümesine dair bir öneri getirilmemiştir.

Yenişehir planının, başlangıçtaki ütopyacı tasarım hedefleri korunmuştur. Modelin kent bütününe yansımamasında, alanın büyümesindeki sınırlılıkların etkin bir rolü vardır. Zamanla gelişen kent dokusu içinde kendi üslup bütünlüğünü koruyan bir ütopya olsa da ilerleyen süreçte kentin bütündeki tipolojik biçimleniş karşısında kentin geneline hakim olan dokuya göre farklı bir doku olarak

kalmıştır. Yenişehir Mahallesi, bütün bu sınırlılıklara rağmen bir lojman yerleşkesi olarak Fabrika özerkliğinde olduğundan, kentin büyümesi karşısında en az değişim gösteren yerdir. Aynı zamanda, Karabük'ün planlama sürecindeki değişim izlerini takip etmekte mihenk taşı olan bir yer niteliğindedir.

Ütopyalar, geçmişin düşüncelerini içinde barındırarak, geleceğe dair yeni fikirlerin inşa edildiği, bir nevi palimpsest olarak düşünülebilir. Yenişehir Mahallesi'nin bir ütopya örneği olarak plan tipolojisinin korunmuş olması, kentin katmanlaşmasını açığa çıkarmakta etkin bir role sahiptir. Bu bağlamda kentin gelişmesi ile ortaya çıkan genel tipolojisine göre Yenişehir Mahallesi güncel heterotopya örneklerinden biri olan palimpsest örneği olarak da değerlendirilmiştir.

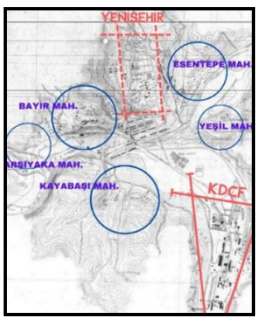
### 3.2. Nezihe ve Pertev Taner Planı-1948

Karabük KDÇF'nin kuruluşu ile bir çekim merkezi haline gelmiştir. Lojman yerleşkesi bir grup fabrika çalışanının barınma ihtiyacını çözerken yoğun göç karşısında yetersiz kalmıştır. Fabrika kurulduktan sonra 10 yıl içinde Yenişehir Mahallesinin etrafında plansız yapılaşmalar artmıştır. İstasyon bölgesinin yer aldığı Bayır Mahalle, fabrikanın batı çeperinde bulunan Kayabaşı Mahallesi ile Araç Çayı kıyısındaki Karşıyaka ve Yeşil Mahalle bölgelerinde, hızlı göç ve kontrolsüz yapılaşmanın etkisiyle düzensiz kent dokuları oluşmuştur. Karabük modernist ilkelere göre biçimlendirilmek istenen bir Cumhuriyet kenti olması nedeniyle, 1941 yılında Karabük'te belediye teşkilatı kurulmuştur. Gecekondulaşma nedeniyle artan çarpık kentleşme, acil müdahale gerekliliğini ortaya koymuş ve 1941 yılında başlayan resmi yazışmalar, 1945 yılında sonuçlanarak, kentsel planlama ile müdahale konusunda harekete geçilmesini sağlamıştır.

Bu kapsamda, İller Bankası tarafından Yüksek Mimar Mithat Yenen ve haritacı Avni Par, alanda tespit çalışmaları yapmak üzere görevlendirilmiştir. Kentin durumunun ortaya serildiği Mithat Yenen'in tespit raporu ve Avni Par tarafından hazırlanan haritalar ile halihazır haritalar oluşturulmuştur (Çabuk vd., 2016). Şekil 5'de Mithat Yenen ve Avni Par'ın çalışmaları sonucu oluşturulan halihazır harita üzerinde Yenişehir Mahallesi, fabrika ve kentin plansız büyüme gösteren mahalleleri işaretlenmiştir.

Karabük'ün imar planı hazırlanması ihalesi işi kapsamında Yüksek Mühendis Mimar Nezihe ve Pertev Taner ile anlaşmaya varılmıştır (Ayten vd., 2010; Çabuk vd., 2016). Karabük'e ait 1/5000 ve 1/2000, 1/1000 ve 1/500 ölçekli planlar ve "Kesin İmar Planı İzah Notu", 1948 yılında onaylanmıştır (Ayten vd., 2010; Çabuk vd., 2016). 1/5000 ölçekli imar planı incelendiğinde düzensiz yapılaşmaya ve Prost'un Yenişehir planına müdahaleler olduğu görülmektedir (Şekil 6). Kayabaşı ve Karşıyaka mahallerindeki gecekondu oluşumları yok sayılırken, Bayır Mahalle ve Yeşil Mahalle'deki plansız yapılar büyük oranda korunmuştur.

**Şekil 5. 1946 Yılı Karabük Kenti:1/10000 Ölçekli Hâlihazır Harita**




**Kaynak: (Çabuk vd.,2016)**

Karabük'ün imar planı hazırlanması ihalesi işi kapsamında Yüksek Mühendis Mimar Nezihe ve Pertev Taner ile anlaşmaya varılmıştır (Ayten vd., 2010; Çabuk vd., 2016). Karabük'e ait 1/5000 ve

1/2000, 1/1000 ve 1/500 ölçekli planlar ve "Kesin İmar Planı İzah Notu", 1948 yılında onaylanmıştır (Ayten vd., 2010; Çabuk vd., 2016). 1/5000 ölçekli imar planı incelendiğinde düzensiz yapılaşmaya ve Prost'un Yenişehir planına müdahaleler olduğu görülmektedir (Şekil 6). Kayabaşı ve Karşıyaka mahallerindeki gecekondu oluşumları yok sayılırken, Bayır Mahalle ve Yeşil Mahalle'deki plansız yapılar büyük oranda korunmuştur.

Prost Planı'nın genel hatlarıyla korunduğu ama adalardaki her boşluğa KDÇF'nin yetki ve iradesi ile yeni konutlar, kreş, park, çocuk bahçesi ve misafirhane, stadyum eklendiği görülmektedir (Çabuk vd., 2016). Sinema ve eğitime ayrılan alanların bir kısmının konut iskâna açıldığı bilinmektedir. Yüzevler ve Dereevler bölgesindeki konut adalarına 160 adet tek ve iki katlı bahçeli yapı ile 39 adet konut bloğu önerilmiştir (Çabuk vd., 2016). Bu konutlar, kentin büyüme potansiyeline bağlı olarak iki, üç ve dört odalı tipolojilerde tasarlanmış; her biri için 1/100 ölçeğinde plan, kesit ve görünüş çizimleri hazırlanmıştır (Çabuk vd., 2016).

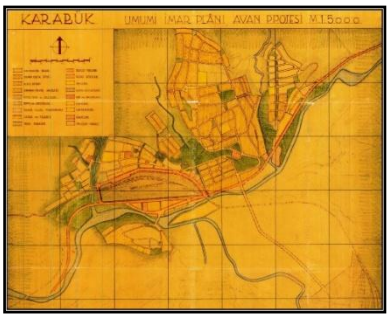
Plan özellikleri bakımından konut tasarımında geleneksel Safranbolu konutu örnek alınmıştır. Bahçeli konut tipolojisi plan düzleminde Prost Planı'nı çizgilerini taşısada cephe biçimlenişi açısından Prost planına benzememektedir. Taner Planı'nda da "Bahçe Kent" konsepti devam ettirilmiş; ancak Yenişehir dışındaki bölgelerde kamulaştırma yapılmadığı için mevcut mülkiyet yapıları dikkate alınarak parselasyon yoluna gidilmiştir. Ayrıca, Yüzevler'de bir ilkokul, Dereevler'de ise bir kreş, park, çocuk bahçesi ve haftalık pazar alanı tasarlanarak sosyal donatı alanları artırılmıştır (Çabuk vd., 2016).

Karabük'ün hızlı büyüme potansiyeli dikkate alınarak hazırlanan planda ileride bir kent merkezi ihtiyacı doğacağı düşünülmektedir. Kamu binaları, hükümet meydanı olarak geçen bölge etrafında toplanmışlardır. Teknik hizmet binaları Araç Çayı kıyısına yerleştirilmiştir. Plan tasarımında mevcut fabrika dışında bir sanayi alanı önerilmemiş olup zanaatkarlar için küçük sanayi alanı olarak istasyon bölgesinin kuzeyi önerilmektedir. Küçük ölçekli yanıcı içerikli sanayi alanlarının, Eskipazar yolu üzerinde kent dışı bir alana önerildiği, plan raporlarında görülmektedir (Çabuk vd., 2016).

Çabuk vd. (2016), Taner Planı'nda ulaşım şemasının oldukça rasyonel düzenlendiğini belirtmiştir. Planda taşıt yolları üç kademeli olarak düzenlenmiştir. Kaldırımlarda yapılan ağaçlandırma, 1/1000 ölçekli plan üzerinde işlenmiş; yaya yolları, kaldırımlar ve merdivenli yollar düşünülmüştür.

Taner (1948), ana kararlarına göre kentte, biri ulaşım ve aktarma diğeri ise kamusal merkez olan iki meydan tasarlamıştır. "İstasyon Meydanı" ulaşım ve aktarma meydanı olarak tasarlanmıştır. "Cumhuriyet ve Hükümet Meydanı" nın, kentin gelecekte bir ilçe merkezi olacağı öngörüsü ile kamu hizmet binalarınca çevrelenen ve anıt alanı için yer ayrılan bir meydan olduğu görülmektedir (Ayten vd., 2010; Çabuk vd., 2016). Yenişehir planında büyüme aksı, mahallenin ortasından geçen birbirini kesen iki aks iken Taner planında bu aksın Zonguldak- Kastamonu karayolu boyuna taşındığı görülmektedir.

**Şekil 6. Nezihe- Pertev Taner Planı**




**Kaynak:** (Çabuk vd., 2016)

Taner Planının büyüme aksı, Yenişehir Mahallesi'nin sağında ve solunda bulunan bölgelere göre Zonguldak- Kastamonu yoluna paralel bir akstadır. Taner Planı'nda kentin gelecekte bir ilçe merkezi olacağı öngörülerek resmi binalar İstasyon Caddesi üzerinde "Cumhuriyet ve Hükümet Meydanı" etrafında konumlandırılmıştır.

Plan kararlarında İstasyon ve İnönü caddeleri üzerinde "yol boyu ticaret" işlevi işlenmiş, mevcut hal yapısı genişletilmiş ve istasyon karşısına bir toptancı hali eklenmiştir. Fakat kentte bir ticaret bölgesi oluşturulmamıştır. Kentin Safranbolu ve Eskipazar istikametinden gelen giriş noktalarına birer han yeri tasarlanmıştır. Kentin coğrafi sınırlılıkları, konut bölgelerinin birbirinden kopuk parçalı bir doku oluşturmasına neden olmuştur. Bu nedenle parçalı konut yerleşimlerine özel birer çarşı alanı ayrılmıştır.

Taner Planı'nda fabrika içinde bulunan spor sahası, bu alana yeni endüstri binaları eklenmesi gerekçesiyle, Yenişehir Mahallesi içine taşınmıştır. İstasyon bölgesinde yakın olan konumlar, malzeme taşıma işleri olan işlevleri, bu bölgeye çekmiştir. Bölgede plansız konumlanmış kereste fabrikası ve yerel baskı, özel işletmeler olan demir çelik haddehanelerinin bu bölgede konumlanmasıda etkili olmuştur.

1953 yılında ilçe statüsüne Kavuşan Karabük Belediyesinin sorumluluk alanı genişlemiştir. 50 yıllık bir vizyon ile yapılan Taner Planı, kentin hızlı nüfus artışına bağlı büyümesi ve yerel baskılar nedeniyle etkinliğini kaybetmiştir. 1962 yılında İller Bankası tarafından yeniden halihazır haritalar hazırlatılması kararı alınmıştır (Çabuk vd., 2016).

### 3.3. Gündüz Özdeş Karabük-Safranbolu Bütünleşik Planı-1968

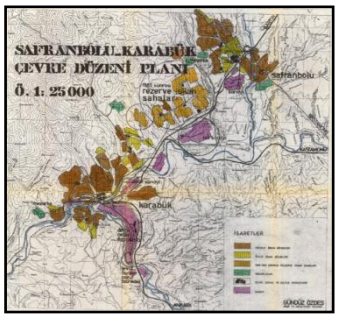
1962 yılında İller Bankası tarafından, Karabük'ün son durumunu gösteren yeni halihazır haritaları yaptırılmıştır (Fındıkoğlu, 1963; Ayten vd., 2010). 1960'lı yılların modernizm eleştrileri, yerellik, ekoloji ve kültürel mirasın korunması gündemlerini canlandırmıştır.

1964 yılında ülkemizinde altına imza attığı Venedik Tüzüğü ile tarihi ve kültürel miras niteliğinde olan alanlar koruma altına alınmıştır. Çabuk, vd. (2016), 1960 yılında Türkiye'de gerçekleşen ihtilal sonrası 'Planlama' her alanda önceliği aldığını, İmar ve İskân Bakanlığı bünyesinde Bölge Planlama Dairesi'nin kurulduğunu ve "Zonguldak Bölgesi Ön Planı" çalışmasının 1964 yılında yayınlandığı belirtmiştir. Bu süreçle paralel olarak Karabük'ün komşuluğunda bulunan Safranbolu, Prof. Dr. Gündüz Özdeş'in hazırladığı 1/25000 çevre düzeni planı sınırları içine dahil edilmiştir (Şekil 7).

Bu kapsamda Karabük ve Safranbolu'nun zaman içinde bütünleşmesi ve Karabük'ün Safranbolu yönüne doğru gelişmesi hedeflenmiştir. Karabük'ün 1/25000 ölçekli çevre düzeni planı, 1/5000 ölçekli nazım imar planları ve 1/1000 ölçekli uygulama imar planları Gündüz Özdeş tarafından hazırlamıştır. Planın Karabük kısmı 1968 yılında tamamlanmıştır.

Safranbolu'nun sit sınırlarının belirlendiği bu planın oluşturduğu koruma vizyonu, ilerleyen yıllarda Safranbolu'nun UNESCO Dünya Mirası Listesi'ne kabul edilmesinin de temelini oluşturmuştur. Karabük Safranbolu bütünleşik planı aynı zamanda Karabük kentinin potansiyel büyüme aksının yönünü, Safranbolu'ya doğru çevirmiştir. Plan kararlarında, mevcut konut alanlarının imarı dondurulmuş, öneri konut alanları düşük yoğunluklu planlanmıştır. Öneri sanayi alanları, 100. Yıl Mahallesi hariç olacak şekilde uygulamaya geçirilmiştir.

**Şekil 7. Prof. Gündüz Özdeş, 1968, Karabük- Safranbolu Çevre Düzeni Planı. Ö:1/25000**




**Kaynak:** (Çabuk vd., 2016)

Planlama süreci 1962 yılında hâlihazır haritanın hazırlatılması ile başlamıştır. 1969 yılında planın uygulamaya geçirilmesine kadar süren ara dönemde, yol ve yeşil alan olarak ayrılması planlanan alanlarda gecekondulaşma devam etmiştir. Bu nedenle Özdeş Planı uygulama kabiliyetini yitirmiştir (Çabuk, vd., 2016). Sonuç olarak Özdeş Planı'nın gereksinimleri karşılayamaması nedeniyle 1974 yılı sonrasında revizyon ihtiyacı gündeme gelmiştir.

## 3.4. Baran İdil Karabük Şehir Planı-1980

Gündüz Özdeş tarafından hazırlanan 1968 tarihli plan, dönemin kentsel ihtiyaçlarına yanıt vermekte yetersiz kalmış; özellikle planın uygulanabilirliğine dair sorunlar nedeniyle revizyona ihtiyaç duyulmuştur. Bu doğrultuda, 1974 yılında İller Bankası, Karabük'ün yeni imar planının hazırlanması işini Yüksek Mühendis Mimar Baran İdil'e vermiştir. Hazırlanan revizyon planı, 1980 yılında onaylanarak yürürlüğe girmiştir.

Baran İdil Planı, "alan kısıtlılığı" nedeniyle genel hatlarıyla Özdeş Planı ile benzerlik göstermektedir. İdil (1980), hazırladığı raporunda plan kararlarının alternatifleri olduğu için kendi planını esnek olarak nitelendirmiştir. Plan raporunda Özdeş Planı'nında alt ve üst ölçekli plan kararları arasında bir bağlantı olmadığını vurgulamıştır. İki plan arasında benzerlikler kadar dikkat çekici farklar da bulunmaktadır. En temel farklardan biri, yoğunluğa göre bölgelenen alanların dağılımıdır. Özdeş Planı'nda kentsel gelişim, daha merkez odaklı bir strateji izlerken; İdil Planı'nda Safranbolu ve Yüzüncü Yıl Mahallesi çevresinin gelişimi öncelik kazanmıştır. Özdeş Planı'nda sanayi alanı olarak düşünülen, İdil Planı'nda konut alanı olarak değiştirilmiştir, (Şekil 8).

**Şekil 8. Baran İdil Planı**



**Kaynak:** (Çabuk et al. 2016)

Yüzüncü Yıl mahallesi yakınındaki "Yüksekokul Alanı" plana işlenmiştir. Böylelikle gelecekte kente bir üniversite kurulma ihtimali gündeme gelmiştir. Özdeş Plan'ındaki spor ve eğlence merkezlerinin yeri, İdil Planı'nda gelecekte üniversite olması beklenen alanların yakınına kaydırılmıştır. Özdeş Planı'nda mahalle ve semt ölçeğinde yetersiz olan sosyal donatımlar, İdil Planı'nda yeniden

düzenlenmiştir. Özdeş planın açıkları arasında planlanmayan konuların yönetmeliklerce düzenlenmesi varken, İdil planı yapılaşma kotlarına kadar değinerek plan kısıtlarını artıran plan notları düşmüştür. Özdeş planında kadastral durum göz ardı edilmiş olup, gelişme alanlarının gelecekte düzenlenmek üzere bırakıldığı görülmektedir, İdil planı kadastral mülkiyetleri dikkate alarak plan sınırının tamamını imar sınırları içine almıştır.

### 3.5. Karabük Planlama Sürecinin Tarihsel Açıdan Değerlendirmesi

Bir endüstri kenti olarak kurulan Karabük'ün şehir planlaması, şehircilik ekolünün dört önemli ismi tarafından, dört farklı dönemde yapılmıştır. Tarihsel süreçte meydana gelen önemli kırılmalar şehir planlama yaklaşımını etkilemiştir. Karabük kentin farklı dönemlerde yapılan şehir planlarının biçimselliği de tarihi kırılmalardan etkilenmiştir. Çalışmada, Karabük'ün Avrupa ve Amerika ile paralellik gösteren planlama süreci; dört faklı dönem etkisi ile yapılan şehir planları, tasarım üslübu ve plan kararları bakımından deşifre edilmiştir. Savaştan çıkmış genç Cumhuriyet ülkesi Türkiye'de modern şehirleşmeye önem verilmiştir. Karabük'ün geçirdiği planlama süreci ülkemizin batılı örnekler gibi modernize olmasını hedefleyen bir vizyonun eseridir. Bu nedenle Karabük Türk şehircilik tarihi açısından önemli bir yere sahiptir. Bu nedenle kentin kuruluşundan itibaren şehir planlaması önemsenmiştir.

Modern şehircilik ekolü temsilcilerinden biri olan, ünlü Şehirci Mimar Henri Prost, 1938 yılında, Yenişenir Mahallesi planını hazırlamıştır. Planda modern üslup, ütopik bir yaklaşım ile benimsenmiştir. 5000 kişi kapasiteli bir yerleşke olarak tasarlanan mahalle içerisinde ihtiyaç duyulan bütün işlevler bulunmaktadır. Konut dağılımları statü ayrımlarına dikkat edilerek yapılmıştır. Planın bütüncül yaklaşımı bir ütopya niteliğinde olduğundan bu ayrışma, yoğun rekreasyon alanları ve sosyal donatıların akılcı ve estetik dağılımı gibi özel dokunuşlar nedeniyle hissedilmemektedir. Henri Prost'un hazırladığı Yenişehir Planı, aynı dönemde Avrupa ve Amerika'da fordizm etkisi ile yaygınlaşan ütopik banliyöleşme, uydu kent ve bahçe- şehir örneklerinin ustaca harmanlandığı bir örnektir.

Prost Planı mahalle ölçeğinde tasarlanmış bir öneridir. Tasarım alanı önceden kamulaştırıldığından plan kararları kendi içinde tutarlıdır. Fakat bu örnek model kent geneline yayılmamıştır. Kentte artan gecekondulaşma sorunu yeni bir plan yapılmasını gündeme getirmiştir. Öncelikle mevcut doku halihazır haritalarda tespit edilmiştir. Nezihe ve Pertev Taner tarafından Karabük'ün alt ve üst ölçeklerde planları hazırlanmıştır. Kentin büyüme aksları üst ölçeklerde tayin edilirken, 1/100 gibi alt ölçeklerde konut önerileri de getirilmiştir. Taner Planında, kısmen Prost Planı sürdürülmeye çalışsada gerek coğrafi sınırlılıklar gerekse mülkiyet koşulları bu durum karşısında bir engel teşkil etmiştir. Taner planı hazırlandığı dönemde eş zamanlı olarak Avrupa gündeminde olan Atina Anlaşması ile modern planlamanın ilkeleri belirlenmiştir. Bu bakımdan Taner Planı, genel hatları ile modern planlama ilkelerini benimsemektedir. Plan kentsel büyüme hızı karşısında yetersiz kaldığından yeni bir planlama ihtiyacı doğmuştur.

1968 yılında yürürlüğe giren Gündüz Özdeş Planı, Karabük ve Safranbolu'yu birleştiren bir plandır. Karabük'ün büyüme aksını Safranbolu yönüne çevirmiştir. 1960'lı yıllarda dünya gündemine hakim düşünce modern dönem eleştrilerini içermektedir. Endüstrileşme etkisi ile yaşanmaz hale gelen kentlerin sorunlarına çözümler, toplum için insani şartlar sağlayacak mekânsal düzenlemeler tartışılmaktadır. 1964 yılında Venedik Tüzüğü'nün yürülüğe girmesi, tüzük altında imzası olan ülkemizi de etkilemiştir. Özdeş Planı Safranbolu'nun korunması bağlamında bu tüzüğün ilkelerini benimsemiştir. Genel hatları ile modern üslup benimsenen planda, konut alanlarının yoğunluğunun düşürülmesi, imarlı alanların imarının durdurulması, yeşil alanlara ve rekreasyon alanlarına yer vermesi bakımından dönemin ekolojik kaygılarını taşımaktadır. Taner Planı ile benzer şekilde plan kararının alınması ve uygulamanması sırasında geçen süreçte kent, kontrolsüz büyümeye devam etmiştir. Özdeş Planında

yeşil alan olarak tasarlanan alanlarda gecekondulaşmaya bağlı çarpık kentleşme olması planın uygulanabilirliğini sınırlandırmıştır. Böylelikle tekrardan bir revizyon yapılması gerekmiştir.

1980 yılında Baran İdil tarafından hazırlanan revizyon planı da dünya gündemi ile eş zamanlılık göstermektedir. 1970'lerin sonunda başlayan ekonomik durgunluk ve enerji krizleri, Avrupa ülkelerinde ekonomik yapıyı ve kent altyapılarını yeniden gözden geçirmeye zorlamıştır. Sanayileşmeden hizmet sektörüne geçiş ve küreselleşme, kentlerin ekonomik fonksiyonlarını değiştirmiş, yeni ekonomi odaklı planlama ihtiyacı ortaya çıkmıştır. 1980'li yıllarda Avrupa'da kent planlaması, ekonomik krizler, sosyal sorunlar, çevresel bilinç ve yeni planlama yaklaşımlarıyla şekillendi. Bu dönemde, sürdürülebilir, katılımcı ve bütünsel kent planlaması kavramları önemli hale geldi. Kent planlamasında geleneksel tekniklerin yanı sıra, ekolojik planlama ve sürdürülebilir kalkınma ilkeleri gelişti. Çevre duyarlılığı ve yeşil alanların korunması ilkelerini vurguladı. Bu bağlamda İdil Planı, esnek tasarım anlayışı ile dünya gündemi ile paralel bir çizgidedir.

Yapılan çalışmada, Karabük kent planlama süreci dünyada kent planlama anayışını etkileyen tarihsel süreçle karşılaştırılmıştır. Bu karşılaştırmanın özeti Tablo 1'de gösterilmektedir.

**Tablo 1. Kentsel Tasarımda Endüstri Devrimi Etkisi ile Dünya ve Karabükte Gerçekleşen Değişimin İzleri**

| Kronolojik Kırılma | Kentsel Mekânda Uluslararası Ölçekte Meydana Gelen Değişim | Kentsel Mekânda Karabük Ölçeğinde Meydana Gelen Değişim |
|---|---|---|
| 19. yüzyıl Endüsrti Devrimi ve Fordizm | *Artan endüstrileşme ile yoğun göç alan şehirler yetersiz alt yapı nedeniyle yaşanmaz hale gelmiştir.<br><br>*Bu dönem Avrupa ve Amerika'da kentten kaçış etkisi hakimdir.<br><br>*Uydu kentler, banliyöler kıra özlemi gideren, sağlıklı, güvenli, eşitlikçi bir yaşam anlayışı sunmaktadır.<br><br>*Deneysel ütopik modeller ile ideal kent yaşamı hayali deneyimlenmektedir. | *1934 KDFÇ kurulması<br><br>*1938 Henri Prost ile kentleşmeye dair ilk yerleşim planı<br><br>*Plan ütopik özellikler taşımaktadır. |
| Atina Anlaşması 1941 | Modern Planlama standartları oluşturulmuştur. | *1948 Nezihe-Pertev Taner Planı<br><br>*Modern üslup benimsenmiştir. |
| Venedik Tüzüğü 1964 | *Venedik Tüzüğü, yerel halkın ve yerel yönetimlerin demokratik haklarını güvence altına alır. Bu, korumacı yaklaşımın temelini oluşturur; çünkü yerel değerler, haklar ve özgürlükler korunmalıdır.<br><br>*Tüzük, sürdürülebilir kalkınma ve doğal/ kültürel varlıkların korunmasını destekler. | 1968 Gündüz Özdeş Planı<br><br>*Bütünleşik Karabük Safranbolu Çevre Düzeni Planı Hazırlanmıştır.<br><br>*Modern üslup ve korumacı yaklaşım bir arada benimsenmiştir. |

| | | |
|---|---|---|
| | *Doğal çevre ve yerel değerlerin "korunması" anlamında korumacı yaklaşım benimsenmiştir. | *Safranbolunun yerel değerlerini koruma altına alan sınırlar belirlenmiştir. |
| Avrupa Kentsel Şartı 1992 | *Avrupa Konseyi Yerel ve Bölgesel Yönetimler Kongresi tarafından 1992'de kabul edilmiştir.<br><br>*Yerel yönetimlere kent planlaması ve yönetiminde rehberlik ederek, sürdürülebilir, demokratik ve uyumlu bir kentsel toplum oluşturmayı amaçlar. | 1980 Baran İdil Planı<br><br>*Alternatifler barındıran esnek planlama yapılmıştır.<br><br>*Plan onay süreçleri yerel yönetime geçmiştir. |

### 3.5. Karabük Planlama Sürecinin Heterotopya Bağlamında Değerlendirmesi

1930'lı yıllarda ıssız bir coğrafyada kurulan demir çelik fabrikası, bu bölgede bir endüstri kenti kurulmasına neden olmuştur. Fabrikanın sürdürülebilirliği için ilk etapta, Fordist üretim ilkelerine göre, fabrika çalışanlarının konfor alanı sağlanmıştır. Fabrika için modern dönem şehir planlama anlayışına örnek bir plan şemasına sahip, lojman yerleşkesi tasarımı yapılmıştır. Karabük kentinin tarihselliği kentteki bu ütopik lojman yerleşkesi ile önem kazanmaktadır. Kentin planlaması ve planların uygulaması, kentte olan göç hızının gerisinde kalmıştır. Plansız alanlarda ortaya çıkan oluşumlar, planlı alanlardaki karmaşa, kenttin katmanlı tipolojisi, heterotopya açısından araştırılmış ve Tablo 2'de özetlenerek gösterilmiştir.

Modelin benimsediği üslup bahçe-kent ekolünün devamı niteliğindedir. Henri Prost tarafından hazırlanan Yenişehir Mahallesi Planı, sınırlı bir alan için düzenlenmiş, kentin gelecekteki büyümesini esas alan bir plan niteliğinde olmadığından 1939–1948 yılları arasında kentin sınırları içersinde, fabrikanın çekim etkisi ile plansız konut dokuları ortaya çıkmıştır. Çoğunluğunu işçi kesimin oluşturduğu bu plansız doku bir heterotopya niteliğindedir.

Göçlerle birlikte artan sağlıksız yaşam koşullarını düzeltmek ve endüstriyel saçaklanma etkisi ile kentin gelişim bölgelerinde oluşacak kent dokularının biçimlenişini belirlemek bu planın öncelikli hedefi olmuştur. Yenişehir Mahallesi'nde örnek bir yerleşim alanı kurulmasına rağmen endüstrinin çekim etkisi, gecekondulaşma sonucu çarpık kentleşmenin belediye sınırları içinde hızla artmasına neden olmuştur. Nezihe- Pertev Taner planı endüstrinin çekim etkisi ile ortaya çıkan sorunlara bir çözüm arayışı olarak hazırlanmıştır.

**Tablo 2. Foucault'nun Genişletilmiş Heterotopya Örneklem Alanının Karabük Kentinde Analizi**

| **Tip** | **Özellikler** | **Heterotopya Örneklem Alanı** | **Genişletilmiş Güncel Örneklem Alanı** | **Karabükdeki Örnekler** |
|---|---|---|---|---|
| Kriz Heterotopyaları | *Medikal geçiş evresi mekânlarıdır.<br><br>*Coğrafi bağlamı yoktur. | Kışla<br><br>Manastır<br><br>Yatılı okul | Rehabilitasyon Merkezleri | *Yenişehir Mahallesindeki<br><br>Huzur Evi |

| | | | | |
|---|---|---|---|---|
| | *Her yüzyıla kolay uyumlanır. | Huzur Evi | | |
| Sapma Heterotopyaları | *Normlara uymayanların kapatıldığı mekânlardır.<br><br>*Kontrole tabi mekânlardır.<br><br>Kişiyi toplumdan izole eder.<br><br>*Toplumsal davranışlara ve inanışlara göre değişkenlik gösterir.<br><br>*Zamanın dönüşümüyle paralel dönüşüm gösterir.<br><br>*Birbiri ile çelişkili durumları yan yana getirebilir. | Hapishane<br><br>Akıl hastanesi | Kapalı Konut<br><br>Soylulaştırma<br><br>Azınlık Mahalleleri<br><br>Getto | *Bölgesel göçlerle gelen işçiler ve ailelerin düzensiz bir biçimde, plansız alanlarda oluşturduğu mahalle dokuları<br><br>*Bayır Mahallesi<br><br>*Hürriyet Mahallesi |
| Yan yanalık | *İşlevsel veya anlamsal bakımdan birbiri ile uyumsuz mekânlardır.<br><br>*Bir mekânın içinde birden fazla mekânsallık barındırabili. | Tiyatro<br><br>Sinema<br><br>Acem Bahçe | Kentsel Düğüm Noktaları<br><br>Azınlık Mahallesi | *Bayır Mahallesi<br><br>*Hürriyet Mahallesi<br><br>*Yenişehir Sineması |
| Zaman Biriktiren Heterokroniler | *İçerikleri çeşitli zaman dilimine ait bilgi aktaran mekânlardır.<br><br>Tarihin katmanlaşmasını, bir arada tutulmasını ve sunulmasını sağlayan mekânlardır. | Kütüphane<br><br>Müze | Palimpsest | *Yenişehir Mahallesi |
| Geçici Heterokroniler | *Belirli bir zamanda geçici işleve sahip mekânlardır.<br><br>İşlevi yerine getirdikten sonra kentsel boşluğa dönüşürler. | Fuar<br><br>Panayır<br><br>Tatil Köyü | Kamp Alanı<br><br>Pazar Yeri<br><br>Konser Alanları | *Alışveriş ve ticaretin yapıldığı geçici alanları<br><br>*Araç Çayı kıyısına kurulan sezonluk panayır alanı |
| Kapalı veya Kontrollü Giriş Çıkış Yapılan Heterotopyalar | *İzinli, kontrole ve kurala tabii giriş çıkış yapılır.<br><br>Sınırlı giriş çıkış yapılan mekânlardır. | Hapishane<br><br>Kışla<br><br>Sauma<br><br>Hamam<br><br>İbadethane | Çatışma Mekânları<br><br>Meydan<br><br>Cadde<br><br>Sokak<br><br>Park<br><br>Kapalı Konut Siteleri | *Kentin en yoğun kullanılmı meydanı ve ticaret akslarını bulunduran bölgeler<br><br>*Bayır Mahallesi<br><br>*Hürriyet Mahallesi |

| | | | | |
|---|---|---|---|---|
| Girişin Yanılsama Olduğu Geçici Heterotopyalar | *Giriş yapılan ama aidiyet hissedilmeyen mekânlardır. | Motel<br>Konukevi | Oteller<br>Tatil Köyleri | *Yenişehir Mahallesi'ne sonradan eklenen misafirhane ve otel |
| İlüzyon Heterotopyaları | *Gerçekliğin yitirildiği yanılsama yaratan mekânlardır. | Gemi<br>Genelev | Tema Parklar | *Bayır Mahallesi ve İstasyon bölgesindeki ticaret alanları arasında kalan eğlence mekânları |
| Başka Heterotopyaları | *Bulunduğu bağlama göre düzenli ve o bağlamdan kopuk yerlerdir. | Koloniler | *Kentsel Dönüşüm, canlandırma ve soylulaştırma bölgeleri | *Kentsel dönüşüm bağlamında Bayır Mahalle ve Hürriyet Mahallesi |

Karabük planlama sürecinde ortaya çıkan heterotopik oluşumlar Foucault'nun altı ilkesi ve literatürdeki güncel örnekler açısından değerlendirilmiştir. Yapılan analiz aşağıda Tablo 2'de özetlenmiştir.

Taner Planı'nda, Prost Planı'ndaki bahçe-şehir yaklaşımı sürdürülmüş fakat konut alanlarında parselasyon yapılmıştır. Plansız alanlardaki gecekondu oluşumları büyük ölçüde yok sayılmıştır. Taner Planı genel hatları ile kentsel müdahaleyi sağlamış olsada işlevsel dağılım kendiliğinden oluşan doku yüzünden tam anlamıyla gerçekleşmemiştir. İstasyon bölgesinde plansız konumlanan kereste fabrikası, bu bölgenin zorunlu olarak, küçük ölçekli endüstri yapıları için, imara açılmasına neden olmuştur. Fakat kentin bu bölümü aynı zamanda ticaret aksının devamında ve bu aksla güçlü bir ilişki kurmaktadır. Bu bölgedeki boş alanların yerel baskılar da dikkate alınarak endüstri işlevleri ile değerlendirilmesi başka bir heterotopya oluşumuna neden olmuştur.

Taner Planı'nda farklı işlevlerde parçalı iki meydan düşünülmüştür. Bu nedenle kentin bütüncül bir merkezi yoktur. Planda ticaret işlevleri kentin belirli bir bölgesinde konumlanmamıştır. Mevcut caddeler ticaret aksı olarak kullanılmaya devam edilmiştir. Kentin merkez ihtiyacı ve ticaret bölgesinin olmayışı planın zayıf yönlerini oluşturmaktadır. Bu yaklaşımlar nedeniyle ilerleyen süreçte kamu yapıları dağınık yerleştirilmiş, güçlü bir kent meydanının biçimsel etkisi ile oluşması beklenen kent kimliği oluşmamıştır. Ticaret için özel bir bölge seçilmemiş ve ticaret işlevleri de kendi içinde sınıflandırılamamaştır. Ticaret aksı olarak kullanılan caddelerin yoğunluğu artırmıştır. Bu bölgelerdeki işlev karmaşası ve yoğunluk heterotopya oluşumlarını artırmıştır.

Özdeş Planı Karabük'ün potansiyellerini öne çıkarmayı hedeflemiştir. Karabük'ün büyüme yönünü Safranbolu'ya çevirmiştir. Safranbolu'nun korunmasına önem vermiştir. Konut alanlarındaki yoğunlukların azaltılmasını önermiştir, yeşil alanları artırmıştır. Çay kıyılarının rekreatif kullanımı, spor alanlarının bu bölgelerde konumlandırılması gibi plan kararları, ekolojik kaygıları olan bir plan olduğunu göstermektedir. Plan kentin çarpık yapılaşmış altlığının üzerine uygulandığı için bu bölgelerin yıkımı ve yeniden yapımı büyük bütçeler gerektireceğinden, yerinde uygulanamamıştır. Bu bölgelerin heterotopya durumu artmaya devam etmiştir.

İdil Planı, Özdeş Planı'nın statik bir plan olması ve kadastral durumu dikkate alınması gerekçeleriyle tasarlanmıştır. Bu planda Safranbolu ve 100. Yıl mahallesi ve çevresine önem verilmiştir. Plan kararları alternatifli olduğundan esnek ve dinamik bir yapıya sahiptir. Planda rakamsal değerler her açıdan yüksek tutulmuştur. Tüm bunlara rağmen İdil Planı da kentin artan nüfusu ile gerçekleşen

büyümeyi kontrol altına almakta yetersiz kalmıştır. Özdeş Planı ve Taner Planı'nda olduğu gibi halihazır altlıklardaki gecekondu yapılaşmasına dokunulmamıştır. Bu bölgeler hetertopya özelliğini korumuştur.

## 4. Değerlendirme ve Sonuç

Erken dönem modern şehir plancıları, ideal kent planının merkezine, kapitalist sistemin enstürmanı olan mekânları ve onlarla ilişkili kentsel pratikleri yerleştirmektedir. Kent merkezlerine yerleştirilen endüstri mekân pratikleri saçaklanma etkisi ile çeperlerinde konumlanan konut alanları oluşturmaktadır. Endüstrinin çekim etkisi kentlerin büyümesini kaçınılmaz hale getirmiştir. Bu büyüme kentlerin yaşanabilir yerler olmasını giderek zorlaştırmıştır. 19. yüzyıl endüstri odaklı yerleşkelerin kurulması ön plana çıkmıştır. Bu yerleşkeler büyüyerek endüstri kentlerini oluşturmuştur. 1940' lı yıllarda Avrupa şehirleri endüstrileşmenin etkisi ile kimliklerini kaybederken, kentsel sorunların artması, insanların kent dışına taşındığı ütopya önermelerini ortaya çıkarmaktadır. Mevcut şehirlerin yoğunluk yükünün seyreltilmesi için banliyöler, uydu kentler, bahçe kentler gibi tasarım önermeleri geliştirilmiştir. Bu ütopya önerileri, mekânsal bölgelemesi kendi içlerinde yapılmış olan ve ana kentten uzak konumlanan yerleşkelerdir. Fordizim'in etkisi ile bu kentlere ulaşım kolaylıkla sağlanmaktadır. Ana kentle ulaşımın tren ya da kara yolu ile sağlandığı bu modüller, saçaklanma etkisiyle zamanla ana kentle birleşmektedir. 1960'lar, modernizme karşı eleştrilerin arttığı bir dönemdir. Bu dönem post-endüstriyel ve post-modern dönem olarak bilinmektedir. Modern üslubun kentsel plan tipolojileri üzerindeki etkinliği giderek azalmaktadır. Hümanist söylemler, yaşam hakları, özgürlükler, eşitlik, adalet, kimlik, aidiyet, kirlilik, çevre sorunları gibi konular gündemde etkin bir biçimde tartışılmaktadır.

Modernizm ve Bauhaus ilkeleri ile konut alanlarının kent merkezinin dışına taşınmasını hedefleyen ütopyaların, kentin saçaklanarak büyümesine neden olmuştur. Bu ütopyalar bir çözüm aracı olma özelliğini yitirmiştir. 1960'ların tartışma konularına ortak çözüm kenti giderek yok eden endüstri alanlarının kent merkezlerinden uzaklaştırılmasıdır. Bu büyük deplase hamlesi kentin yeniden bölgelenmesinin önünü açmıştır. Kentsel boşluklar bir süre atıl kalsa da bu bölgeler zamanla dönüşüm geçirmiştir. Bu bölgelerde kenti canlandıracak tasarımlar yapılması hedeflenmiştir. Bu dönem kentsel krizlerin kentten kaçarak değil kentin içinde çözüldüğü bir dönemdir. Teknolojinin hızlı yükselişi fütürist ütopyaların üretilmesinin önünü açmaktadır. Tarihi mirasın korunması, ekolojik dengenin bozulmaması gibi söylemler, bu dönemin en önemli söylemleridir. Kentin doğal dokusu ve yapılı çevrenin silüetinin korunması, önemli dönemleri temsil eden yapıların ve dokuların korunması hedeflenmiştir. Kentlerin çarpık kentleşen bölgelerinin temizlenmesi, dönüşüme girmesi, bazı yapıların yeniden işlevlendirilmesi yoluyla kentsel mekânlara müdahalle yapılması önerilmiştir. Ütopyalar, kelime anlamından da anlaşılacağı üzere hayali yerlerdir. Ütopya tasarım önermeleri ise birer kent modeli kurgusudur. Bu nedenle ütopya tasarımlarının pek çoğu tasarıda kalmıştır. İçlerinden bazıları hayata geçirilse de ütopyaların tasarımsal sınırlılıkları büyüyerek yaygınlaşmalarının önünde engel olmuştur.

19. yüzyıl, endüstri devriminin dinamikleri ile kontrolsüzce kentleşme gerçekleşmiştir. 20. yüzyılın ilk yarısı bu sorunlara çözüm olarak kentten uzaklaşma fikri önem kazanmıştır. 20. yüzyılın ikinci yarısında kentsel sorunlar, kentlerin içinde alınan tedbirlerle çözülmeye çalışılmıştır. 21. yüzyıl ise 20. yüzyılın son çeyreğinde başlayan teknoloji hamlelerinin hızla gelişmesi ile şekillenmektedir. Bilgisayar teknolojileri, internetin bulunması ve yaygınlaşması, cep telefonu teknolojileri, nano teknolojiler, yapay zeka gibi kavramlar 21. yüzyılın sinerjisini oluşturmaktadır. Bu sinerji beraberinde hakikat arayışını getirmiştir. İçinde yaşadığımız yüzyıl günümüze değin koyulmuş bütün kuralların haliyle de bütün mekânların da sorgulandığı bir dönemdir. 21. yüzyılın ütopya arayışı çağın sorunları ile şekillenmektedir. Kirlilik, kıtlık, savaşlar, bölgesel göçler, afetler görünen en önemli sorunlardır. 19. yüzyılın sosyalist ütopistleri için özgürlük, adalet ve eşit şartların sağlanması tartışılırken; 21. yüzyıl dünyası salgınların, savaşların, ekonomik krizlerin etkisinde nasıl hayatta kalınır sorusu tartışılmaktadır.

19. ve 20. yüzyılda mekânın zamansallığı ve anlamsallığı tartışılırken, modernitenin mekânın anlam derinliğini eriterek soyutlaştırdığı kanısı ortaya çıkmıştır. Yeni anlam arayışları ile post-modernizm ortaya çıkmıştır. Modernite, gerek mimari gerek şehircilik bağlamında mekânı işlevsellikle ön planda tutmuştur. Bu durum bireyin topluluktan koparak yalnızlaşmasına neden olmaktadır. Oysa insan doğası gereği etkileşimde olması gereken bir canlıdır. İşlevlerin kusursuz işlediği bir dünyada gündelik yaşam her ne kadar kolay olsada oldukça sıkıcıdır. Hümanist söylemlerle gündelik hayata sızan modernizmin kuralcı yapısı postmodern süreçte tartışılmıştır.

Mimari ve şehircilikte, 1960'lı yıllarda başlayan eleştiriler ve teknolojik gelişmelerden etkilenmiştir. Modernitenin kalıplaşmış ilkeleri ve bilinen asal geometrik formlara sadık tasarım anlayışı yerini; kalıplaşmış düzen ve yapısından uzak, geleneksel geometrik kuralların dışına çıkan, düzensizlik ve organiklikle ilgilenen ve çeşitli bilgisayar programları aracılığı ile kolaylıkla modellenen amorf geometrilere bırakmıştır. 21. yüzyılda, uzak dünya kavramı giderek yok eden internet, erişimi sınırsız kılmış, gündelik hayata gerçek olmayan anlamına gelen "sanal" kavramı, yerleştirmiştir. Hizmet sektörü internet ile yön değiştirmiştir. Yapay zeka araçları düşünen insan modelinin yerine geçmektedir. Bilinen üretim ve tüketim pratiklerini değişmektedir. Bilinen mekân anlayışı, ekonomik, sosyal, politik itkiler ile dönüşmektedir. Bu değişim kentleşme anlayışına da yansımaktadır. Kentsel mekân pratiklerinde meydana gelen değişimler ideal kent ne olmalı sorusunu her daim gündemde tutmaktadır.

Her dönem ortaya çıkan ütopyalar kentlerin sürdürülebilirliğinde önemli bir rol oynamaktadır. Sürdürülebilirlik kavramı her ne kadar 1980'lerden sonra güncel literatüre girmiş olsa da kentsel krizlerin çözüm arayışı olarak ortaya çıkan ütopyalar, kentsel sürdürülebilirliği sağlamak konusunda deneysel birer alan oluşturmaktadır.

Heterotopya kavramı, Foucault'nun altı ilkesi ve güncel literatür örnekleri aracılığı ile araştırıldığında, kavramın katmanlı yapısı ortaya çıkmaktadır. Heterotopya kavramını ötekinin, farklı olanın mekânı olarak tanımlamak, kavramın anlamsal derinliğini sığlaştırmaktadır. Foucault'nun heterotopya tanımlamasındaki örnekler üzerinden ele alındığında kavramın üç temel olgu ile ortaya çıktığını söylemek mümkündür.

Heterotopya kavramını ortaya çıkaran ilk olgu, heterotopyaların kendiliğinden var olmasıdır. Bu heterotopya türü; öteki, farklı, azınlık, dışlanmış olarak tabir edilenlerin tek başlarına ya da türdeşleri ile birleşerek oluşturduğu mekânsallıktır. Bu mekânsallık, topluluğun normlarına uymayanların, topluluk içinde kendine yer tayin etme biçimidir.

Heterotopya kavramını ortaya çıkaran ikinci olgu, kapitalist sistemin sürdürülebilirliği için normlar çerçevesinde modernizm eliyle üretilmiş heterotopyalardır. Bu heterotopyalara örnek olarak hapishaneler, müzeler, tatil köyleri, gibi örnekler verilebilir. Bu örneklerin birbiri ile ilişkisi olmasa da mekânsal bakımdam tüketim toplumunun kurallı yapısını korumak için üretilmişlerdir.

Heterotopya kavramını ortaya çıkaran üçüncü olgu zamanın ruhuna göre işlevini yitiren anlamların/mekânların yerini alan/dolduran heterotopyalardır. Bu heterotopya oluşumları da kentsel sürdürülebilirlik için önemli rol oynamaktadır. Bir kentte işlevini yitirmiş bir mekânın yerine getirilen bir başka işlevsel mekân kentin sürdürülebilirliğini sağlarken, heterotopya olması da kaçınılmazdır.

Bu bağlamda, ortaya çıkış biçimi açısıdan değerlendirilen heterotopyaların ortaya çıkışındaki olgulardan ikisi kentsel mekânı doğrudan etkilemektedir. Modernite eliyle ya da işlev değişikliği gibi nedenlerle ortaya çıkan heterotopyalar sürdürülebilir kentleşme bağlamında oldukça büyük öneme sahiptir.

Çok katmanlı bir kavram olan heterotopya, zaman-mekân bağlamında; kentsel büyüme sonucu sürekli değişen kent planlarında da ortaya çıkmaktadır. Kavram kentsel mekânda; yan yanalığın,

aradalığın, üst üsteliğin mekânı olarak ortaya çıkmaktadır. Yan yanalık, aradalık, üst üstelik gibi kavramlar, fiziki mekân tarifi yapmanın yanı sıra zamansallıkta bildirmektedir. Tarihsel kırılmalar sonucu değişim gösteren kentsel plan tipolojilerinde bu durumlar gözlemlenebilmektedir. Tarihsel süreçte katmanlaşnan plan tipolojileri, mekânların, yan yana, üst üste, arada kalması gibi durumlarla palimsest özelliği göstermektedir.

20. yüzyılın başında Cumhuriyet ile tanışan Türkiye'de, Sümerbank ve İller bankası kalkınma projeleri geliştirerek batılı endüstrileşme ve modernizasyon hareketine dahil olmuştur. Sümerbank yatırımları aracılığı ile bir köy yerleşimi olan Karabük'te kurulan KDÇF, önemli bir bölgesel kalkınma hamlesidir. Başlangıçta, barınma alanları prefabrik konutlarda karşılanan fabrikanın, sürdürülebilirliği için 1938 yılında bahçe- şehir ekolünü temsil eden Şehirci Henri Prost davet edilmiştir. Henri Prost tarafından, lojmanlar için kamulaştırılan alana, bahçe- şehir tarzında ütopik bir yerleşke tasarlanmıştır. Yerleşkenin, modern üsluptaki tasarımının ilerleyen dönemde kentin gelişme ve büyümesinde, bir rol model olması beklenmiştir.

Mülkiyet hakları, kamulaştırma ve coğrafi sınırlılıklar gibi negatif etmenler Prost Planın sürdürülebilir olmasının önünde engel olmuştur. Fabrikanın çekim merkezi olması nedeniyle hızla artan nüfusun barınma ve lojman ihtiyacı konusunda yerleşkenin yetersiz kalması, fabrika çeperlerinden yayılan gecekondu alanları ile çarpık kentleşmeye neden olmuştur.

Karabük coğrafi olarak yüksek yamaçlarla çevrili bir bölgededir. Kentin konut dokusu bu yamaçlara dağınık biçimde yerleşmektedir. Yamaçlar arasındaki derin vadiler konut alanlarının bütünleşmeni engellemektedir. Yamaçlarla çevrili şehrin dik eğimli arazisi yapılaşmayı zorlaştırmaktadır. Kentin içinden geçen ve kentin beklenen büyüme aksına paralel giden Araç Çayı, coğrafi bir sınır oluşturmaktadır. Aynı zamanda bu çay taşkın riski nedeni ile yapılaşma için de sınır oluşturmaktadır.

Çalışma kapsamında incelenen endüstri kenti Karabük'ün planlama süreci dört dönemden oluşmaktadır. Bu dönemlerde batıda şehircilik anlamında gerçekleşen değişimlere paralel olarak planlama yapılmıştır. Fordizm etkisi ile ortaya çıkan banliyö ve uydu kent kültürünün etkisi, Karabük ölçeğinde kentin kuruluş aşamasında deneysel bir model olarak görülmektedir. Demir Çelik Fabrikası için mahalle ölçeğinde Henri Prost tarafından tasarlanan lojman yerleşkesi, Türkiye ölçeğinde önemli bir örnektir. Bu yerleşke 19. yüzyılın sonlarında ortaya çıkan ve 20. yüzyılın ilk yarısında etkili olan bahçe-şehir yaklaşımını temsil eden bir modeldir. Yerleşkenin tasarımında modern üslup benimsenmiştir. Bahçe-şehir yaklaşımı ile alçak katlı, ekolojik, sağlıklı, yeşile doygun bir tasarım olmasını sağlamıştır. Tarihsel açıdan Yenişehir Mahallesi'nin tasarımı Karabük'te ilk kentsel oluşumun izini oluşturmaktadır. Yenişehir mahallesi kendi içinde bir ütopyadır.

Demir çelik fabrikasının çekim potalsiyeli ile Karabük kenti yoğun göç almıştır. Lojman yerleşkesi sınırlı bir alanda, 5000 kişi kapasiteli olarak tasarlandığından, kente göçle gelenlerin barınma sorununu çözmekte yetersiz kalmıştır. Mahalle çeperleri, kentin tren istasyonuna yakın bölgeler ve kentin içinden geçen çayın kenarındaki alanlar hızla gecekondu bölgelerine dönüşmüştür. Bu gecekondu yerleşimleri; Yenişehir Mahallesi'nin tutarlı, ütopik tasarımı karşısında, bir heterotopya oluşturmaktadır. Hızlı nüfus artışı kentin 1941 yılında belediye statüsüne kavuşmasını sağlamıştır. Gecekondulaşmanın durdurulması için ilk tedbir bu dönemde alınmıştır. Kentteki bozuk dokuların tespit edilerek halihazır haritalara işlenmesi ve bundan sonra da kentin büyümesini öngören bir kent planı tasarısı için Nezihe ve Taner Pertev çifti görevlendirilmiştir.

Taner Planı olarak adlandırılan bu dönemde, Prost Planının izleri takip edilmeye çalışılmış fakat mülkiyet hakkı gibi nedenler ile imar düzenlemeleri parsel bazında yapılmak zorunda kalınmıştır. Taner Planı'nda 'İstasyon Meydanı' ve 'Cumhuriyet ve Hükümet Meydanı' şeklinde iki meydan tasarımı

olması belirgin bir kent merkezi olmasının önüne geçmiştir. Kentsel doku içerisindeki güçlü akslar ticaret aksı olarak tayin edilmiş, kente özgü bir ticaret bölgesi planlanmamıştır. Güçlü akslar üzerindeki konumlanan ticaret işlevleri, bu akslar üzerinde yoğunluğu artırarak, karmaşık bir doku oluşturmuştur. Bu bölgelerdeki düzensiz ticaret alanı dağılımı bir heterotopya oluşturmaktadır. Kent meydanı olarak tasarlanan bölgede kentin gelecek vizyonuna göre yeteri kadar kamu binası önerilmemesi ilerde kamu binalarının kent içinde farklı alanlara dağılmasına neden olmuştur. Bu durum da bir heterotopya oluşturmuştur. Göç yolu ile gelen işçilerin kendi imkanları ile oluşturdukları yerleşim alanları çarpık kentleşme bağlamında bir heterotopyadır. Fakat bu heterotopyalar fabrikanın sürdürülebilirliği için önem arz etmektedir. Lojmanların yetersizliği nedeniyle kalacak yeri olmayacan işçilerin barınma sorunlarını kendi imkaları ile çözmeleri istenilen bir durum olmasa da fabrikanın devamlılığı açısından bu heterotopik oluşumlara göz yumulduğu görülmektedir. Taner Planı, kentin büyüme hızı karşısında 10 yıl içinde geçerliliğini yitirmiştir.

1968 yılında kabul edilen Gündüz Özdeş Planı, Karabük ve Safranbolu'yu birleştiren ve Karabük'ün büyüme yönünü Safranbolu'ya çeviren bir plandır. Bu plan, 1960'larda dünya genelinde hakim olan modern kent eleştirilerini yansıtarak, hızlı sanayileşmenin kentler üzerindeki olumsuz etkilerine çözüm aramayı amaçlamıştır. 1964 yılında kabul edilen Venedik Tüzüğü'nün ilkelerine uygun hareket edilerek, Safranbolu'nun korunması ön planda tutulmuştur. Plan, modern mimari tarzı benimsemekle birlikte ekolojik unsurlar da taşımaktadır. Konut alanlarındaki yoğunluğun azaltılması önerilmiş, yeşil alanlar artırılmıştır. Özdeş Planı Karabük'ün potansiyellerini öne çıkarmayı hedeflemiştir. Plan; kentin çarpık yapılaşan altlığının üzerine uygulandığından, planda ayrılan bölgelerde de çarpık yapılaşma devam ettiğinden, yerinde uygulanamamış ve planda tekrar revizyon gerekmiştir. Çarpık kentleşen bölgelerin heterotopya durumu artmaya devam etmiştir.

Özdeş Planı'nın esnek olmayan katı yapısı, kentin büyümesini kontrol altına alamayışı, tasarı alanlarının gecekondulaşmaya devam etmesi, İdil Planı'nın hazırlanmasına neden olmuştur. İdil Planı'nın plan kararları alternatifler içerdiğinden plan esnek bir yapıya sahiptir. Geniş ölçekli bir kent planı olmasına rağmen mevcut gecekondu dokuları kaldırılmadığından, plan kısmen uygulamaya geçirilmiştir. Bu nedenlede çarpık kentleşmeyi önlemede yetersiz kalmıştır. Kentin plansız alanlarında ve de planlandığı halde uygulama başlatılamayan alanlarda, gecekondulaşma devam etmiştir.

Karabük'ün planlama dönemleri incelendiğinde, yapılan plan çalışmalarının modern üslubü benimsediği görülmektedir. Plan tasarıları kendi içlerinde tutarlı, uygulanabilirliği yüksek, iyi birer şehircilik örnekleri olmalarına rağmen kentin büyüme dinamikleri, bu planların uygulanmasına elverişli bir ortam sağlamamıştır. Planlar, plansız alanlarda kendiliğinden yapılaşan dokuların üzerine çizilen taslaklar ile oluşturulmuştur. Bu çarpık dokuların kent içinden kaldırılması; siyasal, ekonomik ve toplumsal nedenlerden ötürü mümkün olmamıştır. Üst üste katmanlanarak hazırlanan planlar, kısmen hayata geçirilse de Yenişehir Mahallesi dışındakiler hiçbir zaman tam anlamıyla kentin bütününe nüfuz etmemiştir. Bu nedenle de kentin en yoğun kullanımlı bölgelerinde heterotopya oluşumları ortaya çıkmıştır.

Endüstri Devrimi, kentleri yalnızca fiziksel anlamda değil, toplumsal ve kültürel anlamda da köklü biçimde dönüştürmüştür. Bu dönüşüm sürecinde, ütopyacı kent anlayışı ile yaşanabilir, sağlıklı ve dengeli kentler tasarlanmak istenmiş, ancak bu tasarımların birçoğu plan taslaklarından öteye geçememiştir. Michel Foucault'nun heterotopya kavramı, kentlerin içinde barındırdığı çok katmanlı, çoğu zaman çelişkili mekânsal örgütlenmeleri anlamak için güçlü bir araçtır. Ütopya ile heterotopya arasında kurulan bu bağlam, kentlerin yalnızca planlanan yapılar değil; aynı zamanda gündelik yaşam pratikleriyle şekillenen, çok yönlü ve dinamik alanlar olduğunu ortaya koyar.

Bugünün sürdürülebilir kent araştırmaları geçmişteki ideal kent ütopyalarının izlerini taşımakla birlikte, gerçekçi, çok aktörlü ve katılımcı bir yaklaşıma evrilmiştir. Sürdürülebilirlik artık yalnızca çevresel değil, sosyal ve ekonomik adalet boyutlarını da kapsayan bütüncül bir kent anlayışı sunmaktadır. Bu bağlamda, heterotopyaların sunduğu alternatif mekânsal örgütlenmeler ve geçici, deneysel çözümler, sürdürülebilir kent modellerinde yenilikçi yaklaşımlar için zemin oluşturmaktadır. Sonuç olarak, sürdürülebilir kentleşme modelleri, geçmişin ütopyacı ideallerinden beslenen; ancak çok katmanlı, esnek ve kapsayıcı yapısıyla heterotopik gerçekliklerle iç içe geçmiş modellerdir.

## Çatışma Beyanı (Competing Interests)

Çalışmanın yazarları, herhangi bir çıkar çatışması olmadığını beyan etmektedir.

*The authors declare that they have no competing interests.*

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## Etik Beyanı (Ethical Statement)

Bu çalışmanın hazırlanma sürecinde bilimsel ve etik ilkelere uyulduğu ve yararlanılan tüm çalışmaların kaynakçada belirtildiği beyan olunur.

*It is declared that scientific and ethical principles have been followed while carrying out and writing this study and that all the sources used have been properly cited.*

## Araştırmacının Katkı Oranı (Author's Contributions)

Yazarlar çalışmaya eşit oranlarda katkı sağlamışlardır.

*The authors contributed equally to the study.*

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Research Article

# Quantitative Fire Load Assessment in Historic Buildings: A Material-Based Fire Load Analysis of UNESCO World Heritage Site in Safranbolu, Turkiye

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**Keywords**

Fire load density,
Fire risk assessment,
Heritage buildings.

**Abstract**

Fire risk management in historic buildings constitutes a critical challenge for cultural heritage preservation. The failure to adequately address fire risk, particularly in historic cities such as Safranbolu, may result in irreversible losses. This study addresses the research gap in quantitative fire load assessment methodologies for historic wooden structures by conducting an analysis on a heritage building in Safranbolu, Turkiye. The proposed methodology systematically quantifies both fixed and movable fire loads using established calorific values and mass calculations in accordance with BS 7974 and NFPA 557 standards. Fire load densities were determined for all combustible materials and subsequently compared against international risk classification standards. The results revealed a total fire load density of 6.713 GJ/m², placing the building in the "High Fire Risk" category (Level 6). Fixed fire loads (2.757 GJ) were predominantly associated with Scots pine ceiling beams (39.9% of fixed loads) and floor coverings (10.2% of fixed loads), whereas movable fire loads (1.567 GJ) were largely attributed to plastic chairs (74.1% of movable loads). Material-based interventions were estimated to potentially reduce fire load density by 1.2–1.6 GJ/m² through strategic replacement of selected furnishings. This research introduces a replicable quantitative framework for fire load assessment in heritage buildings, thereby contributing to evidence-based fire risk management strategies while ensuring the preservation of cultural authenticity.

## 1. Introduction

Historic buildings represent irreplaceable repositories of architectural and cultural heritage, embodying the aesthetic accumulation of societies and gaining value over time [1]. These structures are remembered not only for their physical presence but also for their symbolic significance as representations of history and identity. In Turkiye, the Cultural Heritage Preservation Board, established in 1986, has been responsible for developing inspections, regulations, and guidelines for the protection, restoration, and transmission of buildings with historical and cultural value to future generations.

Fire incidents in heritage buildings cause catastrophic losses that extend far beyond material damage, leading to the irreversible destruction of collective memory by preventing the transfer of cultural information and documents to future generations [2]. The widespread use of wooden materials with low fire resistance, combined with the presence of carpets, furniture, and flammable insulation products, increases fire risk and exacerbates potential losses [3]. Recent high-profile disasters, such as the 2019 Notre Dame

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Cathedral fire, highlight the urgent need for proactive fire risk assessment in heritage sites.

Fire risk in historic buildings encompasses both the probability of fire outbreak and spread, as well as the material and intangible losses that may result. The necessity of safeguarding historic buildings and the artifacts they contain requires a fire safety approach that incorporates unique and innovative solutions tailored to their specific characteristics [4]. A fundamental step in fire safety is the determination of fire load density, which provides insight into the potential magnitude, rate of spread, and severity of a fire [5]. Fire load refers to the total potential energy of combustible materials within a given area of a building [6].

Depending on the flammability properties of these materials, the tendency of a fire to spread and intensify varies significantly [7]. In this context, the type, quantity, and distribution of combustible materials in historic buildings strongly influence the overall fire load, underscoring the need to balance conservation principles with fire safety strategies [8].

Current fire safety research predominantly emphasizes modern building typologies, with limited focus on the distinctive characteristics of historic structures. While general fire load assessment methodologies are available [6,9], their application to heritage buildings requires careful adaptation to account for traditional materials, historical construction techniques, and preservation constraints. The frequent occurrence of fires in historical buildings in Turkiye in recent years, coupled with the absence of specialized regulations tailored to heritage structures, underscores both the importance and urgency of addressing this issue [10].

Safranbolu, with its traditional urban fabric and cultural heritage, has been inscribed on the UNESCO World Heritage List since 1994. However, over the past 11 years, 58 fires have been recorded in the “Historic Bazaar” district, leaving many structures unusable. This alarming situation demonstrates that fire risk remains a serious and ongoing threat to historic buildings, emphasizing the necessity of implementing preventive and risk-reduction measures (Figure 1).

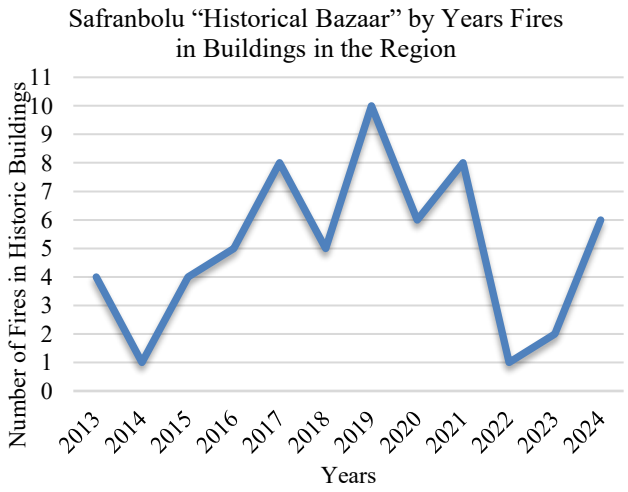


**Figure 1.** Annual distribution of fire incidents in historic buildings of the Safranbolu Historical Bazaar [11]

## 2. Literature Review

Fires in historic buildings frequently result in irreparable losses [12]. The extensive use of wooden materials in such structures substantially increases fire risk [13], leading not only to historical, cultural, functional, and economic damages but also to adverse psychological impacts on society. Even when historic buildings are restored in line with their original form after a fire, their authenticity and historical value inevitably diminish due to the replacement of original materials [14]. The Notre Dame Cathedral fire on April 15, 2019, stands as a prominent example of these challenges, where, despite comprehensive restoration efforts, the building’s original character was irreversibly compromised (Figure 2).



**Figure 2.** The Notre Dame Cathedral fire on April 15, 2019 [15] (above) and post-fire restoration works (below) (Personal archive)

The flammability of materials in historic buildings directly influences fire load and outbreak risk, thereby complicating fire risk management processes. This challenge is particularly critical in wooden structures, where traditional construction methods and materials generate unique fire behavior patterns that differ from those observed in modern buildings.

Fire load assessment in historic buildings requires specialized approaches that account for both traditional and contemporary materials. Gouveia and Andrade [16], for example, examined fire load density in 43 historic buildings in Ouro Preto, Brazil, reporting an average of 2.989 GJ/m². Their study highlighted the significant contribution of wood materials, particularly in commercial buildings where intensities reached up to ten times the Brazilian fire safety standard values. However, the Brazilian context differs considerably from Ottoman heritage buildings with respect to construction techniques, material use, and climatic conditions, thereby limiting direct comparability with Turkish heritage sites.

Material composition and spatial function are also critical factors in fire load distribution. Nayak and Subramanian [17] analyzed fire loads in educational, office, and library buildings, noting that the predominant sources were paper, wood, and furniture. Their findings showed that classrooms had lower fire loads compared to other spaces, while libraries and storage areas exhibited significantly higher values due to the concentration of paper materials.

The distinction between fixed and movable fire loads is another key parameter in risk assessment. Li et al. [5] separately calculated fixed fire load (FFL) and movable fire load (MFL) in historic wooden buildings in Beijing, identifying an average building fire load of 2.847 GJ/m². Most of the load originated from fixed elements such as roof panels, beams, and columns. Using K-means clustering, they observed that fixed fire load initially decreases with increasing building size but rises again beyond a certain threshold, whereas movable fire load varies depending on building function. While their study provides valuable insight into fixed versus movable fire load dynamics, differences in residential usage patterns and wood species between Chinese and Ottoman buildings indicate that fire load patterns remain highly context-specific.

Fire load values also depend on building size, function, and user density, beyond material content alone. Su et al. [12] investigated live fire loads in 21 historic Japanese buildings, demonstrating strong correlations between room fire load density, spatial dimensions, and intended use. Storage rooms showed the highest fire load density (0.431 GJ/m²), underscoring the importance of functional programming in risk assessment. Nevertheless, Japanese wooden buildings represent a different architectural and cultural tradition compared to Ottoman-era structures, where spatial organization and material selection follow distinct historical trajectories.

Beyond individual buildings, fire risks in historic environments extend to the urban scale. Geospatial analyses of hazardous facilities and their compliance with fire safety regulations provide essential insights for integrated urban risk management and public safety planning [18]. Neto and Ferreira [3], for instance, proposed six interventions to evaluate and mitigate fire risks in historic cities, considering building age, structural characteristics, narrow streets, and flammable material concentrations. Applying both the Fire Risk Index (FRI) and the Analise de Risco de Incêndio em Centros Antigos (ARICA) method to 269 historic buildings in Guimarães, Portugal, they found that more than 30% of the buildings presented moderate to high fire risk. Their findings led to recommendations for specific fire regulations and the use of fire-resistant materials in historic contexts. Although Mediterranean parallels exist with Safranbolu, the ARICA methodology emphasizes urban-scale analysis, contrasting with the building-level material quantification required for UNESCO heritage sites.

While existing literature establishes core principles of fire load assessment, several gaps remain in the context of heritage buildings. First, quantitative data on fire load densities in historic structures remain limited, as most studies prioritize modern building typologies. Second, the integration of modern furnishings into historic interiors creates hybrid fire load conditions that necessitate specialized analysis. Third, systematic methodologies for material-based fire load reduction in heritage contexts are still underdeveloped.

This study addresses these gaps by conducting a comprehensive quantitative fire load analysis of a representative historic building within a UNESCO World Heritage site. The research focuses on a material composition–based approach, considering both traditional construction materials and contemporary furnishings in its evaluation of fire risk. The methodology further encompasses maximum risk scenario modeling through complete combustion analysis of all combustible materials, thereby providing a conservative yet replicable framework for heritage fire safety planning.

## 3. Material and Method

Safranbolu, distinguished by its refined examples of wood and stone craftsmanship and its well-preserved traditional urban fabric, is renowned for its historic houses that exemplify classical Ottoman urban architecture [19]. Inscribed on the UNESCO World Heritage List in 1994, the city's residential quarters are designated as urban conservation areas, predominantly reflecting the architectural characteristics of the 18th and 19th centuries.

In this study, the Karabük University Prof. Dr. Fuat Sezgin Science, Culture and Art Academy building (commonly referred to as the "Stone Building"), one of the significant historical structures of Safranbolu, was examined. Located in the Safranbolu district of Karabük, the building was constructed in 1890 by Abdurrahman Pasha, then Governor of Kastamonu, as a Syphilis Hospital. The rectangular-shaped structure measures 17 × 25 m, covering a total area of 644.28 m². Its exterior walls consist of cut stone plaque cladding over a rubble masonry system. Scots pine timber, sourced locally, was extensively used in the construction, particularly for doors, windows, stairs, floor coverings, various structural components, and decorative details.

The Stone Building was selected as a representative case study due to its typical 18th–19th century Ottoman architectural features, particularly its reliance on regional timber and traditional construction techniques commonly found across UNESCO World Heritage sites. Its present mixed-use function illustrates the hybrid fire load conditions frequently encountered in heritage buildings, where traditional structural materials coexist with contemporary furnishings and operational necessities. This duality, combined with Safranbolu's documented fire history and the availability of detailed building records, enables the development of a replicable analytical framework applicable to heritage structures in similar contexts worldwide.

Historically, the building served as the Karabük University Fethi Toker Faculty of Fine Arts and Design between 2002 and 2015. At present, it is used for meetings and exhibitions. Furnishings include armchairs, tables, cabinets, curtains, and carpets, contributing to the overall fire load. Fire protection equipment currently installed in the building consists of a hand-held extinguisher containing dry chemical powder and a 30-meter-long fire hose (Figure 3).




**Figure 3.** The Stone Building selected as the case study area (above), and existing firefighting equipment (below) (Personal archive)

In order to assess the potential fire risk of the historic building, it is first necessary to determine the fire load densities of its spaces. For this purpose, data on the volume, calorific (unit heat) value, and density of combustible materials were collected, and fire loads were calculated separately for fixed (e.g., structural elements) and movable (e.g., furniture, carpets, curtains) materials. These two categories were then combined to obtain the total fire load of the building, which was normalized by the floor area to determine the total fire load density. The calculations were carried out using Eqs. (1) and (2)

$$FL = \sum_{i=1}^{N} M_i \, x \, C_i \quad (1)$$

$$FLD = \frac{\sum_{i=1}^{N} M_i x \, C_i}{A_f} \quad (2)$$

In these equations, FL represents the fire load (MJ), while $M_i$ (kg) denotes the mass of the i-th substance in a space containing N substances, and $C_i$ (MJ/kg) refers to its unit heat value. The fire load density (FLD) is defined as the ratio of the fire load to the floor area $A_f$ (m²) of the space, expressed in MJ/m² [9]. For clarity, large-scale energy values in this study are presented in gigajoules (GJ), where 1 GJ = 1,000 MJ, while fire load density values are reported in MJ/m², in accordance with standard fire safety literature.

In the subsequent stage, the calculated fire load and fire load density values were compared with reference values reported in the literature, and the overall fire risk of the building (classified as low, medium, high, etc.) was determined (Figure 4).

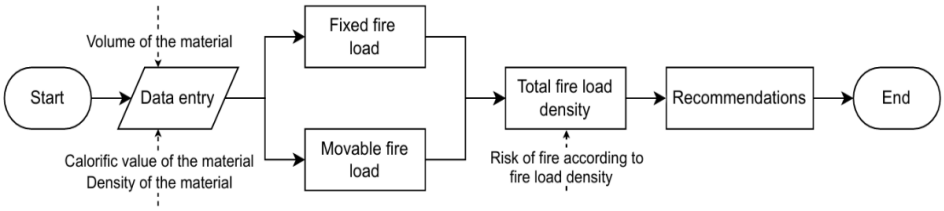


**Figure 4.** Flow chart of fire load and risk analysis process

All combustible building components and non-structural elements were included within the scope of this study. The materials considered in the analysis comprised wooden floors, ceiling and wall coverings, furniture, and curtains. According to Eurocode 1 [20], only combustible materials or fire dynamics that contribute to the fire load are taken into account, while natural stone materials are excluded from thermal effect calculations. In this context, the contribution of stone elements to the fire load was not considered in the present study.

The concept of Fixed Fire Load (FFL) refers to the fire load associated with elements that are generally immovable within the building, whereas Movable Fire Load (MFL) refers to the fire load originating from movable elements [12]. An initial on-site survey was conducted to identify combustible materials present in the building, and a comprehensive inventory was created. The type and quantity of materials were determined through direct measurements and supplemented with information obtained from available documents. For the calculations, the volume, density, and unit heat values of combustible components such as wooden floors, ceiling coverings, furniture, and textiles were utilized. These values were derived from previously published studies. The properties of the most frequently used materials in the building, as well as those with the highest calorific (unit heat) values, are presented in Table 1.

**Table 1.** Calorific values and density of materials used in the building [21-34]

| Material Type | Calorific Value (Unit Heat Value) (c)(GJ/kg) | Density (d)(kg.m$^{-3}$) |
|---|---|---|
| Wool | 2.310E-2 | 1.72 |
| Scots pine | 1.843E-2 | 550 |
| Plastic | 4.37E-2 | 886 |
| Hornbeam | 1.654E-2 | 786 |
| Walnut | 2.321E-2 | 660 |
| Polyester Fabric | 1.13E-2 | 0.001 |

In determining the fire load, it was assumed that all combustible materials within the space were evenly distributed and completely combusted. Following this assumption, the total fire load of the materials on the roof and on each floor was calculated separately for fixed and movable components. The fire load density of each floor was then obtained by dividing the total fire load by the corresponding floor area, expressed in MJ/m², and subsequently converted to GJ/m² for consistency in presenting large-scale values. The resulting fire load density values were analyzed with reference to the risk classification table provided in the literature (Table 2).

**Table 2.** Fire outbreak risk according to fire load density [35]

| Fire Risk Level | | Fire Load Density (GJ/m$^2$) |
|---|---|---|
| Low | 1 | FLD ≤ 0.425 |
| | 2 | 0.425 < FLD ≤ 0.850 |
| Medium | 3 | 0.850 < FLD ≤ 1.275 |
| | 4 | 1.275 < FLD ≤ 1.700 |
| | 5 | 1.700 < FLD ≤ 3.400 |
| High | 6 | 3.400 < FLD ≤ 6.800 |
| | 7 | 6.800 < FLD ≤ 13.600 |
| | 8 | 13.600 < FLD |

## 4. Findings and Discussion

The fire load analysis demonstrates that the Stone Building exhibits a significantly elevated fire risk due to the extensive presence of combustible materials, particularly Scots pine structural elements and modern plastic furnishings. With a total fire load density of 6.713 GJ/m², the building falls into the High Fire Risk category (Level 6), approaching the upper threshold of this classification.

### *4.1. Fixed Fire Load Analysis*

The total fixed fire load was calculated as 2.757 GJ, accounting for 63.8% of the building's overall fire load (Table 3). Scots pine, with its relatively high calorific value ($1.843 \times 10^{-2}$ GJ/kg), represents the dominant contributor to the fixed fire load distribution. Among the individual components, ceiling beams constitute the largest single source at 1.102 GJ (39.9% of the fixed load), followed by door and window joinery at 0.628 GJ (22.8%). Floor coverings contribute 0.281 GJ (10.2%), while ceiling coverings add 0.087 GJ (3.1%). Additional contributions arise from ceiling cornices (0.323 GJ, 11.7%), roof structural elements (0.114 GJ, 4.1%), and other miscellaneous wooden components. Collectively, these elements create a concentration of fire load that facilitates rapid vertical fire propagation throughout the structure.

This distribution pattern indicates that ceiling and floor assemblies pose the greatest risk for fire spread due to their high concentration of combustible material. Because these structural elements are integral to the building's historical fabric, their replacement or modification poses particular challenges: fire risk mitigation strategies must therefore balance safety requirements with the preservation of heritage authenticity (Table 3).

**Table 3.** Total fixed fire load (TFFL)

| Flammable Material | Material | Volume (V-m$^3$) | | | Density (d-kg.m$^3$) | Total Number (N) | Unit Heat Value (c-GJ.kg$^{-1}$) | Fixed Fire Load (FFL- GJ) |
|---|---|---|---|---|---|---|---|---|
| | | Length (L-m) | Width (W-m) | Height (H-m) | | | | |
| Ceiling Coating | Scots pine | 428.81 | | 0.02 | 550 | 1 | 1.843E-2 | 86.813 |
| Floor Coating | Scots pine | 1384.62 | | 0.02 | 550 | 1 | 1.843E-2 | 280.705 |
| Ceiling Beaming | Scots pine | 1552.68 | 13.00 | 0.17 | 550 | 1 | 1.843E-2 | 1101 |
| Ceiling Cornice | Scots pine | 417.94 | 3.80 | 0.02 | 550 | 1 | 1.843E-2 | 322.665 |
| Roof Strut | Scots pine | 0.20 | 0.20 | 28.62 | 550 | 1 | 1.843E-2 | 11.604 |
| Roof Purlin/Pitch | Scots pine | 0.15 | 0.20 | 85.45 | 550 | 1 | 1.843E-2 | 25.984 |
| Roofing | Scots pine | 431.77 | | 0.02 | 550 | 1 | 1.843E-2 | 88.270 |
| Treillage | Scots pine | 1.00 | 0.10 | 0.90 | 550 | 47 | 1.843E-2 | 42.877 |
| Window | Scots pine | | 0.36 | | 550 | 93 | 1.843E-2 | 338.806 |
| Door | Scots pine | | 1.50 | | 550 | 19 | 1.843E-2 | 289.230 |
| Staircase | Scots pine | | 16.67 | | 550 | 1 | 1.843E-2 | 169.048 |
| | | | | | | | Total Fixed Fire Load (GJ) | 2.757 |

### *4.2. Movable Fire Load Analysis*

The total movable fire load was calculated as 1.567 GJ, representing 36.2% of the building's overall fire load (Table 4). Plastic chairs were identified as the dominant contributor, accounting for 1.161 GJ (74.1% of the movable load) owing to their exceptionally high calorific value ($4.37 \times 10^{-2}$ GJ/kg). This result underscores the disproportionate influence of modern furnishing materials on the fire risk profile of historic buildings. Walnut furniture components represent the second most significant source, with closets contributing 0.202 GJ (12.9%) and tables 0.162 GJ (10.3%). Additional contributions arise from hornbeam sofa sets (0.042 GJ, 2.7%), wool carpets (0.053 GJ), and polyester curtains ($6 \times 10^{-5}$ GJ), although their overall impact remains minimal. The predominance of plastic furniture in the movable fire load clearly demonstrates how the integration of contemporary materials can substantially alter fire risk conditions in heritage contexts. Notably, the 417 plastic chairs alone contribute more energy than all wooden structural components combined in certain sections of the building (Table 4).

**Table 4.** Total movable fire load (TMFL)

| Flammable Material | Material | Volume (V-m$^3$) | | | Density (d-kg.m$^3$) | Total Number (N) | Unit Heat Value (c-GJ.kg$^{-1}$) | Movable Fire Load (MFL- GJ) |
|---|---|---|---|---|---|---|---|---|
| | | Length (L-m) | Width (W-m) | Height (H-m) | | | | |
| Carpet | Wool | 2 | 3 | 0.008 | 1.72 | 28 | 2.310E-2 | 0.053 |
| Table | Walnut | 1.40 | 1.20 | 0.90 | 660 | 7 | 2.321E-2 | 162.132 |
| Chair | Plastic | 0.40 | 0.40 | 0.45 | 886 | 417 | 4.37E-2 | 1161 |
| Sofa Set | Hornbeam | 4.16 | 0.88 | 0.88 | 786 | 1 | 1.654E-2 | 41.643 |
| Closet | Walnut | 1.0 | 0.83 | 2 | 660 | 8 | 2.321E-2 | 202.205 |
| Curtain | Polyester | | 0.204 | | 0.001 | 26 | 1.13E-2 | 6E-5 |
| | | | | | | | Total Movable Fire Load (GJ) | 1.567 |

### *4.3 Total Fire Load Assessment and Risk Classification*

The combined fire load density of 6.713 GJ/m² places the Stone Building within the High Fire Risk category (Level 6) according to established classification standards [35]. This value lies within the range of 3.400–6.800 GJ/m² but is close to the upper threshold, indicating severe fire risk conditions that warrant immediate attention.

The fire load distribution highlights specific vulnerabilities: ceiling systems dominate the fixed fire load, while plastic furnishings overwhelmingly shape the movable fire load. This combination creates a compound risk scenario in which both structural fires and contents fires could propagate rapidly and with considerable intensity. Graphics 2 and 3 clearly illustrate this distribution, showing the concentrated accumulation of fire loads in particular building elements and furnishing categories. The building's proximity to the upper limit of Level 6 classification underscores the urgent need for mitigation strategies to reduce the total fire load and prevent escalation into the highest risk category (Level 7: 6.800–13.600 GJ/m²) (Figure 5).

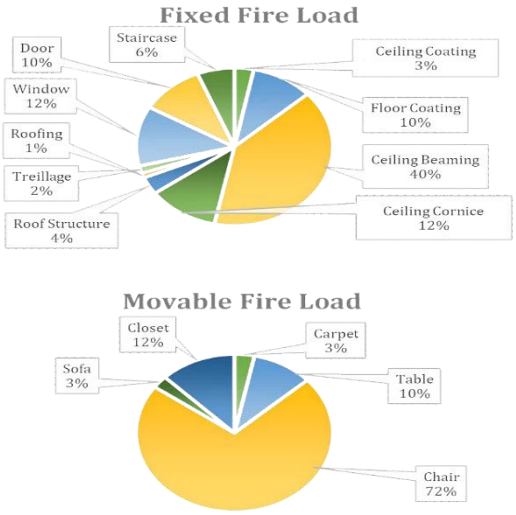


**Figure 5.** Fixed fire load (above), Movable fire load (below)

### *4.4. Comparative Analysis with Literature*

Table 5 presents a comparison between the fire load density of the Stone Building and those reported for similar historic structures in previous studies. The Stone Building's fire load density of 6.713 GJ/m² substantially exceeds most comparable examples, which typically range between 3.096 and 5.297 GJ/m² [5,36]. This elevated risk profile can be attributed to two primary factors: the extensive use of Scots pine in structural components and the considerable presence of high-calorific plastic furniture.

A direct comparison with Qingyun Academy (5.297 GJ/m²) and various historic halls in China (3.096–4.336 GJ/m²) illustrates that, although wooden heritage buildings generally exhibit elevated fire loads, the Stone Building's values surpass the commonly observed range. This deviation highlights the critical role of material management strategies—particularly the reduction or replacement of high-calorific modern furnishings—in mitigating fire risk, while preserving the structural and historical authenticity of the building.

**Table 5.** Comparison of total fire load densities obtained from experiments and literature [5], [36]

| No: | Building Type | Building Area (m²) | Total Fire Load Density (GJ/m²) |
|---|---|---|---|
| 1 | Qingchenggong Hall | 414.53 | 4.223 |
| 2 | Qifobao Hall | 369.90 | 3.471 |
| 3 | Daxiong Hall | 341.00 | 3.788 |
| 4 | Wuliang Shoufo Hall | 254.82 | 3.848 |
| 5 | Jingshan Park Side Hall | 240.35 | 3.897 |
| 6 | Shenchuzheng Hall | 342.42 | 3.336 |
| 7 | Hanyuan Hall | 296.02 | 3.095 |
| 8 | Bai Hall | 595.89 | 4.335 |
| 9 | Qingyun Academy | 322.60 | 5.297 |
| 10 | Stone Building (This Study) | 644.28 | 6.712 |

### *4.5. Material Interventions*

Based on the fire load analysis, material-based interventions could significantly reduce the building's fire load density while preserving its historical character. Plastic chairs were identified as the dominant contributor to the movable fire load (1.161 GJ, 74.1% of total movable load) due to their high calorific value ($4.37 \times 10^{-2}$ GJ/kg). Replacement with materials of lower unit heat values, such as hardwood chairs ($1.6 \times 10^{-2}$–$1.8 \times 10^{-2}$ GJ/kg) or steel-frame alternatives, could reduce the total movable fire load by 67–88%, corresponding to a building-wide fire load density reduction of 1.2–1.6 GJ/m². The reduction potential was quantified through detailed calculations of plastic chair replacement scenarios. Under current conditions, 417 plastic chairs contribute substantially to the movable fire load, with each chair having a volume of 0.072 m³ (0.40 × 0.40 × 0.45 m), a density of 886 kg/m³, and a calorific value of $4.37 \times 10^{-2}$ GJ/kg. This results in a total fire load of 1.161 GJ ($417 \times 0.072$ m³ $\times$ 886 kg/m³ $\times$ $4.37 \times 10^{-2}$ GJ/kg).

In Scenario A, replacement with hardwood chairs (oak, $1.7 \times 10^{-2}$ GJ/kg calorific value, density 750 kg/m³) [37] yields a total fire load of 0.382 GJ ($417 \times 0.072$ m³ $\times$ 750 kg/m³ $\times$ $1.7 \times 10^{-2}$ GJ/kg). This represents a reduction of 0.779 GJ, corresponding to a 67% decrease in chair-related fire load and translating into a building-wide fire load density reduction of 1.21 GJ/m². In Scenario B, replacement with steel-frame chairs upholstered with polyester results in an estimated total fire load of 0.142 GJ ($417 \times 0.01$ m³ upholstery $\times$ 30 kg/m³ $\times$ $1.13 \times 10^{-2}$ GJ/kg). Although this calculation is based on an approximate calorific value for polyester, it suggests an 88% reduction relative to current plastic chairs, corresponding to a building-wide density reduction of 1.58 GJ/m².

These results demonstrate that strategic furniture replacement could reduce the building's overall fire load density from 6.713 GJ/m² to approximately 5.5–5.9 GJ/m². Such a reduction may shift the building closer to a lower risk classification threshold, thereby significantly improving its fire safety profile while maintaining functional requirements. With regard to fixed fire loads, Scots pine structural elements ($1.843 \times 10^{-2}$ GJ/kg) remain the dominant contributors, particularly ceiling beams (39.9% of the fixed load). While

replacement of these elements is not feasible due to heritage constraints, fire-retardant treatments could potentially lower effective calorific values by 15–25%. However, their application in heritage contexts is limited by concerns such as potential alterations to visual appearance, uncertain long-term durability, and increased maintenance requirements. In contrast, floor and ceiling coverings (13.3% combined) may offer greater flexibility for substitution with fire-resistant alternatives without compromising historical authenticity. Future material selection for heritage buildings should prioritize materials with calorific values below $2 \times 10^{-2}$ GJ/kg in high-volume applications, provided that heritage compatibility is ensured. Nonetheless, these recommendations represent only theoretical fire load reduction potential. Practical implementation requires further specialized investigations, including structural performance analysis, heritage conservation assessment, fire dynamics modeling, and regulatory compliance evaluation. The interventions proposed here therefore establish a foundation for fire load reduction strategies, which must ultimately be validated through comprehensive multidisciplinary assessments before application.

### *4.6. Practical Implications and Fire Safety Strategies*

The High Fire Risk classification (Level 6), with a fire load density of 6.713 GJ/m², necessitates immediate and comprehensive fire safety interventions extending beyond material replacement strategies. This classification not only triggers regulatory requirements but also provides critical baseline data for systematic risk management in heritage buildings. The building's proximity to the upper threshold of Level 6 highlights the urgency of proactive measures to prevent escalation into the highest risk category (Level 7: 6.800–13.600 GJ/m²) and to address vulnerabilities related to rapid fire propagation. Enhanced fire detection and suppression systems constitute the most urgent interventions for structures at this risk level. Given the concentration of fire loads in ceiling systems (39.9% of fixed load) and the potential for rapid vertical fire spread through wooden structural elements, early detection becomes essential to prevent catastrophic losses. The use of heritage-compatible suppression technologies—such as water mist systems designed specifically for historic buildings—could provide effective fire control while minimizing collateral water damage to irreplaceable cultural materials and architectural features.

The findings carry important implications for fire safety planning across Safranbolu's historic building stock, particularly considering the 58 fire incidents recorded in the Historic Bazaar area over the past 11 years. The quantitative methodology presented in this study enables resource prioritization based on empirical fire load analysis rather than subjective assessments. This approach supports the development of evidence-based fire safety protocols applicable not only in Safranbolu but also across UNESCO World Heritage sites with comparable fire risk profiles. Emergency response planning and building management protocols must also be reconsidered in light of these results. The combination of extensive wooden structural systems with high-calorific plastic furniture (74.1% of movable loads) creates compound risk scenarios that require specialized evacuation procedures and fire service strategies. Furthermore, the integration of quantitative fire load data into insurance risk assessments, regulatory compliance frameworks, and conservation planning represents a critical step in balancing cultural preservation objectives with public safety requirements.

### *4.7. Study Limitations*

This study focuses exclusively on fire load quantification through material analysis and does not incorporate fire dynamics, structural performance, or the effectiveness of suppression systems. Several methodological limitations may affect the accuracy and generalizability of the findings. First, the reliance on literature-derived material property values rather than laboratory testing of building-specific samples introduces uncertainty in the fire load estimates. Calorific values vary considerably with material age, moisture content, treatment history, and local sourcing conditions, factors not fully captured by generalized literature values.

Second, the assumption of complete combustion provides conservative estimates of fire load but may overstate actual fire risk. In real-world conditions, combustion efficiency is significantly influenced by oxygen availability, ventilation patterns, compartmentalization, and suppression efforts. Building fires rarely achieve complete combustion; instead, efficiency typically ranges between 60% and 80% depending on ventilation and material configuration. Finally, this study does not account for spatial distribution effects of fire loads. The arrangement and density of combustible materials within rooms can substantially alter fire spread patterns and heat release rates. The assumption of uniform material distribution may therefore oversimplify actual fire behavior in heritage buildings, which often feature complex spatial configurations and heterogeneous material concentrations.

## 5. Conclusion

This study presents a comprehensive quantitative fire load assessment of a representative historic building in the Safranbolu UNESCO World Heritage site, thereby contributing empirical evidence to the limited database on heritage fire safety research. The systematic analysis of fixed and movable fire loads provides critical insights into material-related fire risk factors that affect historic structures. The Stone Building was found to have a total fire load density of 6.713 GJ/m², placing it in the *High Fire Risk* category (Level 6) and considerably exceeding comparative values reported for similar historic buildings (3.096–5.297 GJ/m²). Fixed fire loads (2.757 GJ) are dominated by Scots pine structural elements, with ceiling beams accounting for 39.9% and floor coverings 10.2% of the total. Movable fire loads (1.567 GJ) are overwhelmingly attributed to plastic chairs (74.1%), illustrating how modern furnishing choices can dramatically reshape the fire risk profile of heritage buildings. These findings underscore the decisive influence of material selection on fire safety, with high-calorific materials producing disproportionate hazards.

Material-based interventions demonstrate substantial potential for reducing fire risk while maintaining historical

integrity. Strategic replacement of plastic furnishings with alternatives of lower calorific value could reduce total fire load density by 1.2–1.6 GJ/m², potentially shifting the building toward a lower risk classification. This case study thus establishes a replicable methodology for fire load assessment in heritage contexts, offering a foundation for evidence-based risk management and informing preservation planning, insurance assessments, and regulatory compliance strategies. The results provide immediate practical implications for heritage fire safety management. Insurance institutions may utilize the findings to develop evidence-based premium models, while regulatory authorities can design heritage-specific fire safety codes. Furniture replacement emerges as the most technically and economically feasible intervention, offering reductions of 67–88% in chair-related fire load with moderate investment and minimal impact on heritage authenticity. From a cost–benefit perspective, such interventions present an effective strategy for catastrophic loss prevention, provided they are implemented in coordination with conservation specialists and fire safety engineers. The High Fire Risk classification further emphasizes the urgent need for enhanced detection systems, revised emergency planning, and the formulation of heritage-sensitive fire safety protocols for Safranbolu's broader building stock. Although based on a single case study, the Stone Building's representative features—its hybrid nature combining traditional construction with contemporary usage—ensure that the findings are broadly applicable to similar heritage sites undergoing adaptive reuse. Nevertheless, this research is subject to certain limitations. The scope is restricted to fire load quantification through material analysis and does not incorporate fire dynamics, structural resistance, or suppression system performance. The assumption of complete combustion, while providing conservative estimates, does not fully reflect realistic fire scenarios in which ventilation, compartmentalization, and suppression significantly influence fire behavior. In addition, the reliance on literature-based material property values, rather than laboratory analysis of building-specific samples, introduces uncertainty into the fire load calculations.

Future studies should expand upon this work by integrating fire dynamics modeling to evaluate realistic spread patterns in heritage structures, analyzing structural fire resistance of traditional materials, and assessing the compatibility of modern fire protection technologies with conservation requirements. Comparative analyses across a broader range of historic building typologies would further improve the generalizability of fire load assessment methodologies. Economic feasibility studies and the development of heritage-specific fire safety standards represent further priorities requiring interdisciplinary collaboration.

In conclusion, historic buildings necessitate specialized fire risk assessment approaches that account for their distinctive material compositions, construction techniques, and preservation constraints. This study demonstrates that systematic fire load analysis provides valuable insights into heritage fire safety, while establishing critical baseline data for future research. Effective fire risk management in heritage contexts requires not only recognition of material contributions and the impact of contemporary additions, but also the implementation of intervention strategies that preserve cultural authenticity while safeguarding human life and property.

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Research Article

# Green Envelope Systems for Enhanced Thermal Performance and Reduced Energy Demand in Mosques in Hot Climates

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**Keywords**

Green System,
Green Roof,
Energy Consumption,
Cooling Load,
CO2 Reduction.

**Abstract**

This study examines the effectiveness of integrating green roof and green façade systems as passive strategies to improve the thermal performance and environmental sustainability of a large-scale religious building—the Imam Al-Bukhari Mosque, located in Tripoli, Libya. The research addresses a significant knowledge gap concerning the application of green envelope technologies in mosques situated in hot Mediterranean climates. Three simulation scenarios were developed using DesignBuilder (v6), powered by EnergyPlus: (1) the existing building (baseline), (2) green roof combined with direct green façade (Sc-1), and (3) green roof combined with indirect green façade (Sc-2). The analysis covered energy consumption (kWh/m²), heating and cooling demands, and annual $CO_2$ emissions (kg/m²), based on hourly climatic data derived from the Tripoli Meteonorm weather file. The results demonstrate substantial energy and environmental gains with the implementation of green systems. Compared to the baseline, Scenario 1 achieved reductions of 11.1% in total energy consumption, 13.0% in cooling load, 86.2% in heating demand, and 10.5 kg/m² in annual $CO_2$ emissions. Scenario 2, featuring an indirect façade configuration, showed superior performance across all metrics with a 12.9% reduction in energy use, 15.2% in cooling load, 88.8% in heating demand, and 12.18 kg/m² in $CO_2$ savings. These improvements are attributed to the enhanced thermal insulation, evaporative cooling, and air buffering provided by the green envelope systems. This study underscores the significant potential of green roofs and façades to reduce operational energy use and environmental impact in religious buildings. Findings support their broader adoption in arid and semi-arid urban contexts, especially when indirect façade configurations are applied. The study also contributes to the literature by providing scenario-based evidence for mosque retrofits and the integration of green infrastructure in the Mediterranean region.

## 1. Introduction

The building sector is one of the major contributors to global energy consumption and environmental degradation. According to the International Energy Agency (IEA), buildings are responsible for nearly 30% of final energy use globally and emit a significant portion of carbon dioxide emissions associated with fossil fuel consumption [1]. The World Energy Council (WEC) further highlights that enhancing building energy performance, especially in hot climates, is crucial to achieving global sustainability targets [2]. In this context, the role of passive energy strategies has gained increasing attention. Unlike mechanical solutions, passive design strategies—including natural ventilation,

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thermal mass optimization, and green envelope systems—offer low-cost and environmentally friendly approaches to improving indoor thermal comfort and reducing energy demand [3]. Among these, green systems—comprising green roofs and green facades—are increasingly integrated into building envelopes due to their capacity to act as thermal buffers, mitigate the urban heat island (UHI) effect, enhance biodiversity, and support stormwater management [4], [5].

The concept of integrating vegetation into architecture is not new. From the legendary Hanging Gardens of Babylon to the pioneering visions of Le Corbusier in the 20th century, nature has consistently played both symbolic and functional role in the built environment. However, the modern green roof typologies—categorized as extensive, intensive, and semi-intensive—have been systematically studied only in recent decades [6]. Extensive green roofs, characterized by shallow soil and drought-resistant vegetation, are lightweight and require minimal maintenance, making them ideal for retrofitting. Intensive green roofs, on the other hand, can support a wider variety of plant species, including trees but involve higher structural loads and maintenance requirements [7].

Green façades are another important typology of vertical greening systems, typically divided into two categories: direct greening, in which climbing plants grow directly on the façade, and indirect greening, which employs supporting structures such as trellises [8]. Both types provide shade and evaporative cooling, reducing heat gain on building surfaces and, consequently, decreasing cooling loads.

Numerous studies have demonstrated the performance benefits of green envelopes. For example, Bevilacqua [9] showed that green roofs can reduce indoor temperatures by up to 4–6°C in warm climates. Similarly, Florides et al. [10] highlighted the potential of green facades in shielding envelopes from solar radiation and decreasing thermal transmittance. In Mediterranean contexts, studies by Eumorfopoulou and Aravantinos [11] and Santamouris et al. [12] have emphasized the effectiveness of vegetated surfaces in enhancing thermal performance and occupant comfort during the summer months.

Despite the wealth of research on residential and commercial buildings, a significant gap remains in the literature regarding the application of these systems in religious structures—particularly mosques. Mosques are among the most frequently visited and symbolically significant buildings in Muslim societies. Given their large interior volumes, high ceilings, and typically continuous daytime use, mosques have high energy demands, especially for cooling in hot climates [13]. Moreover, their architectural constraints often limit the applicability of conventional energy retrofit strategies.

In Türkiye and other Islamic countries with hot and arid or Mediterranean climates, mosques represent a substantial portion of the urban architectural fabric. However, few studies have explored the potential of integrating passive design strategies, such as green roofs and facades, into mosque architecture. Research by Jim [14] suggested that integrating bioclimatic elements into buildings could enhance sustainability while preserving architectural integrity. Yet, mosque-specific studies remain rare.

To address this research gap, this study investigates the effect of green envelope systems—both green roofs and green facades—on the indoor energy performance of mosques located in hot climate regions. By selecting a representative case in a hot climatic zone and analyzing various envelope configurations through simulation-based methods, the study aims to assess energy savings potential and indoor thermal behavior associated with green system integration.

In addition to environmental benefits, green systems also have symbolic and socio-cultural relevance in the context of Islamic architecture, where gardens and vegetation are traditionally associated with serenity, paradise, and spiritual well-being [15]. Therefore, this research not only addresses an ecological imperative but also aligns with the cultural heritage of mosque design.

This study makes a unique contribution to the literature by combining architectural simulation with passive system evaluation specifically for mosque buildings—a typology largely overlooked in current energy research. The outcomes are expected to offer practical insights for architects, engineers, and decision-makers seeking sustainable retrofitting strategies in climate-sensitive regions.

## 2. Material and Method

### *2.1. Case Study and Climatic Context*

This study investigates the application of green systems (GS) to the Imam Al-Bukhari Mosque, a prominent religious facility located in Tripoli, Libya (Fig. 1). As one of the largest mosques in the country, accommodating up to 2,400 worshippers, the building holds significant architectural and cultural value. Its large surface area, symbolic identity, and central location within a dense urban environment make it a valuable prototype for testing energy-efficient retrofitting strategies in similar religious structures across North Africa and the broader MENA region.

The selection of this mosque is motivated by the lack of green system integration in large-scale religious buildings in Libya, despite their substantial operational energy consumption. Previous studies have shown that mosques, due to their unique operational patterns—including continuous use throughout the day, high occupant density during prayer times, and large, often uninsulated domed spaces—consume more energy than comparable non-residential buildings [16], [17]. Therefore, introducing passive or semi-passive systems, such as green roofs and façades, into mosque architecture has the potential to significantly reduce cooling loads while maintaining indoor thermal comfort.

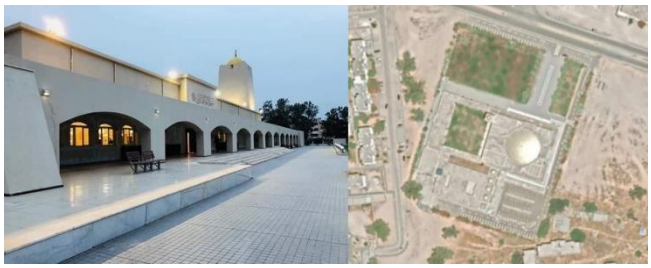

**Figure 1.** Imam Al-Bukhari Mosque and layout plan

Tripoli, the capital of Libya, is situated along the Mediterranean coastline and is characterized by a hot semi-arid climate (BSh) according to the Köppen–Geiger classification [18]. The city experiences long, dry, and extremely hot summers, with daytime temperatures often exceeding 35°C from June to September. Winters are mild and relatively wet, with average monthly temperatures ranging from 10°C to 18°C, and annual precipitation totaling approximately 370–400 mm, most of which falls between December and February [19]. Relative humidity during the summer months tends to be low (often below 30%), which increases evaporative cooling demands and contributes to higher indoor thermal stress (Figure 2).

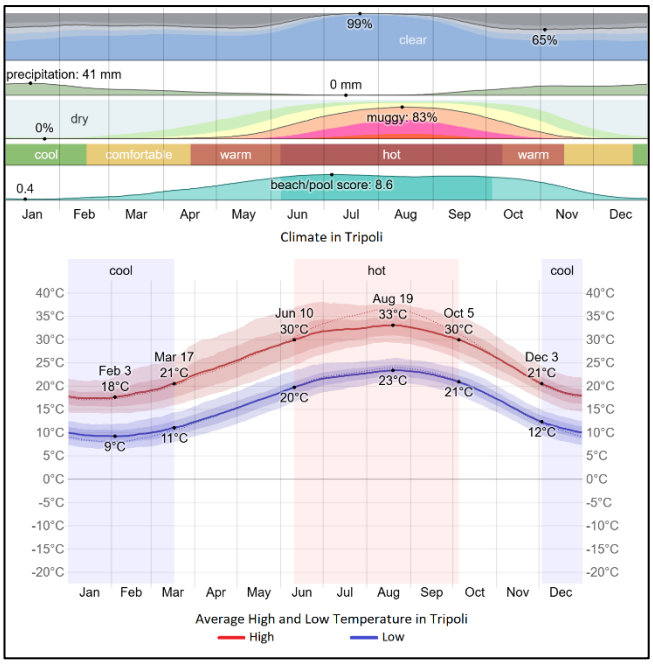


**Figure 2.** Tripoli climatic properties [20], [21]

Furthermore, natural ventilation is largely ineffective in such climates due to the weak prevailing winds and the massive, thermally inert envelopes of mosque buildings [22]. During winter, the prevailing winds come from the west and northwest, carrying some moisture from the Mediterranean Sea; however, their cooling effect is negligible during the peak summer period.

Given these environmental challenges, passive design strategies that incorporate vegetative systems are increasingly recognized for their ability to reduce rooftop solar gain, improve building envelope performance, and mitigate urban heat island effects [23], [24]. However, there remains a significant research gap regarding the integration of such systems in religious buildings—particularly mosques located in hot-arid and Mediterranean transitional climates. This study aims to address this gap by simulating the energy-saving potential of green roof and façade systems applied to the Imam Al-Bukhari Mosque, and by assessing their impact on indoor thermal conditions and annual cooling energy demand.

### *2.2. Simulation Tool, Approach and Parameters*

The simulation was conducted using DesignBuilder V6, a widely recognized building performance simulation software that operates on the EnergyPlus engine. DesignBuilder is commonly used for dynamic building simulation, enabling detailed modeling of energy performance, including HVAC behavior, thermal loads, and passive systems [25]. This platform supports detailed dynamic thermal modeling by incorporating a range of building parameters, such as geometry, orientation, construction materials, occupancy schedules, lighting loads, and HVAC system performance. Its robust capabilities allow for both annual and seasonal assessments of energy consumption, making it a reliable tool for evaluating passive design interventions in complex building types like mosques.

As illustrated in Figure 3, the Imam Al-Bukhari Mosque was initially modeled in its current configuration to establish a baseline energy consumption profile. The model accurately represents the mosque's architectural form, spatial layout, and thermal properties of the building envelope materials. Following validation of the baseline model, two green system scenarios were implemented and simulated: (i) a green roof combined with a direct green façade, and (ii) a green roof combined with an indirect green façade. These scenarios were carefully developed to reflect feasible retrofit strategies that could be applied to the existing mosque structure without altering its functional or religious identity.

Each scenario was simulated under identical boundary conditions, including occupancy profiles and climatic inputs, to ensure a valid comparison of results. The integration of green systems was evaluated in terms of their impact on cooling and heating load reduction, $CO_2$ emission reduction, and overall annual energy demand. This modeling approach provides a robust understanding of how vegetative systems influence building energy performance, particularly in hot-dry climates such as that of Tripoli.

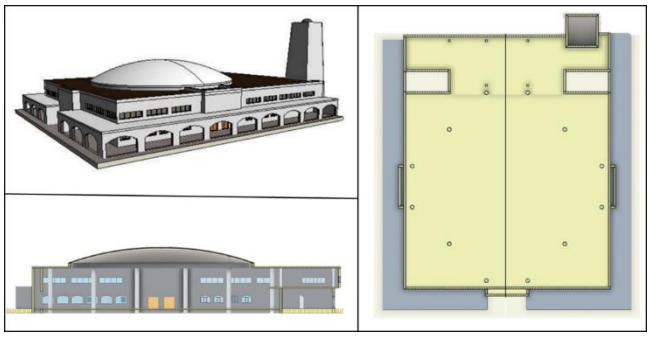

**Figure 3.** Model of the mosque

The internal loads, occupancy schedules, and HVAC configurations were customized to reflect typical mosque usage patterns in Tripoli, Libya's Mediterranean climate. Hourly weather data from the Climate.OneBuilding database [26] were used to simulate a full calendar year (8760 hours), capturing seasonal variations in solar radiation, temperature, wind, and humidity.
Key simulation parameters included:

Simulation period: Full year (8760 hours)

Weather data source: Tripoli_Meteonorm.epw [26].

HVAC setpoints: 22°C for cooling, 20°C for heating, following ASHRAE 55 guidelines [27].

Occupancy: Five daily prayer sessions, assuming full capacity (2400 people) during peak hours.

Lighting load: 5 W/m², scheduled around prayer and night usage [28].

Ventilation strategy: Natural ventilation in off-peak hours; mechanical ventilation during peak occupancy

Thermal zoning: Modeled as a single conditioned thermal zone.

Simulation timestep: 1 hour.

Envelop airtightness was set at 0.7 ACH, reflecting best practices for naturally ventilated spaces. Ground reflectance was assumed to be 0.2, while roof albedo was defined based on the green roofing materials used. Occupancy profiles were seasonally adjusted in accordance with local religious practices and daylight variability [29]. The electrical emission factor used for $CO_2$ savings calculations was 0.42 ton$CO_2$eq/MWh.

### *2.3. Green System Scenarios*

Three simulation scenarios were developed to evaluate the thermal and environmental impacts of the green system interventions:

Baseline: The existing building configuration without any green interventions.

Scenario 1 – Green Roof + Direct Green Façade: A green roof combined with a vegetated façade, where plants are directly attached to the wall surface.

Scenario 2 – Green Roof + Indirect Green Façade: A green roof combined with green façades supported by a metal frame creating a buffer layer between the vegetation and building surface.

All exterior façades were subjected to greening treatments in Scenarios 1 and 2.

### *2.4. Green System Design Parameters*

The green systems applied to the mosque model include an extensive green roof and two types of vertical green façade systems, each with a multilayer composition reflecting standard construction practices for vegetated envelopes. These layers were carefully integrated into the simulation to analyze their thermal behavior and energy performance under Tripoli's climatic conditions. The material properties, layer thicknesses, and thermal transmittance (U-values) of each component are detailed.

*Green Roof Assembly*

The green roof system—as it appears in Figure 4—consists of five main layers, each of which plays a role in enhancing the system's insulation, moisture retention, and drainage performance (Table 1).

**Table 1.** Simulation results

| Material | Thickness (mm) | U-value (W/m²K) |
|---|---|---|
| Soil | 100 | 1.28 |
| Filter layer (Carpet | 3 | 0.06 |
| Drainage layer (PVC) | 100 | 0.17 |
| Protection layer (Polyethylene) | 6 | 0.50 |
| Waterproofing (Bitumen) | 5 | 0.23 |
| Roof (Concrete) | 10 | 1.30 |

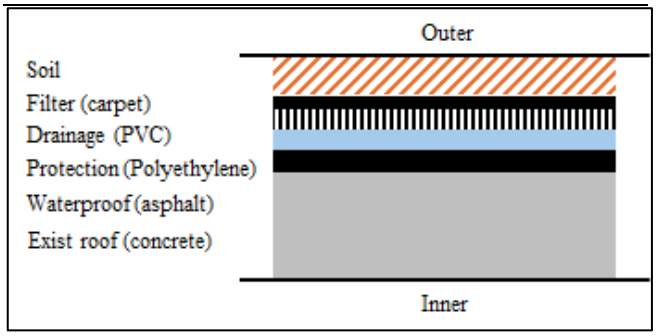


**Figure 4.** Green roof system used in the study

These layers are typical of extensive green roof systems, which are lighter and require less maintenance than intensive systems, making them suitable for retrofit applications on existing structures, such as the Imam Al-Bukhari Mosque.

*Vegetation and Soil Characteristics*

The vegetated layer was modeled using parameters that reflect dense, drought-tolerant plant species commonly used in arid and Mediterranean climates. Key parameters include:

- Soil thickness: 10 cm
- Vegetation thickness: 10 cm
- Leaf Area Index (LAI): 5
- Soil density: 1460 kg/m³

The LAI value—a measure of the total leaf area per unit ground area—plays a significant role in determining the solar shading effect and evapotranspiration capacity of the vegetative layer. A value of 5 is indicative dense foliage, which is capable of significantly reducing incident solar radiation and contributing to cooling through latent heat exchange.

*Façade Greenery Configurations*

Two vertical greening systems were simulated on the mosque façades as appear in Figure 5:

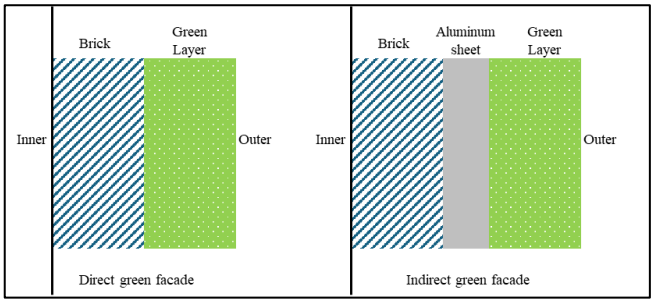


**Figure 5.** Green facade systems used in the study

*Direct Green Façade*: Climbing plants were modeled as growing directly on the building façade surface. This system lacks a ventilation gap and relies on the plant's direct attachment to the wall, which enhances solar shading but may limit convective cooling.

*Indirect Green Façade*: Vegetation was modeled as being supported by an aluminum subframe structure, creating an air cavity between the wall and the plant layer. This configuration promotes stack ventilation, reduces heat transfer through the façade by buffering temperature extremes, and enhances durability by keeping moisture and biological growth away from the main building envelope.

These systems were integrated with care to reflect constructability and climatic appropriateness for the Tripoli region. The differentiation between direct and indirect façade greening allowed for a comparative analysis of thermal buffering capacity, solar gain reduction, and impact on cooling energy demand.

## 3. Results

The data presented in Table 2 offers a comparative analysis of three design scenarios—an existing mosque structure and two intervention cases—focusing on their energy consumption, thermal loads, and associated $CO_2$ savings. The primary objective of the interventions is to assess the environmental performance of implementing green envelopes, specifically green roofs combined with either direct or indirect green façades.

The baseline (existing building) recorded the highest energy consumption at 225 kWh/m², with a cooling demand of 230 kWh/m² and a heating load of 16 kWh/m², resulting in no $CO_2$ savings. These values reflect the typical performance of unmodified buildings in hot-humid climates, where peak summer temperatures and insufficient thermal insulation significantly increase the energy demand for cooling.

**Table 2.** Simulation results

| Scenarios | Energy consumption (kWh/m²) | Cooling Load (kWh/m²) | Heating Load (kWh/m²) | $CO_2$ Saving (kg/m²) |
|---|---|---|---|---|
| Existing building | 225 | 230 | 16 | 0 |
| Sc-1 | 200 | 200 | 2.2 | 10.5 |
| Sc-2 | 196 | 195 | 1.8 | 12.18 |

### *3.1. Energy Consumption*

The annual energy consumption results for the baseline and green system (GS) scenarios are presented in Figure 6. According to the simulation outcomes, the baseline case—which represents the existing mosque structure without any green system interventions—recorded an annual energy consumption of 225 kWh/m². In contrast, Scenario 1, which incorporates a green roof combined with a direct green façade, resulted in a consumption rate of 200 kWh/m², reflecting an 11.1% reduction compared to the baseline. Scenario 2, which employs a green roof in combination with an indirect green façade system, demonstrated the most significant improvement, achieving an energy consumption level of 196 kWh/m²—a reduction of 12.9% compared to the existing condition.

These results emphasize the effectiveness of green systems in moderating indoor thermal loads by enhancing envelope insulation and providing external shading. In particular, the indirect green façade configuration appears to be more efficient, likely due to the ventilated cavity between the vegetation layer and the wall, which facilitates evaporative cooling and reduces solar heat gain. This observation aligns with prior findings by Bevilacqua et al. [9] and Cirrincione et al. [30], who demonstrated that green envelope systems substantially lower cooling energy demands in hot climates by reducing surface temperatures and thermal transmittance.

In conclusion, both green system applications resulted in significant energy savings, with Scenario 2 outperforming Scenario 1. These findings suggest that integrating indirect vertical greening technologies with green roofs can significantly enhance building energy performance, particularly in hot-arid and Mediterranean climates such as Tripoli.

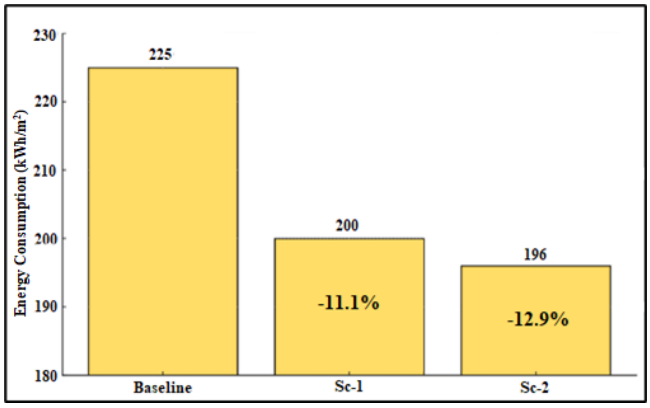


**Figure 6.** Comparison of annual energy consumption (kWh/m²)

### *3.2. Cooling Loads*

Figure 7 presents the annual cooling energy demand for three simulation cases: the baseline mosque model without any green systems, Scenario 1 (Sc-1), which integrates a green roof and direct green façade, and Scenario 2 (Sc-2), which includes a green roof and indirect green façade. The baseline model exhibits the highest cooling energy requirement at 230 MWh annually. When green systems are applied, a noticeable reduction in cooling demand is observed. Sc-1 achieves a 13.0% decrease, reducing total cooling energy to 200 MWh, while Sc-2 provides the greatest reduction of 15.2%, bringing energy consumption down to 195 MWh.

These findings highlight the positive impact of green systems on thermal regulation in buildings located in hot, dry climates such as Tripoli, Libya. The slightly superior performance of Sc-2 is attributed to the use of an indirect façade system, which creates a ventilated air layer between the vegetation and the building wall. This buffer reduces solar heat gain and enhances passive cooling efficiency. These results are consistent with prior research. Bevilacqua et al. [9] emphasized that green façades can reduce wall surface temperatures by up to 10°C and significantly decrease cooling loads in hot climates. Similarly, Cirrincione

et al. [30] confirmed that green roofs improve thermal insulation and lower building surface temperatures through the combined effects of shading and evapotranspiration, leading to energy savings in Mediterranean climates.

In summary, both green roofs and façade systems effectively reduce cooling energy demand, with the indirect green façade offering slightly greater energy savings. This supports the integration of such passive design strategies into mosque architecture and other building types in regions with similar climatic conditions.

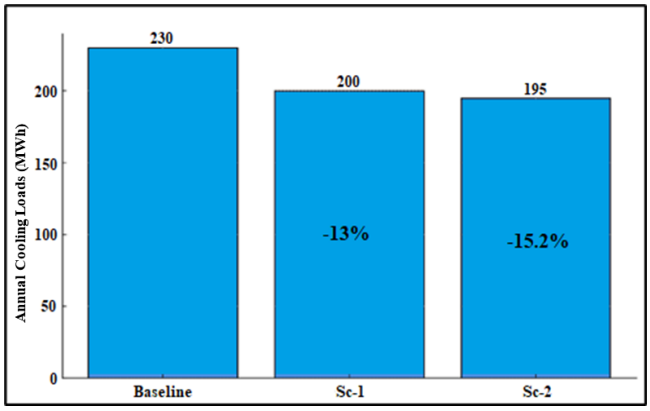


**Figure 7.** Comparison of total cooling load (MWh)

### *3.3. Heating Loads*

Figure 8 presents the annual heating energy demand for three building configurations: the baseline mosque model without green system integration, Scenario 1 (Sc-1), which incorporates a green roof and direct green façade, and Scenario 2 (Sc-2), which applies a green roof with an indirect façade. The baseline model has the highest heating demand at 16.0 MWh/year. In contrast, Sc-1 and Sc-2 show significant reductions in heating energy use, with demands of 2.2 MWh and 1.8 MWh, representing decreases of 86.2% and 88.8%, respectively.

These results suggest that the implementation of green envelope systems—particularly those that combine green roofs with façade vegetation—significantly improves thermal insulation, leading to a substantial reduction in heat loss during the winter season. The indirect façade in Sc-2 performs slightly better, likely due to the ventilated air gap between the vegetation layer and the building envelope, which enhances thermal buffering by reducing heat exchange between the indoor and outdoor environments.

Previous studies support these findings. Bevilacqua et al. [9] reported that vegetative systems significantly enhance the thermal performance of buildings by acting as thermal barriers, reducing heat loss during cold periods. Morover, Ercan et al. [31] determined that green roofs avoid heat loss by 83% compared to the terrace roof. Similarly, Eumorfopoulou and Aravantinos [11] found that green façades contribute to lower heating energy demand by reducing conductive heat losses through walls. The combination of soil layers, vegetation, and protective membranes in green roofs also plays a key role in increasing the effective R-value of the roof system, thereby minimizing energy exchange with the outdoor air.

In conclusion, green systems, especially when implemented as a combined roof and indirect façade solution, offer substantial benefits not only for cooling but also for heating energy savings. This dual-seasonal performance strengthens the case for integrating green infrastructure into building designs located in Mediterranean and similar transitional climate zones.

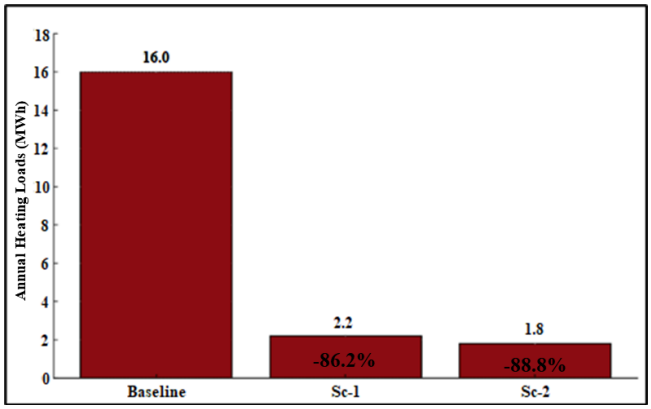


**Figure 8.** Comparison of total heating load (MWh)

### *3.4. CO2 Savings*

Figure 9 compares the carbon dioxide ($CO_2$) emissions reduction across three building configurations: a baseline mosque model without green systems, and two intervention scenarios—Scenario 1 (Sc-1) with a green roof and direct green façade, and Scenario 2 (Sc-2) with a green roof and indirect green façade. As expected, the baseline model provides no emissions savings. In contrast, Sc-1 results in annual $CO_2$ savings of 10.50 kg/m², while Sc-2 achieves 12.18 kg/m², representing an additional 5.4% improvement over Sc-1.

The superior performance of Sc-2 can be attributed to the enhanced insulation and thermal buffering provided by the ventilated air cavity in the indirect green façade. This configuration limits heat exchange more effectively than direct greening systems, thereby reducing the reliance on mechanical heating and cooling, and leading to a greater reduction in fossil fuel-based energy use and associated carbon emissions.

The reduction in $CO_2$ emissions achieved by green envelope systems aligns with prior research. Perini and Magliocco [32] demonstrated that vegetated façades and green roofs can significantly reduce building-related carbon emissions in Mediterranean climates by improving energy efficiency and acting as carbon sinks. Additionally, Coma et al. [33] highlighted the ability of green building envelopes to not only lower energy consumption but also reduce the operational carbon footprint over the building's life cycle.

These results highlight the potential of green infrastructure as a passive design strategy that contributes to climate mitigation goals, particularly in urban environments with high energy demands. Implementing such systems in large-scale public buildings, including mosques, represents a strategic step toward sustainable development in hot-humid and Mediterranean climate zones.

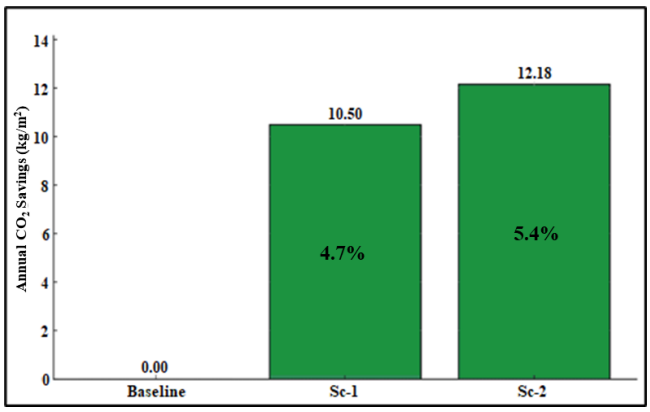


**Figure 9.** Comparison of $CO_2$ savings (kg/m²)

## 4. Discussion

The results of this study demonstrate the significant energy-saving and environmental performance benefits of implementing green roof and green façade systems in a mosque located in a hot Mediterranean climate. By analyzing three scenarios—baseline (existing building), green roof with direct green façade (Sc-1), and green roof with indirect green façade (Sc-2)—the study provides a comprehensive comparison in terms of total energy consumption, thermal loads, and carbon savings.

Overall, Sc-1 and Sc-2 resulted in energy reductions of 11.1% and 12.9%, respectively, compared to the baseline. These findings align with the work of Coma et al. [33], who found that green roofs significantly reduce thermal loads in Mediterranean climates due to their insulation properties and evapotranspiration effects. In this study, the green roof layers—including soil, drainage, filter, waterproofing, and vegetation—reduced heat gains through the roof, leading to notable improvements in cooling energy demand.

"In terms of cooling loads, Sc-1 reduced annual demand by 13.0%, and Sc-2 achieved a 15.2% reduction, highlighting the synergistic effect of combining green roofs and façades. The indirect green façade performed slightly better than the direct system, likely due to the ventilated air cavity, which reduces heat transfer by facilitating natural airflow—a finding consistent with previous studies emphasizing the role of air gaps in double-skin façade systems [8], [35]."

Perhaps the most striking result was the dramatic reduction in heating demand, with Sc-1 and Sc-2 showing decreases of 86.2% and 88.8%, respectively. Although the climate in Tripoli does not require extensive winter heating, the insulating effect of the green systems still contributed to reduced heat loss during cooler periods. The thermal buffering capacity of vegetated façades and roofs appears to stabilize internal temperatures, thereby decreasing the need for active heating [11].

Moreover, the $CO_2$ emission savings highlight the environmental potential of green systems. Scenario 1 (Sc-1) resulted in annual $CO_2$ savings of 10.5 kg/m², while Scenario 2 (Sc-2) achieved 12.18 kg/m², affirming the role of passive strategies in reducing greenhouse gas emissions. These outcomes reinforce the conclusions of Bevilacqua et al. [9] and Cirrincione et al. [30], who demonstrated that integrating green technologies into building envelopes can significantly decrease operational carbon emissions over the building's lifespan.

The comparative analysis between Sc-1 and Sc-2 reveals that the indirect green façade consistently outperformed the direct system, albeit marginally. This suggests that incorporating an air cavity and structural separation in façade greening systems enhances thermal performance—a finding previously reported by Mazzali et al. [34]. Additionally, although indirect façades may require more complex installation, their long-term benefits in terms of energy efficiency and carbon reduction justify the initial investment.

From a practical perspective, these findings hold significant implications for sustainable mosque design and retrofitting in warm climates. Mosques typically feature large, open prayer spaces with high occupancy during peak times, which increases internal loads. The adoption of green envelope strategies can help mitigate these loads without compromising indoor comfort. Furthermore, since mosques often serve as community landmarks, integrating visible green systems may also promote environmental awareness and act as demonstrative models of sustainability within the urban fabric.

Nevertheless, while the results are promising, future studies should explore the economic feasibility, maintenance requirements, and long-term durability of green systems in arid climates. Additionally, integrating photovoltaic panels with green roofs, as suggested by Tabares-Velasco and Srebric [34], may further enhance the energy performance of religious buildings.

## 5. Conclusion

This study assessed the energy performance and environmental benefits of implementing green roof and façade systems on a large-scale religious building—Imam Al-Bukhari Mosque—located in the hot Mediterranean climate of Tripoli, Libya. Using dynamic thermal simulations conducted in DesignBuilder (v6), powered by EnergyPlus, three design scenarios were compared: the existing baseline structure, a green roof combined with a direct green façade (Sc-1), and a green roof combined with an indirect green façade (Sc-2). The objective was to quantify reductions in energy consumption, cooling and heating loads, and associated $CO_2$ emissions, thereby providing evidence supporting the adoption of passive bioclimatic strategies in religious buildings.

The results demonstrate that green envelope interventions can significantly mitigate a building's environmental footprint. Compared to the baseline, Sc-1 reduced energy consumption by 11.1%, cooling load by 13.0%, and heating load by 86.2%, while Sc-2 achieved even greater reductions—12.9%, 15.2%, and 88.8%, respectively. Correspondingly, annual $CO_2$ savings reached 10.5 kg/m² in Sc-1 and 12.18 kg/m² in Sc-2. These findings confirm the capacity of green systems to improve thermal performance in warm climates, particularly when façade ventilation (as in indirect systems) is incorporated. The results support previous literature indicating the efficacy of vegetated systems in stabilizing indoor temperatures and reducing dependence on mechanical heating and cooling.

The indirect green façade scenario (Sc-2) consistently outperformed the direct system (Sc-1) across all performance indicators. This outcome aligns with prior findings highlighting the thermal buffering role of the air cavity in indirect systems. Furthermore, the significant reduction in heating loads—even in a warm climate—underscores the year-round benefits of passive envelope enhancements, particularly in buildings with large uninsulated volumes and intermittent occupancy, such as mosques.

From a design and policy perspective, these results advocate for the integration of green infrastructure into religious and community buildings in arid and semi-arid regions. Not only do green systems contribute to climate resilience by reducing urban heat island effects and promoting stormwater retention, but they also serve an educational role by demonstrating sustainable practices within culturally significant structures. While initial installation costs and maintenance requirements may pose challenges, the long-term energy and environmental benefits provide strong justification for such investments.

Future work should expand on these findings by incorporating economic feasibility studies, implementing real-time monitoring of green systems in religious buildings, and conducting life cycle assessments (LCA) that account for embodied energy and materials. Additionally, exploring hybrid strategies—such as integrating photovoltaic systems with green roofs—may yield even greater performance outcomes.

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## Conflict of Interest Statement

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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# Tarihi dokuların biyofilik tasarım kriterlerine göre değerlendirilmesi: Safranbolu örneği

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ÖZET

Günümüzde artan kentleşme ile insanlar, sadece salgın hastalıklar ve doğal felaketlerin etkisiyle değil, aynı zamanda iklim değişikliği, çevresel bozulma, hava kirliliği, psikolojik stres ve sağlıklı yaşam koşullarına duyulan ihtiyaç gibi faktörler nedeniyle de doğaya ve biyofilik prensiplerle tasarlanmış yaşam alanlarına olan ilgilerini artırmaktadır. Bu eğilim, modern şehirlerde yapılı çevrelerin doğayla daha bütünleşik ve sürdürülebilir mekânlara dönüşmesine yönelik talebi artırmaktadır. Biyofilik tasarım da insanların yaşadığı çevrelerde doğaya ait özelliklerin yer almasının istendiği bir anlayışı yansıtmaktadır. Biyofilik tasarımlarla beraber insanların yaşam kalitesinin artacağı ve doğaya uyumlu yaşam alanları ortaya konulabileceği düşünülmektedir. Modern dünyada yeni bir kavram olarak değerlendirilen biyofilik tasarımın, Osmanlı şehircilik yapısında mevcut olduğu ve günümüze ulaşan tarihi dokular üzerinden görülebildiği tespit edilmiştir. Araziye uygun yerleşim, mülkiyet haklarının gözetimi, yerel malzemelerin kullanımı, doğal habitatlar ile ortak bir yaşamın sürdürülmesi gibi etkenler Osmanlı yerleşimlerinde etkin bir biçimde var olmuştur. Safranbolu geleneksel kent dokusunun tipik bir Osmanlı kenti olduğu bilinmektedir. Bu bağlamda Safranbolu geleneksel dokularından Bağlar, Kıranköy ve Çarşı bölgeleri biyofilik tasarım kriterlerine göre değerlendirilmiş ve her dokunun farklı biyofilik tasarım kriterlerinde öne çıktığı görülmüştür. Çalışmada Safranbolu geleneksel dokularının biyofilik tasarım ilkelerine göre incelenmesi ile sürdürülebilir kent anlayışının eski yerleşimlerde var olduğu ortaya konulmuştur. Sonuçta Osmanlı şehircilik anlayışında doğayla etkin bir bağın olduğu ve biyofilik tasarım kriterlerine göre kentleşmenin gerçekleştiği görülmüştür.

# Evaluation of historical textures according to biophilic design criteria: case study of Safranbolu

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ABSTRACT

In the context of increasing urbanization, interest in nature and biophilic-designed environments has grown, driven not only by pandemics and natural disasters but also by climate change, environmental degradation, air pollution, psychological stress, and the need for healthier living conditions. This trend highlights the demand for integrated and sustainable urban spaces aligned with biophilic principles. As cities expand, the focus on natural and ecologically adaptive environments has become essential. Biophilic design promotes the incorporation of natural elements into the built environment, aiming to enhance human well-being and foster a harmonious relationship between nature and urban areas. Although considered a modern concept, biophilic design principles have been present in Ottoman urbanism, as evidenced by surviving historical urban fabrics. Elements such as site-appropriate settlements, protection of property rights, the use of local materials, and coexistence with natural habitats were integral to Ottoman city planning. Safranbolu, a prominent example of Ottoman urbanism, exemplifies these principles. The Bağlar, Kıranköy, and Çarşı districts of Safranbolu were evaluated based on biophilic design criteria, and specific examples illustrate how these principles were applied in areas with different functions. This study investigates Safranbolu's traditional urban fabric through the lens of biophilic design to understand how sustainability has been maintained from the past to the present. The study concludes that Ottoman urbanism established a deep connection with nature, adhering to biophilic principles in its urban development.

## I. GİRİŞ

Biyofili kavramı, 20. yüzyılın ikinci yarısından itibaren gelişen ve insanın doğa ile olan ilişkisini temel alan bir kavram olarak literatüre girmiştir. İlk kez 1964 yılında psikiyatrist Erich Fromm tarafından ortaya atılan bu kavram, canlı organizmaların yaşama karşı duyduğu içsel bağlılığı ve sevinci ifade etmek amacıyla kullanılmıştır. Fromm, biyofiliyi psikolojik bir temele dayandırarak bireylerin canlı varlıklar ve doğal ortamlarla kurduğu olumlu etkileşimler kurduğunu vurgulamıştır [1]. Ancak biyofili kavramı doğa bilimci Edward O. Wilson'ın 1984 yılında yaptığı çalışmalarla daha geniş bir perspektif kazanmış ve Wilson biyofiliyi insanın yaşam süreçlerini izleme ve bu süreçlerle bağlantı kurma eğilimi olarak tanımlamıştır. Wilson, 1993 yılında biyofili hipotezini geliştirerek, insanın tarihsel olarak doğayla iç içe yaşadığı evrimsel süreçlerden yapılı çevrelere geçiş yapmasına rağmen, doğaya ve canlılığa duyduğu bağın devam ettiğini ileri sürmüştür [2]. Bu hipotez, biyofilik tasarım anlayışının temellerini oluşturmuş ve doğanın yapılı çevre ile bütünleşik bir şekilde ele alınması gerektiğini ortaya koymuştur.

Günümüzde artan kentleşme, küresel ısınma, doğal afetler ve salgın hastalıklar, insanları yapay çevrelerden uzaklaşarak doğa ile daha güçlü bir etkileşim kurmaya yönlendirmiştir. Doğal çevreyle etkileşim kurma ve doğadan faydalanma arzusu, bireylerin fiziksel ve ruhsal sağlıklarını olumlu yönde etkilemekte, yaşam kalitelerini artırmaktadır. Modern kentlerde doğadan kopuk yapılaşmanın yarattığı olumsuz etkiler, biyofilik tasarım anlayışına duyulan ihtiyacı artırmış ve doğal unsurların yapılı çevrelere entegrasyonu, sağlıklı ve sürdürülebilir yaşam alanları yaratmak için önemli bir strateji haline gelmiştir. Biyofilik tasarım, insan-doğa etkileşimini güçlendirmek amacıyla doğal öğelerin mimari ve kentsel tasarımda etkin bir şekilde kullanılması üzerine kuruludur. Bu tasarım yaklaşımı, doğanın yalnızca görsel bir unsur olarak değil, aynı zamanda kullanıcıların psiko-sosyal iyileşmesine katkıda bulunan bir bileşen olarak değerlendirilmesini sağlamaktadır.

Son yıllarda yapılan araştırmalar, biyofilik tasarımın insanların öğrenme ve üretkenlik seviyelerinde artış sağladığını, stresi azalttığını ve iyileşme süreçlerini hızlandırdığını ortaya koymuştur. Sanchez ve ark. tarafından yürütülen bir çalışmada, biyofilik tasarıma dayalı iş yerlerinde kullanıcıların yaratıcılık, sağlık ve performans düzeylerinde olumlu değişiklikler gözlemlenmiştir [26]. Benzer şekilde Little, biyofilik şehir anlayışının kentlerdeki yeşil alanların insan sağlığı üzerindeki doğrudan ve dolaylı etkilerini incelediği çalışmasında, biyofilik tasarım yaklaşımının bireylerin fiziksel ve ruhsal sağlıklarını olumlu yönde etkilediğini tespit etmiştir [27]. Kellert, insanların yaşadıkları ve çalıştıkları yapılı çevrelerin sürdürülebilirlik ilkelerine dayalı olarak iyileştirici ortamlar sunması gerektiğini savunmakta, yapılı çevrede biyofilik öğelerin etkin kullanımıyla toplumsal refahın artırılabileceğini belirtmektedir [3]. Kellert, bu doğrultuda, psikolog Judith Heerwagen ve Betty Hase'nin biyofili üzerine çalışmalarını geliştirerek yapılı çevrede biyofili etkilerini derinlemesine incelemiştir [5]. Biyofilik tasarım kavramına yönelik çalışmalarda, güneş ışığından olabildiğince faydalanmak, bitki ve hayvanlarla sürekli etkileşimde bulunmak ve doğayla etkin bir uyum yakalamak gibi unsurların, biyofilik tasarım ögeleri olarak insan yaşamına önemli katkılar sağladığı ortaya konulmuştur. Bu ögelerin, insanların öğrenme ve üretkenlik seviyelerini artırdığı, iyileşme süreçlerini olumlu yönde etkilediği ve stresi azaltmaya yardımcı olduğu belirlenmiştir [6].

Biyofilik tasarımın temel hedefi, doğal sistemlerin kent içi alanlarda sürdürülebilir şekilde korunması ve kentsel çevrede biyofilik unsurların aktif olarak kullanılmasıdır. Bu doğrultuda, biyofilik tasarım kent içi ısı adası etkilerini azaltmakta, biyoçeşitliliği desteklemekte, hava kirliliğini minimize etmekte ve insan-doğa etkileşim alanlarını genişletmektedir. Aynı zamanda, yerel tarımın teşviki, erişilebilir yeşil ve mavi alanların oluşturulması gibi toplumsal faydalar da biyofilik tasarımın dolaylı etkileri arasında yer almaktadır [7]. Bu bağlamda, biyofilik

tasarım yalnızca bireylerin sağlık ve refahını değil, aynı zamanda çevresel sürdürülebilirliği de hedefleyen bir tasarım yaklaşımı olarak ön plana çıkmaktadır.

Tarihi kent dokuları ve geleneksel Osmanlı şehircilik anlayışı incelendiğinde, biyofilik tasarım unsurlarının bu dokuların doğal bir parçası olarak var olduğu görülmektedir. Osmanlı kentlerinde topografya ile uyumlu yerleşim planları, doğal malzemelerin yapılarda kullanımı ve doğayla iç içe bir yaşam biçiminin benimsenmesi, modern biyofilik tasarım ilkelerinin tarihsel kökenlerine işaret etmektedir [8]. Safranbolu şehri, Osmanlı döneminde biyofilik unsurları barındıran sürdürülebilir bir yerleşim dokusuna sahiptir. Şehirdeki yapıların topografyaya uygun bir biçimde ve birbirlerinin ışık ve manzaralarını engellemeyecek şekilde konumlandırılmaları, doğal malzemelerin kullanımı ve insan-hayvan-bitki etkileşimine olanak sağlayan açık alanların varlığı, Safranbolu'nun biyofilik tasarım açısından zengin bir örnek oluşturduğunu göstermektedir.

Çalışmada biyofilik tasarım kriterlerinin incelenmesi, değerlendirilmesi ve tarihi yapılar üzerinden analiz edilerek yorumlanması hedeflenmiştir. Safranbolu tarihi dokusu sürdürülebilir şehircilik anlayışına uygun, doğayla uyumlu mimarisi olan bir Osmanlı şehridir. Safranbolu tarihi dokusunun biyofilik tasarım kriterleri ile değerlendirilerek anlaşılması ve bu değerlendirmeler sonucunda öneriler sunulması amaçlanmıştır.

## II. BİYOFİLİK YAKLAŞIMLAR ve TARİHİ DOKULAR

Osmanlı dönemi şehircilik anlayışına bakıldığında, doğaya saygılı ve doğal malzemelerden oluşan mimari yapılar öne çıkmaktadır. Cansever, Osmanlı şehirlerinde yaşayan ailelerin tüm fertlerinin doğayla doğrudan temas halinde olduğunu ve evlerin doğayla bütünleştiğini vurgulamaktadır [8]. Bu dönemde bahçelerin varlığı, doğayla olan organik ilişkinin bir göstergesi olarak ortaya çıkmaktadır.

Biyofili, günümüzde doğaya olan yönelimin arttığı bir ortamda ortaya çıkan güncel bir kavramdır. Ancak tarihi Anadolu şehirlerine bakıldığında, geçmiş dönemlerde insanların hâlihazırda doğaya uyumlu bir yaşam tarzı sürdürdükleri ve doğayla iç içe oldukları gözlemlenmektedir. Anadolu şehirlerindeki tarihi dokuların biyofilik tasarım ilkelerini barındırması, doğaya olan özlemi ve insanların doğal ortamlara duydukları ihtiyacı desteklemektedir. Bu tarihi dokular, insanlara doğal unsurlarla çevrili alanlar sunarak biyofiliyi tetiklemekte ve doğaya olan ihtiyacı karşılamaktadır.

Bu noktada, biyofili olgusunun tarihi dokularla ilişkisi, insanların doğa sevgisi ile tarihi çevreleri keşfetme arzusunu birleştirerek sürdürülebilir bir yaşam tarzını teşvik etmektedir. Tarihi dokuların korunması ve yeniden günümüze kazandırılması, biyofili olgusunun güçlenmesine katkıda bulunurken, aynı zamanda doğal çevrenin ve kültürel mirasın korunmasına da katkı sağlamaktadır.

Kellert, biyofilik tasarım kriterlerini genel olarak altı başlıkta toplamıştır [4]. Bu başlıkları çevresel etkenler, doğal şekiller ve formlar, doğal desenler ve süreçler, ışık ve mekân, mekâna dayalı ilişkiler ve insan doğa ilişkileri olarak sıralamıştır. Bu genel çerçevelerin içerisinde ise özel nitelikler belirleyerek biyofilik tasarım kriterlerinin tanımını genişletmiştir [9] (Tablo 1).

Kellert daha sonra biyofilik tasarıma dair kriterlerini tekrardan düzenlemiş ve bunları üç başlıkta sunmuştur. Doğanın doğrudan deneyimlenmesi, doğanın dolaylı deneyimlenmesi ve yer ve mekânın deneyimlenmesi şeklinde genel başlıklarını sunmuş ve bu başlıklar altında biyofilik tasarım kriterlerini değerlendirmiştir [9] (Tablo 2).

**Tablo 1.** Biyofilik tasarım kriterleri [4]

| Çevresel Etkenler | Doğal Şekiller ve Formlar | Doğal Desenler ve Süreçler | Işık ve Mekân | Mekâna Dayalı İlişkiler | İnsan Doğa İlişkileri |
|---|---|---|---|---|---|
| • Renk<br>• Su<br>• Hava<br>• Gün ışığı<br>• Bitkiler<br>• Hayvanlar<br>• Doğal elementler<br>• Manzaralar<br>• Cephe yeşillendirme<br>• Jeoloji ve peyzaj<br>• Habitat ve ekosistemler<br>• Ateş | • Botanik elementler<br>• Ağaç ve sütunlu destekler<br>• Hayvan motifleri<br>• Kabuklar ve spiraller<br>• Yumurta, oval ve tübüler şekiller<br>• Kemerler, tonozlar ve kubbeler<br>• Eğrisel formlar<br>• Doğal özelliklerin simülasyonu<br>• Biyomorfi<br>• Jeomorfoloji<br>• Biyomimikri | • Duyusal değişkenlik<br>• Bilgi zenginliği<br>• Yaş, değişim ve eskime<br>• Büyüme ve çiçeklenme<br>• Merkezi odak noktası<br>• Desenli bütünler<br>• Sınırlı mekanlar<br>• Geçiş alanları<br>• Bağlantılı seriler<br>• Parçaların bütüne entegrasyonu<br>• Tamamlayıcı zıtlıklar<br>• Dinamik denge ve gerilim<br>• Fraktallar<br>• Hiyerarşik organize oranlar ve ölçekler | • Doğal ışık<br>• Filtrelenmiş ve dağınık ışık<br>• Işık ve gölge<br>• Işığın yansıması<br>• Işık havuzları<br>• Sıcak ışık<br>• Şekil ve form olarak ışık<br>• Havadarlık<br>• Mekânsal değişkenlik<br>• Şekil ve form olarak mekân<br>• Mekânsal uyum<br>• İç-dış mekanlar | • Yere coğrafi bağlantı<br>• Yere tarihi bağlantı<br>• Yere ekolojik bağlantı<br>• Yere kültürel bağlantı<br>• Yerel malzemeler<br>• Manzara yönelimi<br>• Bina formunu tanımlayan peyzaj özellikleri<br>• Peyzaj ekolojisi<br>• Kültür ve ekoloji entegrasyonu<br>• Yerin ruhu<br>• Yersizlikten kaçınmak | • Manzara ve sığınma<br>• Düzen ve karmaşıklık<br>• Merak ve cezbetme<br>• Değişim<br>• Güvenlik ve korunma<br>• Ustalık ve kontrol<br>• Sevgi ve bağlılık<br>• Cazibe ve güzellik<br>• Araştırma ve keşif<br>• Bilgi ve biliş<br>• Korku ve dehşet<br>• Saygı ve maneviyat |

**Tablo 2.** Biyofilik tasarım kriterleri [9]

| Doğanın Doğrudan Deneyimlenmesi | Doğanın Dolaylı Deneyimlenmesi | Yer ve Mekânın Deneyimlenmesi |
|---|---|---|
| • Işık<br>• Hava<br>• Su<br>• Bitkiler<br>• Hayvanlar<br>• Peyzaj<br>• Hava<br>• Manzara<br>• Ateş | • Resimler<br>• Malzemeler<br>• Doku<br>• Renk<br>• Şekiller ve formlar<br>• Bilgi zenginliği<br>• Değişim, yaş ve eskime<br>• Doğal geometriler<br>• Simüle edilmiş doğal ışık ve hava<br>• Biyomimikri | • Manzara ve sığınma<br>• Organize karmaşıklık<br>• Hareketlilik<br>• Geçiş alanları<br>• Yer<br>• Bütünü oluşturmak için parçaları bir araya getirmek |

Bir diğer yöntemde biyofilik tasarım kriterleri üç ana başlıkta toplanmış ve bu başlıklar altında biyofilik niteliklerin özellikleri tanımlanmıştır. Bu başlıklar; mekânda doğa, doğal benzerlikler ve mekânın doğasıdır [10] (Tablo 3). Zhong vd., önceki çalışmalardan referansla biyofilik tasarım kriterlerini doğa birleşimi, doğa ilhamı ve doğa etkileşimi başlıkları altında değerlendiren bir çalışma ortaya koymuşlardır [7] (Tablo 4).

**Tablo 3.** Biyofilik tasarım kriterleri [10]

| Mekânda Doğa | Doğal Benzerlikler | Mekânın Doğası |
|---|---|---|
| • Doğayla görsel bağlantı<br>• Doğayla görsel olmayan bağlantı<br>• Ritmik olmayan duyusal uyaranlar<br>• Termal ve hava akışı değişkenliği<br>• Suyun varlığı<br>• Dinamik ve dağınık ışık<br>• Doğal sistemlerle bağlantı | • Biyomorfik formlar ve desenler<br>• Malzemelerin doğayla bağlantısı<br>• Karmaşıklık ve düzen | • Manzara<br>• Sığınma<br>• Gizem<br>• Risk |

**Tablo 4.** Biyofilik tasarım kriterleri [7]

| Doğa Birleşimi | Doğa İlhamı | Doğa Etkileşimi |
|---|---|---|
| • Su<br>• Hava<br>• Günışığı<br>• Bitkiler<br>• Hayvanlar<br>• Peyzaj<br>• Hava durumu<br>• Zaman ve mevsimsel değişim | • Biçimler ve şekiller<br>• Desenler ve geometriler<br>• Resimler<br>• Mekanizmalar<br>• Malzemeler, doku ve renk | • Manzara ve sığınma<br>• Karmaşıklık ve düzen<br>• Cezbetme (tehlike ve gizem)<br>• Yerle bağlantı<br>• Mekanların bağlantısı |

## III. MATERYAL ve METOT

Literatürde yer alan makale, tez ve bildiriler incelendiğinde genel olarak biyofilik tasarımların güncel yapılarda veya dokularda değerlendirildiği görülmüştür. Tarihi yapıların biyofilik olarak değerlendirildiği çalışmaların ise genel olarak ülkemizdeki tarihi doku veya yapılar özelinde olduğu tespit edilmiştir. Tarihi dokular üzerinde yapılan bu çalışmaların 2015 yılından itibaren ele alındığı görülmüştür. Bu nedenle 2015-2024 yılları arasında tarihi dokular üzerinde yapılan çalışmalar incelenmiştir. Bu çalışmalarda tarihi dokular üzerinde biyofilik tasarım kriterlerinin değerlendirilmesinde en çok Browning ve Ryan'ın belirlediği ilkelerden faydalanıldığı görülmektedir (Tablo 5) [11, 12, 13, 14, 15, 16, 17]. Bu çalışmada da literatürde genel bir kabul gördüğü için Ryan vd.'nin belirlediği biyofilik tasarım ilkelerinden faydalanılarak değerlendirmeler yapılmıştır.

Çalışmada Osmanlı şehirciliğini yansıtan belirgin özellikleri sebebiyle Safranbolu tarihi dokuları ele alınmıştır. Safranbolu, Türkiye'nin Karabük iline bağlı bir ilçe olup, özgün bir tarihi dokuya sahiptir. Zengin kültürel mirası, Osmanlı dönemine ait tarihi evleri ve geleneksel Türk mimarisini koruyan sokaklarıyla, günümüzde de önemli bir yerleşim konumundadır. Bu çalışmada, Safranbolu tarihi dokusunu oluşturan Çarşı, Kıranköy ve Bağlar bölgeleri biyofilik tasarım kriterlerine göre değerlendirilmiştir. Bu bölgelerde yapılan teknik incelemeler neticesinde rastlanılan biyofilik tasarım ögeleri fotoğraflandırılarak sunulmuştur. Ryan vd.'nin belirlediği biyofilik tasarım kriterlerinin çalışma alanlarındaki somut karşılıkları kanıtlar olarak sunulmuştur. Sonuçta bu üç bölge üzerinde 14 biyofilik tasarım kriterinin varlığına göre 1-3 arası puanlamalar yapılmıştır.

## IV. ÇALIŞMA ALANI

Safranbolu yerleşimini Bağlar, Kıranköy ve Çarşı bölgeleri oluşturmaktadır. Bu yerleşimlerden Çarşı bölgesi, Osmanlı döneminde halkın genel olarak yaşadığı alan olarak bilinmektedir. Bağlar bölgesi yazın sıcaklardan korunmak için kullanılan alandır. Kıranköy yerleşimi ise gayrimüslim halkın kullandığı bölgedir (Şekil 1).

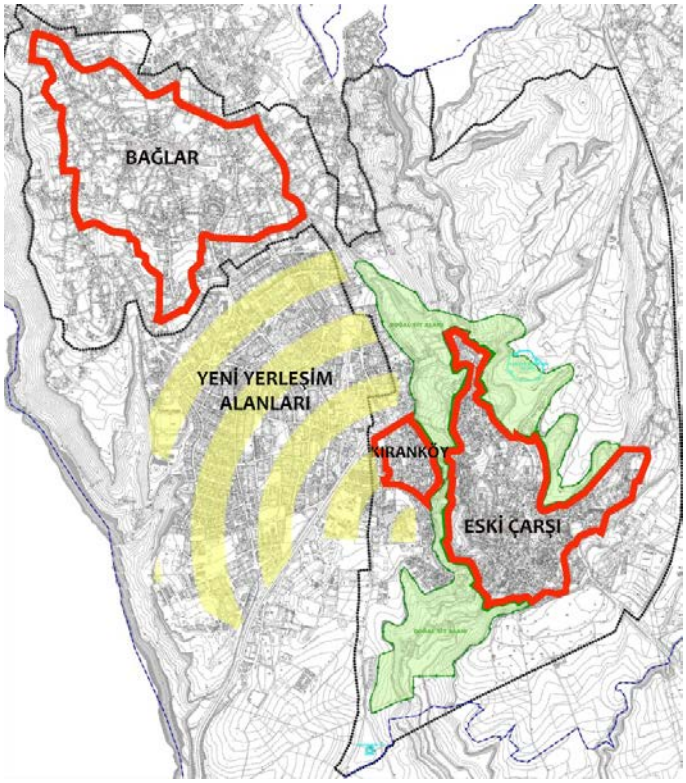
Osmanlı şehirlerinde en önemli birim mahalledir. Mahalle içerisinde yer alan konutlar, camiler ve diğer yapılar bir ilişki içerisindedir. Bu alanlarda yaşam, dini inançlar üzerine inşa edilmiştir. Komşuluk ilişkileri, yapıların inşalarında dikkat edilen hususlar, bölgede var olan yapı malzemeleri, sokakların ve mahallelerin oluşumu gibi etkenler o şehrin kendine has kültürünün ve kent kimliğinin oluşmasına olanak vermiştir.

Genel olarak bakıldığında yapıların dış cephelerinde kullanılan malzemelerin renkleri ve dokularının doğayla uyumlu olduğu saptanmıştır. Bina cephelerinde ve çatı kiremitlerinde dış cephe malzeme kullanımlarında doku ve renklerin uyumu dikkati çekmektedir. Doğal desen ve örüntülerin özellikle yapıların iç kısımlarında süslemelerde yoğun olduğu göze çarpmaktadır. Bina cephelerinde ise genel olarak yoğun bir desen örneğine rastlanılmamaktadır.

Bu alanlarda inşa edilen yapılar genel olarak bölgede yoğun olarak bulunan ahşap malzemelerden üretilmişlerdir. Safranbolu ilçesinin Karadeniz bölgesinde bulunması ve ormanlık alanlarının çokluğu sebebiyle yapı malzemesi olarak ahşap sıkça kullanılmıştır. Bu nedenle iklim, topografya, bitki örtüsü gibi coğrafik özellikler Safranbolu tarihi kent dokusunun oluşumu için büyük önem arz etmektedir.

Safranbolu şehrinin tarihi dokusu fiziksel niteliklerinin ötesinde, insanlara doğayla bütünleşik bir yaşam sunarak, duygusal, sosyal ve zihinsel ihtiyaçlarını karşılayabilecekleri bir ortam da sağlamaktadır. Bu nedenle,

Safranbolu'nun tarihi dokusunun korunması ve değerlendirilmesi, insanların doğayla olan ilişkilerini güçlendirmek ve psikolojik refahlarını desteklemek için önemlidir.




**Şekil 1.** Safranbolu Bağlar, Kıranköy ve Çarşı yerleşim bölgeleri [18]

*4.1 Çarşı*

Safranbolu kentinin oluşumunda merkez nokta, günümüzde Çarşı bölgesi olarak bilinen alandır (Şekil 1). Bu bölgede, Osmanlı döneminden kalma tarihi dükkânlar, konutlar, anıtsal yapılar bulunmaktadır. Çarşı bölgesi, günümüzde de Safranbolu tarihi dokusunun merkezi olarak kabul edilmektedir. Safranbolu şehrinde XVI. yüzyıldan itibaren Cinci Hanı ve Hamamı, Köprülü Mehmet Paşa Camii gibi yapılar inşa edilmiş ve kent Osmanlı döneminde bu alanda gelişim göstermiştir [19].

Çarşı bölgesi Kıranköy ve Bağlar bölgelerine göre daha alt kotlarda yer almaktadır. Bu bölgede merkez noktalarda dükkânların ve vakıf yapılarının yer aldığı, konutların ise yamaçlara yayıldığı görülmektedir. Çarşı bölgesindeki konutlara bakıldığında topografyaya uyumlu bir yerleşim yapıldığı ve evlerin birbirinin manzarasını kesmeyecek biçimde yerleştirildikleri tespit edilmiştir (Şekil 2). Bu düzenleme, aynı zamanda bireysel yapılar arasında hava akışı değişkenliğini destekleyerek, kent içi rüzgâr koridorlarının oluşumuna katkı sağlamaktadır. Bu mekânsal organizasyon, güneşlenme sürelerini optimize etmekte ve termal konfor ile çevresel dengeyi artırarak biyofilik tasarım ilkelerine uygun bir mekânsal düzenleme sunmaktadır. Yapıların topografyaya uyumlu bir biçimde yerleşmesi, güneş ışığına ve manzaraya erişimi engellemeyecek şekilde düzenlenmiş olup, doğayla görsel bağlantıyı da güçlendirmektedir.

Farklı duvar örgüleri, sıralı pencerelerin yer alması ritmik bir düzen sunarak karmaşıklık ve düzen ilkelerini sağlamaktadır (Şekil 3, 4).



**Şekil 2.** Çarşı bölgesinde konutların yerleşimi (Yazarın arşivinden)



**Şekil 3.** Çarşı bölgesinde pencere örnekleri [20]

Osmanlı şehirciliği anlayışında planlanan şehirde sokaklarda genel olarak peyzaj ögelerine yer verilmemiş, ancak bahçelerde yeşil ögeler kullanılmıştır. Yaprak döken ve yaprak dökmeyen ağaçların varlığı doğal sistemlerle olan bağlantıyı kuvvetlendirerek farklı mevsimler arasında farklı dokular oluşmasına imkân tanımaktadır. Böylelikle her mevsim doğayla görsel bağlantı sağlanmaktadır (Şekil 5).



**Şekil 4.** Çarşı bölgesinde duvar örgüleri (Yazarın arşivinden)

Çarşı bölgesindeki topografik eğim nedeniyle istinat duvarları üzerinde inşa edilen yapılar, mekânsal güvenlik algısını zayıflatabilecek bir unsur olarak değerlendirilmektedir (Şekil 6). Bu yapısal düzenleme, biyofilik tasarımın risk ve korku kriterini sağlamaktadır. Bölgedeki kamu ve sivil yapılarda taş ve ahşap gibi doğal malzemelerin kullanımı, doğayla malzeme bağlantısı kriterini sağlamaktadır (Şekil 6). Bu özellikler, Çarşı bölgesinin biyofilik tasarım potansiyelini destekleyen önemli unsurlar arasında yer almaktadır.




**Şekil 5.** Çarşı bölgesinde farklı mevsimlerden görüntüler, a) kış mevsimi [21], b) bahar mevsimi (Yazarın arşivinden)



**Şekil 6.** Çarşı bölgesinde yapı örnekleri (Yazarın arşivinden)

Çarşı bölgesinde kanyonların arasından akan bir dere bulunmaktadır. Bu durum da bölgede suyun varlığını ortaya koymaktadır (Şekil 7). Dere şu an korunmaktadır ve su akışının sesiyle dereyle işitsel bir temas sağlamaktadır. Ayrıca derenin varlığı görsel olmayan bağlantı ve ritmik uyaranlar kriterlerinin sağlanmasına da imkân tanımıştır. Bunun yanı sıra şehir içerisinde birçok alanda bina duvarlarına bağımlı veya bağımsız olarak sokaklarda yer alan çeşmelere de sıkça rastlanılmaktadır. Bu durum da doğaya görsel olmayan bağlantı ve ritmik uyaranlar kriterlerini karşılamaktadır. Günümüzde bu çeşmelerden bazıları çalışır durumda iken bazıları ise çalışmamaktadır (Şekil 8).

Safranbolu tarihi dokusunda Osmanlı şehirlerinde olduğu gibi içe dönük bir plan düzeni mevcuttur. Genel olarak mahremiyet esaslı olan bu durum ile iç mekân ve dış mekân arasında bir ayrım yapılmıştır. Bu durum sığınma ve gizem ilkeleriyle bağdaşmaktadır.

Çarşı bölgesinde yer alan yapılarda kubbe, kemer ve tonoz gibi mimari elemanlar, strüktürel ögeler olarak öne çıkmakta ve aynı zamanda biyomorfik formlardan oluşmaktadır. Bu elemanlar, Osmanlı dönemi mimarlığının simgesel ifadeleri arasında yer almakta ve mekânsal organizasyonda bir süreklilik sunmaktadır. Bunun yanı sıra,

doğal formların yapı detaylarında kullanıldığı gözlemlenmektedir. Özellikle pencere pervazları, kapı girişleri ve cephelerde, bitkisel motifler, organik hatlar ve kıvrımlı desenler gibi biyomorfik unsurlar dikkat çekmektedir. Bu doğal formlar, mimarinin doğa ile bağını güçlendirmekte ve biyomorfik desen kriterini sağlamaktadır.

Yapılarda kullanılan gönye çıkma, köşe çıkma ve çıkma üstünde çıkma gibi çıkmalar yapılara çok yönlü manzaralar ve ışık kaynakları sağlarken aynı zamanda çıkmanın uzunluğuyla orantılı olarak risk ve gizem duyguları da uyandırmaktadır (Şekil 9).



**Şekil 7.** Çarşı bölgesinde suyun varlığı [22]



**Şekil 8.** Çarşı bölgesinde çeşme örnekleri [20]



**Şekil 9.** Çarşı bölgesinde farklı çıkma örnekleri [20]

*4.2 Kıranköy*

Safranbolu, tarih içerisinde farklı kültürlere, dil ve inanışlara ev sahipliği yapmıştır. Bu topluluklardan birisi de Rumlardır. Rumlar 18-19. yüzyıllarda Kıranköy'ü yaşam alanı olarak kullanmışlardır Safranbolu'da genel olarak

marangozluk, duvarcılık, kunduracılık, demircilik ve terzilik gibi işlerle uğraşan Rumlar için 19. yüzyıldan itibaren bağcılık önemli bir ekonomik kazanç yöntemi olmuştur [23]. Bağcılığın artmasıyla Rumlar, Kıranköy yerleşimindeki evlerinin alt katlarında şarap mahzenleri yapmışlardır [23], [24].

Kıranköy yerleşiminde konut yapılarının yakın konumlanması sebebiyle sokakların dar olduğu görülmektedir. Ulu Cami yakınlarındaki yapıların birbirine yakın olarak inşa edilmesinden dolayı bahçelerinin küçük olduğu, merkezden uzaklaştıkça ise konutların birbirlerinden daha uzak konumlanması sebebiyle bahçelerin genişlediği gözlemlenmiştir (Şekil 10). Yapıların birbirine yakın konumlandırılması ve dar sokaklar, kullanıcıların görüş açısını sınırlayarak mekânda bir gizem duygusu yaratmakta ve kullanıcıları mekânın henüz görülmeyen noktalarını keşfetmeye teşvik etmektedir.



**Şekil 10.** Kıranköy konut dokusunda yapılar (Yazarın arşivinden)

Kıranköy yerleşimindeki geleneksel yapılarda zemin katların taş malzemelerden diğer katların ise ahşap elemanlardan inşa edildikleri görülmektedir. Bu yapılar genellikle iki veya üç katlı olmaktadırlar. Kapı ve pencere pervazları da ahşap malzemelerden inşa edilmiştir. Sıvasız olan yapılarda hımış yapım tekniğinin gereği olan ahşap elemanlar da görülebilmektedir. Doğal malzemelerin kullanımı doğal malzemelerle bağlantının yanı sıra doğal sistemlerle bağlantı kriterine de uymaktadır (Şekil 11).



**Şekil 11.** Kıranköy yerleşiminde yapılarda doğal malzemelerin kullanımı (Yazarın arşivinden)

İncelenen alanda, yoğun yapılaşmanın bir sonucu olarak yeşil unsurların sınırlılığı, ritmik olmayan duyusal uyaranların yanı sıra, doğayla görsel bağlantı, doğal ışık kullanımı ve termal hava akışı değişkenliği gibi biyofilik tasarım kriterlerinin sağlanmasını da zorlaştırmaktadır. Bu durum, kullanıcıların doğal çevreyle etkileşim kurmasını sınırlandırarak, biyofilik tasarımın temel unsurlarının mekânsal bağlamda yeterince uygulanamamasına neden olmaktadır.

Bitişik nizamda inşa edilen yapılarda, giriş katlarındaki pencere sayısının az, üst katlardaki pencere sayısının ise daha fazla olması, iç mekânlarda hava akışında farklılıkların oluşmasına neden olmaktadır. Bu durum, özellikle alt ve üst katlar arasında mikroklimatik farklılıkların ortaya çıkmasına imkân tanıyarak, yapı içi doğal havalandırma dinamiklerine olumlu yönde katkı sağlamakta ve mekânsal konfor koşullarını doğrudan etkilemektedir. Kıranköy sokaklarında su ögelerinin varlığı oldukça azdır. Bölgede yer alan Ulu Camii'nin şadırvanında ve binaların sokağa cephe veren duvarlarında tasarlanmış olan az sayıda çeşme suyun varlığını göstermektedir (Şekil 12). Ancak, su ögelerinin sınırlılığı, biyofilik tasarım kriterlerinden biri olan suyla görsel, işitsel veya dokunsal bağlantının yeterince sağlanamaması nedeniyle olumsuz bir etki yaratmaktadır.



**Şekil 12.** Kıranköy yerleşiminde su ögeleri (Yazarın arşivinden)



**Şekil 13.** Kıranköy yapılarında farklı çıkma örnekleri (Yazarın arşivinden)



**Şekil 14.** Kıranköy yerleşiminde kapı girişlerinde bitkisel motifler (Yazarın arşivinden)

Yapıların yaşam alanı olarak kullanılan zemin üstü katlarında yer alan pencerelerden güneş ışığından faydalanmak üzere farklı çözümler sunulmuştur. Bu bağlamda, yapılar sokaklara farklı biçimlerde çıkmalar yapmış ve böylelikle farklı açılardan ışık almaları sağlanmıştır. Bu düzenlemeler, yalnızca doğal ışık kullanımını artırmakla kalmayıp, aynı zamanda termal ve hava akışı değişkenliği parametresiyle de doğrudan ilişkilidir. Aynı zamanda dar sokaklarda yer alan yapılar için de farklı bakış açıları ve manzaralar sağlanmaktadır (Şekil 13). Yamaçlarda yer alan ve önünde güneş ışığı almasını engelleyecek unsurların yer almadığı yapılarda da doğal ışık ve manzaradan etkin bir biçimde faydalanılmaktadır.

Yığma taş tekniğiyle inşa edilen zemin katlardaki giriş kapı açıklıkları genellikle kemerli biçimde tasarlanmıştır. Bazı yapılarda kemerli girişlerin bitki motifleriyle bezendiği görülmekte olup, bu durum biyomorfik form ve şekillerin kullanımını açıkça ortaya koymaktadır (Şekil 14). Bölgede yer alan cami ve hamamlar, özellikle kubbe, kemer ve tonoz gibi organik formdaki mimari ögeleri barındırarak biyomorfik form ve şekillerin kullanım kriterlerini sağlamaktadır. Geleneksel yapılardaki pencerelerin pervazlarında ise biyomorfik formların uygulandığı dikkat çekmektedir (Şekil 15). Bununla birlikte sıralı pencereler ritmik bir düzen oluşturmaktadır. Konutlarda kapaklı pencere uygulamaları, bu yapıların mevsimsel gereksinimlerle kontrollü olarak ışıklandırmalarının yapılmasına ve hava akışının sağlanmasına katkı sunmaktadır. Ayrıca güvenlik kaygıları sebebiyle de bu kapakların kontrollü olarak kullanıldığı düşünülmektedir [20]. Kapaklı pencerelerin varlığı, ışığın kontrollü olarak kullanılabilmesine katkıda bulunmaktadır. Aynı zamanda, bu pencereler doğal havalandırma sağlayarak termal ve hava akışı değişkenliğini kontrollü olarak artırmakta ve mekânsal konfor koşullarına katkıda bulunmaktadır. Bunun yanı sıra Kıranköy yerleşiminde bazı yapılarda küçük pencerelerin olduğu da tespit edilmiştir. Yapılardaki bu noktalar gizem uyandırmaktadır (Şekil 15). Ayrıca bölgede yer alan çıkmaz sokaklar da risk duygusunu ön plana çıkarmaktadır (Şekil 16).

Kıranköy yerleşim dokusunda gözlemlenen çıkmaz sokaklar, mekânsal yönelim kısıtlamaları nedeniyle kullanıcı algısında belirsizlik ve güvensizlik duygularını tetikleyebilecek bir unsur olarak değerlendirilmektedir. Bu durum, biyofilik tasarım kriterlerinden risk ve korku unsurlarıyla ilişkilendirilebilecek bir mekânsal özellik olarak öne çıkmaktadır. Ayrıca çıkmaz sokaklar, insanlardaki keşfetme arzusunu tetiklemektedir. Bu durum da gizem unsurunu desteklemektedir.



**Şekil 15**. Kıranköy yerleşiminde pencere örnekleri (Yazarın arşivinden)



**Şekil 16.** Kıranköy yerleşiminde çıkmaz sokak örneği (Yazarın arşivinden)

*4.3 Bağlar*

Safranbolu'nun tarihi dokusunu tamamlayan bir diğer önemli bölge Bağlar'dır (Şekil 1). Bağlar, adını bölgedeki üzüm bağlarından almaktadır. Bağlar, Kıranköy ve Çarşı bölgelerinden daha yüksek bir konumda bulunmaktadır. Bağlar bölgesi daha çok yaz aylarının sıcaklığından korunmak adına kullanılan bir sayfiye mekanıdır [25]. Bu bölgede, Osmanlı dönemine ait birçok tarihi konak ve ev bulunmaktadır. Bölgedeki konutlar genellikle iki veya üç katlıdır ve bu yapılar genellikle bahçe içinde yer alır. Tarihi evlerde kullanılan ahşap oyma süslemeler, geleneksel Türk sanatının bir örneği olarak dikkat çekmektedir. Bağlar bölgesi aynı zamanda Safranbolu'nun tarım ve bağcılık geçmişini de yansıtmaktadır. Doğayla iç içe olan bu bölgede doğayla görsel bağlantı kurulmaktadır (Şekil 17).

Bağlar bölgesinde yer alan konutlarda yapının tamamının ahşap olduğu örneklerle giriş katın taş olup üst katların ahşap malzemelerle inşa edildiği örnekler de bulunmaktadır. Yapıların sokağa bakan bahçe duvarları ise farklı örgülerde taş malzemelerden inşa edilmişlerdir. Bu durum da doğaya görsel olmayan referanslar sunmakta ve aynı zamanda doğa ile malzeme bağlantısı da kurmaktadır (Şekil 18). Bölgede yeşil alanlar yoğun olduğu için ritmik olmayan duyusal uyaranlara da sık rastlanmaktadır. Yaprakların esintileri, böcek ve hayvan hareketleri, kuş cıvıltıları gibi uyaranlar hissedilmektedir.



**Şekil 17.** Bağlar bölgesinde bahçeli ev örnekleri (Yazarın arşivinden)

Bağlar yerleşimindeki yapılar bahçeli olduğu için komşu yapıların güneş ışığı ve manzarasını genellikle engellememektedir. Doğal peyzajın içerisinde yer alan bu konutlarda yüksek rakımlarda yer almanın da getirdiği bir hava akışı sirkülasyonu sağlanmaktadır. Yapıların zemin katlarında daha az pencere açıklığı yer almakla birlikte üst katlarda pencerelerin artmasıyla doğal ışıktan mümkün olduğunca faydalanılmaktadır. Pencere pervazlarında ve yapıların giriş kapılarında doğal formlardan yararlanılmış, aynı zamanda kemerli açıklıklar da düzenlenmiştir (Şekil 19).

Bölgenin yerleşim planlamasında yapılar, Çarşı ve Kıranköy bölgelerine göre daha aralıklı konumlandırılmış olup, bu durum sokak algısında daha karmaşık bir görüntü sunmaktadır. Bunun yanı sıra, yapıların pencerelerindeki tekrarlayan düzenler ve cephelerde kullanılan geometrik desenler, şehir dokusundaki yolların, sokakların ve yapıların organik ve çok katmanlı yerleşiminden kaynaklanan ritmik tekrarlarla birlikte, karmaşıklık ve düzen ilkesiyle bağdaşmaktadır. Sokak boyunca devam eden ve mahremiyet sebebiyle yüksek yapılmış duvarlar da bir gizem kaynağıdır. Bu bahçe duvarlarının aynı zamanda sığınma güdüsünden de kaynaklandığı söylenebilmektedir. Bahçe duvarlarının bitki örtüsüyle zenginleştirilmesi, ritmik olmayan duyusal uyaranlar ve doğal sistemlerle bağlantı gibi biyofilik kriterlerin de somut bir yansımasını oluşturmaktadır (Şekil 20).



**Şekil 18.** Bağlar bölgesinde konut örnekleri (Yazarın arşivinden)

Bağlar sokaklarında su ögeleri az sayıdadır. Bölgede yer alan binaların sokağa cephe veren duvarlarında tasarlanmış az sayıda olan çeşmeler, suyun varlığını göstermektedir (Şekil 21). Bu çeşmelerden kullanılıp aktif olan ve hiç aktif olmayan örnekler bulunmaktadır.



**Şekil 19.** Bağlar bölgesinde pencere ve kapı örnekleri (Yazarın arşivinden)



**Şekil 20.** Bağlar bölgesinde bahçe duvarları (Yazarın arşivinden)



**Şekil 21.** Bağlar bölgesinde su ögeleri (Yazarın arşivinden)

## V. BULGULAR ve DEĞERLENDİRMELER

Literatürde yer alan çalışmalar incelendiğinde biyofilik tasarım kriterlerinin tarihi dokular üzerinde ele alındığı örneklere az rastlanılmıştır. Tarihi dokularda biyofilik değerlendirmeler yapan çalışmaların da daha çok yapı özelinde ele alındığı görülmektedir. Osmanlı Dönemi şehir planlama anlayışının irdelenmesi günümüze kaynaklık edecektir. Bu bağlamda tarihi dokuların kıyaslanmasına yönelik bir biyofilik tasarım değerlendirmesi, çalışmanın özgün yanını ortaya koymaktadır.

Safranbolu tarihi dokusunu oluşturan Çarşı, Kıranköy ve Bağlar bölgeleri biyofilik tasarım kriterlerince değerlendirilmiştir. Buna göre doğayla görsel bağlantının Çarşı ve Kıranköy bölgelerinin merkez noktalarında

yoğun yapılaşmalar olması sebebiyle Bağlar bölgesine göre daha az olduğu tespit edilmiştir. Doğayla görsel olmayan bağlantıların ise benzer yapım teknikleri nedeniyle üç bölgede de benzer olduğu görülmüştür.

Ritmik olmayan duyusal uyaranların yine yapılaşmanın yoğun olduğu Çarşı ve Kıranköy bölgelerinde Bağlar bölgesine göre daha az hissedildiği gözlemlenmiştir. Termal ve hava akışı değişkenliğinin her üç bölge özelinde de etkisi benzer olarak değerlendirilmiştir.

Çarşı ve Kıranköy bölgelerinde su ögelerine daha sık rastlanırken Bağlar bölgesinde su ögelerine daha az oranda rastlanmıştır. Çalışma şehir dokusu özelinde incelendiğinden yapıların içerisindeki havuzlar değerlendirilmemiştir. Su varlığı açısından en yoğun bölge Çarşı bölgesidir. Çeşmelerin sıklığı ve yerleşim alanı içinden geçen derenin etkisi kendisini göstermektedir. Dinamik ve dağınık ışık etkilerinin, yapı yoğun bölgelerde sokakların dar ve eğimli yapısı ile cephelerdeki çıkmaların oluşturduğu ışık-gölge geçişleri sayesinde daha belirgin hale geldiği tespit edilmiştir. Bu mekânsal özellikler, ışığın günün farklı saatlerinde mekânda hareket etmesine ve farklı açılardan dağılarak mekânın algısal zenginliğini artırmasına olanak sağlamaktadır.

Doğal malzemelerin yapı elemanı olarak kullanılması sebebiyle doğal malzemelerle olan bağlantı da üç bölge özelinde eş olarak değerlendirilmiştir.

Çarşı ve Kıranköy bölgelerinin Bağlar bölgesine göre daha yoğun yerleşim alanı olarak kullanılması sebebiyle anıtsal ve sivil yapı çeşitlilikleri bu bölgelerde daha fazladır. Bu nedenle Çarşı ve Kıranköy yerleşimlerinde biyomorfik formlar ve desenler daha belirgindir.

Yapıların yerleşimleri, kapı ve pencere dizilimleri, bahçe duvarlarının örgüleri ve çatı örtüleri gibi etkenler karmaşa ve düzen kriterinin tüm bölgelerde varlığını ortaya koymaktadır.

Yapıların yoğun olarak yer aldığı bölgeler haricinde manzaradan etkin biçimde faydalanacak şekilde yerleşim planı yapıldığı görülmektedir. Topografyaya uyumlu yerleşim ile komşu yapıların güneş ve manzarasını kesmeyen yapılaşma biçimleri üç bölgede de kendisini göstermektedir. Bağlar bölgesinde, yapıların diğer bölgelere göre daha geniş bahçelerinin olması sebebiyle bu alanlarda manzara etkisinden daha fazla yararlanılmaya çalışıldığı görülmüştür. Ancak Çarşı ve Kıranköy yerleşimlerinde de manzaradan etkin biçimde yararlanıldığı görülmektedir. Dar sokakların olduğu yerlerde çıkmalarda sokağa açılan pencerelerle farklı bakış açıları sağlandığı görülmektedir. Yapıların kendi manzaraları haricinde yapının kendi varlığıyla oluşturduğu manzara da ayrıca önem arz etmektedir. Bağlar bölgesinde geniş bahçeler ve bu bahçelerin içerisinde yer alan bol yeşil alanlarla yapıların kendi manzaraları da farklı bir bakış açısı sunmaktadır.

Bahçeli yapılarda bahçe duvarları genel olarak mahremiyet sebebiyle yüksek olarak tasarlanmıştır. Bu durum da sığınma hissi uyandırmaktadır. Üç bölgede de bu durum gözlemlenmiştir. Ancak bahçeli yapıların oransal olarak daha çok olduğu Kıranköy ve Bağlar bölgelerinde bu durum kendisini daha çok göstermektedir.

Camilerin varlığı, çevresel bağlamda güven ve aidiyet hissini güçlendiren, toplumsal bütünleşme ve mekânsal süreklilik sağlayan önemli unsurlar arasında yer almaktadır. Çarşı ve Kıranköy'de merkezi noktalarda konumlanan anıtsal camiler, yalnızca dini işlevleriyle değil, avlularıyla oluşturdukları açık alanlar ve sosyal toplanma noktalarıyla da kullanıcılar için bir sığınma hissi yaratmaktadır. Kıranköy'de yer alan ve kiliseden camiye dönüştürülen Ulu Cami de tarihsel süreçte bölgenin sosyal ve mekânsal dinamiklerine entegre olmuş, bu bağlamda bireylerde mekânsal güvenlik ve aidiyet algısını destekleyen bir yapı niteliği taşımaktadır.

Kıranköy'de çıkmaz sokaklara rastlanmıştır. Bu durum da risk ve korku hissi uyandırabilmektedir. Bunun yanı sıra özellikle Çarşı bölgesinde eğimden dolayı oluşan istinat duvarları üzerine inşa edilmiş yapılar da risk ve korku unsuru oluşturabilmektedir. Bunun yanı sıra gizem kriteri de sağlanmaktadır.

Yapıların mahremiyet gözetilerek inşa edilmesi, lineer olmayan yerleşim düzenleri, pencere biçim ve yerleşimleri gibi unsurlar da üç bölgede de gizem unsuru oluşturmaktadır.

Bu çalışmada, Safranbolu'nun Çarşı, Kıranköy ve Bağlar bölgelerindeki tarihi dokular, biyofilik tasarım kriterlerine göre değerlendirilmiştir. Her bir bölge için biyofilik tasarım kriterlerine göre bir puanlama sistemi geliştirilmiştir. Puanlar, her kriter için 1 ile 3 arasında sıralanmış olup, 3 en yüksek başarıyı temsil etmektedir. 14 kriter üzerinden yapılan değerlendirmede maksimum 52 puana ulaşılabilmektedir. Her bölgenin kriterlere göre toplam puanı ve başarı oranı açıkça belirtilmiştir. Literatürden elde edilen veriler ve alan gözlemleri ışığında, Ryan vd.'nin belirlediği biyofilik tasarımın 14 temel kriteri değerlendirilmiştir. Her bir kriterin dokusal bağlamdaki somut karşılıklarını ortaya koymak adına temel kriterlerin açıklamalarından yola çıkılarak kanıtlar sunulmuş ve bu kanıtlar tabloda açıkça ifade edilmiştir. Bu yaklaşım, kriterlerin teorik çerçeveden uygulama bağlamına geçişini açıklamayı ve kriterlerin mekânsal düzeydeki yansımalarını daha sistematik bir şekilde ortaya koymayı amaçlamaktadır (Tablo 5).

**Tablo 5.** Biyofilik tasarım kriterlerine göre Çarşı, Kıranköy ve Bağlar bölgelerinin değerlendirmeleri

| **Kriterler** | **Kanıtlar** | **Çarşı** | **Kıranköy** | **Bağlar** |
|---|---|---|---|---|
| Doğayla Görsel Bağlantı | • Doğa ile iç içelik (toprak, ağaç, bitki ögeleriyle etkileşim) | **2** | **2** | **3** |
| Doğayla Görsel Olmayan Bağlantı | • Rüzgâr ve gölgelikler<br>• Yapı malzemeleriyle doğal doku oluşturulması | **3** | **2** | **2** |
| Ritmik olmayan duyusal uyaranlar | • Esintiler, yaprakların hareketlenmesi<br>• Hayvan hareketleri<br>• Gölge, ışık ve ısının değişimi | **2** | **2** | **3** |
| Termal ve hava akışı değişkenliği | • Mekân yönlenmeleri<br>• Pencere açıklıklarının çokluğu | **3** | **2** | **3** |
| Suyun varlığı | • Çeşme ve cami avlularının varlığı | **3** | **2** | **1** |
| Dinamik ve dağınık ışık | • Farklı açılarda mekân yönelimleri<br>• Çıkmalarla sağlanan ışık açıları | **2** | **2** | **3** |
| Doğal sistemlerle bağlantı | • Doğal malzemelerin varlığı<br>• Süreçler içerisinde oluşan mevsimsel etkiler ve desenler | **3** | **3** | **3** |
| Biyomorfik formlar ve desenler | • Kapı ve pencerelerde doğal desenler<br>• Yapı yüzeylerinde ve bina girişlerindeki doğal desenler<br>• Cephelerde yer alan nazarlıklar | **2** | **3** | **1** |
| Doğal malzemelerle bağlantı | • Doğal malzemenin yapı strüktüründe kullanılması (taş, ahşap) | **3** | **3** | **3** |
| Karmaşıklık ve düzen | • Sokak dokularının yapıların yerleşimine bağlı olarak düzeni<br>• Bahçe duvarlarında, çatı örtülerinde, cephe tipolojilerinde farklılıkların oluşturulması<br>• Yapı yüksekliklerindeki farklılıklar | **2** | **2** | **2** |
| Manzara | • Yapıların doğa manzarasına bağlantısı<br>• Yapıların oluşturduğu manzara etkisi | **2** | **1** | **3** |
| Sığınma | • Bahçe duvarlarının varlığı<br>• Camilerin varlığı<br>• Zemin katlarda yükseltilmiş ve küçük pencere açıklıkları | **3** | **2** | **2** |
| Gizem | • Yapı bahçelerine ve zemin katlara insan ölçeğinde görsel bağlantının azlığı<br>• İçe dönük yapı tasarımı oluşturulması | **2** | **2** | **3** |
| Risk/Korku | • Çıkmaz sokakların varlığı<br>• Cami ve meydanların azlığı | **1** | **2** | **3** |
| **Toplam** | | **33** | **30** | **35** |
| **Başarı Yüzdesi** | | %78,5 | %71,4 | %83,3 |

Değerlendirmede, biyofilik tasarım kriterleri ışığında bölgelerin genel özellikleri detaylı bir şekilde analiz edilmiştir. Her bölgenin farklı kriterlerde ön plana çıktığı görülmüştür. Bağlar bölgesi, biyofilik tasarım kriterlerine en yüksek uyumu göstermektedir. Geniş bahçeleri, doğal unsurların zenginliği ve manzara ile bütünleşen yerleşim dokusu, bu bölgenin güçlü yönlerini oluşturmaktadır. Ritmik olmayan duyusal uyaranlar, dinamik ışık düzenlemeleri ve doğal sistemlerle kurulan güçlü bağ, Bağlar'ı biyofilik kriterlere en iyi uyum sağlayan yerleşim haline getirmiştir. Ayrıca, yapıların doğal manzaralarla etkileşimi ve geniş yeşil alanların varlığı, bölgenin toplamda 35 puan alarak en yüksek başarıyı elde etmesine katkıda bulunmuştur. Bu özellikleriyle Bağlar, biyofilik tasarım kriterlerine %83,3 oranında uyum sağlamayı başarmıştır.

Çarşı bölgesi, toplamda 33 puan alarak ikinci sırada yer almıştır. Bu bölgede, doğal malzemelerin kullanımı, suyun varlığı ve termal hava akışı değişkenliği gibi biyofilik kriterler öne çıkmıştır. Özellikle suyun varlığı açısından zengin bir bölge olan Çarşı, doğal öğelerin kent dokusuna entegrasyonunu sağlayarak önemli bir başarı göstermektedir. Bununla birlikte, yoğun yapılaşma nedeniyle doğayla görsel bağlantı açısından sınırlı kalmış ve ritmik olmayan duyusal uyaranların azlığı nedeniyle daha düşük puanlar almıştır. Böylelikle Çarşı bölgesinin biyofilik tasarım kriterlerine %78,5 oranında uyum sağladığı görülmüştür.

Kıranköy bölgesi ise toplamda 30 puanla üçüncü sırada yer almıştır. Bölge, biyomorfik formlar ve desenler açısından öne çıkmasına rağmen, özellikle suyun varlığı ve manzara ile olan bağlantı konularında sınırlı kalmıştır. Yapıların daha yoğun bir yerleşime sahip olması, termal ve hava akışı değişkenliği açısından sınırlı bir başarı göstermesine neden olmuştur. Bununla birlikte, doğal malzemelerle olan bağlantı, gizem unsurları ve sığınma hissi gibi bazı biyofilik kriterlerde 2 veya 3 puan almıştır. Değerlendirmeler sonucunda Kıranköy bölgesinin biyofilik tasarım kriterlerine %71,4 oranında uyum sağladığı saptanmıştır. Genel olarak, yapılan değerlendirmeler sonucunda bütün dokularda biyofilik tasarım izlerine rastlanılmış olup her dokuyu ön plana çıkaran kriterler bulunmaktadır.

## VI. SONUÇLAR

Bu çalışma, biyofilik tasarım kriterleri çerçevesinde Safranbolu'nun geleneksel kent dokusunu analiz ederek, biyofilik ilkelerin geçmişte doğal bir şekilde uygulandığını ve tarihi dokuların bu ilkeleri bünyesinde barındırdığını ortaya koymuştur.

Günümüzde, hızla artan kentleşme, doğayla olan bağın zayıflamasına ve insan sağlığı ile yaşam kalitesi üzerinde olumsuz etkiler oluşmasına yol açmaktadır. Bu bağlamda, Safranbolu gibi tarihi dokular, doğayla uyumlu ve insanın psiko-sosyal ihtiyaçlarına uygun bir yapılaşma biçiminin sürdürülebilirliği için önemli bir model sunmaktadır. Safranbolu'nun, doğayla görsel ve görsel olmayan bağlantı, ritmik olmayan duyusal uyaranlar, termal ve hava akışı değişkenliği, dinamik ve dağınık ışık, doğal sistemlerle bağlantı, doğal malzemelerle bağlantı, sığınma ve gizem gibi biyofilik tasarım kriterleri açısından genel olarak güçlü bir uyum gösterdiği tespit edilmiştir. Yapılan analizler, Çarşı, Bağlar ve Kıranköy bölgelerinin her birinin, farklı biyofilik kriterler bağlamında ön plana çıkan özgün mekânsal ve yapısal özelliklere sahip olduğunu ortaya koymaktadır.

Sonuç olarak Safranbolu, yalnızca tarihi dokuların korunması için değil, aynı zamanda çağdaş kent planlamasında biyofilik tasarım unsurlarının uygulanabilirliğine yönelik bir örnek oluşturmaktadır. Bu bağlamda, biyofilik tasarım kriterlerinin, restorasyon projelerinde mevcut biyofilik unsurların devamlılığını sağlayacak şekilde ele

alınması, tarihi dokuların doğal ve kültürel bütünlüğünün sürdürülebilir bir şekilde korunmasına katkıda bulunacaktır. Ayrıca, biyofilik tasarımın mimarlık ve şehir planlama disiplinlerinde yaygınlaştırılması amacıyla eğitim programları oluşturulmalı ve farkındalık artırılmalıdır. Yerel yönetimler de biyofilik tasarımları teşvik edici politikalar benimsemelidir. Gelecekte yapılacak araştırmaların, biyofilik tasarım unsurlarının çağdaş kentlerde nasıl uygulanabileceğine ve bu uygulamaların kentsel sürdürülebilirlik üzerindeki etkilerine odaklanması, alandaki bilgi birikimini derinleştirecektir. Bunun yanı sıra kentsel yaşam kalitesinin arttırılmasına yönelik stratejilerin geliştirilebilmesi adına biyofilik tasarım uygulamalarının sosyo-ekonomik boyutları da araştırılmalıdır.

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# Mathematical Approaches in Contemporary Architectural Practices: The Case of Baku

*Çağdaş Mimarlık Uygulamalarında Matematiksel Yaklaşımlar: Bakü Örneği*

Dr. Öğr. Üyesi Nergiz AMİROV[1] ,Prof. Dr. Narmin AGHAYEVA[2]

***Öz***

*Matematik, mimarlıkta soyut kavramların mekânsal gerçekliklere dönüştürülmesini sağlayan temel bir araç olagelmiştir. Bu çalışma, matematik ile çağdaş mimarlık arasındaki ilişkiyi, Bakü'de yer alan üç ikonik yapı: Mirvari Restoran, Bakü Kristal Salon ve Crescent Alışveriş Merkezi üzerinden nitel bir vaka analizi yöntemiyle incelemektedir. Bu yapılar, farklı işlevsel ve dönemsel özellikler taşımalarına rağmen, ortak biçimsel özellikleri olan kabuk yapı sistemleri, eğrisel geometriler ve parametrik tasarım yaklaşımları sayesinde seçilmiştir. Ayrıca, her biri Hazar Denizi kıyısında konumlanarak benzer çevresel dinamiklere maruz kalmaktadır. Bu bağlamda, parametrik geometri, yapısal optimizasyon ve çevresel simülasyon gibi matematiksel ilkelerin bu yapıların form ve performansında nasıl rol oynadığı araştırılmıştır. Literatür taraması, biçimsel-mekânsal analiz ve bağlamsal yorumlama yoluyla yürütülen çalışma, tasarım üretimi, malzeme verimliliği, iklimsel duyarlılık ve kültürel simgesellik olmak üzere dört ana tema etrafında yapılandırılmıştır. Bulgular, matematiğin yalnızca teknik doğruluk sağlamadığını, aynı zamanda estetik ifade ve kültürel anlamı da güçlendirdiğini ortaya koymaktadır. Seçilen örnekler üzerinden yapılan bu analiz, dijital çağda işlevsel, sürdürülebilir ve etkileyici mimarlığın inşasında matematiğin üretken ve bütünleştirici bir rol oynadığını vurgulamaktadır.*

***Anahtar Kelimeler: mimarlık, geometri, hesaplama, matematik, sürdürülebilirlik***

***ABSTRACT***

*Mathematics has long served as a fundamental tool in architecture, enabling the transformation of abstract concepts into spatial realities. This study explores the relationship between mathematics and contemporary architecture through a qualitative case analysis of three iconic structures in Baku: the Mirvari Restaurant, Baku Crystal Hall, and Crescent Mall. Despite differing in function and construction period, these buildings were selected for their shared formal characteristics such as shell structures, curvilinear geometries, and parametric design logic and their common placement along the Caspian Sea waterfront, exposing them to similar environmental dynamics. The research investigates how mathematical principles such as parametric geometry, structural optimization, and environmental simulation contribute to the form and performance of these structures. Conducted through literature review, formal-spatial analysis, and contextual interpretation, the study is structured around four key themes: design generation, material efficiency, climatic responsiveness, and cultural symbolism. The findings reveal that mathematics not only ensures technical precision but also enhances aesthetic expression and cultural meaning. This analysis underscores the productive and integrative role of mathematics in shaping functional, sustainable, and evocative architecture in the digital age.*

***Keywords: architecture, computation, geometry, mathematics, sustainability***

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## INTRODUCTION

Architecture has always been deeply intertwined with mathematics, serving as a bridge between the tangible world of structures and the abstract realm of ideas. From the golden ratios of ancient Greek temples (Markowsky, 1992) to the complex geometries of modern skyscrapers (Williams, 2016), mathematical principles have underpinned architectural innovation throughout history. In modern times, the advent of computational tools and advanced modeling techniques has elevated the role of mathematics, enabling architects to push the boundaries of form, function, and sustainability (Kolarevic, 2003; Peters, 2013).

This paper delves into the symbiotic relationship between mathematics and modern architecture, with a particular focus on three iconic structures in Baku: Mirvari Restaurant, the Baku Crystal Hall, and Crescent Mall. These buildings not only stand as landmarks of contemporary design but also exemplify how mathematical approaches can transform conceptual ideas into functional and aesthetically striking realities. The selected buildings span different decades and represent a variety of architectural typologies, yet all reveal an intentional use of mathematical logic whether through geometry, structural reasoning, or environmental simulation (Oxman, 2008).

**Figure 1** illustrates the geographic placement of the three case studies along Baku's coastal edge. Each structure occupies a distinct urban context, contributing to the waterfront's architectural diversity while responding to site-specific environmental and cultural dynamics.

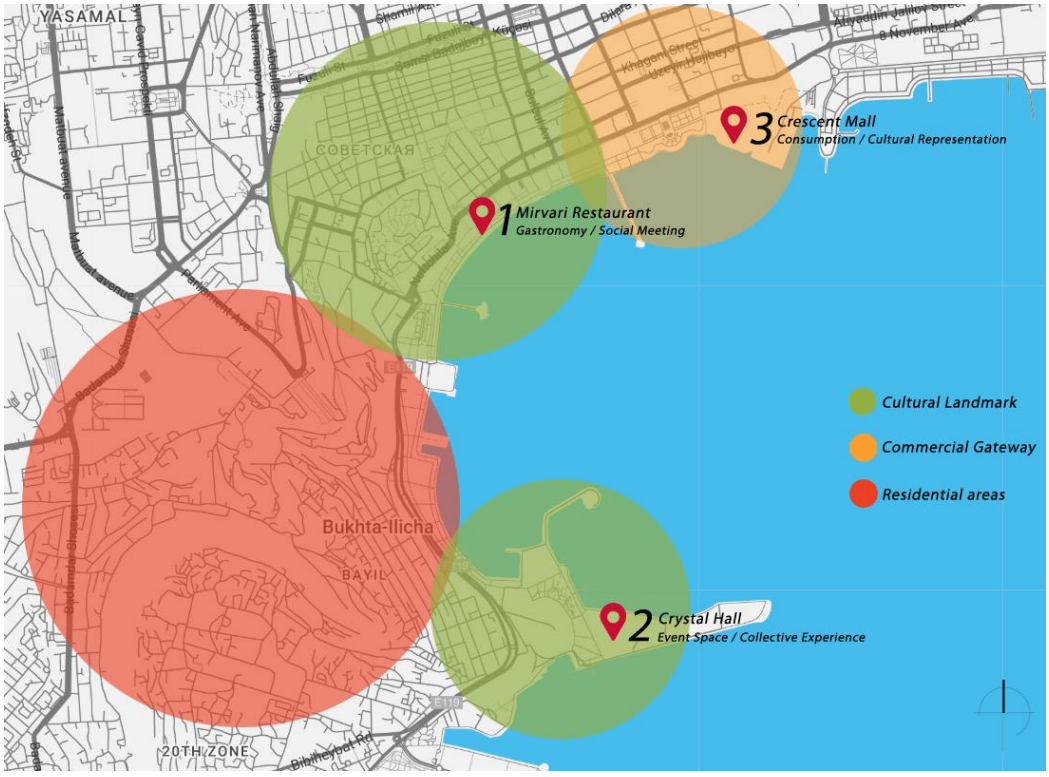


**Figure 1.** Urban placement map illustrating the spatial impact zones and coastal positioning of the three architectural case studies. Each colored area represents the primary functional influence of the buildings on their surrounding urban context, emphasizing their symbolic and performative roles within Baku's waterfront development.

This study aims to examine how mathematical principles shape architectural expression and performance across three main themes: (1) mathematics in design, (2) material science and structural optimization, (3) environmental control strategies and (4) cultural and symbolic interpretation is

included. The methodology follows a qualitative case study approach, incorporating literature review, formal-spatial analysis, and contextual interpretation. A simplified diagram illustrating the research strategy is also included in the methods section for additional clarity.

Mathematical shapes have always played a significant role in architectural innovation, inspiring forms that are both visually dynamic and structurally efficient (Kolarevic, 2003). Hyperbolic shapes, parametric curves, and three-dimensional spatial masses have become defining elements of modern architecture, allowing architects to achieve complex and organic designs. The Mirvari Restaurant reflects organic, wave-like shapes derived from sinusoidal curves and parametric modeling, evoking fluidity and natural rhythm. The crystalline geometry of the Baku Crystal Hall draws inspiration from triangular tessellations and polyhedral forms, showcasing the power of mathematical symmetry. Crescent Mall, with its distinctive crescent shape, pays homage to cultural symbolism while utilizing advanced computational geometry to create its smooth, arched form. These mathematical inspirations not only enhance the aesthetic value of these buildings but also ensure their structural stability and environmental performance (Peters, 2013).

The first theme explored in this paper is the role of mathematics in design. Architectural design today often relies on parametric modeling and computational algorithms, tools that allow for the creation of complex geometries and innovative forms. Mirvari Restaurant's organic wave-like structures, the Baku Crystal Hall's crystalline facade, and Crescent Mall's crescent-shaped form all showcase how geometry and parametric tools can manifest cultural symbolism and functional beauty in built environments.

Another crucial aspect is material science and structural optimization. Mathematics is indispensable in ensuring the efficient use of materials, calculating load distributions, and predicting structural performance. For example, finite element analysis guided the structural design of the Baku Crystal Hall to ensure stability and lightweight efficiency, while sustainable material choices in Crescent Mall highlight how mathematical modeling contributes to reducing environmental impact. The use of precise calculations in the design and fabrication of Mirvari Restaurant's innovative forms further emphasizes the importance of mathematics in achieving structural integrity and design excellence.

In addition to analyzing these themes, this paper traces the evolution of three-dimensional thinking in architecture. From the geometric foundations of ancient structures to the dynamic possibilities enabled by modern computational tools, the paper highlights how mathematical approaches have shaped architectural practice. These tools not only allow architects to envision bold designs but also ensure their feasibility.

Before proceeding to the individual case studies, the following section presents a brief theoretical overview of the historical and contemporary interplay between mathematics and architecture, establishing a conceptual foundation for the in-depth analysis that follows.

## 1. Methods

This study adopts a qualitative case study approach to explore how mathematical principles influence contemporary architectural design, material systems, and environmental strategies. Focusing on three significant structures in Baku; Mirvari Restaurant, Baku Crystal Hall, and Crescent Mall. The research investigates how mathematical thinking is embodied spatially, structurally, and environmentally within these examples.

### *Research Design*

The research methodology is structured around a comparative, thematic analysis. Each selected building is examined through four consistent analytical themes:

- Mathematics in Design
- Material Science and Structural Optimization
- Environmental Control Strategies
- Cultural and Symbolic Aspects

This thematic structure ensures a systematic and comparable investigation across different cases and architectural periods.

***Case Study Selection Criteria***

The buildings selected for analysis were chosen based on the following criteria:

- Architectural and cultural significance within Baku's urban fabric
- Demonstrable use of mathematical principles in form, structure, or environmental performance
- Diversity in typology and design era (ranging from mid-20th century to contemporary works)

This selection aims to provide a representative yet focused exploration of mathematical applications in different architectural contexts.

***Data Collection and Sources***

Data for each case study was collected through:

- Academic literature and project reports
- Architectural daigrams and visual documentation
- Digital analyses and computational simulations where available
- Secondary sources such as interviews, project websites, and technical publications

All visual materials used for analysis have been clearly cited, and when necessary, architectural diagrams were created or adapted to support the evaluations.

***Analytical Process***

**Figure 2** shows the analytical workflow of the study follows five sequential stages:

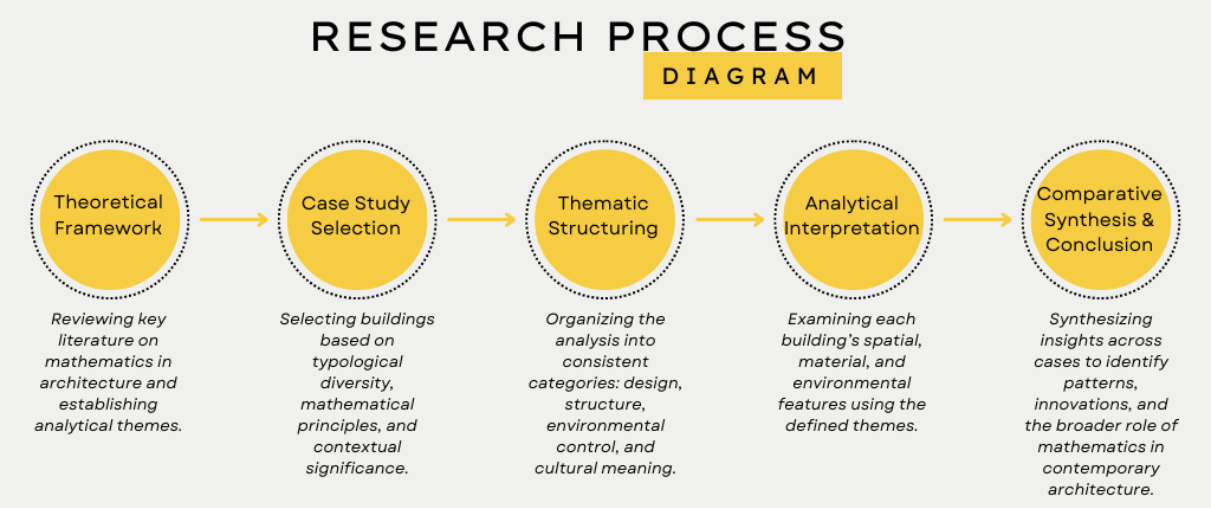


**Figure 2.** Research process diagram. (Visualized by the author, 2025).

The five stages of the research process include:

1. Reviewing theoretical literature on mathematics and architecture
2. Selecting and justifying the case studies
3. Structuring the analysis into defined thematic categories
4. Interpreting each building individually within these themes
5. Synthesizing the findings comparatively to reach broader conclusions

This methodological structure provides clarity and depth in examining the complex interplay between mathematical logic and architectural expression.

## 2. The Interplay of Mathematics and Architecture

Mathematics has been an integral part of architectural practice since the earliest human settlements. In its simplest form, mathematics provided a foundation for proportionality, measurement, and structural stability, enabling even rudimentary structures to serve their functional purposes (Burry & Burry, 2010). The use of basic geometry in ancient architecture such as the layout of circular huts or the precise alignment of the Pyramids of Giza illustrates how mathematical principles informed early design practices. The Great Pyramid of Giza, constructed around 2600 BCE, is often cited for its approximation of the golden ratio, believed to convey harmony and aesthetic perfection (Markowsky, 1992; Rossi, 2004). Similarly, Greek and Roman architecture employed mathematical proportions, notably those outlined by Vitruvius in De Architectura, to achieve balance and visual harmony in structures like the Parthenon (Vitruvius, trans. Morgan, 1914; Rowland & Howe, 1999). During the Gothic era, mathematical calculations were fundamental in designing soaring arches, ribbed vaults, and intricate stained glass windows. These innovations allowed for both greater structural efficiency and an enhanced interplay of light and shadow, emphasizing both spiritual and aesthetic aspirations (Scott, 2003).

In modern architecture, mathematics transcends its historical role as a tool for measurement and evolves into a medium for creative exploration. The introduction of computational design tools, such as Rhinoceros and Grasshopper, has revolutionized the field, enabling designers to manipulate complex geometries and develop novel architectural forms (Kolarevic, 2003; Peters, 2013). Zaha Hadid's Heydar Aliyev Center in Baku exemplifies how parametric design can facilitate the creation of fluid, organic structures grounded in advanced mathematical logic (Schumacher, 2011).

Beyond design, mathematics underpins computational simulations used to predict a structure's performance under various conditions. Tools like finite element analysis (FEA) enable precise modeling of load distributions, stresses, and deformations, thereby ensuring safety and efficiency in complex forms (Timoshenko & Goodier, 1970; Adeli, 2001). Santiago Calatrava's Turning Torso in Sweden, a twisting tower composed of mathematically calculated segments, exemplifies the balance between structural rigor and sculptural form (Jodidio, 2005).

One of the most fascinating aspects of mathematics in architecture is its dual function in both structural logic and aesthetic harmony. Proportions, symmetry, and visual rhythm all stem from mathematical rules that govern spatial relationships (Salingaros, 2006). The Sydney Opera House, whose shell-like geometry is based on sections of a sphere, exemplifies this synergy, achieving structural innovation through formal simplicity (Murray, 2004). Similarly, Buckminster Fuller's geodesic domes rely on tessellated triangulation to create lightweight yet resilient spatial enclosures (Fuller, 1975).

Mathematics also finds profound expression in decorative systems. Islamic architecture, in particular, is celebrated for its complex tilework and muqarnas, which are rooted in geometric logic and often explore infinite repetition and symmetry (Abas & Salman, 1995; Bonner, 2017). The Renaissance marked a pivotal shift in the application of mathematical knowledge to design, with architects like Brunelleschi and da Vinci integrating perspective and proportion into architectural drawing and construction (Kemp, 2012; Payne, 1999).

In contemporary practice, mathematical concepts such as fractals, topology, and non-Euclidean geometry challenge traditional design methods. For instance, the Eden Project in the UK, with its interlocking geodesic domes, draws on fractal logic and organic mathematics to create biomimetic forms (Grimshaw Architects, 2002). Meanwhile, sustainability imperatives have brought environmental simulation to the fore, enabling optimization in energy, daylighting, and ventilation. The Louvre Abu Dhabi's perforated dome uses geometric algorithms to blend solar control with symbolic expression (Nouvel, 2017).

The relationship between mathematics and architecture is deeply reciprocal: while mathematical discoveries inspire new design possibilities, architectural challenges stimulate mathematical innovation. Structural complexity in skyscrapers, for example, has led to breakthroughs in materials science and applied mathematics (Adeli, 2001). Conversely, architectural projects increasingly serve as platforms to visualize abstract mathematical ideas such as hyperbolic geometry, toroidal forms, and tessellations previously confined to theoretical domains (Senechal, 1990; Steinhardt & Ostlund, 1987). Frank Gehry's Guggenheim Museum in Bilbao illustrates this phenomenon by transforming computer-generated mathematical models into expressive, buildable structures (Jodidio, 2005).

Understanding this evolving relationship provides essential context for analyzing contemporary buildings. As computational technologies and climate-conscious design shape architectural priorities, mathematics emerges not only as a supportive mechanism but also as a generative force in shaping form, function, and performance.

Building upon this foundation, the following case studies; Mirvari Restaurant, Baku Crystal Hall, and Crescent Mall, exemplify the active application of mathematical principles in contemporary architectural practices. These examples are analyzed in terms of geometry, material logic, environmental responsiveness, and cultural symbolism. **Figure 3** illustrates key historical milestones where mathematics and architecture intersected, providing a conceptual backdrop for the detailed discussions that follow.

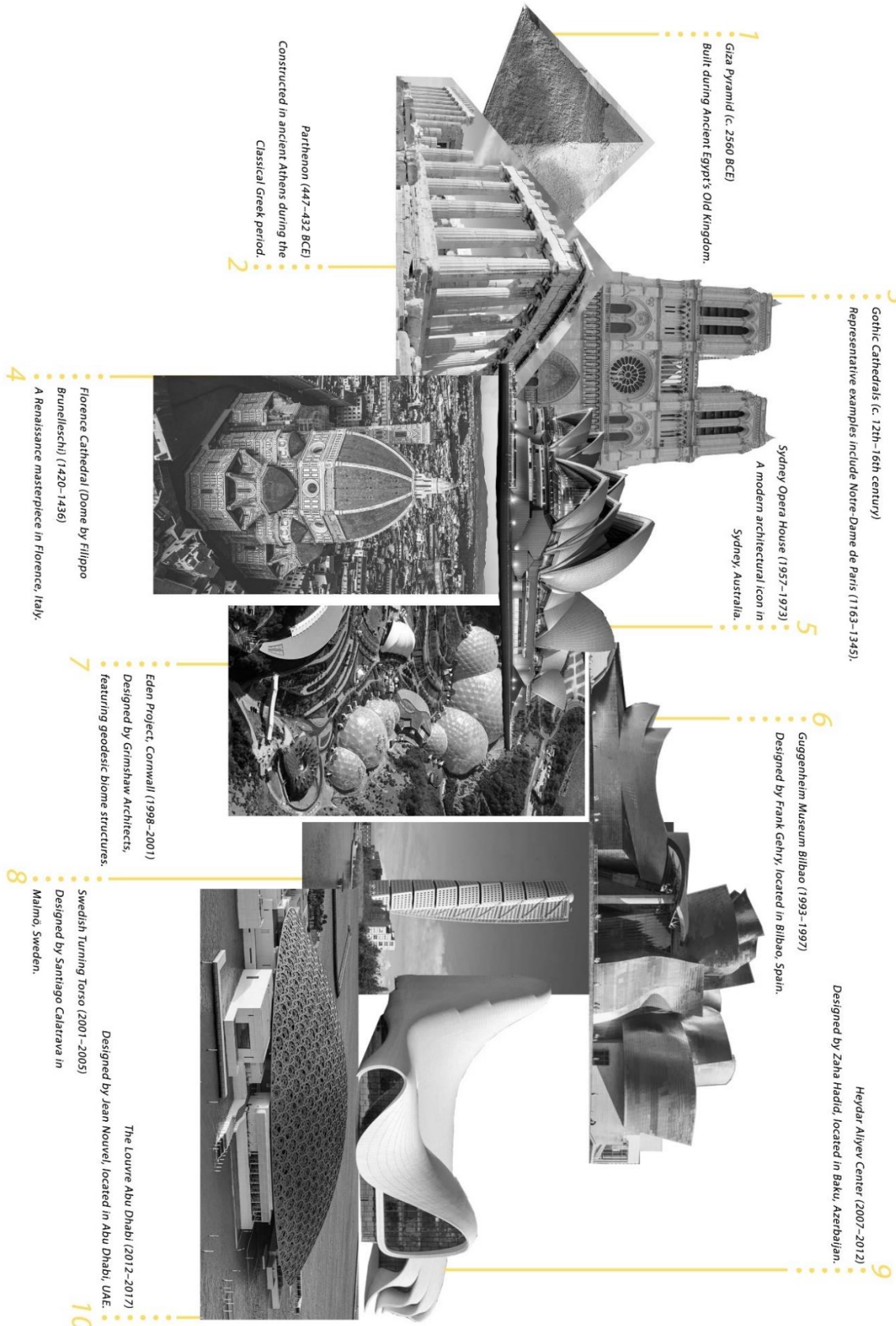


**Figure 3.** Chronological diagram of exemplified structures in the context of the interaction of mathematics and architecture. (Visualized by the author, 2024).

## 3. Mathematics in Contemporary Architecture: Case Studies

### 3.1 Mirvari Restaurant (1962)

The Mirvari Restaurant, located along Baku's Seaside Boulevard, exemplifies the integration of organic, wave-like forms with mathematical principles in architectural design. Completed in 1962, the structure reflects a mid-20th-century fascination with fluid geometries inspired by natural elements, particularly the undulating waves of the Caspian Sea.

#### 3.1.1. Mathematics in Design: Organic and Wave-Like Forms

The Mirvari Restaurant's shell-like roof structure stands as a prime example of organic architecture, where mathematical precision is employed to emulate forms found in nature. The undulating roof resembles a hyperbolic paraboloid, a doubly curved surface mathematically defined by the equation:

$z=(x^2/a^2)-(y^2/b^2)$ **(Figure 4)**

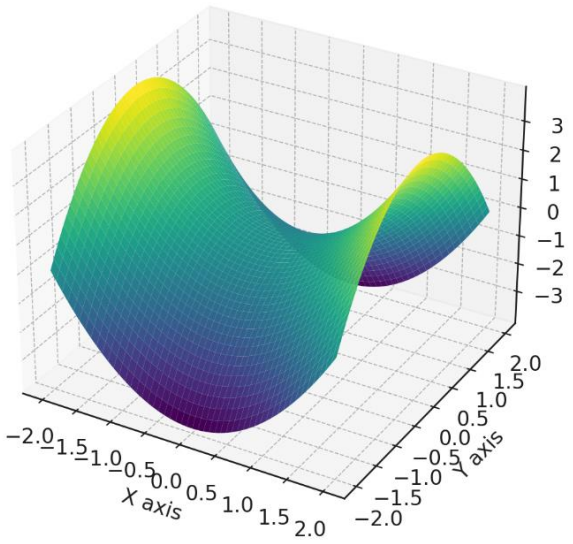


**Figure 4.** Visualization of a hyperbolic paraboloid surface defined by the equation $z = (x^2/a^2) - (y^2/b^2)$, illustrating the doubly curved geometry characteristic of structures such as the Mirvari Restaurant roof. (https://rabmcmenemy.medium.com/decoding-our-snacks-unveiling-the-hyperbolic-paraboloid-of-pringles-using-python-83c695e52515).

This geometry is renowned for its structural efficiency and aesthetic dynamism. Hyperbolic paraboloids allow architects to span large areas with minimal material thickness, ensuring structural integrity while achieving elegant, flowing forms (Seaside Boulevard Department, 2020).

It was precisely the hypar form that the Spanish architect and engineer Félix Candela exploited in the construction of the "La Jacaranda" hall in Acapulco **(Figure 5)**, a precedent that clearly influenced the design approach of V. Shulgin and R. Sharifov for the Mirvari Restaurant **(Figure 6)**. Positioned prominently on the elevated Seaside Boulevard terrace, the Mirvari pavilion initially had its base exposed directly to the Caspian Sea waves, forging a strong environmental and symbolic relationship with the fluid landscape.

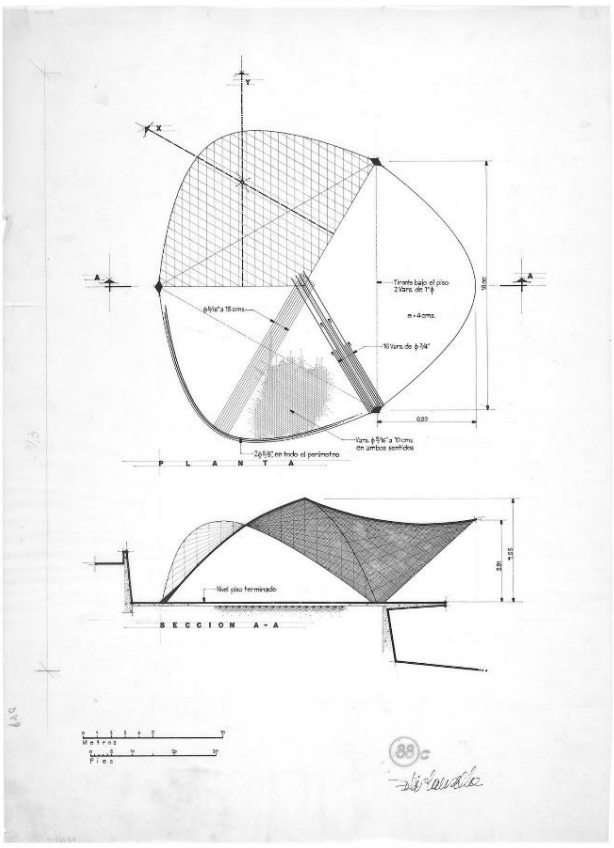


**Figure 5.** Nightclub "La Jacaranda", Acapulco, Felix Candela, 1957. (Flickr.com/photos/gallery400).



**Figure 6.** Mirvari Restaurant, Baku, 2016. (https://kobold-wizard.livejournal.com/793199.html).

What distinguishes the unique engineering of this slender reinforced concrete (6-8 cm) edifice is its absence of conventional walls; instead, the ceiling gracefully extends into the supports, unfurling skin to the petals of a flower. This wall-less pavilion design offers multiple advantages:

- Natural ventilation: Fresh air circulates freely, minimizing the need for mechanical systems.
- Enhanced daylight: Ample daylight penetrates the space, reducing reliance on artificial lighting and creating a luminous atmosphere.
- Flexibility: The open plan supports multiple functions, from casual gatherings to formal events.
- Psychological openness: The absence of barriers fosters a welcoming, inclusive environment.

The mathematical foundation of the hyperbolic paraboloid ensures even force distribution, with most stresses handled through compression, enabling lightweight yet resilient structures. This engineering logic symbolically ties the pavilion to its maritime context, with the form echoing the fluidity of ocean waves (Architecture Courses, 2010).

Building upon this structural logic, mathematical thinking also guided the form-finding process of the Mirvari Restaurant, even before the advent of contemporary computational tools (Oxman, 2006). While today parametric design is associated with digital tools such as Rhinoceros and Grasshopper, its foundational principles have existed in architecture for decades. In the Mirvari Restaurant, architects explored variations of key geometric parameters curvature, axis orientation, symmetry manually, in an early form of parametric thinking (Parametric Architecture, 2023).

This process involved:

- Defining key geometric relationships
- Adjusting parameters iteratively
- Testing structural performance through physical modeling

Such manual "parametric" adjustments optimized the curvature of the roof, balancing load-bearing capacity with light transmission and spatial rhythm. Had contemporary computational tools been available, the shell could have been digitally modeled by setting parameters like:

- Curvature radii (along x and y axes)
- Support span dimensions
- Targeted daylight penetration rates
- Structural stress distribution optimization (via Finite Element Analysis)

Nonetheless, the architects' mastery of mathematical relationships enabled the realization of a highly complex, performance-optimized form without computational assistance. The Mirvari Restaurant exemplifies how early architects achieved sophisticated parametric manipulations through geometric intuition, laying the groundwork for today's computational design methodologies.

This intuitive application of parametric logic not only shaped the restaurant's iconic form but also directly informed its structural behavior, where mathematical optimization played a crucial role in achieving material and load efficiency (Chilton, 2000).

The shell structure of the Mirvari Restaurant demonstrates advanced mathematical optimization. Shell forms work primarily in compression, minimizing tensile forces and allowing the structure to achieve remarkable strength with minimal material usage. Mathematical models were instrumental in distributing loads evenly across the surface, resulting in a lightweight yet robust roof that seamlessly integrates form and function (Seaside Boulevard Department, 2020).

The Mirvari Restaurant's thin shell operates primarily under compressive forces, minimizing tensile stresses that typically demand heavier reinforcement. This fundamental efficiency principle enabled the realization of a vast, unobstructed space with minimal material mass.

In comparison with other hypar shell structures of the era such as Los Manantiales in Mexico or the Valencia Exhibition Hall in Spain, Mirvari showcases:

- Minimal surface design for efficient material use
- Structural form derived directly from mathematical properties
- Resistance to external loads such as wind pressure and seismic activity

Mathematical load distribution analysis, though conducted manually at the time, ensured that stress paths followed the natural curvature of the shell, significantly reducing the risk of localized failures. By embracing the intrinsic strength of mathematically generated forms, Mirvari demonstrates a profound synergy between geometry, material behavior, and structural logic, prefiguring sustainable design strategies of later decades.

### 3.1.2. Material Science and Structural Optimization

The primary material used in the construction of the Mirvari Restaurant is reinforced concrete. This choice was strategic, as reinforced concrete offers the necessary compressive strength, moldability, and resilience to support complex architectural forms. Its plastic behavior is particularly advantageous in shaping thin, curved surfaces like the hyperbolic paraboloid, a geometry that defines Mirvari's iconic shell roof (Chilton, 2000). The adaptability of the material allowed the architects to create expansive, column-free interiors without sacrificing structural integrity. Moreover, the doubly curved surfaces of the shell were generated through straight-line elements, enabling a relatively simple yet cost-effective formwork system that reduced construction complexity and minimized material waste (Seaside Boulevard Department, 2020).

Building on these material advantages, the structural logic of the hyperbolic paraboloid further reinforced the efficiency of the design. As a doubly curved anticlastic surface — featuring opposite curvatures along orthogonal axes the hypar derives its strength primarily from form, not mass. This results in highly efficient load distribution, where internal stresses are transferred through compressive flow lines rather than tension. As a consequence, the Mirvari shell structure operates predominantly under compression, enabling thinner shell thicknesses (as low as 6–8 cm) while maintaining structural resilience (Billington, 1983).

Studies on thin-shell structures have demonstrated that this geometric form inherently resists deformation under various external forces, including wind uplift and seismic vibrations (Pottmann et al., 2007). The negative Gaussian curvature of the hypar not only prevents buckling under compression a failure common in flat or singly curved surfaces but also enhances overall shell stiffness. These structural advantages align with Félix Candela’s pioneering work, where form-driven strength became a defining characteristic of expressive concrete architecture (Pottmann et al., 2007).

To realize this geometry in practice, the Mirvari Restaurant’s construction employed prefabricated formwork and generative construction methods. By relying on ruled surfaces composed of straight-line segments, the builders achieved a high degree of precision in forming the shell’s curvature **(Figure 7).**

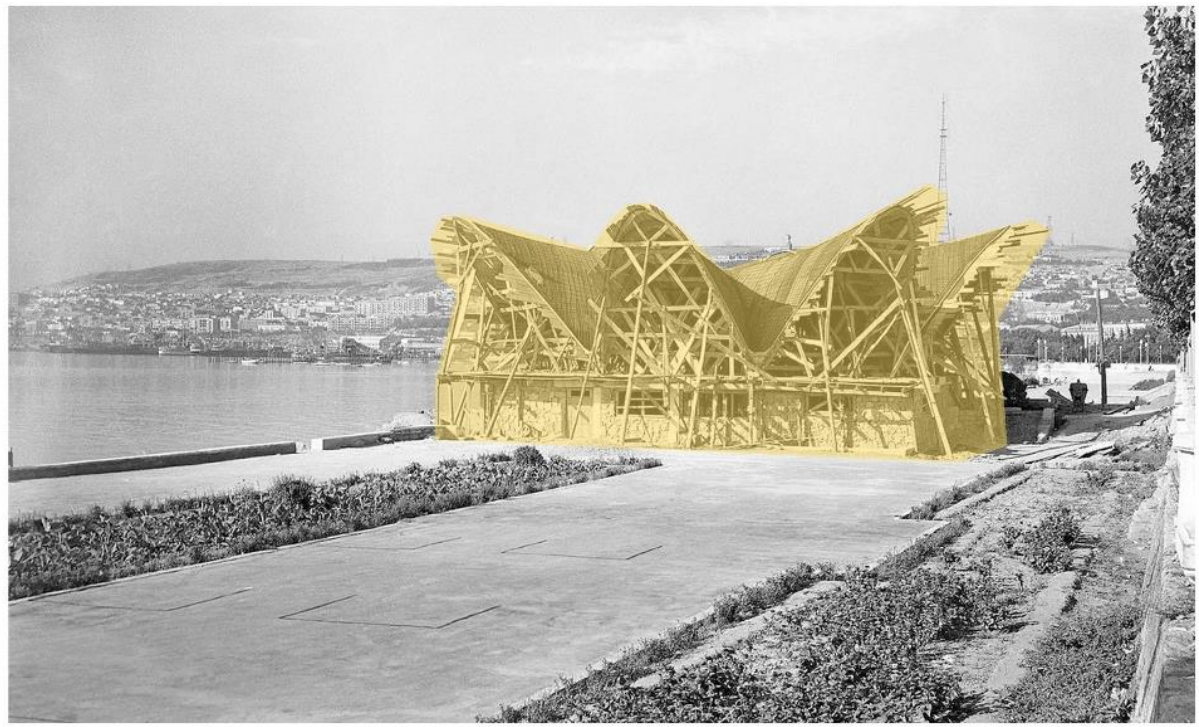

**Figure 7.** A visual of the construction process of the Mirvari restaurant, 1961. (From the archive of Parviz Polukhzada, https://jp.pinterest.com/pin/522276888038285399/).

This approach reduced construction time and material costs while ensuring the roof's structural efficiency and aesthetic quality (Chilton, 2000). The Mirvari Restaurant exemplifies how material science and structural efficiency can converge to create an architecturally and structurally significant building. Through the strategic use of reinforced concrete and the application of hyperbolic paraboloid geometry, the restaurant's design achieves a harmonious blend of aesthetic expression and functional performance. This project highlights the potential of innovative materials and geometric principles to shape modern architecture (Seaside Boulevard Department, 2020). The use of straight timber or steel formwork further reduced material waste and enabled faster fabrication and assembly on site.

This rationalization of geometry not only facilitated the shaping process but also enabled efficient reinforcement placement, further enhancing structural integrity. Today, this method could be modeled and validated using Finite Element Analysis (FEA) to simulate stress paths, deformation behavior, and optimization of material thickness across the shell. While the original designers worked intuitively, the outcomes align closely with current principles of form-finding and structural optimization often visualized in modern engineering software (Oxman & Oxman, 2010). The Mirvari Restaurant thus exemplifies how mathematical geometry and material innovation converge to realize an architectural form that is both expressive and performance-driven.

The Mirvari Restaurant thus represents a compelling convergence of material science, geometric logic, and efficient construction methodology. Through the strategic deployment of reinforced concrete and the deliberate use of hyperbolic geometry, the structure achieves a harmonious balance between expressive form and technical performance. It exemplifies how architectural innovation emerges from a deep understanding of both material behavior and mathematical form. The material and structural intelligence embedded in the Mirvari Restaurant's design showcases how a nuanced understanding of

geometry and construction can yield sustainable, resilient, and visually powerful architecture even without digital tools.

This seamless integration of material science and geometry supports both sustainability and aesthetic intent. By minimizing material usage while maximizing span and openness, the design reflects an efficient, contextually responsive, and mathematically disciplined approach. The result is not only a building that endures environmental stressors but also one that inspires through its lightness, clarity of form, and connection to the natural movement of the Caspian Sea.

### 3.1.3. Environmental Control Strategies

The Mirvari Restaurant, situated along Baku's Seaside Boulevard, offers a compelling example of architectural design that responds harmoniously to its environmental context. From the earliest stages of its conception, the building demonstrated a deliberate integration with natural forces leveraging wind, sunlight, humidity, and the surrounding landscape to enhance occupant comfort, functionality, and long-term performance.

One of the primary strategies employed was the building's spatial openness and orientation. The pavilion's positioning along the Caspian Sea was carefully considered to align with prevailing wind patterns, allowing the structure to operate as a naturally ventilated system. Its wall-less design ensures continuous cross-ventilation, effectively eliminating the need for mechanical cooling in Baku's hot summer months. This bioclimatic strategy not only reduces energy loads but also fosters a sensory connection between occupants and their coastal surroundings (Seaside Boulevard Department, 2020; Yeang, 1995). While such airflow patterns can now be modeled through Computational Fluid Dynamics (CFD), the intuitive grasp of local microclimate displayed by the architects was exceptionally forward-thinking.

In addition to ventilation, the design strategically maximizes daylight. The restaurant's undulating shell roof, formed by a hyperbolic paraboloid geometry, reflects and diffuses sunlight into the interior spaces. Unlike flat roofs that create harsh light and shadow contrast, the curved surface disperses light softly, producing ambient illumination that supports visual comfort and lowers the need for artificial lighting (Chilton, 2000). The building's site placement and openness further enhance this strategy by enabling southern light entry while blocking low-angle glare, creating a consistently well-lit interior throughout the day.

Another environmental challenge addressed by the building is the coastal climate itself. The Caspian shoreline is characterized by fluctuating humidity and high salt content in the air conditions that accelerate material degradation. To mitigate these risks, the architects specified reinforced concrete, enhanced by protective coatings and admixtures to resist chloride intrusion and chemical corrosion. This material choice contributes to the building's longevity and aligns with standard marine construction practices (Mehta & Monteiro, 2014). Additionally, the curved roof provides natural shading, reducing heat gain during peak sunlight hours and maintaining a comfortable indoor climate.

The restaurant's integration with the surrounding landscape is another defining feature. The low-profile shell structure allows the building to blend seamlessly with the waterfront setting, minimizing its visual impact on the natural environment. This approach reflects a sensitivity to the cultural and ecological significance of the site, aligning with principles of context-sensitive design (Billington, 1983).

The Mirvari Restaurant's environmental strategy is not confined to its form and materials; it extends to its relationship with the landscape. The low-profile geometry allows the structure to integrate seamlessly with the sloping terrain of the Seaside Boulevard, preserving views and reducing visual

impact. This context-sensitive positioning not only respects the natural topography but also provides passive thermal buffering by partially embedding the building in its site (Billington, 1983). Outdoor seating areas capitalize on these advantages, offering panoramic sea views while maintaining shaded, well-ventilated environments thus fostering a strong biophilic experience for users (Kellert, 2005).

In sum, the Mirvari Restaurant exemplifies early principles of passive sustainable design. Its ability to intuitively harness local climate conditions without reliance on mechanical systems or computational modeling underscores the timeless value of site-specific architectural thinking. By merging geometry, material resilience, and environmental logic, the building continues to stand as a reference point for climatically responsive design in coastal contexts. The environmental intelligence of Mirvari lies in its seamless blend of form and function demonstrating how local climate, material science, and architectural intuition can collaboratively shape resilient and inspiring public architecture.

#### 3.1.4. Cultural and Architectural Significance

The Mirvari Restaurant stands as a cultural and architectural icon in Baku, reflecting the evolving identity of the city during the mid-20th century. Designed in 1962, its wave-like form and open-air character symbolized a new era of spatial experimentation and social openness in Soviet-era Azerbaijan. Its use of organic geometry derived from mathematical principles pays homage to its coastal setting while simultaneously expressing a spirit of optimism, futurism, and integration with the landscape (Luzuriaga, 2021) **(Figure 8).**

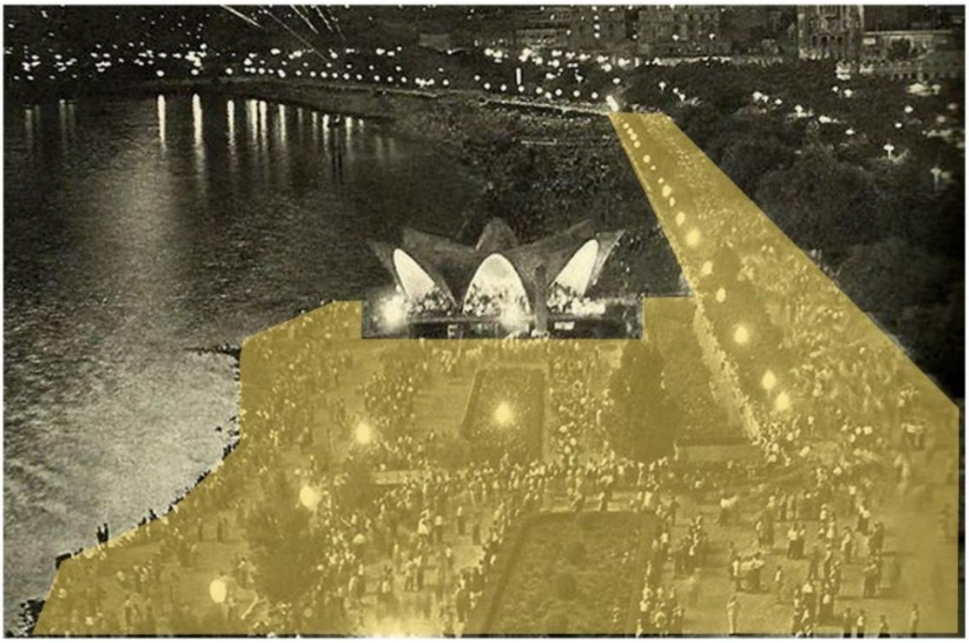

**Figure 8.** Mirvari Restaurant and its importance in public space, 1962. (https://www.trend.az/life/interesting/3109651.html).

The design is emblematic of a broader architectural movement in which mathematics, culture, and context coalesced. Inspired by global structural pioneers like Félix Candela, the architects V. Shulgin and R. Sharifov brought the language of modern structural expressionism to the local cultural stage. The result is a structure that embodies both international design discourse and local identity, highlighting Baku's historical role as a crossroads between East and West (Kuban, 1985).

More than an architectural achievement, Mirvari has served as a social landmark. Located at the heart of the city's seaside promenade, the pavilion has hosted civic ceremonies, performances, and

communal gatherings. Its open configuration, lack of interior boundaries, and transparency foster inclusivity qualities that have reinforced its role as a democratic public space over decades. These characteristics align closely with ideas of architecture as spatial agency, where built form becomes a catalyst for public interaction and shared memory (Awan, Schneider & Till, 2011).

The building continues to inspire contemporary architects and students, not only through its formal elegance but also through its enduring message: that mathematics and cultural expression need not be opposing forces, but rather collaborators in the making of resilient, meaningful architecture. As a result, the Mirvari Restaurant illustrates the timeless relevance of geometric thinking in achieving socially embedded design. Mirvari is not simply a mathematically inspired structure it is a cultural artefact embedded in Baku's collective memory. Its ability to merge public life, expressive geometry, and architectural innovation secures its place as a model for context-aware design in both historical and contemporary discourse (Luzuriaga, 2021).

### 3.2. Baku Crsytal Hall (2012)

The Baku Crystal Hall, designed for the Eurovision Song Contest in 2012, exemplifies the transformative role of mathematical geometry and parametric design tools in modern architecture. The building's distinctive crystalline facade showcases the interplay between aesthetics, structural stability, and computational precision, making it an iconic example of how mathematics shapes contemporary design practices.

#### 3.2.1. Mathematics in Design: Geometry and Parametric Tools

At the core of Baku Crystal Hall's design is the use of triangular tessellation, a geometric approach that divides a surface into a network of interconnected triangles **(Figure 9)**. This method leverages the inherent stability of triangles, as they are one of the simplest and most robust geometric forms for distributing forces evenly. In the context of the Hall, the tessellated facade functions as a diagrid system, where the diagonal grid provides both structural efficiency and visual dynamism (Glymph et al., 2002).

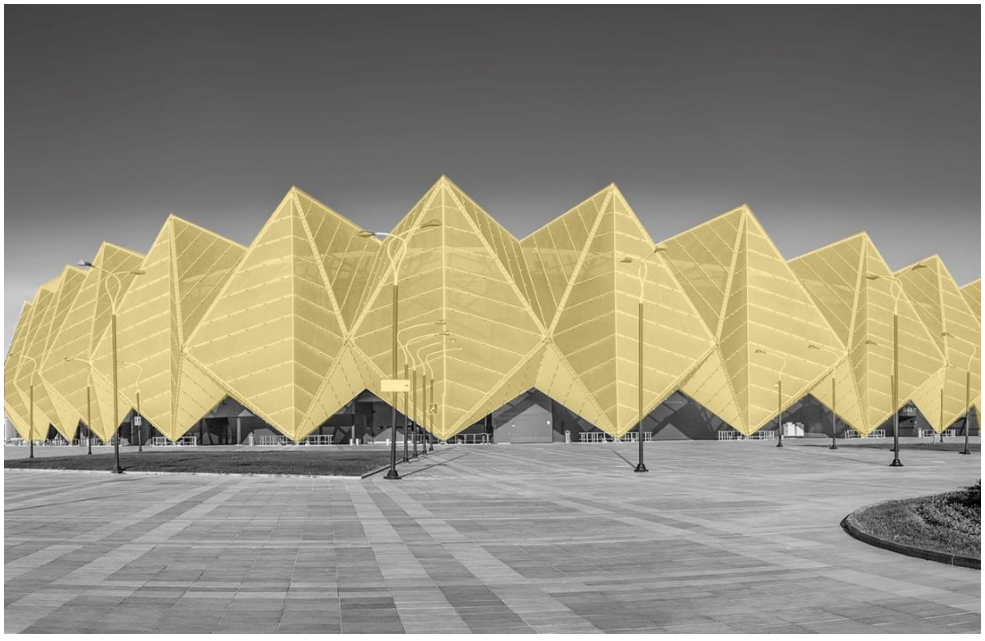

**Figure 9.** Structural and visual dynamism of Crystal Hall, Baku, 2013. (https://www.dezeen.com/2013/10/17/baku-crystal-hall-stadium-in-azerbaijan-by-gmp-architekten/).

The triangular panels vary in scale and orientation, echoing polyhedral geometry and creating a prismatic surface evocative of a cut gemstone. These tessellated surfaces inherently resist shear deformation and align with Delaunay triangulation principles, which maximize angular efficiency and minimize the risk of structural distortion (Pottmann et al., 2007).

The mathematical principles behind the Hall's form were brought to life through parametric design tools particularly Rhinoceros and Grasshopper which allowed architects to define and manipulate geometric relationships through adjustable parameters. These tools operate using parametric functions, where design elements (e.g., triangle size, angle, position) are generated from equations rather than manual drafting. For example, the tessellated facade may be described through functions such as:

P(x, y) = [x, y, sin(ax + by)]

where a and b are parametric coefficients controlling the surface undulation pattern **(Figure10)**.

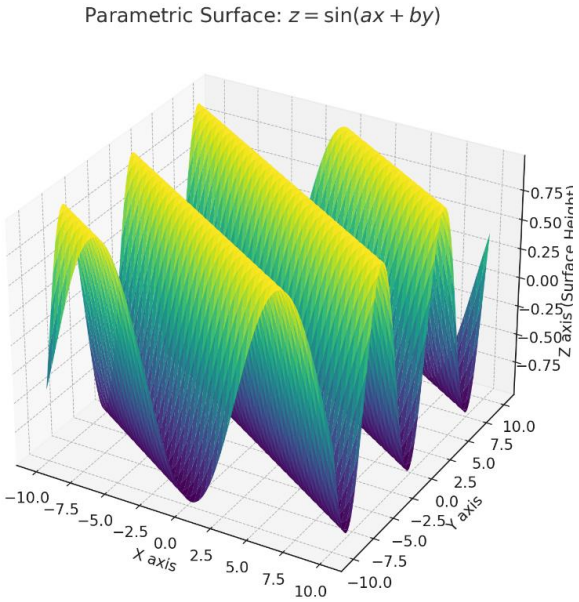


**Figure 10.** Parametric surface described by the equation z = sin (ax + by). The coefficients a and b control the frequency and orientation of the undulations, which are often used in architectural form generation to create wave-like facades or roofs. (Visualized by author, 2025).

The function P(x, y) = [x, y, sin(ax + by)] defines an undulating surface commonly used in architectural form generation. In this equation:

- x and y represent the coordinates on the horizontal plane,
- z = sin(ax + by) assigns a height value (z) to each point on that plane,
- a and b are constants that control the frequency and directional orientation of the wave pattern.

Such wave-like parametric surfaces are frequently employed in façade articulation or free-form shell structures, allowing designers to explore complex geometries derived from simple trigonometric relationships.

Figure 10 was generated using Python with the Matplotlib library, a widely used open-source tool for scientific visualization. The graph visualizes the equation z = sin(ax + by) on a meshgrid of x and y values,

illustrating how coefficients a and b influence the frequency and orientation of surface undulations. This type of 3D visualization is commonly used in computational architecture to simulate wave-like geometries and test the behavior of parametric surfaces prior to fabrication. The example here aims to conceptually represent how mathematical functions can inform architectural form generation.

Such models enable real-time form optimization, balancing aesthetic values with engineering constraints like wind pressure, material efficiency, and fabrication limits. The feedback loop created by simulation tools allowed designers to test geometric configurations under various environmental loads, including computational fluid dynamics (CFD) simulations for wind stress analysis and daylight distribution mapping (Oxman & Oxman, 2010). Beyond the geometric shell, the Hall integrates an advanced LED lighting system embedded into the facade's triangular modules. These lighting elements were placed based on parametric scripting, enabling dynamic light shows coordinated by algorithmic sequences. The color transitions and pulsations reflect both symbolic themes such as Azerbaijan's identity as the "Land of Fire" and practical functions such as wayfinding and ambient mood regulation. Crucially, this system was not appended post-design but developed in tandem with the facade geometry, ensuring seamless aesthetic and functional integration (Schumacher, 2009).

In addition to visual impact, the design process accounted for structural efficiency through digital fabrication coordination. The facade modules, each uniquely dimensioned, were prefabricated using CNC techniques directly informed by parametric models. This workflow minimized human error and allowed for precise alignment during on-site assembly. Through algorithmic rationalization, the number of unique triangle types was reduced while preserving geometric variation, demonstrating an advanced balance between formal complexity and buildability. In contemporary architectural practice, parametric design enables designers to define relationships between form, performance, and context using adjustable variables. These variables commonly referred to as parameters serve as the core components of computational design logic. They represent key design factors such as geometry, material properties, environmental responsiveness, or fabrication constraints. By altering these parameters, designers can simulate different scenarios, evaluate their impact, and iteratively refine architectural outcomes. This section introduces the conceptual framework of such parameters, highlighting how they were applied to the case of Baku Crystal Hall to guide both the formal articulation and technical optimization of its complex façade.

While the parametric terms referenced in this study such as triangle_size, panel_orientation_angle, and led_density_factor are not drawn directly from project-specific code, they are conceptually rooted in standard parametric modeling environments such as Grasshopper, RhinoScript, and Dynamo. These platforms enable designers to create and control geometric and performance-based relationships by defining adjustable input variables, often represented as sliders or numeric fields. Although expressed in symbolic form here, these parameters reflect the logical structure of algorithmic design workflows, providing a meaningful way to describe how parametric thinking guided architectural decisions. The goal is not to reproduce proprietary code but to clarify the types of variables that shaped form generation, environmental adaptation, and fabrication strategies **(Table 1)**.

| ***Parameter*** | ***Definition*** | ***Design Impact*** |
|---|---|---|
| *triangle_size* | Length of sides for each tessellated panel | Affects material usage, geometric rhythm, and structural efficiency |
| *panel_orientation_angle* | Angular tilt of each triangular module | Controls light reflection, façade shading, and wind deflection |

| | | |
|---|---|---|
| *led_density_factor* | Number of LEDs per square meter | Regulates façade brightness and animation smoothness |
| *wind_pressure_tolerance* | Maximum allowable wind load per panel (e.g., 2.4 kN/m²) | Ensures façade's resistance to environmental forces |
| *solar_exposure_value* | Average hours of sunlight per panel per day | Informs orientation for daylight optimization and passive solar gains |
| *load_path_curvature* | Degree of curvature for primary load-bearing lines in diagrid geometry | Guides structural performance and weight distribution |
| *module_fabrication_code* | CNC or digital tag identifying each panel's fabrication script | Enables precise manufacturing and minimizes on-site errors |

**Table 1.** Parametric variables commonly used in architectural computational modeling environments. (Glymph et al., 2002; Pottmann et al., 2007; Oxman & Oxman, 2010).

These parameters were conceptually extracted to illustrate the mechanics of a typical parametric workflow as applied to a complex façade system. In practice, designers would script these relationships using visual node-based programming, with real-time feedback loops evaluating performance, manufacturability, and cost. Parametric environments also enable the interlinking of environmental simulations such as daylight and wind studies with form generation tools, ensuring that the final output is not only formally expressive but also optimized for real-world behavior.

The parameters outlined in the following table are derived from a synthesis of common practices in computational design environments such as Grasshopper, RhinoScript, and Dynamo, as detailed in the works of Glymph et al. (2002), Pottmann et al. (2007), and Oxman & Oxman (2010). These platforms employ variable-driven logics where design elements respond dynamically to input values, enabling rapid prototyping and real-time feedback. The listed parameters, though presented in symbolic form, reflect standard categories of control used in algorithmic modeling: geometric (e.g., size, curvature), performative (e.g., solar exposure, wind loads), and fabrication-specific (e.g., CNC codes). Such frameworks are widely applied in practice to rationalize complex forms, enhance structural logic, and ensure digital-to-physical fidelity in large-scale architectural assemblies. Their inclusion in this study is meant to conceptually illustrate the parametric rationale behind Baku Crystal Hall's design, in line with established literature on performative geometry and data-informed architecture.

By including this logic in the architectural narrative, this study aims to bridge the conceptual and technical aspects of design, offering clarity on how mathematical thinking operates within computational systems. This clarification also responds to concerns about the origin and function of the parameters listed, reaffirming that they are rooted in the conventions of current digital design practice and reflective of real-world applications.

Ultimately, Baku Crystal Hall embodies the fusion of mathematical geometry, digital computation, and cultural expression. It stands as a symbol of modern architecture's shift toward data-driven form generation, where algorithms guide spatial decisions and aesthetics arise as a natural byproduct of structural logic. As such, the building demonstrates how mathematical thinking once confined to static proportions now animates entire architectural ecosystems through dynamic, performative geometries.

### 3.2.2 Material Science and Structural Optimization

The primary structural framework of the building consists of high-strength steel, selected for its superior strength-to-weight ratio, ductility, and prefabrication adaptability. Steel enabled the realization of the hall's complex crystalline geometry and allowed for a modular construction approach essential for the project's compressed eight-month timeline (Architizer, 2012). The components were laser-cut and prefabricated off-site using CNC technologies, reducing on-site labor time and minimizing human error.

To optimize the performance of the envelope, the design employs a diagrid (diagonal grid) structural system a spatial network of interconnected triangular modules. This system efficiently channels loads across multiple axes, offering enhanced resistance to lateral forces such as wind and seismic activity (Glymph et al., 2002). The geometric rationale behind the diagrid lies in the inherent stability of triangles, which prevents deformation under asymmetric pressure and supports dynamic force redistribution. **Figure 11** showcases the steel diagrid framework of Baku Crystal Hall, highlighting the triangular modules that provide both structural support and aesthetic form. The system efficiently distributes stress throughout the structure, enhancing its ability to withstand lateral loads such as wind and seismic forces.

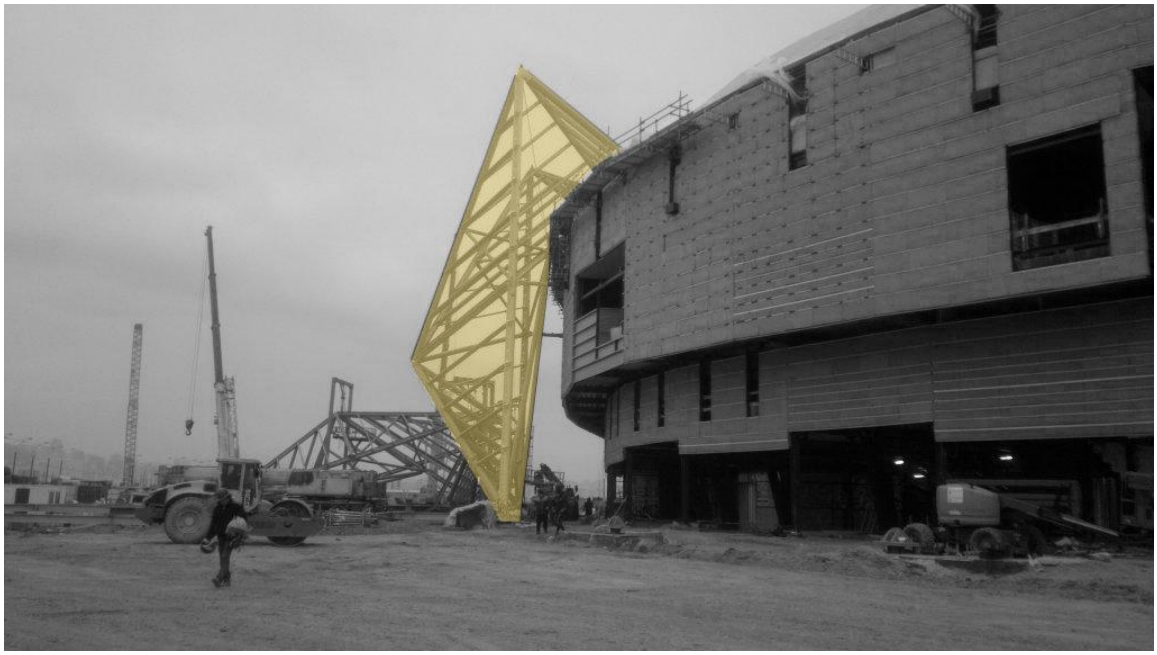

**Figure 11.** Structural photography of the diagrid system showing modular panel connections. (https://www.temsan.com.tr/stadyumlar/baku-eurovision-stadi-2012 )(Adapted from Pottmann et al., 2007).

The structure is subdivided into three independent components: the central roof, the enveloping grandstand frame, and the outer membrane façade. This segmentation facilitated parallel construction workflows, enabling different teams to operate simultaneously on site. Each segment followed a modular logic, allowing for prefabricated steel frames and façade panels to be produced concurrently. This strategy significantly reduced construction time while ensuring consistent dimensional accuracy (Menges, 2012).

Moreover, advanced simulation methods such as Finite Element Analysis (FEA) were used during the early stages of design to test load performance and material behavior under varying environmental conditions. These simulations informed the optimization of steel member profiles and joint locations,

ultimately reducing material usage without compromising structural integrity (Oxman & Oxman, 2010). **Figure 12** illustrates a Finite Element Analysis (FEA) simulation applied to the actual facade geometry of Baku Crystal Hall, modeled with triangulated membrane panels. The analysis demonstrates how load distribution behaves across a folded diagrid surface, particularly under uniform static loads such as gravity and wind shear conditions typical for lightweight membrane architecture.

The color spectrum reflects varying stress intensities:

- Red zones correspond to high-stress concentrations—especially at panel intersections and support nodes.
- Mid-range tones show moderate loads transferred along the panel edges.
- Blue areas reveal low-stress regions—often found at mid-panel zones away from load entry points.

This type of analysis helps verify that triangulated diagrid systems are not only visually dynamic but also structurally advantageous, as they distribute loads efficiently and reduce redundancy (Kolarevic, 2003; Tam et al., 2022). Simulations like this are typically generated using Karamba3D or Ansys environments, which translate panel geometries and constraints into a mesh network of nodal interactions, supporting architectural decisions related to form-finding and material optimization. Such workflows exemplify performance-oriented design, where aesthetic geometry and structural logic converge (Oxman, 2010; Moussavi, 2006). This integrative approach is central to contemporary parametric design practices, ensuring both visual richness and mechanical efficiency.




**Figure 12.** FEA simulation illustrating stress concentrations across the triangulated façade of Baku Crystal Hall. Red zones indicate areas of high stress; blue zones show lower load impact. Modeled for representational purposes using Rhino + Karamba3D by author, 2025. (Adapted from principles in Tam et al., 2022; Kolarevic, 2003).

The hall's façade features a folded membrane structure spanning approximately 20,000 square meters, constructed from a high-performance PTFE-coated fiberglass textile. This material was selected for its lightweight properties, tensile strength, fire resistance, and capacity for dynamic lighting effects. Its translucency enables the integration of around 80,000 programmable LED lights, which illuminate the 32,000 square meter facade and provide adaptable visual performances (SSF Ingenieure AG, 2012). This membrane system not only enhances aesthetic expression but also contributes to the building's thermal and daylighting performance through its semi-permeable light diffusion capacity (Kolarevic & Klinger, 2008). Arena is lit by 1200 LED light points. Lighting rate at 1m height is 850 lux. The integration of natural and artificial lighting was meticulously planned to create an adaptable and energy-efficient lighting environment (ArchDaily, 2012). The lighting design in this iconic structure was inspired by the hyperboloid. A single-leaf hyperboloid is a surface formed by rotating a hyperbola symmetrically positioned with respect to one of the coordinate axes in a rectangular coordinate system around another axis in space. In the image, the lighting of the structure and a hyperbola symmetrical about the Y axis and rotating about the Z axis are emphasized **(Figure 13)**.

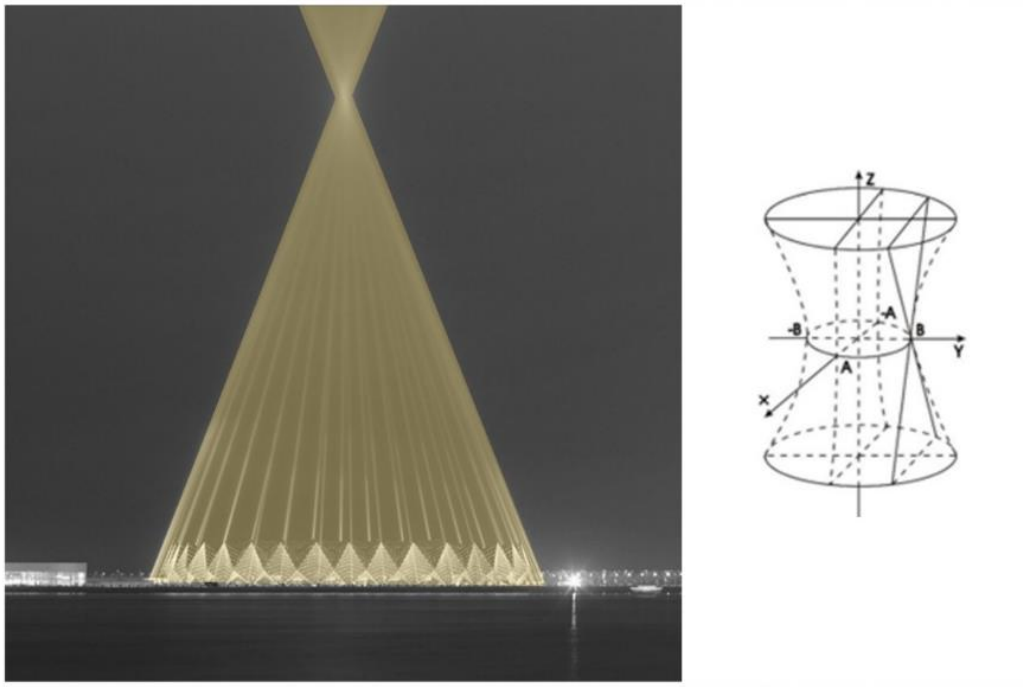


**Figure 13.** Lighting design of the Crystal Hall and its relationship to the hyperboloid shape, Baku, 2013. (https://www.dezeen.com/2013/10/17/baku-crystal-hall-stadium-in-azerbaijan-by-gmp-architekten/).

The lighting system of the Baku Crystal Hall exemplifies the integration of architectural expression and technological precision. Designed by Lichtvision Design, the façade features over 5,400 RGB LED nodes strategically embedded within the membrane panels to create dynamic night-time illuminations that enhance the crystalline geometry of the structure (Lichtvision Design, 2025). The use of a lightweight PVC-PES mesh membrane, developed by PFEIFER Structures, not only reduced the overall weight of the façade system but also enabled a seamless embedding of lighting elements without compromising the integrity of the envelope (PFEIFER Structures, 2024). According to ArcelorMittal (2024), the façade consists of approximately 180 prefabricated triangular panels, each equipped with programmable LED modules that allow for vivid, programmable light displays. This system contributes both to the visual identity of the venue and its symbolic representation as a cultural beacon during international events **(Figure 14)**.

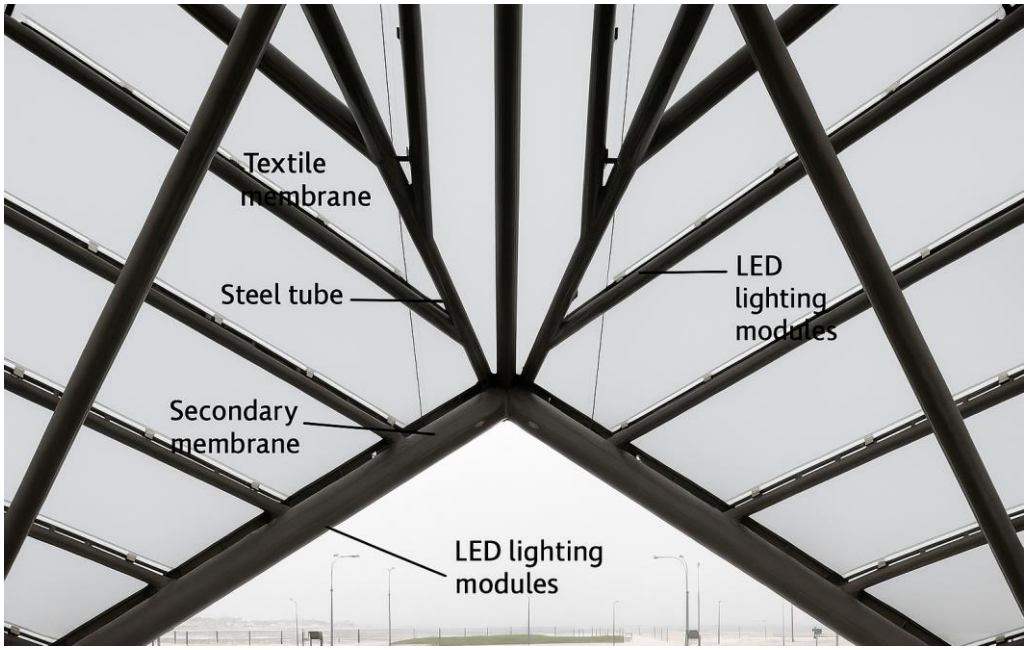


**Figure 14.** Diagram showing the layering of the textile membrane façade and integrated LED lighting modules. (Author's visualization based on SSF AG and Lichtvision Design technical documentation, 2025)

The project exemplifies the integration of material performance modeling and digital fabrication workflows in high-performance architecture. The use of parametric tools enabled the coordination between form generation and fabrication constraints, while material-specific design principles ensured structural soundness and expressive aesthetics. By leveraging the synergy between computational design, prefabrication, and structural engineering, the Baku Crystal Hall demonstrates how modern architecture can respond to both creative ambition and logistical efficiency.

### 3.2.3 Environmental Control Strategies

The Baku Crystal Hall exemplifies how architectural form and engineering logic converge to address complex environmental dynamics through mathematical modeling and performance-based design strategies. Situated on the Caspian Sea shoreline, the building is exposed to high humidity, intense wind loads, and seismic activity, all of which significantly influence its environmental control systems.

Due to Baku's geographic position (latitude ~40.4°N), the orientation and transparency of the Baku Crystal Hall façade played a critical role in daylighting strategy. The building was strategically aligned to maximize southern solar gain during winter months while minimizing glare and overheating in summer. The translucent textile membrane, with a visible light transmittance (VLT) estimated around 30–35%, filters harsh direct sunlight while allowing sufficient diffuse daylight to penetrate the interior (Kolarevic & Malkawi, 2005).

Parametric simulations were employed to evaluate solar angles, shading patterns, and daylight penetration across different times of day and seasons. These analyses enabled the adjustment of panel orientations and opacities to maintain optimal luminance levels inside the arena without excessive energy use for artificial lighting. **Figure 15** illustrates how the building's façade orientation and geometry were optimized to maximize solar gain during winter while minimizing heat ingress during summer, thereby enhancing passive thermal regulation and reducing HVAC dependency.

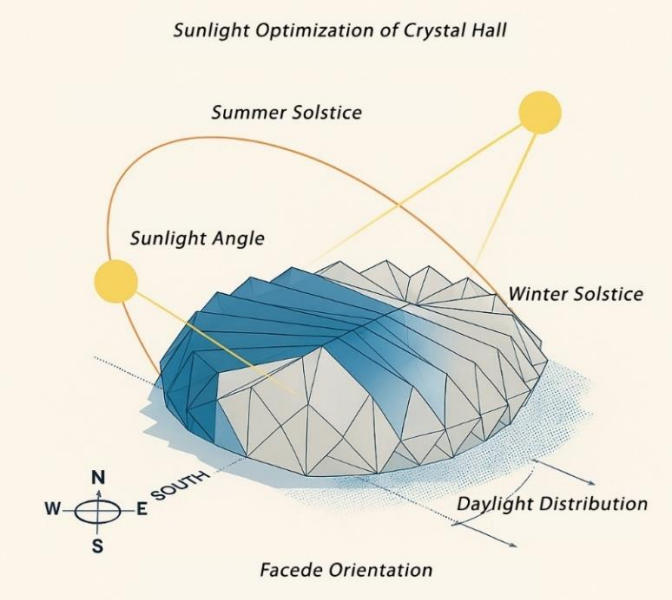


**Figure 15.** Sunlight angle simulation and daylight distribution diagram for Baku Crystal Hall, showing façade orientation and solar trajectory across seasonal variations. (Author's visualization based on location-specific solar studies, 2025).

Baku is famously known as the "City of Winds," with average wind speeds reaching over 10 m/s during winter months. To counteract these conditions, computational fluid dynamics (CFD) simulations were conducted to shape the building's form for aerodynamic resilience. The faceted geometry and lowered profile of the structure help reduce wind-induced turbulence and pressure zones by facilitating streamlined airflow around the façade, a strategy commonly adopted in aerodynamic architectural design to mitigate vortex shedding and uplift forces (Yadav & Roy, 2024). These simulations informed not only the orientation of openings but also the reinforcement of the membrane anchoring points **(Figure 16)**.

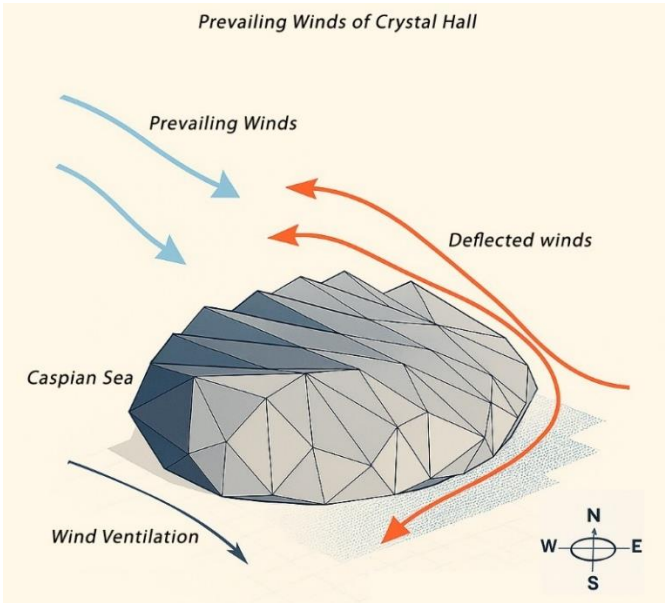


**Figure 16.** Diagram showing the aerodynamic response of the Baku Crystal Hall to prevailing wind directions from the Caspian Sea. The faceted envelope acts as a wind deflector, minimizing pressure differentials and reducing turbulence near pedestrian zones. (Adapted by author, based on environmental simulation concepts by Blocken, 2018).

High ambient humidity and salt-laden air posed challenges for the longevity of materials. The design incorporated corrosion-resistant steel alloys and specially treated textile membranes to ensure durability under constant exposure to marine air. Protective coatings and structural detailing were guided by hygroscopic performance modeling, which accounted for moisture accumulation and dissipation across the envelope system (González & Navarro, 2006).

Although not part of a major seismic fault line, Baku sits in a zone of moderate to high seismic risk due to tectonic interactions in the Caucasus region. Finite element analysis (FEA) and modal response simulations were used to evaluate structural behavior under seismic excitation. The diagrid system distributes lateral forces efficiently across the crystalline shell, providing inherent flexibility and redundancy in the load path (Dzenis & Jiang, 2006). The segmentation of the roof, façade, and stands into modular, decoupled systems allows for differential movement during seismic events, enhancing overall resilience.

By integrating performance simulations with site-specific environmental data, the Baku Crystal Hall achieves a highly adaptive design. It demonstrates how mathematics, when applied contextually, can support sustainability, occupant comfort, and long-term structural integrity in environments facing diverse natural stressors.

#### 3.2.4 Cultural and Architectural Significance

Baku Crystal Hall represents a pivotal moment in Azerbaijan's efforts to reframe its national identity through contemporary architecture. Constructed in the context of hosting the 2012 Eurovision Song Contest, the building became a strategic tool of cultural diplomacy, reflecting the state's aspiration to align itself with Western modernity while asserting its presence on the global stage (Broers & Mahmudlu, 2022). As such, the Crystal Hall exemplifies how monumental architecture can function as both a medium of spectacle and a symbol of state-led nation branding.

The structure's expressive, futuristic form marks a distinct departure from Soviet-era architectural narratives, embodying Azerbaijan's post-independence ambitions and aesthetic liberalization. Positioned prominently along the Caspian Sea, the Crystal Hall plays a symbolic role in re-establishing Baku's identity as a cosmopolitan and modern capital. This spatial positioning is significant: it reinforces the city's historical connection to the sea while simultaneously enhancing the building's iconic visibility in the urban skyline (Bayrakdar, 2024).

In this regard, Baku Crystal Hall is not merely a venue for large-scale events; it is an architectural statement deeply embedded in the politics of urban image-making. The building aligns with broader post-Soviet transitions wherein architectural production is utilized as a means of consolidating political legitimacy and projecting national narratives (Guliyev, 2009). Through its distinctive form and strategic location, the Crystal Hall contributes to both the performative identity of the city and the symbolic vocabulary of the nation.

### 3.3. Crescent Mall (2022)

The Crescent Mall in Baku, Azerbaijan, exemplifies the fusion of mathematical design and cultural symbolism, drawing inspiration from the crescent a significant emblem in Islamic art and Azerbaijani heritage. This architectural approach not only enhances the mall's aesthetic appeal but also reinforces its cultural relevance within the urban landscape.

### 3.3.1 Mathematics in Design: Crescent Geometry and Cultural Inspiration

The crescent shape, characterized by its curved form, is a fundamental element in Islamic architecture, symbolizing progress and enlightenment. In the design of Crescent Mall, architects employed geometric principles to create a structure that mirrors this iconic form. The building's façade and overall layout incorporate sweeping curves and arcs, reflecting the crescent's geometry and creating a harmonious visual flow (HBA Architecture, n.d.). This design strategy utilizes mathematical concepts such as circular arcs and parabolic curves to achieve the desired aesthetic effect. Incorporating the crescent shape serves as a deliberate nod to Azerbaijani culture, where the crescent holds historical and symbolic importance **(Figure 17)**. By embedding this form into the mall's architecture, designers pay homage to national identity and cultural heritage. This approach aligns with the broader trend in contemporary architecture of integrating culturally significant symbols to foster a sense of place and community connection (DSA Architects International, 2024).

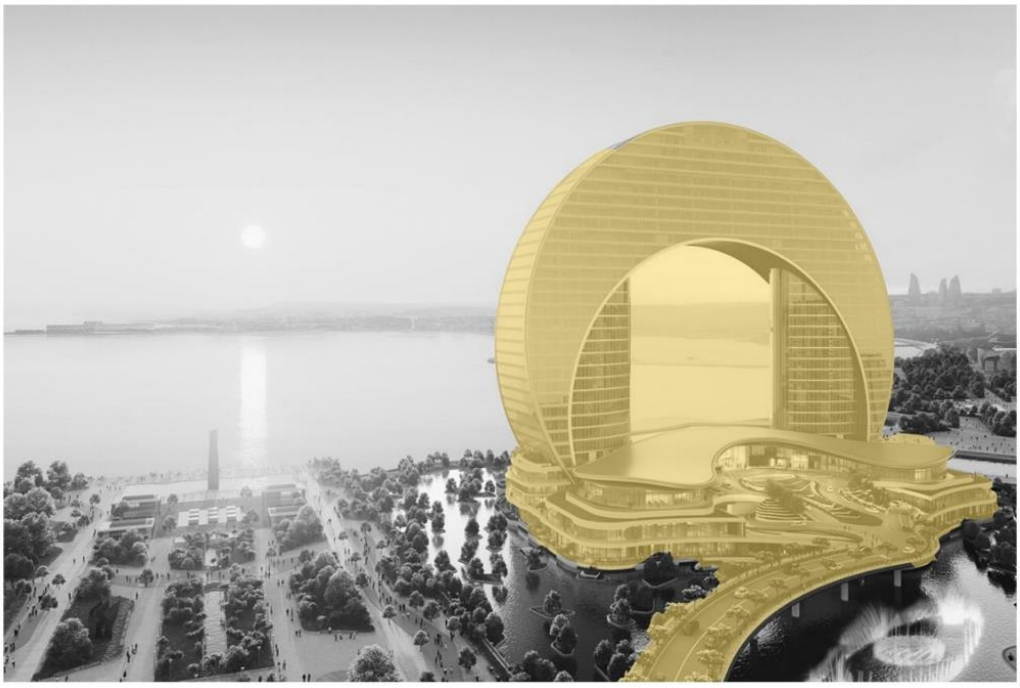

**Figure 17.** The building's design reflecting the crescent's geometry and creating a harmonious visual flow, Baku, 2024. (https://www.gillespies.co.uk/projects/the-crescent-development).

This formal strategy is grounded in mathematical concepts such as circular arcs, parabolic curves, and ellipses, all of which are essential for modeling the smooth transitions and curvature required by the crescent shape. These geometries are not merely symbolic but also structurally functional. The translation of such abstract forms into constructible elements necessitates a high degree of mathematical precision **(Figure 18)**.

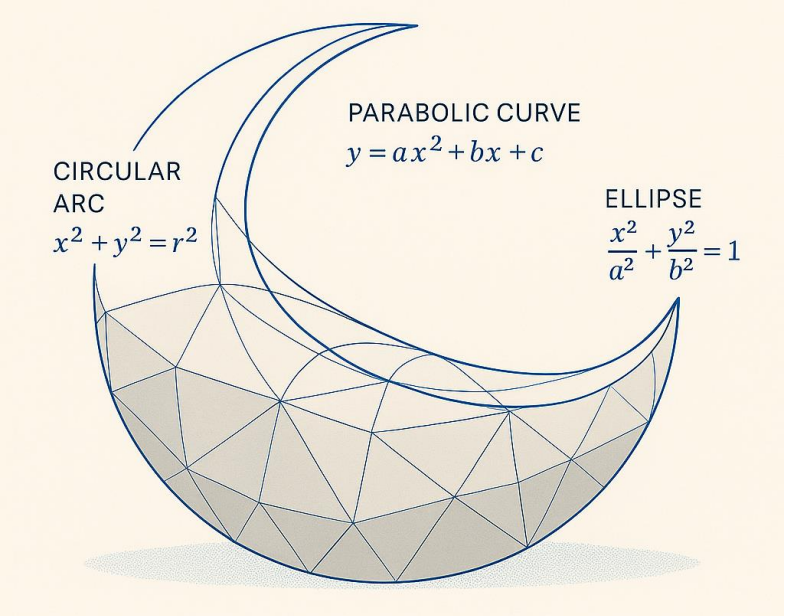


**Figure 18.** Diagram illustrating the primary crescent geometry applied to the building envelope of Crescent Mall, showcasing the use of arcs and curves derived from symbolic Islamic forms. (Author's visualization, generated in Adobe Photoshop and Rhinoceros 3D, 2025).

Architects and engineers rely on computational design platforms to digitally model these curves, ensuring that the expressive form aligns with technical feasibility **(Figure 19)**. Advanced geometry, vector calculus, and surface modeling techniques are used to simulate load-bearing behavior and optimize the distribution of structural stresses throughout the curved envelope (Architizer, n.d.).

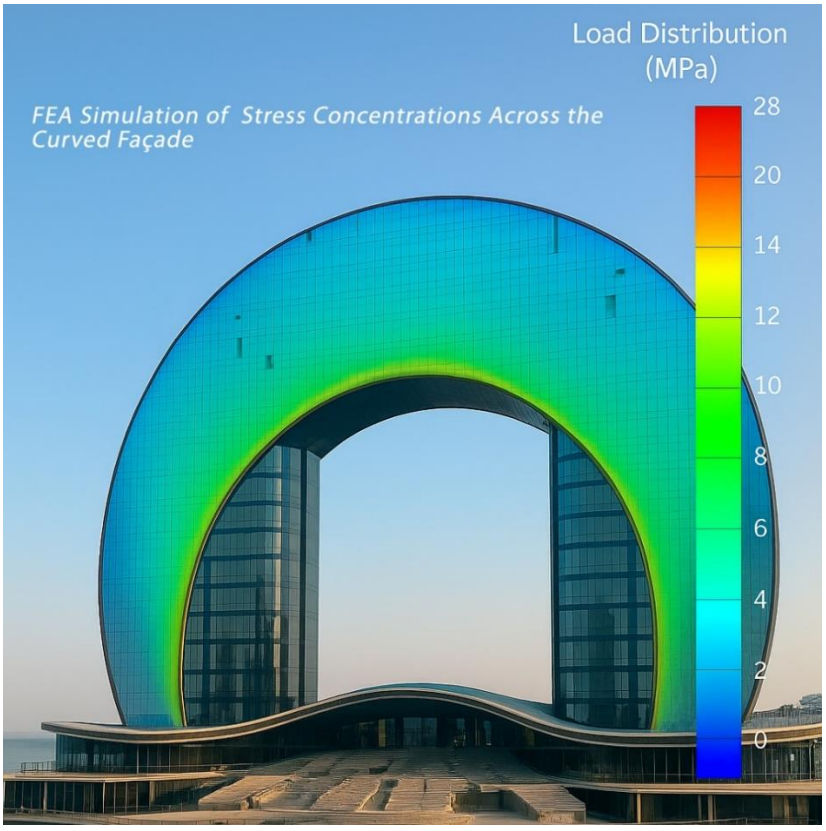


**Figure 19.** Load distribution simulation over the Crescent Mall structure. (Visualized by author, 2025).

The digitally enhanced image illustrates the distribution of structural loads along the crescent-shaped envelope. Warmer colors (red–orange) indicate areas of higher compressive stress, particularly concentrated around the vertical support cores and the lower arc of the structure. Cooler colors (blue–green) reflect regions of minimal stress, such as the apex of the arch. This visual analysis helps clarify how gravitational and lateral forces are redirected through the continuous curved geometry of the structure.

In addition to its cultural symbolism and structural rigor, the crescent form also responds sensitively to the mall's location along Baku's waterfront. The curved profile of the building complements the natural contours of the coastline, enhancing its contextual integration. By echoing the sinuous edges of the seafront, the architecture merges visually and experientially with the landscape, reinforcing a sense of environmental continuity. This alignment with natural topography and urban vistas elevates the mall's identity as a contemporary landmark. Furthermore, it contributes to user orientation and movement, guiding circulation intuitively along curved paths and open vistas (HBA Architecture, n.d.).

Ultimately, the design of Crescent Mall exemplifies the synthesis of culturally responsive symbolism and mathematically informed design. It demonstrates how geometry can bridge tradition and innovation, enabling an architectural language that is at once expressive, functional, and contextually grounded. The project offers a compelling case for integrating symbolic forms through advanced design methodologies to generate architecture that is meaningful, performative, and place-specific.

### 3.3.2 Material Science and Structural Optimization

The Crescent Mall in Baku exemplifies a sophisticated integration of material science and sustainable design principles, reflecting the city's dual aspiration for technological advancement and environmental stewardship. The architectural articulation of the building embraces both regional identity and global best practices in sustainability, serving as a prominent case of how commercial developments can embrace ecological consciousness without compromising aesthetic ambition.

At the core of its sustainable strategy lies the carefully curated façade system, which utilizes a hybrid approach combining unitized and stick curtain wall assemblies, metal cladding, fiber cement panels, laminated timber, and expanded metal mesh (Koltay Facades, n.d.). This material palette was selected not only for its visual richness and texture but also for its proven performance in terms of durability, insulation capacity, and low embodied energy. Each element contributes to the thermal regulation of the envelope, facilitating the minimization of unwanted heat gain or loss across seasonal transitions.

Building upon this foundation, the Crescent Mall incorporates a series of passive and active energy efficiency measures. High-performance low-emissivity glazing, combined with continuous insulation layers, limits thermal bridging and contributes to the reduction of operational energy demands, particularly for mechanical heating and cooling (HBA Architecture, n.d.). These measures align with current global benchmarks for energy-efficient commercial buildings and demonstrate the potential of integrated façade engineering.

Beyond energy, the building's infrastructure supports sustainable water usage practices. Rainwater harvesting mechanisms are embedded within the roof design and are supplemented by low-flow plumbing fixtures, collectively reducing the mall's dependence on potable water sources and mitigating urban runoff (DSA Architects International, 2024). This holistic approach reflects an understanding of water scarcity challenges increasingly relevant in global urban planning discourses.

Interior environmental quality also receives critical attention through the use of low-VOC materials and finishes, which enhance indoor air purity and contribute to occupant health. Coupled with

expansive openings and atriums that facilitate the penetration of natural daylight deep into the interior volumes, the design reduces reliance on artificial lighting during daytime hours and fosters a healthier indoor microclimate (Crescent Mall, n.d.). **Figure 20** illustrates the spatial distribution of natural light and the impact of material translucency on ambient quality.

Ultimately, Crescent Mall presents a compelling model for the integration of material science and sustainable strategies in commercial architecture. Through the thoughtful application of environmentally responsive materials, energy-efficient systems, and resource-conscious design decisions, the building not only achieves visual and functional excellence but also sets a precedent for sustainability in high-profile urban developments.

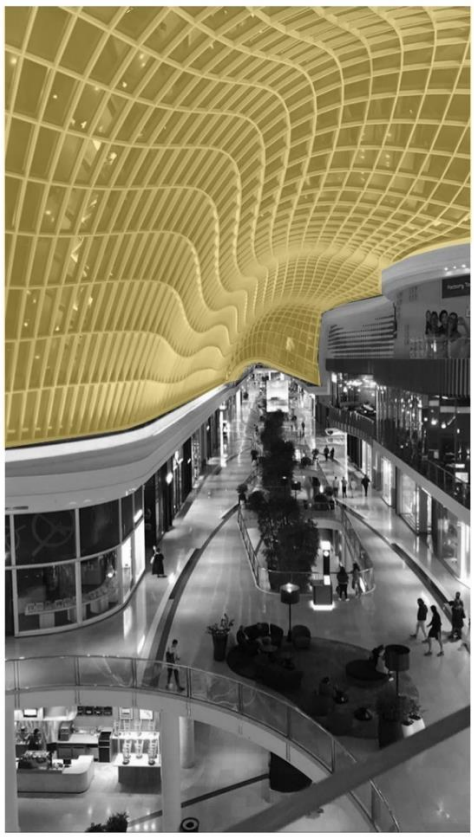

**Figure 20.** The design maximizes natural daylight penetration, reducing the need for artificial lighting, Baku, 2024. (https://jp.pinterest.com/pin/67272588177722300/)

**Table 2** summarizes the key sustainable design strategies employed in Crescent Mall, showcasing how material selection, energy efficiency, water management, and environmental responsiveness were holistically integrated. These measures reflect a commitment to both architectural excellence and ecological stewardship, positioning the mall as a benchmark for sustainable development in the region.

| ***Category*** | ***Design Features*** | ***Sustainability Benefit*** |
|---|---|---|
| ***Material Strategy*** | High-performance façade systems (unitized & stick curtain walls, metal cladding, fiber cement panels, timber laminates, expanded metal mesh) | Enhanced durability, thermal performance, and architectural identity |
| ***Energy Efficiency*** | High-performance glazing, insulation, optimized HVAC systems | Reduced energy consumption and improved thermal comfort |

| | | |
|---|---|---|
| ***Water Conservation*** | Rainwater harvesting, low-flow fixtures, greywater reuse systems | Minimized potable water use and reduced burden on municipal infrastructure |
| ***Indoor Environmental Quality*** | Use of low-VOC materials, maximized natural daylight, improved air ventilation | Healthier indoor air quality, lower reliance on artificial lighting |
| ***Environmental Integration*** | Façade orientation responding to sun path and prevailing winds, site-specific landscaping | Passive solar control, enhanced microclimate responsiveness, ecological design harmony |

**Table 2.** Key sustainable strategies applied in Crescent Mall's design, highlighting material, energy, water, and environmental considerations. (Prepared by the author, based on project analysis and design integration, 2025).

### 3.3.3 Environmental Control

The Crescent Mall in Baku exemplifies an integrative approach to environmental control, embedding site-specific climatic adaptation within its architectural and technological systems. As a coastal city subject to high wind velocities, solar radiation fluctuations, and humidity variation due to its proximity to the Caspian Sea, Baku poses distinctive environmental challenges for large-scale structures (Amirinia et al., 2017). The building's aerodynamic crescent-shaped geometry contributes to passive microclimatic regulation by mitigating wind-driven turbulence and minimizing eddy formation along pedestrian-level zones. Its form acts as a wind-deflecting envelope, dispersing pressure loads and reducing structural stress concentrations on the façade surface, which is particularly important in open coastal zones where wind speeds frequently exceed 20–30 km/h (Reiter, 2010). This streamlined geometry facilitates passive cross-ventilation by channeling prevailing breezes through recessed entryways and atrium voids, enhancing indoor air renewal while reducing mechanical ventilation dependency. As shown in **Figure 21**, the curved form and central void of the Crescent Mall create natural ventilation pathways that harness prevailing winds, while simultaneously offering unobstructed views and daylight access. This spatial configuration not only enhances passive cooling but also reinforces the building's environmental responsiveness.

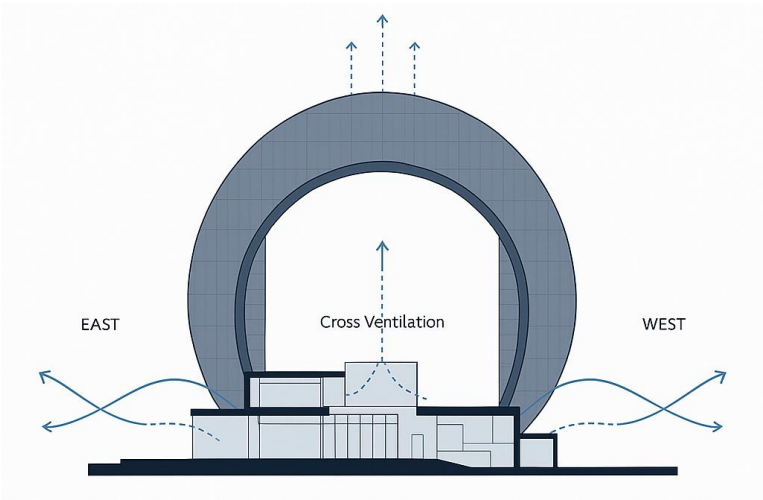


**Figure 21.** Ventilation and view analysis section diagram of Crescent Mall, showing passive airflow channels guided by building geometry and orientation. (Author's illustration based on environmental simulation principles, 2025).

In tandem with its aerodynamic modulation, Crescent Mall integrates a daylight-responsive lighting strategy. The structure's façade orientation and fenestration layout were informed by solar path simulations, optimizing the balance between visible light transmittance and heat gain. Solar shading coefficients were adjusted through material selection and horizontal louver placement, allowing the building to retain daylight quality while preventing overheating during peak summer insolation (Mardaljevic et al., 2009). Studies have shown that strategic glazing angles and translucent materials can reduce cooling demand by up to 35% in mixed-use commercial buildings located in temperate coastal climates (Matos et al., 2022).

Artificial lighting systems within the mall employ a layered luminance scheme incorporating daylight harvesting sensors and occupancy-responsive controls. High-efficacy LED arrays are deployed in a zoned network, adjusting luminous flux based on diurnal light levels and spatial activity patterns. This dynamic illumination protocol not only enhances visual comfort but also contributes to a 25-40% reduction in operational energy usage, aligning with recent findings on smart lighting integration in commercial infrastructure (Baharudin et al., 2021).

**Table 3** illustrates how Crescent Mall integrates both natural and artificial lighting strategies to improve environmental quality and reduce energy consumption. These design decisions reflect a responsive architectural approach that adapts to climatic and spatial demands.

| ***Lighting Type*** | ***Design Strategies*** | ***Implementation at Crescent Mall*** |
|---|---|---|
| ***Natural Light*** | Building orientation, daylight-responsive facade design, high-transmittance glazing | South-facing facades maximize solar exposure; glass curtain walls admit diffuse daylight |
| ***Artificial Light*** | LED technology, smart lighting control systems, energy-efficient fixtures | Smart-controlled LED systems adjust brightness based on occupancy and daylight availability |
| ***Integration Method*** | Combined modeling for daylight and electric light scenarios | Lighting simulations inform the placement and output of fixtures; synergy enhances user comfort |

**Table 3.** Summary of Lighting Strategies Implemented at Crescent Mall. (Prepared by the author, based on project analysis and design integration, 2025).

The synergy between aerodynamic design and environmental lighting control reflects an advanced mode of sustainable architecture that integrates form, material, and technology. Rather than treating environmental systems as ancillary elements, Crescent Mall embeds them into its core design logic responding to wind vectors, solar geometry, and internal comfort metrics within a unified architectural language. This approach supports regional energy reduction goals while establishing a new paradigm for contextually responsive commercial development in the Caspian region (UN Habitat, 2024).

### 3.3.4 Cultural and Architectural Significance

The Crescent Mall in Baku stands as a contemporary icon symbolizing Azerbaijan's architectural ambition and cultural repositioning in the post-Soviet era. As part of the larger Crescent Bay development designed by DSA Architects International, the mall plays a pivotal role in reshaping Baku's urban and socio-cultural landscape. Rather than serving solely as a commercial hub, it emerges as an emblematic site of lifestyle transformation bridging traditional values with global consumerist aspirations (DSA Architects International, 2024).

Located along the Caspian shoreline, the mall's strategic placement reinforces a long-standing symbolic relationship between Baku and the sea, evoking themes of openness, prosperity, and cosmopolitanism. The design is intentionally expressive, characterized by sweeping curves and fluid forms that echo the maritime identity of the city while also referencing regional cultural motifs associated with movement and continuity. The mall's curvature complements the adjacent Crescent Tower, collectively forming a visual dialogue that dominates the city's evolving skyline and reflects the nation's aspiration to assert itself architecturally on a global stage (HBA Architecture, n.d.).

Internally, the mall blends high-end retail architecture with motifs derived from Art Nouveau, a style that resonates subtly with Baku's early 20th-century architectural heritage. This deliberate design decision by Hirsch Bedner Associates allows for a contemporary reinterpretation of past elegance, cultivating a space where modernity and nostalgia co-exist (HBA Architecture, n.d.). The interplay of natural light, layered textures, and fluid spatial organization within the interior aims to enhance experiential richness, aligning with global trends in immersive retail environments.

Culturally, Crescent Mall functions as more than a shopping destination. It has become a node for social interaction, cultural programming, and civic life. Hosting exhibitions, concerts, and seasonal celebrations, the mall contributes to the public sphere by offering accessible, curated cultural experiences—thus positioning itself not just as a passive consumer space but as an active cultural producer. These events foster urban engagement and help democratize cultural participation in a city where such spaces have traditionally been limited to state-controlled institutions (Vigo Visa, 2025).

In essence, Crescent Mall is emblematic of a broader urban strategy wherein architecture is leveraged not only for economic stimulus but also for nation-branding and soft power projection. Through its formal language, cultural programming, and symbolic coastal positioning, it encapsulates Azerbaijan's efforts to construct a modern identity that is at once rooted in tradition and forward-looking.

**DISCUSSION**

The architectural analysis of Mirvari Restaurant, Baku Crystal Hall, and Crescent Mall demonstrates that mathematical reasoning in architecture functions not only as a technical necessity but also as a catalyst for environmentally responsive, culturally embedded, and symbolically meaningful design. Across all three structures, geometry acts as both an aesthetic language and a performative logic, echoing contemporary discourse on biophilic, sustainable, and technologically advanced built environments.

The Mirvari Restaurant exemplifies an early form of bioclimatic design, where mathematical geometry specifically the hyperbolic paraboloid enabled passive ventilation, daylight modulation, and material efficiency. While modern computational tools were absent, the architects achieved outcomes aligned with current ecological design principles, such as natural airflow, minimal material use, and contextual integration. These design goals reflect strategies discussed by Kellert (2015) and Beatley (2016), where built environments foster sensory connection with the surrounding landscape. The building's openness and shell form, derived from mathematical principles, resonate with the restorative effects of natural geometry and spatial fluidity outlined by Ulrich (1984) and Tsunetsugu et al. (2010).

By contrast, the Baku Crystal Hall operates within the realm of digitally driven architectural production, integrating parametric design tools to coordinate geometry, structural logic, and facade lighting. The use of tessellated surfaces and LED systems not only enhanced visual performance but also responded to environmental stressors such as wind, daylight, and humidity. These strategies parallel findings by Chen et al. (2019) and Zellweger et al. (2020), who highlight the performance benefits of digital geometry in contemporary architecture. Moreover, the integration of programmable lighting and

responsive façade systems reflects Ryan and Browning's (2014) patterns of biophilic design, especially those related to dynamic light and visual complexity.

The Crescent Mall further deepens the symbolic and cultural dimension of mathematically informed design. The crescent geometry, derived from circular arcs and parabolas, is not only structurally efficient but also emotionally and culturally resonant. This formal language aligns with arguments by Kellert, Heerwagen, and Mador (2008), who emphasize that architecture can embody cultural identity while supporting ecological and psychological well-being. The building's orientation, façade porosity, and integration with prevailing wind patterns also support natural ventilation and energy efficiency, consistent with environmental control strategies discussed by Bakar et al. (2019) and Gregory and Andrews (2020).

All three buildings emphasize the intertwined role of geometry, material science, and environmental sensitivity reflecting Robertson et al.'s (2020) argument that wood and geometric modulation are powerful tools in enhancing sustainability. Although their construction periods and technologies differ, the underlying logic of using mathematics to reconcile formal ambition with environmental responsiveness remains constant. While the Mirvari Restaurant achieves this through analog experimentation, the Baku Crystal Hall and Crescent Mall realize it through advanced simulations and material modeling illustrating the continuity of biophilic principles across technological eras (Evans et al., 2020; Browning et al., 2014).

These findings collectively reinforce that mathematics in architecture is not a neutral abstraction but a method of embedding meaning, resilience, and ecological harmony into built form. Whether through structural shells, triangulated skins, or symbolic arcs, mathematical thinking facilitates design that is at once innovative and humane a principle at the core of biophilic and sustainable design theory (Burnard & Kutnar, 2015; Chang & Chen, 2020). As such, the case studies from Baku offer both historical insight and forward-looking strategies for contemporary practice.

## CONCLUSION

The exploration of mathematics in architecture reveals a profound and enduring synergy between abstract principles and tangible design. From its historical roots in geometry to its contemporary applications in computational tools, mathematics has consistently served as both a foundation and a frontier for architectural innovation. The examples reviewed and analyzed in the article encompass a centuries-long era of the development of Azerbaijan's architectural heritage. This demonstrates that Azerbaijan, in its urban planning and interior design, has consistently kept pace with the times, adhering to the principles of parametric contemporary architecture and design. This article has examined how mathematical approaches shape modern architecture through three case studies in Baku: Baku Crystal Hall, Mirvari Restaurant and Crescent Mall. Each of these structures exemplifies the diverse ways in which mathematics underpins design, material optimization, and environmental performance.

The Baku Crystal Hall demonstrates the potential of mathematical geometry and parametric tools to realize complex and iconic forms. The tessellation of its facade, inspired by crystalline structures, not only embodies aesthetic precision but also ensures structural efficiency through computational modeling. This integration of form and function underscores how mathematics transforms abstract ideas into practical realities, setting a benchmark for contemporary architectural practice.

Mirvari Restaurant offers a contrasting perspective, where mathematics is used to craft organic, wave-like forms that harmonize with their natural surroundings. The hyperbolic paraboloid roof exemplifies how geometric principles and material science combine to create lightweight, durable, and visually

dynamic structures. Furthermore, the restaurant's sensitivity to its coastal context highlights how environmental control, informed by mathematical simulations, can enhance occupant comfort and sustainability.

Crescent Mall reflects the cultural and symbolic potential of mathematics in design, drawing from the crescent geometry integral to Azerbaijani identity. This structure leverages computational tools to blend cultural heritage with modern urban demands, creating a space that is not only visually striking but also environmentally responsive. The aerodynamic design and energy-efficient lighting systems demonstrate how mathematics drives innovation in sustainable strategies, contributing to the building's functional and ecological performance.

Expanded comparative **Table 4** synthesizes the design intentions, mathematical foundations, analytical processes, and urban implications of the three case studies. The selection of Mirvari Restaurant, Baku Crystal Hall, and Crescent Mall reflects distinct architectural typologies (public, event, and commercial) integrated into Baku's coastal fabric. Each project exemplifies how mathematical thinking informs not only form but also performance, spatial quality, and cultural resonance.

| ***Structure*** | ***Design Dynamics*** | ***Mathematical Approach*** | ***Types of Analysis Used*** | ***Key Architectural & Environmental Outcomes*** | ***Urban Role / Contextual Contribution*** |
|---|---|---|---|---|---|
| ***Mirvari Restaurant*** | Organic, shell-like geometry; wall-less openness; inspired by marine elements and natural fluidity | Hyperbolic paraboloid surface ($z = x^2/a^2 - y^2/b^2$) | Form-finding simulations, geometric modeling, material optimization | Lightweight and sculptural concrete shell; passive ventilation and light play via openness | Public recreational spot along the boulevard; spatial openness enhances coastal interaction |
| ***Baku Crystal Hall*** | Crystalline, modular expression; event architecture; LED-integrated kinetic façade | Triangulated diagrid geometry; FEM simulations; parametric logic | FEM structural analysis, CFD, lighting optimization, parametric rationalization | Structural efficiency under time pressure; dynamic LED-integrated facade; airflow-responsive form | Urban-scale performance venue; iconic identity in Baku's skyline and cultural branding |
| ***Crescent Mall*** | Crescent symbolism; cultural narrative; commercial typology blended with fluid coastal aesthetics | Circular and parabolic geometries; surface simulations | Lighting mapping, ventilation and wind analysis, sustainable water strategies | Culturally embedded design; passive ventilation; integration of sustainable material layering | Commercial and social anchor along the waterfront; mediates between built and natural context |

**Table 4.** Comparative Matrix of Design Logic, Mathematical Approaches, and Urban Contributions of the Examined Structures. (Prepared by the author, based on project analysis and design integration, 2025).

Collectively, these examples illustrate the centrality of mathematics in modern architecture, where it acts as both a creative catalyst and a technical necessity. The evolution of three-dimensional thinking, from ancient geometric ratios to advanced parametric systems, highlights the expanding scope of mathematical applications. Today's architects not only use mathematics to solve structural challenges but also to push the boundaries of form, integrating cultural narratives and sustainability goals into their designs. Looking forward, the integration of emerging technologies such as artificial intelligence, machine learning, and immersive modeling platforms promises to further elevate the role of mathematics in architecture. These advancements will enable architects to design adaptive, resilient, and innovative structures that respond dynamically to environmental, social, and cultural contexts. The future of architecture lies in the continued exploration of this intersection, where mathematical precision meets creative imagination.

In conclusion, mathematics is not merely a tool for architectural problem-solving; it is a lens through which architects can reinterpret and reshape the built environment. By bridging theoretical abstraction with practical execution, mathematics empowers architects to create spaces that are not only functional and sustainable but also culturally and aesthetically resonant. As global challenges such as urbanization and climate change intensify, the partnership between mathematics and architecture will play an increasingly pivotal role in designing a built environment that balances innovation with responsibility.

***Etik Standart ile Uyumluluk***

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ISPARTA UYGULAMALI BİLİMLER ÜNİVERSİTESİ

**Turkish Journal of Forestry** | 2025, 26(3): 441-451
Research article (Araştırma makalesi)

# Tarihi kentlerde biyoçeşitlilik bağlamında peyzaj planlama ve tasarımı: Safranbolu kenti örneği

**Ayşe Betül Çufalı**[a,*], **Aysel Uslu**[b]

**Öz:** Kentsel peyzaj konusunda biyoçeşitliliğin korunması ve geliştirilmesi peyzaj planlama ve tasarımında öncelikli konular arasındadır. Kentleşme ile yapılı çevre oranı artmakta doğal alanlar ise azalmaktadır. Artan kentsel doku ile bitki ve hayvan toplulukları için habitatlar olumsuz etkilenmektedir. Böylece kentlerde biyoçeşitlilik oranının azaldığı gözlemlenmektedir. Buna rağmen, son yıllarda kentsel biyoçeşitliliğin iyileştirilmesine yönelik çabalar artmaktadır. Bunun sonucu olarak kent ile doğayı entegre ederek biyoçeşitliliğe destek olan kentsel peyzaj tasarımı ve planlamaları gündeme gelmektedir. Bu çalışmada UNESCO kültür mirası listesinde yer alan Safranbolu ilçesi (Karabük) üzerine bir çalışma yürütülmüştür. Makalede; tarihi ve doğal değerleri açısından son derece zengin olan bir kent örneğinde, biyoçeşitliliği destekleyecek peyzaj tasarımı ve planlamaya ilişkin somut öneriler geliştirilmesi amaçlanmıştır. İlk aşamada elde edilen uydu görüntüleri ve yerinde sörvey çalışmaları ile mevcut durum tespiti yapılmıştır. Bunun üzerine saptanan sorunlar için "koruma, bağlantı, yapı, döngüler, biyolojik etkileşimler ve yaban hayatı destekleyen tasarımlar" başlıkları altında çeşitli planlama ve tasarım çözüm önerileri oluşturulmuştur. Tarihi özelliğini korurken kentsel biyoçeşitliliği destekleyecek unsurlar arasında mevcut yeşil ağın güçlendirilmesi ön plandadır. Ayrıca bu durumu desteklemek amacıyla kent merkezinde ve yakın çevresinde yöresel ve doğal malzeme kullanımı önemlidir. Bunun yanı sıra, geleceğe yönelik öneri tasarı alanlarında bitki seçimi, doğal bitki örtüsü göz önüne alınarak yapılmalıdır.
**Anahtar Kelimeler:** Kentsel biyoçeşitlilik, Kentsel peyzaj tasarımı, Peyzaj planlama, Safranbolu

# Landscape planning and design solutions within the scope of biodiversity in historical cities: A case study of Safranbolu city

**Abstract:** Protection and development of biodiversity in urban landscapes planning and design process is among the priority issues. By urbanization, the ratio of built environment increases, and natural areas decrease. Habitats for plants and animals are negatively affected by the increasing urban texture. Thus, it is observed that biodiversity in cities is affected negatively. However, in recent years, there have been increasing efforts to improve urban biodiversity. As a result, urban landscape design and planning that support biodiversity by integrating the city and nature are on the agenda. In this study, a study was conducted on Safranbolu district (Karabük), which is on the UNESCO cultural heritage list. The aim of the article is to develop recommendations for landscape design and planning to support biodiversity in a city that is extremely rich in historical and natural values. In the first stage, the current situation was determined with satellite images and on-site surveys. Various planning and design solutions have been proposed for the problems identified under the headings of "protection, connectivity, construction, cycles, biological interactions and designs that support wildlife". Among the elements that will support urban biodiversity while preserving its historical character, strengthening the existing green network is at the forefront. Additionally, to support this approach, it is important to use local and natural materials in the city center and nearby. Furthermore, in future design proposal areas, the plant selection should be done by considering the natural vegetation.
**Keywords:** Urban biodiversity, Urban landscape design, Landscape planning, Safranbolu

## 1. Giriş

Bir yaşam alanı olan kentler, kültürel ve doğal unsurların bir arada karşılıklı etkileşim içinde bulunduğu bir ekosistem olarak tanımlanmaktadır (Karadağ, 2009). Kentleşmeyle beraber tarımdan ve topraktan uzaklaşma gerçekleşmiş (Kıray, 1982), doğal alanlar azalarak yapılı çevrede artış gözlemlenmiştir. Kentleşmedeki artış ile belirli bir alandaki toplam tür çeşitliliğini ifade eden biyolojik çeşitlilik (Lovejoy, 1980) ya da biyoçeşitlilik genel anlamda olumsuz etkilenmiştir. Ancak kentler, birçok yaban hayatı için uygun olmayan habitat olarak kabul ediliyorken (Govil vd., 2024), günümüzde çeşitli yaban hayatı popülasyonuna ev sahipliği yaptığı görülmektedir (Müller vd., 2013). Bu durumda kentsel alanlarda biyoçeşitliliği hem engelleyen hem de destekleyen durumlar söz konusudur (Şekil 1). Bu durumdaki kentsel alanlar ve banliyölerde küçük ve orta ölçekli memeliler ve kuşlar gibi türlerin uyum sağlayarak yaşamlarını sürdürdükleri saptanmıştır (Müller vd., 2013). Biyoçeşitlilik kavramı güncel bir kavram olsa da doğayı kente dahil eden çeşitli peyzaj çalışmaları tarih boyunca olmuştur. Bunlara örnek olarak Olmsted'in Zümrüt Kolye-*Emarald Neclace* planı 19. Yüzyılda parkı kentin sisteminin bir parçası olarak yapılandırmıştır (Zaitzevsky, 1982). Yine Howard Bahçe Şehir-*Garden City* anlayışı kent ve kır ikilisini dengelemeyi amaçlamaktadır (Swaffield, 2005).

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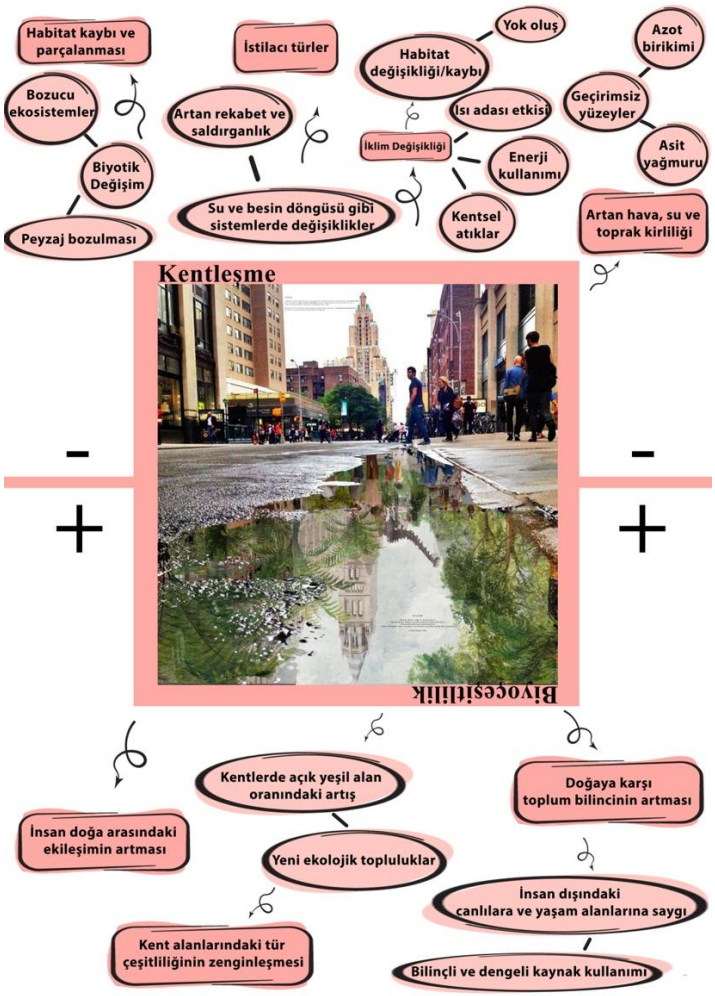
Ayrıca kentte ulaşım koridorları boyunca gelişim gösteren ancak bu koridorlar arasında açık yeşil alan tasarlayarak yeşile erişim kolaylığı sağlayan Kopenhag'ın Parmak Planı-*Finger Plan* kent merkezine yakın yeşil alanlar sunmuştur (Swaffield, 2005). Böylece kentsel biyoçeşitlilik kavramı yıllar içerisinde ivme kazanarak gelişmiştir. Bu kavram, disiplinler arası çalışılması gereken bir konu olmakla birlikte peyzaj mimarlığı, bu konuda birçok kesişim noktasında yer almaktadır (Norton vd., 2016). Arazi kullanımı ve habitat parçalanması gibi yerel, bölgesel ve küresel ölçeklere odaklanarak biyoçeşitlilik üzerine çalışmalar giderek daha önemli bir duruma gelmektedir.

Bu çalışmada mevcut kentsel biyoçeşitliliği desteklemek ve artırmak üzerine kentsel peyzaj planlama ve tasarım önerileri üzerine bir çalışma yürütülmüştür. Çalışma alanı olarak tarihi ve kültürel değerlerinin yanı sıra doğal peyzaj alanları ile de önemli bir yere sahip Karabük ili Safranbolu ilçesi seçilmiştir. İlçe sınırları içerisinde kentsel, arkeolojik ve doğal sit alanlarını barındırması ile koruma ve kullanma dengesi göz önünde bulundurulması gerekmektedir. Çalışma kapsamında uydu görüntüleri ile mevcut durum saptanarak geleceğe yönelik planlama ve tasarım önerileri sunulmuştur.

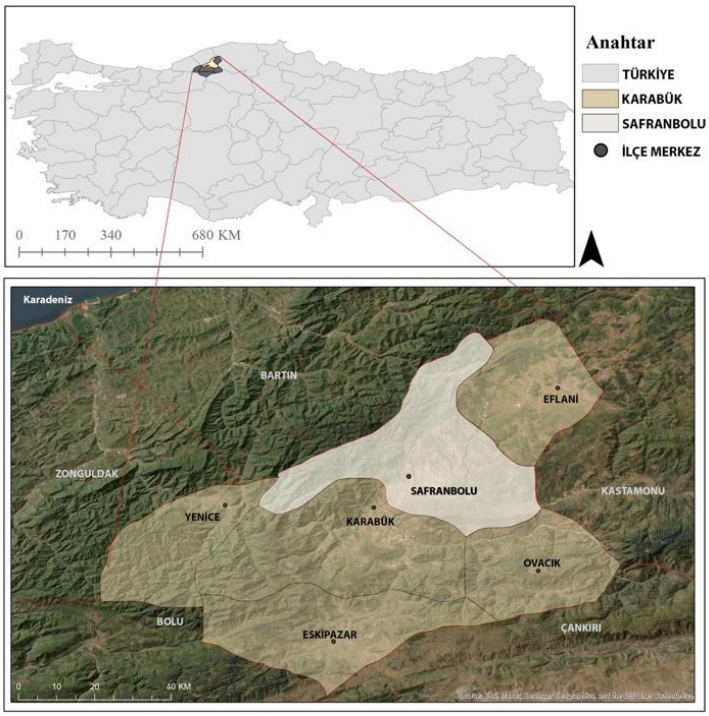
## 2. Materyal ve yöntem

### *2.1. Materyal*

Çalışmanın ana materyalini Karabük ili Safranbolu ilçesi oluşturmaktadır (Şekil 2). İlçenin adı Safran bitkisinden gelmektedir (ÖzkuAçıkgöz, 2010). Yüzölçümü 1013 km² (Kara, 2021; Gümüşoğlu, 2006) olan ilçenin rakımı 581 m'dir (Tan, 2019).




Şekil 1. Kentsel alanlarda biyoçeşitliliği destekleyen ve engelleyen durumlar (Ayşe Betül Çufalı)
Figure 1. Enhancing and limiting factors on biodiversity in urban areas (Ayşe Betül Çufalı,)




Şekil 2. Safranbolu konumu
Figure 2. Location of Safranbolu

İlçe 1994 yılından beri UNESCO tarafından Dünya Mimari Miras kenti korumasındadır. İlçede tarihi süreç içerisinde kentsel yapının farklılaştığı üç bölge göze çarpmaktadır (Aktüre ve Şenyapılı, 1976; Ayvazpınarı, 2020). Bunlar Kıranköy, Çarşı (Şehir) ve Bağlar bölgesidir.

Kıranköy bölgesi, 1500'lü yıllarda Rumların yerleştiği bölge olarak bilinmektedir (Yazıcıoğlu, 2001; Deniz ve Ersöz, 2020). 1924 yılında ise Kıranköy bölgesini oluşturan mahalleler birleştirilerek "Misak-ı Milli" mahallesi adı verilmiştir (Eski, 2018). Ancak Safranbolu halkı bölgenin adını hala "Kıranköy" olarak kullanmaktadır (Deniz ve Ersöz, 2020).

Çarşı Bölgesi ise ticaretin ve kentsel dokunun yoğun olduğu tarihi kent bölgesidir (Aktüre ve Şenyapılı, 1976). Şehir bölgesinin çevresi, rüzgâra karşı alanı koruyan (Bozkurt, 2022) yüksek tepelerle çevrili bir biçimdedir. Söz konusu Çarşı bölgesi, Gümüş, Akçasu dereleri ve bu iki derenin birleşmesiyle oluşan Tabakhane Deresinin oluşturduğu vadi içerisinde yer almaktadır (Ayvazpınarı, 2020).

Daha serin ve yaylaların olduğu (Günay, 1989) Bağlar Bölgesi ise geçmişte Safranbolu halkı için yaz mevsiminde bir sayfiye alanı olarak kullanılmıştır (Bozkurt, 2022). Bağlar bölgesi de zamanla farklı mahallelere bölünmüştür (Deniz ve Ersöz, 2020). Mahallenin ismi verimli arazilere ve meyve bahçelerine sahip üzüm bağları merkezi olmasından gelmektedir (Ak, 2019).

### *2.2. Yöntem*

Bu çalışma 3 aşamada gerçekleştirilmiştir:

1. Literatür Tarama: Küreselleşme sonucu son bilgiyi takip etmek bilimsel çalışmalar için önemli bir aşamadır. Bu sebeple öncelikle araştırma kapsamına faydalı olacak kuramsal çerçeve belirlenerek açıklamalarına yer verilmiştir.
2. Veri Toplama ve Bulgular: Alan hakkında veri elde etmek amacıyla Google Earth görüntüleri ile Copernicus uydu verilerinden yararlanılarak haritalar oluşturulmuştur. Ayrıca arazide yapılan yerinde sörvey çalışmaları ile bulgular desteklenmiştir.
3. Sonuç: Elde edilen haritalar doğrultusunda peyzaj koridor, leke ve matris verileri ile ilişkilendirilerek çeşitli öneriler sunulmuştur. Elde edilen haritalar doğrultusunda Parris vd. (2018), çalışmasında kullanılan kentsel biyoçeşitliliği destekleyen ilkelerden yararlanılarak alt başlıklar altında planlama ve tasarım önerileri sunulmuştur (Çizelge 1). Aşağıda bu makalede çalışma alanı için izlenen yöntem çerçevesinde, kentsel biyoçeşitliliği destekleyen 7 ilke başlıkları ve açıklamaları verilmiştir.

## 3. Bulgular ve Tartışma

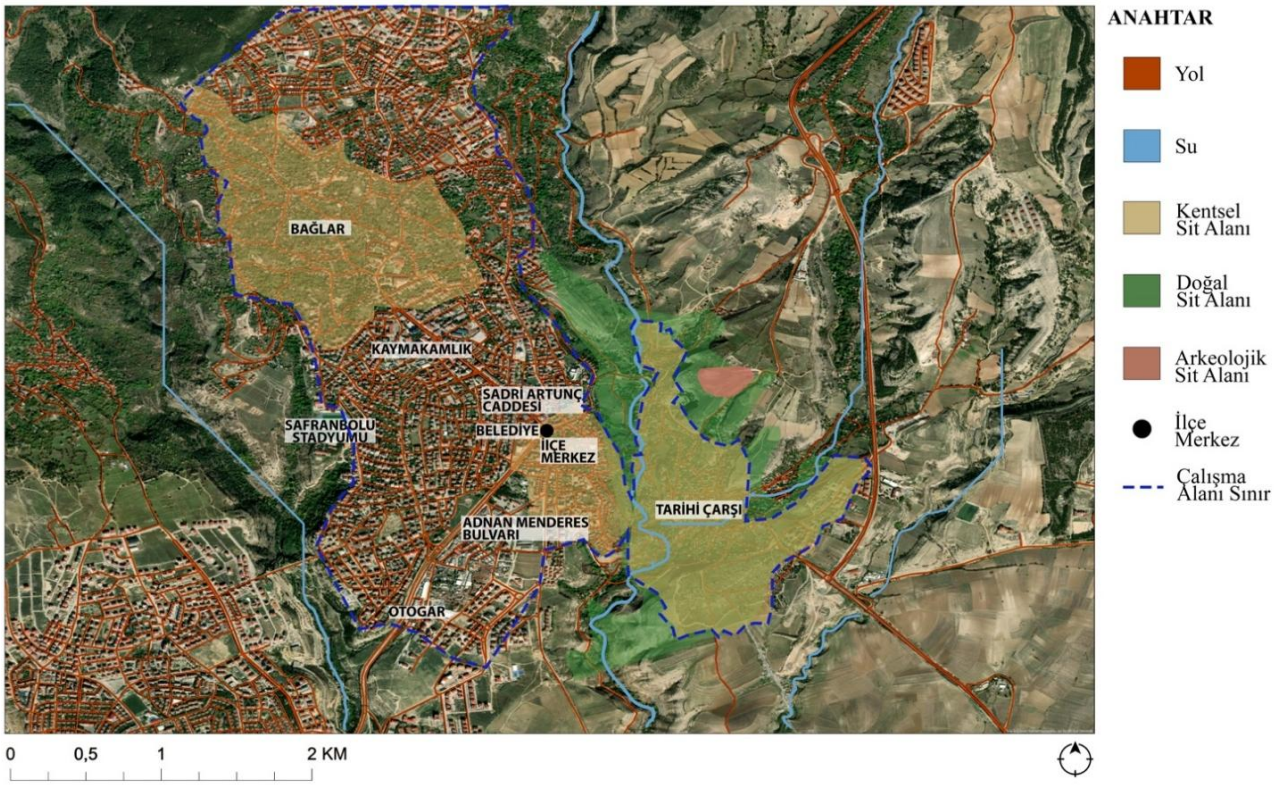
Çalışma alanı sınırları dahlinde Safranbolu ilçesi irdelenmiştir. Alanda; kentsel karakterli peyzaj özellikleri ile arkeolojik ve doğal sit alanları yer almaktadır (Şekil 3). Böylece tarihi ve doğal koruma alanları ile beraber yeni gelişen kent merkezinde mevcut biyoçeşitliliği koruyarak ve potansiyel alanlarda artırarak ekolojik dengeye bütüncül bir yaklaşım ile katkı sunmak amaçlanmıştır.

Şekil 3 'te sınırlı kentsel dokunun görüldüğü kentsel sit alan sınırları arası bağlantılılık koparak Çarşı bölgesi ve Bağlar bölgesi arası kuzeye doğru yoğun kentsel bir büyüme görülmektedir. Alanda biyoçeşitlilik açısından önemli bir yere sahip olan peyzaj koridoru niteliğinde 3 akarsu koridoru görülmektedir. Bu koridorda saptanan potansiyel biyoçeşitlilik rezerv alanlarına ait fotoğraflar Şekil 4'te yer almaktadır.

Alanda yer yer parçalanmış olarak görülse de kent çevresinde yoğun orman dokusu mevcuttur. Ancak özellikle koruma bölgesi dışında kalan kent dokusu içinde aktif yeşil alan eksikliği göze çarpmakladır (Şekil 5).

Çizelge 1. Kentsel biyoçeşitliliği destekleyen 7 ilke (Parris vd., 2018)
Table 1. The 7 principles (*lamps*) enhancing urban biodiversity (Parris et.al, 2018)

| | |
|---|---|
| Koruma (*Protection*) | Şehirlerin içinde ve çevresinde yüksek biyoçeşitliliğe sahip (hem mevcut hem de potansiyel) alanların belirlenmesi ve korunmasıdır. |
| Bağlantı (*Connectivity*) | Kentsel biyoçeşitliliğin ikinci ilkesi, hayvanların, mantarların ve bitkilerin (sporlar, polenler ve tohumlar) yayılımının kentsel peyzaj boyunca hareket etmesini sağlamak için habitat alanları arasındaki bağlantıyı korumak veya yeniden kurmaktır. |
| Yapı (*Construction*) | Kentsel biyolojik çeşitliliğin üçüncü ilkesi, bir dizi bitki ve hayvan türü için yaşam alanı sağlayabilecek ekolojik özellikler inşa etmektir. |
| Döngüler (*Cycles*) | Su, besin ve enerji döngüsü, ekosistem hizmetlerinin ve biyolojik çeşitliliğin sürdürülmesi için kritik öneme sahiptir. |
| Biyolojik etkileşimler (*Biological Interactions*) | Kaynaklar için rekabet, simbiyoz, otçulluk, predasyon, tozlaşma ve parazitlik gibi biyolojik etkileşimler, belirli bir yerin biyolojik çeşitliliğini şekillendiren önemli süreçlerdir. |
| Yaban hayatı destekleyen tasarımlar (*Benevolence*) | Kentsel ekolojinin sıklıkla göz ardı edilen bir yönü, engelleyen bir kentsel formun önemidir. Kentsel altyapı, ölüm oranını artırarak (örneğin, yaban hayatı-araç çarpmaları veya binaların camlarına çarpan kuşlar yoluyla) biyoçeşitlilik üzerinde bariz olumsuz etkilere sahip olabilir. |
| Yenilik (*Novelty*) | Yeni ekolojik topluluklar ve yeni ekosistemler, tarihsel benzerleri olmayan yerli ve egzotik türlerin yeni kombinasyonlarının varlığı ile karakterize edilir (Hobbs vd., 2006; Kowarik, 2011). Biyolojik çeşitliliğin kentsel ortamlarda devam etmesi veya artması için, yeni ekolojik toplulukları destekleyen alanların, abiyotik ve biyotik koşulları kalıntı ekosistemlerinkinden farklı olsa bile önemli habitatlar olarak kabul edilmesi gerekir. |




Şekil 3. Safranbolu sit alanları
Figure 3. Protected zones of Safranbolu



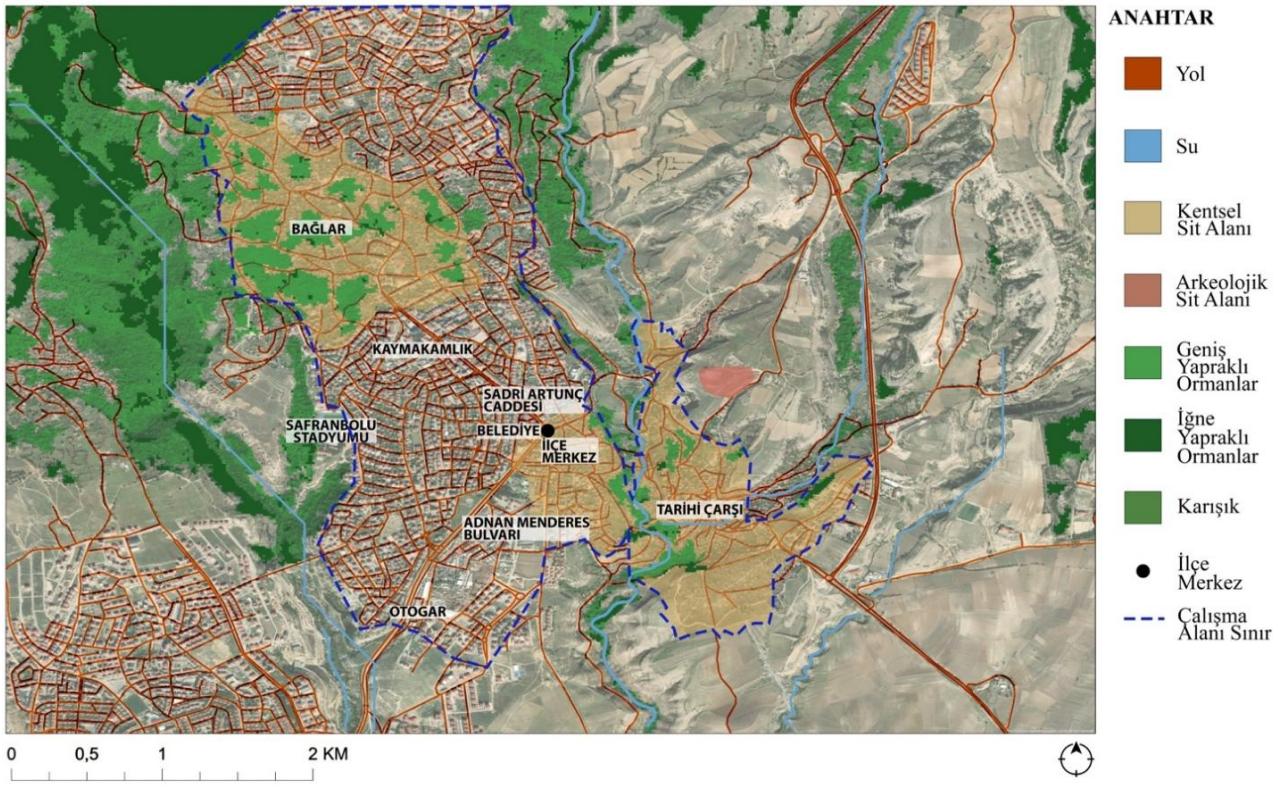

Şekil 4. Akarsu koridorlarında potansiyel biyoçeşitlilik geliştirme alanları (Ayşe Betül Çufalı)
Figure 4. Potential biodiversity enhancement areas in river corridors (Ayşe Betül Çufalı)

Mevcut yeşil alan yoğunluğu haritasında (Şekil 7) tarihi kent ve çevresinde, yeni gelişim gösteren bölgeye oranla yeşil alan fazladır. Tarihi alanlarda konut- yeşil alan birlikteliğinin dengeli olduğu görülmektedir (Şekil 6). Ayrıca ilçenin kuzeybatısında yer alan Bağlar bölgesinde de yer yer leke biçiminde yeşil alanların varlığı görülmektedir (Şekil 7). Ancak yeni gelişen kent bölgesinde yeşil alanlar arasında nicelik ve nitelik açısından bir bağlantı görülmemektedir. Ağaç örtüsü yoğunluğunun mevcut uydu görüntüsünde de azaldığı saptanmıştır.

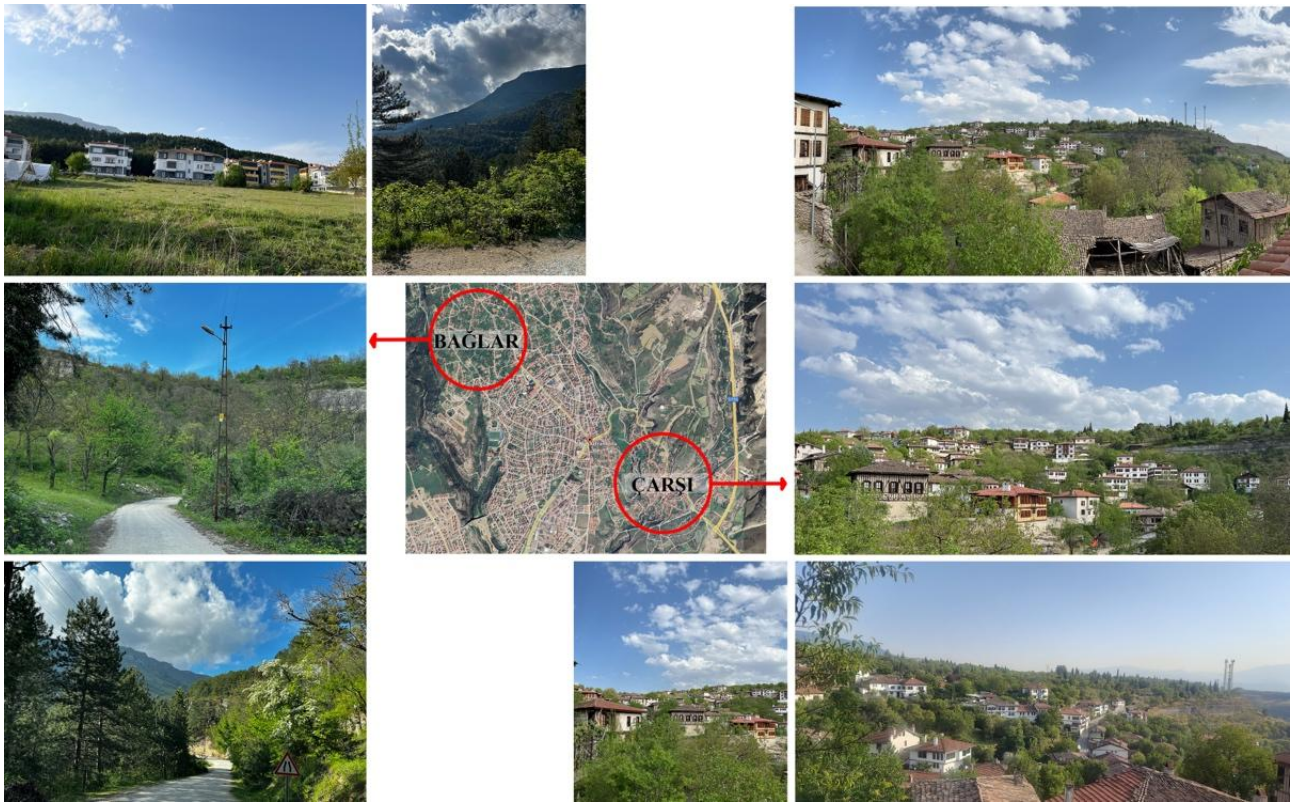
Bu haritaların yanı sıra çalışma kapsamında yapılı çevrenin daha net görülmesi amacıyla uydu görüntülerinden yapılı çevre analizi de yapılmıştır (Şekil 8).

Elde edilen harita doğrultusunda, kentsel sit alanları dışında yoğun yapısal alanlar mevcuttur. Özellikle tarihi kent merkeziyle kıyaslandığında yıllar içerisinde kentin önemli bir biçimde büyüdüğü görülmektedir.

Kentleşme, dünya çapında arazi kullanımının yoğunlaştırılmasının önemli bir biçimi olarak görülmektedir (Nguyen vd., 2023). Yol ve yapılı çevrenin yoğun olması sonucu zemin geçirimliliği düşerek, kentteki canlı çeşitliliğin önemli kaynaklarından olan hidroloji ağında olumsuz etkilere sebep olmaktadır. Safranbolu'da bu durumu saptamak amacıyla uydu görüntüler ile geçirimsizlik haritası da hazırlanmıştır (Şekil 9).



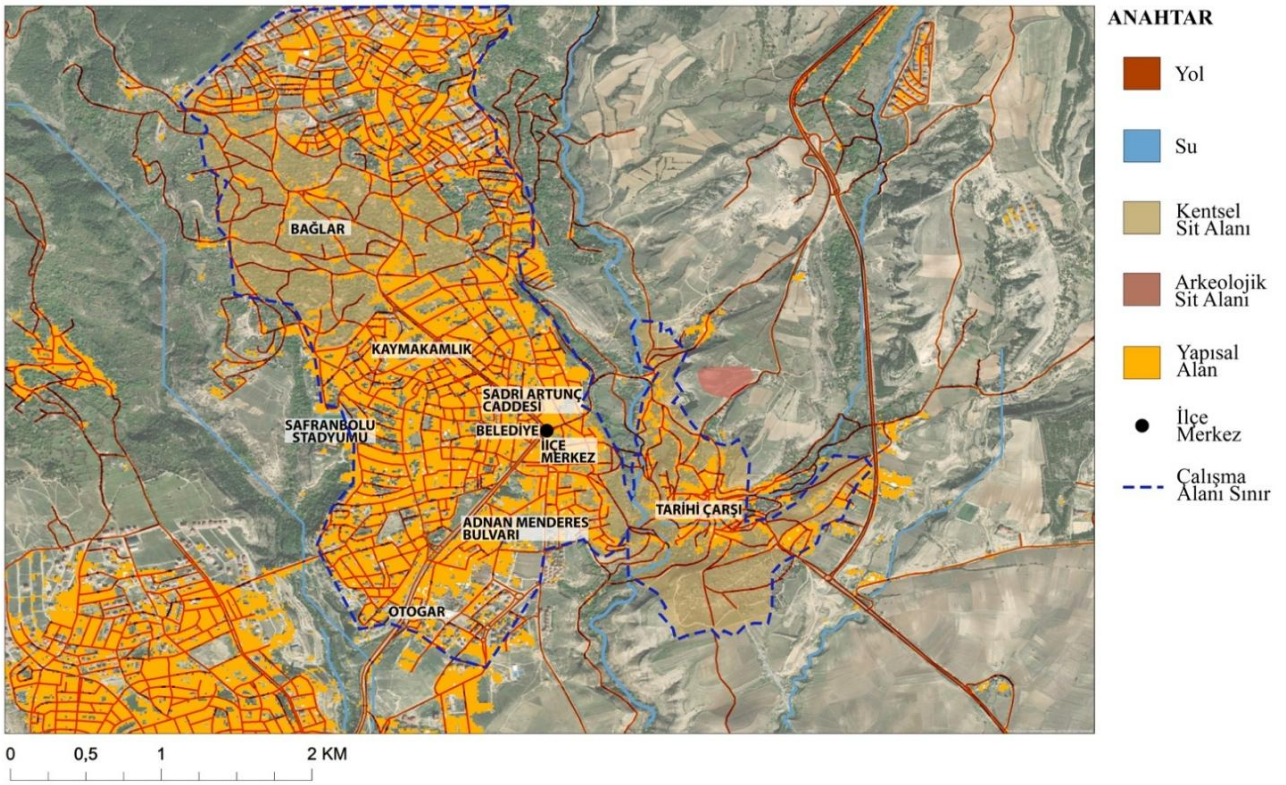

Şekil 5. Safranbolu ormanlık alanlar ve içerdiği ağaç tipleri
Figure 5. Forest areas and tree types in Safranbolu



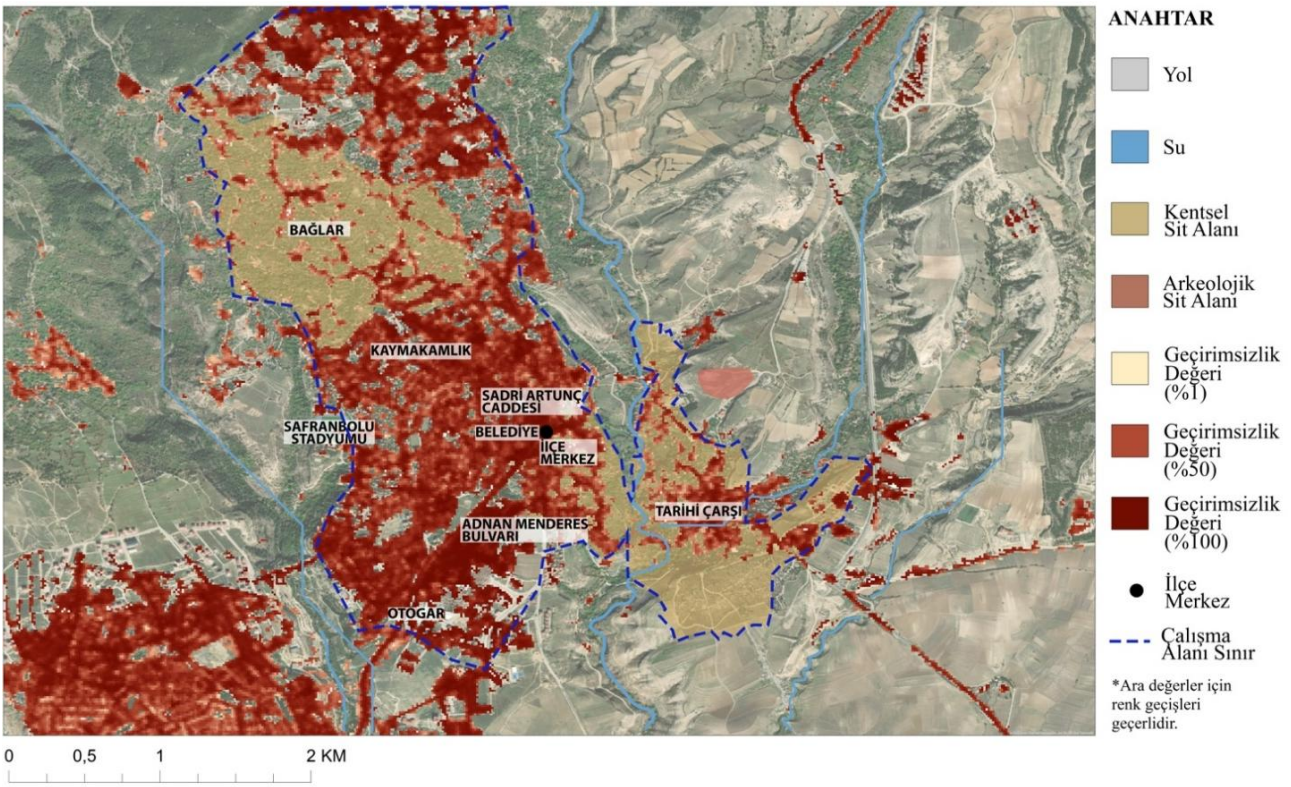

Şekil 6. Tarihi bölgelerde konut-yeşil alan birlikteliği (Ayşe Betül Çufalı)
Figure 6. Building environment-green space coexistence in historical zones (Ayşe Betül Çufalı)




Şekil 7. Safranbolu yeşil alan ve ağaç örtüsü yoğunluğu
Figure 7. Grassland and tree cover density in Safranbolu




Şekil 8. Safranbolu yapılı alan
Figure 8. Built-up areas in Safranbolu




Şekil 9. Safranbolu zemin geçirimsizlik haritası
Figure 9. Imperviousness density in Safranbolu

Geçirimsizlik haritası doğrultusunda yeni gelişen kentsel alanda tarihi çarşıya oranla daha yoğun bir kentsel doku ile geçirimsizlik alanların çoğaldığı görülmektedir. Kentsel dokunun genişlemesi yüzey geçirimlilik oranını doğrudan etkilemektedir. Geçirimsiz alanların artması ile habitat parçalanmasında artış, döngülerin ve zincirlerin değişmesi gibi biyoçeşitlilik ve ekosistem işleyişi için tehditler oluşmaktadır (Filazzo vd., 2019). Habitat parçalanması sonucu ise tür kompozisyonları bozulmaktadır (Faeth vd., 2011).

Bu etkileri kısmen dengeleyen ve insan sağlığına fayda sağlayan yeşil altyapı uygulamaları mevcuttur. Örneğin, yağmur suyu, yeraltı suyu, geri dönüştürülmüş su, nehir, göl veya sulak alanlardaki sular koruma ve kullanım dengesi içinde planlı bir biçimde yönetilebilmektedir. Yeşil alan varlığı artırılarak geçirgen yüzey alanına katkı sağlanmaktadır. Böylece su tutma ve yeniden kullanma kapasitesi artırılmış olacaktır.

Safranbolu geneline bakıldığında Tarihi Çarşı ve çevresinde yüzey geçirimlilik oranı, yeni gelişen kent dokusundan daha yüksek olduğu görülmektedir. Yine Bağlar Bölgesi'nde de kentsel sit alanı konumunda olması sebebiyle yoğun kent dokusu ve dolayısıyla yüksek geçirimsizlik oranları görülmemektedir. Ancak ilçe merkezi ve kuzey bölgesine doğru artan kent dokusuyla beraber biyoçeşitliliğin olumsuz etkileneceği %50-100 oranında geçirimsizlik oranları görülmektedir.

Yürütülen çalışma doğrultusunda, Safranbolu ilçesinin arkeolojik, doğal ve kentsel sit alan varlığı ile önemli bir yere sahip olduğu görülmüştür. Ancak yeni gelişen kentsel doku ile artan yapılı ve geçirimsiz alanlar göze çarpmaktadır. Ayrıca bu sebeple yapılı alanlarda yeşil alanların azaldığı görülmektedir.

## 4. Sonuç ve öneriler

Çalışma kapsamında Safranbolu kenti için, kentsel biyoçeşitliliği destekleyen 6 ilke doğrultusunda saptanan mevcut durum ve buna yönelik planlama ve tasarım açısından çözüm önerileri sunulmuştur. Tarihi bölgelerde ve yeni gelişen kent bölgesinde biyoçeşitlilik açısından farklı durumlar söz konusudur. Tarihi bölgelerde su ögesi, yeşil alan varlığı gibi biyoçeşitliliği destekleyen alanlar görülmektedir. Ancak yeni gelişen kentsel alanda artan yapılaşma sonucu yeşil bantta kopukluklar, ekolojik döngüleri olumsuz yönde etkileyen geçirimsiz alanların artması, flora ve faunayı destekleyen alanların kısıtlığı gibi olumsuzluklarda artış görülmektedir. Bu sorunların çözümüne yönelik çeşitli kentsel peyzaj tasarım önerileri sunulmuştur. Çalışmayı kısıtlayan bir durum olarak, çalışma alanında kentsel, doğal ve arkeolojik sit alan mevcudiyeti olmasıdır. Bu sebeple çözüm olarak radikal değişikliklerden kaçınılmıştır.

### *4.1. Koruma*

Kentsel alanlarda mevcut bitki ve hayvan türleri tespit edilip korunması ile habitat kaybı önlenebilir. Safranbolu kenti endemik bitki türleri açısından zenginliğe sahiptir. Özellikle adını aldığı safran bitkisi ilçede önemli bir yere sahiptir. Ancak geçmişte Safranbolu'nun 40 köyünde yetiştirilen safran bitkisinin tarımı, ilçede 7 köyde yapılmaktadır (Ayvazpınarı, 2020).

*4.2. Bağlantı*

Kentler, hızla genişlerken, biyolojik çeşitlilik açısından önemli alanları da tehdit etmektedir. Kent çeperinde özellikle kuzey bölgesinde yoğun yeşil alanlar mevcuttur ancak kentsel dokuda bu bağlantılar koparak yapılı çevre yoğunlaştığı görülmektedir. Örneğin; Tokatlı Kanyonu boyunca uzanan yeşil aksın, tarihi çarşı bölgesinde kentsel dokunun yoğunlaşmasıyla kesintiye uğradığı gözlemlenmektedir. Çalışma alanı sit alanı sınırları içerisinde yer aldığından çözüm için radikal değişiklikler yapılamamaktadır.

*4.3. Yapı*

Kentsel alanlarda bitki ve hayvanların yaşam alanlarını destekleyecek yapıların yapılması sayesinde biyoçeşitliliğe katkı sunulmaktadır. Örneğin tarih boyunca çeşitli kültürler tarafından önem verilen kuşlara yönelik, kent içi alanlarında özel alanlara yer verilmiştir. Osmanlı döneminde de önem verilen kuş evleri günümüzde de görülmektedir. Safranbolu kentinde de Osmanlı dönemine ait izlere rastlanılmaktadır. O dönemlerde yapı cephelerine tasarlanan kuş evleri örnekleri mevcuttur (Şekil 10).



Şekil 10. Safranbolu kuş evi örnekleri (Belder, 2024)
Figure 10. Bird house examples in Safranbolu (Belder, 2024)

*4.4. Döngüler*

Safranbolu ilçesi ve çevresinde yürütülen çalışmalar ve raporlar doğrultusunda ilçenin su kaynakları açsından zengin bir durumda olduğu görülmektedir (Bölükbaşı Ertürk, 2014). Ancak artan kentsel doku ile su döngüsünü olumsuz etkileyen zemin geçirimsizlik oranının yapılı çevrede arttığı saptanmıştır.

*4.5. Biyolojik etkileşimler*

Tozlaşmanın (polinasyon) büyük çoğunluğunu sağlayan arılar ve çeşitli böcekler (Calderone, 2012; Sarı, 2016), biyoçeşitlilik açısından önemli bir yere sahiptir. Peyzaj tasarımının estetik katkısının yanı sıra biyolojik etkileşimlere fırsat sunduğu, ekosistem dengesini koruduğu gözlemlenmektedir. Polinatör böcekler için tasarlanan, biyoçeşitliliği koruyan ve artıran böcek otelleri gibi tasarımlara alanda rastlanmamıştır (Şekil 11).

*4.6. Yaban hayatı destekleyen tasarımlar*

Çeşitli ulaşım ağları habitat parçalanmalarına sebep olarak biyoçeşitlilik üzerinde olumsuz etkilere sahiptir. Safranbolu'da, tarihi kent merkezi çevresinde ve ilçenin kuzey kesimlerinde yoğun kent dokusunun azaldığı ve doğal, bozulmamış alan varlığı ile potansiyel yaban hayata uygun alanların varlığı dikkat çekmektedir. Bu bölgede yaşamını süren yaban hayatını taşıt yollarının tehlikelerinden koruyan ekolojik köprülerin alanda eksikliği tespit edilmiştir.

Elde edilen sonuç doğrultusunda kentsel biyoçeşitliliği destekleyen ilkeler örnek alınarak Safranbolu genelinde kentsel peyzaj tasarım önerileri sunulmuştur (Çizelge 2).

Yürütülen bu çalışma ileride benzer çalışmalara örnek niteliğindedir. Fakat gelecekte yapılacak benzer çalışmalarda arazi çalışmaları ve yerinde gözlemlerin artırılması gerektiği düşünülmektedir. Böylece uydu görüntüleri üzerinden elde edilen veriler alan çalışmalarıyla desteklenerek doğruluğu tespit edilerek ilerlenecektir.



Şekil 11. Böcek oteli örnekler (Hane ve Korfmacher, 2022)
Figure 11. Examples of insect hotels (Hane and Korfmacher, 2022)

Çizelge 2. Kentsel biyoçeşitliliği destekleyen 6 ilkeye yönelik öneriler
Table 2. Recommendations for 6 principles enhancing urban biodiversitya

| İlkeler | Öneriler |
|---|---|
| Koruma (Endemik Bitki Türlerinin Sürdürülebilirliği) | Mevcut biyoçeşitliliği korumak ve devam ettirmek için yerel ve yöreye özgü bitki türleri tercih edilmelidir. Safran bitkisi gibi yöreye özgü endemik bitkilerin üretim politikaları üzerinde çalışmalar artırılmalıdır. Böylece doğal bitki türlerinin yetiştirilmesi desteklendiğinde pestisit ve diğer zararlı kimyasalların kullanımını azaltılmış olacaktır. Bu durum sağlıklı ekosistem sunmak ve biyoçeşitliliğin artırılması açısından önemlidir. |
| Bağlantı | Özellikle yeşil banttın devamlılığını sağlamak amacıyla tarihi çarşıda bulunan yapıların bahçe, çatı ve cephelerinde yeşil alanların bağlantısı sağlanmalıdır. Ayrıca Karabük ile bağlantıyı sağlayan Adnan Menderes Bulvarı, Bartın yolu ile bağlantıyı sağlayan Mimar Sinan Caddesi ile Safranbolu'nun yeni yerleşim bölgesi için ana arter niteliğinde olan Sadri Artunç Caddesi gibi kent içi ana yollarda tasarım çözümleri ile yeşil ağın bağlantısı güçlendirilmelidir. |
| Yapı | Mevcut kuş evlerini koruyarak ve yenilerini tasarlayarak kent içerisinde kuşlara da yaşam alanı sunarak biyoçeşitliliğe katkı sunulabilir. Ayrıca yuvalama ve barınak alanları oluşturularak kent içi alanlarda yaban hayatını destekleyecek habitat çeşitliliği oluşturulabilir (Reynolds vd., 2019). Örneğin tarihi çarşıda mevcut durumda yaşayan hayvan türlerine yönelik yeni alanlar tasarlayarak kentleşme sonucu oluşabilecek tür kaybının önüne geçilebilir veya habitat alanı genişletilebilir. Ayrıca tarihi çarşı ile Tokatlı Kanyonu arası duraklama ve barınma alanları sunulursa habitat devamlılığı da sağlanmış olacaktır. Böcek otellerindeki gibi yeşil akslar üzerinde ve göç rotalarında da kuşlar için dinlenme alanları tasarlanmalıdır. Bunun için ölü ağaçlardan yararlanılarak kent içinde toplanma alanları ve meydanlarda heykeller tasarlanabilir. Örneğin ilçe merkezinde bulunan Misak-ı Milli Meydanı bu tasarımlar için uygundur. |
| Döngüler | Ekolojik döngüleri olumsuz etkileyen durumları önlemek amacıyla kentsel alanlarda yapılı çevre yoğunluğu azaltılarak kentsel yeşil alanlar oluşturulmalıdır. Bunun yanı sıra zemin malzemesi seçilirken geçirimli malzeme tercihi ile su döngüsüne katkı sağlanmaktadır. Geçirimli zemin kaplamaları doğru teknikle uygulanmalıdır. Böylece yer altı suyu beslenimi desteklenmektedir. Aksi takdirde yer altı suyu beslenimi engellenmiş olacaktır. |
| Biyolojik etkileşimler | Polinatör böcekler için özel alanlar önerilmektedir. Böylece üst ölçek kararlarının yanı sıra alt ölçek öneri tasarımlarla bütüncül bir biçimde biyoçeşitlilik desteklenmelidir. |
| Yaban hayatı destekleyen tasarımlar | Ekolojik koridorlar yaban hayvanlarının büyüklükleri, görüş açıları ve mesafelerine göre değişkenlik göstermektedir (Kintsch ve Cramer, 2011). Çalışma alanında sit alanları bulunması sebebiyle büyük ölçekli kararlar alınamadığı yerlerde 1,5 metre ve daha az boyutlarda açıklığa sahip küçük boy alt geçitler (Gülci vd., 2014) de tasarlanabilir. Ancak yaban hayvanlarının geçitleri kullanabilmesi adına doğru yer tespiti önemlidir (Ruediger, 2001; Özcan, 2021). Dolayısıyla kaynakları verimli kullanabilmek amacıyla alanda daha detaylı çalışmalara ihtiyaç vardır. |

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# Çumra İrva ve İska İdaresi Yerleşkesinin Tarihsel Mirası

Mehmet Mutlu[1, 2]

***ÖZET***

Anadolu'nun coğrafi açıdan tarıma elverişli ve verimli bölgelerinden birisi olan İç Anadolu kesiminde yer alan Konya ili, aynı zamanda ülkemizin en kurak bölgesi olduğu için tarihin her döneminde sulama sorununa çözüm aramıştır. Bu sorunun çözümü için yapılan çalışmaların en kapsamlılarından birisi de 20. yüzyılın başlarında hayata geçirilen Konya Ovası Sulaması Projesi'dir. Beyşehir gölünden alınan suyun kanallarla Çumra'ya taşınması çalışmalarını içeren proje, Osmanlının son dönemindeki en önemli yatırımlarından birisidir. Dönemine göre iddialı ve büyük projenin idari yönetim binası da aynı ilçede oluşturulmuştur. Proje, bir Alman şirket tarafından hayata geçirilirken, yerleşke içerisine yine aynı firma tarafından inşa edilen idari bina ve lojmanlar adeta Almanların geleneksel konut anlayışının temsilcisi olarak inşa edilmişlerdir. Gerek tasarım ve gerekse estetik anlayış olarak dikkat çekici yapılar olan ve idari bina, lojmanlar ve atölye binasından meydana gelen yapılar, cephe özellikleriyle de birbiriyle uyum içindedirler. Yerleşkede yer alan idari bina çatı katı ile birlikte üç katlı olarak inşa edilmişken, başmühendis lojmanı çatı katı dahil 2 katlı olarak yapılmıştır. Mühendis lojmanları ise tek katlı olup, tüm lojmanlarda bodrum kat bulunmaktadır. Aynı zamanda ilçenin en eski yapıları olan bu binalar günümüzde de halen kullanılmaktadır. Bununla beraber bugüne kadar herhangi bir bilimsel çalışmada konu edilmemiştir. Çalışma, bu özel yapıların ilk kez literatüre kazandırılacak olması açısından önem arz etmektedir.

***Anahtar Kelimeler:*** *Çumra, Alman evleri, Su idaresi.*

# The Historical Legacy of the Irrigation Administration Settlement in Çumra

***ABSTRACT***

Konya province, located in Central Anatolia, one of the most fertile and geographically favorable regions of Turkey, has historically faced challenges related to irrigation due to its arid climate. One of the most comprehensive initiatives to address this issue was the Konya Plain Irrigation Project, implemented in the early 20th century. This project, which involved transporting

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water from Lake Beyşehir to Çumra via canals, was among the most significant investments of the late Ottoman period. The administrative headquarters of this ambitious and large-scale project was also established in the same district. While the project was carried out by a German company, the administrative building and lodgings constructed within the project campus reflected the traditional German architectural approach to residential structures. These buildings, which include an administrative building, lodgings, and a workshop, are notable for their design and aesthetic coherence, exhibiting a harmonious facade composition. The administrative building was designed as a three-story structure with an attic, while the chief engineer's lodging was built as a two-story structure with an attic. The engineers' lodgings are single-story buildings, all of which include a basement. As the oldest surviving buildings in the district, they remain in use today. However, they have not yet been the subject of any scholarly research. This study aims to introduce these unique structures into the academic literature for the first time.

***Keywords:*** *Çumra, German houses, Water administration.*

## 1. GİRİŞ

İlk çağlardan itibaren insanlar, su kaynaklarına yakın bölgelerde yerleşim kurarak, suyu hem içme hem de tarımsal faaliyetler için kullanmışlardır. Sulak alanların çevresinde tarım yapma arzusu, suya erişimin daha kolay olduğu göl ve nehir kenarlarında ilk tarımsal faaliyetlerin başlamasına neden olmuştur. Zamanla, suyun çeşitli kanallar aracılığıyla yerleşim birimlerine taşınması, tarımsal üretimde sürdürülebilirliği artırmıştır (Muşmal, 2015, s.12). Osmanlı Devleti'nde geniş ve verimli topraklar bulunmasına karşın, tarımsal faaliyetler bu alanların sınırlı bir kısmında gerçekleştiriliyordu. Buna rağmen, devletin ekonomisi büyük ölçüde geçimlik üretime dayalı tarımsal faaliyetlere bağlıydı (Güran, 1998, s. 67). Osmanlı Devleti'nin son dönemlerinde nüfusun yaklaşık %80'inin tarımla uğraşıyor olması, tarımsal alanlarda sulama sorununun çözümünü hayati bir mesele haline getirmekteydi (Muşmal, 2022, s. 10).

Karasal iklimin hüküm sürdüğü Konya Ovası'nda yıllık ortalama yağış miktarının yetersiz olması, tarımsal verimliliği sınırlamakta ve zaman zaman kuraklıkların yaşanmasına neden olmaktaydı (Altan, 1940, s. 131). Bu durumun sonucu olarak da Konya Ovası, su kaynaklarına duyduğu ihtiyaç nedeniyle tarih boyunca sulama projelerinin odağında olmuştur. Bölgenin tarımsal üretimini maksimize etmek amacıyla sulu tarım çalışmalarına ilk olarak 1819 yılında başlanmış, özellikle Sultan II. Abdülhamid döneminde proje çeşitli aşamalarda ele alınmış ve kanal açma gibi somut adımlar atılmıştır (Yılmaz, 2010, s. 5). Bu süreç, tarihsel olarak insanlığın su kaynaklarını yönetme ve tarımsal verimi artırma çabasının bir parçası olarak değerlendirilmektedir.

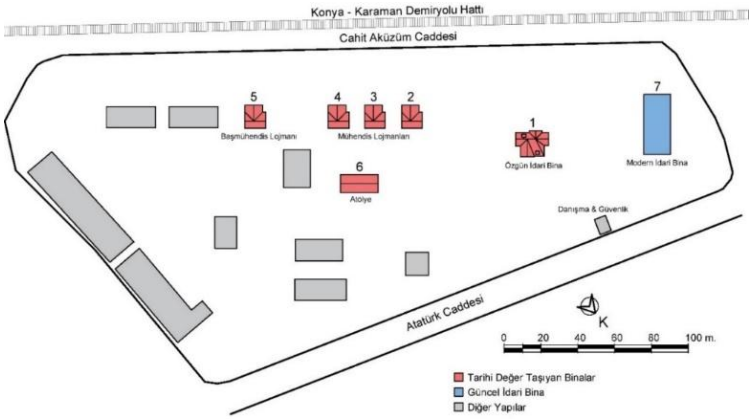
Avlonyalı Ferit Paşa, Konya valiliği görevini yürüttüğü dönemde bölgenin imarı adına çeşitli çalışmalar gerçekleştirmiştir (Tahsin Paşa, 1931, s. 66). 1898 yılında Konya valiliğine atanan Ferit Paşa, görevine başladıktan sonraki ilk yaz mevsiminde yaşanan kuraklık ve çiftçilerin karşılaştığı zorluklara tanık olmuş, bu durumun olumsuz etkilerini gidermek amacıyla çeşitli girişimlerde bulunmuştur (Kırmızı, 2014, s. 104). Konya valiliği sonrasında II. Abdülhamid zamanında Sadrazamlığa atanan Ferit Paşa, İstanbul'da da konu ile ilgisini sürdürmüş ve Konya Ovası Sulaması Projesi'nin ihalesini gerçekleştirmiştir

(Bildirici, 1994, s. 108-109; Turan, 1942, s. 54). Konya ovasını sulama projelerinin en kapsamlısı olan ve 1907 yılında ihale edilen bu proje (Yarıcı, 2010, s. 260), 1913 yılında tamamlanmıştır (Atam, 2020, s. 459). Proje, Türkiye'nin ilk modern ve o devirde dünyanın en önde gelen sulama projelerinden biridir (Yılmaz, 2010, s. 5). Proje kapsamında Beyşehir gölünden alınan su; üç ana isale hattı, buna bağlı kanallar ve taksim merkezleri (regülatörler) ile 217 kilometre uzaklıktaki Konya Ovası'na ulaştırılmıştır (Bildirici, 1994, s. 108; Yılmaz, 2010, s. 6).

Konya Ovası Sulaması inşaatı tüm fizibilite çalışmaları tamamlandıktan sonra ihaleye çıkarılmış ve % 4 tenzilatla Anadolu Osmanlı Demiryolu Şirketi'ne 19 Milyon 500 bin Frank, yani 850 bin Osmanlı altını keşif bedeli ile verilmiştir (Yılmaz, 2010, s. 5-6). Sözleşme 10 Kasım 1907 tarihinde İstanbul'da imzalanmıştır. Projenin yapımını üstlenen "Anadolu Osmanlı Demiryolu Şirketi" esasen Türkiye'de demir yolları inşa etmek amacı ile Alman ve İstanbul'daki iş adamları ortaklığında 1889 yılında kurulmuş bir şirkettir. Şirket hem yazışmalarda ve hem de projelerde Fransızca dil kullanmıştır (Mutlu, 2024, s. 571) (Şekil 10). Şirketin Fransızca olan ismi de "Societe du Chemin de Fer Ottoman d'Anatolie"dir (Bildirici, 1994, s. 112).

Sulama kanalları ve sanat yapıları da dahil olmak üzere bütün projeler müteahhit firma tarafından hazırlanmış ve Osmanlı Hükümeti'nce onanmıştır. Projelerde kullanılan dil Fransızcadır. Müteahhit firma iş sonunda bütün projelerin aydınger ve ozalitlerini, çalışma konumuz olan İrva ve İska idaresi yönetim binasının arşivine bırakmıştır (Bildirici, 1994, s. 126). Osmanlının bir kurumu olan Konya Ovası İrva ve İska İdaresi, çalışma sahası ve yapılarıyla beraber Cumhuriyet döneminde kurulan Devlet Su İşleri (DSİ) Çumra Şube Müdürlüğü'ne devredilmiştir (URL 1).

**Şekil 1.** Yerleşkede bulunan tarihi binaların alandaki konumları[3]




[3] Çalışma içerisinde kaynak gösterilmeyen tüm çizim ve fotoğraflar yazara ait olup, tamamı yapının 2024 yılındaki durumunu belgelemektedir.

DSİ Çumra İşletme Şefliği yerleşkesi içinde projenin idari merkezi olarak kullanılan bu merkez binasının dışında, bir adet başmühendis lojmanı, üç adet mühendis lojmanı ve bir adet de atölye binası olmak üzere altı farklı yapı yer almaktadır (Şekil 1). 3 adet mühendis lojmanı, aynı plan tipinde inşa edilmiştir. Günümüzde tescil edilerek koruma altına alınmış bulunan yapıların bazı kaynaklarda 1901 yılında inşa edildiği bilgisi bulunsa da (Karpuz, 2009, s. 1595; Durdu, 2011a, s. 376), çalışmamız esnasında bu tarihi veren herhangi bir bilgi ya da belgeye rastlanmamıştır. Bununla beraber, inşaatın yer tesliminin 1 Temmuz 1908 tarihinde, kesin kabulünün de 1913 yılı aralık ayında yapıldığı göz önüne alındığında (Mutlu, 2014, s. 456) en azından yerleşkedeki çalışmaların merkezi olan idari binanın bu tarihten daha önce, 20. yüzyılın başlarında yapılmış olduğu kesindir.

**Şekil 2.** İrva ve İska Projesinin idare ve lojmanlarının eski fotoğrafları




İdare binası
**Kaynak:** URL 2



İdare binası ve lojmanlar
**Kaynak:** DSİ Çumra Şube Müdürlüğü Arşivi

Yapıların bulunduğu alan, güncel tapu kayıtlarına göre, Baraj mahallesi, 241 ada ve 1 nolu parsel üzerinde yer almaktadır. Yerleşke, günümüzde 47.770 m²'lik bir alan üzerindedir. Çumra'nın 1926 yılında ilçe statüsüne kavuştuğu düşünüldüğünde (Durdu, 2011b, s. 363) bu yapıların hemen hemen çeyrek yüzyıl öncesinde inşa edilmiş olduğu anlaşılmaktadır. Yerleşkenin ilk fotoğraflarından anlaşıldığı kadarıyla alanda önce idare ve atölye binaları, daha sonra ise lojmanlar inşa edilmiştir (Şekil 2).

Tüm sulama projesinin maliyeti 19.500.000 frank olarak hesaplanmışken, bu bütçeden ne kadarlık kısmının İrva ve İska İdaresi yerleşkesinde bulunan yapılara ayrıldığı net olarak belli değildir. Başbakanlık Osmanlı Arşivi'nde kayıtlı 12 Şevval 1325 (18 Kasım 1907) tarihli ve İ.TNF. 17/35 sayılı belgenin 15. sayfasında proje bütçesinin harcamasınının öngörüldüğü iş kalemleri sıralanmıştır (Muşmal, 2022, s. 67). Burada ilgili yapıların maliyeti ile ilgili doğrudan bilgi bulunmazken, "Memur ve müstahdemlerin ikametine mahsus binalar" işine ait ayrılan 150.000 franklık bütçe dikkati çekmektedir.

## 2. YERLEŞKE ALANINDAKİ TARİHİ YAPILAR

### 2.1. İdari Bina

Konya Ovası İrva ve İska Projesi idari binası, günümüze ulaşak eski fotoğraflardan anlaşıldığı kadarıyla merkez çalışmaları kapsamında inşa edilen yapıların ilk ve en erken

inşa edilen binasıdır (URL 2). İdari bina, yerleşke içindeki tarihi yapılar arasında kuzeybatı tarafa konumlandırılmıştır (Şekil 1). Kullanılan çatı arasıyla beraber üç katlı olarak inşa edilen binada bodrum katta bulunmaktadır. Yapının kademelerle hareketlendirilen cepheleri, kullanılan çatı arasını kapatan örtü ile birlikte yapıyı dinamik bir görüntüye dönüştürmüştür. Kat yükseklikleri her katta değişkenlik göstermektedir. Bodrum katta 2,20 m olan yükseklik, zemin katta 3,30 m, 1. katta ise 3,50 m olarak alınmıştır. Bu değişkenliğe bağlı olarak üç kollu çeyrek döner merdivenle çözülen düşey sirkülasyonda merdiven ölçülerinde her katta değişiklikler söz konusudur. Çatı katı kullanım amaçlı planlandığı için eğim %120 gibi oldukça fazla tutulmuş ve bu şekilde alt katlarda kullanılan tüm hacimlerin çatı katında da aynı şekilde kullanılabilir olmasına olanak sağlanmıştır (Şekil 3).

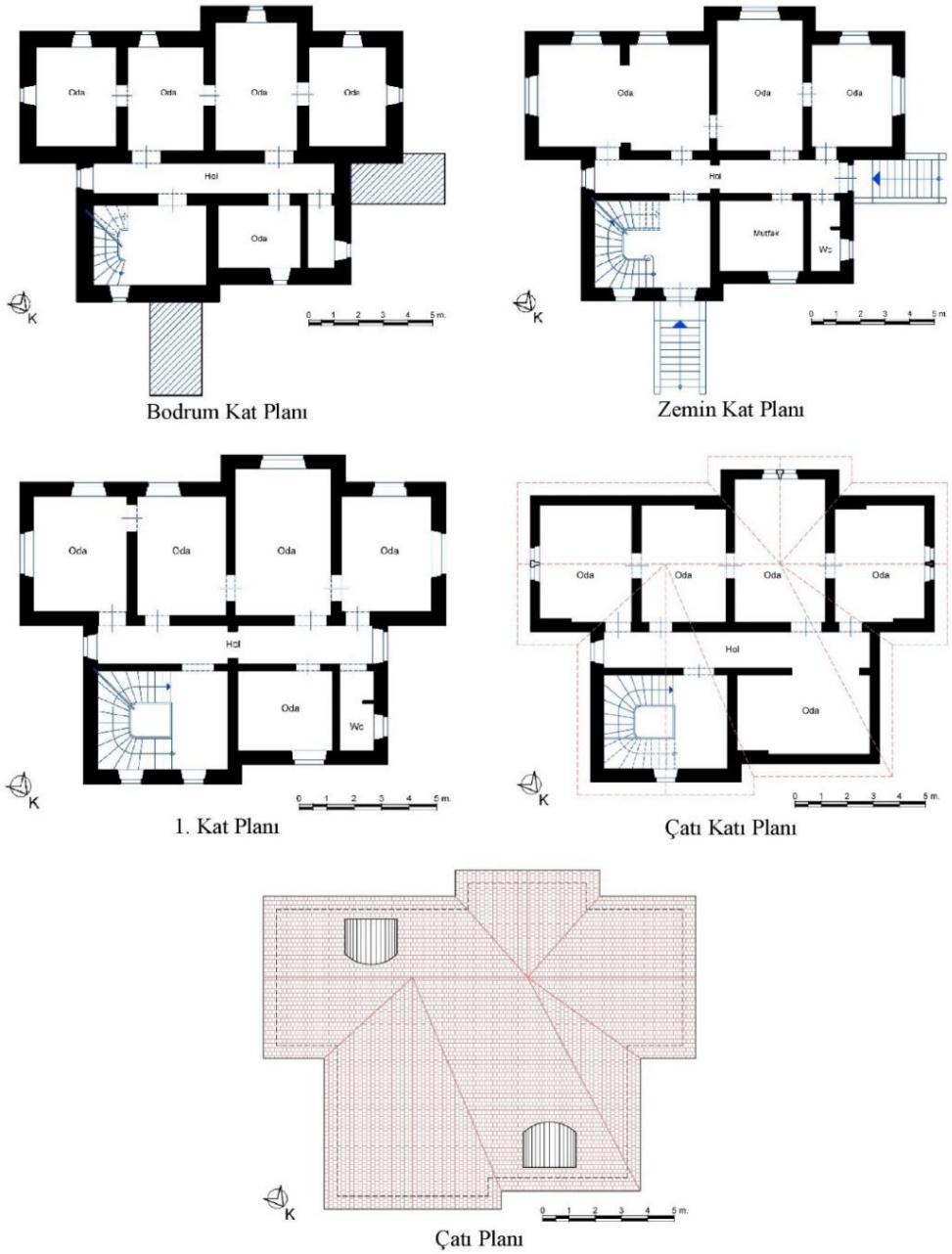
İdari binanın zemin katına hem kuzeydoğu, hem de kuzeybatı cephesinden giriş sağlanmaktadır. Her iki merdiven de +2,00 m kotundaki zemin kat döşemesine ulaşmakta olup, kuzeybatıdaki merdivenle doğrudan koridora ulaşılırken, kuzeydoğudaki merdiven ise merdiven evine açılarak buradan bir kapı ile aynı koridora bağlanmaktadır (Şekil 3). Yığma sistem kurallarına göre inşa edilen yapıda bodrum katta dış duvarlar 60-80 cm arasında değişen kalınlıklarda, iç duvarlar ise yaklaşık 50 cm kalınlığında inşa edilmiştir. Zemin katta dış duvar kalınlıkları 60-70 cm'ye iç duvarlar ise 40 cm'ye düşürülmüştür. 1. katta ise dış duvarlar genellikle zemin kat ile aynı tutulurken iç duvar kalınlıkları 20-40 cm arasında değişen ölçülerde inşa edilmiştir. Çatı katı planında da 1. kat ile benzer kalınlıklarda duvarlar kullanılmıştır. Yapının doğu köşesine yerleştirilen üç kollu çeyrek döner merdiven, binadaki düşey sirkülasyonu sağlamaktadır.

İki farklı şekilde ulaşılabilen, güneydoğu-kuzeybatı doğrultusundaki holün kuzeydoğu ucunda binaya girişin sağlandığı kapılarından birisi yer alırken, güneybatı ucuna bir mazgal pencere yapılmak suretiyle holün aydınlatma sorunu çözülmüştür. Yaklaşık 13,35 m uzunluğa sahip hol, ortaya yakın bir kısımda dişler yapılarak iki bölümlü hale getirilmiştir (Şekil 3).

Zemin kat holünün güneybatı tarafında dört adet bağımsız oda bulunmaktadır. Odaların her biri koridora açıldığı gibi, aynı zamanda iç duvarlara açılan kapılarla birbirleriyle de irtibatlı hale getirilmiştir. Bu odalardan güneydoğu tarafta bulunan iki tanesi, aradaki taşıyıcı duvar büyük oranda boşaltılarak tek mekâna dönüştürülmüştür. Hem bitişiğindeki oda da güneybatı tarafa yaklaşık 50 cm taşırılmak suretiyle genişletilmiştir. Köşedeki odalar her iki yöne, aradaki odalar ise güneybatı yönlerine açılan birer adet mazgal pencere ile aydınlatılmaktadır (Şekil 3).

Holün kuzeydoğu tarafında, merdiven evi dahil üç mekân yer almaktadır. Merdiven evi, buraya açılan kapının güneydoğu tarafına açılmış bir mazgal pencere ile aydınlatılmaktadır (Şekil 5). Merdivenin bitişiğinde bulunan ortadaki oda günümüzde mutfak olarak kullanılmaktadır. Kuzeybatı taraftaki, yaklaşık 120 cm genişliğindeki mekân ise içten iki bölüme ayrılarak tuvalet ve lavabo olarak düzenlenmiştir. Bu bölüm kuzeybatı yönüne açılmış bir mazgal pencere ile, mutfak ise kuzeydoğu yönüne açılmış bulunan bir adet mazgal pencere ile aydınlatılmaktadır (Şekil 3).

**Şekil 3.** İdare binasının planları




Yapıdaki bu mekân düzenlemesi, bodrum ve çatı katı da dahil olmak üzere her katta çok küçük değişikliklerle tekrar edilmektedir. 20 adet rıhtla ulaşılan 1. katın merdiven evinde,

alt kata giriş kapısının izdüşümüne üst katta pencere yapılmak suretiyle pencere sayısı ikiye çıkartılmıştır. Aynı şekilde alt katta doğrudan koridora ulaşılan kuzeybatı tarafındaki kapının olduğu bölüm de bu katta pencere olarak düzenlenerek koridorun her iki taraftan da ışık alması sağlanmıştır (Şekil 3).

Duvar kalınlığının değişmesine bağlı olarak farklılık gösteren küçük ölçü değişikliklerinin haricinde bu kattaki göze çarpan önemli farklardan birisi, güneybatı taraftaki dört adet odanın birbirleriyle irtibatlandırılmalarının alt kata göre farklılık göstermesidir. Alt katta aradaki duvarın büyük bir açıklık olarak boşaltılmasıyla tek mekân haline getirilmeye çalışılan iki oda, bu katta tamamen ayrılmış ve birbirlerine bir kapı ile bağlanmıştır. Holün kuzeydoğu tarafında bulunan mekânlarda da zemin kattaki düzenleme aynen korunmuştur. Tüm mekânların ışıklandırılmasında da zemin katta kullanılan pencereler aynen tekrar ettirilmiştir (Şekil 3).

İdare binasının çatı katında da alt kattaki düzenleme büyük oranda benzerdir. Bu katta hol yine güneydoğu tarafta bulunan mazgal pencere ile aydınlatılmışken, alt katta, holün kuzeybatı ucunda kullanılan pencere çatı katında kullanılmamıştır. Yine bu kata çıkan merdiven evinin ışıklandırılmasında, altta kullanılan iki adet pencere yerine, bu iki pencerenin ortasına gelen tek pencere tercih edilmiştir (Şekil 3).

Çatı katında holün güneybatı tarafına dizilen mekânlarda da konum ve büyüklük olarak çok büyük farklar gözlanmazken çatı sisteminden kaynaklı zorunluluklar sebebiyle bu mekânların aydınlatmalarında teknik ve ustalık gerektiren çözümlemelere gidilmiştir. Bu katta çatının eğimli yüzeylerinin izdüşümünde bulunan mekânların dış duvarları yaklaşık 1 m yükseltilmek suretiyle çatı arasında çatı eğimi dolayısıyla sınırlanan yüksekliğin önüne geçilmeye çalışılmıştır. Alt katta her iki yönden pencereler açılmak suretiyle aydınlatılan köşe mekânlar, bu katta çatı eğimi sebebiyle tek cepheden ışık almak durumunda kalmıştır. Bu sebeple güneydoğu ve kuzeybatı yöndeki odalar, duvar izdüşümünde alın duvarları olarak düzenlenerek hem çatı kırma-beşik çatı kombinasyonuna dönüşmüş ve hem de çatı alanında kullanılabilecek alan artırılmıştır. Bu duvarlar üzerine daha dar çiftli pencereler yerleştirilmek suretiyle cephe görünümlerinde estetik düzenlemeye gidilmiştir. Aynı çözüm, bu yöndeki dışa taşırılan büyük odada da uygulanmıştır. Çatı eğiminden dolayı ışık alabileceği tek yön olan güneybatı yönü kullanım dışı kalmış olan güneydoğu yönündeki ikinci odanın ışık sorunu ise, çatı üzerine, izdüşüme yapılan bir kuş evi aydınlatması ile çözülmüştür (Şekil 3-4).

Holün kuzeydoğu tarafında, merdiven evinin dışındaki iki mekân bu katta birleştirilerek geniş bir odaya dönüştürülmüştür. Merdiven evinin, kuzeydoğu cephesinde kalkanduvar kullanılmak suretiyle çatı arası yüksekliği sorunu çözülmüş ve bu kısım tek pencere ile aydınlatılma yoluna gidilmiştir. Kuzey köşede bulunan, birleştirilerek genişletilen odanın ışık sorunu çatı eğimi sebebiyle cephede çözümlenemediği için burada da kuş evi sistemi kullanılmak suretiyle ışık sorunu çatıdan çözülmüştür (Şekil 3).

Zemin kattan 12 rıhtla ulaşılan bodrum katta üst katlara benzer şekilde, bir hol ile birbirine bağlanan altı adet birimden meydana gelmektedir. Güneydoğu-kuzeybatı doğrultusundaki

hol, güneybatı tarafına açılmış bir mazgal pencere ile aydınlatılmaktadır. Holün güneybatı yönüne sıralanmış dört birim içten birbirleriyle kapılarla irtibatlandırılmışken, sadece ortadaki iki mekânın holden bağımsız girişi bulunmaktadır. Birbirlerine yakın genişliklerdeki bu odalardan kuzeybatıdaki bağımsız girişli oda yaklaşık 50 cm dışarıya doğru genişletilmiştir. Bu kanatta köşelerdeki odalar her iki cepheye açılan pencerelerle aydınlatılırken, aradaki odalar ise güneybatı yöne açılmış birer pencereyle aydınlatılmaktadır. Kullanılan pencerelerin tamamı mazgal pencere şeklindedir (Şekil 3). Holün kuzeydoğu tarafında, merdiven haricinde iki adet bağımsız bölüm bulunmaktadır. Kuzeybatı tarafta bulunan küçük mekân yaklaşık 110 cm genişliğinde olup, yığma yapı inşa ilkeleri gereğince üst katlarda ıslak hacim olarak kullanılan birimlerin taşıyıcı fonksiyonlarını üstlenmek üzere ölçülendirilmiştir. Bu mekân kuzeybatı tarafına açılmış bulunan mazgal pencere ile aydınlatılmaktadır. Bu birim ile merdiven arasında bulunan oda da diğer odalarla benzer ölçülerdedir. Bu oda da kuzeydoğu tarafında bulunan mazgal pencere ile aydınlatılmaktadır (Şekil 3).

**Şekil 4.** İdare binasının cephe görünüşleri



Kuzeyden Görünüş



Kuzeydoğu (Giriş) Cephesi



Güneyden Görünüş



Güneydoğu Cephesi

İdari binanın genelinde cepheyi etkileyen pencere düzenlemesi ve çatının yapı üzerindeki etkisi tüm cephelerde hissedilmektedir. Yapının kat izdüşümleri cepheyi çevreleyecek biçimde profilli silmelerle tüm cepheyi çevreleyecek biçimde vurgulanmıştır. Yapının subasman seviyesini sınırlayan silmenin alt kısmı farklı ölçülerdeki altıgen kabayonu

taşlarla, köşe kısımlar ise bosajlı (suyolu açılmış) prizmatik kesme taşların bir miktar dışarı taşırılarak vurgulanması ile örülmüştür. Köşe taşlarında, pencere denizlik, söve ve kemerlerinde andezit, diğer kısımlarda ise kireçtaşı kullanılmak suretiyle bu seviyede bir kontrast meydana getirilmiştir (Şekil 3-4). Bodrum kat pencereleri hem genişlik ve hem de yükseklik olarak üst kat pencerelerinden daha küçük tutulmuştur.

Bodrum kat pencerelerinin denizlik kısmı, yekpare andezit taşından yapılmıştır. Her iki taraftaki söveler ise iki parçadan meydana gelmektedir. Söveler, alt kısımdaki parça sade görünümde iken, üst bölümde söve ile kemer geçişini sağlayan kısımda basık kemere üzengi noktası oluşturacak biçim ve ölçüde şekillendirilmiştir. 3 parçadan meydana gelen basık kemer, ortada alt ve üste taşırılarak vurgulanmış kilit taşının her iki tarafındaki bir çift kemer taşı ile oluşturulmuştur (Şekil 5).

**Şekil 5.** İdare Binası merdiven ve cepheden detaylar



Merdiven



Bodrum kat penceresinden detay



Zemin kat penceresinden detay

Binanın subasman üzeri, her kat ve cephede benzer teknikte yapılmıştır. Pencere üstleri, katları sınırlayan profillerle birleşerek sonlanmaktadır. Hafif basık kemer formuyla yapılan üst kısım, dışa taşırılmış ve ölçü olarak vurgulanmış kilit ve üzengi taşlarının arasına yerleştirilen profilli birer kemer taşıyla geçilmiştir. Söveler yekpare görünümde iken, parapetin kısmı ise alt kısmı profillendirilmiştir. Pencerenin parapet altında kalan kısmı da yine pencere ile aynı renk olarak alt kısımdaki kat silmesi ile birleşmektedir.

Yapının özgün tasarımında girişlerin üzerinde saçak bulunmamaktadır. Ancak günümüzde ana giriş kapısı olarak kullanılan kuzeydoğu girişinin üzrinde muhdes saçak yer almaktadır. Yapıldığı süreç içerisinde uzun yıllar Konya Ovası İrva ve İska İdaresinin idari binası olarak hizmet vermiş bulunan bina, günümüzde Devlet Su İşleri 4. Bölge Konya Ovası Sulaması (KOS) Şube Müdürlüğü tarafından kamuya ve personele açık misafirhane olarak kullanılmaktadır.

### 2.2. Başmühendis Lojmanı

Yerleşkedeki tarihi yapı grubundan güneydoğu tarafta bulunan yapı başmühendis lojmanı olarak projelendirilmiştir (Şekil 1). Alandaki tarihi yapı gruplarından, mühendis lojmanlarıyla birlikte en geç inşa edilen yapılardandır. Yerleşkenin erken tarihli fotoğrafında (URL 2) idari bina ve atölye binası görünmekteyken ne başmühendis ne de

mühendis lojmanları görünmemektedir. Bu durum, Atölye binasının özgün projesinin üzerinde bulunan 1912 tarihi ile birlikte değerlendirildiğinde (Şekil 10), lojmanların 1912 yılından sonraki dönemde inşa edilmiş olduğunu göstermektedir.

Yapı, bodrum, zemin ve çatı katı olmak üzere üç kattan meydana gelmektedir. Konutun esas kullanım katı olan zemin kata kuzeybatı ve güneybatı cephelerinde bulunan iki ayrı merdivenden ulaşılabilmektedir. Bununla beraber konutun esas girişi, güneybatı cephede bulunan giriştir (Şekil 6).

Altı adet rıhttan meydana gelen merdiven aracılığıyla ulaşılan güneybatı girişi, tek kollu ve iki tarafı çeyrek döner olarak düşünülmüş merdivenin bulunduğu merdiven evine açılmaktadır. Burada bulunan üç adet kapıdan güneydoğu ve kuzeydoğudaki kapılar iki ayrı odaya açılmaktadır. Güneydoğudaki oda, yaklaşık olarak 3,65 x 2,40 m ölçülerindedir. Odanın güneydoğu ve güneybatı duvarlarına açılmış olan iki adet pencere bulunmaktadır. Kuzeydoğudaki oda ise yaklaşık 4,00 x 4,00 m ölçülerinde, kare planlı bir mekândır. Bu odayı aydınlatan iki adet mazgal pencere, güneydoğu duvarında yer almaktadır. Yapının kuzeydoğu cephesi tamamen sağır bırakılmıştır.

Zemin katın kuzey köşesinde bulunan odası daha müstakil bir işlev üstlenecek özellikte işlevlendirilmiştir. Bu oda bir taraftan bitişiğindeki oda ile arasında bulunan bir kapı ile irtibatlı hale getirilmişken, öte yandan dışarıdan da bağımsız bir şekilde ulaşılabilecek özellikte planlanmıştır. Merdiven evinde bulunan üçüncü kapı, merdivenin altından yaklaşık 1,00 x 1,50 m ölçülerindeki bir hole açılmaktadır. Aynı zamanda yapının kuzeybatı tarafında bulunan merdiven ile bağımsız olarak da ulaşılabilen bu holün kuzeydoğu tarafında, yaklaşık 3,20 x 4,00 m ölçülerindeki odaya geçilebilmektedir. Odanın kuzeybatı duvarında iki adet mazgal pencere yer almaktadır. Holün güneybatı tarafında ise wc bulunmaktadır. WC'nin kuzeybatı duvarına açılmış bir pencere ile havalandırılması sağlanmıştır (Şekil 6). Konutun bu bölümünü oluşturan ve bir hol ile bağımsız olarak dışarıya bağlantısı bulunan oda ve ıslak hacim, bu bölümün konut içinde ofis olarak da kullanılmaya uygun tasarlandığını göstermektedir.

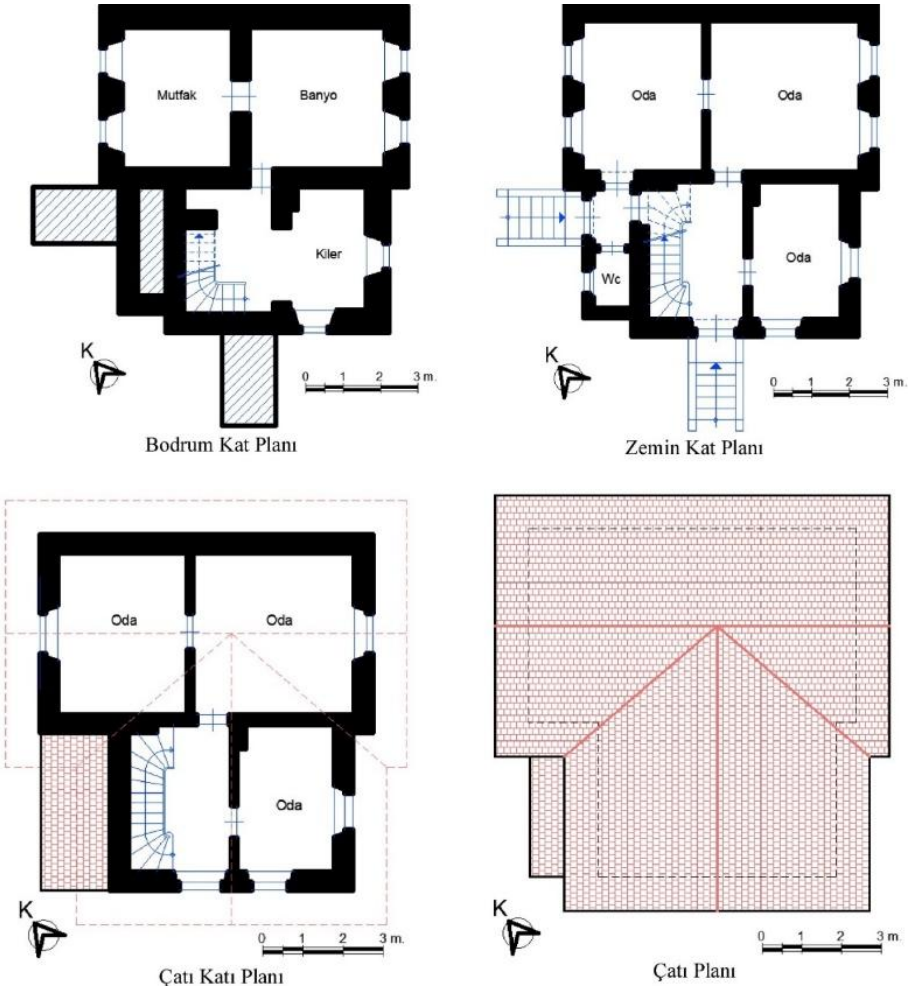
Zemin kat merdiveni ile yapının üst katını meydana getiren çatı katına ulaşılmaktadır. Üst katta, çatı arasının rahat bir şekilde kullanılabilmesi için eğim yönündeki dış duvarlar yaklaşık 1,0 m yükseltilmiştir. Çatı, kırma-beşik çatı kombinasyonu ile tasarlanarak, çatı arasındaki mekânların çatı eğiminden mümkün olduğunca az etkilenmesi sağlanmıştır (Şekil 6).

Çatı katında, güneydoğuda bulunan oda alt kattaki oda ile hem ölçü ve hem de pencereler bakımından aynıdır. Alt kattaki hol ve ıslak hacim, tek kat olarak planlanmış olduğu için bu katta bu mekânların üzeri, çatı olarak yapılmıştır[4]. Bu sebeple alt katta bağımsız girişi

[4] Yapının özgün halinde böyle iken, bu kısım sonraki düzenlemelerde üst katta da ıslak hacim olarak düzenlenmiştir. Bu düzenlemenin sonradan yapıldığı, zemin ve çatı katını ayıran silmenin burada devam etmemiş olması, buraya açılan pencerelerin niteliğinin yapının diğer pencereleri ile uyumsuzluğu ve çatı düzenlemesinde görülen zorlama çözümlemeden de açıkça anlaşılmaktadır (Şekil 7). Çalışmamızda, yapının özgün niteliği dikkate alınmış, yapının özgününde bulunmayan bu kısımlar değerlendirilmeye alınmamıştır.

de bulunan kuzeydeki odaya ulaşım sorunu, doğu köşedeki oda ile aralarına açılan bir kapı ile çözülmüştür. Kuzeybatı ve güneydoğu yönden oda cephesini oluşturan kalkan duvarların yüksekliği dolayısıyla her iki odanın da dışarıya bakan cephelerine açılan birer pencere ile odalardaki ışık sorunu çözülmüştür.

**Şekil 6.** Başmühendis lojmanı planları




Zemin katta bulunan merdiven yardımıyla yapının bodrum katına ulaşılmaktadır. Yığma yapı inşa kuralları gereği bodrum katta iç duvarlarda kalınlık 50 cm olarak alınmıştır. Bodrum katta ıslak hacimlerin izdüşümünde bulunan kısım dolgu olarak geçilmiştir. Güney köşede bulunan oda, bodrum katta günümüzde kiler olarak değerlendirilmiştir. Kuzeydoğu yönde bulunan iki odanın ise günümüzde bir tanesi mutfak olarak kullanılmaktayken diğer oda ise yıkanma yeri (banyo) olarak değerlendirilmektedir (Şekil 6).

Başmühendis lojmanının cephe özellikleri, alandaki diğer tarihi yapılarla örtüşecek niteliktedir. İdari binada olduğu gibi başmühendis lojmanında da subasman kotuna kadar olan bölüm altıgen kabayonu taşlarla, köşe kısımlar ise bosajlı (suyolu açılmış) prizmatik kesme taşların bir miktar dışarı taşırılarak vurgulanması ile örülmüştür. Köşe taşları ve pencere denizlik, söve ve kemerleri bordo renge boyanmıştır. Pencerelerde kullanılan teknik ve biçim de idari bina pencereleriyle aynı şekildedir. Bodrum ve zemin katı ayıran hatta herhangi bir kat silmesi kullanılmamışken, zemin kat ile çatı katını ayıran kat hizası basit profilli bir silme ile vurgulanmıştır (Şekil 7).

Yapının her iki girişinde de özgün saçak bulunmamaktadır. Ancak günümüzde güneybatı giriş niteliksiz bir camekân ile kapatılmış, kuzeybatı giriş ise üzeri saçaklı ve yine niteliksiz ahşap bölme ile rüzgârlık olarak düzenlenmiştir. Geniş saçaklı çatının üzeri marsilya tipi kiremit ile kaplıdır. Yapı günümüzde Devlet Su İşleri 4. Bölge Konya Ovası Sulaması (KOS) Şube Müdürlüğü tarafından yapıldığı dönemdeki tahsis durumunda olduğu gibi başmühendis lojmanı olarak kullanılmaya devam etmektedir.

**Şekil 7.** Başmühendis lojmanı cephe görünüşleri



Batıdan görünüş



Doğudan görünüş



Güneybatı cephesi



Kuzeydoğu cephesi

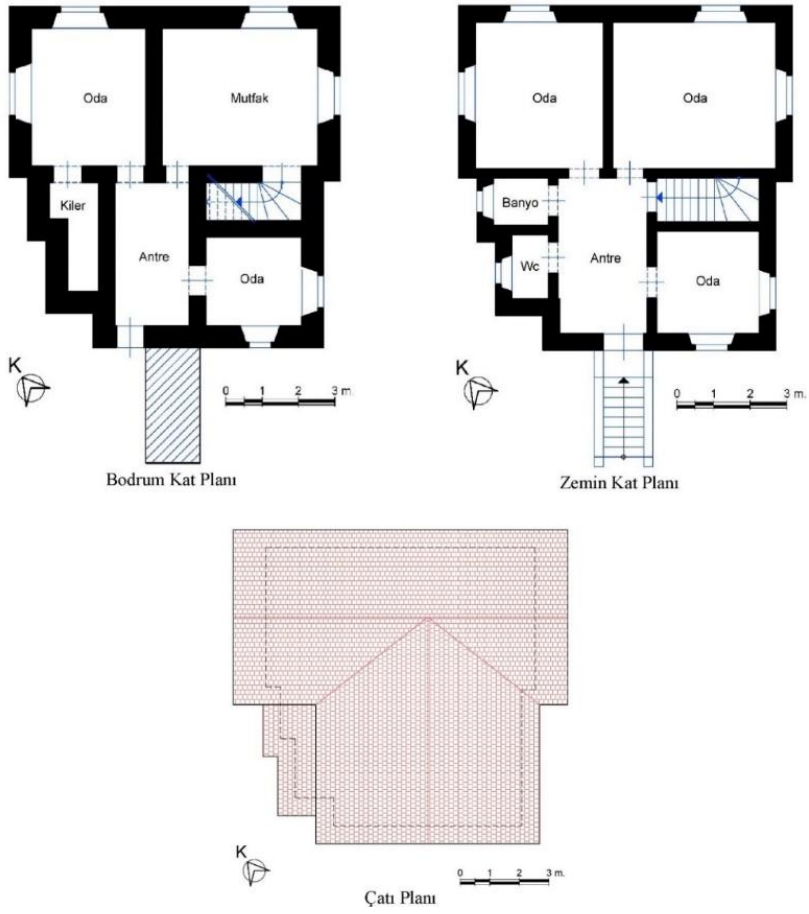
## 2.3. Mühendis Lojmanları

Yerleşkede idari bina ile başmühendis lojmanının arasına inşa edilmiş üç adet mühendis lojmanı bulunmaktadır (Şekil 1). Mühendis lojmanları, başmühendis lojmanı ile birlikte 1912 yılından sonraki dönemde inşa edilmiş olması kuvvetle muhtemeldir.

Her üçüde aynı plan tipine sahip mühendis lojmanları, diğer yapılar gibi günümüzde hizmet vermeye devam etmektedir. Mühendis lojmanlarının da esas kullanım alanları zemin ve bodrum katlarıdır. Bu yapılarda çatı araları kullanım alanı olarak değerlendirilmemiştir.

Yapılara giriş, güneybatı cepheden sağlanmaktadır. Bu cephede bulunan dokuz rıhtlı bir merdivenle zemin kata ulaşılırken, yine aynı cephede bulunan alçak bir kapı ile yapının bodrum katına bağımsız giriş yapılabilmektedir. Ayrıca, bodrum katta, doğu köşede bulunan ve mutfak olarak kullanılan mekânda bulunan bir iç merdiven ile zemin kat ile bodrum katın birbiriyle bağlantısı sağlanmıştır (Şekil 8).

**Şekil 8.** Mühendis lojmanları planları



Güneybatıda bulunan merdivenle ulaşılan kapı, antreye açılmaktadır. Antrenin güneydoğu tarafında 2,80 x 2,80 m ölçülerinde, kare planlı bir oda yer almaktadır. Odanın güneybatı ve güneydoğu duvarlarından dışarıya açılan pencereler, mazgal pencere olarak düzenlenmiştir. Bu odanın hemen bitişiğinde bulunan bir merdiven, zemin kat ile bodrum katın irtibatını sağlamaktadır. Antrenin kuzeybatı tarafında ise ıslak hacimler yer almaktadır. Bu bölümde giriş kapısı tarafına wc konumlandırılmışken, hemen yanında ise banyo yer almaktadır (Şekil 8). Yapının kuzeydoğu tarafında, kapıları doğrudan antreye açılan iki adet oda yer almaktadır. Bu odalardan güneydoğu tarafta bulunanı yaklaşık 4,00 x 4,50 m ölçülerindedir. Odayı, güneydoğu ve kuzeydoğu duvarlarına açılmış bulunan iki adet mazgal pencere aydınlatmaktadır. Kuzey köşedeki oda ise bu odaya göre daha küçük olup, yaklaşık 3,50 x 4,0 m ölçülerindedir. Bu oda da kuzeydoğu ve kuzeybatı duvarlarına açılmış iki adet mazgal pencere yardımıyla aydınlatılmıştır (Şekil 8).

Binanın bodrum katına güneydoğu taraftaki iki odanın arasında bulunan merdivenin yanı sıra, güneybatı cephede bulunan bağımsız kapı ile doğrudan da ulaşılabilmektedir. Antreye açılan üç kapı, üç ayrı bağımsız bölüme ulaşmayı sağlamaktadır. Bodrum katta bulunan duvarların tamamı 50 cm kalınlığa sahiptir. Güney köşedeki oda, üst katta olduğu gibi güneydoğu ve güneybatı duvarlarına açılmış bulunan mazgal pencerelerle aydınlatılmaktadır. Antrenin kuzeydoğu tarafında yanyana bulunan iki kapıdan da iki ayrı odaya ulaşılmaktadır. Bunlardan kuzey köşede yer alan odanın içinden üst katta bulunan ıslak hacimlerin izdüşümünde bulunan mekân bağlantılı hale getirilmiş ve bu küçük mekân kiler, depo vs. olarak kullanılacak biçimde değerlendirilmiştir. Bu odanın aydınlatması, üst kattaki izdüşümünde bulunan odada olduğu gibi kuzeydoğu ve kuzeybatı duvarlarına açılmış mazgal pencerelerle sağlanmıştır. Bodrum katın doğu köşesinde bulunan oda, mutfak olarak kullanılmaktadır. Hem bu katta ve hem de üst katta yapının en geniş odası olarak dikkati çeken bu mekân, üst katın izdüşümüne yerleştirilmiş, kuzeydoğu ve güneydoğu duvarlarına yerleştirilmiş mazgal pencerelerle aydınlatılmaktadır. Bu mekânın güneybatı tarafında bulunan bir kapı ile ulaşılan merdivenle bu katın zemin katla bağlantısı sağlanmıştır (Şekil 8-9).

Mühendis lojmanları, cephe düzenlemesi olarak yerleşkede bulunan diğer binalarla tam bir uyum içindedir. Bu yapılar gerek idari bina ve gerekse başmühendis lojmanı ile benzer özellikler göstermesinin yanı sıra bazı önemli farklar da bulundurmaktadır. Mühendis lojmanlarının subasman seviyesine kadar olan bölümü, idari bina ve başmühendis lojmanı ile aynı tarzda, altıgen kesme taşlarla; köşe kısımlar ise bosajlı (suyolu açılmış) prizmatik kesme taşların bir miktar dışarı taşırılarak vurgulanması ile örülmüştür. Köşe taşları ve pencere denizlik, söve ve kemerleri bordo renge boyanmıştır (Şekil 10).

Mühendis lojmanlarının bodrum kat pencereleri, idari bina ve başmühendis lojmanının bodrum kat pencereleriyle aynı teknikte yapılmıştır. Ancak üst kat pencerelerinde tamamen farklı bir teknik kullanılmıştır. Üst katta (zemin katta) pencereler yine basık kemerli olarak yapılmışken, bu üç grup yapıda kemer, taş malzeme yerine tuğladan yapılmıştır. Bodrum ve zemin katı ayıran kat silmesi mevcutken, tek katlı yapıda üst kotta kat silmesi bulunmaması sebebiyle üst kottaki kat silmesi uyumunu ortaya koyabilmek için

pencerelerin üst kısımlarına yakın bir bölümlerinden tüm cepheyi çevreleyecek şekilde iki sıra tuğladan örülen bir silme, tüm yapıyı dolanarak yapıya hareketlilik kazandırmaktadır.

**Şekil 9.** Mühendis lojmanlarının iç mekânından görünümler



Zemin katta yer alan odadan görünüş



Zemin kat odasında tavan kaplaması



Mutfaktan 1. kata çıkış merdiveni

**Şekil 10.** Mühendis lojmanları cephe görünüşleri



Güneyden görünüş



Güneydoğu cephe



Kuzeyden görünüş



Doğudan görünüş

Yapıların çatılarında üçgen alınlıkla sonlanan cephelerde saçak mesafesi uzun tutularak bu bölümde yapılan uygulama ile cephelere hareketlilik kazandırılmıştır. Mühendis lojmanlarının cephelerinin en dikkat çeken yanı, o dönemde Osmanlı mimarisinde pek

rastlanmayan çıkıntılı saçakları ve alın süslemeleridir. Bu amaçla her iki tarafta saçak seviyesinde çiftli eliböğründe şeklindeki ahşap konsol elemanları tarafından desteklenen çıkmanın üst ve her iki yanda bulunan alt köşeleri ızgara şeklinde kapatılmıştır. Orta kısım ise eliptik bir ahşap parça ile sınırlandırılarak estetik bir görünüm elde edilmiştir. Bu uygulamanın yapıldığı her cephede bu düzenlemenin orta kısmında, çatı arasını aydınlatmak amacıyla elips formlu pencereler kullanılmıştır.

Mühendis lojmanları günümüzde Devlet Su İşleri 4. Bölge Konya Ovası Sulaması (KOS) Şube Müdürlüğü tarafından personel lojmanı olarak kullanılmaktadır.

### 2.4. Atölye Binası

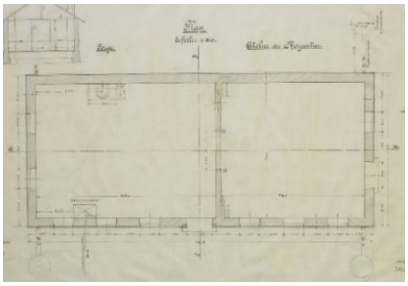
Yerleşkede, kuzeydoğu tarafta bulunan tek katlı ve uzunca yapı, atölye binası olarak inşa edilmiştir (Şekil 1). Yapının niteliği ve inşa amacı hakkında farklı söylemler bulunsa da günümüzde işletmenin arşivinde bulunan özgün projesine göre (Şekil 10) bu yapının atölye binası olarak projelendirilmiş olduğu kesindir. Yerleşkenin eski fotoğraflarında da görüldüğü üzere, alanda ilk inşa edilen iki yapıdan (ilki idari binadır) birisi bu atölye binasıdır (Şekil 2).

Yapı, dıştan dışa yaklaşık olarak 18,15 x 7,65 m ölçülerindedir. Yapının duvarları 45 cm kalınlığındadır. Yapı günümüzde tek yapı durumundadır. Ancak özgün planında birbiriyle irtibatı bulunmayan iki ayrı bağımsız bölüme sahip bir yapı olarak düzenlendiği görülmektedir. Özgün projesine göre kuzeybatı kanatta yer alan mekâna güneybatı duvarında bulunan; güneydoğu kanatta yer alan mekâna da güneydoğu cephede bulunan bir kapı ile girilmektedir (Şekil 10).

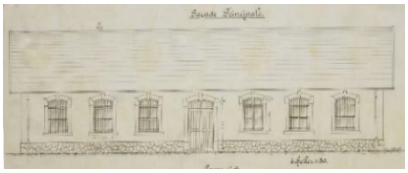
**Şekil 10.** 1912 tarihli orijinal projeden kapak sayfası, plan ve cephe görünüşü




Orijinal projenin kapağı



Orijinal projenin kat planı



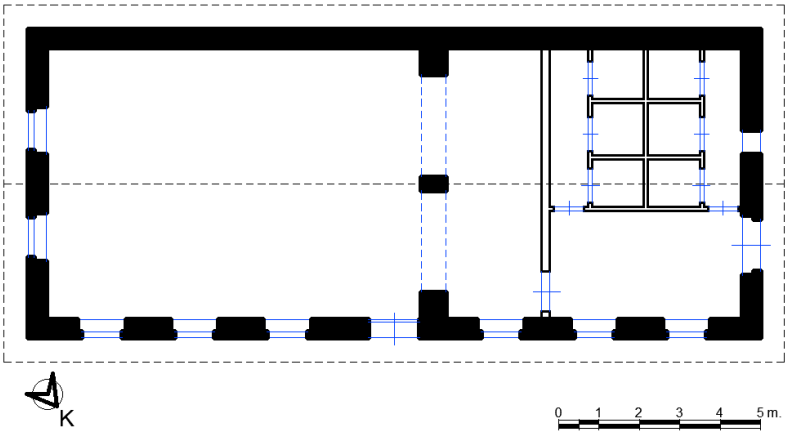
Orijinal projenin cephe görünüşü

**Kaynak:** DSİ Çumra Şube Müdürlüğü Arşivi

Günümüzdeki durumunda, aradaki duvarın kaldırılmasıyla tek birime dönüştürülmüştür (Şekil 11). Yapının örtü sisteminde de zaman içinde önemli değişiklikler yapıldığı anlaşılmaktadır. Orijinal projesine göre yapıda tavan döşemesi bulunmayıp doğrudan beşik çatı ile örtülmüş durumdayken, mevcut durumunda ise tavanın betonarme döşemeyle geçildiği ve üzerine de sarkan saçaklı beşik çatı yapıldığı görülmektedir. İç bölümde yapılan düzenlemeler ve kapı ve pencerelerde orijinal projeye göre yapılmış olan köklü değişiklikler, yapının muhtemelen asıl işlevini tamamladıktan sonra, ihtiyaçlar doğrultusunda yeniden düzenlemeden geçirildiğini göstermektedir.

Yapının her iki bağımsız bölümü de içteki duvarın kaldırılmasıyla birleştirildikten sonra bina, iki girişe sahip bir yapı haline gelmiştir. Bu girişlerden ilki güneybatı cephesindedir. Bu cephede orta kısımda bulunan kapının her iki tarafına simetrik vaziyette üçer adet pencere yerleştirilmiştir. Yapının kuzeydoğu cephesi tamamen sağır bırakılmışken, kuzeybatı cephesinde alt bölümde iki adet standart pencerenin yanısıra, üst bölümde beşik çatının kalkan duvarına açılmış daha küçük ölçekli bir pencere daha bulunmaktadır (11-13).

**Şekil 11.** Atölye binasının mevcut planı




Kuzeydoğu ve kuzeybatı cephelerinde bulunan pencereler parapet, söve ve kemer olarak değerlendirildiğinde, orjinalinde daha büyük ölçüdeyken, mevcutta pencere boşluklarının alt bölümleri belli bir yüksekliğe kadar örülmek suretiyle üst bölümde iki kanatlı küçük ölçüde bir pencere olarak yeniden düzenlendiği anlaşılmaktadır (Şekil 12).

Yapının güneydoğu cephesinin üst bölümünde de kuzeybatı cephesindekiyle benzer biçimde bir tepe penceresi bulunmaktadır. Alt kısımda ise kuzeydoğu tarafta, kapı yüksekliğinde, içi duvar örülerek kapatılmış lento ve söve ile sınırlandırılmış kısım, buranın da bir zamanlar kapı olarak kullanıldığını göstermektedir. Bu kapının, atölyeye malzeme giriş çıkışına elverişli ölçüde düşünüldüğü anlaşılmaktadır (Şekil 13).

**Şekil 12.** Atölye binası iç mekân ve cepheden görünümler



Saçak



Pencerelerden detay



Atölye iç mekânı görünümü

Günümüzde yapıya girişler bu cepheden sağlanmaktadır. Bu kısımda yapılmış olan muhdes camekânlı bölme ile rüzgârlık oluşturulmuş ve buradaki kapı ile binaya giriş sağlanmıştır. Özgün planında bu kısım, 130 cm genişliğinde bir kapı olarak tasarlandığı görülürken, yapının kapı ve pencerelerinde görülen lento ve söve vurgularının bu kısımda bulunmaması, kapının özgün niteliğinin değiştirilmiş olma ihtimalini güçlendirmektedir (Şekil 10-13).

**Şekil 13.** Atölye binası cephe görünümleri



Kuzeydoğu cephe



Kuzeybatı cephe



Kuzeyden görünüş



Güneyden görünüş

Atölye binasının kuzeybatı mekânı, orinal projesinde 9,30 m uzunluğa sahipken günümüzde betonarme bir kirişle ayrılmış olan kısmın uzunluğu 9,50 m'dir. Buradan da yapının her iki bölümünü ayıran duvarın kaldırılarak, betonarme tavan inşa edildiği dönem, bu bölümün kiriş olarak geçildiği anlaşılmaktadır. Kiriş, ortada kısmında betonarme bir kolonla desteklenmiştir. Yeni düzenlemede bina, güneydoğu tarafından yaklaşık 4,80 m uzaklıkta bir duvar ile bölünerek bu kısma wc ve duşlardan müteşekkil ıslak hacimler oluşturulmuştur.

Çatısı marsilya tipi kiremitle kaplanmış olan yapı, günümüzde spor salonu olarak değerlendirilmektedir.

## 3. Değerlendirme ve Sonuç

Osmanlı İmparatorluğu'nun son döneminde gerçekleştirilen en büyük ve en önemli projelerden biri olan Konya Ovası İrva ve İska Projesi, dönemin teknolojik ve ekonomik olanakları çerçevesinde kapsamlı bir altyapı yatırımı olarak değerlendirilmektedir. Bu proje, özellikle tarımsal verimliliği artırmak amacıyla sulama sistemlerinin inşa edilmesini hedeflemiştir. Bununla birlikte, projenin etkin bir şekilde yürütülebilmesi için yalnızca sulama sistemleriyle sınırlı kalınmamış, idari ve teknik personelin koordinasyonunu sağlayacak idare binaları, lojmanlar ve atölyeler gibi destekleyici yapılar da projeye entegre edilerek inşa edilmiştir. Bu yapılar, yalnızca projenin başarılı bir şekilde yürütülmesine katkı sağlamakla kalmamış, aynı zamanda bölgedeki tarımsal ve ekonomik faaliyetlerin sürekliliğini temin eden idari merkezler olarak da fonksiyon görmüştür.

Günümüzde hala kullanımda olan bu yapılar, tarihsel ve kültürel miras açısından önemli birer belge niteliğindedir. Konya Ovası İrva ve İska Projesi, yalnızca sulama altyapısının modernizasyonuna katkı sunmakla kalmamış, aynı zamanda bölgenin sosyo-ekonomik gelişimine de önemli katkılar sağlamış ve Osmanlı tarım politikalarının somut bir örneği olarak tarih sahnesindeki yerini almıştır.

Osmanlı İmparatorluğu'nun tarımsal altyapıyı modernize etme amacıyla hayata geçirdiği bu projeye ait yapıların tamamı Almanlar tarafından inşa edilmiştir. Çalışmamıza konu olan yerleşkedeki yapılar, neo-klasik ve "heimatstil" olarak bilinen Alman yerel mimari tarzının bir kombinasyonu ile inşa edilmiştir. Dolayısıyla, bu yapılar ilçenin en eski yapılarından biri olmanın yanı sıra, 19. yüzyıl geleneksel Alman konut mimarisinin bölgedeki temsilcileridir (Bozkurt, 2012, s. 365).

Konya özelinde değerlendirilen bu yapılar, Anadolu'nun farklı bölgelerinde de benzer örneklerle temsil edilmektedir. Bağdat ve Hicaz Demiryolu projeleri kapsamında Osmanlı-Alman iş birliği sonucu, Alman mühendis ve işçileri için inşa edilen lojmanlar, Konya'daki yapılarla benzerlik göstermektedir. Bauhaus öncesi mimari anlayışın etkisiyle kırma çatılar, tuğla-taş kombinasyonlu cepheler ve ahşap detaylar bu yapıların ortak mimari unsurları arasında yer almaktadır. 1892-1920 yılları arasında inşa edilen Ankara Garı lojmanları (Sunay, 2020, s. 741-763), Eskişehir İstasyonu lojmanları (tuğla cepheli ve

yüksek tavanlı), Uşak (Gürsoy, 2016), Adana ve Mersin (Akpolat, 2004, s. 77-93) lojman yapıları, bu mimari ekolün Anadolu'daki önemli temsilcileridir.

Konya Ovası İrva ve İska İdaresi yerleşkesinde yer alan Mühendis Lojmanları, Konya il merkezinde aynı dönemde Almanlar tarafından inşa edilen Konya İstasyon yerleşkesi lojmanları (No: 37 ve No: 40) ile benzer mimari unsurlar taşımaktadır. 20. yüzyılın ilk çeyreğine tarihlenen bu yapılar, birebir aynı planlama anlayışını takip etmese de cephe düzenlemeleri açısından çarpıcı benzerlikler göstermektedir. Özellikle ahşap payandalarla taşınan saçakların tepe noktasında kemerle sonlandığı detaylar, Konya Envanteri'nde (2010, s. 561) ve diğer akademik kaynaklarda belirtilmiştir (Erdoğan, 2005, s. 132-137).

Bu yapılar, inşa edildikleri tarihten günümuze kadar kesintisiz hizmet vermeye devam etmektedir. Ancak, günümüzdeki değişen konfor standartlarına uyum sağlamakta güçlük çekmektedirler. Yapılarda zamanla kapı ve pencere doğrultusunda niteliksiz müdahaleler gerçekleşmiş, özellikle ıslak hacimlerde belirgin değişiklikler meydana gelmiştir. Buna ek olarak, binaların girişlerine eklenen rüzgârlıklar ve saçaklar, orijinal mimari dokuyu bozarak yapıların estetik bütünlüğünü olumsuz etkilemektedir. Bununla birlikte, yapıların 100 yıldan uzun süre boyunca korunarak günümüze ulaşabilmesi, büyük ölçüdé resmi kurumlar tarafından kullanılmasına bağlanabilir. Ancak, bu yapıların ihtiyaç duyduğu restorasyon çalışmaları için finansal kaynak bulma konusundaki sorunlar, sürecin en büyük engellerinden biri olarak karşımıza çıkmaktadır.

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Yazarın herhangi bir kişi ya da kuruluş ile çıkar çatışması yoktur.

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Derleme Makale / Review Article

# Tarihi yapılarda tespit edilen sorunların yapı malzemeleri üzerinden iyileştirilmesi

## *Improving the deteriorations of historic buildings through building materials*

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*Anahtar Kelimeler*:

*Tarihi çevre, doğal çevre, koruma, mimari sürdürülebilirlik, malzeme iyileştirmeleri*

ÖZ

Tarihi yapılar günümüz şartlarına uyum sağlayabilmeleri ve varlıklarını sürdürebilmeleri adına çeşitli müdahalelere ihtiyaç duyabilmektedir. Bu süreçte yapılarda tespit edilen sorunların yenilikçi bir çerçevede ele alınarak tarihi dokuya ve çevreye zarar vermeden giderilmesi gerekir. Bu çalışmada yıllar içerisinde tarihi yapılarda görülen aksaklıklar ve ihtiyaçlar ele alınarak bunların yapı malzemesi ölçeğinde giderilmesine yönelik çözüm önerileri sunulmuştur. Çalışmanın metodolojisine göre, nem sorunu, enerji performansı, termal konfor, çevresel etkiler ve iç mekân hava kalitesi olarak belirlenen beş farklı kategoride son on yılda literatüre kazandırılmış olan çalışmalar incelenmiştir. Bu çalışma, yeni malzeme ve teknoloji kullanımının tarihi çevre kadar doğal çevreye olan etkilerinin de incelenmesi açısından bilinçlendirici bir yaklaşıma sahiptir.

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ABSTRACT

Historic buildings may need various interventions to adapt to changing conditions and maintain their existence. The problems identified in the buildings should be addressed in an innovative framework and should be eliminated without harming the historical texture and the environment. In this study, the problems and needs of historical buildings over the years are discussed and solutions are proposed to eliminate them on the scale of building materials. Recent studies in five different categories, namely humidity and dampness, energy performance, thermal comfort, environmental impacts, and indoor air quality, were examined. This study has an awareness-raising approach in terms of examining the effects of the use of new materials on the natural environment as well as the historical environment.

## Giriş

İnşa edildiği döneme ait fiziksel özelliklerini bütüncül bir şekilde barındıran ve toplumsal, görsel veya tarihi açıdan bir değere sahip yapılar, tarihi bina kategorisinde değerlendirilmektedir [1]. Ayrıca kültürel mirasa ait olan bir yapının 100 yıl boyunca yıkılmadan ayakta kalması ona 'tarihi yapı' unvanı kazandırır [2]. Ancak bu kadar uzun süre tarihe tanıklık eden yapılarda yıllar içerisinde değişen çevresel koşullar, kullanıcı hataları veya yapı malzemelerinin ömrünü tüketmesi nedeniyle çeşitli deformasyonlar görülmeye başlar. Bu tür sorunların üstesinden gelinmesinde yeni malzeme ve tekniklerden faydalanılması, yapıların ömrünü uzatarak tarihi yapıların sürdürülebilirliğe katkı sunabilmektedir [3].

Tarihi yapıların koruma işlerinin yapının bütünlüğünü bozmayacak şekilde gerçekleştirilmesi gerekir. Ancak koruma işlemleri doğal kaynakların kullanıldığı, atık malzemelerin ortaya çıktığı, maliyetli ve özen gerektiren bir süreçtir. Bu sürecin doğal ve yapılı çevreye en az etki edecek şekilde yürütülmesi elzemdir. Tarihi binaların restorasyonunda kullanılan malzemeler, yapı ile uyumu, rengi, dokusu, işlevi ve özellikleri açısından dikkatle seçilmelidir [4].

## Yöntem

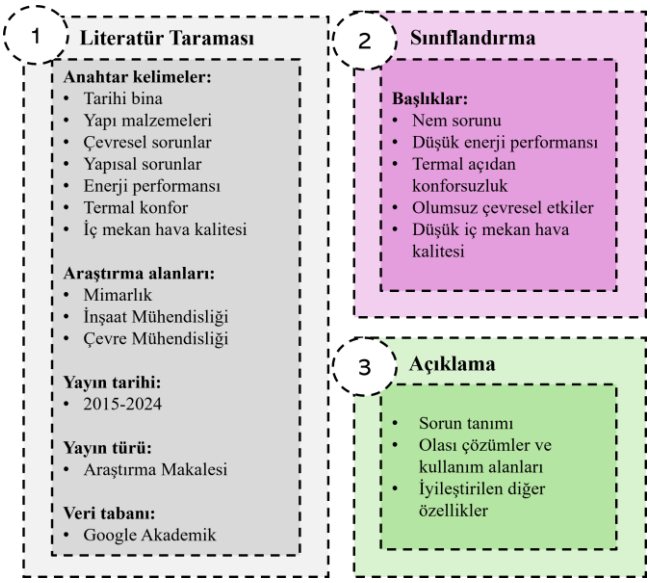
Kültürel mirasın korunmasına yönelik alınması gereken önlemlerin gözler önüne serilmesi, güncel malzeme teknolojilerinin tartışılması ve tarihi yapıların korunması ile ilgilenen yetkililerin bilinçlendirilmesi çalışmanın temel amaçlarındandır.

Bu çalışmada tarihi yapılarda sıkça görülen çeşitli sorunları ele alan ve son on yılda yayınlanmış olan çalışmalar incelenmiştir. Seçilen çalışmaların yapı malzemesi ölçeğinde bir yenilik sunmasına da ayrıca özen gösterilmiştir. Tarihi yapılardaki problemler nem sorunu, düşük enerji performansı, termal açıdan konforsuzluk, olumsuz çevresel etkiler ve düşük iç mekan hava kalitesi olmak üzere beş ana başlık altında toplanmıştır.

Her bir başlık altında açıklanan tarihi yapı sorunu; (1) ilgili sorunun tanımlanması, (2) olası çözümlerin ve yapıda kullanım alanlarının verildiği bir görsel ve (3) yapıda iyileştirilen diğer özelliklerin açıklamasını içeren bir tablo ile desteklenmiştir (Şekil 1).

## Bulgular

Beş ana başlık altında incelenen çalışmalarda, nem sorunu için odun külü katkısı ve kil bariyeri; düşük enerji performansının artırılmasına yönelik olarak soğuk renk malzeme ve membran kullanımı; termal konforsuzluğun giderilebilmesi için termal kütle, faz değiştiren malzeme (FDM) ve çeşitli gölgelendirme elemanları; çevresel etkilerin düşürülmesinde atık malzemeden yararlanılması ve atık yönetimi; iç mekan hava kalitesinin iyileştirilmesinde ise yeşil yapı malzemelerinin kullanımına değinilmiştir.




Şekil 1. Çalışmanın metodolojisi.

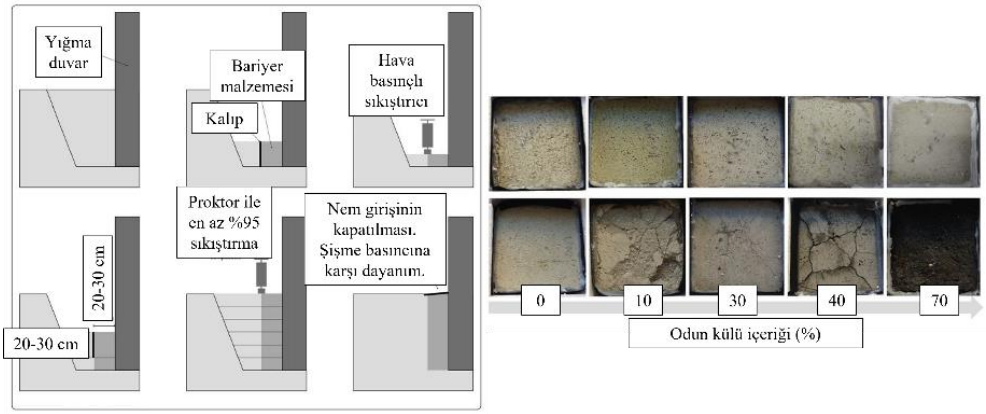
### Nem sorunu

Yapı malzemelerinde yıllar içerisinde meydana gelen hasar, topraktan gelen neme karşı yapıyı savunmasız hale getirebilir. Nem, yapı strüktürüne ve kaplamalara zarar vererek bina kabuğunda gerçekleşen ısı alışverişini artırır ve bu durum binanın enerji tüketiminin de artmasına neden olur. Ayrıca kullanıcılarda konforsuzluk hissine de yol açan iç mekanlardaki yüksek nem artışı, küf oluşumuna ve bina kullanıcılarında çeşitli sağlık problemlerinin gelişmesine neden olabilmektedir [5].

Tarihi yapılardaki nem artışı, yapının taşıyıcı sisteminin zarar görmemesi adına üstesinden gelinmesi gereken ciddi bir sorundur. Bu aşamada düşük maliyetli, tarihi dokuda en az etkiye neden olacak nem bariyerlerinden faydalanılabilir. Piyasada düşük hidrolik iletkenliğe sahip olarak satılan bentonit kil-kum karışımı ve buzul tortusu içeren farklı bariyerler tarihi bir bina kapsamında değerlendirilmiş ve test edilen toprak numunelerinin zeminden nem girişi ve buna bağlı gerçekleşen hasarı önlemede etkili olabileceği görülmüştür. Bahsi geçen kil karışımları birçok koruma projesinde uygulanmış ve laboratuvarda test edilmiştir [6].

Neme maruz kalmış tarihi binalardan nemin uzaklaştırılmasında kireç harcının içine katılan odun külü de etkili olabilmektedir [7]. Yapılan deneysel bir çalışmada kireç harcına %20 ila %40 oranında katılan odun külünün harç üzerinde puzolanik aktivite göstererek kılcal doygunlukta odun külü içermeyen harçlara göre daha fazla suyu emdikleri ortaya çıkmıştır (Tablo 1). Bunun nedeninin harç içeriğindeki gözenek sayısının artması olduğu bilinmektedir. Kullanılan biyokütle özelliğindeki odun külü, nemli ortamlarda bulunan yığma duvarların derzlerinin onarılmasında, belirtilen ideal oranlarda olmak kaydıyla, kullanılabilir. Bu oranların üzerine çıkılması durumunda ise kuruma aşamasında harçta büzülmeler gözlemlenmiştir [7].

Tablo 1. Nem sorunu ve olası çözümler

| | |
|---|---|
| *Sorunlar* | Nemin bina strüktürüne zarar vermesi, dayanımı düşürmesi, kullanıcı konforsuzluğuna neden olması ve yalıtımı zedelemesi sonucunda binanın enerji tüketiminde artışa neden olması. |
| *Olası çözümler ve yapıda kullanım alanları* | Yığma duvarların toprakla temas eden yüzeyinde kil bariyerlerinin [6] ve kireç harcında odun külünün kullanımı [7].<br>  <br>Yukarıdaki görsellerde yığma duvara uygulanan kil bariyerin inşa edilme aşamaları (solda) ve farklı oranlarda odun külü içeren kireç harcındaki bozunmalar (sağda) gösterilmektedir. |
| *İyileştirilen özellikler* | Tarihi dokuya minimum müdahale, malzeme gözeneklerinin kapatılarak nem girişinin ve hasarın önüne geçilmesi. |

**Düşük Enerji Performansı**

Tarihi yapıların enerji tüketimlerinin azaltılmasında genellikle içten uygulanan yalıtım katmanı ve bunun yeterli gelmemesi durumunda aktif olarak enerji tüketen cihazlarla iyileştirmelere gidilir. Yakın zamanda bu yöntemlere ek olarak etkin şekilde enerji verimliliği sağlayacak yenilikçi çözüm ve malzemelerin arayışına girişilmiştir.

Bu çalışmalardan biri İtalya'da gerçekleştirilen soğuk renkli cephe malzemelerinin kullanımıdır. Ilık veya sıcak iklimlere sahip bölgelerde termal konforun sağlanması ve soğutma yükünün düşürülmesi adına genellikle açık renkli elemanlar tercih edilmektedir. Ancak tarihi çevrelere hâkim olan renkler gri veya kırmızı tonlarındadır. Bu durum dikkate alınarak seçilen tarihi bir yapı üzerinden yürütülen çalışmada, enerji performansının iyileştirilmesi adına tarihi binaların dış görünüşüne etki etmeden yenilikçi, soğuk renkli, çimento bazlı malzeme kullanımı önerilmiştir. Laboratuvarda elde edilen çıktılar, dinamik simulasyonlarda vaka çalışması ölçeğinde kullanılmıştır. Harçlara renk pigmentleri eklenerek oluşturulan bu yeni cephelerin yüzey sıcaklıkları geleneksel cephelerle kıyaslandığında 8°C düşüş ve soğutmadan kaynaklı enerji tüketiminde %3 oranında azalma sağlandığı görülmüştür [8].

Gerilebilir membranlar, maliyet etkin ve sürdürülebilir bir şekilde binaların strüktürel performanslarını iyileştirmek için yaygın olarak tarihi binalarda uygulanmaktadır. Ancak bu tür membranların iç mekân konforuna ve enerji tüketimine olan etkilerini ortaya koymak önemlidir. Bu amaçla İtalya'da yer alan ve orta avluya sahip tarihi bir yapının orta avlusunun plastik bir polimer türü olan ETFE ile kaplanmasının binanın enerji performansına olan etkisi araştırılmıştır (Tablo 2). Enerji simülasyonlarının sonucunda, uygulanan membran sayesinde özellikle kış aylarında en yüksek enerji kazanımının sağlandığı görülmüştür. Yıllık karbon salımlarında sıcak aylarda %6, soğuk aylarda %10 düşüş gözlemlenmiştir [9].

Tablo 2. Enerji performansının iyileştirilmesine yönelik olası çözümler

| | |
|---|---|
| *Sorunlar* | Enerji performansında düşüş, iklim değişikliği, geleneksel iyileştirme hamlelerinin yetersiz olması. |
| *Olası çözümler ve yapıda kullanım alanları* | Yapı kabuğunda soğuk renkli malzemeler [8] ve avlu üzerinde ETFE membran kullanımı [9].<br>  <br>Yukarıdaki görsellerde soğuk renk pigmenti eklenen harç karışımı (solda) ve tarihi bina avlusuna gerilen üst örtünün detayları (sağda) gösterilmektedir. |

| | |
|---|---|
| *İyileştirilen özellikler* | Termal konfor, enerji performansı, maliyet etkinliği, strüktürel performans, çevresel etkiler. |

**Termal Konfor Eksikliği**

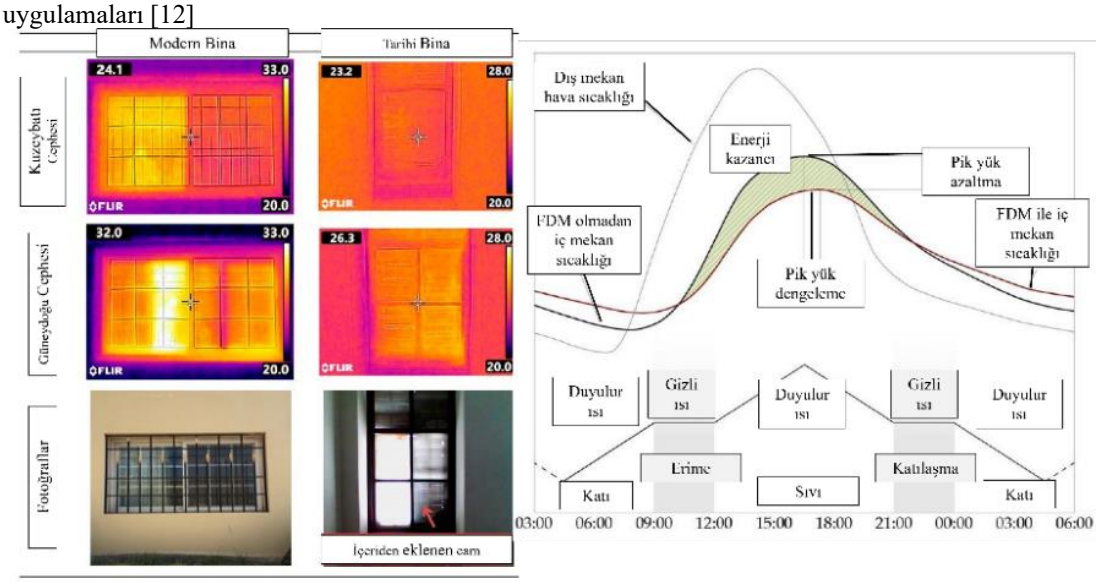
Küresel çapta gerçekleşen iklim değişikliği tarihi yapıların iç mekân sıcaklıkları ve dolayısıyla kullanıcıların termal konforu üzerinde olumsuz etkilere neden olabilmektedir. Bu nedenle mevcut binalar daha fazla aktif sistemlere bağlı kalmakta ve yeni binalara göre bu tür yapıların enerji tüketimleri artış göstermektedir. Neticede daha fazla karbon salımı gerçekleşmekte ve küresel ısınma artış göstererek iklim değişiklikleri de bundan payına düşeni almaktadır. Bu kısır döngüden çıkabilmek adına termal konforun sağlanması, konunun kilit noktasını teşkil etmektedir [10].

Termal konforun sağlanmasında aktif sistemlerin büyük rol üstlendikleri ve kullanımları süresince harcanan enerjinin tarihi binaların mevcut enerji tüketiminden daha az olduğu bilinse de [10], aktif sistemlerden önce pasif tasarım ilkeleri bağlamında malzemelerin sağladıkları avantajların irdelenmesi mimari sürdürülebilirliğin sağlanması açısından esastır.

Bu pasif ilkelerden biri olan termal kütlelerin kullanımının ısıl konforun sağlanmasında etkili olduğu bilinmektedir. Saha araştırmasına dayalı bir çalışmada doğru yönelim, cam seçimi, gölgelendirme elemanları ve havalandırma ile bu etkinin daha da güçlendirilebildiği görülmüştür. Özellikle sıcak iklimlerde konfor şartlarının sağlanmasında cam türü seçiminin termal kütleden daha etkili olduğu bilinmektedir. Tüm bu bahsi geçen yapı malzemelerinin ekstrem hava koşullarında ve gerekli görüldüğü durumda aktif sistemlerle desteklenmesi, ısıl konfor ve enerji performansı açısından etkili olacaktır [11].

Diğer yandan tarihi binaların çoğunluğunda halihazırda termal kütle kullanıldığı bilinmektedir. Ancak termal kütlenin yeterli olmadığı durumlarda restorasyon aşamasında faz değiştiren malzeme (FDM) içeren harçların kullanımı, binaların termal ataletini iyileştirebilir ve bu müdahale aynı zamanda tarihi binanın dış görünüşüne etki etmez (Tablo 3). Kireç harcına granül parafin FDM'nin eklendiği deneysel ve sayısal simülasyonlara dayalı bir çalışmada, ağırlıkça %10 FDM harcı içeren numunenin referans numuneye göre enerji kullanımında %9-18 düşüş ve malzemenin termal iletkenliğinde %22,5 azalma sağladığı gözlemlenmiştir [12].

Tablo 3. Termal konforun iyileştirilmesine yönelik olası çözümler

| | |
|---|---|
| *Sorunlar* | Termal konforsuzluk ve buna dayalı enerji tüketiminde gerçekleşen artış, küresel ısınma, karbon salımlarındaki artış. |
| *Olası çözümler ve yapıda kullanım alanları* | Yapı kabuğunda termal kütle kullanımı, uygun cam seçimi, gölgelendirme elemanları [11] ve FDM uygulamaları [12]   Yukarıdaki görsellerde 2020 yılı ilkbahar sezonunda saat 10:00-14:00 aralığında elde edilen tarihi ve modern binalara ait termal kamera görüntüleri (solda) ve FDM kullanımından kaynaklanan enerji kazanımı (sağda) gösterilmektedir. |
| *İyileştirilen özellikler* | Termal konfor, enerji performansı, maliyet etkinliği, aktif sistemlere olan bağımlılığın azaltılması, çevresel etkiler. |

**Olumsuz Çevresel Etkiler**

Tarihi yapıların korunmasında kullanılan her yeni malzeme yeni ham madde ihtiyacını da beraberinde getirerek çevre

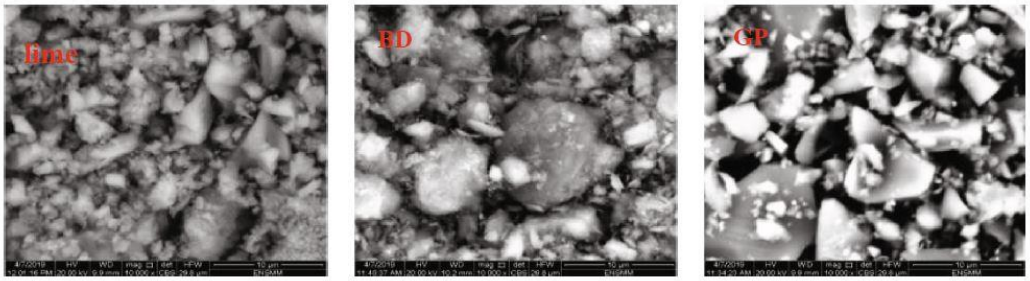
üzerinde bir yük oluşturur. Bunun çözümlerinden biri de atık malzeme kullanımına yönelmektir. Bu sayede yapı malzemelerinin mekanik ve fiziksel özelliklerinin geliştirilebilmesinin yanı sıra çevresel etkilerinin düşürülebilmesi de mümkün olabilmektedir.

Kuzey Cezayir'de gerçekleştirilen ve vaka çalışmasına dayalı olarak laboratuvarda gerçekleştirilen deneysel bir çalışmada kireç harçlarına eklenen %30 oranındaki seramik atığı ve cam şişelerden elde edilen cam tozu sayesinde puzolanik aktivitenin görüldüğü ve özellikle basınç dayanımında artış sağlandığı tespit edilmiştir. Sınanan numuneler arasında %30 oranında cam tozu içeren harçta, en düşük açık gözenekliliğe sahip olması nedeniyle suya karşı en yüksek direncin sağlandığı görülmüştür (Tablo 4). İyileştirilen özelliklerin yanı sıra ham madde ihtiyacının kullanılan atık oranınca düşürülmesi çevresel açıdan kayda değerdir [13].

Meksika'da saha araştırması ve sayısal hesaplamalara dayalı bir çalışmada atık yönetiminin önemine değinilmiştir. Koruma projelerinde inşaat atıklarının geri dönüştürülecek, yeniden kullanılacak ve atık sahasına gönderilecek yapı malzemeleri şeklinde tasniflenmesinin Toolkit gibi araçlarla basitleştirilebildiği ortaya çıktı. Bu yaklaşım kaynak verimliliğinin sağlanması yoluyla çevresel etkileri düşürebildiği gibi restorasyon maliyetlerinin azaltılmasında da önemli katkılar sağlanmıştır [14].

Ayrıca tarihi binaların kullanım aşamasında gösterdiği çevresel etkilerin yüksek olduğu düşünüldüğünde, uyarlanabilir yeniden kullanım süresinde yenilikçi ve enerji performansı yüksek yapı malzemelerinin kullanımı çevresel etkilerin düşürülmesinde etkili olabilmektedir [15]. Ancak yapı malzemelerinin üretim aşamalarında harcanan gömülü etki ile kullanım aşamasındaki operasyonel etkilerin birlikte ele alınması bütüncül bir yaklaşım için daha uygundur [16].

Tablo 4. Çevresel etkilerin azaltılmasına yönelik olası çözümler

| | |
|---|---|
| *Sorunlar* | Artan karbon salımı ve ham madde ihtiyacı. |
| *Olası çözümler ve yapıda kullanım alanları* | Harçlarda atık taş, cam ve tuğla tozu kullanımı [13] ve yapı malzemelerinin tasniflenmesi yöntemiyle atık yönetimi [14]   Yukarıdaki görselde harçlara ait SEM (Taramalı Elektron Mikroskobu) görüntüleri yer almaktadır. |
| *İyileştirilen özellikler* | Malzemelerin fiziksel ve mekanik özelliklerinin iyileştirilmesi, çevresel etkilerin düşürülmesi. |

**Düşük İç Mekan Hava Kalitesi**

Tarihi binalarda kullanılan yeni malzemeler, açığa çıkardıkları uçucu organik bileşikler nedeniyle iç mekanlarda çeşitli sağlık sorunlarını da beraberinde getirebilir. Bu nedenle tercih edilen yeni malzemelerin formaldehit gibi kansere yol açan madde içeriklerinin önceden tespit edilmesi, kullanıcı sağlığı açısından son derece önemlidir. İç mekân hava kalitesinin düşük olduğu ortamlarda hasta bina sendromu görülebilmektedir. Bu sendrom, alerji, astım, öksürük, yorgunluk, baş ağrısı, göz ve burunda tahriş gibi rahatsızlarla kendini belli etmektedir [17, 18].

Yeşil yapı malzemelerinin kullanımı ile iç mekanlarda istenen hava kalitesinin sağlanabilmesi mümkündür. Bu malzemeler, ekolojik, sağlıklı, geri dönüştürülebilen veya yüksek performansa sahip özellikte olup yaşam döngüleri boyunca çevreye ve insan sağlığına etkileri en aza indirgenmiş olan yapı malzemeleridir [19].

Tayvan'da yapılan ve yasal düzenlemeleri inceleyen bir araştırmada yasalarla güvence altına alınan iç mekan hava kalitesinin standartlarına ve yeşil malzeme özelliklerine değinilmiştir. 2000'li yılların başından beri sağlanan farkındalık ve denetimde sağlanan etkinlik nedeniyle piyasadaki ürünlerin %75'inin yeşil yapı malzemelerinden oluştuğu bildirilmiştir. Binanın iç yüzey alanının en az %45'i ve dış mekana bakan yüzey alanının en az %10'unun yeşil yapı malzemelerinden oluşmasının gerekliliği standartlarla belirtilmiştir. Bina Teknik Yasası'nda yer alan geri dönüştürülmüş plastik, kauçuk, tuğla ve ahşabın yanı sıra EPA tarafından belirlenen zehirli malzemeleri içermeyen ve Montreal Protokolü'ne uygun yalıtım ürünleri, su bazlı boya ve kaplamalar ve diğer sertifikalı malzemeler yeşil yapı malzemelerini oluşturur (Tablo 5). Bu tür malzemelerin çevreye ve insan sağlığına karşı zararsız olması ve ulusal standartlara uygun olması zorunludur [20].

Diğer yandan Steinemann vd. [21], yeşil binaların iç mekan hava kalitesi ile doğrudan bir ilişki kurabilmeleri için yapı malzemelerin emisyonlarının araştırılmasının yanı sıra kullanıcı beklenti ve görüşlerinin alınmasının gerekliliğine değinmişlerdir.

Tablo 5. İç mekân hava kalitesinin iyileştirilmesine yönelik olası çözümler

<table>
<tr><td>Sorunlar</td><td>Düşük iç mekân hava kalitesi, hasta bina sendromu, kanserojen madde içerikleri.</td></tr>
<tr><td>Olası çözümler ve yapıda kullanım alanları</td><td>Yeşil yapı malzemelerinin kullanımı [20]
<table>
<tr><th rowspan="2">İç ortamdaki hava kirleticileri</th><th colspan="2">Standard</th></tr>
<tr><th>Konsantrasyon</th><th>Test süresi</th></tr>
<tr><td>Karbondioksit ($CO_2$)</td><td>1000 ppm</td><td>8 sa</td></tr>
<tr><td>Karbonmonoksit (CO)</td><td>9 ppm</td><td>8 sa</td></tr>
<tr><td>Formaldehit (HCHO)</td><td>0,06 ppm</td><td>1 sa</td></tr>
<tr><td>T. uçucu organik bileşikler</td><td>0,56 ppm</td><td>1 sa</td></tr>
<tr><td>Bakteri</td><td>1500 CFU/m³</td><td>Tavan değer</td></tr>
<tr><td>Mantar</td><td>1000 CFU/m³</td><td>Tavan değer</td></tr>
<tr><td>Kaba partiküller (PM10)</td><td>75 µg/m³</td><td>24 sa</td></tr>
<tr><td>İnce partiküller (PM2.5)</td><td>35 µg/m³</td><td>24 sa</td></tr>
<tr><td>Ozon ($O_3$)</td><td>0,06 ppm</td><td>8 sa</td></tr>
</table>
CFU: Koloni oluşturabilen birim, ppm: milyondaki partikül miktarı<br>Yukarıdaki grafikte çeşitli iç mekan hava kirleticilerine ait sınır değerler verilmiştir.</td></tr>
<tr><td>İyileştirilen özellikler</td><td>Döngüsel ekonomiye katkı, insan sağlığının ve doğal çevrenin korunması, malzemelerde standardizasyon.</td></tr>
</table>

## Sonuç ve Değerlendirme

Tarihi yapılar kültürel ve evrensel mirası oluşturdukları için geleceğe aktarılmaları son derece mühimdir. Bu hususta bu tür yapıların zaman içerisinde maruz kaldıkları sorunların giderilmesine yönelik çağdaş önlem ve metotlara ihtiyaç duyulmaktadır. Bu çalışma tarihi dokuya, bina kullanıcılarına ve doğal çevreye olumsuz etkileri olan beş farklı sorunun yapı malzemeleri üzerinden çözümlenmesine ve/veya etkilerinin azaltılmasına odaklanmaktadır. Sorunun öncelikle malzeme ölçeğinde ele alınması, tarihi binaların aktif sistemlere olan bağımlılığını azaltmak ve küresel iklim değişikliğine katkı sunacak yeni sorunların önüne geçilebilmesi adına önemlidir. Çalışma kapsamında okuyuculara sunulan öneriler şu şekilde özetlenebilir:

- Nem sorununa karşın doğal bir malzeme olan kil bariyerlerinin yığma duvarların önünde toprak seti olarak kullanımı önerilmiştir. Böylelikle suyun yapı kabuğu ile olan teması en aza indirilmiş; yapısal unsurlara ve kullanıcı konforuna zarar verebilecek nemin binadan uzaklaştırılması sağlanmıştır. Ayrıca odun külünün kireç harcına %20-40 oranında eklenmesi ile harçların su emme özellikleri iyileştirilebilir.
- Tarihi yapıların kabuğunda soğuk renkli malzeme kullanımı ile yüzey sıcaklıklarında 8ºC düşüş ve yazın soğutma için harcanan enerjide %3 azalma sağlanabilmektedir. Ayrıca avluların membran ile kapatılması, yıllık karbon salımını soğutmadan kaynaklı harcanan enerji üzerinden %6; ısıtmadan kaynaklanan enerji üzerinden ise %10 düşürebilmektedir.
- Kullanıcı konforunun sağlanması kaynak tüketimi ve çevresel etkilerin düşürülmesinde bir diğer kilit noktadır. FDM gibi yenilikçi teknolojilerin tarihi binalarda %10 oranında uygulanması enerji tüketimini %18'e kadar düşürebilmekte ve malzemenin termal iletkenliğini %22,5 oranında düşürebilmektedir.
- Yapılarda yeni malzeme kullanımı daha fazla ham madde ihtiyacı anlamına geldiğinden bunun yerine daha önceden kullanılmış malzemelere başvurulması, çevresel sürdürülebilirliğin sağlanmasında etkilidir. Yapılan çalışmalarda %30 oranında seramik ve cam atıkları içeren kireç harcının su direncinin artırıldığı ve basınç dayanımında artış sağlandığı görülmüştür.
- Yapılarda yeşil yapı malzemelerinin kullanımı, atık kullanımına teşvik etmesi, insan sağlığına olan etkileri ve malzeme onarımları açısından doğal ve tarihi çevre üzerinde olumlu etkilere sahiptir. Tayvan'da binanın iç yüzeylerinde %45 ve dış yüzeylerinde ise %10 oranında yeşil malzeme kullanım zorunluluğu bulunmaktadır.

Özetlenen çalışmaların önerdiği çözümler ve uygulama yöntemleri Tablo 6'da verilmiştir. Tüm bu önerilerin değerlendirilmesinde tarihi dokuya zarar verilmemesi, kullanıcı konfor ve sağlığının gözetilmesi ve doğal çevreye yönelik tahribatın öne geçilmesi elzemdir. Sonraki çalışmalarda yapılı çevrede karşılaşılan çeşitli sorunlara dair yenilikçi teknoloji ve sistemler sürdürülebilir mimari çerçevesinde kapsamlı olarak ele alınabilir.

Tablo 6. Tarihi bina sorunlarına yapı malzemesi ölçeğinde öneride bulunan çalışmalar

| Yapı sorunu | Malzeme ölçeğindeki olası çözümler | Araştırma metodu | Kaynak |
|---|---|---|---|
| Rutubet | Kil bariyeri | Saha uygulamaları<br>Laboratuvar testleri | [6] |
| | Odun külü | Laboratuvar testleri | [7] |
| Enerji performansı | Soğuk renkli malzeme | Laboratuvar testleri<br>Dinamik simülasyon | [8] |
| | Membran örtü | Dinamik simülasyon | [9] |
| Termal konfor | Termal kütle | Saha araştırmaları | [11] |
| | FDM uygulamaları | Laboratuvar testleri<br>Dinamik simülasyon | [12] |
| Çevresel etki | Atık malzeme | Laboratuvar testleri | [13] |
| | Malzemelerin sınıflandırılması | Saha araştırması<br>Sayısal hesaplamalar | [14] |
| İç mekân hava kalitesi | Yeşil yapı malzemesi | Yasal düzenlemelerin incelenmesi | [20] |

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# Mimar Sinan'ın Anıtsal Camilerinde Mekânsal Bütünlük: Merkezi Plan Şemasının Analizi

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## ÖZ

Türk mimarlığında anıtsal camilerin yapımı, Mimar Sinan gibi bir dahi ile özel bir dönem yaşamıştır. İstanbul'un fethiyle imparatorluk mülkü haline gelen ve o zamana dek yapılmış en muazzam eserlerden biri olan Ayasofya'nın örtü sistemi, Sinan dönemi öncesinde bazı yapılar üzerinde denenmiş olsa da Sinan'ın uzun kariyeri ve özgün tarzıyla devletin ekonomik gücü birleştiğinde, yaklaşık 50 yıllık bir süreçte Türk mimarisinde anıtsal cami yapıları doruk noktasına ulaşmıştır. Sinan'ın tüm çabaları, mekân bütünlüğünü en üst seviyeye çıkarma amacına dayanmıştır. Bu hedef, statik ve estetik sınırlamalarla şekillenmiş olmasına rağmen, en net şekilde Şehzade Mehmet, Süleymaniye ve Selimiye camileri gibi üç anıtsal eserde görünür hale gelmiştir. Bu üç eser, Sinan'ın neredeyse yarım yüzyıl süren arayışlarının somut bir yansımasıdır. Sinan, sadece ideal bir mekân arayışına odaklanmakla kalmamış, aynı zamanda bu hedefe ulaşmasını en çok engelleyen örtü sistemini de mükemmel bir şekilde çözmüştür. Bu örneklerle, Sinan hâlâ mimarlık sanatının zirvesini temsil etmektedir. Bu çalışma, Sinan'ın mekân bütünlüğüne odaklı arayışlarının ve bu alandaki üstün başarısının en önemli üç örnek üzerinden incelenmesini amaçlamaktadır.

# Spatial Integrity in Mimar Sinan's Monumental Mosques: Analysis of the Central Plan Scheme

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## ABSTRACT

The construction of monumental mosques in Turkish architecture experienced a special period with a genius like Mimar Sinan. Although the covering system of the Hagia Sophia, which became an imperial property with the conquest of Istanbul and is one of the most monumental works ever built, had been tried on some buildings before the Sinan period, the combination of Sinan's long career and unique style with the economic power of the state led to the culmination of monumental mosque structures in Turkish architecture in a period of about 50 years. All of Sinan's efforts were based on the goal of maximizing the integrity of space. This goal, although shaped by static and aesthetic limitations, is most clearly visible in three monumental works: the Şehzade Mehmet, Süleymaniye and Selimiye mosques. These three works are a concrete reflection of Sinan's almost half-century-long search. Sinan not only focused on the search for an ideal space, but also perfectly solved the covering system that most prevented him from achieving this goal. With these examples, Sinan still represents the pinnacle of the art of architecture. This study aims to analyze Sinan's search for spatial integrity and his outstanding success in this field through three of the most important examples.

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## 1. Giriş

Osmanlı İmparatorluğu'nun muhteşem mirası içinde, Mimar Sinan'ın eşsiz mimari eserleri, dönemin estetik ve mühendislik harikaları arasında öne çıkar. Sinan'ın ustalığı, imparatorluğun manevi ve fiziksel kalbinde yer alan anıtsal camilerinde en görkemli şekilde sergilenir. Camilerde merkezi plan, caminin mimari düzenlemesinde ibadet alanının merkezinde genellikle büyük bir kubbenin yer aldığı, ibadet alanının bu kubbenin altına toplandığı bir plan tipini ifade eder. Bu tür plan düzeni, caminin iç mekânında bir merkezîlik ve bütünlük hissi oluşturmayı amaçlar. Merkezi plan tasarımı, Osmanlı cami mimarisinde özellikle 15. ve 16. yüzyılda zirveye ulaşmış ve Sinan'ın eserlerindeki iç mekânların düzenlenmesinde benzersiz bir rol oynamıştır. Anıtsal camilerin iç mekânlarında oluşan deneyimi, mekânın işlevselliği ve estetik değeri üzerinden anlamlandırmayı ve Sinan'ın bu yapıları tasarlarken kullandığı merkezi plan düzenlemelerinin bu mekânlara olan etkisi detaylı olarak incelendiğinde, Sinan'ın arayışının ipuçlarını bulmak mümkün olabilir.

Türklerin Anadolu'ya göçleri, Sanat ve mimari açısından zengin ve çeşitli bir kültürel mozaiğin oluşmasına neden olmuştur. Göçebe yaşam tarzından yerleşik düzene geçiş sürecinde, Türklerin sanatsal ifade biçimleri de gelişmiş ve çeşitlenmiştir. Bu gelişim, Selçuk Beylikleri ve ardından Osmanlı İmparatorluğu dönemlerinde önemli mimari yapılar ve sanat eserleri ile somut bir şekilde kendini göstermiştir. Selçuklu dönemindeki yapılar, özellikle Anadolu'nun coğrafi yapısına ve kültürel mirasına uygun olarak, o dönemin mimari tarzının örneklerini yansıtmıştır. Ancak, Türk mimarisinin zirvesi ve belki de en etkileyici dönüm noktası, 16. yüzyılda Mimar Sinan'ın eserleriyle gerçekleşmiştir. Osmanlı İmparatorluğu'nun en büyük mimarlarından biri, hatta birincisi olarak kabul edilen Mimar Sinan, kendinden sonrası için döneminin ötesinde bir miras bırakmıştır. Sinan, kendine özgü mimari tarzıyla yapıtlarında estetik, mühendislik ve fonksiyonelliği ustalıkla birleştirmiştir. Anıtsal camileri, köprüleri, sarayları ve diğer yapıları hem teknik açıdan çarpıcı hem de sanatsal anlamda muazzam örnekler sunar. Onun eserlerinde Türk kültürünün 16. yüzyıldaki bütün içeriğini bulmak mümkündür (Kuban, 1968).

Sinan'ın eserleri, Türk mimarisinin gelişiminde ve zenginleşmesinde dönüm noktalarından birini temsil ederken, aynı zamanda Anadolu'nun kültürel mirasının taşıyıcısı olarak da önemli bir role sahiptir. Sinan, imparatorluğun kültürel mimarisini kendi gözlem ve becerileriyle harmanlamış, özellikle de Ayasofya gibi çağları aşan bir mimari örnek, şüphesiz diğer mimarlara olduğu gibi ona da ilham vermiştir. Ancak Bizans'ın Osmanlının eline geçen mimari kültür mirası Sinan'ın sanatını yeterince tanımayan ya da tanımak istemeyen batılı mimarlık ve sanat tarihçileri tarafından uzun süre onun sanatının etki hatta taklit ile geliştiği şeklinde değerlendirilmiştir. Avrupalı ve Amerikalı arkeologlar ile sanat tarihçileri, Sinan'ın mimari ustalığının, Türk sanatının zirvesini temsil ettiğini çok sonra anlamış ve Türk sanatının evrensel önemini ve etkisini kabul etmek durumunda kalmışlardır. Sinan'ın yapıtları, uluslararası düzeyde sanat ve mimarlık açısından önemli bir referans noktası oluşturmuş, bu da Türk sanatının evrensel çapta tanınmasına ve değer görmesine katkıda bulunmuştur.

Sinan'ın inşa ettiği yüzlerce yapı, sadece mimari açıdan değil, aynı zamanda estetik zenginlikleri, teknik ustalığı ve işlevsel anlayışıyla da dikkat çeker. Bu yapılar, döneminin mimari anlayışını en üst düzeyde

temsil etmekte olup, olağanüstü bir estetik duyarlılıkla şekillendirilmiştir. Sinan'ın eserleri, çeşitli işlevleri olan dini yapılar, köprüler, hamamlar, saraylar ve askeri yapılar gibi geniş bir yelpazede kendini gösterir. Estetik açıdan, yapılarında kullanılan süslemeler, kubbe tasarımları ve detaylar, döneminin ötesinde zamanın testini geçmiş bir estetik anlayışın izlerini taşır. Bu estetik zenginlik, Sinan'ın yapıtlarını sadece yapısal açıdan değil, aynı zamanda görsel anlamda da göz alıcı kılar. Ancak onun sanat yaşamındaki en büyük arzusu, cemaati gök kubbe gibi büyük bir kubbe altında toplayan, mekân birliği tam, aydınlık ve ferah bir cami inşa etmek olmuştur (Benian, 2011). Sinan'ın cami inşası, aldığı mimari ve kültürel mirası dikkate alarak, merkezi planı kullanarak yüzlerce ton ağırlığındaki kubbeyi hem işlevsel hem de estetik bir biçimde zemine taşımayı amaçlayan bir tasarım sürecidir (Akyürek ve Kahraman, 2021).

Sinan'ın sanatının inceliklerini hamamlardan köprülere, su yollarından küçük ölçekli cami ve mescitlere kadar inşa ettiği her yapıda görmek mümkündür. Ancak söz konusu olan anıtsal yapılarsa, mekânın şekillenmesine etki eden unsurlar da farklılaşır. Örneğin mekân örtüden bağımsız düşünülemezken, yapının statiği ve mekân özellikleri de örtü ve destekleyici elemanları tarafından kısıtlanır. Özellikle merkezi planlama ile inşa edilen yapılarda mekân içerisinde taşıyıcıların ikinci plana itilmesi ve ayrıca örtü sistemi ile bunu destekleyen geçiş ögelerinin sorunsuzca çözülmesi problem haline gelir. Bu önemli sorunları çözüşteki ustalığı Sinan'ın mimari dehasının düzeyini gösterir. Sinan'a kadar geleneksel ve içe dönük cami yapısı, Sinan'la birlikte dışarıdan algılanan bir mimari düzene, alımlı cephelere kavuşarak Osmanlı mimarisinde yeni bir estetik anlayış ortaya koyar (Kuran, 1988).

İstanbul'un fethedildiği 1453 yılı ile 1535 yılları arasındaki dönem, mimarinin sanat alanında etkin olduğu bir dönemdir. Osmanlı İmparatorluğu'nun İstanbul dönemi mimarlık faaliyetlerinde önemli etkenler genellikle camilerin çevresinde şekillenmiştir. İstanbul'da Fatih, Beyazıt ve Sultan Selim camileri gibi fetihten sonra inşa edilen yapılar, Edirne Üç Şerefeli Camii gibi öncül prensipleri ortaya koyarak ve sağlam bir mimari anlayışı ilerleterek, Mimar Sinan'ın dönemine temel oluşturmuştur (Eker, 2016). Bu çalışmada Mimar Sinan'ın inşa ettiği camiler bağlamında değerlendirmeler yapılarak, özellikle Türk mimarisinin en seçkin örnekleri kabul edilen üç anıtsal yapısı, Şehzade, Süleymaniye ve Edirne Selimiye camilerinin merkezi plan şemaları analiz edilecek ve Mimar Sinan'ın mekânsal bütünlük anlayışı, kendi uygulamalarıyla ortaya konmaya çalışılacaktır.

## 2. Malzeme ve Metot

Bu çalışmada Mimar Sinan'ın üç önemli anıtsal camisi olan Şehzade, Süleymaniye ve Selimiye camilerinin CAD çizimleri temel materyal olarak kullanılmıştır. Bu çizimlerde, camilerin mimari planları ve yapısal elemanları detaylı bir şekilde yer almaktadır. Kullanılan CAD yazılımı, planların üç boyutlu olarak modellenmesine ve ışınların gönderilmesi sürecinin görselleştirilmesine olanak tanımaktadır. Öncelikle, Mimar Sinan'ın seçilen camilerinin CAD çizimleri temin edilmiştir. Bu çizimler, yapının mimari özelliklerini ve mekânsal organizasyonunu anlamak amacıyla detaylı bir

şekilde incelenmiştir. Her bir caminin planı, mimari tasarım ve fonksiyonellik açısından analiz edilmiştir.

İkinci aşamada, camilerin planlarının farklı noktalarından gözlem yapabilen bir kişinin perspektifinden analiz gerçekleştirilmiştir. Bu aşamada, caminin iç mekânındaki önemli noktalar ve sütunların konumları belirlenmiştir. Sütunlar, gözlemciye engel olabilecek unsurlar olarak değerlendirilmiştir. Sütunların ve diğer yapısal elemanların mekânsal etkilerini gözlemlemek amacıyla, her caminin planında belirlenen noktalardan ışınlar gönderilmiştir. Bu ışınlar, mekânın görünürlüğünü belirlemek ve gizli alanları tespit etmek için kullanılmıştır. Işınların gönderilmesi süreci aşağıdaki adımlarla gerçekleştirilmiştir:

- Nokta Belirleme: İncelenen her camideki kritik gözlem noktaları belirlenmiştir.
- Işın Çizimi: Belirlenen noktalardan cami iç mekânına yönlendirilmiş ışınlar çizilmiştir.
- Veri Toplama: Işınların kesişim noktaları ve cami içindeki görünürlüğü etkileyen alanlar kaydedilmiştir.

Toplanan veriler, gözlemlenen alanların sayısal değerlerini içermekte olup, bu değerler görsel grafikler ve rakamsal tablo formatında düzenlenmiştir. Elde edilen verilerin analizi, mekânsal bütünlük açısından yapıların performansını değerlendirmek amacıyla değerlendirilmiş ve mekânsal bütünlüğü etkileyen faktörler belirlenerek yorumlanmıştır. Son olarak, elde edilen bulgular, Mimar Sinan'ın cami tasarımındaki mekânsal bütünlüğü ve merkezi plan şemasının etkilerini ortaya koymak üzere tartışılmıştır. Camilerin mimari özellikleri ile mekânsal deneyim arasındaki ilişki ele alınarak analiz edilmiştir.

## 3. Bulgular

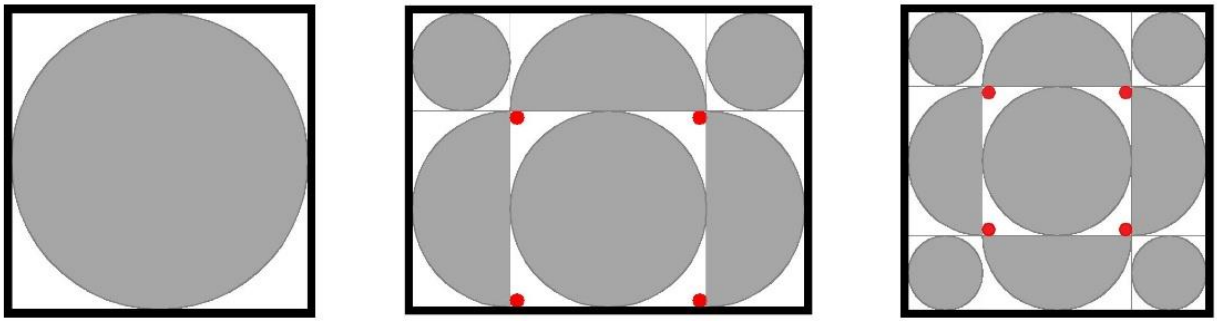
Türk sanatına yüzlerce eser vermiş olan Sinan'ın anıtsal yapıları olarak öne çıkan üç örnek, Şehzade Mehmet, Süleymaniye ve Selimiye camileridir. 1538-39 yıllarında inşa ettiği (Cansever, 2005; Doğan, 1997) ilk yapı olan Haseki Hürrem Camii ile başlayan Sinan'ın serüveni (Kuran, 1973), hemen iki yıl sonra 1540 yılında inşasına başladığı Üsküdar Mihrimah Sultan Camii ile devam etmiştir. Yedi yılda tamamlanan bu eserinin inşası devam ederken (Cansever, 2005; Orman, 2020), 1544 yılında ilk anıtsal camisi olan Şehzade Mehmet Camii'nin inşasına da başlamış (Orman, 2010) ve her iki eserini de 1548 senesinde tamamlamıştır.

Sinan'ın mekâna göre ideal örtü arayışları aslında bu üç eserle olgunluk seviyesine ulaşmıştır. Sinan'ın ilk yapılarından birisi olan Haseki Hürrem Camii, 11,30 m çapa sahip tek kubbeli ve tek mekânlı bir yapıdır (Şekil 1). Yapımından bir süre sonra yapının doğu duvarı iki ayağa taşıttırılmak suretiyle bu kısma ilave edilen mekânla özgün planında değişikliğe gidilmiştir (Kuban, 1968). Yine eş zamanlı olarak inşa edilen Halep Hüsreviye Camii de aynı örtü şemasına sahiptir (Eyice, 1999). Burada tek kubbeli cami fikri, birer bölümü yanlardan taşan beş kubbeli son cemaat yerinin arka köşelerine eklenen mekânlar, kanatlı camiler fikri ile birleştirilmiştir (Aslanapa, 1989). Sinan'ın yapı planını doğrudan

etkileyen örtü arayışları, bu yapılardan sonra inşasına başladığı eserlerde kendini çok açık olarak göstermektedir.

Türk mimarlığında harimin ana kubbeye eklenen yarım kubbelerle genişletilmesi uygulaması, İstanbul'un fethinden hemen sonra başlamıştır. Buradan, Ayasofya'nın örtü sisteminin sonradan inşa edilen eserlere doğrudan etkisinin olduğu sonucunu çıkarmak yanlış olmaz (Benian, 2011). Bu uygulamanın ilk örneği, 1470 yılında inşa edilen Eski Fatih Camii'nde karşımıza çıkmaktadır. Yapı, ana kubbenin güney tarafına eklenmiş bir yarım kubbe ile kuzey-güney yönünde genişletilmiştir. Sinan öncesi bir başka kubbe-yarım kubbe uygulaması ise 1505 yılında ibadete açılan İstanbul Beyazıt Camii'nde görülmektedir. Bu yapıda, Ayasofya'nın örtüsünden esinlenme çok bariz bir şekilde kendini göstermektedir. Beyazıt Camii'nde ana kubbe, kuzey-güney yönünde iki yarım kubbe ile; doğu-batı tarafları ise dörder küçük kubbe ile genişletilmiştir (Alioğlu, 2023).

Mimar Sinan'ın ilk yarım kubbe denemeleri, ne kendinden önce inşa edilmiş olan Eski Fatih ve Beyazıt Camii'nin ne de Ayasofya'nın kopyası ya da benzeri değildir. Sinan, Üsküdar Mihrimah Sultan ve Şehzade Mehmet camilerinde kubbe-yarım kubbe varyasyonlarının, o zamana kadar denenmemiş iki farklı uygulamasını gerçekleştirmiştir. Üsküdar Mihrimah Sultan Camii'nde kubbeye güney, doğu ve batı yönlerde eklediği üç yarım kubbe ile harimi genişleten Sinan; Şehzade Mehmet Camii'nde ise ana kubbeye dört yönden eklediği yarım kubbelerle harim mekânını genişletme yoluna gitmiştir. Burada dikkat çeken bir başka husus da hemen hemen aynı tarihlerde ibadete açılan bu iki yapının örtü sisteminin inşasının da yaklaşık olarak eş zamanlı yürütülmüş olması durumudur. Sinan inşasına daha önce başladığı Şehzade Mehmet Camii'nde ana kubbeyi dört yönde inşa ettiği dört yarım kubbe ile desteklemiştir. Yarım kubbe problemini ilk defa ele aldığı bu eserinde Mimar Sinan, Ayasofya ve Beyazıt Camii plan şemalarını aşarak dört yarım kubbeli ideal bir merkezi planlı yapı meydana getirip Rönesans mimarlarının rüyasını gerçekleştirmiştir (Aslanapa, 1988; 1989). Sinan'ın bu eseri, büyük kubbeli anıtsal camilerinin ilkidir. Sinan için, bu boyutta bir yapı gerçekleştirmek, o zamana kadarki eserleri içinde büyük bir meydan okumaydı. İlk kez böylesine büyük bir mimari kompozisyonu hayata geçirmek ve gerekli teknolojiyi öğrenmek, onun için şüphesiz büyük zorluklar barındırmaktaydı. Bu nedenle, Sinan'ın Şehzade Mehmet Camii'nde, daha sonra inşa edeceği anıtsal camileriyle karşılaştırıldığında kararlı bir yaklaşımla basit ve işlevsel bir yapı inşa ettiği görülmektedir. Sinan'ın bu ilk prestij eseri, diğer büyük camileri ile karşılaştırıldığında bazı özgün dokunuşlarına rağmen sadece işlevini yerine getiren, gösterişten uzak bir yapı olarak öne çıkmaktadır (Güngör, 1988).



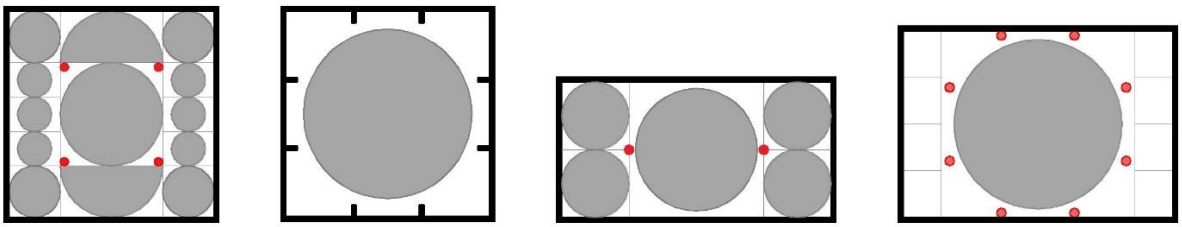
Haseki Hürrem Camii | Üsküdar Mihrimah Sultan Camii | Şehzade Mehmet Camii

**Şekil 1.** Mimar Sinan'ın ilk inşa ettiği bazı camilerinin örtü şemaları

Sinan, Şehzade Mehmet Camii'nin iç mekânında, mimar Yakup Şah'ın II. Bayezid Camii'nin şadırvan avlusunda kullandığı çapraz eksenli planlamayı benimsemiş, bu yaklaşım, kare planlı bir mekânın doğasından kaynaklanan simetri gereksinimini karşılamak amacıyla dört yarım kubbeyle simetrik bir üst yapıya dönüştürülmüştür (Çamlıbel, 1998). 1547-48 yıllarında tamamladığı (Orman, 2020) Üsküdar Mihrimah Sultan Camii'nde ise ana kubbe doğu, batı ve güney yönlerinde yapılan yarım kubbelerle desteklenmiş, güney yönde mekân içindeki iki ayağa oturan ana kubbe, kuzey tarafta ise doğrudan duvarlara gömülü ayaklara taşıtılmıştır (Şekil 1).

Mimar Sinan, Şehzade Mehmet Camii'ni tamamladıktan kısa süre sonra, 1550 yılında, yine Türk sanatı için büyük önem taşıyan Süleymaniye Camii'nin inşasına başlamıştır (Mülayim, 2010). Sinan bir yandan bu eserin inşasıyla ilgilenirken, bir yandan da eş zamanlı olarak 1551 yılında tamamladığı Hadım İbrahim Paşa (Eyice, 2000); 1555-56 yıllarında tamamladığı Beşiktaş Sinan Paşa (Gündüz, 2009) ve 1561 yılında tamamladığı Rüstem Paşa (Tokay, 2008) camilerinin inşasını eş zamanlı olarak yürütmüştür. Bu süreç içerisinde inşa edilen yapılarının tamamı, örtü tekniği açısından birbirleriyle kıyaslandıklarında büyük farklılıklar göze çarpmaktadır (Şekil 2). Sinan bu süreçte Beşiktaş Sinan Paşa Camii'nde, kendinden çok önce Edirne Üç Şerefeli Camii'nde Mimar Muslihûddin ve Şehâbettin Usta tarafından (Çiçek Akçıl, 2012) uygulanmış olan bir şemayı küçük farklılıklarla tekrar kullanmıştır. Yapıda enine gelişen mekân, merkezde tek kubbe ile örtülmüş, kubbe kuzey-güney yönlerinde duvarlara, doğu-batı yönlerinde ise ana sahın ve yan sahınları ayıran eksenin ortasına yerleştirilmiş bir ayağa taşıtılmıştır. Eş zamanlı inşa edilen Hadım İbrahim Paşa ve Rüstem Paşa camileri ise, Edirne Selimiye Camii'nde en yetkin örneğini Sinan'ın elinde bulan, sekizgen taşıyıcılı sistemin farklı iki denemesi olarak karşımıza çıkmaktadır. 1551 yılında tamamlanan Hadım İbrahim Paşa Camii'nde mekânı genişletmek ve aynı zamanda tek kubbenin baskısını karşılayabilmek için giriş duvarının iç tarafında, ileri taşan ayaklar arasında küçük bölmeler meydana getirilmiştir (Eyice, 2000). Cami, mimari yapılanmada tek kubbe ile örtülü olan kübik bir yapıdan farklı olarak, kubbenin sekiz destek üzerinde taşındığı bir sistemde örnek olarak kabul edilmektedir. Bu yapı, Türk mimarlığının evrim süreci içerisinde önemli bir yer tutmakta olup, iç mekândaki duvar payelerinin oluşturduğu destekler aracılığıyla, sekiz destekli camilerin öncüsü olarak kabul edilmektedir (Denknalbant Çobanoğlu, 2019).

Sinan'ın, Süleymaniye ile eş zamanlı inşasını yürüttüğü bir diğer yapı olan Eminönü Rüstem Paşa Camii, 1561 yılında tamamlanmıştır (Tokay, 2008). Bu eser de Hadım İbrahim Paşa Camii gibi sekiz dayanaklı cami örneklerinden olup, Sinan bu yapıda deneyimlediği plan tipinin en gelişmiş örneğini daha sonra Edirne Selimiye Camii'nde uygulamıştır (Giray Küçük, 2020).



Süleymaniye Camii | Hadım İbrahim Paşa Camii | Beşiktaş Sinan Paşa Camii | Eminönü Rüstem Paşa Camii

**Şekil 2.** Süleymaniye Camii ve eş zamanlı inşa edilen bazı camilerin örtü şemaları

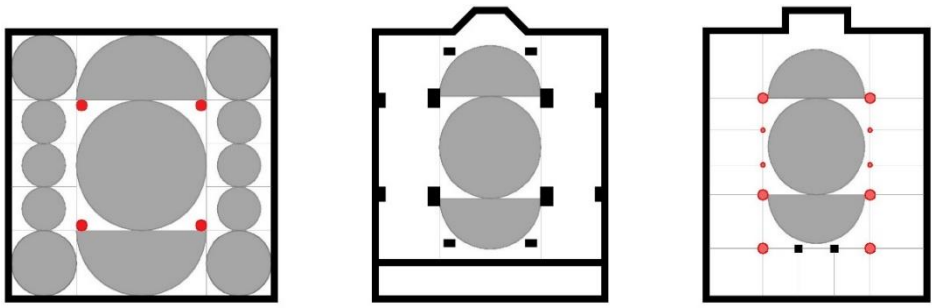
İnşası yedi yıl süren (İnan, 1968) Süleymaniye Camii, şüphesiz Mimar Sinan'ın en dikkat çekici eserlerinin başında gelir. Caminin odak noktasına yerleştiği külliye kompleksi, Sinan'ın sanat ve mimaride zirveye çıktığı bir büyük eser olarak kalmamış, Osmanlı Devleti'nin siyasi ve askeri anlamdaki ihtişamını taçlandıran bir sanat şaheseri ve bu topraklarda yükselen bir medeniyetin simgesi olarak kabul edilmiştir (Aksay, 2009). Sinan bu eserinde ilk defa iki yarım kubbeli planlamayı deneyerek, yeni eseri için en uygun oranları aramıştır (Aslanapa, 1989). Bu yapı kütle bakımından Sinan'ın inşa ettiği en büyük eseridir. Sinan, Şehzade'deki deneyimleri sayesinde büyük yapı tekniklerini tecrübe etmiş olmanın verdiği özgüvenle, Süleymaniye Camii'nin yapımına heyecanla başlamış, daha karmaşık bir düzenlemeyle, mekâna ve yapıya önemli estetik değerler katarak, üst düzeyde mesleki bir birikim ve teknoloji sergilemeyi başarmıştır. Zorlandığı noktalara rağmen çevreye uyumlu, etkileyici ve özgün bir kitle plastiğiyle Süleymaniye Camii, gelecekte Selimiye gibi önemli yapıların habercisi olmuştur (Güngör, 1988).

Bu yapıda merkezi kubbenin kuzey-güney yönünde yarım kubbelerle destekleniyor olması ve doğu-batı taraflarına eklenen yan sahınlar, eseri Ayasofya'nın üst örtüsüne benzer hale getirmiştir (Şekil 2). Bu tespit, ilk anda doğru gibi görünmekle beraber, aslında her iki yapının üst yapı sistemi arasında büyük bir fark söz konusudur. Ayasofya'nın üst yapı düzeni, alt yapısındaki tasarımın devamı niteliğindedir. Bu, kare planlı bir ana kütlenin içine yerleştirilmiş bazilika formuna uygun bir örtü sistemi anlamına gelir. Bu yapı, merkezi kubbeyi ve yan nefleri kapsayacak şekilde tasarlanmıştır. Diğer yandan, Süleymaniye Camii'nde, bütüncül bir yaklaşım sergilenmiştir. Burada, iç mekânın tamamını kapsayan ve güçlü bir şekilde tanımlayan bir üst yapı sistemi vardır. Yani, Süleymaniye'de üst yapı, yalnızca bir örtü değil, iç mekânın genel düzenini de biçimlendiren bir unsurdur (Çamlıbel, 1998).

Sinan, başta Ayasofya olmak üzere kendinden önce inşa edilmiş yapıları gerek statik ve gerekse estetik açıdan detaylıca incelemiştir. Ancak o, incelediği eserleri doğrudan taklit etmemiş, onlarda statik ve estetik açıdan gördüğü hata ve noksanları düzeltme yolunu yeğlemiş, tekrara düşmeyen sanat anlayışıyla Türk mimarlığını zirve noktasına ulaştırmıştır. Süleymaniye Camii'nin inşasını tamamladıktan sonra sarfettiği *"Direksiz kümbedin altında elhak Ayasofiyye gibi asla olubdur kubbesi andan muazzam bina*

*oldu. Hüdanın lütfu rehber"* diyerek strüktür açısından Ayasofya'dan daha muazzam bir eser meydana getirdiğini beyan etmesi, bu yapıyı detaylı olarak incelediğinin bir göstergesidir (Akmandor, 1968). İkisi de birer ibadet yapısı olmakla beraber, cami ve kilise olarak farklı mekân kurgularına ihtiyaç duyan bu yapıların zaten tam anlamıyla birbirinin kopyası olmaları imkânsızdır. İbadet yapısı olmasının yanı sıra, aynı zamanda bir tören yapısı da olan Ayasofya'nın yan nefleri, törenlerde izleyicilere tahsis edilen alan olarak değerlendirildiği için ana neften mekânsal anlamda bilerek ve isteyerek soyutlanmıştır. Süleymaniye'de ise, kubbe altında toplu namaz kılmaya daha elverişli bir plan arayan Sinan, yan sahınları merkezi sahına bağlayarak bu amaca daha iyi hizmet edecek toplu ve rahat bir mekân oluşturmuştur. Özetle Ayasofya'da üst yapı düzeni alt yapının bir devamı iken, yani karesel bir mekân içine yerleştirilen bazilikayı tamamlayan tabii örtü, Süleymaniye'de kendisi bir bütün olan iç mekânı örten bir üst yapı sistemine dönüşmüştür (Kuran, 1968).

Sinan, Süleymaniye Camii'ni tamamladıktan yaklaşık 22 yıl sonra inşa ettiği ve 1580 yılında tamamladığı Tophane Kılıç Ali Paşa Camii'nde (Eyice, 2012) Ayasofya ile büyük oranda örtüşen bir plan kullanmıştır. Son dönem eserlerinden olan bu eser, aynı plan şemasındaki Süleymaniye'den mekân anlayışı bakımından farklıdır (Şekil 3). Eser, bazı özellikleri dolayısıyla, örneğin yan mahfillerin orta mekâna kadar yanaşması bakımından Ayasofya ile büyük benzerlik ortaya koyar (Günay, 2005). Ayrıca, kuzey-güney yönünde yarım kubbenin örttüğü mekânın arkasına çapraz tonozlarla örtülü ikinci bir mekân eklenerek uzatılmış olması Ayasofya'nın narteksini hatırlattığı için, bu durum her iki yapının benzerliğini pekiştirir (Göknil, 1987).



Süleymaniye Camii Ayasofya Camii Kılıç Ali Paşa Camii

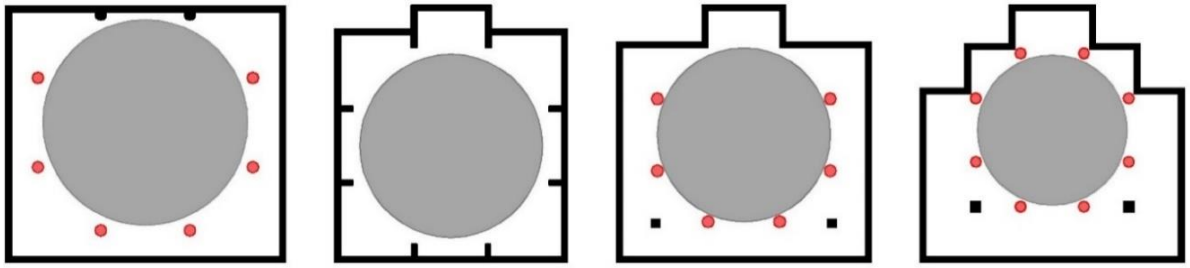
**Şekil 3.** Süleymaniye, Ayasofya ve Kılıç Ali Paşa camilerinin plan şemaları

Sinan Selimiye Camii'ni 86 yaşında iken, 1574 yılında tamamlamıştır (Mülayim ve Çobanoğlu, 2009). 1568 yılında bu eserin inşasına başladıktan bir süre sonra, başta İstanbul olmak üzere Bosna, Lüleburgaz, Hafsa, Payas ve Büyükçekmece'de Sokollu Mehmet Paşa adına birçoğunda cami yapılarının da bulunduğu külliyeler ve farklı eserler inşa etmesinin yanı sıra (Özcan, 1988), Piyale Paşa Camii (Tanman, 2007) gibi küçük ölçekli camileri de eş zamanlı olarak yapmış ve bu yapılarını Selimiye'den önce tamamlamıştır. Mimar Sinan en önemli eseri olan Selimiye'de sekizgen baldaken sistem ile sekizgen tabana oturan kubbe şeması kullanmıştır. Başta Anadolu Selçuklularının türbe yapıları olmak üzere camilerden çok önce küçük ölçekli yapılarda denenmiş olan bu sistem, Sinan tarafından bir cami yapısında ilk kez 1551 yılında tamamladığı Hadım İbrahim Paşa Camii'nde

kullanılmıştır. Yine Selimiye'den çok önce, 1553 yılında tamamladığı Rüstem Paşa Camii'nde sekizgen planlı tabana oturttuğu kubbede bu sistemi kullanmış ve iç mekânda birbirinden uzakta ve yan kısımlara yakınlaşmış dört ayak ile kubbe altı sahnının tüm mekâna olan hakimiyetinin artırılmasını amaçlamıştır (Şekil 2). Sinan bu öncü dememelerinden sonra Selimiye Camii'ni inşa etmiştir. Sinan, muhtemelen kubbe çapının genişlemesiyle ideal bir yük dağılımı için destek noktalarının artırılması gerekliliğinin farkında olduğundan, ilk olarak küçük ölçekli kubbe yapılarında testlere başlamış ve daha sonra Selimiye gibi büyük ölçekli bir projeyi gerçekleştirmiştir. Sinan'ın Selimiye'de elde ettiği iç mekân bütünlüğü Osmanlı mimarisinin ulaştığı en üst noktayı temsil eder. Mekâna hakim tek büyük kubbe, bu bütünlük duygusunu büsbütün vurgular ve eşi benzeri olmayan bir cami ortaya çıkartır (Aksay, 2009). Selimiye'de, iç mekânla dış görünüşün tamamen kaynaşmış olduğu muazzam kubbe, bütün dünyada kubbe mimarisinin gelişiminin en ileri noktası olarak görülebilir (Aslanapa, 1989). Sinan, geniş ve zengin iç mekânı arzuladığı için Selimiye Camii'nde, dikkatlice planlanmış bir yapı strüktürü kullanarak bu isteğini gerçekleştirmiştir. Ancak, büyük çaplı ana kubbe hem içeride hem de dışarıda tüm odak noktasını üzerinde toplamakta, mekânın tek başına örttüğü %37'lik bir oranına rağmen, sanki mekânın tamamının kubbenin altında gibi algılanmasını sağlamakta ve adeta tüm mekânı kaplamış gibi bir his uyandırmaktadır (Güngör, 1988).

Mimar Sinan'ın ilk cami tasarımı ile başlayan ideal mekân arayışı, Selimiye Camii'nden sonra da devam etmiştir. Sinan'ın, Selimiye gibi anıtsal bir eserde en mükemmel sonuca ulaşan sekizgen tabanlı örtü kullanımı bu yapı ile sınırlı kalmamış, daha sonra inşa ettiği küçük ölçekli yapılarında da bu sistemi en ideal çözüm olarak deneyimlemeye devam etmiştir. Örneğin Selimiye'den yaklaşık 10 yıl sonra, 1585-1586 yılları arasında inşa ettiği Fatih Çarşamba'daki Mesih Mehmed Paşa Camii'nde yine sekizgen tabana oturan örtü sistemini kullanmıştır (Şekil 4). Sinan'ın ideal mekân arayışında altıgen tabanlı örtü sistemi de önemli bir yer tutmaktadır. Türk mimarlığının erken örneklerinin ilki olarak Edirne Üç Şerefeli Camii'nde karşımıza çıkan altıgen tabanlı örtü sistemi Sinan tarafından farklı yapılarda denenmiştir. Örneğin Sinan 1555 yılında inşa ettiği Beşiktaş Sinan Paşa Camii'nde (Arslan, 2022) altıgen tabanlı örtü sistemini uygulamışken, sekizgen tabanlı örtü sistemine sahip Edirne Selimiye Camii'nden daha sonra 1583 yılında inşa ettiği Üsküdar Valide-i Atik Camii'nin (Tanman, 1991) örtü sisteminde yine altıgen tabanlı örtü sistemi kullanmıştır.

Mimar Sinan'ın sekizgen tabanlı baldaken sistemi kullandığı son yapılarından biri ise, 1577-78 yıllarında inşa ettiği Azapkapı Sokullu Mehmet Paşa Camii'dir. Bu yapıda, Sinan, Edirne Selimiye'deki gibi merkezi baldakeni oluşturan sekizgen ayaklara ek olarak, kuzeydeki iki payenin yanlarına, ana taşıyıcı işlevi gören kare kesitli ek ayaklar eklemiştir. Sinan'ın son dönemlerinde, bu kadar tecrübe ve deneyimlerinden sonra yenilikler denemeye devam ettiği birçok caminin sekizgen kaideli olması önemli bir noktadır (Erzen, 1981). Öte yandan, Sinan'ın son eseri olarak kabul edilen ve onun ölümünden sonra mimar Davud Ağa'nın tamamladığı düşünülen Karagümrük Nişancı Mehmet Paşa Camii'nde, yapının dış cephe kurulumunda klasik kompozisyonun monotonluğunu gidermek amacıyla kıble yönüne doğru yapısal bir değişiklik yapmıştır (Şekil 4).

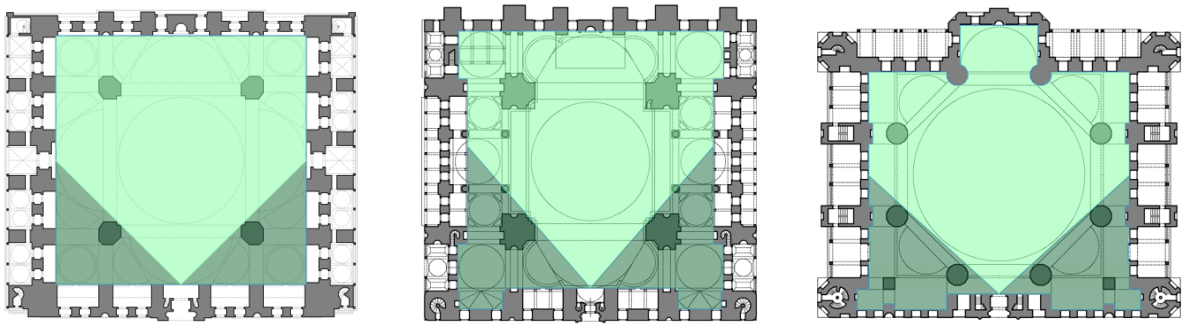


Selimiye Camii | Mehmet Mesih Paşa Camii | Azapkapı Sokullu Mehmet Paşa Camii | Nişancı Mehmet Paşa Camii

**Şekil 4.** Selimiye Camii ve sonrasında inşa edilen bazı camilerinin örtü şemaları

Mimar Sinan'ın eserlerinde mekân bütünlüğü arayışı, mimari anlayışının temel taşlarından birini oluşturur. Sinan'ın anıtsal camilerinde, mekânın bütünsel denge içinde oluşturulması, yapıların iç ve dış mekânlarının uyumlu bir şekilde birbirine bağlanması büyük önem taşır. Bu bütünlük, cami avlularının planlamasından başlayarak ana ibadet mekânının tasarımına kadar uzanır. Sinan, yapılarında genellikle kubbe ve kemerlerin uyumlu bir şekilde bir araya geldiği bir mimari dille estetik bir bütünlük oluşturmayı hedefler. Büyük kubbe ve minareler, yapıların görsel simgeleri olmakla birlikte, bu yapı elemanları iç mekânın genişliği ve ışığın akışıyla da bir araya gelerek izleyiciye derinlik ve bütünlük hissi verir. Sinan'ın anıtsal camilerindeki bu mekânsal bütünlük arayışı, Osmanlı mimarisinin estetik ve işlevsel özelliklerini birleştirerek benzersiz ve etkileyici yapıtlar ortaya çıkarmıştır.

Sinan'ın anıtsal üç camisinin mekân bütünlüğü ve bu yapıların önemli bazı noktalarından mekâna hakimiyet incelendiğinde, bu analiz hem büyük ustanın yapılarında aradığı unsurların olumlu etkilerini ortaya koyar hem de bu anıtsal camilerin neden çıraklık, kalfalık ve ustalık eserleri olarak kabul edildiğine dair ipuçları sunar. Bu değerlendirme, Sinan'ın eserlerindeki mimari titizliği, mekân kullanımının dengesi ve mekânın çeşitli noktalarından algılanan hakimiyetin önemini açıkça göstermektedir.



Şehzade Mehmet Camii | Süleymaniye Camii | Selimiye Camii

**Şekil 5.** Şehzade Mehmet, Süleymaniye ve Selimiye camilerinin girişlerinde mekân görüş açıları

Sinan'ın ilk anıtsal boyuttaki yapısı olan Şehzade Mehmet Camii, mekândaki fil ayaklarının kapladığı alanlar da dahil olmak üzere yaklaşık 1414 m²'lik bir alana sahiptir. Eserin iç mekânına girildiği anda, güneydeki iki fil ayağı mekânın görüş açısını etkileyen doğal ve kaçınılmaz engel olarak dikkati çeker. Giriş noktasına göre doğal görüş açısını sınırlayan bu iki fil ayağı, mekânın bütününün ancak yaklaşık 91°'lik açı ile algılanmasına izin verir (Şekil 5).

Sinan'ın en büyük anıtsal yapısı olan ve kalfalık eseri olarak değerlendirilen Süleymaniye Camii'nde ibadet mekânının net alanı yaklaşık 3560 m²'dir. Bu alana kubbeyi taşıyan devasa fil ayaklarının izdüşüm alanı da dahildir. Süleymaniye'de ana kubbeyi taşıyan fil ayaklarından kuzeydeki ana girişe yakın konumlanan ikisi, Şehzade'ye göre daha dar, yaklaşık 82°'lik bir açı ile mekâna bakış açısı sağlamaktadır (Şekil 5; Tablo 1).

**Tablo 1.** Mimar Sinan'ın anıtsal camilerinin giriş ve kubbe merkezinden mekân görünümlerine ait sayısal veriler

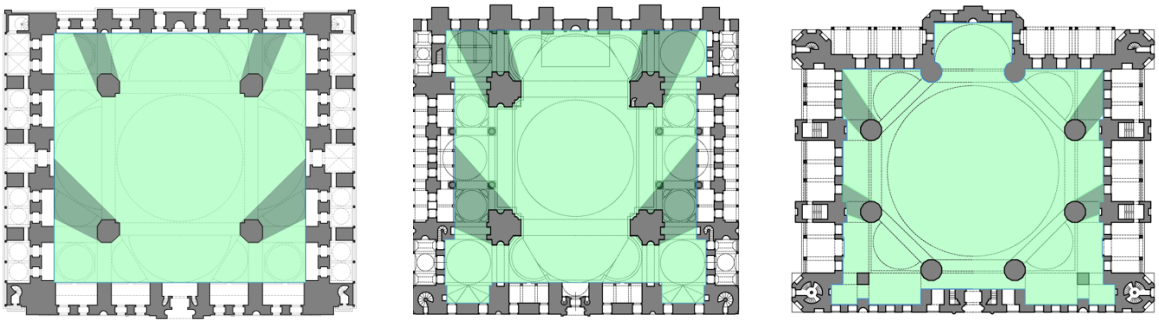
| Özellikler | Şehzade Mehmet | Süleymaniye | Selimiye |
|---|---|---|---|
| Harim mekânının toplam alanı | 1414 m² | 3560 m² | 2100 m² |
| Ana girişten mekânın görüş açısı | 91° | 82° | 96° |
| Ana girişten mekânın görünmeyen alanı | 164 m² | 596 m² | 100 m² |
| Ana girişten mekânın görünürlük oranı | %88 | %83 | %95 |
| Kubbe merkezinden mekânın görünen alanı | 1244 m² | 2705 m² | 1995 m² |
| Kubbe merkezinden mekânın görünürlük oranı | %88 | %76 | %93 |

Selimiye'de üzerine kafa yorulmuş örtü sistemi Sinan'ı sekiz sütunun taşıdığı sekizgen tabana oturan kubbe kullanmaya yönlendirmiş ve o da yaklaşık 2100 m²'lik ibadet mekânına olumlu yansımıştır. Sekizgenin geometrik özelliği olarak birbirinden uzaklaşan karşılıklı sütunlar, doğal olarak mekâna girişin sağlandığı kapıya yaklaşmış ve bu da girişteki görüş açısını 96° ile gerek Şehzade Mehmet ve gerekse Süleymaniye camilerine göre çok daha ideal bir değere çıkarmıştır (Şekil 5). Sinan, Şehzade Mehmet ve Süleymaniye camilerinde yan ve arka sahınları mekânsal kurgu içerisinde kendilerine özgü üst örtü ile birlikte bizzat kullanmışken, Selimiye de ise kubbe altı sahnının sınırları zorlayacak şekilde büyümesi ile yan ve özellikle de arka sahın tamamen ortadan kalkmıştır. Bu sebeple Selimiye'nin kuzeydeki iki sütunu ile kuzey duvarı arasında kalan boşluğu aktif ibadet alanı kurgusu dışında tutarsak, zaten çok iyi durumda olan görüş açısının 110°'nin üzerine çıkacağını değerlendirmek mümkündür (Şekil 5).

Mimari tasarım, bir mekâna giriş anında sağlanan ferahlık duygusunu ve görsel hakimiyetin önemini belirleyici bir şekilde etkiler. Mekânın giriş noktası, ziyaretçinin ilk izlenimi ve algısı açısından kritik bir role sahiptir. Bu noktada, mekânın ferah ve geniş bir hissiyat sunması, ziyaretçide hoş bir karşılama duygusu uyandırır. Ferahlık, genellikle mekânın düzeni, kullanılan renk paleti, ışıklandırma ve açık alanlar gibi unsurlarla ilişkilidir. Ayrıca, girişteki mekâna hakimiyet duygusu, ziyaretçinin mekânın genel yapısını ve düzenini anlamasına yardımcı olur. Bu hakimiyet, genellikle mekânın açık bir düzeni, odak noktaları ve görünürlüğü artıran bir tasarımı içerir. Bu unsurlar bir araya geldiğinde, ziyaretçinin giriş anında ferah bir hissiyat yaşaması ve mekânın görsel yapısını anlaması, mimari tasarımın mekâna girişteki önemini vurgular. Çalışmada bahse konu camiler bu çerçevede incelendiğinde Sinan'ın bu durum üzerine de özellikle yoğunlaşmış olduğu anlaşılır.

Şehzade Mehmet Camii'nin ana girişinde, 1414 m²'lik alanın yaklaşık 1250 m²'lik bölümü, mekâna ilk adım atıldığı anda doğrudan algılanabilir durumdadır. Bu durum, mekânın %88'lik bir kısmının girişten

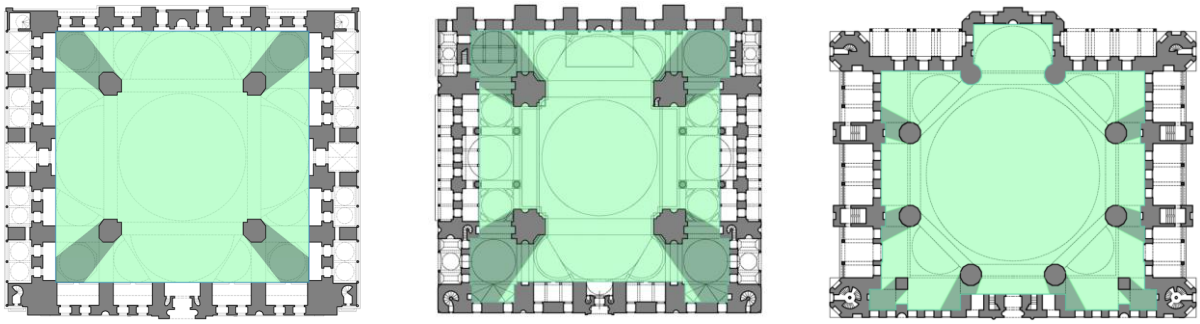
itibaren doğrudan algılanabilir olduğunu göstermektedir (Şekil 6). Bu oran, Sinan'ın ikinci anıtsal yapısı olan Süleymaniye'de %83 iken, Selimiye'de ise %95 gibi inanılmaz bir değere ulaşır.



Şehzade Mehmet Camii | Süleymaniye Camii | Selimiye Camii

**Şekil 6.** Şehzade Mehmet, Süleymaniye ve Selimiye camilerinin girişinde mekân görünürlüğü

Aynı eserler ibadet mekânının kubbe izdüşüm merkezinin tüm mekâna hakimiyeti açısından değerlendirildiğinde de ortaya ilgi çekici sonuçlar çıkmaktadır. Özellikle kubbe altı olgusu, merkezi plan şemasına sahip camilerde ayrı bir önem kazanmış ve bu kısım, tüm mekânın işlevsellik açısından en değerli ve örtü bakımından da üzerinde düşünülmesi gereken bölümü haline gelmiştir. Bu bağlamda Şehzade Mehmet Camii'nin kubbe altı sahnının merkezinden iç mekân 360°'lik bir turla gözlemlendiğinde, kubbeyi taşıyan dört adet fil ayağının, 1414 $m^2$'lik mekânın yaklaşık 170 $m^2$'lik bir kısmının doğrudan görünmesine engel teşkil ettiği anlaşılmaktadır. Başka bir ifade ile böyle bir gözlemde mekânın %88'i görünür durumda iken, %12'lik bir kısmı ise statik sorunların çözümü amacıyla ortaya çıkan zorunlu sebeplerle "kuytuda" kalmaktadır (Şekil 7). Aynı gözlem Süleymaniye Camii'nin kubbe altında yapıldığında yaklaşık 206 $m^2$'lik bir alana oturan devasa fil ayaklarının, mekânın yaklaşık 596 $m^2$'lik bir kısmının, yani toplam alanın %17'sinin görünümünü engellediği, bir başka ifadeyle ancak %83'lük kısmının doğrudan görünmesine izin verdiği anlamına gelmektedir.



Şehzade Mehmet Camii | Süleymaniye Camii | Selimiye Camii

**Şekil 7.** Şehzade Mehmet, Süleymaniye ve Selimiye camilerinin kubbe altında mekân hakimiyeti

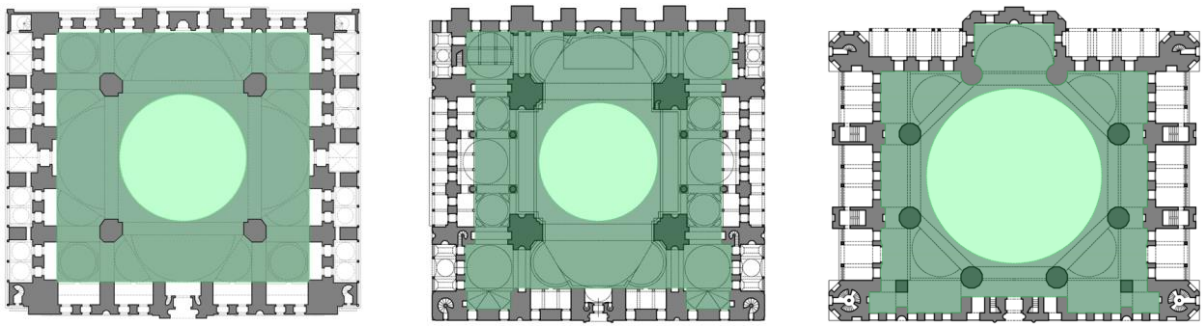
Selimiye Camii'nin kubbe altında mekân bir bütün olarak gözlemlendiğinde, yaklaşık 93 $m^2$ taban alanına sahip sekiz adet ayağın, mekânın sadece %4'ünün görünümünü engellediği, yani alanın yaklaşık %96'sının çok rahat bir şekilde görünür olduğunu ifade etmek mümkündür (Şekil 7). Bu sonuç, Selimiye Camii'ni Sinan'ın diğer anıtsal camilerinden farklı kılan en önemli özelliklerden birisidir (Tablo 2).

Örtü, bir yapıda konstrüksiyonunun çözülmesi gereken temel sorunlarının başında gelir. Çünkü sorunsuz kurgulanamayan bir örtü sistemi, işlevsellik sorunlarıyla ortaya çıkan mekânların ana sebebidir. Özellikle kombine örtü sistemlerinin kullanıldığı anıtsal yapılarda her bir örtü türünün hem kendisinin sorunsuz olarak sisteme katkı sağlaması hem de gerek teknik ve gerekse estetik anlamda birlikte kullanıldığı diğer örtülerle bir uyum ortaya koyması gerekir. Sinan'ın Şehzade'de ilk kez kullandığı dört yarım kubbe, ister istemez ön, yan ve arka sahınların ölçüsünü belirlemiş ve optimum sınırlar içerisinde ölçeklendirdiği bu eserinde, yarım kubbelerin ona sağladığı avantajı kullanarak merkezi kubbe çapını fazla zorlama ihtiyacı hissetmemiştir. Anıtsal üç eseri içinde 19 metrelik çapı ile en küçük kubbeye sahip Şehzade Mehmet Camii'nde merkezi kubbe, yaklaşık 284 $m^2$'lik izdüşümüyle ibadet alanının yaklaşık %20'lik kısmını tek başına örtmektedir (Şekil 8).

**Tablo 2.** Mimar Sinan'ın anıtsal camilerinin mekân ve ana kubbelerine ait sayısal veriler

| **Özellikler** | **Şehzade Mehmet** | **Süleymaniye** | **Selimiye** |
|---|---|---|---|
| Harim mekânının toplam alanı | 1414 m² | 3560 m² | 2100 m² |
| Ana kubbe çapı | 19,00 m | 27,50 m | 31.30 m |
| Ana kubbe izdüşüm alanı | 284 m² | 594 m² | 770 m² |
| Ana kubbenin tüm örtüye oranı | %20 | %17 | %37 |
| Kubbe taşıyıcı ayak sayısı | 4 | 4 | 8 |
| Toplam taşıyıcı taban alanı | 40 m² | 206 m² | 91 m² |
| Her bir taşıyıcıya düşen kubbe alanı | 71 m² | 148,5 m² | 96,25 m² |

Süleymaniye Camii'nin kubbesi, 27,5 metrelik çapı ile yaklaşık 590 $m^2$'lik bir izdüşüm alanına sahiptir. Sinan bu eserinde daha önce Şehzade'de deneyimlediği anıtsal kubbe tecrübesini, kendi sınırlarını zorlayarak, örttüğü alan bakımından Şehzade'ye göre iki katından daha fazla artırmıştır. Bununla beraber, Süleymaniye'de merkezi kubbenin tüm mekân üzerinde örttüğü alan, oransal olarak yaklaşık %17'de kalabilmiştir (Şekil 8).



Şehzade Mehmet Camii Süleymaniye Camii Selimiye Camii

**Şekil 8.** Şehzade Mehmet, Süleymaniye ve Selimiye camilerinin mekân örtülerinde ana kubbenin katkısı

Selimiye Camii, 31 metreyi aşan kubbe çapı ile bütün örtü sistemini tek kubbe üzerinde odak haline getirdiği bir yapı olarak Mimar Sinan'ın tasarım ve mühendislik zekâsının bir ürünüdür. Her taraftan son sınırlarına kadar genişletilmiş tek kubbe ile örtülü mekân, girer girmez insanı adeta sihirli bir

kuvvetle sürükleyip, başka bir dünyaya yönlendirmektedir (Aslanapa, 1989). Kubbe, yaklaşık 770 $m^2$'lik izdüşüm alanı ile 2100 $m^2$'lik ibadet alanının %37'sine yakın kısmını tek başına örter. Bu özelliklere sahip kubbe, Selimiye Camii'nin içte dışta tek hakim öğesidir (Şekil 8). Sinan'ın Sâi Mustafa Çelebi'ye anlattığı anıları içinde, bu kubbeden bahsederken;

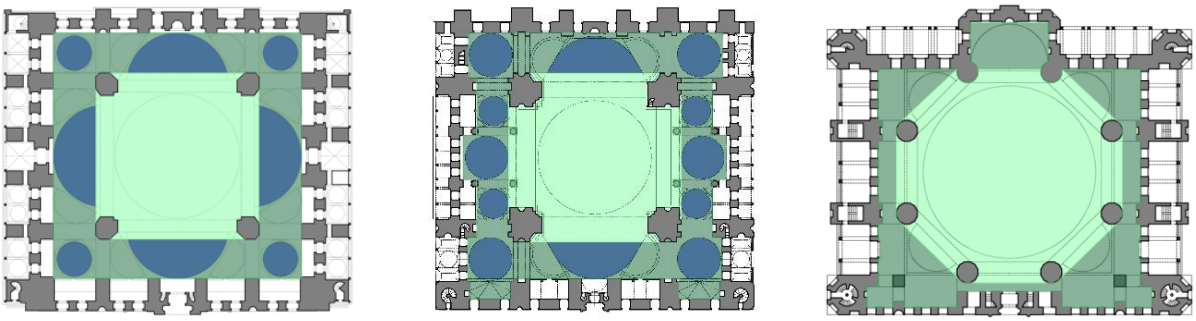
*"Ayasofya kubbesi gibi bir kubbe devleti islâmiyyede bina olunmamışdır, deyu keferei fecerenin mimar geçinenleri müslümanlara galebemiz var derler imiş. O kadar kubbe durdurmak gayet müşküldür dedikleri bu hakirin kalbinde kalmışdır. Mezbur cami binasında himmet idüb biavnillâ hitaalâla sayei Sultan Selim handa izharı kudret idüb bu kubbenin Ayasofya kubbesinden altı zira' kaddin ve dört zira' derinliğin ziyade eyledim"* (Refik, 1931)

cümleleri ile Ayasofya'nın kubbesini geçecek bir kubbe inşasının içinde ukde olarak kaldığı ve bunu kendisine amaç edindiği anlaşılmaktadır.

Mimar Sinan'ın tercih ettiği örtü sistemlerindeki farklılıklar, Selimiye Camii'nin tasarımıyla öne çıkmaktadır. Özellikle, daha önceki anıtsal camilerinde kullanmış olduğu dört ayağa oturan baldaken sistem yerine Selimiye'de merkezi kubbe için fazla sayıda ayakla taşıtılan bir örtü sistemini seçmesi, mekânın işlevi ve yapısal bütünlüğü açısından önemli bir değişimi beraberinde getirmiştir.

Mimar Sinan'ın sadece mükemmel bir tasarımcı değil, aynı zamanda olağanüstü bir yapı mühendisi olması, eserlerini dönemin diğer yapılarından önemli ölçüde farklı kılmıştır. Selimiye Camii'nde, o zamana kadar İslam dünyasında yapılmış en büyük kubbenin inşası, taşıyıcı elemanların mekân içindeki hacmini önemli ölçüde azaltmıştır. Bu durum, eseri sadece mimari açıdan değil, aynı zamanda bir mühendislik şaheseri olarak da öne çıkarmıştır. Sinan, taşıyıcı elemanların mekân içinde kapladığı alanı azaltarak geniş ve işlevsel bir merkezi mekân oluşturmayı amaçlamıştır. Ayrıca, kubbenin taşınmasında kullanılan ayaklarla beden duvarlarını kemerlerle bağlayarak, ayakların mekânın estetiğini bozmasının önüne geçmiş ve ideal bir denge elde etmiştir.

Öte yandan, Şehzade Mehmet ve Süleymaniye camilerinde kullanılan örtü çözümleri genellikle kubbe ve yarım kubbelerle sağlanmışken, Selimiye'de kullanılan sekizgen tabana oturan sistem, ekstra örtü detaylarını gerektirmemiştir. Sadece sekizgenin kareye dönüşümünde köşelerde oluşan alanların tonoz bingi ile geçilmesiyle bu sorun basit bir şekilde çözülmüştür (Şekil 9).



Şehzade Mehmet Camii | Süleymaniye Camii | Selimiye Camii

**Şekil 9.** Şehzade Mehmet, Süleymaniye ve Selimiye camilerinde baldaken taşıyıcı ve mekân ilişkisi

## 4. Tartışma

Mimar Sinan'ın anıtsal camilerinde mekânsal bütünlüğü sağlayan ve görsel hakimiyetin güçlendiği tasarım anlayışları, her bir yapının gelişiminde farklı evreler göstermektedir. Şehzade Mehmet Camii ile başlayan bu süreç, Süleymaniye ve Selimiye camilerinde belirgin şekilde gelişmiştir. Sinan'ın erken dönem yapılarında, özellikle Şehzade Mehmet Camii'nde, kubbenin taşıyıcı sisteminin mekân üzerindeki etkisi daha sınırlı kalmış, ancak zamanla daha karmaşık yapısal ve görsel çözümler geliştirilmiştir. Bu camilerde kullanılan fil ayakları gibi ağır taşıyıcı elemanlar, mekânın algılanabilirliğini sınırlayan engeller oluşturmuş, bu da Sinan'ın ileri dönemlerde daha özgür bir tasarım dili geliştirmesine zemin hazırlamıştır.

Şehzade Mehmet Camii'nin 1414 m²'lik alanı içinde, fil ayaklarının görsel engelleri, mekânın sadece %88'inin girişten itibaren doğrudan algılanabilir olmasına neden olmuştur. Bu sınırlama, Sinan'ın mekân algısını ve girişteki ferahlık hissini ön plana çıkarma çabasının ilk örneği olarak değerlendirilebilir. Öte yandan, Süleymaniye Camii'nde, kubbeyi taşıyan devasa fil ayakları mekâna bakış açısını %83'e kadar daraltırken, Selimiye Camii'nin kubbe altı tasarımı, bu oranı %96'ya çıkararak mekânda büyük bir görsel özgürlük sağlamıştır. Bu ilerleme, Sinan'ın tasarımda odak noktasını daha minimalist bir şekilde, mekânın estetiğine daha fazla önem vererek konumlandırdığını göstermektedir.

Sinan'ın, özellikle Selimiye Camii'ndeki kubbe tasarımındaki yenilikçi yaklaşımı, sadece görsel algıyı değil, aynı zamanda yapısal bütünlüğü de derinden etkilemiştir. Selimiye Camii'nin 31 metre çapındaki kubbesi hem büyüklük hem de taşıyıcı elemanların mekân içindeki hacmini azaltma açısından Sinan'ın mühendislik zekâsının bir yansımasıdır. Kubbenin yaydığı ferah his, ibadet alanındaki merkezi mekânın işlevselliğini artırmış ve ziyaretçiye derin bir manevi deneyim sunmuştur. Bu tür yapısal yenilikler, Selimiye'yi diğer anıtsal camilerden ayıran başlıca özelliklerdir.

Sinan'ın kubbe tasarımındaki evrimi, sadece yapısal bir çözüm arayışı değil, aynı zamanda dini mekânın fonksiyonel ve estetik açıdan nasıl dönüştürülebileceğine dair bir sorgulamanın sonucudur. Şehzade Mehmet Camii'ndeki daha küçük çaplı kubbe ve yarım kubbelerle sınırlı örtü, mekânın daha geleneksel bir yapısal formda kalmasına neden olmuştur. Ancak, Selimiye Camii'nde merkezi kubbenin büyük çapı ve sekizgen taban üzerine oturtulmuş örtü sistemi, mekânın görsel sınırlarını zorlayarak daha özgür bir deneyim alanı ortaya çıkarmıştır. Sinan, her camide örtü sistemini daha ileriye taşıyarak hem estetik hem de işlevsel olarak mekânı dönüştürmüştür.

Sinan'ın camilerde kullandığı örtü sistemlerinin işlevselliği, sadece yapının fiziksel gereksinimlerini karşılamakla kalmamış, aynı zamanda ibadet alanının içsel düzenini ve mekâna hakimiyet duygusunu da güçlendirmiştir. Şehzade Mehmet Camii'ndeki dört yarım kubbe kullanımı, mekânın çeşitli bölümlerine sınırlı ölçüde de olsa derinlik katarken, Selimiye Camii'ndeki tek kubbe ve sekizgen taban tasarımı, mekânın daha geniş ve birleşik bir his uyandırmasını sağlamıştır. Bu tür yapısal yenilikler, Sinan'ın mekâna dair derinlemesine düşünerek hem işlevsel hem de manevi olarak ziyaretçilerin deneyimleyeceği bir bütünsel tasarım ortaya koymasını sağlamıştır.

Sinan'ın erken dönem camilerindeki ayakların (sütunların) ve kubbenin mekân üzerindeki etkileri, onun zamanla daha minimalist, daha özgür ve daha fonksiyonel bir yapı diline geçişine olanak tanımıştır. Selimiye Camii, bu evrimin zirveye ulaştığı bir örnek olup, Sinan'ın hem bir mimar hem de mühendis olarak olağanüstü bir vizyona sahip olduğunu kanıtlamaktadır. Eserlerinde mekânın algısal genişliğini arttırmak ve yapıyı daha işlevsel hale getirmek için yaptığı yenilikler, sadece dönemin estetik ve mühendislik anlayışını değil, aynı zamanda dinsel deneyimin özünü de yeniden şekillendirmiştir.

Sinan'ın tasarım süreçlerinde gösterdiği gelişim hem mimari hem de mühendislik bakımlarından büyük bir ilerleme kaydetmiştir. Her bir cami, önceki yapının ötesinde bir teknik ve görsel başarıyı temsil eder ve Sinan'ın mimari anlayışındaki derinleşmeyi gözler önüne serer. Bu camilerdeki mekânsal bütünlük ve görsel hakimiyet, Sinan'ın sadece bir mimar olarak değil, aynı zamanda bir mühendis olarak da ne kadar ileri bir seviyeye ulaştığını gösteren örneklerdir.

**5. Sonuç**

Mimar Sinan'ın ustalığı ve dehası, Osmanlı İmparatorluğu'nun en önemli dönemlerinde inşa ettiği Şehzade Mehmet, Süleymaniye ve Selimiye camilerinde derin bir şekilde kendini göstermektedir. Bu üç muazzam eser, aynı zamanda mimari açıdan muhteşem birer şaheserdir. İncelemeler, bu camilerin mekân bütünlüğünün, estetik yapısının ve işlevselliğinin titiz bir şekilde planlanmış olduğunu ortaya koymaktadır. Bu yapılar, Mimar Sinan'ın ustalığını ve tasarım vizyonunu sergilerken, aynı zamanda Osmanlı mimarisinin zirvesini temsil etmektedir.

Mimar Sinan'ın 50 yılı bulan sanatsal serüveni sürekli bir arayış içerisinde geçmiştir. Küçük ölçekli yapılarında mekânsal tasarım üzerinde yoğunlaşan bu arayış, anıtsal yapılarında ise mekân özellikleriyle ilişkili olarak örtü sistemi ve strüktürel çözümlemelerle zirve noktasına ulaşmıştır. Bu nedenle Sinan'ın sanatı ile ilgili bir değerlendirme yapmak gerekirse, onun arayışlarının izlerini anıtsal yapılarında bulmak daha kolay olacaktır.

Sinan'ın anıtsal camileri incelendiğinde, bu eserlere ait teknik veriler bizi, onun arayışlarının ipuçlarına götürür. Örneğin ustalığının zirve eseri Selimiye'den daha önce inşa ettiği ve en büyük yapısı olan Süleymaniye'den sonra daha küçük ölçekli bir eser ortaya koyması, onun arayışlarının mekânsal büyükle ilgili olmadığını gösterir.

Mimar Sinan'ın Şehzade Mehmet, Süleymaniye, Selimiye üçlemesinde gelişimi net bir şekilde kubbede kendini gösterir. Bu üçlemede kubbenin sistematik bir biçimde büyümesi, onun kubbe, yani örtü konusuna özellikle eğildiğini göstermektedir. Çünkü kubbe çapı büyüdükçe kubbenin mekân içindeki izdüşüm alanı, dolayısıyla da ana kubbenin tüm örtü içindeki oranı büyümektedir. Bu durum, Sinan'ın kubbe ile ilgili arayışlarının somut bir göstergesi olarak dikkat çeken önemli bir detaydır.

Kubbeyi taşıyan fil ayaklarının inşası teknik bir zorunluluk olmakla beraber, bu ayaklar mekânın bir bütün halinde görünmesini ve algılanmasını engellemeleri açısından aynı zamanda istenmeyen bir durum da ortaya çıkartırlar. Sinan'ın, Selimiye'de ayak sayısını Şehzade Mehmet ve Süleymaniye'ye göre iki kat artırmış olması, aslında onun taşıyıcı ayak sayısını problem olarak görmediğinin ya da bu

olumsuzluğu başka bir çözüm ile ortadan kaldırabileceğini bildiği için bu noktaya takılmadığının bir kanıtıdır. Sinan Selimiye'de ayak sayısını çoğaltmakla beraber, sekizgen taşıyıcı sistem kullanarak bunları tabiri caizse "göz önünden uzaklaştırması", ayak sayısının -doğru bir çözümleme halinde- önemli olmadığı şeklinde yorumladığını gösterir.

Sinan, Selimiye Camii'nin tasarımında kullanmış olduğu sekizgen sistem ve buna bağlı olarak artırdığı ayakları dış duvarlara daha yakın konumlandırmıştır. Bu yaklaşım, Süleymaniye Camii'nde dört ayakla taşınan örtü sistemi ile karşılaştırıldığında, toplam taşıyıcı taban alanının Selimiye'nin büyük kubbesine rağmen daha küçülmesini sağlamıştır. Bu durum, kubbenin yalnızca statik değil, aynı zamanda estetik olarak da öne çıkmasını amaçlayan bir tercihin sonucudur. Statik bir bakış açısıyla değerlendirildiğinde, eğer Selimiye Camii'nde dört adet fil ayağı kullanılmış olsaydı, her bir taşıyıcının taban alanı, Süleymaniye'deki taşıyıcılardan daha büyük olacaktı. Sinan Selimiye'de ayak sayısını artırarak, iç mekânda karşılaşılabilecek hantal taşıyıcı ayaklardan kaynaklanacak olumsuz estetik etkiyi de ortadan kaldırmıştır.

Selimiye Camii, taşıyıcıların mekâna bakış açısıyla ilgili kısıtlamaları açısından önemli bir farklılık göstermektedir. Mekâna girişteki görsel hakimiyet, mekân algısı bakımından önemli bir faktördür. Ancak Sinan, ikinci anıtsal eseri olan Selimiye Camii'nde -belki de bir zorunluluk olarak- bu özelliği ikinci plana atma eğilimindedir. Bu bağlamda, Süleymaniye Camii'nde Şehzade Mehmet Camii'ne göre kısmi bir gerileme olduğu gözlemlenirken, Selimiye Camii'nde girişe yakın taşıyıcıların sağladığı 96°'lik geniş görüş açısı, diğer iki eserle kıyaslandığında net bir şekilde olumlu fark ortaya koymaktadır. Sinan'ın Şehzade-Süleymaniye-Selimiye cami üçlemesinde, mekâna hakimiyeti en belirgin şekilde sağlayan eser, Selimiye Camii olarak öne çıkmaktadır. Her üç yapı da kubbe altında mekâna hakimiyet açısından farklı özellikler sergilemektedir. Şehzade Mehmet Camii, girişte ve kubbe altında benzer oranda mekân görüşü sunma eğilimindedir. Süleymaniye Camii, fil ayaklarından kaynaklı olarak, büyüklükleri ve konumları itibarıyla diğer yapılar arasında en düşük hakimiyet oranını sunan örnek durumundadır. Selimiye Camii ise geniş görüş açısına sahip girişi ve devasa kubbesi sayesinde, girişten itibaren kubbe altına kadar muazzam bir görüş açısı sunmaktadır. Bu durum, Sinan'ın en önemli hedeflerinden birinin bu mekânsal hakimiyeti elde etmek olduğunu açıkça ortaya koymaktadır. Sinan, Selimiye'de sanat yaşamında zirveye ulaştığı büyük kubbesiyle öne çıkarken, bu kubbeyi taşıttığı sekizgen baldaken sistemiyle de mekân bütünlüğünü mükemmel bir biçimde ortaya koymuştur.

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# Sanatla Örülen Mimarlık: Ovacık-Kışla Köyü Camii ve Duvar Resimleri

*Art-Woven Architecture: Ovacık-Kışla Village Mosque and Wall Paintings*

Mehmet MUTLU[1]

***Öz***

*Bu çalışma, Karabük ili Ovacık ilçesine bağlı Kışla köyünde bulunan Kışla Köyü Camii'nin mimari özelliklerini ve zengin duvar resimlerini incelemektedir. Yapı, geleneksel Türk mimarisinin karakteristik unsurlarını barındırmakla beraber, yerel kültürün izlerini de yoğun bir şekilde taşımaktadır. Cami, iki katlı köy odası ile bütünleşik bir yapıya sahiptir. Girişi de köy odasından sağlanan cami, köyün sosyal yapısını ve topluluk ruhunu yansıtan önemli bir mekândır. Yapı mimari detayları, işlevselliği ve estetik unsurları bakımından dikkat çekmektedir. Duvar resimleri, caminin iç mekânını zenginleştiren önemli unsurlardır. Klasik cami içindeki hat levhaları ve dini metinler süslemelerle birlikte görsel bir şölenle sunarken; saat ve halı kompozisyonları, kılıç ve sancak kompozisyonları gibi çeşitli süsleme unsurları, tarihsel ve kültürel bağlamda derin anlamlar taşımaktadır. Bu resimler, sadece estetik bir değer sunmakla kalmayıp, aynı zamanda ibadet ve toplumsal kimliğin pekişmesine de katkıda bulunmaktadır. Kışla Köyü Camii, sadece bir ibadet yeri değil, aynı zamanda köyün kültürel mirasını temsil eden önemli bir yapıdır. Duvar resimleri, yerel sanat anlayışını yansıtarak, ziyaretçilere hem görsel bir deneyim hem de köyün tarihi ve kültürel geçmişi hakkında derin bir bakış açısı sunmaktadır. Bu makale, caminin mimari detaylarını ve iç mekânındaki sanatsal unsurları derinlemesine inceleyerek, Kışla Köyü Camii'nin sanatla örülen mimarlık anlayışını ortaya koymayı amaçlamaktadır.*

***Anahtar Kelimeler: Ovacık, Kışla Köyü, duvar resmi, cami, halk mimarisi.***

**ABSTRACT**

*This study examines the architectural features and rich wall paintings of the Kışla Village Mosque located in Kışla village, within the Ovacık district of Karabük province. The structure embodies characteristic elements of traditional Turkish architecture while also bearing strong traces of local culture. The mosque is integrated with a two-story village room, and its entrance is accessed from this room, making it an important space that reflects the social structure and communal spirit of the village. The building is noteworthy for its architectural details, functionality, and aesthetic components. The wall paintings are significant elements that enrich the interior of the mosque. The calligraphic panels and religious texts within the classic mosque setting are presented alongside decorative elements, creating a visual feast. Various ornamental features such as clocks and carpet compositions, as well as sword and flag motifs, carry profound meanings in historical and cultural contexts. These paintings not only offer aesthetic value but also contribute to the reinforcement of worship and social identity. The Kışla Village Mosque is not merely a place of worship; it is also an important structure that represents the cultural heritage of the village. By reflecting local artistic sensibilities, the wall paintings provide visitors with both a visual experience and deep insights into the village's historical and cultural background. This article aims to explore the architectural details of the mosque and the artistic elements within its interior, thereby revealing the understanding of architecture intertwined with art in the Kışla Village Mosque.*

***Keywords: Ovacık, Kışla Village, wall painting, mosque, folk architecture.***

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**GİRİŞ**:

Türk sanatında mimari unsurlar, tarihsel süreç boyunca çeşitli kültürel ve sanatsal etkilerle şekillenmiş ve gelişmiştir. Bu etkiler, coğrafi, toplumsal ve dini faktörlerin etkisiyle farklı bölgelerde özgün biçimler kazanmıştır. Kırsal mimaride, özellikle camilerde görülen duvar resimleri, bu özgün yapının en dikkat çekici unsurlarından biridir. Bu tür resimler, halkın sanatsal zevklerini ve dini duygularını yansıtmanın yanı sıra, dönemin estetik anlayışını da ortaya koyar. Geleneksel malzeme ve tekniklerle hayata geçirilen kırsal camilerdeki süslemeler, yerel ve evrensel unsurların birleşimiyle oluşmuş benzersiz bir görsel dil oluşturmuştur.

Türklerin resim sanatına olan ilgisi, tarihsel olarak Orta Asya'ya kadar uzanmaktadır. Uygurlar'ın "bezeklik" olarak adlandırılan ve hem kitap minyatürlerinde hem de duvar resimlerinde kendini gösteren sanat anlayışı, Türk resim sanatının ilk önemli örnekleri arasında sayılmaktadır (Arseven, 1956: 61-65; Keskiner, 2008: 9). Bu resimler, dini ve sosyal mekânların süslenmesinde sanatsal bir ifade aracı olarak kullanılmıştır. Türkler'in İslamiyet'i kabulüyle birlikte resim sanatındaki bu gelenek, İslam estetiği ve inanç sisteminin etkisiyle yeniden biçimlenmiştir. Selçuklu Dönemi'nde ise özellikle cami mimarisinde geometrik ve bitkisel motiflere dayalı süslemeler önemli bir yer tutmuş, figüratif tasvirlerden kaçınılması ise İslam sanatının karakteristik özelliklerinden biri olarak ortaya çıkmıştır. Kırsal mimaride de bu süsleme anlayışı devam etmiş ve duvar resimleri bu yapılar için hem sanatsal hem de dini bir anlatım biçimi olarak kullanılmıştır.

Osmanlı İmparatorluğu'nda duvar resimlerinin kırsal mimaride yer bulması, 18. yüzyıldaki Batılılaşma hareketleriyle birlikte hız kazanmıştır. Osmanlı sanatında Batılılaşma'nın başladığı dönem olarak kabul edilen Lâle Devri (1718-1730), mimariden resim sanatına kadar birçok alanda yeniliklerin yaşandığı bir süreç olmuştur (Eyice, 1996: 284; Özcan, 2003: 81-84). Bu dönemde, Avrupa sanatının etkisiyle İstanbul'dan başlayarak Anadolu'ya yayılan bir duvar resmi geleneği oluşmuştur. İlk örnekleri 18. yüzyılın ikinci yarısında görülen bu resimler, genellikle yaş sıva üzerine kalem işi tekniğiyle uygulanmıştır (Erzen, 1997: 488-489). Kare ve dikdörtgen panolar içine yerleştirilen bu tasvirler, daha çok iç mekân süsleme unsuru olarak karşımıza çıkmaktadır.

Kırsal camilerdeki duvar resimleri, Osmanlı sanatının yerel ile evrensel arasında kurduğu köprünün önemli bir örneğidir. İstanbul'daki etkileyici uygulamalardan esinlenen bu resimler, Anadolu'nun kırsal bölgelerinde hem dini hem de sanatsal bir anlam kazanmıştır. Kâbe, cennet ve cehennem tasvirleri, şehir manzaraları ve çeşitli ikonografik unsurlar, bu resimlerin temel temalarını oluştururken; bu eserler aynı zamanda halkın dini bilincini ve görsel kültürünü şekillendirmiştir. Sanatçısı genellikle bilinmeyen bu eserler, mimari yapının ruhunu güçlendiren ve dini mekânlara mistik bir atmosfer kazandıran önemli unsurlar olarak değerlendirilmiştir (Tercanlı, 2020: 374).

Kırsal mimarideki bu duvar resimlerinin tarihsel arka planı, Osmanlı İmparatorluğu'nun sanatsal birikimiyle yakından ilişkilidir. Geleneksel Uygur sanatından başlayarak Osmanlı'ya kadar uzanan bu süreç, resim sanatının mimarideki rolünü sürekli olarak geliştirmiştir. Anadolu'nun kırsal kesimlerinde görülen bu yapılar, yerel halkın yaşamına dokunan, günlük hayatlarına dini ve estetik bir boyut kazandıran eserlerdir. 1900'lü yılların başına kadar süren bu gelenek, özellikle kırsal camilerde varlığını sürdürmüş olup, bugün de bu yapıların önemli birer parçası olarak dikkat çekmektedir.

Mimari yapılarda kullanılan duvar resimleri, Türk sanatının önemli bir parçasıdır. Duvar resimleri, sadece estetik bir değer değil, aynı zamanda ait olduğu topluma has kültürel bir bellek ortaya koyar. Türk sanatında duvar resimlerinin rolü, geçmişin izlerini günümüze taşırken, aynı zamanda yeni nesillere de ilham kaynağı olmaktadır.

Çalışmamızın konusu olan Kışla Köyü Camii, Karabük ili Ovacık ilçesi, Kışla köyünde bulunmaktadır. Bölge, tarih öncesi dönemlerden beri yerleşim almış olup, Roger Matthews, 1998 yılında "Paflagonya Projesi" çerçevesinde yürüttüğü araştırmalarla, bölgedeki ilk yerleşimlerin MÖ 3000-2000 yılları arasındaki erken Tunç Çağı'na ait olduğunu ortaya koymuştur (Çetin, 2019). Hititler Dönemi'nde "Yukarı Ülke" olarak adlandırılan (Akurgal, 1998) geniş bölge içinde yer alan Ovacık, Hititler'in

çöküşünden sonra Frigler, Lidyalılar ve Paflagonyalılar arasında paylaştırılmış, daha sonraki süreçte de Paflagonyalılar'ın kontrolüne girmiştir (Sevin, 1999).

1071 Malazgirt Zaferi ile Anadolu'ya gelen Türkler, Paflagonya Bölgesi'nde de yayılma göstermiştir. Kuzeybatı Anadolu'nun Türk hakimiyetine girmesi, 11. yüzyıl sonları ve 12. yüzyıl başlarına denk gelen bir dönemde gerçekleşmiştir (Ersoy, 2011). Emir Karatekin, 1082 yılında Ovacık'ın da yer aldığı bölgeyi fethederek Türk egemenliğini tesis etmiştir (Sakaoğlu, 1987). Takip eden dönemlerde, Danişmentliler, Çobanoğulları ve Umuroğulları gibi beyliklerin yönetiminde kalan bu bölge, Candaroğlu Beyliği döneminde 1389 yılında Osmanlı İmparatorluğu'nun hakimiyetine girmiştir. Ancak, Candaroğlu ve Osmanlı arasındaki çekişmeler devam etmiş, bu nedenle bölge birkaç kez el değiştirmiştir. Nihayet 1423 yılında Karabük ve çevresi kesin olarak Osmanlı idaresine geçmiştir (Ersoy, 2011).

Cumhuriyet döneminde Ovacık, Çankırı ilinin Çerkeş Kazası'na bağlı bir nahiye olarak varlığını sürdürmüştür. 1959 yılında ilçe statüsü kazanarak Çankırı'ya bağlanmış, 1995 yılında ise Karabük'ün il olmasıyla birlikte idari olarak Karabük iline bağlı bir ilçe haline gelmiştir (Çetin ve Mutlu, 2021a).

Köy odası, Anadolu'nun sosyokültürel tarihine derinlemesine işlemiş, misafirperverlik ve toplumsal dayanışmayı somutlaştıran özgün bir mekân tipolojisidir. İlk örneklerine Selçuklu ve Osmanlı dönemlerinde rastlanan köy odaları, kırsal toplumun sosyal, kültürel ve dini ihtiyaçlarını karşılamak üzere inşa edilmiştir. Fonksiyonel açıdan, köy halkının ortak kullanımına tahsis edilen bu yapılar, hem yolcuların ve misafirlerin konakladığı bir dinlenme mekânı hem de köy içi karar alma süreçlerinin gerçekleştiği bir toplantı merkezi olarak hizmet vermiştir. Özellikle 19. yüzyılda Osmanlı taşrasında yaygınlaşan köy odaları, yerel malzeme ve tekniklerle inşa edilerek geleneksel mimari pratiklerin sürdürücüsü olmuştur. Ahşap, taş ve kerpiç gibi doğal ve erişilebilir yapı malzemeleriyle tasarlanan bu yapılar, aynı zamanda dönemin estetik ve işlevsel gereksinimlerine yanıt veren mimari birer prototip olarak değerlendirilebilir.

Çalışmamızın konusu olan Kışla Köyü Camii, Karabük ili Ovacık ilçesi, Kışla köyünde bulunmaktadır. Ovacık ilçesi ve çevresindeki köylere dair yapılan bilimsel araştırmalar son derece sınırlıdır. Bu konuda gerçekleştirilen çalışmalar, ancak son zamanlarda literatürde yer bulmaya başlamıştır. Çalışmamıza konu olan Kışla Köyü Camii ne mimari özellikleriyle ne de yapının en önemli özelliği olan süsleme özellikleriyle günümüze kadar hiçbir bilimsel çalışmada konu edilmemiştir.

Anadolu'da kırsal mimari örneği olarak dikkati çeken bazı yapılarla ilgili olarak yapılmış, benzer konuları ele alan çalışmalar mevcuttur. Kuyulu (1990) tarafından yapılan ve Kırkağaç Çiftehanlar Camii'ni konu alan çalışma; Rüçhan (1998) tarafından hazırlanan Osmanlı Sanatında Duvar Resimleri konulu çalışma, Okçuoğlu (2000) tarafından hazırlanan 18. ve 19. yüzyıllarda Osmanlı Duvar Resimlerinde Betimleme Anlayışı isimli doktora tezi, Şener (2011) tarafından hazırlanan 18. ve 19. yüzyıllarda Anadolu Duvar Resimleri isimli doktora tezi, Yıldırım'ın (2013) Burhaniye Şahinler Köyü Camii Duvar Resimleri çalışması; Katrancı-Kasalı'nın (2019) Sinirli Köyü Camii Duvar Resimleri isimli çalışması; Eryılmaz ve Özgür Yıldız'ın (2020) Kışlak Eski Camii ve Ahatlar Camii konulu çalışması; Gürbıyık'ın (2020) Demirci Küpeler Köyü Camii Duvar Resimleri isimli çalışması; Tercanlı'nın (2020) Koca Seyfullah Camii ve Koçer'in (2024) Marmaracık-Köylüce-Kızılca Köyleri (Demirci-Manisa) Camileri ve Boyalı Süslemeleri isimli çalışmaları bu çalışmalara örnek gösterilebilir.

Kışla Köyü Cami, Ovacık ilçesindeki bazı ibadet yapılarında görüldüğü gibi bir köy odası ile yakın irtibatlı olarak, odaya entegre biçimde inşa edilmiştir. İlçede bu yapı dışında benzer özellikte inşa edilmiş farklı örnekler de bulunmakla beraber, Kışla Köyü Camii mekânsal büyüklüğünün yanı sıra iç mekânını süsleyen duvar resimleriyle çevredeki benzer örneklerden ayrılmaktadır. Yapı, kırsal yerleşimlerdeki geleneksel mimari yapılarının özgün bir temsilcisi olarak değerlendirildiği için bu çalışma Anadolu'nun kırsal yerleşimlerini taçlandıran bir örnek olarak, bu alandaki literatüre katkı sunulması amacıyla yapılmıştır. Çalışma kapsamında eserin, mimari özelliklerinin yanı sıra süsleme özellikleri de

incelenmiştir. Eserin rölöve planları çıkartılmış, fotoğrafla belgeleme çalışmaları gerçekleştirilmiş, ilçenin faklı mahallelerinde bulunan benzer özellikteki yapıların planları da çalışmaya dahil ederek eserin ünik mimari ve süsleme özellikleri ortaya konulmaya çalışılmıştır. Çalışmanın son bölümünde ise genel bir değerlendirme yapılarak çalışma tamamlanmıştır.

## 1. Mimari Özellikler

### 1.1. Köy Odası Bölümü

Yapının kuzey kanadı köy odası, güney kanadı ise cami olarak düzenlenmiştir. Yapı doğu-batı yönünde hafif eğimli bir arazi üzerine inşa edilmiştir. Caminin güney ve batı yönleri yol cephesine açılmakta, kuzey ve doğu cepheleri ise binanın neredeyse sınırından başlayan sık ağaçlıklı araziye yönelmektedir. (Şekil 1).



Batıdan görünüm



Güneyden görünüm

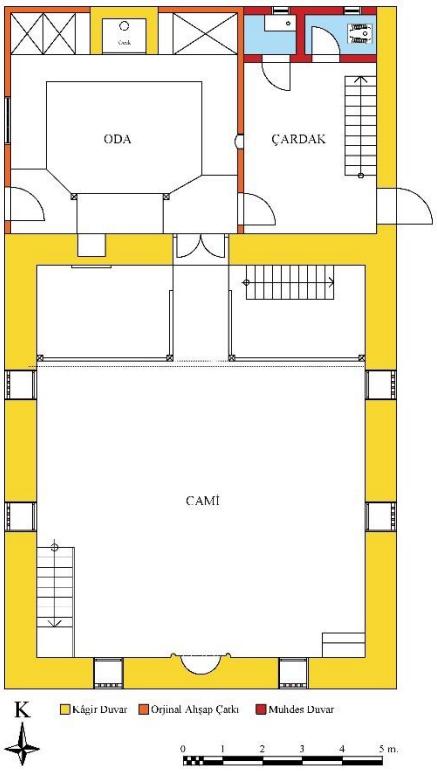
Şekil 1. Kışla Köyü Camii (ve Köy Odası) Batı, Güney ve Kuzey Yönden Görünümler

Camiye doğrudan giriş bulunmayıp, doğu ve batı cephelerinde bulunan kapılarla öncelikle köy odası olarak düzenlenmiş bulunan bölümün zemin katına girilmekte ve iki mekânlı bu kısmın oda bölümünün güney duvarına açılmış kapıyla caminin harim mekânına giriş sağlanmaktadır. Üst kattaki odanın camiye açılan kapısından ise ibadethanenin fevkaniye kısmına, kadınların ibadeti için tahsis edilmiş olan kadınlar mahfiline ulaşılmaktadır (Şekil 2).

Köy Odası olarak değerlendirilen kısım dıştan dışa yaklaşık olarak 9,85 x 5,85 m ölçülere sahiptir. Doğudaki tek kanatlı kapı ile köy odası bölümünün çardak kısmına giriş sağlanırken, batıdaki tek kanatlı kapı ile iki mekânlı zemin katın oda kısmına ulaşılmaktadır. Odaya girişin sağlandığı batı duvarında giriş kapısının kuzeyinde mekânı aydınlatan pencere yer almaktadır. Geleneksel Türk konut mimarlığının tipik oda özelliklerini taşıyan bu odanın kuzey duvarının ortasında ocak bulunmaktadır. Ocağın her iki tarafında ikişerli gruplar olarak düzenlenen ahşap nişler yer almaktadır. Nişler, tepe kısımları sivriltilmiş at nalı kemer formuna sahip dikdörtgen hücreler olarak yapılmıştır. Bu duvar üzerinde, ocağın doğusunda gusülhane, batısında ise yüklük ile bir adet gömme dolap bulunmaktadır (Şekil 2).

Odanın güney duvarını, caminin kâgir malzemeli kuzey duvarı oluşturmaktadır. Bu kısımda bulunan iki kanatlı ahşap bir kapı ile caminin harim mekânına giriş sağlanmaktadır. Odanın doğusunda bulunan ve oda ile çardağı ayıran ahşap çatkılı duvar üzerinde yer alan bir kapı ile zemin kattaki oda ve çardak birimleri birbirine bağlanmıştır. Bu iki mekânı bölen duvarda, bölgede sivil mimarlık yapılarında sıklıkla kullanılan ve “gözgöre” adı verilen özel küçük pencere bulunmaktadır (Şekil 2). Bu pencere, burada bulunan gaz lambasının her iki mekânı da aynı anda aydınlatması amacıyla kullanılmaktadır (Çetin, 2019 :25). Diğer birimlere geçilen kapı ve ocak hariç, oda sedirle çevrelenmiştir.

Köy odasının zemin katındaki iki bağımsız mekândan birisi olan çardak birimine bu odadan ulaşılabildiği gibi, doğu cephede bulunan bağımsız bir kapı ile çardak mekânına yapının doğu cephesinden de giriş bulunmaktadır. Çardak mekânının kuzey tarafında muhdes ıslak hacimler yer almaktadır. Bu kısımda düzenlenen iki küçük bağımsız birimden doğudaki tuvalet, batıdaki ise lavabo olarak değerlendirilmiştir (Şekil 2).




Şekil 2. Kışla Köyü Camii (ve Köy Odası) Zemin Kat Planı

Zemin kat çardak mekânının doğu duvarına bitişik inşa edilmiş 10 basamaklı ahşap merdivenle üst katın çardak mahalline ulaşılmaktadır.

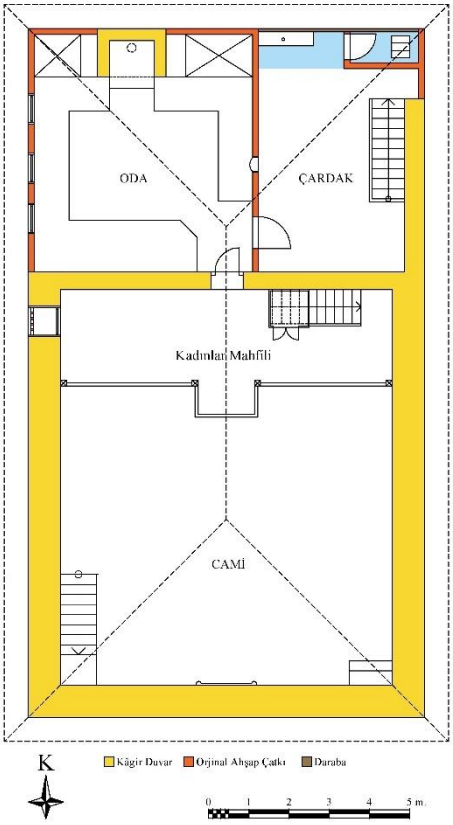
Üst katın çardak mekânının kuzey tarafı yine ıslak hacim olarak düzenlenmiştir. Alt kattaki muhdes ıslak hacim düzenlemesinin aksine bu kattaki ıslak hacimler özgündür. Tuvalet, geleneksel Ovacık sivil mimarlık yapılarının ıslak hacim özelliklerini taşımaktadır. Tuvalete giriş sağlanan bölümde yer alan lavabo da özgün malzeme özelliğini korumaktadır. Bu kattaki çardak mekânının ıslak hacimlerin bulunduğu kuzey cephesi, havalandırma sağlamak amacıyla tahtaların aralıklı olarak düşey yönde çakılması ile oluşturulan ve yörede "daraba" olarak isimlendirilen teknikle yapılmıştır (Şekil 3).



Şekil 3. Caminin Köy Odası bölümünün 2. katında özgün ıslak hacim

1. katta da çardak ve odayı ayıran ortak duvarda, odaya geçişi sağlayan kapının yanı sıra, alt katta olduğu gibi gözgöre penceresi yer almaktadır. Bu kattaki oda da yine alt kattaki oda gibi tipik Türk konutunun oda özelliklerini taşımaktadır. Kuzey duvarda yer alan ocağın batı tarafında üçlü sıralanmış niş düzenlemesi dikkati çekmektedir. Ocağın doğu tarafındaki nişler, bir kapak ile kapatılarak dolap haline getirilmiş, niş ve dolapların yanları da yüklük olarak değerlendirilmiştir. Oda, batı duvarında bulunan üç adet pencere ile aydınlatılmaktadır. Ocağın önü ve kapıların bulunduğu köşe dışında odayı

çepeçevre dolanan sedir yer almaktadır (Şekil 4). Odanın kuzey duvarında bulunan kapı, caminin kadınlar mahfiline ulaşmayı sağlamaktadır.




Şekil 4. Kışla Köyü Camii (ve Köy Odası) 1. Kat Planı

### 1.2. Cami Bölümü

Caminin harim mekânı dikdörtgen planlı olup, içten içe yaklaşık 10,30 x 8,60 m ölçülerindedir. Ovacık Müftülüğü tarafından caminin batı cephesine asılan bilgi levhasında inşa tarihi olarak 1905 bilgisi verilse de harim mekânına girilen iki kanatlı kapının harim tarafının üst kısmında kapı genişliğince ve celi tarzda Arapça yazılmış kitabede *"Sene 1370"* ibaresi yer almaktadır (Şekil 15). Hicri takvime göre verilen bu tarih, Miladi olarak 1950-51 yıllarına tekabül etmektedir. Caminin karakteristik mimari özellikleri ve malzeme nitelikleri, eserin daha erken bir dönemde inşa edilme olasılığını güçlendirmektedir. 1 Şubat 1944 günü Bolu-Gerede merkezli yaşanan 7,4 şiddetindeki deprem yakın çevreyi de fazlaca etkilemiştir (Özçelik, 2017: 95; 2022: 3071-3072; Turhan Sarıköse, 2020: 74-75). Herhangi bir yazılı bilgi bulunmamakla beraber, yapının bu depremden etkilenmiş olması ve yaşanan bu depremden yaklaşık 6-7 yıl sonra geniş çaplı bir onarımdan geçirilerek bu onarım tarihinin kayda geçirilmiş olması muhtemeldir.

Alt kattan harim mekânına girilen kapının doğu tarafına kadınlar mahfiline çıkan 11 basamaktan oluşan ahşap merdiven konumlandırılmıştır. Giriş ekseninde mihrabın yer aldığı camide, kıble duvarının batı tarafında ahşap minber, doğu tarafında ise ahşap vaaz kürsüsü yer almaktadır. Harimi aydınlatan altı adet pencereden iki tanesi mihrabın yanlarına açılmıştır (Şekil 5). Diğer dört adet pencere ise doğu ve batı duvarlarına karşılıklı, simetrik olarak konumlandırılmıştır. Pencerelerin dış kısımlarında ahşap malzemeli, kare kesitli düşey konumlandırılmış parmaklıklar bulunmaktadır. Camideki tüm pencereler giyotin pencere olarak yapılmıştır. Doğu duvarının kuzey tarafında bulunan pencere hariç tüm pencereler yatayda üç, dikeyde ise iki bölümlü olarak altı parça halinde bölümlenmiştir. Harimin doğu, batı ve güney duvarları, resimlerle tezyin edilmiştir. Doğu duvarının kuzey tarafında bulunan pencere de yine 6 bölümlü olarak yapılmış olmakla beraber, 3 bölümü daha küçük bölümlere ayrılarak çok sayıda küçük camlı yüzeylere dönüştürülmüştür (Şekil 5).



Harim mekânından genel görünüm



Doğu duvarında bulunan pencereler

Şekil 5. Kışla Köyü Camii harimi ve doğu duvarından ayrıntı

Mihrap, üstte basit bir basık formlu kemerle sonlanmakta olup, mihrap nişinin kavsara kısmı tonoz olarak geçilmiştir. Kemerin kilit taşı kısmına kabartma tekniğinde yapılmış üç yapraklı bitkisel motif yerleştirilmiştir. Kemer, bu motifin olduğu kısımda dışa bir miktar taşırılarak hareketlendirilmiştir. Kemerin üst orta kısmına sütunce üst başlıklarıyla aynı özellikte bir düzenleme yapılmış ve bunun üst kısmına da bir hilal yerleştirilmiştir. Mihrap her iki yanından dairesel sütuncelerle sınırlandırılmıştır. Alt başlığa oturan sütunceler, üst kısımda dairesel üst başlıktan sonra kademeler halinde daralarak sonlanmaktadır (Şekil 6).



Mihrap



Minber



Vaaz kürsüsü

Şekil 6. Caminin mihrap, minber ve vaaz kürsüsünün genel görünümü

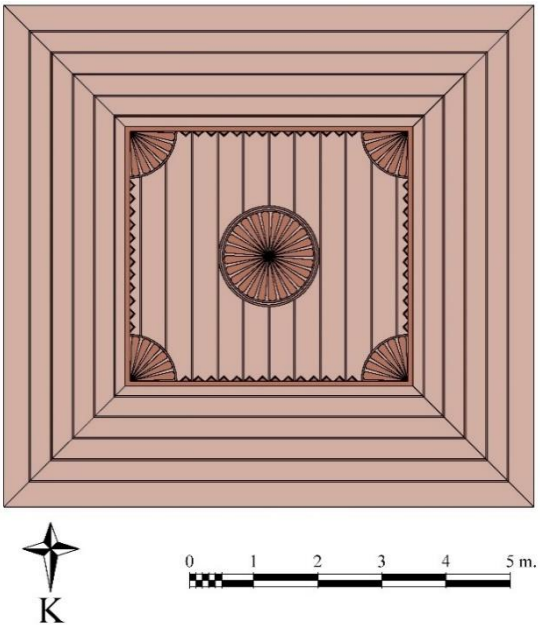
Caminin ahşap minberi, oldukça sade görünümde bırakılmıştır. Yan aynalığı kenarları profilli kapak tahtaları ile oluşturulan minberin korkuluk kısmı da yan aynalıkla bütünleşik imal edilmiştir. Dört yüzeyli konik külah kısmı, üzerine yerleştirilen ahşaptan yapılmış alemiyle tavan kotuna kadar uzanmaktadır. Külah bölümünden köşk kısmına geçiş geniş ahşap silmelerle sağlanmaktadır. Köşkün güney cephesi yekpare ahşap malzemenin içinin geometrik formda boşaltılmasıyla oluşturulmuş ve bu bölüm çıtalarla çerçeve içine alınmıştır. Mihrabın şerefe (taht) altı olarak tanımlanan bölümünde (Arbaş, 1992: 106) yine çıtalarla oluşturulmuş dikdörtgen panonun içi boş bırakılmıştır. En alt bölüm ise yine dışı çıtalarla çerçeve içine alınmış bir kapı olarak düzenlenerek minberin altında oluşan küçük alana giriş sağlanmıştır (Şekil 6).

Minberin kuzey tarafındaki kapı düzenlemesinin üst kısmı yekpare ahşap malzeme ile basık kemerli formda düzenlenmiştir. Kemerin üzerinde çıtalarla sınırlandırılmış olan dikdörtgen formlu panonun içi boş bırakılmıştır. Yarım daire formlu taçlık kısmı da yekpare ahşaptan ajur tekniğinde kesilerek basit bir biçimde hareketlendirilmiştir. Minberin kapı söveleri her iki yanda yükseltilerek, stilize minare şeklinde sonlanmaktadır (Şekil 6).

Caminin doğu ve güney duvarlarının kesiştiği köşesine ahşap vaaz kürsüsü yerleştirilmiştir. Masif ahşap malzemeli kürsünün batı yönünde, içi boş bırakılmış, dış kenarları profilli çerçeveli dikdörtgen bir ahşap

pano yer almaktadır. Bu yönünde, içbükey ve dışbükey kıvrımlarla yukarıya doğru genişleyerek form alan vaaz kürsüsünün kuzey cephesi çıtalar çakılmak suretiyle oluşturulmuştur (Şekil 6).

Caminin tavanı ahşap kaplamalıdır. Tekne tavan şeklinde kademelenerek daralan tavanın merkezine 30 dilimden meydana gelen dairesel formlu tavan göbeği yerleştirilmiştir. Tavan göbeğini oluşturan dairesel geometrik süsleme, çeyrek daire kompozisyona bölünmüş olarak tavanın köşelerinde de kullanılmıştır. Tavanın ortadaki düz kısmı ile son kademeyi yapan tekne kademelenmesinin yan yüzeyi çıtalarla oluşturulan küçük üçgenlerle hareketlendirilmiştir. Tavanın geometrik süslemelerle zenginleştirilen orta kısmı, kuzey-güney doğrultusunda birleşme kısımları çıtalarla kapatılmış ahşapla kaplanmıştır (Şekil 7).




Şekil 7. Kışla Köyü Camii'nin harim bölümünün ahşap süslemeli tavan planı

Yapının köy odası bölümünün üst katındaki odadan ulaşılan fevkani kadınlar mahfili yaklaşık 2,40 m genişliğindedir. Doğu, batı ve kuzey yönlerinde cami duvarlarına oturan mahfili, harim yönünde ikisi yan duvarlara bitişik, diğer ikisi ise orta kısımda bulunan kare kesitli dört adet ahşap sütun taşımaktadır. Sütunların üst kısımları yan sütunlarda harime, orta sütunlarda ise her iki yana doğru genişleyecek şekilde başlıklara sahiptir. T şeklinde profilli sütun başlıklarının ön ve arka yüzeyleri ahşap kaplanmışken, yanlardaki profilli yüzeyler ise, vaaz kürsüsünde de olduğu gibi ince çıtalar çakılmak suretiyle yapılmıştır. Kadınlar mahfilinin orta bölümünde harime konsol biçiminde uzanan 165 cm genişliğe, 70 cm uzunluğa sahip bir balkon bulunmaktadır. Kadınlar mahfili, batı cephelerine açılmış, tavan yüksekliğinden başlayan bir pencere ile aydınlatılmaktadır (Şekil 4-8).



Şekil 8. Kadınlar mahfilinin harimden görünüşü

Yapının cepheleri oldukça sade görünümdedir. Yapının en hareketli cephesini oluşturan batı cephesinin ilk kat seviyesinde harim bölümünü aydınlatan iki adet pencerenin yanı sıra köy odasına girişi sağlayan bir kapı ve kapının kuzey tarafında da odayı aydınlatan bir adet pencere bulunmaktadır. Cephenin ikinci kat seviyesinde ise harim kısmının kadınlar mahfili bölümüne açılan bir pencere ile köy odasının ikinci kat mekânını aydınlatan üçlü bir pencere düzenlemesi yer almaktadır (Şekil 1, 2, 4). Doğu cephesinde ise harim kısmının ilk kat seviyesinde, batı cephesindeki pencerelere simetrik olarak yerleştirilmiş iki adet pencere yer almaktadır. Yapının bu cephesinde, kuzey tarafta bulunan kapı ile, köy odası kısmının çardak bölümüne giriş sağlanmaktadır (Şekil 2, 4).

Yapının yola bakan güney cephesi cami bölümüdür. Bu cephenin ilk kat seviyesine açılmış olan simetrik iki adet pencere, caminin harim mekânını aydınlatmaktadır (Şekil 1, 2, 4). Köy odasının meydana getirdiği kuzey cephe ise özgününde sağır olmakla beraber, günümüzde zemin kattaki muhdes ıslak hacimlerin pencerelerinin bu cepheye açıldığı görülmektedir (Şekil 2).

Eserin köşelerinde pencerelerin alt hizasından başlayarak saçak altına kadar devam eden ahşap dikmeler, sade düzenlenmiş cepheleri hareketlendiren bir uygulama olarak dikkati çekmektedir. Cephede dikkat çeken bir başka husus da pencerelerde bulunan ahşap parmaklıkların günümüzde halen özgün şekilde varlığını sürdürüyor olmasıdır (Şekil 1).

Yapı, karma strüktürle inşa edilmiştir. Eserin cami bölümü kâgir malzemeden inşa edilmişken, köy odası bölümü ise ahşap strüktürlüdür. Cami bölümünde yaklaşık 80 cm genişliğe sahip duvarlar moloz taş malzeme ile örülmüş ve kireç harcı ile sıvanmıştır. Yakın dönemde cephelere yapılan gelişigüzel müdahalelerde çimento kullanıldığı görülmektedir. Köy odası kısmında ise özgün strüktür, ahşap karkas sistemin taşıdığı hımış tekniğidir. Ancak günümüzde zemin katta, çardak kısmının kuzeyindeki ıslak hacimlerde briket, betonarme ve moloz taş kullanılmak suretiyle özgün malzeme dokusunun bozulduğu görülmektedir.

Yapı günümüzde kırma çatı ile örtülüdür. Çatı, kırmızı renge boyanmış oluklu sac levha ile kaplanmıştır (Şekil 1, 4).

## 2. Duvar Resimleri

Kışla Köyü Camii'nin harim mekânının doğu, batı ve güney duvarları, duvarları süsleyen resimleri ve aynı ustanın kaleminden çıkmış olduğu anlaşılan mahalli üslupla yazılmış hat yazılarıyla dikkat çekicidir (Şekil 9). Mekân içindeki duvar resimlerini konuları bakımından mimari resimler, saat resmi, bitkisel resimler, duvar halısı resimleri, bazı nesnel obje resimleri ve yazılar olarak altı alt başlıkta incelemek mümkündür.



Güney (Kıble) Duvarı | Doğu Duvarı | Batı Duvarı

Şekil 9. Harim mekânının resimlerle süslenmiş duvarları

### 2.1. Mimari Betimlemeler

Caminin kıble duvarında, mihrabın doğu ve batı taraflarında, kemer hizasında iki adet cami betimlemesi yer almaktadır. Doğu taraftaki caminin ana kubbe ve minareleri görünüş tekniğinde resmedilmişken, yapının ana bölümü ise kesit tekniğinde betimlenmiştir. Dışı siyah renkli kontur çizgileriyle sınırlandırılmış olan caminin döşeme, tavan ve duvarlar bordo renk ile boyanmıştır. Orta kısımda

mihrabın bulunduğu kompozisyonda kahverengi ile boyanan mihrabın her iki yanında geometrik desenli sütunlar resmedilmiştir (Şekil 10).

Resimde, caminin doğu tarafında üzeri kubbe ile örtülü olduğu görülen bir çeşme, lülesinden su akar vaziyette gösterilmiş ve lülenin altına da çeşmede dolmakta olan bir kova resmedilmiştir. Çeşme, beyaz renge boyanmış ve içi karelerle desenlenmiştir. Mekânın batı tarafında iki adet merdiven görülmekte olup bunlardan birisi yapının dam kısmına kadar devam ederken, diğeri ise yapının yarısında sonlanmaktadır. Mekânın duvar zemini hardal sarısı renk ile renklendirilmiştir. Caminin üst bölümünde, kubbenin her iki tarafına simetrik olarak yerleştirilmiş altı adet minare bulunmaktadır. İkişerli grup halinde farklı yükseklikte resmedilen minarelerden ikisi üçer, ikisi ikişer ve son ikisi de birer şerefeli olmak üzere toplam 12 şerefeli olarak betimlenmiştir. Minarenin gövde kısımları da çeşmede olduğu gibi beyaz zemin üzeri karelerle süslenmiş olarak gösterilmiştir. Minarelerde bulunan şerefelerin tamamı siyah renge boyanmıştır. Minarelerin üst kısımları ay-yıldız şekilli alemle sonlanırken, caminin kubbesi alemsiz olarak resmedilmiştir. Mekânın dış kısmına, her iki tarafında konumlandırılan servi ağaçları ile kompozisyon tamamlanmıştır (Şekil 10).

Mihrap nişinin batı tarafındaki cami, doğudakine göre daha farklı resmedilmiştir. Doğu taraftaki cami ile aynı büyüklükte olmakla beraber, caminin ana mekânının içine, mahalli üsluplu bir hat ile Arapça olarak besmele yazılmıştır. Mekânı sınırlayan döşeme, tavan ve duvar renkleri ile zemin rengi, doğuda resmedilmiş olan cami ile aynıdır. Caminin üst örtüsü, birisi ana kubbe olmak üzere her iki tarafa simetrik olarak yerleştirilmiş toplam beş adet kubbeden meydana gelmektedir. Ana kubbe yeşil, diğer kubbeler ise bordo ve lacivert renklerle renklendirilmiştir. Doğudaki camide olduğu gibi, bu caminin kubbeleri de alemsiz resmedilmiştir. Camide aynı büyüklükte dört adet minare yer almakta olup, her birisinde üçer tane olmak üzere toplam 12 adet şerefe bulunmaktadır. Minarelerin tamamının tepesinde ay-yıldızlı alem mevcuttur. Minarelerin çizim tekniği, doğudaki caminin minareleriyle aynıdır. Bu camide de yapının dışında, her iki yanına resmedilmiş servi motifleri yer almaktadır (Şekil 10).

### 2.2. Saat Betimlemesi

Caminin kıble duvarının doğu tarafında büyükçe bir sarkaçlı saat resmi yer almaktadır. Dikdörtgen formlu kasasının düzenlemesi, cami resimlerinin mekân betimlemeleri ile aynıdır. Dairesel zemine sahip saatin rakamları Arapça olarak yazılmıştır. Rakamların bulunduğu zeminde 5 rakamının olduğu kısma yakın dairenin içinde ise saniye bilgisini veren iç kadran yer almaktadır. Zamanı 12.10 olarak gösteren saattin alt kısımda, orta bölümde sarkaç, sarkacın her iki yanında ise uçları tutamaklı kurma zincirleri bulunmaktadır (Şekil 10).



Cami betimlemeleri



Saat betimlemesi

Şekil 10. Güney (Kıble) duvarı üzerinde cami ve saat betimlemeleri

### 2.3. Bitkisel Betimlemeler

Harimde en yoğun kullanılan süsleme unsuru bitkisel betimlemeler olmakla beraber, bunların çoğu birbirini tekrar eden resimlerdir. "Cami Takımı" adı verilen (Berk, 2021: 463) ve Allah, Muhammed, Ebubekir, Ömer, Osman, Ali, Hasan ve Hüseyin isimlerinin yazılı olduğu; çiçeğin kuşbakışı görüntüsünün üsluplaştırılmasıyla elde edilen penç motifi biçiminde şekillendirilen kompozisyonlar, bu düzenlemeyi dıştan kollarının içine alan bitkisel motiflerle süslenmiştir (Şekil 11).

Doğu duvarının güneye yakın kısmında birbirinin aynısı olarak resmedilmiş iki adet bitkisel motif süslemesinin konusunu hurma ağacı oluşturmaktadır. Hurma ağacı; üç ayaklı, ayak ve boyundan gövdeye doğru genişleyen şişkin gövdeli ve iki yanda kulplu bir vazonun içerisinden yükselmektedir. Gövdesi oldukça ince tutulmuş olan hurma ağacı, merkezinde yukarı doğru uzanan bir adet ve iki yönde aşağıya sarkan üçer hurma dalı; en altta ise hurma meyvesinin bulunduğu kıvrımlı birer dal şeklinde tasvir edilmiştir. Aynı kompozisyon güney tarafta, vaaz kürsüsünün bulunduğu doğu duvarı bölümünde de tekrar edilmiştir (Şekil 11).



Bitkisel süsleme (Batı duvarı) Hurma ağacı (Doğu duvarı) Karanfil (Batı duvarı)

Şekil 11. Harim mekânından resimler.

Harim mekânında bulunan üçüncü süsleme ise çok daha sade olarak yan yana üç ayrı dal olarak resmedilmiş karanfillerdir. Karanfil resimleri batı duvarında, minber ile bu duvar üzerinde bulunan duvar halısı biçiminde resmedilmiş kompozisyonun arasına konumlandırılmıştır (Şekil 9-11).

### 2.4. Duvar Halısı Betimlemeleri

Caminin harim mekânında altı adet duvar halısı olarak resmedilmiş kompozisyon bulunmakta olup, bunlardan iki tanesi harimin doğu duvarında, iki tanesi harimin batı duvarında, iki tanesi de kadınlar mahfilinde yer almaktadır. Kadınlar mahfilinde bulunan örneklerden bir tanesi doğu duvarı üzerindeyken, diğeri ise kuzey duvarının batıya yakın kısmındadır (Şekil 8-9).

Harim kısmında doğu duvarında bulunan halı resimlerinin ilki, bu cephedeki iki pencere arasında yer almaktadır. İki tarafı püsküllü olarak resmedilen kompozisyonda püsküller gerçekçi görünüme uygun biçimde, aşağı doğru dökümlü olarak gösterilmiştir. Lacivert zemin üzerine, sarı ve siyah renkli çizgilerle oluşturulan çerçevede bordo renkli köşelikler yer almaktadır. Altın sarısı renkte yazılan Arapça metinde Kelime-i Tevhit, *"Lâ ilahe illallah Muhammed'ün Resulullah"* ifadesi yer almaktadır (Şekil 12, 1. görsel).

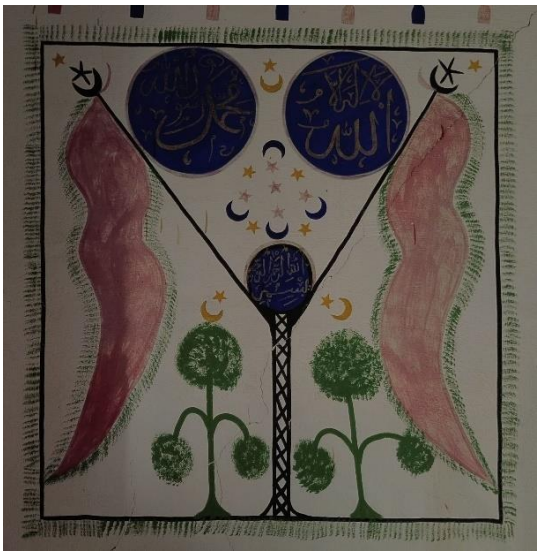
Bu cephedeki ikinci örnek, duvarın güney tarafındadır. Bu örnek de iki tarafı aşağıya sarkan vaziyette püsküllü olarak resmedilmiştir. Düz çizgilerden oluşan iki sıra halindeki çerçevelerden dıştakinde açık kahverengi-siyah; içtekinde ise mavi-beyaz renkler kullanılmıştır. Yeşil zemin dolgusu olarak resmedilen köşeliklerle bordo renkli zemin, dört adet paralel çizginin oluşturduğu çerçeve ile sınırlandırılmıştır. Göbekteki lacivert geometrik şeklin dışlarına dörderli sıralar halinde noktalar konulmuştur. Göbeğin orta kısmında Arapça olarak altın sarısı renkte yazılan *"Muhammed"* ifadesi silinmeye yüz tutmuş durumdadır (Şekil 12, 2. görsel).



1. Görsel (Harim doğu duvarı)



2. Görsel (Harim doğu duvarı)



3. Görsel (Harim batı duvarı)



4. Görsel (Harim batı duvarı)



5. Görsel (Kadınlar mahfili doğu duvarı)



6. Görsel (Kadınlar mahfili kuzey duvarı)

Şekil 12. Harim ve kadınlar mahfili mekânından duvar halısı biçimli resimler ve yerleri

Harim kısmında duvar halısı betimlemesi içeren üçüncü örnek, batı duvarında, minberin basamaklarını bulunduğu kısmın üstünde yer almaktadır. Kare formunda ve dört tarafı da püsküllü resmedilen kompozisyonu meydana getiren unsurlar içinde esas dikkati çeken öge, sancaktır. Sancaklar ortadaki bir ana direğin üzerine belli bir yükseklikte yerleştirilmiş, uç kısımlarına ay-yıldız motifi yerleştirilmiş iki adet sancak direğinde ve bordo renkli olarak resmedilmiştir. Sancak direklerinin sınırlandırdığı ortadaki üçgen alanın üst iki köşesine lacivert tonda iki adet madalyon çizilerek sağdakinin içine Arapça olarak *"Allah Lâ İlahe İllallah"*, soldakinin içine ise *"Muhammedün resûlullah"* ifadesi yazılmıştır. Üçgenin alt köşesinde ise daha küçük çaplı ve aynı renkli madalyonun içinde ise *"Bismillâhirrahmânirrahîm"* yazmaktadır. Alt bölümde ana direğin her iki tarafında yeşil renkle boyanarak elde edilmiş iki adet bitkisel süsleme, kompozisyonda dikkati çeken bir başka ögedir. Bu bitkisel süslemenin hemen üzerine, iç kısma bakışık vaziyette ve sarı renkte iki adet ay-yıldız motifi yerleştirilmiştir. Aynı motif üstteki

madalyonların arasında, yukarıya bakar vaziyette tekrar etmektedir. Kare düzenlemenin üst köşelerinde yine yıldızlar yer alırken, lacivert madalyonların ortasındaki boşlukta ise dört adet siyah renkli ay ile dokuz adet sarı renkli yıldızdan oluşan düzenleme kullanılarak kompozisyon tamamlanmıştır (Şekil 12, 3. görsel).

Batı duvarındaki ikinci halı resmi, pencerelerin arasına konumlandırılmıştır. Harimin doğu duvarındaki 1. görsel ile tamamen aynı şekilde oluşturulan kompozisyonun tek farkı, içinde bulunan hat metnidir. Kompozisyonun içine Fetih Suresi'nin 1. ayeti olan *"İnna fetahnâ leke fethan mûbîna"* ifadesi yine altın sarısı renk kullanılarak yazılmıştır (Şekil 12, 4. görsel).

Camide yer alan halı resmi örneklerinin son ikisi, kadınlar mahfilinde yer almaktadır. Bunların ilki, doğu duvarı üzerindedir. Harim mekânının doğu duvarında bulunan (Şekil 12, 2. görsel) kompozisyonun aynen tekrar edildiği bu resimde, kullanılan renkler farklılaşmaktadır. Bu örnekte düz çizgilerden oluşan iki sıra halindeki çerçevelerden dıştakinde kırmızı-siyah; içtekinde ise diğer örnekte olduğu gibi mavi-beyaz renkler kullanılmıştır. Yine köşeliklerin yeşil zemin dolgusu ile resmedildiği uygulamada kırmızıya çalan renkteki zemin, kırmızı-siyah ve kırmızı-beyaz renklerden ve dört paralel çizgiden oluşan iki ayrı çerçeve ile sınırlandırılmıştır. Göbekteki lacivert geometrik şeklin dışlarına dörderli sıra ile siyah ve beyaz noktalar şaşırtmalı olarak yerleştirilmiştir. Göbeğin orta kısmı boş bırakılmıştır (Şekil 12, 5. görsel).

Kadınlar mahfilindeki diğer örnek ise mahfilin kuzey duvarında, batı köşeye yakın konumda bulunmaktadır. Bu resim de harim mekânının doğu (Şekil 12, 1. görsel) ve batı duvarında (Şekil 12, 4. görsel) bulunan duvar halısı resimleriyle büyük benzerlikler göstermektedir. Buradaki tek fark, üzerinde bulunan metin olup, metinde *"Şefaat ya Resulallah"* ifadesi yazmaktadır (Şekil 12, 6. görsel).

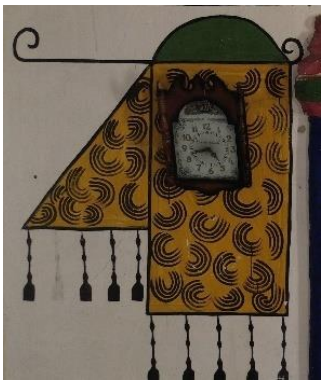
### 2.5. Nesnel Betimlemeler

Caminin süsleme programını oluşturan nesnel ögeler en üst bölümde perde, doğu duvarı üzerinde bulunan iki adet kılıç ve mihrabın her iki tarafındaki tekstil ürünü süslemesidir.

Caminin örtüsünden hemen sonra başlayan, alt kısmından toplanmış görünümdeki perde deseni, bu kotta tüm harim mekânının doğu, batı ve güney duvarlarını dolanmaktadır. Yarım daire formunda ve iç içe çizilmiş yarım dairelerle verilen perde formunda yarım dairelerin her birinin içlerine bordo renkte irice birer nokta konularak desen oluşturulmuştur. Yarım dairelerin her birinin arasından, ucunda püskül bulunan ipler sarkıtılmıştır. Farklı uzunluklarda sarkıtılan püsküller, ritmik olarak kahverengi ve siyah renklerde boyanmıştır (Şekil 12).



Kılıç betimlemesi
(Doğu duvarı)



Tekstil ürünü betimlemesi
(Güney duvarı)



Üst bölümde perde deseni
(Örtü altı kotu)

Şekil 13. Harimde nesnel konulu resimler

Camideki dikkat çeken nesnel betimlemelerden birisi de kılıçtır. Harim mekânının doğu duvarında bulunan cami takımından *"Ali"* isminin yer aldığı tablonun dışına, simetrik iki adet kılıç resmedilmiştir. Tutamak kısmında birer adet sarkan püskül bulunan kılıcın dış kısımlarındaki ikişer adet dairesel asma bölümü, resimde dikkat çeken bir başka detaydır. Kılıçların sap kısımları sarı, uç kısımları bordo renk ile

ifade edilmiş, uç kısımları küt bırakılmıştır. Püsküllerin rengi ise kuzeydekinde bordo iken, güneydekinde sarı renklidir (Şekil 13).

Kıble duvarının her iki yanına, cami resimlerinin altında, süsleme tekniğinden tekstil ürünü olduğu anlaşılan nesneler resmedilmiştir. Düzenlemede dikdörtgen formlu bir parçaya eklenen üçgen formlu diğer parçanın alt kısmından kademeli olarak sarkıtılmış beşer adet püskül bulunmaktadır. Dikdörtgen bölümün üzeri yeşil renkli yarım daire ile sonlanmaktadır. Hardal sarısı renkle boyanarak oluşturulan zeminin içinde, gelişigüzel serpiştirilmiş, dört sıra halinde iç içe geçen yarım dairelerden oluşan motifler kullanılmıştır (Şekil 13).

### 2.6. Hat Yazıları

Mihrap nişinin üzerinde, mihrap duvarının doğu tarafındaki saat resminin üzerinde ve harim mekânına açılan iki kanatlı kapının üst kısmında hat yazıları mevcuttur. Ayrıca cami takımı levhaları olarak, Allah, Muhammet, Ebu Bekir, Ömer, Osman, Ali, Hasan ve Hüseyin isimleri, mekândaki yazı programını oluşturmaktadır.

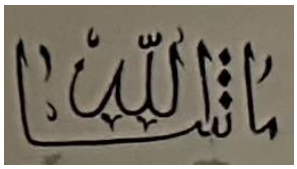
Mihrap ekseninde en üstte Arapça olarak *"lâ ilâhe illallah Muhammedün resûlullah Şefaat ya Resûlallah"* yazılı bir levha bulunmaktadır. Levhanın çerçevesi, cami ve saat betimlemeleriyle aynı teknikte oluşturulmuştur. Yöresel üslup kullanılarak siyah zemin üzerine sarı boya ile yazılan metni çevreleyen çerçevenin batı tarafında, kısa kenar ortasında bir hilal resmi yer almaktadır (Şekil 14).



En üst kottaki yazı levhası
(Güney duvarı)



Mihrap ayeti levhası
(Güney duvarı)



Maşallah levhası
(Güney duvarı)

Şekil 14. Harim mekânının kıble duvarında bulunan hat yazıları.

Mihrap nişinin üzerinde camilerde sıkça görülen ve mihrap ayeti olarak bilinen Âli İmran Suresi'nin 37. ayetinin bir bölümü olan *"kullemâ dehale aleyhâ zekeriyyal mihrâbe"* (Kur'an-ı Kerim, 2019: 54) ifadesinin yer aldığı bir levha bulunmaktadır. Çerçeve, zemin ve hat özelliği olarak üstteki örnekle aynı niteliklere sahip levhada, çerçevenin kısa kenarlarının ortasına dışa bakan, karşılıklı birer hilal motifi yerleştirilmiştir (Şekil 14).

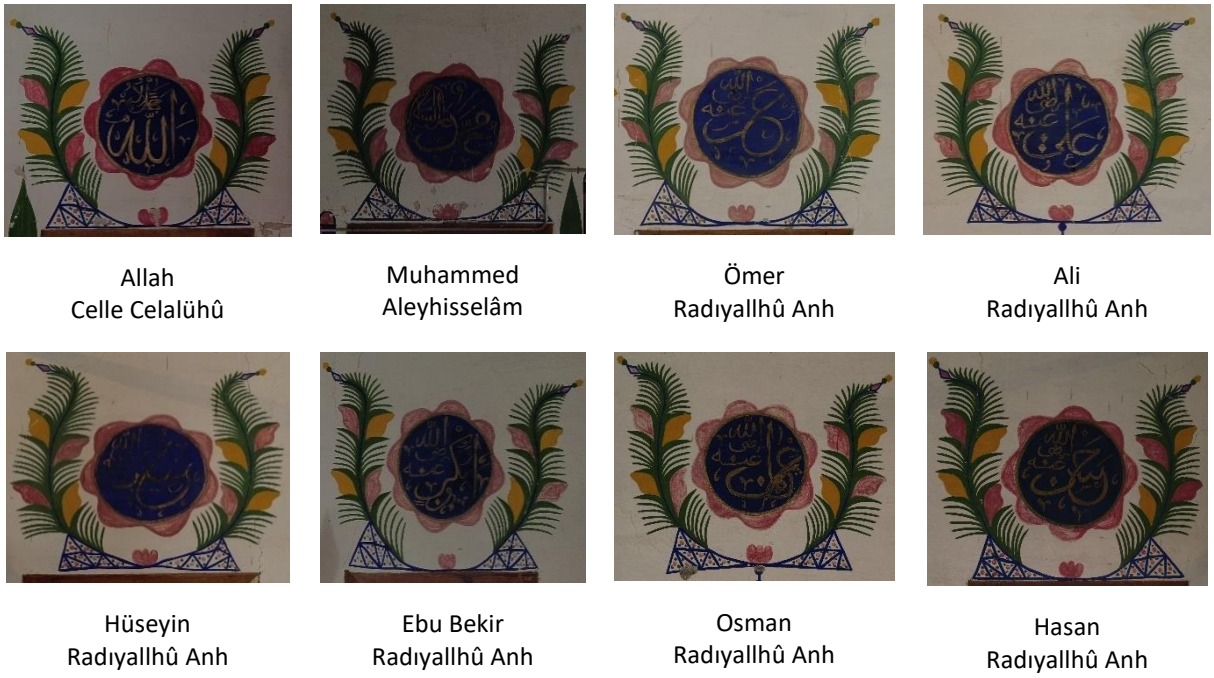
Güney duvarında bulunan son hat metni ise duvarın doğu tarafındadır. Bu kısımda resmedilen saatin üzerine, doğrudan duvar zeminine Arapça olarak *"Maşâallah"* ifadesi yazılmıştır (Şekil 14).

Caminin harim mekânına odadan girişi sağlayan iki kanatlı ahşap kapının üzerinde, harim tarafında, kapı genişliğiyle aynı ölçüde tarih bilgisi veren bir kitabe bulunmaktadır. Lâcivert zemin üzerine sarı renkle Arapça olarak yazılan kitabede *"Sene 1370"* ifadesi okunmaktadır (Şekil 15).



Şekil 15. Harim tarafında, giriş kapısının üzerinde yer alan kitabe.

Harim mekânında yazı içeren son örnekler ise hattatlar tarafından "Cami Takımı" olarak isimlendirilen, sekiz ismin yazılı olduğu grubu oluşturan örneklerdir. Tamamı aynı teknikte hazırlanan kompozisyonlarda tek fark, iç kısma yazılan isimlerdir. Yazılar, sekiz yapraklı bir penç motifinin lâciverte boyanmış zemini içine sarı renkli boya ile oluşturulmuştur (Şekil 16).




Şekil 16. Harim mekânındaki cami takımı yazıları

Yazı unsuru içeren çalışmaların hiç birisinde tarih, hattat ya da nakkaş bilgisine rastlanmamıştır.

**SONUÇ**:

Ovacık ilçesindeki köylerde yer alan geleneksel yapılar, mimari özellikleri, kullanılan malzemeler ve inşa yöntemleri bakımından dikkat çekici özgün örnekler sunmaktadır. Fakat, ekonomik durumlar, değişen yaşam biçimleri, kentleşme ve teknolojik gelişmeler ile hızla azalan nüfus gibi etkenler, bu yapıların günümüzde sürdürülebilirliklerinin sağlanmasını zorlaştırmaktadır (Çetin ve Mutlu, 2021b).

Kışla Köyü Camii, mimari özellikleri ve duvar resimleri ile hem geleneksel hem de yerel unsurları başarılı bir şekilde harmanlayan bir yapıdır. Cami, geleneksel Türk köy camilerinden mimari olarak ayrılmasa da iç mekân düzenlemeleri ve dekoratif unsurlarıyla özgün bir karakter kazanmıştır. Köy odası ile birleştirilmiş bir yapı olması, camiyi sadece ibadet yeri olmaktan çıkarıp köyün sosyal yaşamının bir merkezi haline getirmiştir. Bu, Osmanlı Dönemi'nden günümüze kadar gelen köy odası kavramının sürdürüldüğüne dair önemli bir göstergedir ve caminin topluluk içerisindeki sosyal işlevselliğini artırmaktadır.

Köy odalarının cami veya mescit ile bir arada planlanması Ovacık köy odalarında sıkça karşılaşılan bir tipoloji oluşturur. Bu tipin ilçenin kırsal yerleşimindeki örnekleri olarak; Alınca Köyü, Bölükören Köyü Ortaca Mahallesi, Sarılarsonya Köyü Sonya Mahallesi, Ahmetler Köyü Aydınlar Mahallesi ve Doğanlar Köyü Yiğitler Mahallesi'ndeki ibadet mekânı ile ortak fonksiyona sahip köy odaları gösterilebilir (Şekil 17). Bu ibadet alanları, kimi zaman daha tasarımın başlangıcında planlanmışken, bazı durumlarda ise işlevsel bir değişiklikle sonradan köy odasının bir bölümünün ibadet mekânına dönüştürülmesiyle oluşmuştur. Plan özellikleri itibarıyla değerlendirildiğinde, Kışla merkez köy odası, başından beri cami olarak tasarlanmış bir bölüme sahip olmasıyla bu uygulamanın dikkat çeken örneklerinden biridir (Mutlu, 2024: 8). İki katlı olarak inşa edilen bu yapıda, cami kısmı iki kat yüksekliğinde tutulmuş ve üst katla bağlantılı olan mahfil alanı kadınlara ayrılmıştır.

Caminin iç mekânını süsleyen duvar resimleri, yerel sanat anlayışı ve köy halkının tarihsel-kültürel mirasını yansıtan unsurlardır. Mimari, saat, bitkisel, duvar halısı, kılıç, perde ve sancak gibi nesnel betimlemelerle, resimlerle aynı tekniğin kullanılarak yazıldığı hat unsurları, duvar süslemesinin temalarını oluşturmaktadır. Bu temalardan kılıç, sancak gibi savaş unsurları, yerel kültürde kahramanlık ve tarih bilincinin bir sembolü olurken; saat ve halı motifleri ise günlük hayatın ve zamanın akışının

simgesel temsilleri olarak değerlendirilebilir. Bu resimler caminin ruhani atmosferine estetik ve anlam katarken, topluluğun geçmişini, değerlerini ve kimliğini de pekiştirdiği görülmektedir.




Şekil 17. Ovacık ilçesinde cami ve ibadet mekânının birlikte olduğu örnekler (Mutlu, 2024,16)

Duvar resimlerindeki hat levhaları ve dini metinler, İslam sanatında önemli bir yere sahip olup, caminin kutsal atmosferini derinleştirirken, aynı zamanda mekânda görsel ve manevi bir bütünlük sağlar. Bu anlamda Kışla Köyü Camii, sadece ibadet edilen bir mekân olmanın ötesinde, sanat ve inancın iç içe geçtiği, sosyal ve kültürel değerleri yücelten bir mimari örnektir.

Eserin harim mekânında, kıble duvarına resmedilmiş iki adet cami, mekânda kullanılan mimari süslemeleri temsil etmektedir. Kırsal mimaride camilerde görülen "cami resmi" konulu süslemeler, geleneksel Türk sanatının ve halk sanatının önemli bir parçasıdır. Bu süslemeler genellikle yerel ustaların, dini yapıları süsleme amacıyla geliştirdikleri teknikler ve estetik anlayışlar doğrultusunda yapılır. Özellikle Anadolu'daki köy camilerinde sıkça görülen bu tür süslemeler hem sanatsal hem de dini bir mesaj taşır. Bu cami resimli süslemeler, bölgenin doğal malzemeleri ve yerel estetik anlayışıyla uyum içinde yapılır. Köy camilerinde duvar resimlerinde kullanılan boya, genellikle doğal boyalar olup, işçilik basit ve sade olabilir. Bu süslemelerde cami motifleri genellikle minyatür tarzında, büyük bir sadelikle ve çoğu zaman da perspektif kaygısı güdülmeden çizilir. Caminin kubbeleri, minareleri ve genel mimari unsurları çok stilize edilmiş bir şekilde aktarılır. Gerçekçi detaylardan ziyade, sembolik anlam ön plandadır.

Cami resimleri, İslam'daki mekânsal kutsallığı vurgulamak için kullanılır. Bir mekânda cami motifinin bulunması, oranın kutsal bir alan olduğunu işaret eder. Ayrıca, cami süslemeleri cenneti ya da uhrevi dünyayı sembolize edecek şekilde tasarlanabilir. Camilerde tercih edilen tür resimler, halkın inancını görsel olarak yansıtmak ve cemaatin ibadet ederken kendini manevi bir atmosferde hissetmesini sağlamak amacı taşır. Bu bağlamda cami resimleriyle süslenmiş cami örneklerine kırsal ya da şehir ayrımı olmaksızın her bölgede rastlamak mümkündür. Öte yandan kırsal bölgelerdeki örneklerde karşılaşılan cami resimlerinde doğal olarak yerel ve halk sanatına özgü motiflerin yoğunluğu dikkat

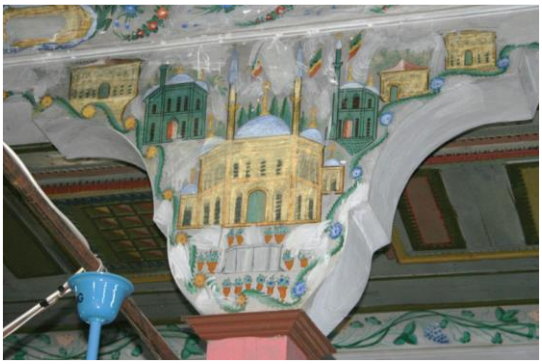
çeker. Örneğin, cami resimlerinin çevresinde bitkisel motifler, lale figürleri, geometrik desenler ya da hayali cennet bahçeleri yer alabilir. Bu süslemeler, caminin iç mekânını hem estetik açıdan zenginleştirir hem de halkın dini bilgilerini görselleştirir. Kışla Köyü Camii'nde kullanılan cami betimlemelerinin her ikisinin de yanlarında resmedilmiş olan servi ağaçları, bu bağlamda değerlendirilebilir.

Kırsal camilerdeki süslemeler genellikle profesyonel sanatçılardan ziyade köy halkı ya da yerel zanaatkârlar tarafından yapıldığından, bu örneklerde sanatın mükemmeliyetinden çok, samimiyet ve içtenlik ön plandadır. Resmedilen yapı çoğu zaman bilinen bir camiyi ya da o bölgenin tarihî camisini simgeleyen yapılar olur. Bununla beraber Kışla Köyü Camii'nde resmedilen iki adet caminin Türk sanatında hangi cami yapılarını simgelediği konusunda bir sonuca varmak mümkün olmamıştır.

Kırsal mimarideki cami resmi konulu süslemeler, bir yandan cami mekânını süslerken, diğer yandan dini ve kültürel değerlerin görsel bir anlatımını sunar. Bu süslemeler, köy halkının kolektif hafızasını, dini kimliğini ve yerel estetik anlayışını bir araya getirir. Sanatsal olarak incelendiğinde, bu resimler halk sanatı içinde önemli bir yere sahiptir ve kırsal mimaride cami mekânlarının estetiğini zenginleştirir. Anadolu'da caminin cami resimleri ile süslendiği çok sayıda örnek görmek mümkündür. Samsun, Bafra Ulu Camii'nin son cemaat mahallinde (19. yy) (Yetiş, 2018: 1001); Muğla Keyfoturağı Camii'nin (1870) harim güney duvarındaki pano üzerinde (Aydın, 2021: 9); Kütahya, Şaphane, Koca Seyfullah Camii'nin (1892) güney duvarında (Tercanlı, 2020: 385); Manisa, Kula, Emre Köyü Carullah Bin Süleyman Camii'nin (1547) mihrap duvarında (Ongan, Sayın ve Baysal, 2022: 432); Çorum, Mecitözü, Doğla Camii'nin (19. yy) hariminin doğu duvarında (Karaçay, 2021: 605); Manisa, Demirci Kışlak Eski Camii'nin (19. yy) hariminin batı duvarında (Eryılmaz ve Özgür Yıldız, 2020: 95); İzmir, Ödemiş, Lübbey Camii'nin (19. yy) mihrabının her iki yanında (Top ve Özbek, 2019: 250); Manisa, Turgutlu, Sinirli Köyü Camii'nin (1874-75) son cemaat mahallinde ve harim kemer köşeliklerinde (Katrancı Kasalı, 2019: 610, 613) olduğu gibi çok sayıda örnekte duvar resmi olarak yapılmış cami temalı süslemelere rastlamak mümkündür (Şekil 18).



Muğla Keyfoturağı Camii
(Aydın, 2021: 9)



Manisa, Turgutlu Sinirli Köyü Camii
(Katrancı Kasalı, 2019: 612)



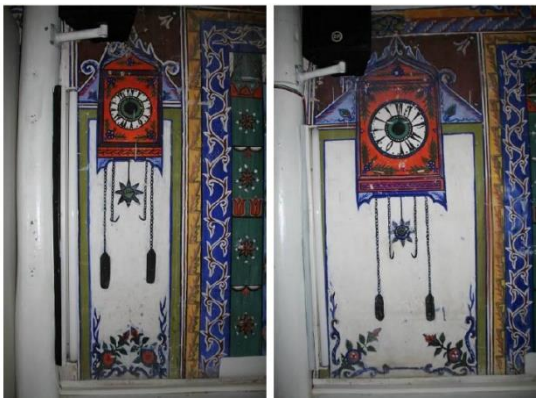
Manisa, Kula, Carullah bin Süleyman Camii
(Ongan, Sayın ve Baysal, 2022: 432)



Kütahya Koca Seyfullah Camii
(Karaçağ, 2021: 605)

Şekil 18. Anadolu'da cami temalı duvar resmi ile süslenmiş bazı camilerden örnekler

Kışla Camii'nde duvar resmi olarak kullanılan objelerden birisi de duvar saatidir. 18. yüzyılda yaygınlaşmaya başlayan saatler, 19. yüzyılda Osmanlı mimarisinde saat kuleleri aracılığıyla kendini göstermiş ve bu dönemde şehir merkezlerinde çok sayıda saat kulesi inşa edilmiştir (Acun, 2011: 7). Zamanla, saat kuleleri de duvar resimleri programına girmiş ve gerek şehir manzaralarında ve gerekse yapıların süslemelerinde sıkça rastlanan motifler haline gelmiştir (Çetinaslan ve Yavuzyılmaz, 2016: 322). Kışla Camii'nde resmedilen duvar saati, Kırşehir, Mucur'daki Emine Hanım (Çarşı) Camii'nde (1679-89) kullanılan duvar saatiyle (Tay, 2017: 700) büyük benzerlik göstermektedir. Yine bu süsleme türünün Türk sanatındaki örnekleri arasında Manisa, Demirci, Marmaracık Köyü Camii'nin (1811-12) hariminin güneydoğu duvarında (Koçer, 2024: 371) bulunan örneği saymak mümkündür (Şekil 19).



Kırşehir, Mucur Emine Hanım Camii
(Tay, 2017: 700)



Manisa, Demirci, Marmaracık Köyü Camii
(Koçer, 2024: 371)

Şekil 19. Cami süslemelerinde duvar saati temaları

Osmanlı camilerinde harim mekânının uygun yerlerine Allah, Muhammed, Ebubekir, Ömer, Osman, Ali, Hasan ve Hüseyin isimlerinin bulunduğu hüsn-i hat levhalarının asılması gelenek haline gelmiştir. Bu grup levhalara "Cami Takımı" adı verilmektedir (Berk, 2021: 463). Zaman içinde artık tüm camilerin neredeyse olmazsa olmaz süslemeleri haline gelen cami takımı, Kışla Camii'nde de bulunmaktadır. Taşınabilir bir levha şeklinde olabilen cami takımları, duvara resmedilerek de ifade edilebilir. Çalışmamıza konu olan caminin cami takımları, duvar resimlerinde kullanılan tekniklerle güney, doğu ve batı harim duvarlarının üst bölümlerine konumlandırılmıştır.

Kışla Camii'nde, sekiz adet ismin yer aldığı cami takımı, ihtiva ettikleri yazı ile hat sanatının konusu iken, kompozisyonlarını meydana getiren bitkisel unsurlarla da bitkisel süslemenin konusudurlar. Bu bağlamda yazıların etrafını çevreleyen sekiz kollu penç motifinin yanı sıra bu düzenlemeyi adeta kolları içine alan her iki taraftaki bitkisel süslemeler, yapraklı ve iki renkli meyveli olarak resmedilmiştir.

Kışla Köyü Camii'nin doğu duvarında da iki örnekle temsil edilen hurma ağacı, cami süslemelerinde çok karşılaşılan bitkisel süslemelerden birisidir. Kur'an-ı Kerim'de cennet bitkileri arasında sayıldığını bildiğimiz (Bozkurt, 1998: 392) ağaçlardan olan hurma ağacının resminin Anadolu'daki çok sayıdaki örneği temsilen Manisa, Demirci Küpeler Camii'nin (19. yy) harim kısmının güney duvarında (Gürbıyık, 2020: 155) ve Manisa, Kula, Emre Köyü Carullah Bin Süleyman Camii'nin (1547) mihrap duvarında (Ongan, Sayın ve Baysal, 2022: 435) karşılaşılan örnekler sayılabilir (Şekil 20).

Çiçek ve yaprak motifleri, camilerde yaygın kullanılan bitkisel süslemelerin başında gelir. Bunlar genellikle stilize edilerek cami kapıları, minber, mihrap ve sütunlar gibi yerlerde kullanılır. Gül, karanfil, sümbül gibi çiçeklerin motifleri, çini ve fresklerde de sıklıkla tercih edilir. Çalışmamıza konu olan Kışla Köyü Camii'nde bitkisel süsleme olarak karanfilin de kullanıldığı görülmektedir. Camide karanfil resmi, batı duvarı üzerine, minberin bulunduğu kısımda, tek renk olarak ve detaylarına girilmeden üçlü grup halinde resmedilmiştir.

Tarih boyunca savaşçı bir millet olarak bilinen Türklerde kılıç, kahramanlık ve güç sembolüdür. Türklerin İslam'ı kabulünden sonra da bu sembolizmi dini yapılarında devam ettirmişlerdir. Özellikle Osmanlı döneminde, fetih ve zafer kavramları camilerle birlikte anılır hale gelmiştir. Kışla Camii'nde kullanılan

iki kılıç figürünün bu anlamda değerlendirilmesi mümkündür. Caminin batı duvarına resmedilen halı desenlerinden birisinin üzerine Kur'an-ı Kerim'den Fetih Suresi'nin 1. ayeti olan ve *"Doğrusu biz sana apaçık bir fetih ihsan ettik"* anlamındaki *"inna fetahna leke fethan mübinâ"* ayeti ile birlikte değerlendirildiğinde milli duygulara hitap eden bu tür unsurların camide yaşatılması başka bir anlam kazanmaktadır.



Manisa, Demirci, Küpeler Camii
(Gürbıyık, 2020: 155)



Manisa, Kula, Emre Köyü Carullah Bin Süleyman Camii
(Ongan, Sayın ve Baysal, 2022: 435)

Şekil 20. Cami süslemelerinde hurma ağacı temaları

Kışla Köyü Camii, mimari yapısı ve duvar resimleriyle hem kültürel mirasın korunması hem de yerel sanatın yaşatılması açısından önemli bir örnektir. Yapının köy odası ile birleşik olması, camiyi bir ibadet mekânı olmanın yanı sıra bir sosyal toplanma alanı haline getirmiştir. Bu yönüyle cami, köy halkının günlük yaşamında önemli bir rol oynamış ve zaman içinde köyün kimliğinin bir parçası haline gelmiştir.

Duvar resimleri ise camiye estetik bir derinlik kazandırmanın ötesinde, tarihsel ve kültürel semboller aracılığıyla köyün geçmişine ışık tutmaktadır. Resimlerdeki unsurlar, köy halkının savaşlar, kahramanlık hikâyeleri ve geleneksel yaşamla olan bağını yansıtırken, dini metinler ve hat örnekleri ise caminin manevi atmosferini desteklemektedir.

Bu çalışmada ele alınan Kışla Köyü Camii, sanatla örülen mimarlık anlayışının somut bir örneği olarak değerlendirilebilir. Yapı, sadece dini bir mekân olmanın ötesinde, köyün tarihini, kültürel mirasını ve topluluk ruhunu yansıtan bir simge olarak köy halkı ve ziyaretçiler için derin bir anlam taşımaktadır. Bu yapı, geleneksel Türk mimarisi ve yerel sanatın uyumlu bir şekilde harmanlandığı, kültürel mirasın korunmasına ve yaşatılmasına katkıda bulunan önemli bir eser olarak gelecekte de değerini koruyacaktır.

***Etik Standartlara Uyum***

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***Etik Kurul İzni:*** *Bu çalışma için etik kurul iznine gerek yoktur. Buna ilişkin ıslak imzalı onam formu, makale süreç dosyasına eklenmiştir.*

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**EXTENDED SUMMARY:**

**Research Problem:**

Each example of vernacular architecture in different regions of Anatolia exhibits unique characteristics, incorporating distinctive technical and artistic elements. The aim of this study is to examine the architectural features and wall paintings of the Kışla Village Mosque in the Ovacık district of Karabük province and to contribute this analysis to the academic literature.

**Research Questions:**

How can the architectural and functional relationship between the village room adjacent to the mosque and the mosque itself be explained? What are the meanings, origins, and connections of the motifs used in the wall paintings with local art? Considering the lack of historical information about the structure and its decorations, how can a comparative analysis with similar examples contribute to addressing these questions? Finally, how can the importance of this mosque and similar rural structures in preserving cultural heritage be evaluated?

**Literature Review:**

Architectural studies conducted in the rural areas of Ovacık have unfortunately not yet found sufficient representation in the international literature. At the national level, architectural and artistic features have not been the subject of scientific research until the past few years. The study by Özköse and others (2018), which focuses on preserving ecological values through rural architecture, is significant as it represents the first architectural research in this area. One of the most comprehensive studies in the field is the work by Çetin (2019), which examines rural architectural structures in the village of Dudaş. In this study, Çetin thoroughly analyzes traditional houses. Similarly, the research conducted by Çetin and Mutlu (2021b), which investigates the architectural structures in the same village in terms of material usage, can also be considered one of the first studies on the region. A more recent study by Mutlu (2024), which examines and provides a typological classification of village rooms commonly found in the Ovacık district and its rural areas, has earned its place in the literature.

In addition, numerous studies focus on examples of vernacular architecture in different regions of Anatolia and their features in the context of wall paintings. Examples of such studies include Wall Paintings of Burhaniye Şahinler Village Mosque by Yıldırım (2013), Wall Paintings of Sinirli Village Mosque by Katrancı-Kasalı (2019), Two Mosques with Wall Paintings in Demirci, Manisa: Kışlak Old Mosque and Ahatlar Mosque by Eryılmaz and Özgür Yıldız (2020), Wall Paintings of Demirci Küpeler Village Mosque by Gürbıyık (2020), An Example of a Mosque Depiction in Kütahya: Koca Seyfullah Mosque by Tercanlı (2020), and The Mosques and Painted Decorations of Marmaracık-Köylüce-Kızılca

Villages (Demirci-Manisa) by Koçer (2024). These works represent studies conducted in various regions and on different structures, offering parallels to the current topic.

**Methodology:**

The mosque we identified in Kışla village, located in the Ovacık district, differs from similar examples due to its construction alongside a village room. Additionally, the fact that the prayer hall's walls are adorned with intriguing mural paintings necessitated a detailed study of the structure. In this context, a comprehensive literature review was conducted to determine whether the mosque had been previously examined in any scientific studies. As a result of our research, it was found that no prior studies had been conducted on the structure, and fieldwork was initiated. Initially, the building's plans were drawn based on on-site measurements, and the drawings were completed. Simultaneously, detailed photographic documentation of the structure was carried out, including both general and detailed shots. To document the murals located on the upper parts of the walls from a better perspective, drone photography was utilized. During the writing phase, a comparative analysis of the architectural and decorative features of the mosque was conducted, taking into account similar examples from Anatolia.

**Results and Conclusions:**

Numerous examples that embody the ancient culture of Anatolia have persisted for thousands of years. While artworks created in urban centers are easily valued due to their more generalized styles, rural examples often disappear without being identified, unable to withstand the ravages of time. Therefore, identifying and ensuring the sustainability of architectural and artistic works in rural areas is of great importance. The Kışla Village Mosque stands out as an exceptional example due to its architectural features and the mural paintings that adorn it.

From an architectural perspective, the construction of the mosque alongside a village room and the access to the mosque from this room is not a common practice in examples of village rooms across Anatolia. Access to both the men's section and the women's section on the first floor of the mosque is provided from the ground and first floors of the village room. Almost all the walls of the prayer hall are embellished with mural paintings, which include a variety of elements such as floral motifs, clocks, swords, carpets, and rugs. It is quite remarkable that such extensive decorations are found in a rural village mosque. There is no information available regarding the date of the decorations of this structure, which is believed to have been built in the early 19th century. Additionally, no artist's signature has been found on the paintings.

The mosque and its murals, which are the focus of this study, can be regarded as a concrete example of an architectural understanding woven with art. Beyond being merely a place of worship, this structure carries profound significance for the village community and visitors as a symbol that reflects the village's history, cultural heritage, and communal spirit. As an important work that harmoniously blends traditional Turkish architecture with local art, this mosque will continue to hold its value in contributing to the preservation and continuation of cultural heritage.

Millî Saraylar, Yıl: 2025, S: 29, s. 91-109

# YILDIZ SARAYI'NDA PENCERE PANJURLARI: OSMANLI SARAYINDA BİR MİMARİ DETAYIN ANALİZİ

**Abdülhamit Tüfekçioğlu*  Mehmet Mutlu****

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**Özet**

Bu çalışma, Yıldız Sarayı'nda yer alan pencere panjurlarını inceleyerek Osmanlı saray mimarisinde işlevsel ve estetik bir detay olarak panjurların kullanımını değerlendirmektedir. Makale, Büyük Mabeyn Köşkü, Çit Kasrı, Yaveran ve Bendegân Dairesi, Küçük Mabeyn Köşkü ile Harem Daireleri'ni kapsamaktadır. İncelenen panjurlar, ahşap malzemeden üretilmiş olup, sabit ve hareketli lamellerle farklı mekanik çözümler sunmaktadır. Panjur sistemleri, pencerelerin biçimine, büyüklüğüne ve bulundukları mekâna göre çeşitlilik göstermektedir; bazı panjurlar tamamen sabit, bazıları ise hareketli lameller aracılığıyla güneş ışığını kontrol etme, iç mekân mahremiyetini sağlama ve estetik görünümü destekleme işlevine sahiptir. Ayrıca panjurlarda menteşe, kanca ve metal destekleme elemanları gibi mekanik detaylar, yapının hem estetik hem de işlevsel bütünlüğünü desteklemektedir. Küçük Mabeyn Köşkü kış bahçesinde beyaz panjurlar kullanılarak iç mekânda ferah ve aydınlık bir atmosfer yaratılmıştır. Bu inceleme, Yıldız Sarayı'ndaki pencere panjurların tarihsel, teknik ve estetik değerini ortaya koymakta, Osmanlı saray mimarisindeki özgün cephe detaylarının korunması ve restorasyon çalışmalarının önemini vurgulamaktadır.

**Anahtar kelimeler:** Yıldız Sarayı, Osmanlı Saray Mimarisi, Pencere Panjurları, Ahşap Lameller, Hareketli Panjur, Sabit Panjur, Küçük Mabeyn Köşkü, Harem Daireleri, Tarihî Cephe Detayları

## WINDOW SHUTTERS IN YILDIZ PALACE: AN ANALYSIS OF AN ARCHITECTURAL DETAIL IN THE OTTOMAN COURT

**Abstract**

This study examines the window shutters of Yıldız Palace, evaluating their functional and aesthetic role as architectural elements in Ottoman palace architecture. The article covers the Büyük Mabeyn Pavilion, Çit Pavilion, Yaveran and Bendegân Apartments, Küçük Mabeyn Pavilion, and the Harem Apartments. The examined shutters are made of wood and feature various mechanical solutions through the use of fixed and movable louvres. The shutter systems vary according to the shape, size, and spatial context of the windows; while some shutters are completely fixed, others employ movable louvres to control sunlight, ensure interior privacy, and enhance visual aesthetics. Moreover, mechanical components such as hinges, hooks, and metal support elements contribute to both the functional and aesthetic integrity of the structures. In the winter garden of the Küçük Mabeyn Pavilion, white shutters were used to create a bright and spacious interior atmosphere. This study reveals the historical, technical, and aesthetic significance of the window shutters in Yıldız Palace and emphasizes the importance of preserving and restoring these unique façade details within Ottoman palace architecture.

**Keywords:** Yıldız Palace, Ottoman Palace Architecture, Window Shutters, Wooden Louvers, Operable Shutter, Fixed Shutter, Küçük Mabeyn Pavilion, Harem Apartments, Historic Façade Details

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## GİRİŞ

Yıldız Tepesi, eğimli bir arazi üzerine konumlanmış köşk ve kasırlardan oluşan geniş bir saray yerleşkesidir. Bu alanın bilinen ilk yapısı, III. Selim tarafından annesi Mihrişah Sultan adına inşa ettirilen bir kasırdır. Aynı dönemde, III. Selim'in babası III. Mustafa'nın anısına rokoko üslubunda bir çeşme de yaptırılmıştır. II. Mahmud döneminde, 1834-1835 yılları arasında tepe üzerinde yeni bir köşk inşa ettirilmiş, ancak bu yapı günümüze ulaşamamıştır. Sultan Abdülmecid, mevcut kasırları yıktırarak 1842 yılında annesi Bezmiâlem Vâlide Sultan için Kasr-ı Dilküşâ adıyla yeni bir köşk yaptırmıştır. Günümüzde "Vâlide Sultan Köşkü" olarak adlandırılan yapının, bu dönemde inşa edilen köşkle özdeş olduğu düşünülmektedir. Sultan Abdülaziz devrinde Yıldız Sarayı alanı genişlemiş; Büyük Mâbeyn Köşkü, Çit Kasrı, Malta Köşkü ve Çadır Köşkü gibi önemli yapılar eklenmiştir. II. Abdülhamid döneminde ise Yıldız Sarayı, imparatorluğun fiilî yönetim merkezi hâline gelmiştir. Padişahın Dolmabahçe Sarayı'ndan ayrılarak Yıldız'a taşınmasıyla birlikte yerleşke büyük ölçüde genişlemiş; bu süreçte Küçük Mâbeyn Köşkü, Câriyeler Dairesi, Kızlarağası Köşkü, Şâle Köşkü, Yıldız Camii, harem binaları, tiyatro binası, marangozhane, eczahane, tamirhane, kilithane, çini atölyesi, kütüphane ve çeşitli şehzade köşkleri inşa edilmiştir. Böylece Yıldız Sarayı, 19. yüzyılın son çeyreğinde Osmanlı başkentinin en kapsamlı saray komplekslerinden biri hâline gelmiştir.[1] Saray kompleksinin temelleri III. Selim tarafından atılmış ve II. Abdülhamit dönemine kadar sürekli gelişen ve büyüyen bir dinamik yapılaşma süreci yaşanmıştır. Buna bağlı olarak da sarayın mimari tarzdaki çeşitlilik kendiliğinden ortaya çıkmıştır.[2] II. Abdülhamit döneminde Yıldız Sarayı'nın uzun süre devletin yönetim merkezi olması, merkezi otoritenin II. Abdülhamid ile birlikte tekrardan güçlendirilme isteği ve buna bağlı olarak tüm yönetim kademesinin sarayın sınırları içerisine alınması, saraydaki mekân sayısını da artırmıştır.[3] II. Abdülhamid zamanında Küçük Mabeyn, Harem Binaları, Cariyeler Dairesi, Kızlarağası Köşkü, Şale Köşkü, Yıldız (Hamidiye) Camii, Tiyatro, Marangozhane, Eczahane, Tamirhane, Kilithane, Çini Atölyesi, Kütüphane ve Şehzadeler Köşkleri inşa edilerek bugünkü Saray kompleksi ortaya çıkmıştır. Ancak, Osmanlı döneminin son sarayı olma özelliğini taşıyan bu yapılar bütününde belli bir üslup birliği bulunmamaktadır.[4] Bu dönemle birlikte Yıldız Sarayı "Saray-ı Hümayun" olmuş ve imparatorluk 33 yıl süreyle buradan yönetilmiştir. Yaklaşık olarak 500.000m$^2$ alana hâkim kompleksin yapı çeşitliliği, planlaması ve yerleşim tertibi Topkapı Sarayı'nı anımsatmakla birlikte Türk saray mimarisinin son geleneksel uygulamasıdır.[5] Sarayın özellikle son dönem yapılarının inşasında Avrupa'da geliştirilen inşa teknikleri ve malzemelerin ciddi biçimde kullanıldığı görülmektedir.[6]

1 Bülent Bilgin, "Yıldız Sarayı", *TDV İslâm Ansiklopedisi*, Cilt 43, İstanbul: Türkiye Diyanet Vakfı Yayınları, 2013, 541.

2 Afife Batur, "Yıldız Sarayı", *Dünden Bugüne İstanbul Ansiklopedisi*, Cilt 7, İstanbul: Tarih Vakfı Yayınları, 1994, 521.

3 Halil Elemana, Devlet Arşivleri Başkanlığı Osmanlı Arşivi'nde (BOA) Bulunan Yıldız Sarayı İnşaatı, Tamiratı ve Tefrişatı ile İlgili Örnek Belgelerin Değerlendirilmesi. *Journal of Universal History Studies*, 4 (2), 229-250. DOI: 10.38000/juhis.1018997. Erişim 16.10.2025.

4 Bülent Bilgin, *Geçmişte Yıldız Sarayı*, İstanbul: Yıldız Sarayı Vakfı Yayınları, 1988, 14.

5 Feridun Akozan, "Tarih Boyunca Türk Sarayları-Milli Saraylar", *Milli Saraylar Sempozyumu Bildirileri*, İstanbul, 1985, 28.

6 Bilgin, *Türk Saray Mimarisi*, 51.

## MİMARİDE PENCERE PANJURLARI

Geleneksel duvarda "boşluk" kavramıyla tanımlanan pencere, yapının cephesinde dolu–boş, saydam–sağır karşıtlığını oluşturan; biyolojik ve psikolojik açıdan iç–dış ilişkisinin kurulmasında önemli rol oynayan temel bir elemandır. Cephedeki boşluğun boyutu, oranı, rengi ve ritmi, yüzeyi oluşturan diğer mimari unsurlarla kurduğu uyum doğrultusunda yapının genel görsel etkisini belirler. Bu bağlamda pencere yalnızca bir açıklık değil, aynı zamanda cephe estetiğini şekillendiren dinamik bir bileşendir.[7] Panjur ise, pencerenin dışına takılan, aynaları açılır-kapanı, dar yatay tahtalardan veya plastik parçalardan meydana getirilmiş kanattır.[8] Panjurlar, mimari cephe düzeninde hem işlevsel hem de estetik bir unsur olarak değerlendirilir. Geleneksel mimaride panjur malzemesi olarak özellikle ahşap malzeme tercih edilmiş, panjur kanatları menteşeler aracılığıyla açılır-kapanır biçimde tasarlanmıştır.

İşlevsel açıdan panjurlar, iç mekânın iklimsel konforunu koruma, güneş ışığını ve rüzgârı kontrol etme, mahremiyet sağlama ve güvenliği artırma gibi amaçlarla kullanılmıştır. Özellikle Akdeniz ve Anadolu iklim kuşaklarında, yoğun güneş ışığının iç mekâna doğrudan girmesini engelleyerek gölgelik etkisi yaratır; kış aylarında ise kapalı tutularak ısı kaybını azaltır. Ayrıca, panjurlar dış etkenlere karşı pencere doğramalarını koruyarak yapı ömrünün uzamasına katkı sağlar.

Panjurlar, estetik yönden ise cephe kompozisyonunda ritim, denge ve oran gibi mimari değerleri destekleyen elemanlardır. Panjur, geleneksel Osmanlı yapı elemanı olmayı, daha çok 19. yüzyıl sonu-20. yüzyıl modernleşmesiyle görülür. Özellikle Osmanlı ve erken Cumhuriyet dönemi sivil mimarisinde, panjurların formu, kanat düzeni ve yüzey süslemeleri yapının kimliğini yansıtan önemli detaylar arasında yer alır.

Günümüzde panjur kullanımı, çağdaş malzeme teknolojileriyle birlikte fonksiyonel güvenlik sistemlerine (örneğin metal panjur ve motorlu kepenk sistemleri) evrilmiş olsa da geleneksel mimarideki panjur anlayışı, koruma ve restorasyon çalışmalarında özgün cephe karakterinin önemli bir bileşeni olarak değerlendirilmektedir.

## YILDIZ SARAYI PENCERE PANJURLARI

Bu çalışmada, Yıldız Sarayı'nda yer alan pencere panjurları incelenmiştir. İnceleme kapsamına sarayın Büyük Mabeyn, Çit Kasrı, Yaveran ve Bendegân Dairesi, Küçük Mabeyn, Harem Daireleri (Baş Kadın Efendi, İkinci Kadın Efendi, Haznedar Usta ve Cariyeler bölümleri) ile Arabacılar Dairesi'nin Kütüphane bölümü dâhil edilmiştir. Buna karşılık, Hünkâr Dairesi, Sünnet Köşkü, Çukur Saray, Avagatlar (Ağalar) Dairesi, Opera Binası, Musahiban Dairesi, Gedikli Cariyeler Dairesi, Merasim (Şale) Köşkü, Arabacılar Dairesi ve Tamirhane-i Hümayun (Güzel Sanatlar Binası) bölümlerinde restorasyon çalışmaları sürdüğü için bu yapılar araştırma kapsamı dışında bırakılmıştır.

### Büyük Mabeyn Köşkü

Saray yerleşkesinin Saltanat kapısından girince hemen sol tarafta bulunan yapıdır. Büyük Mabeyn, Sultan Abdülaziz (1861-1876) zamanında yapılan imar çalışmalarında Çit Kasrı, Malta ve Çadır köşkleriyle birlikte inşa edilmiştir.[9] Eser, Sultan Abdülaziz tarafından 1866 yılında Balyan ailesi mimarlarına dinlenme köşkü olarak yaptırılmıştır. İki kattan meydana gelen kâgir köşk, Sultan II. Abdülhamid'in bazı resmi toplantılarını gerçekleştirdiği, davetler verdiği, resmî odasının da bulunduğu, yerleşke içindeki en büyük binadır.[10]

7 Nihal Uluengin, *Osmanlı-Türk Sivil Mimarisinde Pencere Açıklıklarının Gelişimi*, Doktora Tezi, İstanbul Devlet Güzel Sanatlar Akademisi, 1982.

8 Doğan Hasol, *Ansiklopedik Mimarlık Sözlüğü*, İstanbul: YEM Yayınları, 1990, 398; Metin Sözen, Uğur Tanyeli, *Sanat Kavram ve Terimleri Sözlüğü*, İstanbul: Remzi Kitabevi, 2017, 236.

9 *Bilgin, Türk Saray Mimarisi*, 1993, 50.

10 Yılmaz Öztuna, "İstanbul Yıldız Sarayı", *Hayat Saraylar İlavesi*. İstanbul. (Baskı Tarihi Yok), 42.

Cepheden görününüm



İç mekândan görünüm



**1** Büyük Mabeyn Köşkü'nün içinden ve dışından görünümler

Büyük Mabeyn Köşkü'nün cephesinde bulunan yoğun pencere düzenlemesinde, binaya girişin yapıldığı orta bölümdeki üçlü pencere düzenlemesinde tam kemerli pencereler kullanılmışken, yanlarda ise basık kemer formlu pencereler tercih edilmiştir. Cephede kullanılan çok sayıdaki büyük boyutlu pencere, köşkün içinin de aydınlık olmasını sağlamıştır. Tam kemer formlu orta bölümde yaklaşık 330 cm, basık kemer formlu bölümde ise yaklaşık 300 cm yüksekliğe sahip olan pencerelerin, kemer formu sebebiyle kavis alan üst kısımları sabit lamelli olarak ve iki bölümlü olarak yapılmıştır. Pencerelerin üstünde yer alan sabit panjurlar, tam kemerli pencerelerde yedi adet, basık kemerli pencerelerde ise üç adet lamelden (yatay ahşap elemandan) meydana gelmektedir. Pencerelerin dikdörtgen forma sahip bölümleri ise iki kanatlı panjurlardan meydana gelmektedir. Her bir kanat, alttaki bölüm üsttekine göre bir miktar kısa tutulacak şekilde düşeyde iki bölüm halinde düzenlenmiştir. Bu düzenlemede alttaki bölüm 15, üstteki bölüm ise 19 adet lamelden meydana gelmektedir.







**2** Büyük Mabeyn Köşkü pencere panjur sistemi

Panjurun en önemli bölümünü meydana getiren ahşap lamellerin makta kısımlarına ağaç vidası kullanılarak sac bir levha, sabitlenmiştir. Her iki bölümün de üzerinde yer aldığı panjur çerçevesi pencerelerin dış yanlarından üçer adet menteşe ile tutturulmuştur. Hareketli panjur kanatlarının alt kısımlarında, panjur kanadı açıldığında sabit kalmasını sağlayacak kanca sistemleri bulunmaktadır. Panjur kapalı durumdayken ise cepheye göre sağ tarafta bulunan kanadın üzerine sol taraftaki örtücü kanat gelmekte ve üste gelen kanatta bulunan mekanik sürgülü sistem el ile döndürülmek suretiyle kanatların kapalı vaziyetteyken sabit kalması sağlanmaktadır. İki kanatlı panjurlarda bindirme pervazı, cepheye göre sol taraftaki kanatta bulunmaktadır.

Büyük Mabeyn Köşkü pencere panjurlarının bir diğer özelliği de düşeyde her bir kanadın açılır/kapanır olmasının yanı sıra, her kanatta bulunan ikili düzenlemede, alt bölümde yer alan düzenlemenin aynı zamanda ikinci bir çerçeve ile kanat üzerinde düşeyde de açılıp kapanacak bir sisteme sahip olmasıdır. Bu amaçla bir çerçeveye yerleştirilmiş bulunan panjurlar, ortadan bir kayıtla iki bölüme ayrılan hareketli kanata üstten ikişer adet menteşe ile sabitlenerek hareket özelliği kazandırılmıştır. Dışa doğru açılan bu alt kısım, yanda bulunan kanca sistemi ile açık kalması istendiği zaman sabitlenirken, altında bulunan küçük bir vida düğme ile kullanılmadığı durumlarda kapalı olarak kalması sağlanmıştır.

Panjuru meydana getiren lameller, yanlardan panjur çerçevesine tek bir bağlayıcı eleman ile tutturulmuştur. Muhtemelen ahşap kavela ile yapılan bu bağlantı ile panjuru meydana getiren lamellerin eksenleri etrafında hareket etmesi ile genişleyen ve daralan ara boşluklardan içeriye güneşin girmesi ya da ihtiyaç duyulan zamanlarda mahremiyet açısından tamamen kapatılması mümkün hale gelmektedir. Çok sayıdan parçadan meydana gelen bu lamellerin açılarını aynı anda ayarlayabilmek amacıyla orta kısımlarında düşey bir ahşap öge kullanılmıştır. Bu ahşap parça lamellere birisi kendi üzerinde, diğeri de karşıdaki elemanda olacak şekilde birbirinin içinden geçen iki adet yuvarlak halka ile bağlanmış ve bu mafsallı sistem ile rijitlik ortadan kaldırılarak sisteme hareket özelliği kazandırılmıştır. Böylece hareketli lamellerin bu sistem sayesinde pratik olarak ayarlanması ya da açılıp kapatılması sağlanmıştır.

Çerçeveler köşelerde birbirlerine zıvanalı köşe birleştirme tekniği kullanılarak oluşturulmuştur. Bunun yanı sıra, çerçevelerin daha stabil hale gelmesini sağlamak için köşelerde L şekilli sac lamaların kullanıldığı görülmektedir. Lama demirlerine her iki kol üzerinde ikişer delik açılmış ve bu deliklerden yıldız başlı ağaç vidaları kullanılmak suretiyle yatay ve düşey çerçeve elemanları güçlendirilmiştir. Ahşap malzemelerin birleştirilmesinde vidalar vazgeçilmez bir gereç olma özelliğini günümüzde de sürdürmektedir.[11] Lama ile güçlendirme uygulamaları, pencerelerin içten estetik görünümünü bozmaması amacıyla dıştan yapılmıştır.

Vidaların icadı çok öncelere dayanmaktadır. Mekaniğin kurucusu sayılan Tarentum Archytas'ın, M.Ö. 400'ler civarında günümüzün vazgeçilmezi vidayı icat ettiği bilinmektedir. Bununla beraber günümüzde kullanılan dişli vidalar, imalatı zor olduğu için ancak 17. yüzyıldan sonra yavaş yavaş yaygınlaşma göstermiştir.[12] Yıldız Sarayı Büyük Mabeyn Köşkü'nün inşa edildiği dönemde ağaç vidaları artık kullanılmaya başlamış olmakla birlikte, köşkün pencere panjurlarında tespit edilen ve metal lamalarla birlikte kullanılan bu vidaların, üzerlerinde yer alan şirket bilgilerinden anlaşıldığı üzere, özgün imalata ait olmadıkları; daha çok yakın dönem restorasyonlarında eklenmiş elemanlar oldukları görülmektedir.

**Çit Kasrı**

Çit Kasrı, Büyük Mabeyn'in sağ tarafında bulunmakta olup, birbirinin içinden geçilen odalardan meydana gelen tek katlı bir yapıdır. Kasır, Sultan Abdülaziz (1861-1876) zamanında yapılan yapılaşma çalışmalarında Büyük Mabeyn, Malta ve Çadır köşkleriyle birlikte inşa edilmiştir.[13]



**3** Çit Kasrı'nın cephesinden görünüm

Çit Kasrı'nın ön cephesinde giriş kapısı ve pencereleri düz lentolu tepelikli ve dikdörtgen formludur. 120 cm genişliğe sahip bu cephedeki pencereler 240 cm yüksekliğindedir. Bu cepheye bakan pencereler, ikişer kanatlı ve her bir kanadı düşeyde üçlü düzenlemeye sahip özellikte inşa edilmiştir. İçte bulunan pencere kanatları ile dışta bulunan panjurların arasında yatay parmaklıklar yer almaktadır. Düşeyde üç bölümlü olarak düzenlenen pencerelerin en üstte bulunan kısmın yüksekliği, alttaki kısımlara göre daha az tutulmuş ve bu kısım sabit kasalı olarak düşünülmüştür. Altta ikişer bölümden meydana gelen çift kanatlı bölümde kanatlar içeriye doğru açılmaktadır.

11 Kubulay, Çağatay, Hasan, Efe, Erol, Burdurlu, H. İsmail, Kesik, "Bazı Ağaç Malzemelerin Vida Tutma Mukavemetlerinin Belirlenmesi", *Kastamonu Üniversitesi Orman Fakültesi Dergisi*, 12 (2), (2012), 321-328, Erişim 19.10.2025.

12 https://atlasvida.com/vidanin-tarihcesi/ (16.10.2025)

13 Bilgin, *Türk Saray Mimarisi*, 50.



**4** Çit Kasrı'nın ön cephesinde panjur düzenlemeleri ve detaylar

Pencerelerin tamamı pencerenin sabit kanatlı kısımlarını da örtecek biçimde uzun panjurlarla donatılmıştır. Panjurlar, pencerelere uyumlu olarak düşeydeki üçlü düzenlemeye göre, pencerelerin yatay kayıtlarını karşılayacak şekilde üç bölümden oluşan düzenleme özelliği göstermekte olup dışa açılmaktadır. Bu düzenlemede, pencere formuna uygun şekilde en üsteki bölüm daha kısa iken, alttaki bölümler ise daha uzun tutulmuştur. Üsteki kısa bölümde yedi adet lamel bulunmaktayken, ortadaki bölüm 13 ve en alttaki bölüm ise 11 adet lamelden meydana gelmektedir. Çit Kasrı'nın panjur sisteminde kullanılan lameller Büyük Mabeyn Köşkü örneğine göre farklılık arz etmektedir. Burada ahşap lamellerin makta kısımlarında metal koruyucu sac bulunmamaktadır. Lamellerin dışarıya bakan tarafları Büyük Mabeyn Köşkü'nde düz bırakılmışken, Çit Kasrı'nda ise dışarıya bakan kısımlarının üst bölümleri dairesel formda profillendirilmiştir. Panjurlar, her iki yanda bulunan panjur kasana üçer adet menteşe ile sabitlenmiştir.

Çit Kasrı'nın ön cephesinde kullanılan panjur sistemi, Büyük Mabeyn Köşkü'nün panjur sistemiyle aynıdır. Her iki taraftaki panjur kanadı açık tutulmak istendiğinde kasanın alt kısmındaki yatay çerçeve ögesinde bulunan kancanın ucu, panjurun alt kasasında bulunan kanca yuvasına takılarak sabitlenmektedir.

**Yaveran ve Bendegân Dairesi**

Yaveran ve Bendegân Dairesi sarayın birinci avlusunda, Valide Sultan kapısının girişinde tam karşıda bulunmaktadır. Yapı, sıra odalardan meydana gelmektedir. Yaverlerin yanı sıra telgrafhane ve şifrehanenin bulunduğu yapı Art Nouveau stilinde inşa edilmiş olup, mimarı da Sultan II. Abdülhamid'in baş mimarı Raimondo D'Aronco'dur.[14] Yapı, iki katlı olarak inşa edilmiştir.

Yaveran ve Bendegân Dairesi'nin birinci avluya bakan cephesinde çok sayıda pencere yer almaktadır. Her iki kattaki pencereler tek kanatlıdır ve düşey doğrultuda iki bölüme ayrılmıştır. Alt bölüm, yukarı doğru hareket edebilen bir giyotin pencere sistemiyle açılacak biçimde tasarlanmıştır. Tüm pencerelerde çift kanatlı panjur bulunmakla beraber, panjurlar pencerelerin alttan itibaren yaklaşık 2/3'lük kısmını kapatacak yüksekliktedir.





**5** Yaveran ve Bendegân Dairesi'nin cephe görünümleri

Yaveran ve Bendegân Dairesi'nin panjur düzeni, yukarıda açıklanan Büyük Mabeyn Köşkü ve Çit Kasrı'ndaki örneklere kıyasla oldukça sade bir biçimde tasarlanmıştır. Yapıda yer yer kullanılan dar pencerelerde tek kanatlı panjurlar tercih edilirken, daha geniş açıklıklara sahip pencerelerde çift kanatlı panjurlar uygulanmıştır. Hem zemin katta hem de birinci katta bulunan panjurlar 22 lamelden oluşmaktadır. Lameller, panjur çerçevesinin her iki yanında yer alan düşey elemanlara açılmış eğik kanallara sabitlenmiş olduğundan, önceki örneklerde görüldüğü gibi açılarının değiştirilebilmesine olanak tanıyan bir hareket mekanizmasına sahip değildir.





**6** Yaveran ve Bendegân Dairesi'nin panjurlarından genel ve detay görünümler

14 Bilgin, *Türk Saray Mimarisi*, 52.

Yaveran ve Bendegân Dairesi'nin pencere panjurları, çerçeve düzenlemeleri bakımından da önceki örneklerden farklılık göstermektedir. Daha önce incelenen iki yapıda panjurlar dikdörtgen bir çerçeve içinde tasarlanmışken, bu yapıda çerçevenin düşey elemanları, her iki tarafta da üst yatay elemanı bir miktar aşacak şekilde uzatılmıştır. Bu uzantılar profilli biçimde şekillendirilerek panjurlarda hareket ve estetik bir dinamizm etkisi oluşturulmak istenmiştir. Çerçeveyi meydana getiren dikey ve yatay ögelerin birleştiği köşelerde ahşap geçmelerin haricinde diğer örneklerde de olduğu gibi L şekilli metal levhalar kullanılmış ve bu levhaların her iki koluna açılan ikişer deliğe sabitlenen ağaç vidalarıyla çerçeve sisteminin sağlamlaştırılması sağlanmıştır.

Panjurlar, pencere kasasına düşey doğrultuda ikişer menteşe ile sabitlenmiştir. Bindirme pervazı, sağ taraftaki panjur kanadında yer almaktadır. Panjurların açık konumda sabit kalmasını sağlamak için, alt çerçevelerinin iç yüzeylerinin dışa yakın kısımlarına metal halkalar monte edilmiştir. Pencere denizliklerine yerleştirilen kancaların bu halkalara takılmasıyla, panjurların açık durumda sabitlenmesini sağlayan bir sistem oluşturulmuştur.

**Küçük Mabeyn Köşkü**

Küçük Mabeyn Köşkü, ikinci avluya geçiş yapılan kısımda, sağ tarafta bulunmaktadır. Bu köşkü Sultan II. Abdülhamid kendisi için 1900 yılında özel olarak yaptırmıştır.[15] Köşkün mimarıyla ilgili kesin bir bilgi bulunmazken, eserin baş mimar Raimondo D'Aronco tarafından yapıldığı tahmin edilmektedir.[16] İki katlı kâgir yapı, tavanlarını süsleyen ince kalem işleri ve özellikle Boğaz manzaralarını betimleyen resimleriyle dikkat çekmektedir. Küçük Mabeyn Köşkü, II. Abdülhamid'in çalışma, yemek, dinlenme, kabul ve yatak odalarının bulunduğu özel ikametgâhı olarak düzenlenmiştir. Köşkün Türkiye Cumhuriyeti tarihi açısından da bir hatırası bulunmaktadır. Sultan II. Abdülhamid'in tahttan indirilmesinin ardından Osmanlının idare merkezi yeniden Dolmabahçe Sarayı'na taşınmış olsa da son dönem padişahlarından VI. Mehmed Vahdettin zaman zaman bu köşkü kullanmaya devam etmiştir. Atatürk, 15 Mayıs 1919 tarihinde üçüncü Kolordu Müfettişi olarak Samsun'a hareket etmeden önce Sultan Vahdettin ile yaptığı görüşmeyi bu binanın üst katındaki büyük salonda gerçekleştirmiştir.[17]



**7** Küçük Mabeyn Köşkü'nün genel görünümü

15 Haluk Şehsuvaroğlu, *İstanbul Sarayları*, İstanbul: İstanbul Kapadokya Kitabevi Yayınları, 1954, 27.

16 Bilgin, *Türk Saray Mimarisi*, 54.

17 Haluk Şehsuvaroğlu, *Tarihi Odalar*, İstanbul: İnkılâp Yayınevi, 1954, 135.

Küçük Mabeyn Köşkü'nün alt kat pencerelerini en dışta düşey demir parmaklıklar kapatmaktadır. Parmaklıkların köşelere gelen kısımları geometrik olarak düzenlenmiş, orta bölümlerine ise dairesel süslemeler yerleştirilmiştir. Yaklaşık 120x310 cm ölçülerindeki alt kat pencerelerinin 220 cm'lik kısmı açılır-kapanır olarak düzenlenmişken, üstte kalan yaklaşık 90 cm'lik kısım ise sabit tutulmuştur. Pencereyi ince 4 adet dikey kanattan meydana gelen panjurlar kapatmaktadır. Bu kanatlardan dışta bulunanlar her iki yana beşer adet menteşe ile sabitlenmiştir. Ortada bulunan panjur kanatları ise yine menteşelerle kasaya sabitlenmiş olan kanatlara bağlanmıştır. Bu şekilde panjurların pencerenin dışında bulunan parmaklık dolayısıyla dış kısma açılamama sorunu çözülmüştür.

Küçük Mabeyn Köşkü'nün alt katında bulunan panjurlar, düşeyde üç bölüme ayrılmıştır. Alt bölüm 21, orta bölüm 17 ve üst bölüm ise 18 lameldan meydana gelmektedir. Alt bölümde bulunan lameller iç orta kısımlarında dikey konumda bulunan metal parçaya hareketli mafsallarla bağlanmış ve bu şekilde düşey çubuk üzerinde bulunan tutma koluyla aşağı yukarı hareket ettirilerek lamellerin açılarının değiştirilebilmesi sağlanmıştır.

Köşkün alt katının arka cephesinde yer alan pencereler, ön cephedeki pencerelere göre biraz daha büyük olup 160x315 cm ölçülerindedir. Ön cephedeki pencerelerde olduğu gibi bu pencerelerde de parmaklıklı bir düzenleme uygulanmış, ancak panjur kanatlarının sayısında farklılık görülmüştür.



**8** Küçük Mabeyn Köşkü'nün zemin kat penceresinin genel görünümü ve ön ve arka cepheden panjur detayları

Bu cephede pencereleri kapatan panjurlar altı kanattan oluşmakta ve her iki tarafta üçer kanat olacak şekilde 3+3 olarak simetrik biçimde düzenlenmiştir. Diğer özellikleri bakımından ön cepheyle benzer olan bu panjur sisteminde, üçlü kanat düzenlemesinin pencere kasası ile parmaklık arasında kalan boşluğun gerektirdiği bir çözüm olarak tasarlandığı anlaşılmaktadır.

Köşkün üst katındaki pencereler, alt kattakilerden farklı olarak parmaklık kullanılmadan inşa edilmiştir. Buna karşın, panjur sistemi alt kat pencerelerinde uygulanan sistemle tamamen aynıdır. Her iki katta bulunan panjur kanatları yanlardan beşer menteşe ile sabitlenmiştir. Özgün sistemde bütün lameller hareketli olduğu halde, günümüzde alttan 20 lamel hareketli özellikteyken, üzerinde bulunan lameller ise sabitlenmiştir.

İki kattan meydana gelen Küçük Mabeyn Köşkü'nün üst katında Art Nouveau akımının süsleme özelliklerini gösteren kış bahçesi bulunmaktadır.





**9** Küçük Mabeyn Köşkü'nün arka cephesinden ve kış bahçesinden görünüm

İki kattan meydana gelen Küçük Mabeyn Köşkü'nün üst katında Art Nouveau akımının süsleme özelliklerini gösteren kış bahçesi bulunmaktadır. Cephesi her yönden pencerelerle çevrili bulunan kış bahçesinin tüm pencereleri panjurlu olarak yapılmıştır. Pencereler 165 cm yüksekliğindeyken genişliklerde küçük farklar olmakla beraber ortalama 40 cm'dir. Kış bahçesinde bulunan pencerelerden bazıları tek kanatlı iken, çoğunluğu ise çift kanatlı olarak yapılmıştır. Dört kanatlı pencereler de bulunmakla beraber bu pencereler ortadaki iki kanadı hareketli olacak şekilde çift kanatlı pencere gibi düzenlenmiştir.

Kış bahçesindeki pencere panjurları, tek çerçeve bölümünden oluşmakta olup her biri 26 adet lamelden meydana gelmektedir. Lameller, yanlarda yer alan panjur çerçevelerine sabitlenmiştir. Sağ taraftaki panjur kanadı bindirme çıtalı olup kapatıldığında kilitlenmesini sağlayan bir kulp sistemine sahiptir. Kanatların alt kısmında, yatay çerçeve elemanının üzerinde bir kanca demiri bulunmaktadır. Bu kanca, kullanılmadığı zamanlarda aynı çerçeve üzerindeki kanca yuvasına takılarak sabitlenmektedir. Panjur kanadının açık konumda kalması istendiğinde ise kanca yuvasından çıkarılarak pencere kasasının altındaki yatay ögedeki yuvaya takılmış ve böylece panjur kanadı sabitlenmiştir.

Yıldız Sarayı'ndaki yapıların panjurları genellikle hâkî renkte iken, Küçük Mabeyn Köşkü'nün kış bahçesinde kullanılan panjurların beyaz renkte olduğu görülmektedir. Bu tercih, panjurlar kapalı durumda olsa bile kış bahçesinin iç mekânında aydınlık ve ferah bir atmosferin oluşmasını sağlamaktadır.

Küçük Mabeyn Köşkü'nde bulunan panjurlar günümüzde de özgün biçimleriyle varlığını sürdürmektedir.



**10** Küçük Mabeyn Köşkü'nün kış bahçesinde bulunan panjurlardan genel ve detay görünüm

**Harem Dairesi**

Çalışmamızda Yıldız Sarayı'nın Harem Dairesi'nin yapı gruplarından, Baş Kadın Efendi, Hazinedar Usta ve Cariyeler dairelerinin panjur sistemleri incelenmiştir. Harem Dairesi'ni meydana getiren yapılar, II. Abdülhamit zamanında inşa edilmiştir. Yapılar birbirlerine dar ve basit koridorlarla bağlanmıştır. İki katlı olan bu yapı grupları, bağdadi tekniğiyle inşa edilmiştir.

Baş Kadın Efendi Dairesi'nin 105x255 cm ölçülerindeki pencereleri, üst kısmı basık kemer formunda tasarlanmıştır. Bu bölümde kullanılan panjur sistemi, sarayın diğer bölümlerindekinden tamamen farklıdır. Düşeyde ikiye bölünmüş çift kanatlı pencereye uygun biçimde, panjur çerçevesi de iki bölümden oluşturulmuştur. Her bir çerçevenin içine yerleştirilen 19 adet lamel, çerçevenin orta ve yan elemanlarına açılan kanallara sabitlenerek sabit lamelli bir panjur sistemi meydana getirilmiştir.




**11** Harem Dairesi'nin farklı bölümlerinden cephe görünümleri

Pencerelerin yalnızca bir kanadı açılır özelliktedir. Geniş ve dışa doğru taşkın pencere kasalarının dış yüzeyine dikey kanallar açılmış, panjur kanadı ise bu kanalların içine yerleştirilmiştir. Tek parça hâlinde düzenlenen panjur kanadı, yukarı ve aşağı yönde hareket eden bir giyotin pencere sistemiyle çalışmaktadır. Yaklaşık 1 metre yüksekliğindeki panjur, yukarı kaldırıldığında sabit kalabilmesi için kasanın yan taraflarına yerleştirilen kilitleme mekanizmalarıyla tutulmaktadır.

Baş Kadın Efendi Dairesi'nin pencere panjurları yakın zamanda tamamen yenilenmiştir.





**12** Baş Kadın Efendi Dairesi'nin pencere sistemi ve panjur düzenlemesi

Haznedar Usta (Kalfa) ve Cariyeler Dairesi'nin pencere panjurları, sarayın diğer bölümlerindekilerden farklı olarak kendine özgü bir düzenlemeye sahiptir. 155x220 cm ölçülerindeki pencere yüzeyini tamamen kaplayacak biçimde tasarlanan panjur, düşeyde ikiye, yatayda ise üçe bölünerek altı bölümlü bir kompozisyon oluşturmuştur.

Üst bölümde yer alan panjur çerçevesi sabit durumdadır. Ancak bu bölümde, her iki tarafta yedişer lamelden oluşan elemanlar açıları ayarlanabilir biçimde hareketli olarak düzenlenmiştir. Alt kısımda yer alan dört bölüm ise düşey doğrultuda açılıp kapanabilen iki kanat şeklinde tasarlanmıştır. Her bir kanat yatayda iki eşit parçaya ayrılmış olup, bu parçaların her biri 11 lamelden oluşmaktadır. Hareketli panjur kanatları, yanlardaki kasalara üçer adet menteşe ile sabitlenmiştir.



**13** Haznedar Usta (Kalfa) (solda) ve Cariyeler (sağda) dairelerinin cephe görünümleri

Yapılarda bulunan panjur düzenlemeleri günümüzde sabit lamel olarak işlev görmektedir. Ancak alt taraftaki panjur bölümünde yer alan lamellerin ortasında bulunan, hareketli mafsallarla lamellere tutturulmuş olan hareket sisteminden, lamellerin önceden hareketli sisteme sahip iken, sonradan sabit sisteme dönüştürüldüğünü göstermektedir.

Haznedar Usta (Kalfa) ve Cariyeler dairelerinin pencere düzenlemelerinde bir başka dikkat çeken husus da bu pencerelerde kullanılan parmaklıklardır. Çit Kasrı'nda pencere ve panjur arasında, Küçük Mabeyn Köşkü'nde ise panjurun dışında yer alan parmaklıklar, pencerenin tamamını kaplamaktayken, Haznedar Usta (Kalfa) ve Cariyeler dairelerinin pencerelerinde bulunan parmaklıklar pencerelerin alttan yaklaşık 60 cm'lik bir kısmında bulunmaktadır. Düşey ve yatay metal çubukların arasına yerleştirilen iki farklı çaptaki çemberlerden meydana gelen parmaklıklar, Çit Kasrı örneğinde olduğu gibi pencere kanadı ile panjurun arasında yer almaktadır.





**14** Haznedar Usta (Kalfa) Dairesi'nin ve pencere panjurunun içten ve dıştan görünümü

## DEĞERLENDİRME VE SONUÇ

Yıldız Sarayı'nda incelenen pencere panjurları, Osmanlı saray mimarisinde işlevsellik, estetik ve teknik titizliğin bir arada ele alındığı, özgün bir detay mimarisini gözler önüne sermektedir. Sarayın farklı bölümlerinde kullanılan panjur sistemleri, yapıların konumu, kullanım amacı ve dönemin mimari anlayışı doğrultusunda çeşitlilik göstermektedir. Büyük Mabeyn Köşkü, Çit Kasrı, Yaveran ve Bendegân Dairesi, Küçük Mabeyn Köşkü ve Harem Daireleri'nde gözlemlenen örnekler, bu çeşitliliğin hem tasarım hem de işlev açısından nasıl biçimlendiğini ortaya koymaktadır. Büyük Mabeyn Köşkü'nde yer alan panjurlar, çok parçalı ve hareketli lamelli bir yapıya sahiptir. Bu sistem, iç mekânın ışık, hava ve mahremiyet koşullarını kontrol etmeye olanak sağlayarak hem fonksiyonel hem de estetik bir çözüm sunmaktadır. Lamellerin menteşe, bindirme pervazı ve kanca sistemleri ile donatılması, dönemin malzeme ve işçilik anlayışının yüksek bir düzeyde uygulandığını göstermektedir. Hareketli lamellerin birbirine geçmeli mafsallı sistemle bağlanması, lamellerin eksenleri etrafında hareket etmesini mümkün kılarak ışık kontrolü ve mahremiyet açısından esnek bir kullanım imkânı sunmaktadır. Ayrıca çerçeve birleşimlerinde zıvanalı köşe tekniklerinin uygulanması ve köşelerde L şekilli metal levhaların kullanımı, yapının yapısal sağlamlığını desteklemektedir. Bu özellikler, Büyük Mabeyn Köşkü'nün cephe kompozisyonunda ritim ve dengeyi sağlayan teknik bir zekâyı ortaya koymaktadır.

Çit Kasrı'nda ise panjurlar, Büyük Mabeyn Köşkü'ne kıyasla daha sade bir düzenlemeye sahiptir. Cephedeki pencereler ikişer kanatlı olup, her kanat düşeyde üç bölüme ayrılmıştır. Üstteki kısa bölüm sabit kasalı olarak tasarlanmış, alttaki iki bölüm ise açılır şekilde düzenlenmiştir. Lamellerin üst yüzeyleri dairesel profillendirilmiş ve dışa doğru açılabilme özelliği ile kullanıcıya estetik ve işlevsel bir kullanım imkânı sunulmuştur. Pencerelerin her iki yanında bulunan kasalara üçer adet menteşe ile tutturulmuş olan panjur kanatları, dışa doğru açılabilmekte ve kanca sistemleri ile açık konumda sabitlenebilmektedir. Çit Kasrı örneği, Büyük Mabeyn Köşkü'ndeki daha karmaşık mekanizmaların aksine, sade fakat işlevsel bir çözüm sunarak sarayda farklı yapı tipleri için çeşitlilik gösteren panjur sistemlerinin kullanımını ortaya koymaktadır.

Yaveran ve Bendegân Dairesi'ndeki panjurlar, önceki örneklerden farklı olarak tek kanatlıdır ve düşey doğrultuda iki bölüme ayrılmıştır. Alt bölüm, giyotin pencere sistemi ile açılabilirken, üst bölüm sabit olarak bırakılmıştır. Lamellerin sabitlenmiş olması, önceki örneklerde görülen hareket mekanizmasının sınırlanması anlamına gelmektedir. Bu durum, yapının estetik dinamizmi ile işlevsellik arasındaki tercihi yansıtmaktadır. Ayrıca panjur çerçevelerinin dikey elemanlarının üst yatay elemanı aşacak şekilde uzatılması, profilli biçimde şekillendirilerek, cephe kompozisyonuna görsel bir hareket kazandırmakta ve panjurların estetik değerini artırmaktadır. Panjurların menteşelerle sabitlenmesi ve bindirme pervazı ile kanca sistemlerinin uygulanması, işlevsel güvenliği destekleyen detayların önemini göstermektedir. Bu örnek, sarayda farklı yapı gruplarının kullanım amacına göre panjurların tasarımında esneklik ve çeşitlilik sağlandığını göstermesi bakımından önemlidir.

Küçük Mabeyn Köşkü ve Harem Daireleri'ndeki panjur sistemleri, hareketli ve sabit lamellerin birlikte kullanıldığı, son derece dikkatli bir tasarım anlayışını ortaya koymaktadır. Baş Kadın Efendi Dairesi'nde basık kemerli pencerelerde kullanılan sabit lamelli panjurlar, yapıların iç mekânlarını ışık ve mahremiyet açısından kontrol etme amacına hizmet etmektedir. Haznedar Usta ve Cariyeler Daireleri'nde ise panjurlar alt bölümde hareketli lamellere sahip olup kullanıcıya daha fazla esneklik sunmaktadır. Bu sistemlerin sonradan sabit hale getirilmiş olması, yapının tarihî süreç içinde geçirdiği değişimleri ve restorasyon müdahalelerini göstermektedir. Parmaklık uygulamaları, yapılar arasında farklılık göstererek, güvenlik ve estetik kaygıların panjur tasarımına nasıl yansıtıldığını ortaya koymaktadır. Küçük Mabeyn Köşkü kış bahçesinde kullanılan beyaz renkli panjurlar, kapalı durumda olsalar bile mekâna ferahlık ve aydınlık kazandırarak kullanıcı konforunu ön plana çıkarmaktadır.

Kış bahçesinin cephelerini çevreleyen panjurlar, tek veya çift kanatlı olarak tasarlanmış, lameller hareketli sistemlerle donatılmıştır. Bu düzenleme, Art Nouveau akımının süsleme ve fonksiyonellik anlayışıyla bütünleşen bir estetik çözüm sunmaktadır.

Yıldız Sarayı panjurları, Osmanlı saray mimarisinde hem estetik hem de teknik açıdan yüksek bir titizlik ve işçilik düzeyini göstermektedir. Farklı yapı gruplarında kullanılan panjur tipleri, hareket mekanizmaları ve malzeme uygulamaları, saray yaşamının gereksinimlerini ve padişah ile saray mensuplarının kullanım alışkanlıklarını anlamak açısından önemli bilgiler sunmaktadır. Hareketli ve sabit lamelli sistemlerin bir arada kullanımı, ışık kontrolü, mahremiyet, güvenlik ve estetik kaygıların bütüncül olarak ele alındığını ortaya koymaktadır. Bunun yanı sıra lamellerin menteşe, kanca ve mafsallı mekanizmalarla donatılması, işlevselliği destekleyen teknik bir zekâyı göstermektedir. Ahşap lamellerin makta kısımlarına vidalar ve metal levhalar ile yapılan bağlantılar, cephe estetiğini bozmadan yapının dayanıklılığını artırmaktadır. Bu durum, Osmanlı saray mimarisinde hem malzeme seçimi hem de işçilik kalitesine verilen önemi vurgulamaktadır.

Yıldız Sarayı'ndaki pencere panjurları, yapının mekânsal ve estetik kimliğinin önemli bir parçası olarak değerlendirilebilir. Cephelerdeki ritim, denge ve oran, panjurların tasarımıyla doğrudan ilişkili olup, farklı bölümlerde kullanılan sistemler sarayın tarihî süreç içindeki gelişimini ve dönemin mimari tercihlerini yansıtmaktadır. Hareketli lameller, ışık kontrolü ve mahremiyet açısından kullanıcıya esneklik sağlarken, sabit lameller ve parmaklık sistemleri güvenlik ve yapısal bütünlüğü desteklemektedir. Böylece Yıldız Sarayı, Osmanlı saray mimarisinin son dönemlerinde estetik ve işlevin dengeli bir biçimde bir araya getirildiği seçkin örneklerden biri olarak öne çıkmaktadır.

Sonuç olarak, Yıldız Sarayı'ndaki pencere panjurları yalnızca işlevsel bir eleman değil, aynı zamanda yapının kimliğini ve saray yaşamının sosyal, kültürel ve teknik dinamiklerini yansıtan özgün bir mimari detaydır. İncelenen örnekler, farklı yapı gruplarındaki panjurların kullanım amacına göre çeşitlendiğini ve her sistemin hem estetik hem de teknik açıdan titizlikle tasarlandığını göstermektedir. Hareketli ve sabit lamelli sistemlerin bir arada kullanılması, ışık ve hava kontrolünden mahremiyetin korunmasına, estetik bütünlükten yapı dayanıklılığına kadar pek çok amaca hizmet eden bütüncül bir yaklaşımı ortaya koymaktadır. Bu bağlamda, çalışmada ortaya konan sistematik inceleme, panjurların özgün niteliklerinin korunmasına yönelik restorasyon ve koruma çalışmalarına önemli bir temel sunmakta, Osmanlı saray mimarisinin son dönemlerinde detaylara verilen önemi ve teknik ustalığı anlamak açısından değerli bilgiler sağlamaktadır. Yıldız Sarayı panjurları, mimari detay anlayışı ve işlevselliği bir arada sunan nadir örnekler olarak hem tarihî hem de kültürel miras açısından büyük önem taşımaktadır.

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# Integrating the New with the Old: Transformations of the Değirmenbaşı Street in the City of Safranbolu in Türkiye

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## Abstract

Türkiye is a country rich with heritage. Among numerous cities with such heritage, Safranbolu, stands out. In such cities, new constructions are expected to be integrated into the historic texture of the older parts, with an approach to produce independent 'new' in harmony with the old. Often, new buildings come into being as a result of population growth, economic progress, and land prices. The modern fast build-and-sell system also adds to these pressures. Undeniably, the new buildings play a major role in invading the cities with modern construction materials and the destruction of the green areas leading monotony and sameness that did not exist in the past. In fact, Safranbolu suffers from these new developments. It has not received sufficient attention to the protection of the historical environments. Indeed, it is giving way to the construction of new buildings with different materials and systems, both on empty parcels, and demolishes the existing old buildings. In this context, this paper examines the Bağlar Region houses in Safranbolu.

It employs a case study approach looking into one of the streets: the Değirmenbaşı Street. Data is collected through on-site observations, photographic documentation, and archival research. The paper reveals the different façade characteristics of the old and the new houses of Değirmenbaşı Street and to what extend they either integrate with each other or not. Thus, it maps out the extent to which the character of the city has changed. It concludes that the constructions in the Bağlar district are not harmonious to each other except their building order, floor number, and maximum height. The re-constructed houses have led to the degeneration of the city. It argues that the historical environments should be conserved, adapting to the existing conditions and henceforth. This requires that planning authorities must recognize the importance of the past of the city for establishing its urban identity.

**Keywords:** Bağlar Region of Safranbolu, houses, façade characteristics, Turkey.

## Introduction

Today, cities contain both the reality of survival and renewal together in it. Especially, historical environments have lost their functions and have become almost unrecognizable. Some old structures have been demolished as a result of socio-cultural and economic changes, and the new buildings that have come up are devoid of aesthetic values.In fact, they are foreign to their environment. They have been built in place of them. In this way, the historical buildings have increasingly lost their influence in the built environment. This transformation nourishes conflicts between the old and the new buildings that produce several complexities, threatening the visibility of historical values and their continuity. Increasingly, the disappearance of familiar building - sespecially in visual sense - causes cultural estrangement that influences negatively on both cities and urbanites. This issue is associated with a planning mentality based on the market economy. According to the visual form reflected to space of consumption, almost all cities look like each other.

In this regard, the study examines the ways in which the new is integrated with the old in the Bağlar district in Safranbolu city of Karabük province. This district is located within the urban conservation area (since 27 November 1990). It also reflects the physical and social identity of the city, and demonstrates the alterations and transformations in its physical space.

Therefore, the study aims to expose modified architectural formation of the Bağlar Region, particularly Değirmenbaşı Street.. Its objctives are as follows.

- To establish existing architectural façade characteristics of both the old and new buildings
- To determine similarities and differences between the old and the new structures in historical environments

## Theoretical Framework

### Concepts of Cultural Heritage and Historic Environment

Since the mid-twentieth century, the concept of “heritage” has undergone a profound transformation following the destructive impacts of the Second World War on cities and the subsequent loss of urban identity. During this period, it became evident that cultural heritage was not limited solely to monumental structures but also encompassed ordinary buildings, settlements, and urban fabrics. This understanding was first internationally recognized through the 1964 Venice Charter, which expanded the notion of heritage from a focus on the “monument” to include the broader dimensions of “site” and “place” (Alici, 2021). The broadening of this definition enabled the built environment to be perceived as an integrated whole and has established conservation as a collective responsibility (Assi, 2000).

This perspective reveals that today, the concept of “historic environment” should be evaluated not only in terms of physical protection but also in the context of social, cultural, and spatial continuity. The historic environment can be defined as a cultural heritage area where identity, memory, and ways of life carried over from the past periods to the present are embodied.

### New Constructions within the Historical Environments: An Approach in the Light of ICOMOS Charters

The design of new buildings within historical environments is regarded as an act that must be conducted in accordance with international conservation principles, respecting identity, scale, and intrinsic values of the existing urban fabric. The 1964 Venice Charter of ICOMOS emphasizes that any new construction should be designed “in a harmonious relationship with the historic setting in terms of form, scale, proportion, and material expression.” According to this principle, new architecture should not imitate the historical fabric, but rather establish a respectful dialogue with it, responding to contemporary needs without compromising the

authenticity of the context. In this way, the new structure becomes both a product of its own time and a contributor to the continuity of the environment in which it is situated.

These principles have been further elaborated at the urban scale in the 1987 Washington Charter (Charter for the Conservation of Historic Towns and Urban Areas), which underlines that new constructions should not damage the spatial integrity or the silhouette of historic towns. Here, the focus is not merely on formal compatibility but on the relationship established with the cultural context. A new building should support historical continuity through its sensitivity to urban memory, patterns of use, circulation systems, and the configuration of open spaces.

The Burra Charter (Australia ICOMOS, 1999) extends this perspective by introducing a value-based approach to conservation, emphasizing that preservation encompasses not only physical heritage but also its meanings and social values. Accordingly, any new design should respond to 'spirit of place' by considering the emotional, social, and symbolic dimensions that the environment embodies. Similarly, the Nara Document on Authenticity (1994) asserts that authenticity should be sought not solely in materials but also in the forms, functions, techniques, and environmental contexts. Consequently, new buildings are understood not as mere additions, but as contemporary interpretations of historical continuity, contributing to the ongoing narrative of the built environment.

**The Relationship Between Historical Environment and Cultural Heritage**

Rapoport (1969; 1982) defines architecture not merely as a physical process of production but as a form of cultural expression. Every settlement, according to him, is shaped by the value systems, lifestyles, and beliefs of the society that produces it. Therefore, the 'historical environment' can be understood as a materialized cultural text that embodies the social order and cultural behavior patterns of the past. In this context, not only the formal characteristics of these environments but also the social norms and systems of meaning that generated them are essential components that must be preserved. Consequently, cultural heritage should not be viewed solely as the survival of the physical fabric, but rather as the continuity of meaning that it conveys (Rapoport, 1969; 1982).

In his seminal work 'The Meaning of the Built Environment,' Rapoport (1982) emphasizes that people perceive and experience space not primarily through its formal qualities but through symbolic and semantic relationships. Within this framework, the historical environment becomes more than an aesthetic or technical entity—it is a carrier of collective identity and cultural memory. The historical value of a place is thus determined not only by its age but by the persistence of its meanings; once this continuity is broken, the essence of cultural heritage is lost, even if the physical form remains intact.

Through the "culture–meaning–architecture" triad, he developed in the 2000s, Rapoport provides a theoretical framework for contemporary interventions within historical contexts. The design of new buildings, he argues, should not imitate historical forms but instead comprehend and reinterpret their underlying cultural logic within the present context. True contextual sensitivity in architecture arises not only from physical compatibility but from the ability to regenerate meaning (Rapoport, 2000). Thus, the preservation of the historical environment lies not in the replication of its forms, but in the capacity to sustain and reinterpret its meanings in the contemporary settings.

**A Conceptual Evaluation of New Architectural Designs within the Historical Fabric**

Zeren (2010) perceives the historical environment not merely as a physical assemblage of buildings, but as a holistic organism that embodies cultural identity. In this sense, the façades, stylistic characteristics, and organically evolved street patterns layered over time represent a spatial memory that has developed naturally throughout history. Therefore, each building constitutes a historical datum that defines the identity of its surrounding environment.

At this point, the concept of "context" in architecture gains particular importance. Capon (1999) identifies context as comprising both physical and cultural dimensions, while Güleç (2011) defines physical context as "the spatial characteristics of a place" and cultural

context as "the identity of the users for whom the design is produced." Anderson (2014) further argues that by integrating topography, climate, orientation, material, and local lifestyles into the design process, it becomes possible to develop an authentic and environmentally compatible architectural language.

Designing new structures within historical environments requires from the architect not only formal proficiency but also interpretive competence. In this regard, Akbıyık (2013) emphasizes that the design process necessitates a holistic understanding of both physical and cultural factors, and that new buildings should be integrated into the life cycle of the historical environments. Through such integrations, the new structure becomes an element accepted by its surroundings and contributes to the continuity of the place.

Moreover, Kılıç (2015) argues that there is no single formula for designing within a historical fabric, as each design is shaped by the specific conditions and cultural dynamics of its context. Hence, the question of how new constructions should be articulated in terms of forms, materials, techniques, and styles remains a central issue in contemporary architectural discourse. For designers, the critical dilemma lies in whether a new building should replicate the existing fabric or be conceived as a contemporary interpretation that connects to the historical environment (Kılıç, 2015; Ateş Can & Uyguralp, 2022).

These discussions generally converge into two primary approaches: the approach of harmony/similarity and the approach of contrast/opposition. The former prioritizes formal coherence and historical continuity, while the latter seeks to establish a critical dialogue between the past and contemporary architecture. Indeed, both these provide the theoretical framework for this study.

## Review of Literature

Academic studies conducted on Safranbolu have addressed the multilayered historical structure, cultural heritage, and spatial transformation processes of the city from diverse perspectives. Although these studies predominantly focus on the *Çukur* (*Eski Çarşı*) district, they collectively provide significant insights into understanding the relationship between the historical environment and the new architectural interventions across the entire city.

Selvinaz Gülçin Bozkurt's (2022) analyzes the Çukur (Eski Çarşı) area through cultural landscape criteria such as aesthetic, identity, social, historical, artistic, and scientific values. The study systematically reveals the impacts of urbanization on cultural heritage and emphasizes the necessity of developing conservation, planning, and sustainability oriented strategies to prevent the deterioration of the cultural identity of Safranbolu, its social cohesion, and artistic values.

Adding to this, Oral (2019) examines the relationship between modern architecture and historical identity in Safranbolu. Through a morphological, typological, and aesthetic analysis of contemporary residential and public buildings, Oral argues that the pursuit of "visual harmony" in historical settings often remains superficial, as the symbolic and identity dimensions of traditional architecture tend to be neglected in modern design practices.

Moreover, Kartal and Dinçer (2023) investigate the formal harmony between the old and new houses in the *Babasultan* neighborhood using a three-dimensional fractal analysis method. Supported by quantitative data, they demonstrate that new buildings achieve a high degree of formal and proportional compatibility with the historic fabric, and that fractal analysis provides an effective and objective tool for measuring such harmony.

Similarly, Yetiş, Turcan, and Dinçer (2021) explore the spatial development of the city from the 14$^{th}$ century to the present. Their findings show how the morphogenetic structure of Safranbolu has been shaped by conservation plans and how new urban planning policies have influenced its historic texture. Indeed, they conclude that the city has developed a dynamic balance between the efforts to preserve its traditional fabric and the pressures of new construction, influenced by industrialization, population growth, and evolving planning approaches.

Collectively, these studies provide a multi-dimensional theoretical foundation for understanding the historical environment of Safranbolu, offering crucial insights into the

formal, semantic, and spatial compatibility of new architectural designs within the historic fabric. However, since literature has largely concentrated on the *Eski Çarşı (Çukur)* district, the Bağlar region's ongoing transformations require further academic investigation to achieve a more comprehensive understanding of the contemporary urban dynamics of Safranbolu.

## Research Methods

This study employs a case study approach looking into one of the streets: the Değirmenbaşı Street. Data is collected through the following data gathering techniques.

- Examination of the archives of relevant institutions
- On-site observations
- Photographic documentation of the street character and buildings

Following conceptual research and a comprehensive review of the related literature, information about the study area was collected. Within this scope, the construction dates and registration data of the residential buildings located along the street studied were obtained in 2012 from the Safranbolu Municipality Archive and the Safranbolu Land Registry Office Archive. In 2012, interviews were conducted with the users of the recently constructed houses to obtain information about their construction years.

Field observations were carried out on multiple occasions in 2012 and 2025, allowing for both macro-scale analysis of the surrounding urban fabric and micro-scale examination of individual buildings and their components. Visiting the area at different times made it possible to directly observe the physical changes and development of new constructions over time. During these field studies, both the overall street character and the individual buildings were photographed by the authors.

In addition, in 2025, measurements of the residential buildings and their immediate surroundings along the street were taken, and based on these data, a comprehensive digital street silhouette was drawn. Utilizing both the field data and archival sources, individual façade analysis tables were prepared for each residential building on the street. The template used for these tables was adapted from the doctoral dissertation of the corresponding author Süheyla Birlik's titled *"Tarihi Çevrelerde Kentsel Kimlik Değişiminin Eşik Analizi: Trabzon'da Bir Deneme"* (*Threshold Analysis of Change in Urban Identity in the Historical Environments: A Case Study in Trabzon*) (Birlik, 2006).

## The Case Study

Safranbolu, located in the Western Black Sea Region of Türkiye, is a district of Karabük (Fig. 1). Safranbolu's known history descends to the B.C. 3000 years. The name of the region in antiquity period was Paphlagonia. People living here descendng from the prehistoric period were Kaskians, Paphlagonians, Grecians, Romans, and Byzantines. With the people beginning to settle in Anatolia of the Seljuks, Safranbolu was ruled by Principalities of Çobanoğulları and Candaroğulları. According to Gönenç (1994), Padishah Yıldırım Beyazıt added the region to the Ottoman territory in 1392.

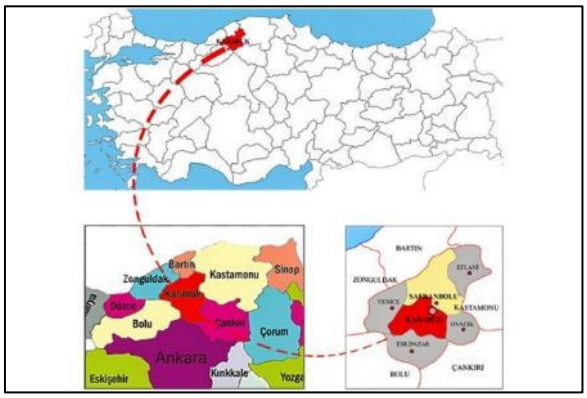



**Fig. 1**: The location of Safranbolu.
Source: Maps obtained from http://cografyaharita.com/ (August, 2025) revised by the authors.

According to Emecen (2003), the present formation of the city has come into being during the Ottoman period. It deserves its actual reputation from its houses. In fact, the houses are perfect samples of old civil architecture, reflecting the Turkish social life of the 18th and 19th centuries. Another important factor was its strategic position, because Safranbolu was an important stopping place on the Kastamonu-Gerede-Istanbul part of the Silk Road (trade route). In this way, Safranbolu was included in the 'List of World Inheritance' by UNESCO (United Nations Educational, Scientific and Cultural Organization) at the end of 1994 and became a world city because of its success in preservation of its heritage as a whole (Safranbolu Tourism Office, 1995).

Safranbolu consists of three traditional distinct districts: Çarşı, Bağlar, Kıranköy (Fig. 2 and Fig. 3). The Çarşı district (Eski Çarşı/old town) is in a valley hollowed out and shaped by the Akçasu and Gümüş streams. It has once been a center for commerce, and here, the Muslim population was living in the winter. The Bağlar district (orchard) is situated on a gentle slope inclining towards the city. It served once as a summer residential area when the people wanted to escape from the scorching heat in the valley and enjoy the wealth of fruits of the months from May to October. The Kıranköy district or the new town is situated over the cliff that forms the Western boundary of the valley. It has been occupied by the non-Muslims until their compulsory immigration in 1923.

The Turkish population settled here later.

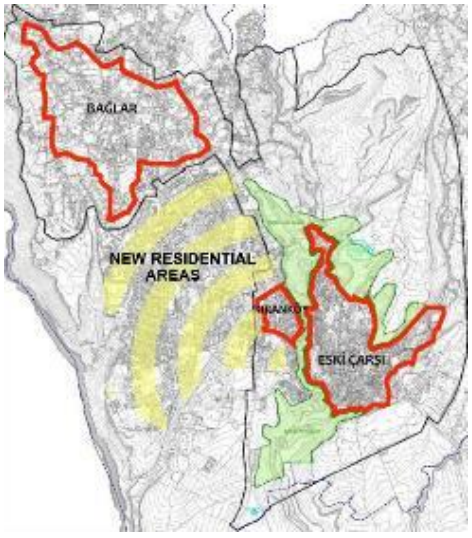



**Fig. 2**: Location of traditional settlement areas in Safranbolu (Eski Çarşı, Kıranköy, Bağlar).
Source: Ecemiş Kılıç & Türkoğlu, 2015.



**Fig. 3**: Çarşı district, Bağlar district, and Kıranköy district.
Source: Safranbolu, 2012; Safranbolu Municipality Archive, 2012.

In the first zoning plan of Safranbolu in 1936, areas surrounding the historical centers were opened for development, anticipating that the establishment of the iron and steel factory in nearby Karabük would generate a new housing demand (Yetiş et al., 2018). As a result of the construction of the factory, the Bağlar district became a primary location for new residential developments (Ongun, 1936). The jury report of the 1968 zoning plan, which was prepared through a design competition, emphasize that the new residential areas were planned without damaging the fabric of the old town, reflecting a design approach based on the principles of preservation (Bankası, 1968). One of the most significant contributions of the plan was its promotion of cooperative housing production (Çabuk et al., 2016).

After 1975, apartment blocks built through housing cooperatives have begun to appear along both sides of Sadri Artunç Avenue, located between the Kıranköy and Bağlar districts. Over time, this area has become the new urban center of Safranbolu (Yetiş et al., 2018). In the 1990 Conservation Zoning Plan, the Bağlar district has been designated as a development area (Okyay, 1990). Up until 2010, new buildings constructed around the historical centers displayed façades that aimed to resemble traditional architecture. However, due to their apartment-scale massing and building heights, these structures have negatively affected the urban silhouette (Yetiş, 2016). In 2010, a new zoning plan was approved that included the urban conservation areas (Çarşı, Kıranköy, and Bağlar) and their buffer transition zones. Since then, the city has experienced rapid expansion and densification. The plan also intervened in the existing built character established by the previous plan, particularly in terms of building height, levels of eaves, and mass proportions. Over time, the development between and around the historic zones has produced a new urban texture, leading to a transformation in the cultural landscape of the city.

Adding to these, the opening of new university faculties in recent years has significantly increased the number of students in Safranbolu, contributing further to the acceleration of new constructions. With a population approaching 70,000, this rapid urban growth has placed increasing pressure on the historical environment, often resulting in new urban images that are incompatible with the traditional fabric. As a city renowned for its tourism, Safranbolu has also undergone spatial transformations driven by tourism activities. However, such transformations are concentrated mainly in the Eski Çarşı (Çukur) district, while the Bağlar district has been comparatively less affected.

Değirmenbaşı Street is one of the key access axes within the Bağlar district. The main vehicular routes connecting the Safranbolu city center converge onto this street, making it a highly active public space with intensive vehicular and pedestrian movement. The public transportation line of the city also passes through here. As a result, Değirmenbaşı Street is one of the most prominent locations where the historic fabric of Bağlar is most perceptible. These characteristics have been influential in defining the study area.

On both sides of the street, traditional houses are situated. One side features large cultural landscape gardens and a few registered heritage buildings, while the other side includes a higher density of housing, comprising both historic and newly constructed structures. The coexistence of old and new buildings, and the visible contrast between authenticity and transformation, make this section particularly suitable as a representative study area for analyzing the interactions between the traditional and contemporary architectural layers of Safranbolu (Fig 4).



**Fig. 4**: Layout of Değirmenbaşı Street.
Source: Revised and updated by the authors based on Google Earth imagery (August, 2025).

## Findings

### General

Today, the Safranbolu houses are determined mainly by the topography (no house prevents the view of another), narrow cobbled streets, gardens separated from the street with rough stone walls. Large double wing doors leading to the yard and sometimes directly into the house. Door knockers, and wooden cages called 'gliste' allow light to come inside and help dry out the fire-wood which is stacked behind it at the same time, hayat (paved hall at the entrance/at the first floor), huge furnaces, cellars, stables, haylofts, and stairs demonstrate the best examples of wood-craft. A central hall called 'sofa' (the main access place; the living room where daily activities took place), rooms, wooden cupboards and shelves, sedir or divan in front of the windows, gusülhane (small bathroom inside the wooden cupboard called 'yüklük'), ceilings with wooden ornaments add to these. The narrow and long windows have their numbers change according to the size of the room. Wooden shutters and cages called 'muşabak', as well as bay windows (the outward surge of the main walls on the façade) and hipped roofs covered with mission tiles produce an adorable character.

In fact, they all come together to form an incomparable architectural aesthetics (Fig. 5). The ground floors of the houses, which are made of stone, form at the same time, the basis of the buildings. They are generally windowless. The other floors consist of half-timber frames. The middle floor has a low ceiling. In this floor, there is a kitchen. The daily life usually passes at the mid-floor. The top floor has a great number of windows and its façades are go-go because of the bay windows. The ceiling here is higher and the rooms are used as the bedrooms.



**Fig. 5**: Traditional Safranbolu houses.
Source: Author Birlik, 2012.

When the summer arrives, the inhabitants of Safranbolu, having spent the winter months within the valley, settle to the plateau above. Interestingly, the economic prosperity of the town has made it possible for its inhabitants to own a second house (Gülersoy, 1997). Thus, the areas with vineyards and orchards have been turned into summer residence areas and hence the Bağlar district has developed (Günay,1999).

The Bağlar district is situated in the North-West of the winter district on a gentle slope facing the South. The houses are within large gardens, and they have an infrequent settlement pattern. The topography here is not as interesting as in the Çarşı district. However, the roads winding among the gardens give the impression that you are walking in a very large part of the

city. In fact, there are always many surprises. Nevertheless, in reality, the total distance is only 1500 m. (Günay,1999). Today, the Bağlar district, blended with green, wood, and stone, demonstrates the new constructions in addition to its old houses. Therefore, its identity has partly changed (Fig. 6).



**Fig. 6**: The Bağlar district.
Source: Safranbolu Municipality Archive, 2012.

## Façade Characteristics of Değirmenbaşı Street

In this study, seven consecutively aligned houses located on Değirmenbaşı Street in the Bağlar district of Safranbolu (sheet no: 106.110.E, block no: 54, plots no: 6–10–11–12–13–14–15) were analyzed (Fig. 7). For each of these buildings, a detailed table was prepared presenting the specific characteristics of their façades (Tables 1–7). These tables include information on the registration status, building names, addresses, materials, and spatial attributes, as well as all the façade components categorized under the main headings such as forms, horizontal and vertical bands, entrance configurations, and bay windows (oriels).



**Fig. 7**: Değirmenbaşı Street.
Source: Author, Birlik; 2012.

**Table 1**: Façade Characteristics of Gökçüoğlu Mansion (2012)

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BUILDING NUMBER 1** | **inventory number** | | | 916 | | | | | | | |
| | **name** | | | **GÖKÇÜOĞLU MANSION** (Astaş Turizm Metal S.) | | | | | | | |
| | **address** | | | Bağlarbaşı District Değirmenbaşı Street No:13 | | | | | | | |
| | **material** | | | rough stone+timber frame filled in with adobe | | | | | | | |
| **settlement features** | **street** | | | less inclined | | | | | | | |
| | **location** | | | on the street+in the garden | | | | | | | |
| | **building order** | | | detached | | | | | | | |
| **shape features** | **floor number** | | | partial basement+ground+2 floor | **entrances** | building entry | location | | on the right side of the building | | |
| | **maximum height** | | | 3 floor | | | form | | square/double leaf | | |
| | **texture** | | | stone+plaster | | | mater. | leaf | timber | | |
| | **windows** | ground floor | form | - | | | | jamb | timber | | |
| | | | proportion | - | | | above of ent. | | cantilever+canopy (later added) | | |
| | | | jamb material | - | | garden entry | location | | - | | |
| | | | array | - | | | form | | - | | |
| | | first floor | form | square, arched square, rectangle | | | leaf material | | - | | |
| | | | proportion | 1, ⅔ | | | above of ent. | | - | | |
| | | | jamb material | timber | **cantilevers** | number | | | 2 | | |
| | | | array | asymmetric on the façade | | type | | | bay window | | |
| | | second floor | form | rectangle, arched rectangle | | locati. | at the street | | on the street | | |
| | | | proportion | ⅔-½, ~⅓ | | | on the build. | | on the left and right side of the building | | |
| | | | jamb material | timber | | size | | | in the room width | | |
| | | | array | ~symmetric on the façade | | form | | | rectangle | | |
| | **solid/void** | | | g. floor windowless/u. floors windowed | | structure | | | knee brace 'eliböğründe' | | |
| | **roof** | form | | hipped | | structural material | | | timber | | |
| | | covering material | | mission tile | | upper form | | | flat/non pediment | | |
| | | eave | form | inclined towards interior | **bay** | material | horizontal | | timber | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | width | wide | | | vertical | timber |

**Table 2**: Façade characteristics of Mehmet Gömleksiz-Hamide House (2012)

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BUILDING NUMBER 2** | **inventory number** | | | - |  |  | | | | | |
| | **name** | | | **MEHMET GÖMLEKSİZ-HAMİDE HOUSE** | | | | | | | |
| | **address** | | | Bağlarbaşı District Değirmenbaşı Street No:11A | | | | | | | |
| | **material** | | | timber frame filled in with adobe | | | | | | | |
| **settlement features** | **street** | | | less inclined | | | | | | | |
| | **location** | | | on the street | | | | | | | |
| | **building order** | | | attached (from the left side) | | | | | | | |
| **shape features** | **floor number** | | | ground+2 floor | **entrances** | building entry | location | | on the right side of the building | | |
| | **maximum height** | | | 3 floor | | | form | | ~square/double leaf | | |
| | **texture** | | | plaster | | | mater. | leaf | timber | | |
| | **windows** | ground floor | form | rectangle | | | | jamb | timber | | |
| | | | proportion | 2 | | | above of ent. | | transom | | |
| | | | jamb material | timber | | garden entry | location | | - | | |
| | | | array | asymmetric on the façade | | | form | | - | | |
| | | first floor | form | rectangle | | | leaf material | | - | | |
| | | | proportion | ½ | | | above of ent. | | - | | |
| | | | jamb material | timber | **cantilevers** | number | | | - | | |
| | | | array | ~symmetric on the façade | | type | | | - | | |
| | | second floor | form | ~square | | locati. | at the street | | - | | |
| | | | proportion | ~1 | | | on the build. | | - | | |
| | | | jamb material | timber | | size | | | - | | |
| | | | array | asymmetric on the façade | | form | | | - | | |
| | **solid/void** | | | g. floor windowless/u. floors windowed | | structure | | | - | | |
| | **roof** | form | | gable | | structural material | | | - | | |
| | | covering material | | mission tile | | upper form | | | - | | |
| | | eaves | form | flat | **bands** | mater. | horizontal | | - | | |
| | | | width | medium | | | vertical | | - | | |

**Table 3**: Façade Characteristics of Mehmet Ergin House (2012)

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BUILDING NUMBER 3** | **inventory number** | | | - |  |  | | | | | |
| | **name** | | | **MEHMET ERGİN HOUSE** | | | | | | | |
| | **address** | | | Bağlarbaşı District Değirmenbaşı Street No:11 | | | | | | | |
| | **material** | | | timber frame filled in with adobe | | | | | | | |
| **settlement features** | **street** | | | less inclined | | | | | | | |
| | **location** | | | on the street | | | | | | | |
| | **building order** | | | attached (from the right side) | | | | | | | |
| **shape features** | **floor number** | | | ground+1 floor | **entrances** | building entry | location | | on the right side of the building | | |
| | **maximum height** | | | 2 floor | | | form | | rectangle/single leaf | | |
| | **texture** | | | plaster | | | mater. | leaf | timber | | |
| | **windows** | ground floor | form | - | | | | jamb | - | | |
| | | | proportion | - | | | above of ent. | | transom | | |
| | | | jamb material | - | | garden entry | location | | - | | |
| | | | array | - | | | form | | - | | |
| | | first floor | form | ~square | | | leaf material | | - | | |
| | | | proportion | ~1 | | | above of ent. | | - | | |
| | | | jamb material | - | **cantilevers** | number | | | - | | |
| | | | array | symmetric on the façade | | type | | | - | | |
| | | second floor | form | - | | locati. | at the street | | - | | |
| | | | proportion | - | | | on the build. | | - | | |
| | | | jamb material | - | | size | | | - | | |
| | | | array | - | | form | | | - | | |
| | **solid/void** | | | g. floor roller shuttered/u. floor windowed | | structure | | | - | | |
| | **roof** | form | | gable | | structural material | | | - | | |
| | | covering material | | marseilles tile | | upper form | | | - | | |
| | | eaves | form | flat | **bands** | mater. | horizontal | | - | | |
| | | | width | medium | | | vertical | | - | | |

**Table 4**: Façade Characteristics of Mehmet Hamdi-Hayriye Macun House (2012)

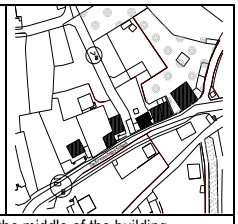
| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BUILDING NUMBER 4** | **inventory number** | | | 879 |  |  | | | | | |
| | **name** | | | **MEHMET HAMDİ-HAYRİYE MACUN HOUSE** | | | | | | | |
| | **address** | | | Bağlarbaşı District Değirmenbaşı Street No:9 | | | | | | | |
| | **material** | | | rough stone+timber frame filled in with adobe | | | | | | | |
| **settlement features** | **street** | | | less inclined | | | | | | | |
| | **location** | | | on the street+in the garden | | | | | | | |
| | **building order** | | | detached | | | | | | | |
| **shape features** | **floor number** | | | ground+1 floor | **entrances** | building entry | location | | ~on the middle of the building | | |
| | **maximum height** | | | 2 floor | | | form | | rectangle/single leaf | | |
| | **texture** | | | plaster | | | mater. | leaf | timber | | |
| | **windows** | ground floor | form | rectangle | | | | jamb | - | | |
| | | | proportion | ⅔ | | | above of ent. | | cantilever | | |
| | | | jamb material | - | | garden entry | location | | - | | |
| | | | array | asymmetric on the façade | | | form | | - | | |
| | | first floor | form | rectangle | | | leaf material | | - | | |
| | | | proportion | ½, 1.5 (later renewed) | | | above of ent. | | - | | |
| | | | jamb material | timber | **cantilevers** | number | | | 1 | | |
| | | | array | asymmetric on the façade | | type | | | bay window | | |
| | | second floor | form | - | | locati. | at the street | | on the street | | |
| | | | proportion | - | | | on the build. | | along the building | | |
| | | | jamb material | - | | size | | | along the building | | |
| | | | array | - | | form | | | setsquare | | |
| | **solid/void** | | | ~g. floor windowless/u. floor windowed | | structure | | | knee brace 'eliböğründe'+beamed | | |
| | **roof** | form | | hipped | | structural material | | | timber | | |
| | | covering material | | mission+marseilles (later renewed) tile | | upper form | | | flat/non pediment | | |
| | | eaves | form | inclined towards interior | **bands** | mater. | horizontal | | timber | | |
| | | | width | medium | | | vertical | | timber | | |

**Table 5**: Façade characteristics of Yusuf Kalyoncu House (2012)

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BUILDING NUMBER 5** | **inventory number** | | | - |  |  | | | | | |
| | **name** | | | **YUSUF KALYONCU HOUSE** | | | | | | | |
| | **address** | | | Bağlarbaşı District Değirmenbaşı Street No:5-5A | | | | | | | |
| | **material** | | | brick masonry | | | | | | | |
| **settlement features** | **street** | | | less inclined | | | | | | | |
| | **location** | | | in the garden | | | | | | | |
| | **building order** | | | attached (from the left side) | | | | | | | |
| **shape features** | **floor number** | | | ground+1 floor | **entrances** | building entry | location | | on the left side of the building | | |
| | **maximum height** | | | 2 floor | | | form | | rectangle/single leaf | | |
| | **texture** | | | plaster | | | mater. | leaf | timber | | |
| | **windows** | ground floor | form | rectangle | | | | jamb | - | | |
| | | | proportion | 1.5 | | | above of ent. | | canopy+window | | |
| | | | jamb material | - | | garden entry | location | | on the left and right side of the garden wall | | |
| | | | array | asymmetric on the façade | | | form | | rectangle/double leaf | | |
| | | first floor | form | rectangle | | | leaf material | | wrought iron | | |
| | | | proportion | 1.5 | | | above of ent. | | arch, | | |
| | | | jamb material | - | **cantilevers** | number | | | - | | |
| | | | array | asymmetric on the façade | | type | | | - | | |
| | | second floor | form | - | | locati. | at the street | | - | | |
| | | | proportion | - | | | on the build. | | - | | |
| | | | jamb material | - | | size | | | - | | |
| | | | array | - | | form | | | - | | |
| | **solid/void** | | | g. floor windowed/u. floor windowed | | structure | | | - | | |
| | **roof** | form | | gable | | structural material | | | - | | |
| | | covering material | | marseilles tile | | upper form | | | - | | |
| | | eaves | form | inclined towards interior | **bands** | mater. | horizontal | | - | | |
| | | | width | medium | | | vertical | | - | | |

**Table 6**: Façade characteristics of Mustafa-Hüsniye Kasacı House (2012)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BUILDING NUMBER 6** | **inventory number** | 880 | | | | | | | | | | |
| | **name** | **MUSTAFA-HÜSNİYE KASACI HOUSE** | | | | | | | | | | |
| | **address** | Bağlarbaşı District Değirmenbaşı Street No:3 | | | | | | | | | | |
| | **material** | rough stone+timber frame filled in with adobe | | | | | | | | | | |
| **settlement features** | **street** | flat | | | | | | | | | | |
| | **location** | on the street+in the garden | | | | | | | | | | |
| | **building order** | attached (from the right side) | | | | | | | | | | |
| **shape features** | **floor number** | ground+1 floor | | | | | | | | | | |
| | **maximum height** | 2 floor | | | | | | | | | | |
| | **texture** | stone+adobe | | | | | | | | | | |
| | **windows** | ground floor | form | - | | | | | | | | |
| | | | proportion | - | | | | | | | | |
| | | | jamb material | - | | | | | | | | |
| | | | array | - | | | | | | | | |
| | | first floor | form | rectangle | | | | | | | | |
| | | | proportion | ½ | | | | | | | | |
| | | | jamb material | timber | | | | | | | | |
| | | | array | ~symmetric on the façade | | | | | | | | |
| | | second floor | form | - | | | | | | | | |
| | | | proportion | - | | | | | | | | |
| | | | jamb material | - | | | | | | | | |
| | | | array | - | | | | | | | | |
| | **solid/void** | g. floor windowless/u. floor windowed | | | | | | | | | | |
| | **roof** | form | pitched | | | | | | | | | |
| | | covering material | mission tile | | | | | | | | | |
| | | eaves | form | inclined towards interior | | | | | | | | |
| | | | width | medium | | | | | | | | |
| **entrances** | building entry | location | ~on the middle of the building | | | | | | | | | |
| | | form | ~square/double leaf | | | | | | | | | |
| | | mater. | leaf | timber | | | | | | | | |
| | | | jamb | timber | | | | | | | | |
| | | above of ent. | cantilever | | | | | | | | | |
| | garden entry | location | - | | | | | | | | | |
| | | form | - | | | | | | | | | |
| | | leaf material | - | | | | | | | | | |
| | | above of ent. | - | | | | | | | | | |
| **cantilevers** | number | 2 | | | | | | | | | | |
| | type | bay window | | | | | | | | | | |
| | locati. | at the street | on the street | | | | | | | | | |
| | | on the build. | on the left and right side of the building | | | | | | | | | |
| | size | in the room width | | | | | | | | | | |
| | form | setsquare | | | | | | | | | | |
| | structure | cantilevered | | | | | | | | | | |
| | structural material | timber | | | | | | | | | | |
| | upper form | flat/non pediment | | | | | | | | | | |
| **bands** | mater. | horizontal | timber | | | | | | | | | |
| | | vertical | timber | | | | | | | | | |

**Table 7**: Façade Characteristics of Yusuf Kalyoncu House (2012)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BUILD NUMBER 7** | **inventory number** | - | | | | | | | | | | |
| | **name** | **YUSUF KALYONCU HOUSE** | | | | | | | | | | |
| | **address** | Bağlarbaşı District Değirmenbaşı Street No:1-1A | | | | | | | | | | |
| | **material** | brick masonry | | | | | | | | | | |
| **settlement features** | **street** | flat | | | | | | | | | | |
| | **location** | in the garden | | | | | | | | | | |
| | **building order** | detached | | | | | | | | | | |
| **shape features** | **floor number** | partial basement+ground+1 floor | | | | | | | | | | |
| | **maximum height** | 2 floor | | | | | | | | | | |
| | **texture** | plaster | | | | | | | | | | |
| | **windows** | ground floor | form | - | | | | | | | | |
| | | | proportion | - | | | | | | | | |
| | | | jamb material | - | | | | | | | | |
| | | | array | - | | | | | | | | |
| | | first floor | form | square, rectangle | | | | | | | | |
| | | | proportion | 1, 1,5 | | | | | | | | |
| | | | jamb material | - | | | | | | | | |
| | | | array | asymmetric on the façade | | | | | | | | |
| | | second floor | form | square, rectangle | | | | | | | | |
| | | | proportion | 1, ~2 | | | | | | | | |
| | | | jamb material | - | | | | | | | | |
| | | | array | asymmetric on the façade | | | | | | | | |
| | **solid/void** | g. floor windowed/u. floor windowed | | | | | | | | | | |
| | **roof** | form | hipped | | | | | | | | | |
| | | covering material | marseilles tile | | | | | | | | | |
| | | eaves | form | flat | | | | | | | | |
| | | | width | wide | | | | | | | | |
| **entrances** | building entry | location | on the right side of the building | | | | | | | | | |
| | | form | rectangle/single leaf | | | | | | | | | |
| | | mater. | leaf | steel | | | | | | | | |
| | | | jamb | timber | | | | | | | | |
| | | above of ent. | balcony, | | | | | | | | | |
| | garden entry | location | on the right side of the garden wall | | | | | | | | | |
| | | form | ~square/ single leaf | | | | | | | | | |
| | | leaf material | wrought iron | | | | | | | | | |
| | | above of ent. | - | | | | | | | | | |
| **cantilevers** | number | 2 | | | | | | | | | | |
| | type | bay window, balcony | | | | | | | | | | |
| | locati. | at the street | In the garden | | | | | | | | | |
| | | on the build. | on the middle and right side of the building | | | | | | | | | |
| | size | in the room width | | | | | | | | | | |
| | form | rectangle | | | | | | | | | | |
| | structure | cantilevered | | | | | | | | | | |
| | structural material | concrete | | | | | | | | | | |
| | upper form | flat/non pediment | | | | | | | | | | |
| **bands** | mater. | horizontal | - | | | | | | | | | |
| | | vertical | - | | | | | | | | | |

## Analysis of the Findings

On Değirmenbaşı Street, well-preserved traditional buildings stand alongside altered historical structures and newly reconstructed houses. Each of these buildings has been numbered in the analysis tables, and their locations have been indicated on the site plan. Accordingly, House Nos. 1, 4, and 6 (inventory numbers: 916, 879, 880) are original historical buildings, whereas House Nos. 2 and 3 have been renovated. House Nos. 5 and 7 have been completely rebuilt.

Information on the construction dates of the houses was obtained from the Safranbolu Municipality Archive, the Safranbolu Land Registry Office Archive, and from the residents of the houses. According to this information, the earliest registration belongs to Mehmet Ergin House. However, it is renewed and has lost its originality. The construction dates of all the examined buildings are presented below in the Table 8.

**Table 8**: Date of construction information of the houses
Source: Safranbolu Municipality Archive, 2012; Safranbolu Land Registry Office Archive, 2012; residents of the houses, 2012.

| House Number | Date of construction |
|---|---|
| 1 | 1889 |
| 2 | 1902 |
| 3 | 1887 |
| 4 | 1889 |
| 5 | 1975 |
| 6 | 1895 |
| 7 | 1909 (1971) |

Within the traditional settlement fabric of Değirmenbaşı Street, the historic building walls, entrance doors, bay windows (oriels), garden walls, trees, and traditional water channels running along the street line collectively constitute the defining elements of the streetscape. However, it has been determined that certain changes in the recent developments have weakened this overall integrity. In order to illustrate the coexistence of the old and new structures, a street silhouette drawing was prepared as part of the study, showing the buildings and their surrounding components together, and interpretative analyses were carried out based on this representation (Fig. 8).

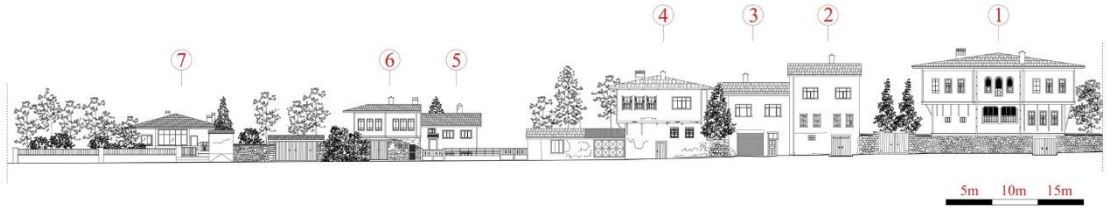



**Fig. 8**: Silhouette of Değirmenbaşı Street.
Source: Author

In the traditional architectural fabric, the front façades of the historic houses define the street boundary, whereas the two later-built structures (House Nos. 5 and 7) are set back approximately five meters from the street line. While this setback could be interpreted as a respectful gesture toward the adjacent historic buildings, it nonetheless weakens the spatial continuity of the street, which was originally defined by the façades of traditional houses and their adjoining garden walls. Material differences are also notable along the street. While traditional houses employ local materials such as stone, adobe, and timber, these materials are absent in the newer constructions—except for the roof structures. The traditional garden walls, typically high and built of unplastered stone, create a tactile surface texture and architectural pattern that enriches the streetscape. Same condition is observed on the ground floors of the

registered Houses No. 1 and 6. In contrast, the newer garden walls are lower and are constructed with iron or aluminum railings, resulting in visual discontinuities in the overall façade texture of the street (Fig. 8). Another factor disrupting the coherence of the streetscape is the variation in window layouts and proportions. As in most Safranbolu houses, the traditional dwellings in the study area display differences in the window sizes and numbers between the floors, influenced by the functional needs, privacy considerations, climatic factors, and the structural characteristics of the wall materials. Nevertheless, a consistent logic and proportional order governs these window arrangements. This differentiation becomes most evident on the ground floors, where solid surfaces dominate, and openings are minimized. Along the street, the ground floors of the historic houses and their adjoining garden walls reinforce this solid continuity, both of which define the identity of the street and integrates the buildings with their surroundings.

However, the newly constructed House Nos. 5 and 7 lack these characteristics. In these buildings, the window organization on the lower and upper floors exhibits similar configurations, and the ground floors contain a higher proportion of transparent surfaces, contrary to the traditional pattern. Furthermore, since the ground floors lie below the street level, their windows are only partially visible in the street silhouette, making the building volumes less perceivable from the street. While traditional houses exhibit rhythmic movement and proportional harmony in their window arrangements, House Nos. 5 and 7 deviate from this rhythm and proportion, thereby disrupting the continuity of façade character within the historic environment.

Bay windows (oriels) are one of the defining identity elements of the traditional urban fabric. They serve to establish a strong spatial relationship between the private interior and the public street, enabling visual connections to different vistas. Indeed, they allow maximum penetration of natural light into the interior spaces. In the study area, the registered traditional houses (House Nos. 1, 4, and 6) all feature street-facing bay windows on their upper floors (Fig. 9). These volumetric extensions not only break the monotony of the façades and create spatial expansion, but also emphasize the entrance and provide protection against climatic conditions. In cases where the cantilever depth increases (as seen in the House Nos. 1 and 4), brackets (consoles) are used as structural supports, arranged rhythmically - similar to the window organization. These rhythmic repetitions across building elements contribute to a coherent architectural character for both the building group and the street as a whole.

In contrast, the later-built House No. 5 lacks a street-facing bay window (Fig. 9). The absence of this volumetric articulation - commonly found in traditional façades - has resulted in a divergent architectural language and has weakened the sense of unity within the streetscape. In contrast, House No. 7 features a bay window on its entrance (upper) floor, designed in imitation of traditional architecture, thereby referencing historical forms while lacking the structural and contextual authenticity of the originals.



**Fig. 9:** Old houses with bay windows (projections) and a new house without a bay window (right)
Source: Author Fidan, 2025.

The doors and windows of the older houses (Nos. 1, 2, 3, 4, and 6) along the studied street are made of wood (Fig. 10). The entrance gates of their gardens are also constructed from wood. The windows feature wooden shutters designed as protection against the climatic conditions. However, in the later-built houses (Nos. 5 and 7), steel doors and PVC windows have been used instead (Fig. 11). These material differences have weakened the continuity of local material use that characterizes the traditional streetscape.



**Fig. 10:** Use of wooden materials in historic houses along the street.
Source: Author Fidan, 2025.



**Fig. 11:** Use of PVC windows and steel doors in newly built houses (Nos. 5 and 7) along the street.
Source: author Fidan, 2025.

In the registered houses (Nos. 1, 4, and 6), timber framing elements are visible on the façades, particularly at the beam levels between the floors and at corner posts. In the façade of the house No. 5, a similar framing pattern has been imitated using different materials to create horizontal and vertical stripes (Fig. 9). However, this application is a poor imitation, lacking both the craftsmanship and the functional intent of the originals.

The Bağlar district has also gained its identity through the presence of large gardens historically used for agricultural production. Today, however, most of these productive activities have largely disappeared. On both sides of the street, vegetation is prominent, and trees are densely distributed (Fig. 12). In contrast, the garden of house No. 5, a later construction, has a higher proportion of paved surfaces and fewer trees compared to the surrounding environment. In the street silhouette, this discontinuity is evident where the continuity of green texture is interrupted by this particular house (Fig. 8).



**Fig. 12:** Vegetation along the street.
Source: author Fidan, 2025.

Traditional houses in Safranbolu have been designed in harmony with the natural topography, developing solutions that respect the surrounding environment. In areas with steeper slopes, multiple-level entrances were often created by taking advantage of the terrain. However, in the analyzed area, the later-built house No. 5 does not adapt to the topography, unlike the traditional houses. On its front façade, a sunken area has been created to allow light into the lower floor, which lies below the street level (Fig. 13). Instead of green landscaping, this open space is covered with hard surfaces, resulting in weak spatial use and limited integration with its context.



**Fig. 13:** The sunken area created in front of the lower floor of house No. 5.
Source: Author Fidan, 2025.

One of the main factors disrupting the overall street silhouette is the construction of low-quality add-on spaces and the lack of coherence in material language used in new additions. The semi-open space later added to the entrance level of House No. 7 fails to establish any design unity with the adjacent building. Its roof covering is made of corrugated metal sheets, the entrance is enclosed with PVC tarpaulin, and its structural columns are made of iron. These poorly executed and deteriorated materials appear inconsistent both among themselves and with the refined architectural character of the surrounding context (Fig. 14). In front of the House No. 5, a white wall separates the open area from the street, topped with gray aluminum railings and balustrades, while the two gates providing access from the street are made of black iron. The gates emphasize vertical divisions, whereas the railings emphasize horizontal lines. This contrast in color and design language among small-scale architectural elements again leads to visual disharmony (Fig. 15). Furthermore, the roof of the storage/garage structure adjacent to the registered House No. 4 also shows a mix of materials — one half is covered with clay tiles, while the other half uses corrugated metal sheets (Fig. 15). However, corrosion has developed on the metal sheet surface, causing the material to lose its original properties, further degrading the visual integrity of the structure and its surroundings.



**Fig. 14:** The incompatibility of the semi-open addition in front of House No. 7 with the surrounding context.
Source: Author Fidan, 2025.



**Fig. 15:** Examples of material inconsistencies observed along the street.
Source: Author Fidan, 2025.

The window alterations in House Nos. 2 and 4 (registered) within the study area have partially compromised their originality (Fig. 16). In the House No. 2, the intermediate floor displays a rhythmic window arrangement with a 1/2 proportional system, which is notably absent on the upper floor. Similarly, in the registered House No. 4, beside the original upper-

floor windows, there are later replacements featuring different proportions and colors. These inconsistencies disrupt not only the overall harmony of the historical fabric but also the visual composition of the individual building façades.



**Fig. 16:** Different window applications in Houses No. 2 and No. 4.
Source: author Fidan, 2025.

Among the houses examined, the registered House Nos. 1 and 6 have successfully preserved their authenticity due to careful restoration work. The later-built Houses No. 5 and No. 7 are also in good condition due to recent material renewals on their façades and applications such as painting and thermal insulation. However, the remaining three houses have suffered or are currently suffering from structural deterioration as a result of lack of regular maintenance and abandonment. This state of disuse has also contributed to the loss of the former vitality of the street.

In addition to the integration deficiencies previously discussed, there are also certain similarities that establish a degree of harmony between the old and the new. The registered and renovated houses are lined up consecutively along the street. The later-built houses, on the other hand, have been set back slightly from the street alignment to show respect for their neighboring structures. In this recession, the continuous façade line created by the older houses that define the street edge has been used as a reference, and the new houses have been positioned parallel to this alignment.

Another aspect of harmony lies in the mass forms of the buildings. The older houses generally exhibit rectangular façades and articulated massing. Their pitched roofs have been designed to adapt to climatic conditions, and their wide eaves provide additional protection. While the registered House Nos. 1, 4, and 6 feature hipped roofs, the House Nos. 2 and 3 have gable roofs (Fig. 8). These volumetric configurations contribute not only to functional performance but also to aesthetic coherence. Similarly, the later-built House Nos. 5 and 7 adopt rectangular forms and gable roofs, consistent with the surrounding fabric. However, the absence of volumetric articulation on the street façade of House No. 5 weakens this visual harmony. When viewed as a whole, the building heights across the street remain within a human scale. While House Nos. 1 and 2 have three stories, the others are two stories high. The mass and heights of Houses No. 5 and 7 are kept respectful to the adjacent registered buildings (Fig. 17). Their roof ridge heights are positioned below the maximum heights of the neighboring structures, and their horizontal mass proportions are also restrained, ensuring compatibility with the scale of the historic environment.



**Fig. 17:** The coexistence of old and new buildings along the street.
Source: author Fidan, 2025.

The findings are summarized in the Table 9.

**Table 9**: Similarities and differences among the old and the new houses

| Similarities | Differences |
|---|---|
| building order | material |
| floor number | location |
| maximum height | texture |
| | windows |
| | solid/void |
| | roof |
| | entrances |
| | cantilevers |
| | bands |

## Conclusions

As living conditions, needs, and expectations evolve, cities tend to lose their distinctive values and regional characteristics, increasingly resembling one another. This process weakens the unique identity of historical environments and demonstrates that qualified architectural contexts are often neglected. The analysis of Değirmenbaşı Street reveals that, in the Bağlar district of Safranbolu, the relationship between the traditional urban fabric and new constructions has been partially maintained at a formal level, yet a comprehensive spatial and semantic integration has not been achieved.

Among the residential buildings in the study area, similarities are observed in terms of building order, number of floors, and maximum height. However, significant differences exist in material use, façade proportions, window rhythm, garden wall character, and topographical adaptation. These differences weaken the overall visual continuity of the street and interrupt its meaningful relationship with the traditional environment. Although certain new buildings incorporate traditional architectural elements such as bay windows (oriels), eaves, and horizontal bands, these features are often applied without understanding their structural and spatial logic. Consequently, the connection between the new and the historic remains superficial-revealing partial attempts at harmony that are insufficient for true integration and even contain contradictions.

The findings indicate that while there are certain similarities in façade composition, these do not extend to the interior spatial organization or patterns of use. In traditional Safranbolu houses, interior layouts have been shaped by social use, privacy principles, and climatic conditions, whereas contemporary houses now follow standardized plan schemes. The absence of traditional spatial practices in new dwellings underscores the influence of the changing social structure. Hence, while some degree of visual coherence is achieved on the façades, the cultural continuity that defines historical identity is not sustained within the interior spaces.

The results also suggest that, although new constructions in the Bağlar district partially respect local materials, proportions, and scales, they fail to reproduce the spatial integrity of the historical environment. The placement of new buildings among the old ones disrupts overall continuity, fragmenting the street rhythm, garden wall texture, and green landscape sequence.

This condition indicates that recent architectural interventions have not been developed within a contextual understanding that considers the “spirit of place” (Burra Charter, 1999). In this sense, it is evident that qualified architectural contexts have not been sufficiently addressed. Therefore, future architectural practices within historical environments should move beyond formal resemblance and focus instead on the historical and cultural meanings of place.

It is thus concluded that, the buildings in the Bağlar district are not fully compatible with one another, except for similarities in building order, floor numbers, and maximum height. Although attempts at achieving harmony are visible, these efforts have been insufficient to

ensure complete integration. Therefore, it is necessary to protect historical environments through urban planning regulations and conservation policies that prevent the construction of new buildings disregarding façade character and historical identity. Urban design guidelines should emphasize the preservation of urban identity, façade features, and the continuity of meaning as essential criteria for sustainable development within the historical environments.

Finally, while this study is limited to a single street scale (Değirmenbaşı Street), this limitation also serves as one of its strengths, as it allows for direct observation of the impact of new constructions on the historical environment. The findings provide valuable insights for urban design, façade rehabilitation, and conservation planning in similar historical contexts. Future research that expands the scope to include user habits, interior spatial organizations, and socio-cultural transformation processes will contribute to developing a meaning-based and context-sensitive approach to new architectural design within historical environments.

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# İÇ MİMARLIK VE ÇEVRE TASARIMINDA YENİLİKÇİ BİR YAKLAŞIM: UNİCERA 2024 CREAVİT FUAR TASARIMI KURGUSU

*An Innovative Approach In Interior Architecture and Environmental Design: Unicera 2024 CreavitFair Design Concept*

Abdullah Süha Ermumcu[1], Esra Uslu[2], Yasin Dönmez[3]

**Makale Bilgisi**

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**Özet**

UNICERA 2024 İstanbul Fuarı, seramik ve banyo sektörlerinde yenilikçi tasarım ve sürdürülebilirliği bir araya getiren önemli bir etkinliktir. Makale, Creavit markası için tasarlanan sergi alanının (800 m²) tasarım sürecini; iç mekân tasarımı, kullanıcı deneyimi ve çevresel sürdürülebilirlik açısından değerlendirmektedir. Çalışmada literatür taraması, saha gözlemleri, tasarım analizi ve 2023 ile 2024 yıllarındaki sergi alanlarının karşılaştırılması yöntemleri kullanılmıştır. Araştırma bulgularına göre, Creavit sergi alanı fonksiyonellik ve estetiği dengeli bir şekilde bir araya getirmiştir. Açık plan düzeni, stratejik giriş noktaları ve geniş koridorlar ziyaretçi hareketliliğini artırırken, dijital paneller ve etkileşimli unsurlar marka kimliğini güçlendirmiştir. Sonuç olarak, Creavit'in sergi alanı, ferah, içe dönüklükten uzak ve sürdürülebilir sergi tasarımına örnek oluşturmaktadır. Kullanıcı odaklı mekânsal düzenlemeler, sürdürülebilir malzeme kullanımı ve ileri teknolojilerin entegrasyonu, serginin başarısını artırmıştır. Gelecekteki fuar tasarımları için gelişmiş dijital entegrasyon, daha kapsayıcı erişilebilirlik çözümleri, genişletilmiş sosyal alanlar, ek sürdürülebilirlik önlemleri ve hibrit sergi modellerinin uygulanmasında rol model bir stant tasarımı olmayı hedeflemiştir.

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**Abstract**

UNICERA 2024 Istanbul Fair is a significant event that brings together innovative design and sustainability in the ceramics and bathroom sectors. This article examines the design process of the 800 m² exhibition space created for the Creavit brand, evaluating it in terms of interior design, user experience, and environmental sustainability. The study employs literature review, on-site observations, design analysis, and a comparative evaluation of the exhibition spaces from 2023 and 2024. According to the research findings, the Creavit exhibition space successfully balances functionality and aesthetics. The open-plan layout strategically placed entry points, and wide corridors facilitate visitor movement while digital panels and interactive elements strengthen brand identity. In conclusion, Creavit's exhibition space serves as a model for spacious, open, and sustainable exhibition design. User-centred spatial arrangements, the use of sustainable materials, and the integration of advanced technologies have enhanced the exhibition's success. The exhibition stand aims to be a role model for future fair designs by incorporating advanced digital integration, more inclusive accessibility solutions, expanded social areas, additional sustainability measures, and hybrid exhibition models.

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# GİRİŞ

Fuar alanları, tarih boyunca ulusal ve uluslararası ticaretin gelişmesine olanak tanıyan, yenilikçi fikirlerin ve teknolojilerin sergilendiği alanlar olarak ekonomik ve kültürel dönüşümde kritik bir rol üstlenmiştir. Sanayi devriminden bu yana gelişen fuarcılık anlayışı, zaman içinde ürün ve hizmetlerin tanıtımının ötesine geçerek, deneyim tasarımının ve marka iletişiminin bir parçası haline gelmiştir. Özellikle 20. yüzyılın ikinci yarısından itibaren, fuar alanları mimarlık, iç mekân tasarımı ve çevre düzenlemesi gibi disiplinlerin kesişim noktasında birer kültürel ve teknolojik merkez olarak konumlanmıştır (Osborne&Fox, 2018; Bennett, 2020).

UNICERA 2024 İstanbul Fuarı hem Türkiye'nin hem de uluslararası platformların önde gelen banyo ve seramik etkinliklerinden biri olarak, ticari hedefler ile estetik değerlerin buluştuğu bir platform sunmaktadır. Creavit markası için tasarlanan sergi alanı, yalnızca markanın kimliğini yansıtmakla kalmayıp, aynı zamanda kullanıcı deneyimi ve sürdürülebilirlik odaklı tasarım anlayışıyla dikkat çekmektedir. Bu çalışma, UNICERA 2024 özelinde, fuar tasarımının fonksiyonel ve estetik boyutlarını analiz etmeyi ve modern fuarcılık anlayışına dair bir çerçeve sunmayı amaçlamaktadır. Konuyla bağlantılı olarak literatür taraması yapıldığında devam eden alt bölümlerde her paragraf fuar ve fuarcılık ile alakalı yayınların kısa bir özeti olarak sunulmuştur. Fuarların ve Fuarcılığın, Kongre turizmi ve fuar organizasyonlarının ekonomik etkilerini ve uluslararası ticaretteki rollerini ele alır. Türkiye'nin bu alandaki potansiyeli analiz edilmiş ve gelişim için stratejik öneriler sunulmuştur. Kongre ve fuar organizasyonlarının turizm gelirlerini artırmadaki etkileri ve yerel ekonomiye olan katkıları vurgulanmıştır. Ayrıca, bu organizasyonların planlama süreçleri ve yönetim stratejileri detaylı bir şekilde incelenmiştir (Aymankuy, 2006).

Ticaret fuarlarının, işletmelerin önemli müşterileriyle ilişkilerini geliştirmedeki rolünü vurgular. B2B pazarlama bağlamında ticaret fuarlarının, müşteri sadakatini artırmada ve yeni iş fırsatları oluşturmada kritik bir araç olduğu belirtilmiştir. Çalışma, ticaret fuarlarının stratejik kullanımıyla ilgili pratik öneriler sunarak işletmelerin rekabet gücünü artırma yollarını tartışmaktadır (Blythe, 2002).

Kongre ve fuar organizasyonlarının yönetimiyle ilgili temel kavramları, organizasyonel süreçleri ve etkinlik planlama yöntemlerini ele alır. Organizasyonların başarıya ulaşması için lojistik destek, pazarlama stratejileri ve bütçe planlamasının önemi vurgulanır. Türkiye bağlamında, kongre ve fuar organizasyonlarının sektörel katkıları ve karşılaşılan zorluklar da detaylandırılmıştır (Çakıcı, 2013).

Sergi alanlarındaki aydınlatma tasarımının kullanıcı algısı üzerindeki etkilerini incelemektedir. Doğru aydınlatma tekniklerinin, sergilenen ürünlerin vurgulanmasında ve mekânın estetik çekiciliğinin artırılmasında oynadığı rol ele alınmıştır. Çalışmada, sergi tasarımında kullanılan aydınlatma düzenlemelerine yönelik öneriler sunulmuştur (Şahin, 2024; Uslu ve Bölükbaşı, 2024).

Kullanıcı deneyimini geliştirmeye yönelik iç mekân tasarımında ergonomi, mekânsal düzenleme ve estetik unsurların önemi fuar alanımızda tasarım ekibi olarak tarafımızca vurgulanmıştır. Bu unsurların, kullanıcı memnuniyetine katkı sağlama potansiyeli detaylandırılmış ve özellikle ticari alanlarda etkili bir şekilde uygulanabilme yöntemleri birlikte alışmış olduğumuz ajanslar tarafından ele alınmıştır.

Şehirlerin turistik ürün olarak pazarlanmasında kullanılan yöntemleri ve bu süreçte kongre ve fuar organizasyonlarının oynadığı rolü incelemektedir. Şehirlerin

marka değerlerini artırma stratejileri ve Türkiye'nin bu alandaki potansiyel şehirleri detaylı bir şekilde analiz edilmiştir (Giritlioğlu, İ., &Avcıkurt, 2010).

İstanbul'un kongre turizmindeki rekabet gücünü değerlendirmektedir. Kongre altyapısı, uluslararası etkinliklerdeki başarılar ve bölgesel avantajlar incelenmiş, İstanbul'un küresel pazardaki konumunu güçlendirme stratejileri önerilmiştir (Heper, & Sarıışık, 2015).

Fuar organizasyonlarının başarısını organizatörlerin perspektifinden değerlendirmektedir. Katılımcı memnuniyetinin artırılması, lojistik hizmetlerin iyileştirilmesi ve organizasyonel süreçlerde verimlilik sağlanması gibi konular ele alınmıştır. Çalışmada, fuarcılık sektörüne yönelik iyileştirme önerileri sunulmuştur (Acartürk, 2013; Ayçiçek, 2021).

Ticaret fuarlarının mekânsal tasarımında kullanılan stratejileri ve bu tasarımların kullanıcı deneyimine olan etkilerini analiz etmektedir. Yazar, görsel unsurların ve mekânsal organizasyonun markayı ve ürünleri nasıl daha etkili bir şekilde tanıtabileceğini tartışmaktadır (Lawson, 2017).

Uluslararası fuarların kültürel ve zihinsel mesafe kavramları çerçevesinde analizini yapmaktadır. Çalışma, farklı kültürel geçmişlerden gelen katılımcıların etkileşim süreçlerini ve bu süreçlerde karşılaşılan zorlukları ele almaktadır. Kültürel farkındalık ve stratejik adaptasyon önerileri sunulmuştur (Sungur, & Aytuğ, 2020).

Bölgesel turizm planlamasının Türkiye bağlamındaki uygulamalarını ele alır ve fuarların bölgesel kalkınmadaki önemine dikkat çeker. Araştırma, turizm altyapısının güçlendirilmesi, yerel ekonomilerin desteklenmesi ve bölgesel planlamada fuarların stratejik kullanımı konularında öneriler sunmaktadır. Ayrıca, turizmin bölgesel kalkınmadaki uzun vadeli etkileri vurgulanmıştır (Tosun, &Jenkins, 1996).

Türkiye'nin kongre turizmi pazarındaki konumunu değerlendirir ve İstanbul ile Antalya gibi şehirlerin kongre turizmindeki potansiyeline odaklanır. Çalışma, kongre turizminin ekonomik faydalarını, pazar genişleme stratejilerini ve Türkiye'nin bu alandaki gelişim fırsatlarını detaylı bir şekilde analiz etmektedir (Pektaş ve Aydın, 2021).

Kongre ve fuar turizminin teorik çerçevesini ele alırken, organizasyonel süreçlerin yönetiminde dikkate alınması gereken unsurları detaylandırmaktadır. Kitap, kongre ve fuarların turizm gelirlerine, yerel ekonomiye ve uluslararası tanıtıma olan katkılarını kapsamlı bir şekilde incelemekte ve Türkiye'nin bu sektördeki fırsatlarını değerlendirmektedir (Usta, 2008).

Modern ticaret fuarlarında sürdürülebilirlik ve dijital entegrasyonun önemini vurgulamaktadır. Yazar, artırılmış gerçeklik (Augmented Reality - AR), sanal gerçeklik (Vitual Reality - VR) ve interaktif ekranlar gibi dijital araçların kullanıcı deneyimine olan katkılarını incelemekte ve geri dönüştürülebilir malzemeler ile enerji verimli sistemlerin uygulanmasını detaylandırmaktadır. Çalışma, sürdürülebilir ve teknoloji odaklı tasarımın gelecekteki fuar organizasyonlarındaki potansiyelini ortaya koyar (Partarakis, 2025).

EMITT 2020 Fuarı'nda katılımcıların performans algısını değerlendirmektedir. Çalışmada, fuarın ticari başarıları, katılımcı memnuniyeti ve organizasyonun genel etkinliği detaylı bir şekilde incelenmiştir. Ayrıca, EMITT örneği üzerinden fuar organizasyonlarının ekonomik katkıları ve pazarlama stratejileri tartışılmıştır (Yılmaz, 2019).

Çukurova Sanayi ve Ticaret Fuarları üzerinden fuarların bölgesel kalkınmadaki etkilerini incelemektedir. Araştırma, fuarların yerel işletmelerin ulusal ve uluslararası pazarlara erişimini kolaylaştırdığı, bölgesel ekonomiyi desteklediği ve altyapı gelişimine katkıda bulunduğunu ortaya koymaktadır. Çalışma, bölgesel kalkınma stratejilerinde fuarcılığın önemini vurgulamaktadır (Yücel, & Ata, 2006).

Kongre ve fuar organizasyonlarının turizm sektörüne olan katkılarını EMITT örneği üzerinden analiz eder. Çalışmada, uluslararası fuarların yerel ve ulusal turizme sağladığı ekonomik faydalar, uluslararası ziyaretçi çekme potansiyeli ve istihdam yaratma kapasitesi detaylandırılmıştır. EMITT örneği, kongre ve fuarların şehir tanıtımındaki etkisini somut bir şekilde ortaya koymaktadır (Şengelvd, 2018).

Uluslararası ticaret fuarlarının firmalar için sunduğu fırsatları ve pazarlardaki etkilerini ele alır. Özellikle, Türk firmalarının uluslararası fuar etkinliklerinde karşılaştığı zorluklar ve bu zorlukların aşılması için stratejik öneriler sunulmuştur. Araştırma, fuarların markalaşma ve yeni pazar bulma süreçlerindeki önemine vurgu yapmaktadır (Güven, & Ceylan, 2019).

Türkiye'de milli fuarcılığın mevcut durumunu analiz eder ve sektörü geliştirmek için öneriler sunar. Milli fuarların yerel ekonomiye olan katkıları, yerli üreticilerin uluslararası pazarlara erişimi ve organizasyonel süreçlerin verimliliği detaylandırılmıştır. Yazar, milli fuarcılığın gelecekteki potansiyelini artırmak için öneriler geliştirmiştir (Badak, 2018).

Türkiye'de uluslararası fuarcılığın geliştirilmesi için gereken sistematik yaklaşımları ele almaktadır. Araştırma, uluslararası fuarların ekonomik ve kültürel etkilerini değerlendirirken, Türkiye'nin bu alandaki rekabet gücünü artırmak için öneriler sunmaktadır. Çalışma, global pazarda daha etkin bir yer edinmek için stratejik yaklaşımlar önermektedir (Badak ve Özdaşlı, 2019).

20 kaynağı inceleyecek olursak; fuarcılığın ekonomik, sosyal, tasarımsal ve teknolojik boyutlarını kapsamlı bir şekilde ele almaktadır. Çalışmalar, fuarların yerel ve ulusal ekonomilere sağladığı katkılara odaklanarak istihdam oluşturma, turizm gelirlerini artırma ve yerel işletmelere yeni ticari fırsatlar sunma gibi avantajlarını vurgulamaktadır. Ayrıca, fuar organizasyonlarının iç mekân tasarımındaki işlevsel ve estetik dengesi ile kullanıcı deneyimi üzerindeki etkileri detaylı bir şekilde incelenmiştir. Özellikle aydınlatma, mekânsal düzenleme ve teknoloji entegrasyonu gibi unsurların sergi alanlarını daha etkili hale getirdiği belirtilmiştir. Sürdürülebilirlik ve dijitalleşme ise modern fuarcılıkta öne çıkan temalar arasında yer almış, geri dönüştürülebilir malzemeler ve Artırılmış Gerçeklik (Augmented Reality-AR) ve sanal gerçeklik (Virtual Reality - VR) teknolojilerinin kullanıcı deneyimini zenginleştirdiği tartışılmıştır. Bununla birlikte, uluslararası ticaret fuarlarının kültürel farklılıklar ve zihinsel mesafeler bağlamında sunduğu zorluklar ve fırsatlar ele alınmış, bu fuarların marka bilinirliği ve pazar genişletme konusundaki önemi vurgulanmıştır. Son olarak, kongre ve fuar turizminin şehir markalaşması ve bölgesel kalkınmadaki rolü, özellikle Türkiye bağlamında değerlendirilmiş, organizasyonel süreçlerin iyileştirilmesine dair öneriler sunulmuştur. Bu kapsamda, kaynaklar fuarcılık sektörünün çok yönlü doğasını anlamak ve geliştirmek için değerli bir rehber niteliğindedir.

Taranan makalelerin genel anlamda mimarlıkla ilgisinin zayıf olduğu ve tasarım süreçlerine değinilmediği görülmektedir. Uygulama sürecinde de birçok detayın olduğu fuarcılık sektörünün çalışmayla tasarım süreçlerine ve uygulamaya katkı sağlanması planlanmaktadır.

## Fuar Alanlarının Tarihsel Gelişimi

Fuarlar, tarih boyunca ticaretin, kültürün ve teknolojinin gelişim süreçlerinde önemli bir araç olarak kullanılmıştır. İlk olarak yerel pazar yerleri ve panayırlar şeklinde ortaya çıkan fuar anlayışı, sanayi devrimiyle birlikte evrilmiş ve günümüzdeki modern fuarcılığın temelleri atılmıştır. Bu bağlamda, fuar alanlarının tarihsel gelişimi hem mimari hem de işlevsel açıdan ticaretin ve toplumların değişimine ışık tutmaktadır.

Tarihsel olarak fuarların ilk örnekleri, Mezopotamya ve Antik Yunan gibi medeniyetlerde düzenlenen pazar yerleri ve festivallere dayanmaktadır. Bu alanlar, ticaretin yanı sıra sosyal etkileşim ve kültürel paylaşımlar için de bir platform sunmuştur (Ünal Kestane, 2015). Ancak modern anlamda fuarcılığın başlangıcı, 19. yüzyılın ortalarında gerçekleşen sanayi devrimi ile ilişkilendirilir.

1851 yılında Londra'da düzenlenen Büyük Sergi (The Great Exhibition), modern fuarcılığın dönüm noktası olarak kabul edilmektedir. Sergiye ev sahipliği yapan Crystal Palace, dönemin mimari yeniliklerini ve sanayi devriminin teknolojik başarılarını sergilemek üzere tasarlanmıştır. Yaklaşık 6 milyon ziyaretçiyi ağırlayan bu etkinlik, uluslararası ticaretin yanı sıra fuar alanlarının mekânsal ve estetik gereksinimlerini de belirlemiştir (Osborne&Fox, 2018).

20. Yüzyılın başlarında, fuarlar yalnızca ticaret ve ürün tanıtımı için değil, aynı zamanda uluslararası ilişkiler ve kültürel etkileşimler için önemli platformlar haline gelmiştir. Expo 1900 Paris, dönemin teknolojik ve sanatsal birikimini sergileyen önemli bir etkinlik olarak öne çıkmıştır. Bu fuarda elektrik enerjisi, otomasyon ve modern tasarım yaklaşımları geniş bir katılımcı kitlesine sunulmuştur (Lawson, 2017).

İhtisas fuarları yaygınlaşmış ve belirli sektörlere yönelik etkinlikler düzenlenmeye başlanmıştır. Özellikle II. Dünya Savaşı'ndan sonra, fuar alanları küreselleşme ve sanayileşme süreçlerinin etkisiyle daha profesyonel organizasyonlara dönüşmüştür. Fuarcılık sektörü, modern mimarlık ve iç mekân tasarımıyla birlikte evrilmiş ve kullanıcı odaklı alanlar haline gelmiştir (Yücel ve Ata, 2006).

Türkiye'de fuarcılık, özellikle Cumhuriyet döneminde hız kazanmıştır. 1930'lu yıllarda düzenlenmeye başlayan İzmir Enternasyonal Fuarı, Türkiye'nin ilk uluslararası fuarı olarak modern fuarcılığın temelini atmıştır. İzmir Kültürpark' ta gerçekleşen bu fuar, yalnızca ekonomik değil, aynı zamanda kültürel bir etkinlik olarak da önemli bir yer edinmiştir (Karpat, 2009).

Samsun Fuarı, Anadolu'da düzenlenen ilk milli fuar olarak 1963 yılında kurulmuştur. Bölgenin ekonomik ve sosyal kalkınmasına katkı sağlayan bu etkinlik, zamanla eski gücünü yitirmiş ve 1992 yılında son kez düzenlenmiştir (Badak, 2018). Türkiye'de fuarcılık sektörü, 1980'lerden itibaren uluslararası standartlara uygun fuar merkezlerinin inşasıyla hız kazanmıştır. İstanbul, İzmir ve Antalya gibi şehirler hem ulusal hem de uluslararası etkinliklere ev sahipliği yaparak sektörde önemli bir yer edinmiştir (Acartürk, 2012).

Günümüzde fuar alanları, dijital teknolojiler ve sürdürülebilirlik odaklı yaklaşımlar sayesinde büyük bir dönüşüm geçirmektedir. Dijital ekranlar, artırılmış gerçeklik (AR) ve sanal gerçeklik (VR) gibi teknolojiler, modern fuar alanlarının vazgeçilmez unsurları haline gelmiştir. Bu uygulamalar, ziyaretçilerin ürünlerle daha interaktif bir şekilde etkileşim kurmasını sağlamaktadır.

Sürdürülebilirlik, modern fuar tasarımlarında öncelikli bir tema olarak öne çıkmaktadır. Çevre dostu malzemelerin kullanımı, enerji tasarruflu sistemler ve geri

dönüştürülebilir sergi elemanları, fuar alanlarının çevresel etkisini azaltmayı hedeflemektedir (Bennett, 2020). Pandemi süreciyle birlikte, sanal fuarlar ve hibrit etkinlikler daha yaygın hale gelmiş, dijital platformlarla fiziksel alanların bir arada kullanıldığı bir model benimsenmiştir.

Fuar alanlarının tarihsel gelişimi, ticaret ve kültürel etkileşim açısından önemli bir dönüşümü yansıtmaktadır. Sanayi devrimiyle başlayan modern fuarcılık anlayışı, 20. yüzyıl boyunca gelişerek günümüzde dijitalleşme ve sürdürülebilirlik odaklı yaklaşımlarla birleşmiştir. Türkiye'deki fuar organizasyonları, bu küresel dönüşümün bir parçası olmuş ve uluslararası standartlara uygun yapılarla fuarcılık sektörüne katkı sağlamıştır.

**Son Yüzyılda Fuarcılıkta Yaşanan Gelişmeler**

Son yüzyılda fuarcılık sektörü, teknolojik yenilikler, dijitalleşme ve küreselleşmenin etkisiyle köklü bir dönüşüm geçirmiştir. Geleneksel ticaret ve sergi alanlarından, ziyaretçilerin interaktif deneyimler yaşadığı çok yönlü mekânlara evrilen fuar alanları, ekonomik ve kültürel anlamda toplumların gelişimine katkı sağlamaktadır. 20. yüzyılın başlarında fuarlar, genel endüstriyel ürünlerin sergilendiği büyük etkinlikler şeklinde düzenlenirken, zamanla sektör odaklı ihtisas fuarları ön plana çıkmıştır. Özellikle otomotiv, tarım, teknoloji ve sağlık alanlarına yoğunlaşan bu fuarlar, belirli sektör uzmanlarını bir araya getirmiştir (Lawson, 2017). Bu dönüşümün erken örneklerinden biri olan 1929 Barcelona Uluslararası Sergisi, mimarlık ve tasarımın sergi alanlarında nasıl bir dönüşüm geçirdiğini göstererek, modern mimarinin fuar tasarımlarındaki rolünü güçlendirmiştir (Osborne, &Fox, 2018).

20. yüzyılın ikinci yarısında küreselleşmenin etkisiyle fuarcılık sektörü uluslararası bir boyut kazanmış, II. Dünya Savaşı sonrası ekonomik iş birliğini teşvik eden fuarlar, ülkeler arası ticaretin gelişimine katkı sunan önemli platformlar haline gelmiştir. 1967'de Expo Montreal, sürdürülebilirlik ve teknolojik yenilikleri odağına alarak uluslararası fuar anlayışını dönemin koşullarına uyarlamıştır. Bu süreçte fuarlar, sadece ticari ürünlerin tanıtıldığı organizasyonlar olmaktan çıkıp kültürel ve sosyal mesajların aktarıldığı platformlara dönüşmüştür (Frost ve Laing, 2018). 1980'lerden itibaren dijitalleşmenin hız kazanması, fuar organizasyonlarının yapısını köklü biçimde değiştirmiştir. Dijital ekranlar, bilgisayar destekli tasarımlar ve multimedya sunumları yenilikçi ziyaretçi deneyimleri sunarken, 2000'li yıllarda artırılmış gerçeklik (AR) ve sanal gerçeklik (VR) gibi teknolojiler, ziyaretçilerle daha interaktif iletişim imkânı sağlamıştır (Duman, 2024).

Hannover Messe gibi uluslararası teknoloji fuarları, robotik sistemler ve yapay zekâ uygulamalarını tanıtarak teknoloji odaklı fuarcılığın gelişimine katkı sağlamıştır (Özer, 2021). Son yıllarda ise sürdürülebilirlik, fuar tasarımlarının temel unsurlarından biri haline gelmiştir. Enerji verimli aydınlatma sistemleri, geri dönüştürülebilir malzemeler ve çevre dostu yaklaşımlar, modern fuar organizasyonlarının ayrılmaz bir parçası olmuştur. 2015 Expo Milano, sürdürülebilir tarım ve çevre temalarıyla fuarların küresel sorunlara dikkat çekme potansiyelini gözler önüne sermiştir (Bennett, 2020).

Covid-19 pandemisi, fuar sektöründe yeni bir dönemin başlamasına neden olmuş, fiziksel etkinliklerin kısıtlandığı süreçte sanal fuarlar ve hibrit modeller yaygınlaşmıştır. Online platformlar üzerinden düzenlenen sanal fuarlar, küresel katılımcılara erişimi kolaylaştırırken, fiziksel katılımın sunduğu deneyim eksikliği hibrit fuar modellerini ön plana çıkarmıştır. Bu model hem dijital hem de fiziksel deneyimleri bir araya getirerek

katılımcıların farklı beklentilerine yanıt verebilmektedir ve gelecekte fuarcılığın dönüşümünde önemli bir rol oynayacaktır (Lawson, 2017).

Türkiye'de fuarcılık sektörü de bu dönüşüm sürecine paralel olarak gelişmiştir. İzmir Enternasyonal Fuarı gibi köklü etkinliklerin yanı sıra İstanbul Fuar Merkezi ve Antalya Expo gibi modern fuar alanları, Türkiye'nin uluslararası fuar sektöründeki konumunu güçlendirmiştir. Dijital teknolojilerin entegrasyonu ve sürdürülebilirlik odaklı yaklaşımlar, Türkiye'deki fuar organizasyonlarının dikkat çeken unsurları arasında yer almaktadır. Örneğin, UNICERA Uluslararası Seramik Banyo Fuarı hem yerel hem de küresel katılımcıları bir araya getirerek Türkiye'nin seramik sektöründeki gücünü uluslararası arenada temsil etmektedir. Günümüzde fuarcılık sektörü, endüstri odaklı organizasyonlardan, dijitalleşme ve sürdürülebilirlik ekseninde gelişen, kullanıcı deneyimine odaklanan etkinlik alanlarına evrilmiştir. Hem Türkiye'de hem de dünyada fuar alanlarının bu değişimlere hızla uyum sağladığı görülmektedir. Teknolojik yenilikler, çevresel farkındalık ve hibrit modeller, gelecekte fuarcılık sektörünün yönünü belirleyen temel faktörler olacaktır (Acartürk, 2012).

## KAVRAMSAL ÇERÇEVE

Tasarım, bireylerin yaşam alanlarını estetik ve işlevsel bir şekilde düzenlemeyi amaçlayan çok yönlü bir süreçtir. Fuar alanları gibi dinamik ve geçici mekanların tasarımı ise, estetik, işlevsellik ve deneyim odaklılık gibi farklı boyutları bir araya getirir. Bu bölümde, iç mekân kavramı, fuar alanlarının tasarım yaklaşımları ve bu mekanların kullanıcı deneyimi üzerindeki etkileri detaylandırılmaktadır.

### İç Mekân Kavramı

İç mekân, yapıların sınırları içerisinde bulunan ve bireylerin fiziksel, sosyal ve psikolojik ihtiyaçlarına cevap veren alanlar olarak tanımlanır. İç mekânın sadece fiziksel bir düzenleme değil, aynı zamanda bireylerin duygusal bağ kurduğu bir alan olduğunu belirtmiştir. Bu bağlamda iç mekân, kullanıcılara hem işlevsel hem de estetik bir deneyim sunar.

İç mekân tasarımının, kullanıcıların mekanla olan etkileşimlerini optimize etmek için yapılandırıldığını ifade eder. İç mekân, işlevsellik, estetik, ergonomi ve sürdürülebilirlik gibi unsurların dengeli bir şekilde bir araya getirilmesiyle oluşturulur (Lawson, 2017). Fuar alanlarında iç mekân tasarımı, esneklik ve modülerlik gerektirir (Dikeç, 2013). Geçici mekanların tasarımında hızlı kurulum ve sökülme süreçlerinin yanı sıra, kullanıcı dostu düzenlemelerin önemine dikkat çekmiştir. Bu özellikler, fuar alanlarının sürekli değişen ihtiyaçlara uygun şekilde yapılandırılmasını sağlar.

### Fuar Alanları ve Tasarım Yaklaşımları

Fuar alanları hem estetik hem de işlevsellik açısından bir araya gelen karmaşık mekanlardır. Bu alanlar, ziyaretçilerin kolaylıkla erişebileceği, yönlendirici ve görsel olarak çekici bir şekilde tasarlanmalıdır. Fuar alanlarının tasarımında şu yaklaşımları öne çıkarmaktadır.

Fonksiyonel tasarım, fuar alanlarının kullanıcı akışını kolaylaştıran, ürünleri ve hizmetleri en verimli şekilde sergileyen düzenlemelerdir. Geniş koridorlar, açık plan düzenlemeler ve net yönlendirme elemanları, fonksiyonel tasarımın temel unsurlarıdır. Estetik, mekanların ziyaretçilerde olumlu bir ilk izlenim yaratmasını sağlarken, tematik tasarım, belirli bir marka veya ürünle ilişkilendirilen unsurların sergilenmesini içerir. Fuar

alanlarında kullanılan malzeme, renk ve aydınlatma seçimlerinin ziyaretçi algısını doğrudan etkilediğini belirtmektedir (Beril Bal ve Bekar, 2025).

Dijital teknolojilerin modern fuar alanlarının ayrılmaz bir parçası haline geldiğini ifade etmektedir. Artırılmış gerçeklik (AR), sanal gerçeklik (VR) ve interaktif ekranlar, kullanıcıların sergilenen ürünlerle daha derin bir bağ kurmasını sağlar (Duman, 2024).

Sürdürülebilirlik, modern tasarım projelerinin temel bir bileşenidir. Enerji verimliliği sağlayan aydınlatmalar ve geri dönüştürülebilir malzemelerin hem çevresel hem de ekonomik faydalar sunduğunu vurgulamaktadır (Akbulut, & Güvenç, 2016).

**Fuar Alanlarında İç Mekân Tasarımının Kullanıcı Deneyimine Etkisi**

İç mekân tasarımı, ziyaretçilerin fuar alanıyla kurduğu etkileşimde belirleyici bir rol oynar. Ziyaretçi deneyimini şekillendiren temel unsurlar şunlardır:

**Mekansal Akış ve Ergonomi**

Fuar alanlarında mekânsal düzenlemenin akıcı bir şekilde tasarlanması, ziyaretçilerin alanı kolayca keşfetmesini sağlar. Bu yaklaşım hem kullanıcı memnuniyetini artırır hem de sergilenen ürünlerin daha fazla dikkat çekmesine katkıda bulunur.

**Teknolojik Entegrasyon**

Artırılmış gerçeklik (AR) ve sanal gerçeklik (VR) gibi teknolojiler, ziyaretçilerin ürünlerle daha derin bir etkileşim kurmasını sağlar. Dijital ekranların ve etkileşimli uygulamaların, ziyaretçilerin bilgiye hızlı ve kolay erişimini sağladığını vurgulamaktadır (Partarakis, 2025).

**Dinlenme ve Sosyal Alanlar**

Fuar alanlarında yer alan oturma ve dinlenme alanları, ziyaretçilerin rahatlamasını sağlayarak deneyimlerini daha keyifli hale getirir. Bu sosyal alanlar, ziyaretçilerin fuar alanında daha uzun süre vakit geçirmesine ve genel memnuniyetlerinin artmasına katkı sağlar. Tasarım kavramları, fuar alanlarının başarısını şekillendiren temel unsurlardır. İç mekân ve çevre tasarımı, fonksiyonel, estetik ve sürdürülebilir yaklaşımlarla birleştirilerek kullanıcı deneyimine katkıda bulunur. Türk ve uluslararası kaynaklardan elde edilen bilgiler, modern fuar alanlarının dinamik yapısını anlamamıza yardımcı olmaktadır.

Araştırmanın temel amacı, UNICERA 2024 İstanbul Fuarı'nda Creavit için tasarlanan sergi alanının tasarım ilkelerini ve kullanıcı deneyimine etkilerini değerlendirmektir. Araştırma, modern fuar alanlarında iç mekân tasarımının rolünü irdeleyerek, bu alanların ticari ve estetik hedeflere nasıl hizmet ettiğini anlamayı hedefler.

Çalışmada, aşağıdaki sorulara yanıt aranmıştır:

- İç mekân ve çevre tasarımı, fuar alanlarında kullanıcı deneyimini nasıl etkiler?
- Creavit' in marka kimliği, fuar tasarımında hangi unsurlarla desteklenmiştir?
- Modern fuar tasarımlarında sürdürülebilirlik ve dijitalleşme ne ölçüde ön plana çıkmaktadır?

Bu sorular, UNICERA 2024 örneği üzerinden ele alınarak, ticari fuar tasarımının gelecekteki uygulamaları için çıkarımlar sunulması hedeflenmektedir.

## UNİCERA 2024 İSTANBUL FUARI VE FUAR MERKEZİ

Bu bölümde, UNICERA 2024 İstanbul Fuarı'nın düzenlendiği İstanbul Fuar Merkezi'nin özellikleri, katılımcı profili, önceki yıllara ait istatistikler, altyapı olanakları ve yerleşim planı ele alınmaktadır (Görsel 1).




**Görsel 1.**İstanbul Fuar Merkezi, fuar salonları yerleşim planı
(Bölüm 1: İstanbul Fuar Merkezi, 2023)

### İstanbul Fuar Merkezinin Alan Büyüklüğü ve Kapasitesi

İstanbul Fuar Merkezi (İFM), Türkiye'nin en büyük ve kapsamlı fuar merkezlerinden biridir. Toplamda yaklaşık 500.000 metrekarelik bir alan üzerine kurulu olan merkez, 96.000 metrekarelik kapalı alana sahiptir. İFM hem ulusal hem de uluslararası etkinliklere ev sahipliği yaparak birçok sektör için önemli bir platform sunmaktadır. Geniş kapasitesi ve çok sayıda salonuyla, aynı anda birden fazla etkinliğin düzenlenmesine de olanak tanımaktadır (İstanbul Fuar Merkezi, 2023).

### Fuar Katılımcı Profili ve Firma Sayısı

UNICERA İstanbul, seramik, banyo ve mutfak sektörlerinde dünya çapında tanınan bir fuar olarak her yıl binlerce profesyoneli bir araya getirmektedir. Katılımcı profili, inovasyon ve tasarım odaklı firmalardan oluşmaktadır. 2024 yılında fuara toplamda 330'dan fazla katılımcı firma iştirak etmiştir. Bu firmalar, seramikten banyo ürünlerine, mimari çözümlerden teknolojiye kadar geniş bir ürün yelpazesi sunmaktadır (UNICERA, 2024).

### Önceki UNICERA Fuarlarında Katılımcı İstatistikleri

Geçmiş UNICERA Fuarları, katılımcı ve ziyaretçi sayıları bakımından önemli bir başarı elde etmiştir. Örneğin, 2023 yılında düzenlenen fuar, toplamda 88.728 ziyaretçiyi ağırlamış ve 327 katılımcı firma yer almıştır. Ayrıca, 110 farklı ülkeden 12.798 yurt dışı ziyaretçi fuara katılım sağlamıştır (Expo Turkey, 2023). Bu veriler, UNICERA Fuarı'nın uluslararası çekiciliğini ve sektördeki önemini göstermektedir (Görsel 2).



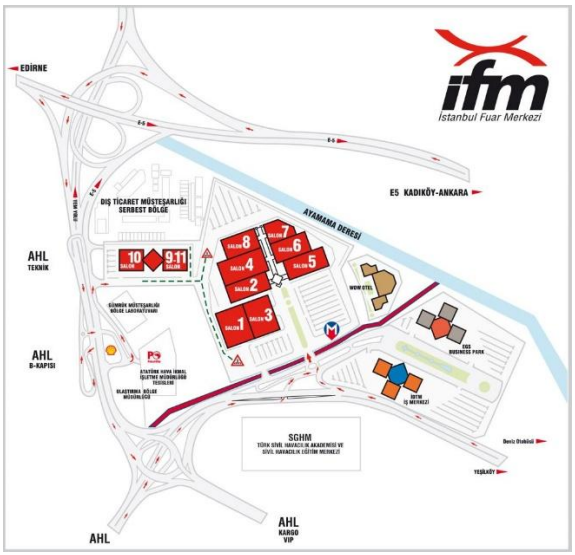

**Görsel 2.** İstanbul fuar merkezine UNICERA 2024 için gelen katılımcılar ve ülkeleri
(Expo Turkey, 2023)

## Otopark ve Altyapı Olanakları

İstanbul Fuar Merkezi, geniş otopark ve altyapı olanaklarıyla katılımcı ve ziyaretçilerin konforunu sağlamayı hedeflemektedir. 7.500 araç kapasiteli otoparkı, restoranlar, kafeler ve bankacılık hizmetleri gibi sosyal alanları ile İFM, ziyaretçiler için ideal bir ortam sunmaktadır (URL:4). Ayrıca, fuar alanında teknik destek ve güvenlik hizmetleri gibi altyapı unsurları da yer almaktadır.

## Fuar Alanının Haritası ve Yerleşim Planı

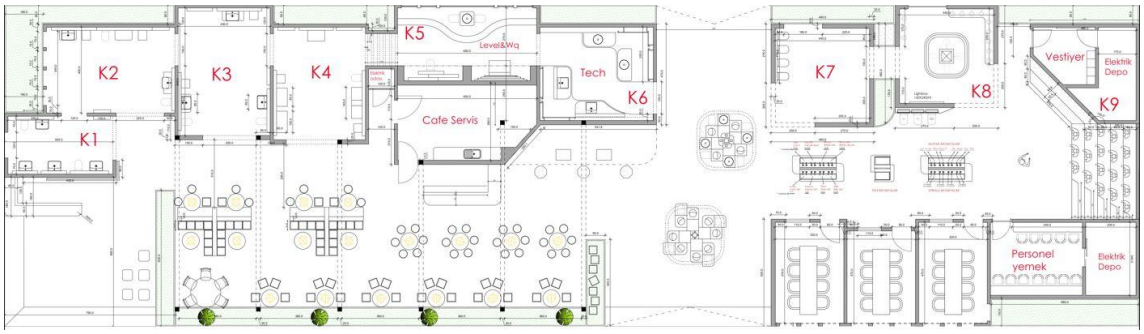
UNICERA Fuarı'nın yerleşim planı, katılımcı firmaların ve ziyaretçilerin fuar alanında kolaylıkla hareket edebilmesi için detaylı bir şekilde hazırlanmıştır. İstanbul Fuar Merkezi, 11 adet fuar salonundan oluşmaktadır ve her bir salon belirli sektörlere veya ürün gruplarına tahsis edilmiştir. Ayrıca, fuarın resmî web sitesinde interaktif haritalar ve katılımcı firmaların stant yerleşimlerini gösteren salon planları bulunmaktadır (Görsel 3) (UNICERA, 2024).




**Görsel1.** İstanbul fuar merkezi otopark yerleşim planı
(Bölüm 2: İstanbul Fuar Merkezi, 2023)

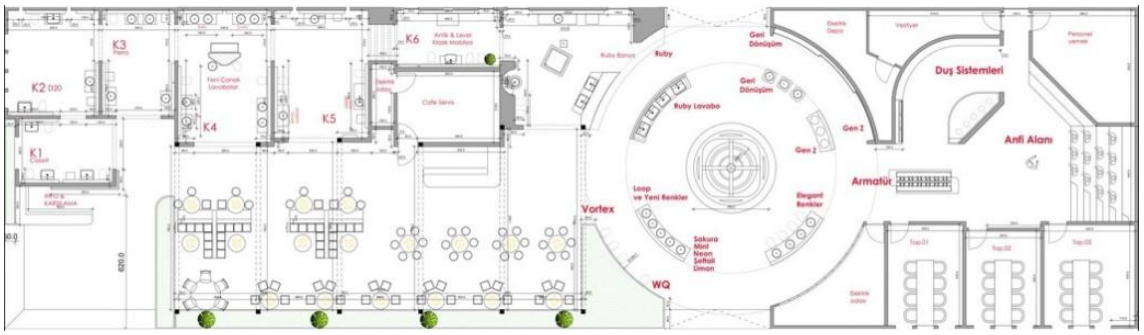
## TASARIM SÜRECİ VE PROJE ÖZELLİKLERİ

İstanbul Fuar merkezi (İFM) de yapılan 04-08 Kasım 2024 Tarihleri arasında düzenlenmiş olan UNICERA 2024 İstanbul Fuarı'nda Creavit için tasarlanan sergi alanı hem markanın kimliğini yansıtmak hem de kullanıcı deneyimini zenginleştirmek amacıyla oluşturulmuştur. Bu bölümde, tasarım sürecinin aşamaları, proje özellikleri ve teknik detaylar ele alınmıştır. Projenin çıkış noktası sergileme alanları ile misafirlerin ağırlanacağı, toplanma alanı ve üniversitelerden sektör ile alakalı bilgi verilmesi hedeflenen öğrencilere yapılacak olan sunumun başlangıcı olan amfinin dengeli bir biçimde alan içerisinde kurgulanması sağlanmıştır. 15 metre genişliğinde ve 53 metre uzunluğundaki fuar alanı tasarım faaliyetlerini zorlaştırsa da lineer bir çözümle sergileme ve ağırlama bölümleri çözümlenmiştir. 2023 fuar alanından başlayan tasarım kurgusu 2024 yılında olgunluğa ulaşmıştır (Görsel 4).




**Görsel2.** UNICERA 2023 Creavit fuar alanı yerleşim planı
(Yazar fotoğraf arşivi, 2024)

2023 ve 2024 yılında görüldüğü üzere tasarımda değişiklikler yapılmıştır. İlerleyen bölümlerde yapılmış olan değişikliklerden ve mevcut değişikliklerin fuar alanına olan katkılarından bahsedilecektir (Görsel 5).




**Görsel3.** UNICERA 2024 Creavit fuar alanı yerleşim planı
(Yazar fotoğraf arşivi, 2024)

### Fuar Tasarım Eskizleri ve Çizimler

Tasarım sürecinin başlangıç aşaması, konsept geliştirme ve ilk eskizlerin hazırlanması olmuştur. "Vision" teması, Creavit 'in sürdürülebilirlik ve yenilikçilik değerlerini ön plana çıkarmak için belirlenmiştir. Şirketin mottosu haline gelmiş olan "bakış açını değiştir", "banyo bu tarafta", "herkes bakar, görüyor musun" gibi reklam sloganları ise bakış açımızı oluşturmakta önemli katkılar sağlamaktadır. Bu bağlamda, eskizlerde aşağıdaki düzenlemeler yapılmıştır (Görsel 6).

- Giriş Alanı: Creavit logosu ve multimedya ekranlarla ziyaretçileri karşılayan etkileyici bir alan.
- Ürün Sergileme Alanları: Her ürün ailesine ayrılmış kütleler.

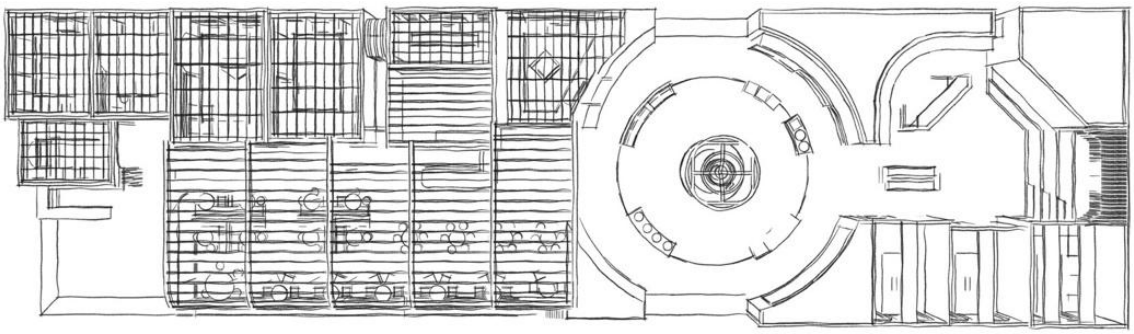
- Dinlenme Alanları: Modern oturma gruplarıyla ziyaretçilere rahat bir mola alanı sunulması.
- Etkileşim Alanları: Ziyaretçilerin dijital araçlarla ürünlerle etkileşim kurabileceği bölümler.

Fuar alanlarının tasarımında, marka kimliğini ön plana çıkaran düzenlemelerin, ziyaretçilerde olumlu bir etki yarattığı dikkate alınmıştır. Bu doğrultuda, işlevsellik ile estetik unsurlar bir araya getirilerek dengeli bir mekânsal düzen sağlanmıştır (Görsel 7).

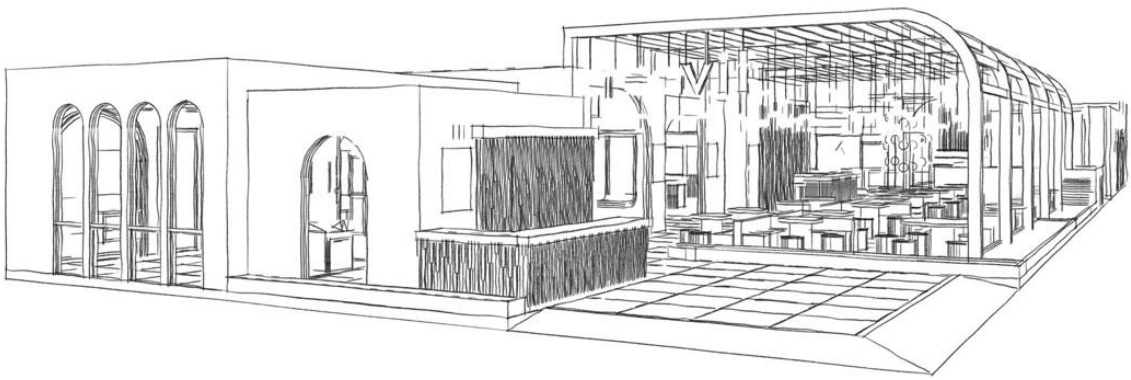
Teknik çizimler, mekânsal organizasyonu ve detayları içermektedir:

- Kat Planı: Ürün sergileme üniteleri, giriş alanı ve dinlenme bölümlerinin yerleşim düzenini gösterir.
- Aydınlatma Planı: Vurgu aydınlatmalarının ve genel ışıklandırma elemanlarının konumları belirtilmiştir.
- Modüler Sistemler: Taşınabilir sergi ünitelerinin ölçüleri ve yerleşim özellikleri detaylandırılmıştır.

Fuar tasarımı sürecinde teknik çizimlerin hem mekânsal verimliliği hem de ziyaretçilerin mekânda rahat hareket edebilmesini sağladığını vurgulamaktadır (Lawson, 2017).



**Görsel 4.** UNICERA 2024 eskiz plan çalışmaları
(Yazar fotoğraf arşivi, 2024)



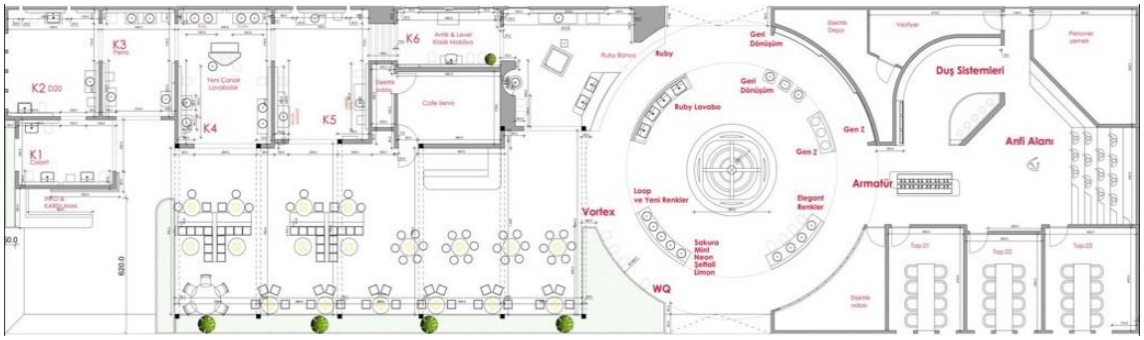
**Görsel 7.** UNICERA 2024 giriş bölümü eskiz çalışmaları
(Yazar fotoğraf arşivi, 2024)

**Proje Özellikleri, Render ve Teknik Detaylar**

Tasarım, 795 m² bir alan üzerine kurulmuş ve aşağıdaki özelliklere göre düzenlenmiştir. Fuarlarda sergi alanlarının tasarımı, kullanıcı deneyimini optimize etmek ve markanın etkili bir şekilde temsil edilmesini sağlamak amacıyla belirli kriterler doğrultusunda şekillendirilmektedir. Bu analizler, saha gözlemleri, literatür incelemeleri ve önceki fuarlardan elde edilen veriler ışığında gerçekleştirilmiştir. Alanın genel yerleşimi, ziyaretçi hareketliliği, ürün sunumu ve mekânsal düzenlemeler, elde edilen

bulgular doğrultusunda değerlendirilmiştir. Bu bağlamda, Creavit'in UNICERA 2024 sergi alanında uygulanan tasarım kararları; alanın farklı misafir grupları için etkin şekilde kullanılmasını sağlayan esneklik modeli, bu esneklikle paralel bağlantıda koridor genişlikleri ve yönlendirmelerin misafir ağırlama stratejisiyle birlikte daha geniş uygulanması ve özel teşhirleri diğerlerinden ayırmak adına aydınlatma vurgusu kullanılarak ziyaretçiler tarafından dikkat çekmesi sağlanmaktadır (Görsel 8 ve 9).

- Esneklik : Modüler sistemler, alanın farklı etkinliklere uyarlanabilmesini sağlamaktadır.
- Ziyaretçi Akışı : Koridorların geniş tutulması ve ürün kimliklerinin doğru yerleştirilmesiyle akıcı bir hareket sağlanmıştır.
- Odak Noktaları : Öne çıkan ürünlerin sergilendiği bölümler, özel aydınlatmalarla vurgulanmıştır.




**Görsel 8.** UNICERA 2024 Creavit fuar planı
(Yazar fotoğraf arşivi, 2024)



**Görsel 9.** UNICERA 2024 Creavit fuar planı renderı
(Yazar fotoğraf arşivi, 2024)

Stant seçiminde ise hem sürdürülebilirlik hem de 2023 yılından kullanabileceğimiz birçok malzemeyi sürdürülebilirlik adına tekrardan kullanmayı benimsediğimiz bir proje tasarımı olmuştur. Aşağıda tekrardan kullandığımız stant, mobilya, reklam panoları ve elektrik aydınlatma armatürleri sıralanmaktadır.

- Giriş bankosu mobilyası (Görsel 8 ve 9),
- Cafe alanı, bankosu ve mobilyaları,
- Cafe alanı konstrüksiyonu (Görsel 8 ve 9),
- Zemin malzemesi (Görsel 8 ve 9),
- Meydanda bulunan lale revizyonu (Görsel 9),
- Toplantı alanı mobilyaları ve koltukları,
- Tüm pencere ve kapılar,

- Amfi alanı ve Ruby parametrik tasarımı (Görsel 11),
- Elektrik ve aydınlatma malzemeleri,
- Reklam pano dili ve kutu harf tabelaları.




**Görsel 10.** UNICERA 2023 Creavit fuar alanı giriş fotoğrafı
(Yazar fotoğraf arşivi, 2024)




**Görsel 11.** UNICERA 2024 Creavit fuar alanı giriş fotoğrafı
(Yazar fotoğraf arşivi, 2024)

2023 yılında 2,8 mm kalınlığında çelik sac ile yaptırmış olduğumuz standın uyumu plan ile uyumlu olmaktaydı (Görsel 12).



**Görsel 12.** 2023 yılına ait çelik konstrüksiyon
(Yazar fotoğraf arşivi, 2024)

2024 yılında ise anıtsal bir meydan oluşturma isteğinden ötürü mevcut çelik standın etrafına eklentilerle meydan ile aynı formu oluşturmak istenmiştir (Görsel 13).




**Görsel 13.** 2024 yılına ait düzenlenmiş çelik konstrüksiyon
(Yazar fotoğraf arşivi, 2024)

Ziyaretçi deneyimini artırmak için teknoloji odaklı çözümler projede yer almıştır:

- Dijital Deneyimleri: Ziyaretçilerin Creavit ürünlerini sanal ortamda incelemesine olanak tanımıştır.
- İnteraktif Paneller: Ürün bilgilerine hızlı erişim sağlanmıştır (Görsel 14)
- Multimedya Ekranlar: Markanın hikayesi ve ürünlerinin kullanım videoları gösterilmiştir (Görsel 15).

Dijital teknolojilerin fuar tasarımında ziyaretçilerin ilgisini artırmada ve markanın yenilikçi yönünü yansıtmada önemli bir araç olmuştur.




**Görsel 14.** Banyo özelliklerini anlatan interaktif paneller
(Yazar fotoğraf arşivi, 2024)




**Görsel 15.**Curve dijital ekran
(Yazar fotoğraf arşivi, 2024)

Sürdürülebilirliği korumaya çalıştığımız bir diğer stant ise parametrik tasarım olan Ruby standı. 2023 yılında ürünün fuar içerisinde gösterimine uygun olması adına stant antrasit rengine boyanmıştır (Görsel 16).




**Görsel 16.** 2023 yılında kullanılan parametrik tasarım ve amfi alanı
(Yazar fotoğraf arşivi, 2024)

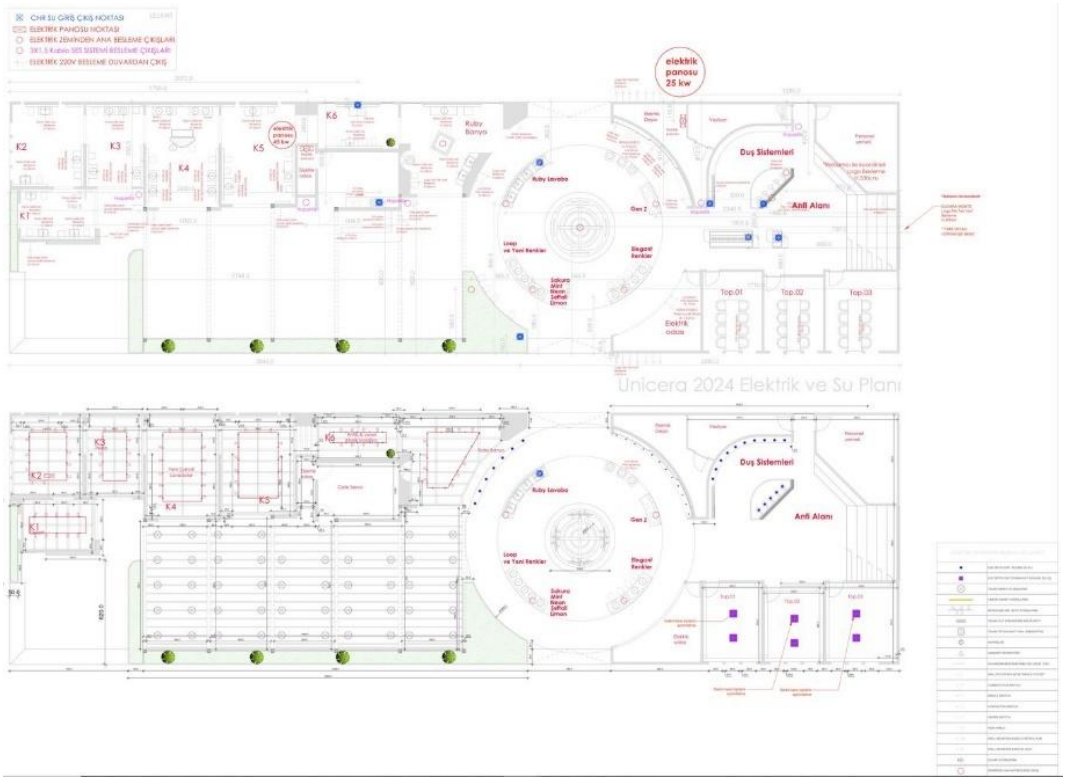
2024 yılında fuar alanı içerisindeki ruby ürününün gösterimine uygun olması amacıyla kullanılan malzeme aynı olup montaj sonrası beyaza boyanmıştır. Saha da koyu bir rengi açık bir renge çevirmek oldukça zorlamıştır. 5 kat boya ile antrasit etkisi tamamen beyaza dönmüştür (Görsel 17).




**Görsel 17.** 2023 yılında kullanılan parametrik tasarım ve amfi alanı
(Yazar fotoğraf arşivi, 2024)

Aydınlatma, ürünlerin sergileniş biçimini ve mekânın atmosferini etkileyen önemli bir tasarım unsuru olarak belirlenmiştir.

- Vurgu Aydınlatmaları: Sergilenen ürünleri ön plana çıkarmak için LED spot ışıklar kullanılmıştır.
- Dolaylı Aydınlatmalar: Mekânın genel atmosferini desteklemek için yumuşak ışıklandırma uygulanmıştır (Görsel 18).




**Görsel 18.** UNICERA 2024 Creavit aydınlatma ve elektrik yerleşim projesi
(Yazar fotoğraf arşivi, 2024)

Sergi alanlarında aydınlatma düzenlemelerinin, ziyaretçi deneyiminde odaklanmayı artırmak için stratejik bir şekilde tasarlanması gerektiğini ifade etmektedir (Çelik, 2017). UNICERA 2024 Fuarı için Creavit sergi alanı, sürdürülebilirlik, teknolojik entegrasyon ve kullanıcı deneyimini ön planda tutan bir tasarım süreciyle gerçekleştirilmiştir. Eskizlerden teknik detaylara kadar her aşamada, marka kimliğini ve yenilikçi yaklaşımı destekleyen bir tasarım hedeflenmiştir.

**Projenin Nihai Fotoğrafları**

Tüm detaylarının projeye uygun şekilde tamamlandığını bilmek ölçeği büyük projelerde başarı olarak kabul edilmektedir. Planlama aşamasında tüm detayların projesini çizmek üreticiler için kolaylık sağladığı için projenin kurulum sürecinde zamana karşı yarışırken tüm ürünlerin eksiksiz ve hatasız olarak alanda bulunması gerekmektedir. 7 günlük kurulum sürecinde herhangi bir kaza veya aksaklık olmadan fuar kurulumu tamamlanmıştır. Fuar alanının bitmiş haline ait fotoğraflar aşağıda gösterilmektedir (Görsel 19, 20, 21 ve 22).




**Görsel 19.** UNICERA 2024 Creavit fuar alanının ziyaretçileri karşıladığı en yoğun nokta
(Yazar fotoğraf arşivi, 2024)




**Görsel 20.** UNICERA 2024 Creavit fuar alanının banyo mekanlarına ait ürün ve ürün kimlikleri
(Yazar fotoğraf arşivi, 2024)




**Görsel 21.** UNICERA 2024 Creavit fuar alanının tekil ürünler standı
(Yazar fotoğraf arşivi, 2024)




**Görsel 22.** UNICERA 2024 Creavit fuar alanının meydanda bulunan sürdürülebilir ürünlerle yapılmış olan standı
(Yazar fotoğraf arşivi, 2024)

## SONUÇ

UNICERA 2024 İstanbul Fuarı'nda Creavit için tasarlanan sergi alanı, modern fuar tasarımının sürdürülebilirlik, estetik ve kullanıcı deneyimi odaklı yaklaşımını yansıtan bir proje olmuştur. Bu bölümde, projenin genel değerlendirmesi yapılmış, elde edilen bulgular detaylandırılmış ve gelecekteki çalışmalara yönelik öneriler sunulmuştur.

Proje, Creavit ‘in yenilikçi vizyonunu ve sürdürülebilirlik değerlerini yansıtan bir tasarım anlayışıyla gerçekleştirilmiştir. Tasarım süreci, markanın kimliğini güçlendirme, kullanıcı deneyimini iyileştirme ve sektörde öne çıkma hedeflerine uygun olarak planlanmıştır. Fuar alanı hem teknik hem de estetik açıdan bir bütünlük sunmuş, ziyaretçilere etkileyici bir deneyim yaşatmayı amaçlamıştır.

Doğal malzemelerin kullanımı ve enerji verimli aydınlatma elemanları, çevresel duyarlılığı ön plana çıkarmış ve Creavit ‘in sürdürülebilirlik hedeflerini desteklemiştir. Bu yaklaşım, modern fuar tasarımında çevre dostu uygulamaların önemini bir kez daha vurgulamaktadır. Bir önceki senelerden kalan aydınlatma elemanları tamir edilip kullanılmıştır. Bununla birlikte reklam tabelalarından da tüm ışıklı kutu harfler tamir edilip kullanılması özellikle desteklenmiştir. Ahşap stant elemanları küçük değişikliklerle bir önceki senelerden farklılaştırarak; boya rengini değiştirerek günümüzde kullanılmıştır.

Dijital deneyimleri ve interaktif paneller, ziyaretçilere ürünleri daha iyi anlama ve deneyimleme imkânı sunarak marka ile kullanıcı arasındaki etkileşimi artırmıştır. Teknolojinin bu şekilde entegre edilmesi, fuar alanlarının daha dinamik hale gelmesini sağlamıştır. Geçtiğimiz senelerden farklı olarak ilk defa büyük ekran panelini curve (eğik) şeklinde kurarak fuar tarihinde bir ilk oluşturulmuştur.

Mekânsal düzenlemelerin açık planlı ve yönlendirme elemanlarının etkili bir şekilde yerleştirilmiş olması, ziyaretçilerin alanda kolayca hareket etmelerini sağlamıştır. Bu durum, ziyaretçi memnuniyetini artırarak fuarın genel başarısına katkı sağlamıştır. Fuarın çevresindeki koridorlardan geçen ziyaretçilerde bu şekilde açık bir planlamanın fuar standımıza baka baka yürümeleriyle göstermiştir. Sadece stant içinden değil stant dışından geçen ziyaretçilerde bu ferahlığı ve dikkat çekiciliği gözlemlendiği tespit edilmiştir.

Sergi alanının estetik detayları, renk seçimleri ve malzeme kullanımı, Creavit ‘in modern ve yenilikçi kimliğini ziyaretçilere etkili bir şekilde aktarmıştır. Meydan tarafında bulunan çelik konstrüksiyon lale tasarımı renkli lavabolarımızı tij yardımıyla asmamıza vesile olurken aynı zamanda anıtsal bir öğe olarak dikkat çekicilik sağlamıştır. Neredeyse tüm misafirlerimiz renkli asılı lavabolarımızın önünde fotoğraf çektirmiştir.

Gelecek fuar projelerinde, yapay zekâ tabanlı yönlendirme sistemleri ve daha gelişmiş AR/VR uygulamalarının dahil edilmesi önerilmektedir. Bu yenilikler, ziyaretçilerin mekanla daha fazla etkileşim kurmasını sağlayabilir. Daha fazla geri dönüştürülebilir malzeme kullanımı, yenilenebilir enerji kaynaklarına dayalı aydınlatma sistemleri gibi uygulamalar sürdürülebilirlik vurgusunu güçlendirebilir. Gelecek tasarımlarda, engelli ziyaretçilerin ihtiyaçlarını karşılayacak daha kapsayıcı düzenlemeler yapılması önerilmektedir. Ziyaretçilerin yoğun tempoda dinlenebileceği daha fazla sosyal alan eklenmesi, deneyim kalitesini artırabilir.

UNICERA 2024 İstanbul Fuarı için tasarlanan Creavit sergi alanı, modern fuar tasarımının tüm gerekliliklerini karşılayan bir proje olarak dikkat çekmiştir. Sürdürülebilirlik, teknolojik entegrasyon ve estetik yaklaşımların bir araya getirildiği bu tasarım, marka kimliğini etkili bir şekilde ziyaretçilere aktarmış ve kullanıcı deneyimini zenginleştirmiştir. Gelecekteki çalışmalar, daha fazla dijitalleşme ve sürdürülebilirlik odaklı yaklaşımlarla bu başarıyı ileriye taşıyabilir.

Dijitalleşmeyi firmaların daha etkin kullanarak birbirlerine örnek olması gerekmektedir. 5 gün süreyle ziyaretçi ağırlayan fuar sistemi harcanan paraların önemli ölçüde kısılmasına katkı sağlayabilir.

**Etik İlkeler**

Bu çalışma etik kurul izni gerektirmemektedir.

**Araştırmacıların Katkı Oranı Beyanı**

Araştırma kapsamında yazarlar eşit oranda katkı sağlamıştır.

**Çatışma Beyanı**

Bu makalenin yazarları herhangi bir kişisel ve finansal çıkar çatışması içerisinde değildir.

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## EXTENDED ABSTRACT

### Introduction

UNICERA 2024 Istanbul Fair is a significant event where innovative designs and sustainability in the ceramics and bathroom sectors converge. This study examines the design process of the exhibition space created for the Creavit brand, evaluating its contributions within the context of interior design and environmental planning. The research aims to explore the role of exhibition design in enhancing user experience and promoting sustainable practices while aligning with Creavit's brand identity. Additionally, it investigates how contemporary fair designs address evolving demands such as technology integration and environmental awareness.

### Method

The study adopts a mixed-methods approach, incorporating qualitative and quantitative frameworks to analyze Creavit's exhibition space at UNICERA 2024 Istanbul Fair. Methods include a literature review, on-site observations, design analysis, and comparative evaluations of past and current designs. The study focuses on spatial organization, material selection, technological integration, and aesthetic features. Design sketches, technical drawings, and photographs were used as visual documentation. Furthermore, the study compares exhibition spaces from 2023 and 2024, aiming to achieve a more efficient and functional fair layout.

### Findings

The study identifies several key findings regarding Creavit's exhibition space:

Spatial Organization: The 15x53-meter exhibition area strikes an effective balance between functionality and aesthetics. Open-plan layouts strategically positioned entry points, and spacious corridors facilitated visitor movement and enhanced product visibility. Interactive panels and clear directional signage enriched the user experience. The design successfully catered to both professional and individual visitors, optimizing visitor engagement. The observation of visitors entering through the designated entry points confirmed the success of the layout design.

Brand Identity and User Experience: Creavit’s brand values were effectively reflected in the exhibition through thematic elements, slogans, digital displays, and innovative lighting. Vibrant colors and dynamic structures enhanced brand recognition, leaving a lasting impression on visitors. Social and rest areas improved user comfort and satisfaction. Additionally, digital panels and interactive screens presenting product stories fostered visitor engagement. Feedback highlighted the positive impact of these features on user experience.

Sustainability Practices: The project implemented sustainable practices such as reusing materials from previous exhibitions, energy-efficient lighting, and modular design elements. Recyclable materials and adaptive structures reduce waste typically associated with temporary spaces. This approach serves as a model for environmentally conscious fair design. Local materials were prioritized to minimize carbon footprints, and energy-efficient technologies significantly contributed to environmental sustainability goals.

Technological Integration: Interactive screens and advanced technologies like augmented reality (AR) and virtual reality (VR) provided visitors with innovative ways to interact with the products. These features not only enhanced the user experience but also reinforced the brand's innovation-driven identity. Technological elements effectively conveyed product specifications and applications to visitors, fostering a deeper connection with the brand.

Aesthetic Appeal: The exhibition emphasized elegance and modernity through clean lines, minimal visuals, and thematic motifs. A central installation featuring suspended lavatories stood out as a distinctive aesthetic element, encouraging social media interaction. Lighting design throughout the exhibition highlighted the products while creating a warm and inviting atmosphere. Variations in lighting schemes across different sections of the space provided visual diversity for visitors.

## Conclusions and Recommendations

The Creavit exhibition space at UNICERA 2024 Istanbul Fair emerges as a model for innovative and sustainable exhibition design. By integrating functional, aesthetic, and technological elements, the project successfully met contemporary design standards and increased visitor engagement. Key takeaways include.

Importance of User-Centric Design: The inclusion of spatial arrangements and social areas underscores the necessity of prioritizing user needs in exhibition design. Ergonomics and aesthetics should harmonize to enhance user satisfaction.

Role of Sustainability: Sustainable practices, such as material reuse and energy-efficient solutions, play a critical role in aligning with global environmental goals. These approaches also provide cost-saving benefits for future exhibitions.

Value of Technology: Advanced digital tools such as AR/VR create dynamic and engaging experiences for visitors, positioning the brand as an innovator in its sector.

The study offers the following recommendations for future fair designs: Advanced Digital Integration: Incorporate AI-powered navigation systems for real-time guidance and personalized visitor experiences.

Enhanced Accessibility: Design inclusive spaces catering to diverse visitor needs, including individuals with disabilities, to attract a broader audience.

Expanded Social Zones: Develop more rest and interaction areas to increase visitor satisfaction and prolong engagement with the exhibition.

Further Sustainability Measures: Utilize renewable energy sources, biodegradable materials, and waste-reduction strategies to minimize environmental impacts, making exhibitions eco-friendlier and more cost-effective.

Hybrid Exhibition Models: Combine physical and digital elements in hybrid formats to enhance accessibility and foster more dynamic interactions. Strengthening the connection between digital and physical spaces can expand participation and engagement.

# KİTAP BÖLÜMLERİ

**Karabük Üniversitesi**
Safranbolu Başak Cengiz Mimarlık Fakültesi

# Cumhuriyetin 100. Yılında Mimarlık Konuşmaları




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EĞİTİM YAYINEVİ GRUBU

# BAŞKENT ANKARA'DA ÖZGÜN İŞLEVİ DIŞINDA MÜZEYE DÖNÜŞTÜRÜLEN CUMHURİYET DÖNEMİ KAMU YAPILARI ÜZERİNE BİR DEĞERLENDİRME

Ayşen Esra Bölükbaşı Ertürk[1]

## 1. Giriş

Ankara'nın başkent olmasıyla Cumhuriyet rejiminin öngördüğü yeni bir yapılanma hem fikri hem de fiziki olarak başlamıştır. Kentin imar planları hazırlatılmış, başta idari ve yönetim binaları olmak üzere sağlık yapıları ile eğitimin her kademesinde hizmet verecek, çağdaş eğitimin yolunu açacak yeni binalar inşa edilmiştir. Diğer yandan ekonomik kalkınmada önemli olan başta yönetim binaları olmak üzere banka, sağlık ve diğer hizmet binalarının inşası da tüm bu yapılanma içinde yer almaktadır. Cumhuriyet'in kurulduğu bu yıllarda, Türk Ulusçuluğu düşüncesi, her alanda olduğu gibi mimaride de etkili olmuştur (Bozdoğan 2008; Onur Işıkoğlu, 2018). Yeni başkentin imarı, mimarlık tarihi açısından ele alındığında Milli Mimari Üslubu, Neoklasik Üslup, Erken Cumhuriyet Dönemi Mimarisi olarak da adlandırılan I. Ulusal Mimarlık Dönemi (Sözen 1984; Aslanoğlu, 2010; Yaldız&Parlak 2018; Hasol 2020, vd.) ile başlayarak, II. Ulusal Mimarlık Dönemi, Modernizm ve sonrasına kadar uzanmaktadır.

Cumhuriyet ideolojisini yansıtan siyasi, ekonomik ve sosyal açıdan yeni bir başlangıcın yapıldığı Ankara'da kent belleğini oluşturan ancak gelişen ve değişen şartlar nedeniyle kullanımları özgün işleviyle sonlanan tarihi yapıların yeni bir işlevle tekrar kent hafızasında yerini koruması önem taşımaktadır. Bu nedenle bir koruma yöntemi de olarak da ele alınan yeni işlev kazandırma ile bu tarihi yapılar tekrar cazibe merkezi haline gelmektedir.

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Başkent olması kararlaştırılan küçük bir Anadolu kenti olan Ankara'nın yapılanmasında önemli olan kamu binalarının Cumhuriyet'in 100. yılında geçirdikleri değişim sürecini müze işlevi bağlamında ele almak bu çalışmanın amacını ve çıkış noktasını oluşturmakla beraber işlev değişikliği olan tarihi yapıların özgün kimliklerinin yeni işlev ve buna bağlı düzenlemelerin gölgesinde kalmadan sürdürebilir olması ve bundan yüzyıl sonra da ilk yapı özelliklerinin okunabilir olması gerekliliğini vurgulamaktır.

## 2. Ankara'da Özgün İşlevinden Ayrı Müzeye Dönüştürülen Kamu Yapıları

### 2.1. I. Türkiye Büyük Millet Meclisi Binası -Kurtuluş Savaşı Müzesi

1915 yılında İttihat ve Terakki Fırkası'nın kulüp binası olarak inşasına karar verilerek halkın yardımlarıyla yapılan projesi Mimar Salim Bey tarafından yapım işi ise askeri mimar olan Hasif Bey tarafından gerçekleştirilmiştir (Aysal 2020:224).

23 Nisan 1920 ile 15 Ekim 1924 yılları arasında TBMM olarak daha sonra ise A.Ü. Hukuk Fakültesinin öncül yapılanmasını oluşturan Hukuk Mektebi olarak kullanılmıştır.

1957 yılında Milli Eğitim Bakanlığı tarafından müzeye dönüştürülmesi kararlaştırılmıştır.

23 Nisan 1961 yılında TBMM Müzesi, 23 Nisan 1981 yılında ise Kurtuluş Savaşı Müzesi adını almıştır (URL 1).

Bina I. Ulusal Mimarlık akımı / Milli Mimari Üslubu özelliklerine sahip olarak bodrum üzerine tek katlı inşa edilmiştir. İç mekânda geniş bir koridorun her iki yanına odalar simetrik olarak yerleştirilmiştir. Plan düzeni açısından meclis toplantı salonu ile bu salonun uzantısı ve dinlenme mekânı olarak kullanılan kulis merkeze alınmıştır. Geniş çatı saçakları, sivri kemerli pencereleri, kemer köşeliklerindeki kabaralarla dönemin özeliklerini gösterir.

Bodrum kat, depo, fotoğraf atölyesi vd. mekânları içermektedir. Üst katta ise kurtuluş savaşını anlatan belgeler, antlaşma metinleri, madalyalar, sikke ve fotoğraflar ile diğer eşyalar sergilenmektedir.

Meclis toplantı salonu ahşap kürsü ve mebuslar için oturma sıralarıyla özgün haliyle sergilenmektedir (Fotoğraf 2-3). Koridorun her iki yanında bulunan mekânlarda sergileme yapılmaktadır.



**Fotoğraf 1.** I. Meclis Binası- Kurtuluş Savaşı Müzesi. (URL-1) Kaynak:(https://www.ktb.gov.tr/TR-96356/ankara---kurtulus-savasi-muzesi-i-tbmm-binasi.html)



**Fotoğraf 2-3.** I. Meclis Binası- Kurtuluş savaşı Müzesi. Meclis Toplantı Salonu (Bölükbaşı Ertürk 2023)

### 2.2. II. TBMM Binası- Cumhuriyet Müzesi

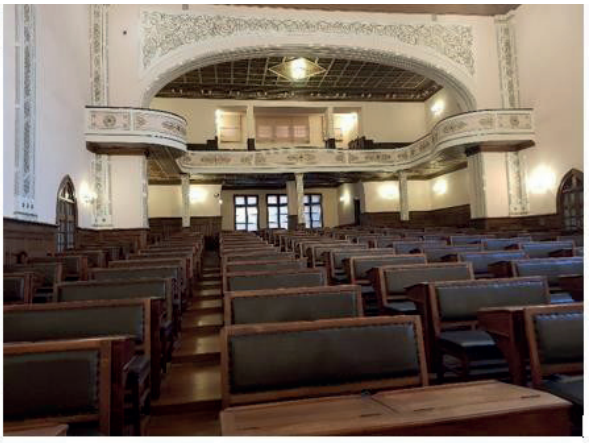
1923 yılında Mimar Vedad Tek tarafından tasarlanan yapı I. Ulusal Mimarlık dönemi özelliklerini yansıtmaktadır (Fotoğraf 4). Bodrum üzerine iki katlı olan yapıda iç mekânın ortasında iki kat boyunca yükselen meclis salonunu çevreleyen birimler yer alır (Fotoğraf 5).

I. TBMM binası yeterli gelmeyince meclis binası olarak düzenlenmiş ve 18 Ekim 1924 tarihinde hizmete açılmıştır. Binada; Türk Siyasi tarihinde önemli yeri olan II. TBMM, 1924-1960 yıllarında Atatürk ilke ve devrimlerinin gerçekleştirilmesi, önemli yasaların çıkarılması, uluslararası anlaşmaların imzalanması ve çok partili sisteme geçiş gibi Türkiye siyasi tarihinin önemli olayları gerçekleşmiştir. (Hasol 2020: 41)




**Fotoğraf 4.** II. TBMM Binası- Cumhuriyet Müzesi. (URL-2) Kaynak: (https://tarihvakti.com/tbmmnin-acilmasi/)



**Fotoğraf 5.** II. Meclis- Cumhuriyet Müzesi – Meclis Toplantı Salonu (Bölükbaşı Ertürk 2023)

### 2.3. Ankara Vakıf Oteli- Ankara Palas Müzesi

İlk dönemlerinde Evkaf Müdürlüğü'ne bağlı olduğundan "Evkaf Oteli" olarak da anılan (Sumbas 2013:178) Ankara Palas, Ankara'nın başkent olması nedeniyle burada yürütülen çalışmalara katılmak için çevre illerden gelen milletvekilleri ile yabancı devlet yetkililerinin konaklaması ve ağırlanması için inşa edilmiştir. Binanı ilk mimarı Vedad Tek'in görevden ayrılmasıyla Mimar Kemalettin Bey binanın tasarım sürecini ve yapımını devam ettirmiştir.

Bodrum üzerine iki katlı binanın zemin katı, ortada üstten ışık alan balo salonu ve bunu çevreleyen bir hol etrafındaki farklı ölçülerdeki mekânlardan oluşmaktadır. Binada dikey sirkülasyon merdivenlerle sağlanmış olup üst katta otel odaları bulunmaktadır.

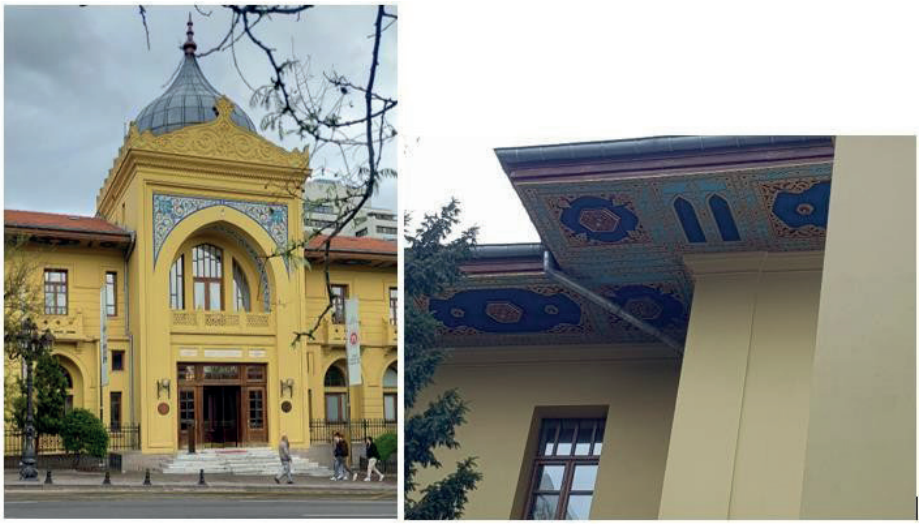
I. Ulusal Mimarlık akımının özelliklerine uygun olarak, girişin öne çıkarılarak vurgulanması, bina köşelerinin cepheden dışa taşkın ve yüksek yapılarak geniş saçaklı çatılarla örtülmesi, cephedeki mukarnas, sivri kemer, çini vd. unsurlarla Selçuklu ve Osmanlı dönemi mimarisindeki cephe düzeni ve bezeme özelliklerine gönderme yapması dikkat çekicidir. Bunların yanında betonarme karkas olarak inşa edilmesi (Aslanoğlu 2010:269), kalorifer tesisatı, elektrik ve sıcak su gibi konfor koşullarının oluşturulması o denem için yenilikçi yaklaşımlar olarak değerlendirilebilir. Milli Mimari mirasının yeni malzeme ve yapım teknikleriyle buluşturan anlayış hâkimdir.

Ankara Palas 1968'de Vakıflara devredilmiş ve 1972'ye kadar onarılmıştır. Bir ara Oleyis Sendikasına otel olarak kiralanmış; 1975'te tekrar Vakıflara geçmiş ve 1976-81 arasında Sanayi ve Teknoloji Bakanlığı'nca kullanılmıştır. 1981 başında Bayındırlık Bakanlığı'na devredilmiş; eskisine sadık kalınarak restore edildikten sonra Devlet Konukevi olarak 1983 yılında kullanıma açılmıştır (Sumbas 2013: 193 dipnot 16). 22 Şubat 2024 tarihinde Milli Saraylara bağlı müze olarak ziyarete açılmıştır.

Ankara Palas Müzesi Erken Cumhuriyet yapısı olması tarihi kimliğinin yanı sıra özgün mimari özellikleriyle değer bulmuş ve müze konsepti içinde ele alınmıştır. İç mekânda özgün tefriş ve o dönemde kullanılan eşyalar sergilenmektedir. Balo salonu başta olmak üzere burayı çevreleyen mekânlarda serbest vitrinler, dijital bilgi panoları ve duvar vitrinleri ile sergileme yapılmaktadır. Ayrıca müzede son dönem Osmanlı eserleri de sergilenmektedir. Günümüz kullanımında binanın üst katı ofis ve idari kat olarak, bodrum kat ise konferans, toplantı gibi etkinliklere ayrılmıştır.



**Fotoğraf 6.** Ankara Palas -Ankara Palas Müzesi (Bölükbaşı Ertürk 2025)



**Fotoğraf 7-8.** Ankara Palas-Ankara Palas Müzesi Mimari ve Süsleme Detayları (Bölükbaşı Ertürk 2025).



**Fotoğraf 9.** Ankara Palas -Ankara Palas Müzesi. Sergi Salonu. (Bölükbaşı Ertürk 2025)



**Fotoğraf 10.** Ankara Palas -Ankara Palas Müzesi. Sergi Salonu. (Bölükbaşı Ertürk 2025)

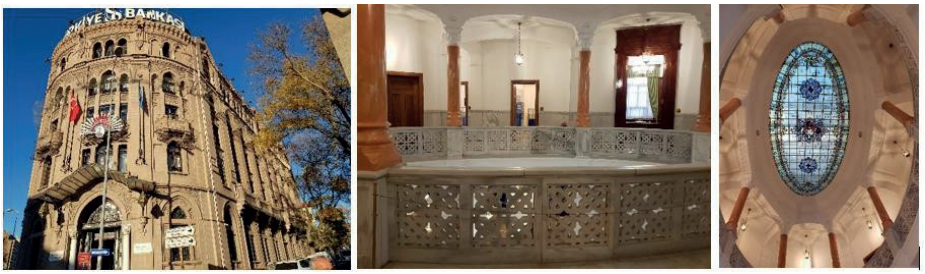


**Fotoğraf 11-12.** Ankara Palas. Solda Yapıya Ait Özgün Detaylar. Sağda Kalorifer Peteği (Bölükbaşı Ertürk 2025).

### 2.4. Türkiye İş Bankası-İktisadi Bağımsızlık Müzesi

İtalyan Mimar Giulio Mongeri tarafından 1929 yılında İş Bankası'nın üçüncü Genel Müdürlük binası olarak inşa edilmiştir**.** Bodrum üzerine, simetrik olarak planlanmış, beş katlı, ortası avluludur. Bina köşe parsele konumlandırılmış

«Hâkimiyet-i Milliye» meydanına bakan köşesi yuvarlatılarak ikizkenar üçgen biçiminde tasarlanmıştır. Bu cephedeki ana girişten başka yan cephelerden de yapıya girilmektedir.



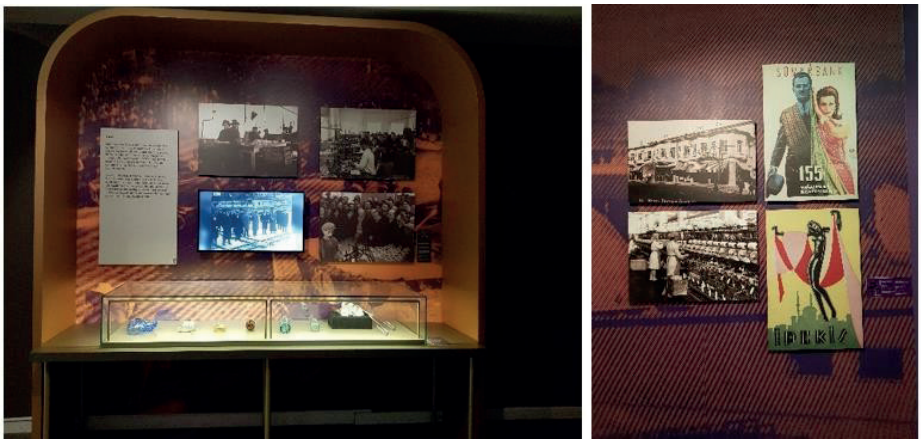
**Fotoğraf 13.** Türkiye İş Bankası – İktisadi Bağımsızlık Müzesi Cephe (solda) ve İç Mekân (ortada) ve (oval tepe ışıklığı) (Bölükbaşı Ertürk 2023)

Erken Cumhuriyet dönemi mimarisinin günümüze ulaşmış en önemli örneklerinden biri olan tarihi binada, Osmanlı mimari özelliklerinin yanı sıra cephenin yatay olarak silmelerle bölünerek vurgulanması ve girişin üzerindeki cam gölgelik Art Nouveau akımının etkisini göstermektedir. Yapının arka ve bir yan cephesine 1956 ve 1973 yıllarında eklemeler yapılmıştır (Aslanoğlu 2010).

Türkiye İş Bankası İktisadi Bağımsızlık Müzesi 2 Mayıs 2019 tarihinde açılmıştır. Binanın müze olarak düzenlenmesiyle; Bodrum katında kiralık kasa dairesi ziyaretçiyle buluşturulmuştur. Giriş katında banko ve vezneler özgün olarak sergilenmektedir. Ayrıca bu kattaki bir diğer sergileme dijital pano, fotoğraf, film, belge ve çeşitli objelerle bankanın iktisadi kalkınma için yaptığı sanayi yatırımları anlatılmaktadır.



**Fotoğraf 14-15.** Türkiye İş Bankası – İktisadi Bağımsızlık Müzesi İç Mekân Sergileme (Bölükbaşı Ertürk 2023)



**Fotoğraf 16-17.** Türkiye İş Bankası – İktisadi Bağımsızlık Müzesi (Bölükbaşı Ertürk 2023)




**Fotoğraf 18-19.** Türkiye İş Bankası – İktisadi Bağımsızlık Müzesi Sanayi Yatırımlarının Anlatıldığı Sergileme (Bölükbaşı Ertürk 2023)

Birinci katta toplantı odaları yer alır. İkinci katta geçmiş yıllardaki banka reklamları ve banka faaliyetleri tanıtılmaktadır. Üçüncü kat, ağırlıklı olarak güncel sanat eserlerinin sergilendiği sanat galerisi olarak düzenlenmiştir. Dördüncü katta Kurtuluş savaşını konu alan devamlı sergi bulunmaktadır. Beşinci kat ise eğitim ve çeşitli faaliyetler için kullanılmaktadır. Burada çocuk ve yetişkin gruplarına yönelik atölye ve seminerler düzenlenmektedir.

İş Bankası idare meclisi salonu tüm donatı ve tefrişiyle özgünlüğü korunarak ziyaretçiye açılmıştır. İdare meclisi her yıl bankanın kuruluş yıldönümünde burada toplantı yaparak bankanın kuruluş amacı ve Cumhuriyet'in ilk yıllarında yapılan faaliyetler açısından belleğin canlı tutulmasını sağlamaktadır.



**Fotoğraf 20-21.** İdare Meclisi Salonları (Bölükbaşı Ertürk 2023)

### 2.5. Ziraat Bankası- Ziraat Bankası Müzesi

Milano doğumlu olan ancak uzun yıllar Türkiye'de yaşayan ve İstanbul Sanayi-i Nefise Nefise Mektebi'nden mezun olan Giulio Mongeri tarafından tasarlanmıştır. 1926 yılında başlanan inşaatı 1929 yılında tamamlanmıştır (Hasol 2020).

Bina bodrum katı, zemin katı, asma kat, birinci ve ikinci kat ile çatı katından oluşmaktadır. Katlarda mekânlar ortada banka holü çevresine yerleştirilmiştir. Betonarme iskelet sistemi uygulanmıştır (Aslanoğlu 2010: 240). Simetrik cephe düzeni olan yapıda köşeler dışa taşkın kule görünümündedir. Geniş saçakların alt yüzeyleri Selçuklu motifleriyle bezenmiştir. Girişin cepheden öne çıkartılarak vurgulanması, kabaralar, sivri kemerli cepheler, mukarnas ve kıvrık dala bağlı rumi motifinin kullanıldığı kemer köşelikleri ile korkuluklarda geometrik motiflerin kullanımı Selçuklu ve Osmanlı mimarisinin etkisini göstermektedir.

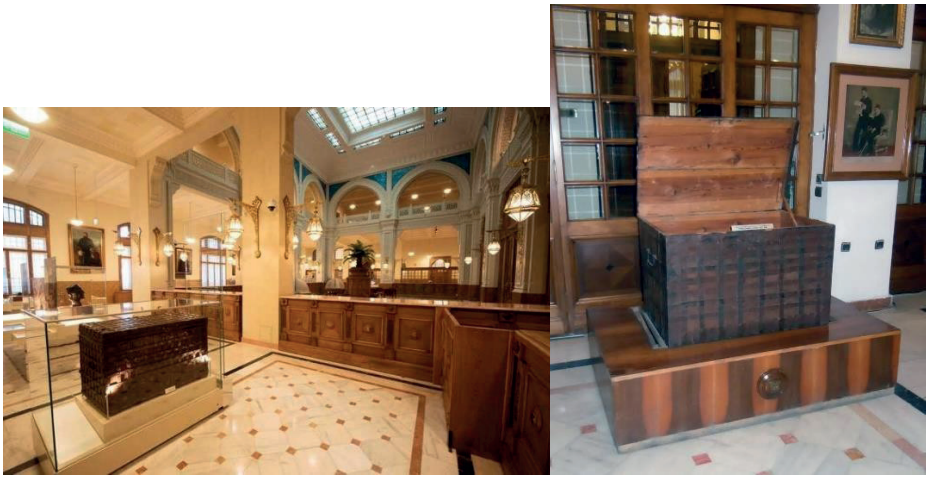


**Fotoğraf 22-23.** Ziraat Bankası- Ziraat Bankası Müzesi (Bölükbaşı Ertürk 2023)

Müze, Ziraat Bankasının 118. kuruluş günü olan 20 Kasım 1981 tarihinde açılmıştır. Zemin katta özgün yapı korunarak dijital uygulamalarla desteklenmiş bankanın tarihçesi anlatılmaktadır. Ayrıca yevmiye defterleri kinin dağıtım ve satışına ilişkin o dönem için önemli olan çeşitli defterler, yazı ve kristal hokka takımları hesap makinaları sergilenmektedir. Ayrıca o dönemin yardımlaşma ve dayanışma fikrinden çıkan 1863 yılına ait "memleket sandığı" sergilenmektedir. Memleket Sandıkları, çiftçilerin dayanışma ve ekonomik birliktelikleri esasına dayanmakta olup aynı zamanda Ziraat Bankası'nın temeli olan sistemdir. (URL 3). Ziraat Bankasının kuruluşu, etkinlikleri, sanat koleksiyonları ziyaretçilerle buluşturulurken çağdaş sergileme yöntemleri kullanılmıştır.



**Fotoğraf 24-25.** Müzeye dönüşen binanın iç mekân düzenlemesi. (URL-4) (Kaynak https://kulturportali.gov.tr/turkiye/ankara/gezilecekyer/tc-zraat-bankasi-muzes)



**Fotoğraf 26-27.** Memleket Sandığı. Ziraat Bankası Müzesi. URL-5)

(Kaynak: https://kulturportali.gov.tr/turkiye/ankara/gezilecekyer/tc-zraat-bankasi-muzes)



**Fotoğraf 28-29.** Ziraat Bankası Eski Kasaları (URL6)

(Kaynak: https://kulturportali.gov.tr/turkiye/ankara/gezilecekyer/tc-zraat-bankasi-muzes)

## 2.6- Milli Emlak ve Eytam Bankası- PTT Pul Müzesi

Türk halkının inşaat yatırımlarını desteklemek ve gerekli kredileri sağlayabilmek için kurulan Emlak ve Eytam Bankası'nın Ulus'ta bulunan binasının mimari tasarımı 1933-1934 yılları arasında Clemens Holzmeister tarafından yapılmıştır (Aslanoğlu 2010:253; Hasol 2020:76). Bina, bodrum, zemin ve üzerindeki iki kattan oluşmaktadır. Üst katlar güney yönünde geriye çekilmiş olup çalışma alanları bir koridor üzerinde tasarlanmıştır. Ön cephede zemin katın dışa taşkın tasarlanması, birinci katta açık bir balkon oluşturmuştur. Bu sütunlu cephe düzenlemesi binanın kütleselliğini kırarak neo-klasik etki yaratmıştır. Betonarme iskelet sistemi uygulanan yapıda Ankara taşı ve mermer

kullanılmıştır. Milli mimari üslubunun dışına çıkılarak yapılmış bina tasarımı, Başkentin modern mimarlık anlayışında tasarlanmış öncül yapıları arasındadır.

Daha sonra Emlak Bankası Uluş şubesi olarak kullanılan yapı, restorasyonu tamamlandıktan sonra PTT Pul Müzesi olarak 2013 yılında müze işleviyle açılmıştır.

Müzede haberleşme tarihinin yanı sıra geçmişten günümüze pullar konularına göre sergilenmektedir. Özel günler ve anı pullarının yanı sıra zarflara da yer verilmiştir. Tarihi binanın pul ve haberleşme temalı materyallerle buluşturulmasının dışında çok amaçlı salon, çocuk oyun alanı, pul satış bölümü ve kafeterya gibi sosyal alanlar oluşturulmuştur. İç mekânda PTT'nin hâkim rengi olan sarının özellikle vurgulayıcı olarak kullanılması, tarihsel süreçte her zaman önemli olan haberleşme teşkilatının kurumsal kimliğin hafızada canlı kalmasına yardımcı olmaktadır.



**Fotoğraf 30-31.** Emlak Eytam Bankası- PTT Pul Müzesi ve Sergileme Alanı (Bölükbaşı Ertürk 2023)



**Fotoğraf 32-33.** Emlak Eytam Bankası- PTT Pul Müzesi ve Sergileme Alanı (Bölükbaşı Ertürk 2023)



**Fotoğraf 34-35.** Emlak Eytam Bankası- PTT Pul Müzesi ve Sergileme Alanı (Bölükbaşı Ertürk 2023)



**Fotoğraf 36.** Sergi Salonu-PTT Pul Müzesi (Bölükbaşı Ertürk 2023)

## 2.7. Ankara Türk Ocağı Binası- Resim Heykel Müzesi

1926 yılında açılmış olan bir yarışma sonrasında kazanan Arif Hikmet Koyunoğlu tarafından tasarlanmış ve 1927-1930 yılları arasında inşa edilmiştir (Aslanoğlu 2010:194). İlk olarak Türk Ocakları Merkez Binası olarak inşa edilen daha sonra Ankara Halkevi olarak hizmet veren ve günümüze kadar pek çok kurumun kullanımına verilmiştir.

Türk Ocakları Merkez Binası, 1931 yılı başlarında Türk Ocakları'nın kapanmasından sonra 10 Haziran 1931 tarihinde Cumhuriyet Halk Fırkası (Partisi)'na devredilmiş, 1932 yılında Türk halkının eğitim ve kültürel yönden

kalkınmasını sağlamak amacıyla Halkevlerinin açılması üzerine Ankara Halkevi binası olarak kullanılmıştır. 1952-1961 yılları arasında Türk Ocağı, Devlet Tiyatrosu, Ankara Belediyesi Nikâh Dairesi, 1961'de Milli Eğitim Bakanlığı ve Türk Ocakları Derneği, 1965'de Köy İşleri Bakanlığı ve Türk Ocakları Derneği, 1971'de Milli Savunma Bakanlığı, 1972'de Milli Eğitim Bakanlığı – Ankara Halk Eğitimi Merkezi ve Akşam Sanat Okulu olarak hizmet vermiştir 1975'de Kültür Bakanlığı'nın bünyesinde yer alışının ardından, aslına uygun restore edilmiştir. 2 Nisan 1980'den bu yana "Devlet Resim ve Heykel Müzesi" olarak kullanılmaktadır (Merdim, 2011).

Bodrum üzerinde iki katlı binada akustik değerler ve teknik olarak sahne donanımının bulunduğu tiyatro sahnesi bulunmaktadır Namazgah Tepesi olarak da bilinen yerde Etnografya Müzesi'nin yanındadır. Birinci Ulusal Mimarlık döneminin cephe özelliklerini gösteren bina dönemin simetrik anlayışına uygun olarak tasarlanmıştır. Merdivenlerle ulaşılan giriş eksende yer alır. Ayrıca binanın yan ve arka cephelerinde de girişler mevcuttur (İnci Fırat, 1998).

Ankara'nın Cumhuriyet döneminde kültür sanat etkinliklerine ev sahipliği yapması, ilk opera ve tiyatroların gerçekleştirilmesi amacıyla kullanılması önem taşımaktadır (Kırmızı 2022:42-43) Ankara Resim ve Heykel Müzesi koleksiyonuna, görsel sanatlar alanında 19. yüzyılın sonundan günümüze kadar Türkiye'de değişen sanat anlayışlarına ve tarihsel süreçlere tanıklık eden eserleri görmek mümkündür. Müzenin koleksiyonu resim, heykel, seramik, özgün baskı, Türk süsleme sanatı ve fotoğraftan oluşmaktadır.



**Fotoğraf 37.** Ankara Türk Ocağı Binası - Resim Heykel Müzesi (URL 7) Kaynak:https://www.kulturportali.gov.tr/turkiye/ankara/gezilecekyer/ankara-resm-ve-heykel-muzes




**Fotoğraf 38-39.** (Ankara Türk Ocağı Binası- Resim Heykel Müzesi. İç Mekân (solda), Tiyatro Salonu(sağda) (URL 8) Kaynak: https://www.kulturportali.gov.tr/turkiye/ankara/gezilecekyer/ankara-resm-ve-heykel-muzes




**Fotoğraf 40.** Ankara Türk Ocağı Binası- Resim Heykel Müzesi. Sergi Salonları (URL-9) Kaynak https://www.kulturportali.gov.tr/turkiye/ankara/gezilecekyer/ankara-resm-ve-heykel-muzes

## 2.8. Ankara Devlet Demir Yolları Cer Atölyesi- Cer Modern

Ankara'daki endüstri arkeolojisinin sınırlı örneklerinden olan ve Türkiye Cumhuriyeti Devlet Demiryolları tarafından tren ve vagonların bakım ve onarımlarını yapıldığı atölyelerdir. Birbirine bitişik dört birimden oluşan yapı grubu yeni bir yapının eklenmesiyle U formunda, önündeki giriş avlusu ile tasarlanmıştır. 1990'lı yıllara kadar atıl bir vaziyette kalan atölye binaları restorasyon sonrasında 2010 yılında Cer Modern adını alarak önceleri Çağdaş Sanat Müzesi" daha sonra ise "Modern Sanatlar Merkezi" olarak yeni işleviyle kullanıma açılmıştır. Bodrum katta ek galeriler, oditoryum, atölyeler ve servisler yer alırken avlu katında, atölyelerden dönüştürülen ana sergi salonlarının yanı sıra giriş holü, müze mağazası ve kafe bulunmaktadır. Avlu hem kafenin uzantısı olarak hem de sanat etkinliklerinde zaman zaman kullanılmaktadır.




**Fotoğraf 41.** Cer Modern'in temelini oluşturan demiryolu atölye binası. (URL-10) (Kaynak: https://kentvedemiryolu.com/ankarada-demiryolunun-cermoderne-uzanan-tarihi/)



**Fotoğraf 42.** Cer Atölyeleri (URL-11) (Kaynak: https://www.santiye.com.tr/bir-bakista-cer-modern-3004.html)



**Fotoğraf 43.** Eski Cer Atölyeleri ve Eklenen Yeni Bina. Cer Modern Restorasyon Sonrası. (URL-12) (Kaynak: https://www.sabitfikir.com/haber/cer-modern-de-edebiyat-gunleri-basliyor)




**Fotoğraf 44.** Cer Modern İç Mekân. (URL-13)

(Kaynak: https://www.gzt.com/arkitekt/ankarada-tren-bakim-atolyelerinden-sanat-galerisine-bir-donusum-hikayesi- cer-modern-sanatlar-merkezi-3786260)

## 2.9. Ankara Merkez Kapalı (Ulucanlar) Cezaevi - Ulucanlar Cezaevi Müzesi

Tarihi Ulucanlar Cezaevi, Ankara'da Altındağ ilçesi sınırlarında, günümüzde müze işleviyle kent hafızasını oluşturan önemli bir bileşen olarak ziyarete açılmıştır. 1925 yılında askeri bir deponun hapishane yapısına dönüştürülmesiyle (Meral 2015: 72) tarihi yapı, Cebeci Tevkifhanesi, Cebeci Umumi hapishanesi, Ankara Hapishanesi, Ankara Merkez Kapalı Cezaevi, Ankara Cebeci Sivil Cezaevi (Meral, 2015: 53-85; Öztürk 2023: 208) ve özgün işleviyle son olarak Ulucanlar Cezaevi olarak anılmıştır.

Tarihi binaya eklenen avlu ve koğuşların yanı sıra yarı açık cezaevi alanının da bulunduğu bütün içinde kent belleğinin kalıcı bir parçası olarak Ulucanlar Cezaevi Müzesi ve kültür -kongre merkezi olarak düzenlenmiştir. 2006 yılında cezaevi nakil yoluyla boşaltılmış, KTVKK tarafından tescillenerek koruma altına alınmış ve bu doğrultuda restorasyon çalışmalarına başlanarak 2010 yılında kapalı kısım müze olarak, daha sora 2012 yılında ise yarı açık olan kısım kültür sanat etkinliklerinin yapılacağı merkez olarak açılmıştır.

Ana bina ile ona eklenen avlu ve koğuşlardan oluşan yapı topluluğu içinde pek çok birimi barındırmaktadır. Tarihi yapının giriş ve idari bölümü Ulucanlar Caddesi yönünde bulunmaktadır. Cezaevindeki koğuş, zindan vb. yerlerde balmumundan yapılmış heykellerle canlandırma tekniğini kullanılarak, vaktiyle burada kalmış ülkenin önemli şahsiyetleri ve onlara ait eşyalar sergilenmektedir.

Buna ek olarak sergilemeye ses unsurunun dâhil edilmesi buradaki zor şartları daha da vurgulayarak izleyiciye yansıtmaktadır.



**Fotoğraf 45.** Ulucanlar Cezaevi Müzesi. (URL-14)

Kaynak: (https://www.kulturportali.gov.tr/turkiye/ankara/gezilecekyer/ulucanlar-cezaev-muzes)





**Fotoğraf 46-47.** Ulucanlar Cezaevi Müzesi Koğuş, Canlandırma Tekniğinde Sergileme (URL-15) Kaynak: https://www.altindag.bel.tr/#!ulucanlar_cezaevi_muzesi

## 2.10. Ankara Hukuk Mektebi 1927 -Ankara Vakıf Eserleri Müzesi

Ankara'da bir Hukuk Mektebi'nin açılmasının gündeme gelmesiyle (İnan 1974), 1928 yılına kadar çeşitli binalarda eğitim öğretim faaliyetine devam eden okul, 1927 yılında yapımına başlana bir ilkokul binasının tahsis edilmesiyle 1928 yılı sonlarından itibaren başlamak üzere Ankara Hukuk Mektebi olarak

günümüz Ankara Vakıf eserleri müzesi binasında eğitime başlamış ve 1941 yılında okulun Ankara Hukuk Fakültesi adıyla yeni binasına taşınmasına kadar bu binada eğitimi sürdürmüştür. (URL-17). 1941 yılından günümüze kadar Diyanet İşleri Başkanlığı, Ankara Müftülüğüne ait hizmet binası ve Akşam Sanat Okulu olarak kullanılmıştır. 2004 yılında Vakıflar Genel Müdürlüğü tarafından yapılan restorasyon çalışmalarının ardından 2007 yılında Ankara Vakıf Eserleri Müzesi olarak açılmıştır.

Bodrum üzerine zemin ve bir kat olarak tasarlanmış bina yığma ve kâgir olarak, plan ve cephe düzeni açısından simetrik anlayışla inşa edilmiştir. Ön cephe kolonlar ile dışa çıkıntı yapacak şekilde vurgulanmıştır. Aynı zamanda bu özelliğiyle tarihi binanın cephesine hareket kazandırılmıştır. Halı, kilim, ahşap, maden, çini, tekstil, el yazması vb. eserlerin sergilendiği binada, sergi salonlarının yanı sıra laboratuvar, kütüphane, seminer odası, idari hizmet birimlerini içeren mekânlar bulunmaktadır.




**Fotoğraf 48.** 1929-1941 yılları arasında Ankara Hukuk Fakültesi olarak kullanılan bina. (URL-16) Kaynak: https://www.law.ankara.edu.tr/tarihce-2/




**Fotoğraf 49.** Ankara Vakıf Eserleri Müzesi. (URL-17) Kaynak; https://avem.vgm.gov.tr/muzemiz/muzemize-tarihi-yolculuk



**Fotoğraf 50-51.** Ankara Vakıf Eserleri Müzesi Sergi Salonları. (URL-18) Kaynak: https://avem.vgm.gov.tr/muzemiz/muzemize-tarihi-yolculuk

## 2.11. Maliye Vekâleti Binası -Ankara Sosyal Bilimler Üniversitesi Hazine Müzesi

Erken Cumhuriyet Dönemi'nin ilk bakanlık binası olarak 1925 yılında inşa edilen yapının mimari tasarımı Yahya Ahmet tarafından yapılmıştır. Binada Maliye Bakanlığı, Gümrük ve Tekel Bakanlığı, ortadaki kısım ise Başbakanlık olarak kullanılmıştır.1927 yılından sonra yapılan eklentilerle ana kütlede dışa taşkın olan girişin de bulunduğu orta bölüm, köşeler ve merdivenli ikincil girişlerin bulunduğu akslar yükseltilmiş ve kule görünümü almıştır

(Hasol 2020:44). I. Ulusal Mimarlık akımının mimari ve cephe özelliklerini yansıtmaktadır.



**Fotoğraf 52.** Maliye Vekâleti Binası. (URL-19). Kaynak: https://kulturenvanteri.com/yer/eski-maliye-bakanligi- binasi/#17.1/39.943455/32.855396




**Fotoğraf 53.** Ankara Sosyal Bilimler Üniversitesi Hazine Müzesi. (URL-20) Kaynak: https://www.trthaber.com/foto- galeri/turkiye-Cumhuriyet'inin-ilk-hazine-kasa-dairesi-muzeye-donusturuldu/36582/sayfa-10.html

Ankara Sosyal Bilimler Üniversitesi'ne tahsis edilen ve Rektörlük biriminin de bulunduğu yapı bütündeki eski Maliye Vekâleti Binası, ASBÜ Hazine Müzesi olarak düzenlenerek değerli iktisadi evrakların aynı sıra kıymetli evrak, para ve ticaretle ilgili tarihsel sürece ait sergileme yapılmıştır. Türkiye Cumhuriyeti'nin

ilk hazine kasa dairesi de burada bulunmaktadır. Altı farklı anahtarı olan ve bunların bir arada çalıştığı güvenlik sistemine sahip kasa dairesi Cumhuriyet dönemine ışık tutan binanın önemli bir bölümünü oluşturmaktadır.




**Fotoğraf 54.** Türkiye Cumhuriyeti İlk Hazine Kasa Dairesi. (URL-21) Kaynak: https://www.trthaber.com/foto- galeri/turkiye-Cumhuriyet'inin-ilk-hazine-kasa-dairesi-muzeye-donusturuldu/36582/sayfa-10.html



**Fotoğraf 55.** Ankara Sosyal Bilimler Üniversitesi Hazine Müzesi İç Mekân. (URL-22) Kaynak: https://www.trthaber.com/foto-galeri/turkiye-Cumhuriyet'inin-ilk-hazine-kasa-dairesi-muzeye-donusturuldu/36582/sayfa-10.html

## 3. Sonuç ve Değerlendirme

Erken dönemden başlamak üzere Cumhuriyet dönemi Ankara'sında mimari yapılanma, yukarıda ele alınan farklı işlevlerdeki yapılarla kentin fiziki biçimlenişi yanında düşünce yapısı ve yaşam tarzına da etki etmiştir. Yeni başkentin bu öncül kamu yapıları Cumhuriyet ideolojisini mimari aracılığıyla ortaya koymuştur. Ankara'da Ulus ve çevresi, inşa edilen yapılarla yönetim merkezi olmasının yanında ekonomik ve sosyal açıdan da yenilikçi yaklaşımla kamusal bir merkez olma özelliğine kavuşmuştur.

I. Ulusal Mimarlık Dönemi, II. Ulusal Mimarlık Dönemi ve Modernizm etkisinin de görüldüğü bu yapıların özgün işlevi ilerleyen yıllarda değişen yaşam koşulları, teknolojik sebepler ya da binaların ihtiyaca cevap verememesi gibi nedenlerle sonlanmış olsa da, Cumhuriyetle birlikte süreçte yaşanan tarihe tanıklığı yeni nesillere aktarmak bu yapıların güncel misyonu olmuştur.

İnşa edildikleri dönem itibariyle sahip oldukları özgün işlevleri zaman içinde sonlanmış olan bu tarihi binalar yapılan restorasyon çalışmaları sonrasında müze işlevi verilerek tekrar kullanıma açılmıştır.

Yeniden işlev kazandırma yoluyla var olan tarihi yapı stoğunun yeniden kullanıma açılması sonrasında, tarihi yapının yıllar içinde ve nesiller arasında özgün kimliğinin önce ikinci planda kalması, sonrasında ise unutularak yeni işlevine uygun anılması bu çalışmanın vurgulamak istediği noktadır. Çalışmaya dâhil edilen ve yeniden işlevlendirilen tarihi kamu yapıları "müze" olarak eğitim, kültür ve bilgi amaçlı kullanım ile yeniden düzenlenmiştir. Tarihi yapılarda hem yapının kendi özgün donatısının yerinde sergilenmesi hem de döneme ışık tutacak eserlerin, belge ve objelerin sistematik sergilemesi yapılmıştır. Tüm bunlar çağdaş müzecilik ve sergileme yöntemleri açısından ele alındığında balmumu heykellerle canlandırma tekniği, dijital panolar, çeşitli vitrin sistemleri, ses ve görüntü düzenleri vd. yöntemlerin yanında ziyaretçi yönetim planı ile desteklenmiştir. Kent hafızasını oluşturması açısından önemli olan bu düzenlemeler tarihi yapının özgün adıyla değil de yeni işlevini öne çıkaran adıyla anılması ile çoğu zaman kuşaklar arası geçişte bir boşluk yaratmakta ve yeni nesil tarafından sadece son işlevi ile bilinmektedir. Bu durum kent hafızasında ve ülke tarihinde mimari yoluyla ortaya konulan kimliğin önce ikincil olması sonra da unutulması tehlikesini de gündeme getirmektedir. Her biri döneminin öncü mimarları tarafından tasarlanan ve kendi kurumsal kimlikleri altında «Cumhuriyet» fikri ve ideolojisinin anlaşılmasında ve yaşatılmasında varlıklarını sürdürmekte olan bu tarihi binaların her koşulda özgün yapı kimlikleri hatırlatılmalı ve kent hafızasında sürdürülebilirliği sağlanmalıdır.

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# Cumhuriyetin 100. Yılında Mimarlık Konuşmaları




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EĞİTİM YAYINEVİ GRUBU

# CUMHURİYET DÖNEMİ MİMARLIK MİRASININ YANGINA KARŞI KORUNMASINDA YAPISAL ÖNLEMLER

Bilgehan Bakırhan[1]

## 1. Giriş

Afetler, toplumların büyük ölçüde zarar görmesine yol açan; kökenini bazen doğa olaylarından, bazen de insan kaynaklı etkenlerden alan olağandışı olaylardır (Varol & Gültekin 2016). Bu olaylar genellikle jeolojik, atmosferik, biyolojik veya antropojenik olmak üzere dört ana başlıkta sınıflandırılır (Erler, 2002). Her ne türden olurlarsa olsunlar, doğal afetlerin tümü, birey açısından beklenmedik ve kontrol dışı gelişen kazalar kategorisine girer; bu kazaların tarihsel süreçte oynadığı rol ise modern tarih yazımı tarafından yoğun tartışmalara konu edilmiştir (Zachariadou, 2001). Bu bağlamda, yangınlar da depremler gibi ani ortaya çıkan ve kısa sürede büyük tahribata neden olan afetler arasında yer alır (Tanış, 2018).

Yangınlar, yalnızca insanların yaşamını ve mal varlığını tehdit etmekle kalmaz; aynı zamanda tarihî mimarlık mirasının devamlılığı açısından da ciddi tehlikeler oluşturur. Tarihî yapıların yok olmasında başlıca faktörlerden biri olan yangınlar, can ve mal kaybının ötesinde, gelecek kuşaklara devredilen belge değerlerinin ve bu sayede toplumsal hafızanın da silinmesine yol açar (Bakırhan & Beyhan, 2021). Bu nedenle, tarihî eserlerin yangına karşı korunması stratejik bir önceliktir. Bu kapsamda, alevlerin ve toksik dumanın içeride yayılımını durdurmaya yönelik alınan yapısal tedbirler pasif yangın güvenliği önlemleri arasında yer alır. Bu önlemler, yangın anında yapının dayanıklılığını artırarak hem kullanıcıların güvenli tahliyesine olanak tanır hem de yapısal bütünlüğün korunmasını sağlar.

Bu çalışmanın temel amacı, Türkiye'de 1923–1950 yılları arasında inşa edilen yapıların pasif yangın güvenliği açısından nasıl kurgulandığını, bu yapılarda

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yer alan yapısal önlemleri ve dönemin kentleşme politikaları ile mevzuatlarının bu önlemlere olan etkisini ortaya koymaktır. Yangın güvenliği, özellikle tarihî yapılar söz konusu olduğunda yalnızca bir topluma ait somut değerlerin emniyetini sağlamak değil, aynı zamanda kültürel mirasın sürdürülebilirliği ve gelecek nesillere aktarılması açısından stratejik bir müdahale alanıdır. Çünkü yangın, telafisi mümkün olmayan fiziksel kayıplara neden olmakla kalmayıp, yapıların taşıdığı tarihsel, kültürel ve sembolik değerleri de geri dönülemez şekilde tehdit etmektedir (Feilden, 2003; ICCROM, 1996).

Bu çalışmada erken Cumhuriyet döneminin mimarlık pratiği içinde yangına karşı alınan pasif önlemler; yapı malzemesi tercihi, yangın duvarları, saçak ve çıkma detayları, döşeme sistemleri, merdivenler ve yapı içi kompartımanlaşma gibi unsurlar üzerinden değerlendirilerek, dönemin yangın güvenliği yaklaşımına bütüncül bir bakış sunulması hedeflenmektedir. 1923–1950 yılları arasında Türkiye genelinde inşa edilmiş farklı işlevlere sahip kamu ve özel yapılar bu çalışmanın kapsamını oluşturarak ele alınmış; coğrafi olarak ise başta İstanbul, İzmir ve Trabzon gibi dönemin kentsel gelişiminde rol oynamış şehirler örneklem olarak ele alınmaktadır. Analiz kapsamında, yapıların mimari planları, kent imar belgeleri, yapı yönetmelikleri, arşiv kayıtları ve dönemsel fotoğraflar incelenmiş; bu veriler doğrultusunda yapısal pasif yangın önlemleri irdelenmiştir. Bu kapsamda ulaşılan veriler, görsellerle sunulmuş ve hem tarihî yapıların korunması hem de günümüz uygulamaları için referans oluşturabilecek şekilde derlenmiştir. Çalışmada, nitel araştırma yöntemi benimsenmiş; belge taraması ve mimari analiz yöntemi birlikte kullanılmıştır.

## 2. Pasif yangın güvenliği bağlamında yapısal önlemler

Pasif yangın güvenliği önlemleri, yapıların yangın anında can ve mal kaybını en aza indirecek şekilde tasarlanmasını ve inşa edilmesini sağlayan, yapının fiziksel özelliklerine entegre edilmiş önlemler bütünüdür. Bu önlemler, yangının başlamasını engellemekten ziyade, başladığında yayılmasını yavaşlatmayı, belirli bölgelerde sınırlandırılmasını sağlamayı ve kullanıcıların güvenli bir şekilde tahliyesine olanak tanımayı amaçlar. Yangına dayanıklı yapı malzemelerinin kullanımı, yangın duvarlarıyla bölgeleme (kompartımanlaştırma), yangın yalıtımı, duman kontrol sistemleri, kaçış yollarının düzenlenmesi ve merdiven çekirdeklerinin izole edilmesi gibi bileşenler bu kapsamda değerlendirilir (Karlsson & Quintiere, 2000; Buchanan, 2001). Bu tür yapısal önlemler, aktif sistemlerin (sprinkler, alarm vb.) aksine dış müdahale ya da kullanıcı etkileşimi gerektirmez; bu yönüyle de özellikle tarihî yapıların korunmasında ve sürekli denetimin mümkün olmadığı ortamlarda önemli avantajlar sunar (British Standards Institution, 2008). Ayrıca, pasif önlemler çoğu zaman yapı tasarımının erken aşamalarında belirlenir ve yapının ömrü boyunca işlevselliğini korur.

Tarihî mirası oluşturan mimari eserlerin büyük çoğunluğunun günümüze değin ulaşmasında hiç şüphesiz dönemin korumacılık anlayışını temel alan uygun müdahalelerin alınması rol oynamaktadır. Bu tedbirlerden biri olan edilgen (pasif) yangın korunumu; Cumhuriyet Dönemi süreci içerisinde özellikle sivil yapılarda olmak üzere yapı öğelerinin oluşumunu, detay çözümlemelerini ve malzeme kullanımlarını konu alan müdahale yöntemlerini içermektedir (Çelik, 1998).

## 3. Cumhuriyet'in ilk yıllarında yangına dayanıklı yapılaşma politikaları

Cumhuriyet'in ilk yıllarında, özellikle 1923–1950 döneminde Türkiye'de yangına dayanıklı yapılaşma, modern kentleşme politikalarının ayrılmaz bir parçası olarak ele alınmıştır. Bu dönemde yangınla mücadele sadece teknik bir sorun değil, aynı zamanda medeniyet, modernleşme ve kamusal düzenin yeniden inşasıyla ilişkilendirilmiştir (Bozdoğan, 2001). Osmanlı'dan devralınan itfaiye teşkilatı, Cumhuriyet döneminde mevcut koşullara ve uluslararası standartlara uygun şekilde yeniden yapılandırılmış; bu kapsamda yasal altyapılar oluşturulmuş ve eğitim kurumları tesis edilmiştir. 25 Eylül 1923 tarihinde itfaiye hizmetlerinin askeriyeden belediyelere devredilmesiyle, itfaiye teşkilatları günümüzdeki hâlini almıştır (İBB İtfaiye Daire Başkanlığı, 2016). Bu gelişme, yangınla mücadelede yerel yönetimlerin rolünü artırmış ve itfaiye hizmetlerinin daha etkin bir şekilde sunulmasını sağlamıştır. Bu gelişmeler, sadece yangınla mücadele kapasitesini artırmakla kalmamış, aynı zamanda halkın yangınlara karşı bilinçlenmesini ve toplumsal dayanışmanın güçlenmesini sağlamıştır. İstanbul İtfaiyesi'nin bu süreçte öncü rol üstlenmesi, yangına dayanıklı yapılaşmanın ve toplumla ilişkili güvenlik politikalarının kurumsallaşmasında önemli bir adım olmuştur (Şekil 1 ve 2).

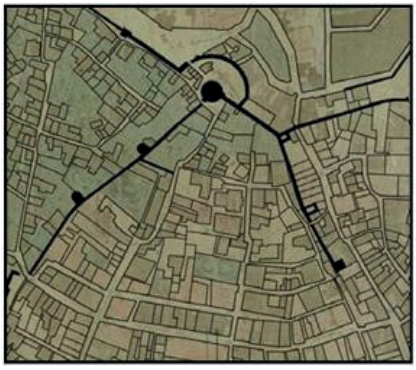


Şekil 1. 1929'da kurulan itfaiye tahrip müfrezesi / İstanbul (Tekin, 2015).



Şekil 2. 1932'de Yangın söndürme araçları ve itfaiyeciler / İstanbul (Tekin, 2015).

Yangınların sıklıkla büyük yıkımlara neden olduğu Osmanlı kent dokusuna karşılık, Cumhuriyet yönetimi yangına dayanıklı yapı üretimini teşvik eden bir dizi mevzuat ve planlama yaklaşımı geliştirmiştir. 14 Nisan 1930 tarihli ve 1580 sayılı Belediye Kanunu'nun 15. maddesinin 22. fıkrası, yangına karşı alınacak mimari ve yapısal tedbirleri belediyelere yasal sorumluluk olarak yüklemiştir. Bu kapsamda; imalathane, fabrika ve dükkân gibi mekânlarda yangına karşı koruyucu donanımların bulundurulması, kamusal yapılarda yangın gözetleme ve ihbar sistemlerinin kurulması, sokak dokusu içinde itfaiye araçlarının ulaşımına uygun altyapıların planlanması ve gerektiğinde stratejik noktalarda yangın havuzları veya sarnıçlarının inşası gibi fiziksel düzenlemeler öngörülmüştür. Örneğin, 1888 ve 1890 yıllarında meydana gelen büyük yangınların ardından, Galata Kulesi çevresinde yangın güvenliğini artırmaya yönelik çeşitli önlemler alınmıştır. Bu kapsamda, kule etrafındaki dar ve düzensiz sokaklar genişletilmiş, böylece yangının yapı adaları arasında hızla yayılmasının önüne geçilmesi amaçlanırken itfaiye araçlarının kolaylıkla erişimine olanak sağlamıştır. Aynı zamanda bu müdahale, bölgenin kentsel dokusuna daha planlı ve kontrollü bir biçim kazandırmaya yönelik ilk adımlardan biri olmuştur (Şekil 3 ve 4).



Şekil 3. 1888 ve 1890 yangınları sonrası Galata Kulesi çevresindeki yol genişletme çalışmaları (Özyurt, 2007).



Şekil 4. 1888 ve 1890 yangınları sonrası Galata Kulesi çevresindeki yol genişletme çalışmaları (Özyurt, 2007).

Bir başka güvenlik tedbiri ise yangınların erken tespit edilmesi, yerinin belirlenmesi ve müdahale sürecinin hızlı başlatılması açısından tarihî kent dokusunda hayati bir işleve sahip olan yangın gözetleme kuleleridir. Bu kuleler, erken cumhuriyet döneminde özellikle İstanbul gibi sık ve büyük çaplı yangınların yaşandığı yerlerde, hem kontrol noktası olarak işlev görmüş hem de itfaiye organizasyonlarının mekânsal planlaması açısından önemli bir yapı türü olmuştur. Yüksek bina olmaları sayesinde geniş görüş alanı sağlayan kuleler, yangın güvenliğini destekleyen pasif gözlem ağı oluşturmuş ve aynı zamanda kent peyzajının ayrılmaz bir unsuru hâline gelmiştir (Şekil 5). Beyazıt Yangın Kulesi, Cumhuriyet'in ilanından sonra yangın gözetleme amacıyla kullanılmaya devam etmiştir (Şekil 6). 1962 yılında, havanın açık olduğu bir

günde Büyükada'da çıkan bir yangın, kulede görevli olan itfaiyeci tarafından tespit edilerek, yangının yeri sokağına kadar belirlenmiş ve bu sayede hızlı müdahale sağlanmıştır (İBB İtfaiye Daire Başkanlığı, 2016).



Şekil 5. Beyazıt Yangın Kulesi / İstanbul (İstanbul Üniversitesi, 2020).

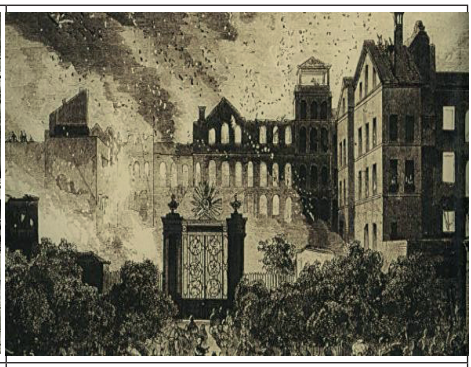


Şekil 6. Beyazıt Kulesi ve çevresi/ İstanbul (İstanbul Üniversitesi, 2020).

Osmanlı'da özellikle İstanbul'da evlerin ahşap malzemeden inşa edilmiş olması yangınla mücadaleyi zorlaştıran etmenlerden biridir. Ayrıca evlerin birbirine bitişik olması, nispeten kuvvetli rüzgârların bulunması ve bina saçaklarının yangın yayılımını kolaylaştırması durumu güçleştirmiştir (Sakaoğlu, 1994). 1870 yılında meydana gelen büyük Pera yangını, İstanbul'un ve Türkiye'nin yapılaşma politikalarında köklü değişikliklerin başlangıcını oluşturmuştur (Şekil 7 ve 8).



Şekil 7. 5 Haziran 1870 Pera Yangını – Beyoğlu/İstanbul (GZT, 2021).



Şekil 8. 5 Haziran 1870 Pera Yangını – Beyoğlu/İstanbul (GZT, 2021).

Bu yıkıcı olayın ardından, yangınların tekrarını önlemek amacıyla kâgir yapı sisteminin zorunlu hale getirilmesi kararlaştırılmıştır. Bu bağlamda, özellikle alt katları taş, üst katları ise tuğla duvarlarla örülen tam kâgir yapıların teşvik edilmesi önemli bir adımdır. Sadece duvar malzemeleriyle sınırlı kalınmamış; ahşap döşeme kirişleri ve çatı sistemlerinin de yangına karşı daha dirençli olması gerektiği vurgulanarak, bu elemanların demir ya da bakır gibi yanmaz malzemelerle değiştirilmesi önerilmiştir (Çelik, 1998). Yapılarda çatı

tutuşmalarını önlemek amacıyla ahşap malzemeye göre yangına daha fazla mukavemet gösteren pişmiş toprak kullanılarak yangın duvarı detayları tercih edilmiştir (Şekil 9 ve 10).



Şekil 9. Yangın Duvarı – Fatih / İstanbul (Erdem Meydan Arşivi)



Şekil 10. Yangın Duvarı – Samatya / İstanbul (Yavuz Tiryaki Arşivi)

Yapı adalarının yangın duvarlarıyla ayrılması, geniş yol akslarının ve meydanların planlanması ve inşaat mahallerinin geometrik biçimlerinin kurallar çerçevesinde yapılması gerektiği ile çıkmaz sokakların yapılmasına izin verilmeyeceği gibi ilkeler devreye sokularak yangın güvenliği tesis edilmek istenmiştir (Tankut, 1990). Beyoğlu Pera yangını sonrasında tulumba ile söndürme sürecinin yerini modern itfaiye teşkilatı devralmıştır. Avrupa'nın en modern itfaiye teşkilatlarından biri olan Macaristan İtfaiye'sinin başında bulunan Szechenyi Paşa 26 Eylül 1874'te İstanbul'a getirilmiş ve ilk itfaiye alayını kurmuştur. (Şekil 11 ve 12).



Şekil 11. İstanbul İtfaiye Amiri Ödön Széchenyi Paşa, 1874 (İstanbul Büyükşehir Belediyesi İtfaiye Daire Başkanlığı, 2016.)



Şekil 12. İstanbul İtfaiye Alayı, 1874 (GZT, 2021).

1930 yılında 1580 sayılı Belediyeler Kanunu ve 1933 yılında Alman şehir plancısı Hermann Jansen'in önerdiği Ankara İmar Planı yayımlanarak; yangına karşı önleyici yapısal düzenlemeler kurumsallaştırılmış ve tüm yurtta zorunlu hâle getirilmiştir. Ayrıca, dönemin kamu yapılarında betonarme teknolojisinin

yaygınlaşması ve yıllara göre artış göstermesi pasif yangın güvenliği açısından bir dönüm noktası olarak değerlendirilmelidir (Özer, 2020) (Tablo 1). Tüm bu gelişmeler, yangın riskine karşı daha dirençli bir kentsel çevrenin inşa edilmesine yönelik bütüncül bir iradenin göstergesidir.

**Tablo 1.** 1930 yılı ve sonrasında inşa edilen bazı kâgir ve betonarme binalar

| Yapı Adı | Malzeme | Konum | Yıl |
|---|---|---|---|
| Ankara Etnografya Müzesi | Kâgir ve Betonarme | Ankara | 1930 |
| İstanbul Sirkeci Posta ve Telgraf Binası | Kâgir ve Betonarme | İstanbul | 1930 |
| Atatürk Lisesi | Kâgir ve Betonarme | İzmir | 1930 |
| Gazi İlkokulu | Kâgir ve Betonarme | Eskişehir | 1932 |
| Ulus İş Hanı (Işıklar Hanı) | Kâgir ve Betonarme | Ankara | 1937 |
| Ankara Tren Garı | Kâgir ve Betonarme | Ankara | 1937 |
| Saraçoğlu Mahallesi (Memur Evleri) | Kâgir ve Betonarme | Ankara | 1944 |

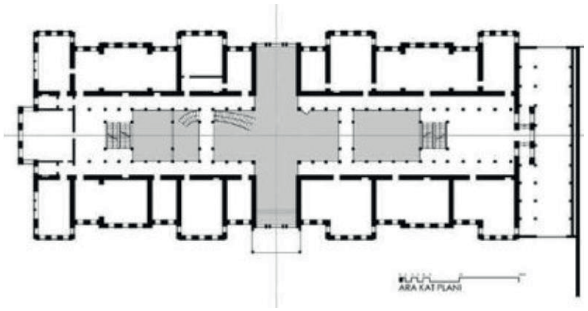
## 4. Örnek yapı incelemeleri ve dönemsel analiz

Cumhuriyet'in erken döneminde yangına karşı geliştirilen yapısal stratejilerin somutlaştığı mimari örnekler, bu politikaların sahadaki yansımalarını ortaya koyma açısından önemli bir veri kaynağı sunmaktadır. Bu bölümde, Cumhuriyet'in erken döneminde alınan yapısal önlemlerin mimari izdüşümleri, çeşitli kentlerde inşa edilmiş seçili yapılar üzerinden irdelenmiştir.

### *İstanbul Mimar Sinan Güzel Sanatlar Üniversitesi Ana Binası (Sanayi-i Nefise Mektebi)*

Cumhuriyet'in erken dönemlerinde yangın güvenliği bilinci, yalnızca yeni yapılaşmalarda değil, mevcut eğitim ve kültür yapılarının iyileştirilmesinde de önemli bir tasarım kriteri olarak ele alınmıştır. Bu bağlamda, Sanayi-i Nefise Mektebi olarak inşa edilen ve Cumhuriyet döneminde İstanbul Devlet Güzel Sanatlar Akademisi olarak işlevine devam eden MSGSÜ Ana Binası'nda gerçekleştirilen müdahaleler dikkat çekicidir. 1949 yılında Sedad Hakkı Eldem ve Mimar Mehmet Ali Handan'ın öncülüğünde yürütülen yenileme sürecinde, özellikle ana merdiven tasarımı pasif yangın güvenlik önlemleri açısından değerlendirilebilecek nitelikler taşımaktadır. Merdiven kurgusu; yangın anında güvenli tahliyeyi sağlamak amacıyla geniş sahanlıklar, taş basamaklar ve yangına dayanıklı taşıyıcı elemanlar kullanılarak tasarlanmıştır (Nezih, 2013). Ayrıca, merdivenin zıt yönlü konumlandırılmasıyla bina içerisindeki kaçış yollarının

doğrudan ve kesintisiz olması hedeflenmiş (makas merdivenler), böylece yangın sırasında hızlı ve güvenli tahliye için yapısal bir çözüm geliştirilmiştir. Dönemin yapı tekniği ve koruma anlayışı göz önüne alındığında, Eldem'in bu müdahalesi yalnızca estetik bir tercih değil, aynı zamanda erken Cumhuriyet döneminin yangın güvenliği politikalarına uygun bilinçli bir tasarım kararı olarak değerlendirilebilir (Şekil 13 ve 14).



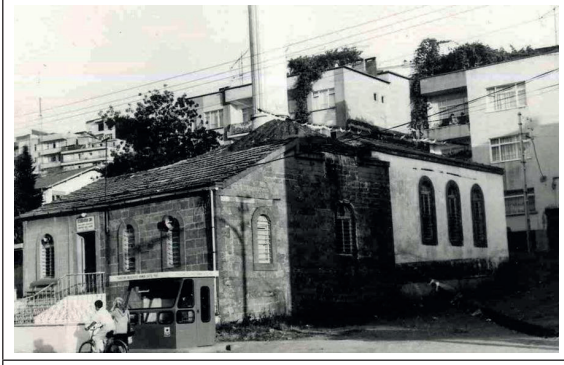

Şekil 13. MSGSÜ Ana Binası'ndaki Makas Merdivenler (Nezih, 2013).



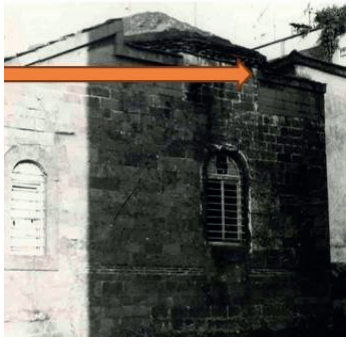
Şekil 14. MSGSÜ Ana Binası'ndaki Makas Merdivenler (Yanar, 2012).

### *Trabzon Hatuncuk Hatun Camii*

Trabzon'un tarihî dokusunu yansıtan ve cumhuriyet dönemi mimari mirasının izlerini taşıyan cami, ilk olarak tekke olarak inşa edilse de 1925 yılında tekkelerin kapatılması ile camiye dönüştürülmüştür. Hem mimari özellikleri hem de dini işlevi açısından dönemin sosyo-kültürel yapısını ve dönüşüm sürecini yansıtır. Yapıda yer alan kirpi saçak, yağmur ve kar suyunu binadan uzaklaştırmak amacıyla yapılmış bir tasarımdır. Bu detay yangının çatıya ulaşmasını engelleyerek aynı zamanda yangın güvenliği açısından da önemli bir işlevi yerine getirir (Şekil 15 ve 16).



Şekil 15. Hatuncuk Hatun Camii (Otyakmaz, 2022).



Şekil 16. Hatuncuk Hatun Camii Kirpi Saçak Detayı (Otyakmaz, 2022).

### *İzmir Cumhuriyet Meydanı*

1922 yılında İzmir'de büyük bir yangın çıkmış ve sonrasında kentin yeniden imar sürecinde, kamusal alanların artırılması ile yangın güvenliğinin tesisi açısından stratejiler oluşturulmuştur. Geniş meydanlar, bulvar ve park alanları, olası yangın senaryolarında hem yangının yayılımını fiziksel olarak sınırlamak hem de tahliye ve müdahale süreçlerini kolaylaştırmak amacıyla tasarlanmıştır. Özellikle Cumhuriyet Meydanı gibi büyük alanların planlanması, yangın anında toplanma, kaçış ve itfaiye erişim noktaları oluşturmak açısından önemli bir fonksiyon üstlenmiştir. Bu yaklaşım, modern şehircilik ilkeleriyle uyumlu olarak, yangına karşı dayanıklı kent dokusu oluşturmanın bir parçası olarak görülmüştür (Güngördü, 2022) (Şekil 17 ve 18).



Şekil 17. 1922 Yangını Sonrasında İzmir Cumhuriyet Meydanı (Serçe vd., 2003).




Şekil 18. İzmir Cumhuriyet Meydanı'nın Konumu (Güngördü, 2022).

## 5. Değerlendirme ve Sonuç

Bu çalışma, Türkiye'de inşa edilen yapılar üzerinden erken cumhuriyet döneminin pasif yangın güvenliği yaklaşımlarını ortaya koymayı hedeflemiştir. Elde edilen bulgular, dönemin yangına karşı yapısal önlemlerinin yalnızca teknik gereklilikler değil, aynı zamanda modernleşme ve kamu güvenliğinin tesisine yönelik bütüncül bir vizyonun parçası olarak ele alındığını göstermektedir.

Cumhuriyet'in ilk yıllarında yürürlüğe konan yasa ve yönetmeliklerle, yangına dayanıklı malzeme kullanımı, yapı adalarının yangın duvarlarıyla ayrılması, geniş sokak akslarının planlanması ve yangın gözetleme kuleleri gibi fiziksel önlemler sistematik bir biçimde teşvik edilmiştir. Bu dönemde kâgir ve betonarme yapı teknolojisinin yaygınlaşması, yangın güvenliğinde önemli bir aşama olarak öne çıkmış; özellikle kamu binalarında dayanıklı ve modern yapı sistemlerinin tercih edilmesi, kentlerin yangına karşı daha dirençli hâle getirilmesine katkı sağlamıştır.

Ayrıca, itfaiye hizmetlerinin askeriyeden belediyelere devredilmesi, yerel yönetimlerin yangınla mücadelede daha etkin bir rol üstlenmesine olanak

tanımış, yangın riski yüksek olan bölgelerde planlama ve altyapı yatırımları hız kazanmıştır. Bu durum, sadece fiziksel mekân düzenlemelerinde değil, aynı zamanda toplumsal bilinç düzeyinde de yangın güvenliği kültürünün yerleşmesine katkıda bulunmuştur.

Örnek yapı incelemeleri ve dönemsel belgeler, erken cumhuriyet döneminde pasif yangın önlemlerinin yapı tasarımında ve kent planlamasında bilinçli tercihlerle şekillendiğini ortaya koymuştur. Yapısal düzenlemelerin hem kent ölçeğinde hem de bina bazında sistemli bir biçimde kurgulanması, günümüz koruma ve restorasyon yaklaşımları için de değerli bir referans sunmaktadır.

Sonuç olarak, erken cumhuriyet dönemi mimarlık mirası yalnızca estetik ya da işlevsel değerleriyle değil, aynı zamanda dönemin yangın güvenliği politikalarının somutlaştığı örnekler olarak da değerlendirilmelidir. Bugün bu yapıların korunmasında, dönemin özgün pasif yangın önlemlerinin anlaşılması ve bu doğrultuda restorasyon stratejilerinin geliştirilmesi büyük önem taşımaktadır. Bu çalışma ile dönemin yangına karşı dirençli tasarım prensipleri belgelenmiş ve hem tarihî çevre koruma çalışmalarına hem de günümüz yangın güvenliği politikalarının geliştirilmesine katkı oluşturmak amaçlanmıştır.

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# INTERNATIONAL COMPILATION OF RESEARCH AND STUDIES IN ARCHITECTURE, PLANNING AND DESIGN



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SERÜVEN YAYINEVİ

# Chapter 2

## RESEARCH GENEALOGIES AND EPISTEMOLOGICAL TRAJECTORIES IN MODULAR CONSTRUCTION, CONSTRUCTION TECHNOLOGY AND ENERGY-EFFICIENT BUILDING RESEARCH (1970–2020)

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## 1.INTRODUCTION

The development of scientific studies is seen as a cumulative process progressing step by step. Scientific studies, which develop and grow through a layered approach, do not follow a linear path, especially since the industrialization period, with the blurring of sharp boundaries, the increasing interrelationships between different fields, the emergence of interdisciplinary studies, and the proliferation of studies in social sciences. This study focuses on the evolution of developments in the field of 'Modular structure, construction technology, and energy-efficient buildings' by examining the research conducted on this topic. It investigates how the boundaries of the field have evolved in relation to technological advancements and changing industrial priorities. It explores how these boundaries are shaped by the interaction and relationships between research agendas, production technologies, construction practices, and broader socio-economic conditions.

The aim of this research is to present a historical and epistemological analysis of the scope and methodology of research in the field of 'modular structure, building technology, and energy-efficient buildings' from the 1970s to 2020, based on doctorate thesis produced in this area. Within this long time period, the study critically examines the question: How was knowledge in this field produced and structured over time? This question also answers the reasons and mechanisms behind methodological changes and transformations in the research area.

Doctoral dissertations serve as cornerstones in the production of academic knowledge. Therefore, the three key terms selected for this study – 'modular structure, construction technology, and energy-efficient buildings' – were searched in the ProQuest Doctoral Dissertations and Doctoral Studies database. To find long-term research trends in these areas, doctoral dissertations were scanned starting from 1970. This covered a 50-year period to illustrate the technological, industrial, and environmental aspects of the field. For each 10-year period, three dissertations corresponding to the specified term were selected. Through these three doctoral studies selected for each 10-year period, the dominant research methodologies, epistemological frameworks, and methodological trends over time were determined. The historical development of knowledge production in these areas was examined, and doctoral research was positioned within significant global trends such as energy crises, digitalization, and emerging technologies. Furthermore, the study observed whether an epistemological shift occurred through the examined dissertations and analysed the development of research tools, methodologies, and analytical capabilities.

## 2.REVIEW ON THE EPISTEMOLOGICAL FRAMEWORK AND SCIENTIFIC RESEARCH TRADITIONS

The epistemological approach, when analysing scientific fields, addresses two questions: What is knowledge, and how is knowledge produced and justified? These questions continue to influence the development of research problems and shape scientific research traditions in various fields. However, with the proliferation of interdisciplinary studies and the prominence of research in the social sciences, the answer to the question of how knowledge is produced has begun to diversify and change. In this context, the question of whether knowledge is based on an objective external reality or on context-dependent interpretations frequently dominates epistemological debates. At this point, different perspectives have been examined. Foundationalism argues that knowledge is based on an external reality accessible through observation, measurement, and empirical analysis. From this perspective, scientific validity relies on methodical research and repeatable results. On the other hand, anti-foundationalist approaches challenge the idea of absolute foundations. They argue that what we know is shaped by context, how we interpret it, and historical conditions. The rise of anti-foundationalist views has increased epistemological diversity, making it difficult to distinguish which

field is which, particularly since the 1990s, with the blurring of boundaries between specific areas and the proliferation of interdisciplinary studies. This diversification revived interest in the problem of distinguishing scientific knowledge from non-scientific claims, and different perspectives developed in this area. Karl Popper's focus on falsifiability and Thomas Kuhn's ideas about paradigms and scientific revolutions had a major influence on early debates. While Popper argued that scientific progress occurred through assumption and refutation, Kuhn characterized scientific evolution as an oscillation between stable stages of "normal science" and paradigm shifts triggered by unresolved anomalies. Imre Lakatos later introduced the concept of research programs, arguing that scientific progress should be assessed not through the examination of isolated theories, but through the comparison of competing research programs over time.

These perspectives offer a valuable framework for examining long-term research trajectories. They do not view methodological change as a sign of an epistemological rupture; instead, they see scientific progress as a process that builds upon itself over time as tools, problems, and evaluation criteria change.

## 3.RESEARCH GENEALOGIES on MODULAR CONSTRUCTION, CONSTRUCTION TECHNOLOGY, ENERGY EFFICIENT BUILDINGS

Research genealogies offer a structured framework for analysing the evolution of knowledge fields over time through recurring themes, keywords, methodologies, and disciplinary connections. This study analyses doctoral research in the fields of modular construction, building technology, and energy-efficient building studies from the 1970s to the 2010s to identify breaks in research focus and epistemological orientation. According to a comprehensive review of the ProQuest database, the increasing importance of modularization, technological innovation, and energy efficiency in the building environment is reflected in the continuous increase of doctoral dissertations on these topics. The research objectives, methodologies, and core epistemological assumptions of selected dissertations were examined in ten-year periods. Global trends, including energy crises, technological advancements, and changes in construction practices, were considered as contextual factors influencing research objectives. To support this approach, four main technical stages – industrialization and standardization, computerization and automation, digital integration and performance optimization, and data-driven intelligent systems – were identified. These stages provide a contextual framework for analysing shifts in research direction over time.

Figure 1 illustrates four main stages: industrialization and standardization, computerization and automation, digital integration and performance optimization, and data-driven intelligent systems. These stages provide a foundation for understanding the research genealogies discussed in this section. Thus, the parallelism between the timeline of change and transformation observed when examining studies in each 10-year period will also be investigated.

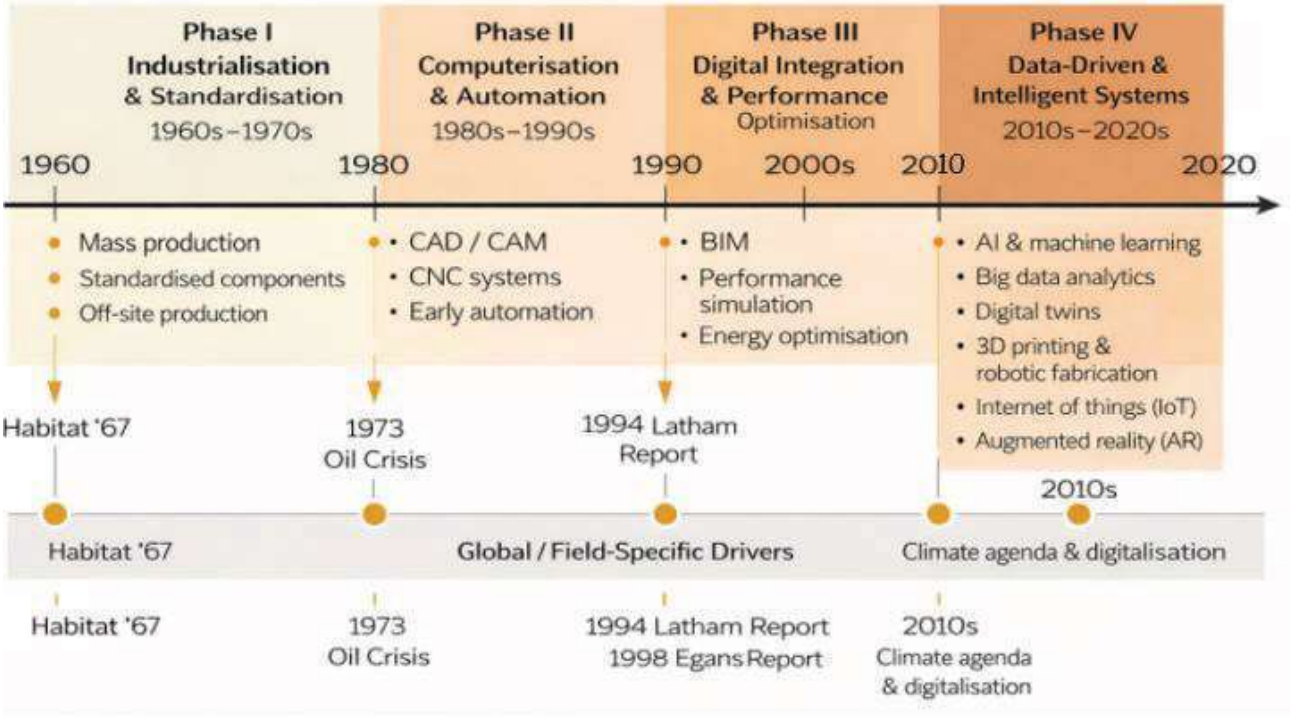


**Figure 1.** Technological paradigms and research drivers shaping 'modular construction' and 'energy efficient building' research (1960-2020)

### 3.1. The Changes in Scientific Research Traditions and Trends from the 1970s to the 2010s

Research genealogies in modular construction, building technology, and energy-efficient building studies reveal distinct thematic and methodological patterns across successive decades. For each decade between the 1970s and 2010s, doctoral dissertations indexed in the ProQuest database were examined, and three representative studies were selected based on thematic relevance and institutional affiliation. Rather than offering detailed case-by-case descriptions, this section highlights the dominant research concerns and methodological trends that characterized each period. Table 1 shows the theses selected to observe the long-term development of research agendas in the fields of modular construction, building technologies, and energy-efficient building studies, as well as the changes and transformations in technological paradigms and research methods. As summarized in this table, the number of theses has continuously increased, highlighting the importance of interest in this field.

In the 1970s, research in this field was largely influenced by energy efficiency concerns and industrialization, particularly the 1973 oil crisis. Theses from this period (Kosaner, 1979; Romancheck, 1979; Sedlak, 1975) employed predominantly empirical and experimental research strategies, including case studies, prototype development, simulations, and analytical testing. The focus of the studies concentrated on industrial building systems, building facade performance, and alternative construction materials, reflecting an early engagement with off-site manufacturing and energy-conscious design.

The increasing availability of computer-aided design and early automation techniques in the 1980s created new research opportunities in the field of construction. Selected theses from this decade (Graham, 1988; Sotoodeh-Khoo, 1988; Grobler, 1988) adopted quantitative research methods, including numerical analysis, computer programming, optimization techniques, and survey-based research.

Table 1. Overview of doctoral dissertations by decade, keywords, epistemological position, theoretical perspective and research methodology in modular construction, construction technology and energy-efficient building studies (1970–2020)

| DECADE | KEYWORDS | NO OF DISSERTATION | SOURCE (Full reference of the dissertation from ProQuest) | EPISTEMOLOGY | THEORETICAL PERSPECTIVE | METHODOLOGY/ METHODS | ANNOTATIONS for Decades |
|---|---|---|---|---|---|---|---|
| 1970's | Modular construction<br>Construction technology<br>Energy efficient buildings | Architecture: 9<br>All: 641 | ▪ Kosaner, Y. (1979). *A study of industrialised building systems with special reference to Turkey*. The University of Manchester (United Kingdom) | Objectivism | Positivism | Comprehensive review and classification<br>Case Study | -Maintaining industrialization in building systems |
| | | | ▪ Romancheck, R. (1979). A Study Of The Residential Energy Envelope To Assess Energy, Economic, And Environmental Factors In The Selection Of Residential Energy Systems. (volumes I And II). Drexel University. Philadelphia, Pennsylvania. | Objectivism | Positivism | Simulations<br>Measurements<br>Experimental Data | |
| | | | ▪ Sedlak, V. F. (1975). Folded surface structures: The potential use of paperboard for low-cost enclosures. University of Surrey (United Kingdom) | Objectivism | Positivism | Literature Review<br>Survey<br>Prototype manufacture<br>Analytical tests<br>Experimental investigations | |
| 1980's | Modular construction<br>Construction technology<br>Energy efficient buildings | Architecture: 52<br>All: 1.167 | ▪ Graham, C. W. (1988). *The HUD-Code and modular housing industries: variable identification for technological, marketing, and management orientation indices*. Texas A&M University. (USA) | Objectivism | Positivism | Exploratory data analysis<br>Survey<br>Questionnaire | -Developments in the computer programming<br>-Automation studies in the construction industry |
| | | | ▪ Sotoodeh-Khoo, H. (1988). Integrated real-time expert systems and sensor-based data-acquisition in the automation of construction equipment and operations. Stanford University (USA) | Objectivism | Positivism | Analytical model<br>Optimization<br>Experimentations | |
| | | | ▪ Grobler, F. (1988). Object-oriented data representation for unified construction project information. University of Illinois at Urbana-Champaign | Objectivism | Positivism | Computer Programming<br>Knowledge-based review<br>Data Analysis &Progressing | |
| 1990's | Modular construction<br>Construction technology<br>Energy efficient buildings | Architecture: 141<br>All: 3.600 | ▪ Al-Homoud, M. (1994). Design optimization of energy-conserving building envelopes. Texas A&M University (USA) | Objectivism | Positivism | Simulations<br>Optimizations<br>Linear- Dynamic Programming | -Searching for new technologies<br>-Establishing a new paradigm for design and building energy optimization |
| | | | ▪ Malkawi, A. M. (1994). Building energy design and optimization: Intelligent computer-aided thermal design. Georgia Institute of Technology (USA) | Objectivism | Positivism | Simulations<br>Optimization<br>Transfer Function | |
| | | | ▪ Mathew, P. A. (1996). Integrated energy modeling for computational building design assistance. Carnegie Mellon University. (USA) | Objectivism | Positivism | Quantitative Analysis<br>Simulations<br>Case Study | |
| 2000's | Modular construction<br>Construction technology<br>Energy efficient buildings | Architecture: 276<br>All: 8.098 | ▪ Kassab, M. S. M. (2008). Enhancing the energy -efficient design of office buildings using a based-simulation design support system. University of Calgary (Canada) | Objectivism | Positivism | Case Study<br>Simulations<br>Quantitative Analysis | -New cross-research fields<br>-Integrating technology, construction industry and building performances |
| | | | ▪ El Ghandour, W. (2007). Integrated information-based construction simulation system. University of Alberta (Canada) | Objectivism | Positivism | Literature Review<br>Review Ontology<br>Surveys<br>Simulations | |
| | | | ▪ Primikiri, E. (2004). Thermal building performance optimization using spatial archetypes. University of Michigan (USA) | Objectivism | Positivism | Simulations-Optimization<br>Case Study<br>Analytical calculations | |
| 2010's | Modular construction<br>Construction technology<br>Energy efficient buildings | Architecture: 305<br>All: 11.412 | ▪ Sheffer, D. A. (2011). Innovation in modular industries: Implementing energy-efficient innovations in US buildings. Stanford University (USA) | Objectivism | Positivism | Quantitative analyses with technical interviews<br>Case Studies<br>Analytic Data | -Increasing the number of dissertations about innovations and technological developments in the construction industry<br>-Increasing the number of used tools and implementations of innovations on buildings |
| | | | ▪ Kawecki, L. R. (2010). Environmental performance of modular fabrication: Calculating the carbon footprint of energy used in the construction of a modular home. Arizona State University (USA) | Objectivism | Positivism | Scientific measurements<br>Observations- Data collection | |
| | | | ▪ Jafar Ramaji, I. (2016). An integrated building information modeling (BIM) framework for multi-story modular buildings. The Pennsylvania State University (USA) | Objectivism | Positivism | A comprehensive Literature Review<br>Site visits and interviews/ Observations | |

In the 1990s, with increasing global awareness, environmental issues, energy efficiency, and sustainability studies became significantly important. The theses examined (Al-Homoud, 1994; Malkawi, 1994; Mathew, 1996) investigated techniques related to energy optimization, computational modelling, and performance-based analysis aimed at reducing energy consumption. With the increasing use of computer technologies, simulation-based methods and optimization algorithms, supported by statistical and analytical data analysis, became dominant. It was observed that quantitative methodologies maintained their prevalence and strengthened the objective orientation of research applications.

In the 2000s, research agendas expanded further thanks to advanced simulation tools and system integration. Studies encompassing multiple disciplines, connecting automation, information systems, and construction technology, began to appear. The methods employed in the study maintained a quantitative nature, based on various approaches such as advanced computational models, analytical calculations, and optimization techniques.

Between 2010 and 2020, studies on modular construction and energy-efficient buildings were characterized by increasingly data-intensive and performance-oriented approaches, driven by the development and widespread use of digital tools. Doctoral dissertations examined during this period (Kawecki, 2010; Sheffer, 2011; Jafar Ramaji, 2016) continued to rely primarily on quantitative methodologies, including scientific measurements, data collection, analytical modelling, and case-based analysis. While advanced digital tools such as Building Information Modelling (BIM), automation technologies, and manufacturing technologies expanded the analytical capacity of research, the underlying epistemological orientation remained largely objectivist.

### 3.2. Definition of Epistemological Positions

This section clarifies the epistemological positions, theoretical perspectives, and associated research methodologies that underpin the analysis of research genealogies in modular construction, construction technology, and energy-efficient building studies. Establishing these conceptual contrasts is key for properly interpreting the epistemic orientation of the selected doctoral dissertations across different decades.

Epistemological perspectives, generally situated on a continuum from objectivism to subjectivism, embody varying assumptions regarding the essence of reality, the nature of knowledge, and the researcher's function in knowledge creation. Objectivism posits the existence of a reality that can be accessed through systematic, objective scientific methodologies and is separate from human perception. Structured analytical frameworks, empirical observation, experimentation, and the gathering of knowledge through quantifiable and repeatable processes are characteristics of objectivist research. Feast and Melles (2010) emphasize that objectivist epistemology prioritizes the logical development of theories based on actual data and looks for solid foundations to enable scientific investigation. Subjectivism, on the other hand, views reality as socially and interpretively produced. According to this viewpoint, various interpretations of reality may coexist and knowledge is shaped by the meanings people give to their experiences. Subjectivist methods emphasize context-dependent, historically and culturally situated understandings rather than absolute or universal facts. Coherence, plausibility, and interpretative consistency—rather than congruence with an actual external reality—are used to evaluate knowledge. As a result, subjectivist research traditions frequently use qualitative research techniques including discourse analysis, interpretive inquiry, and interviews. Feast and Melles (2010) define constructionism as a third epistemological perspective that goes beyond this binary divide and is especially pertinent to design and interdisciplinary research contexts.

By contending that knowledge is created through interactions between researchers and the social world, constructionism bridges the subject-object gap. Constructionism holds that knowledge is created through common meanings, language, and social activities rather than presuming a fixed external reality or entirely subjective interpretation. According to this viewpoint, truth is created through interpretive processes that are ingrained in certain institutional and cultural settings rather than discovered. Consequently, constructionist studies often use qualitative and interpretive approaches including ethnography, grounded theory, and phenomenological research.

Crotty conceptualizes the research process as consisting of four interconnected elements: epistemology, theoretical perspective, methodology, and methodologies in order to operationalize these epistemological disparities within research practice (Feast and Melles, 2010). This framework offers a methodical framework for connecting specific research techniques to philosophical presumptions about knowledge. Table 2 summarizes the connections between epistemological stances, related theoretical viewpoints, and frequently used approaches and techniques based on this model.

Table 2. Knowledge Framework by Crotty (Feast and Melles, 2010)

| Epistemology | Theoretical perspective | Methodology | Methods |
|---|---|---|---|
| Objectivism | Positivism<br>Post-positivism | Experimental research<br>Survey research<br>Etc. | Sampling<br>Measurement and scaling<br>Statistical analysis<br>Questionnaire<br>Focus group<br>Interview<br>Etc. |
| Constructionism | Interpretivism<br>• Symbolic interactionism<br>• Phenomenology<br>• Hermeneutics<br>Critical Inquiry<br>Feminism | Ethnography<br>Grounded theory<br>Phenomenological research<br>Heuristic inquiry<br>Action research<br>Discourse analysis<br>Feminist standpoint research<br>Etc. | Qualitative interview<br>Observation<br>• Participant<br>• Non-participant<br>Case study<br>Life history<br>Narrative<br>Theme identification<br>Etc. |
| Subjectivism | Postmodernism<br>Structuralism<br>Post-stucturalism | Discourse theory<br>Archaeology<br>Genealogy<br>Deconstruction<br>Etc. | Autoethnography<br>Semiotics<br>Literary analysis<br>Pastiche<br>Intertextuality<br>Etc. |

Table 2 shows that positivist and post-positivist theoretical stances are most closely related to objectivist epistemology. Asserting that trustworthy information can only be acquired by scientific techniques based on observation, measurement, and experimentation, positivism is based on the idea of separating science from metaphysics. According to this paradigm, the goal of scientific investigation is to find generalizable, universal truths that are thought to exist apart from the researcher. Thus, the methodological underpinnings of positivist research strategies are empirical and quantitative research methodologies, including surveys, measurement-based approaches, statistical analysis, and experimental studies.

### 3.3 Evaluation of the Epistemological Positions of Selected Dissertations

Although building science is typically found in architectural departments, scientific and engineering-oriented methodologies of inquiry have long influenced the field's study. The natural and applied sciences are strongly related to the three keywords this study looked at: energy-efficient buildings, construction technology, and modular construction. Because of this, an analysis of PhD dissertations written between the 1970s and the 2010s shows a consistent and obvious agreement with objectivist epistemological stances.

The primary research methodologies over the decades under examination are quantitative. Throughout the dataset, experiments, simulations, analytical modelling, optimization strategies, and performance-based assessments are frequently used. Positivist theoretical stances, which hold that knowledge is observable, quantifiable, and independent of the researcher, immediately align with these methodological preferences. This is not an accidental pattern. Instead, it represents the epistemological underpinnings of construction-related research, where technical performance and empirical verification continue to be primary objectives. Interestingly, more information on this epistemic coherence may be found in the disciplinary distribution of PhD research. The number of dissertations has increased significantly over time, especially in the fields of architecture and civil engineering, as Figure 2 illustrates. Contributions from information systems, management, and other multidisciplinary fields have become more prominent since the 1990s.

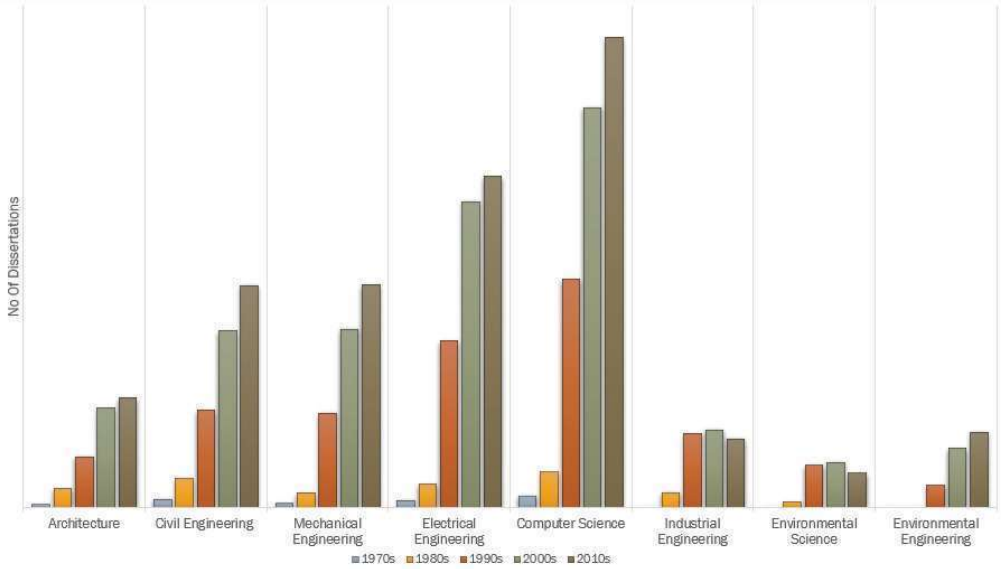


**Figure 2.** Distribution and comparison of different subjects according to years in the dissertations

This observation is further supported by a closer look at topic groupings. Three broad research concerns—standardization, technical advancement, and environmental performance—were used to analyse the chosen dissertations. These concerns were reflected across topic areas such as management, ecology, energy, information technology, robotics, and artificial intelligence. Energy-related research has been around since the 1970s, as seen in Figure 3, but ecological topics only became well-known after the 1990s, coinciding with the growth of sustainability discourse in the built environment.

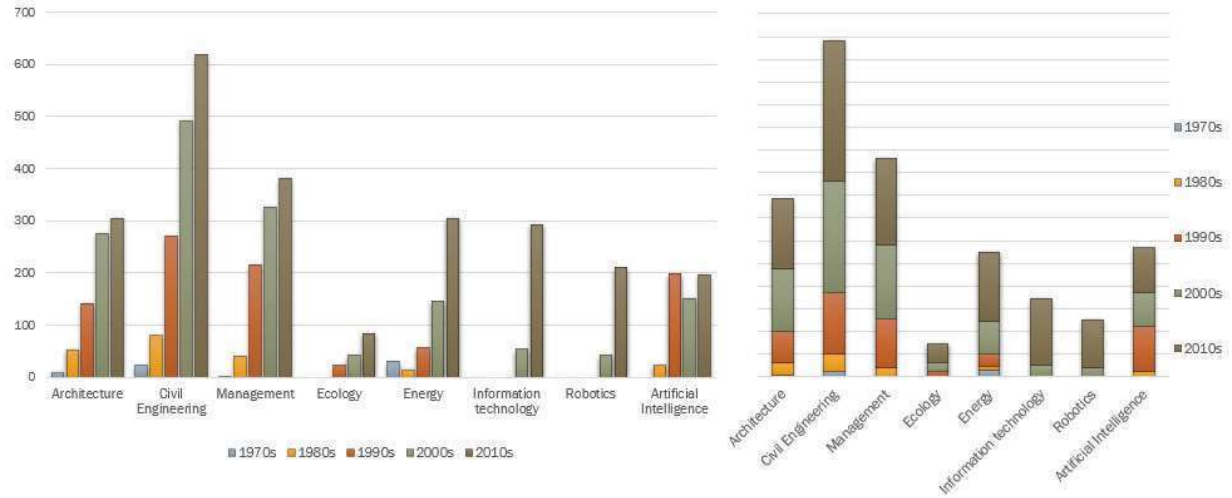


**Figure 3.** Comparison of different subjects with each other and epistemological position of selected dissertations

Technological themes follow a similar trajectory. Early references to artificial intelligence appear as early as the 1980s; however, research focused explicitly on information technologies and robotics became more pronounced after the 2000s. The big jump that happened in the 2010s is due to the fast growth of digital tools and their use in construction research. These new technologies mostly made it easier to analyse data, not change the basic ideas that guide research. This relationship is especially clear when you look at both the scope of the discipline and the epistemological position. As summarised in Figure 4, civil engineering accounts for the highest number of dissertations, followed by architecture and management-related studies. Despite this disciplinary expansion and thematic diversification, the core methodological approaches remain largely unchanged. Surveys, prototype

development, analytical testing, experimental investigations, simulations, optimisation processes, and case studies continue to dominate.

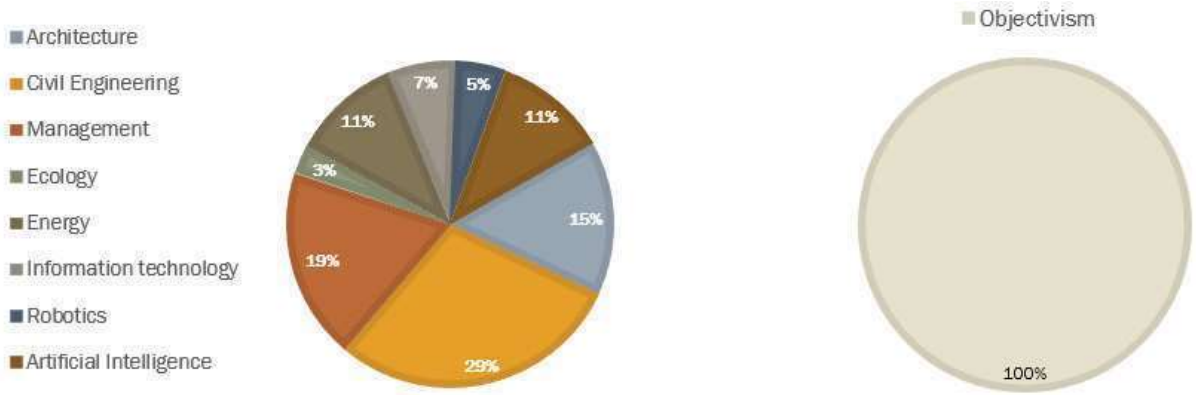


**Figure 4.** Comparison of different subjects with each other and epistemological position of selected dissertations

Taken together, these findings indicate that the expansion of research domains in modular construction and energy-efficient building studies reflects methodological and thematic diversification rather than an epistemological shift. The epistemological positioning of the selected dissertations remains consistently objectivist, with positivism serving as the dominant theoretical perspective across all examined decades.

### 3.4 Definition of Problem Area Considering Global and Field Specific Events

Modular construction, construction technology, and energy-efficient building studies have research genealogies that are intricately linked to both global and field-specific advancements. Research priorities in this field have not developed in a vacuum; rather, they have been influenced by international agendas, technological advancements, and historical occurrences that have redefined the scope of inquiry and the framing of research problems over time. As previously demonstrated by the timeline of significant socioeconomic and technological advancements (see Figure 1), shifts in the focus of research clearly correlate with significant worldwide events and changes in the construction sector. The oil crisis of the 1970s was a major turning point that made academics pay more attention to energy efficiency, alternative building materials, and building systems that are focused on performance. During this time, research on modular construction became more in line with definitions of energy-related problems. This showed that people were worried about resource scarcity and efficiency.

In the years that followed, automation and digital technologies had a bigger and bigger effect on construction research. Beginning in the 1980s, when early automation systems and computer-aided design tools became available, research problems slowly changed. Previously material and component-focused investigations have shifted to computational analysis, process optimization, and system efficiency. These advancements strengthened the significance of quantitative and simulation-based techniques and broadened the range of methodological tools available to researchers. Global worries about resource efficiency, environmental impact, and sustainability grew during the 1990s and early 2000s. Redefining research topics and promoting the methodical incorporation of environmental factors into construction research were made possible in large part by international reports, regulatory frameworks, and performance standards. As a result, topics such as energy optimisation, lifecycle performance, and integrated building systems gained increasing visibility within academic studies.

Digitalization, data processing, and rapid advancements in intelligent systems have continued to shape research problems in recent decades. The convergence of construction technology with information systems, artificial intelligence, and automation has resulted in new research areas focusing on data-driven decision-making, performance monitoring, and system integration. While these developments have significantly increased the scope and complexity of research topics, it is important that they largely follow accepted scientific frameworks. By enhancing analytical capacity and methodological rigor, they have strengthened existing approaches rather than altering current epistemological perspectives.

## 4. Conclusion

This chapter aimed to trace the research genealogies and epistemological trajectories of doctoral research in the fields of modular construction, building technology, and energy-efficient building studies from the 1970s to the 2010s. The analysis shows that while research topics, tools, and interdisciplinary intersections have diversified, the fundamental epistemological orientation has remained predominantly objectivist. A comparison of theses from different decades reveals a unsurprising consistency in their epistemological stances. Throughout the period examined, despite significant diversity in research topics, analytical tools, and interdisciplinary interactions, the dominant epistemological orientation has remained objectivist. The consequence of this continuity is that researchers still employ quantitative, performance-based methods. This stability is closely related to the strong links between the chosen research areas and the natural and applied sciences, where technical verification and empirical measurement are central components of scientific research.

Although architecture is often considered a design and craft-centered discipline, the standardization processes of construction systems have long been influential in the field of building sciences studied within this area. These influences date back to the Industrial Revolution and became more pronounced in the 20th century (Gözen, 2011). According to Eisenman, World War II marked a significant shift from mechanical production paradigms to information-based and electronic systems. The logic of production in many sectors, including construction, changed with the emergence of digital computing technologies in the 1960s, followed by the development of Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM). These digital technologies have been widely incorporated into construction and architecture research in the following decades. The use of simulation tools, optimization strategies, and performance-based evaluation techniques has gained importance in academic research. These developments have facilitated the growth of research agendas and encouraged the development of interdisciplinary fields linking information systems, building performance, and construction technology. However, this expansion, viewed through the prism of Kuhn's concept of normal science, can be seen not as a fundamental epistemological break, but rather as a cumulative development within an established scientific paradigm. The results show that advances in construction technology and digital tools have led to increased methodological sophistication rather than a fundamental shift in epistemology. Research in this field has evolved through incremental advancements within established scientific paradigms, consistent with Kuhn's concept of normal science. Consequently, the proliferation of interdisciplinary research areas has enhanced analytical capabilities while maintaining consistent assumptions about knowledge production in construction science.

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# Chapter 2

## THE IMPACT OF TEACHING METHODS ON ARCHITECTURE STUDENTS' CLIMATE-ORIENTED DESIGN PROCESSES

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## I. Introduction

Sustainable development aims to raise awareness by confronting environmental, social and economic challenges. Sustainable development goals were announced as an international call in 2015 and adopted by the member states of the United Nations as principles to be achieved by the end of 2030 [1]. The historical background of these sustainable goals can be briefly summarized as follows:

- In 1992, a comprehensive plan to improve human life and protect the planet, called Agenda 21, was adopted by more than 178 countries at the Earth Summit [1].

- In 2000, UN member states unanimously accepted the Millennium Declaration at the Millennium Summit in New York [1].

- At the World Summit on Sustainable Development in South Africa, the Johannesburg Declaration on Sustainable Development and the Plan of Implementation were adopted in 2002 [1].

- The United Nations Environment Program (UNEP) attributes more than 40-45% of total energy consumption and total greenhouse gas emissions to the building sector in Europe [2].

- In 2012, the document, published under the title "The Future We Want", was adopted by UN member states [1]. At the 2012 Rio+ 20 Earth Summit, world leaders paved the way for the development of future Sustainable Development Goals [3], [4].

- The UN General Assembly established a working group to develop the Sustainable Development Goals in 2013 [1].

- In 2015, the working group started negotiations on the post-2015 development agenda and the process resulted in the adoption of 17 development principles [1]. Many of the new goals defined as "Transforming our World 2030 Agenda for Sustainable Development" are closely related to architecture and the built environment [3]. The Paris Agreement on climate change was signed in 2015 [1].

- Today, these principles of sustainable development are monitored and assessed on a country-by-country basis at the annual High Level Political Forum on Sustainable Development [1] (Fig. 1).

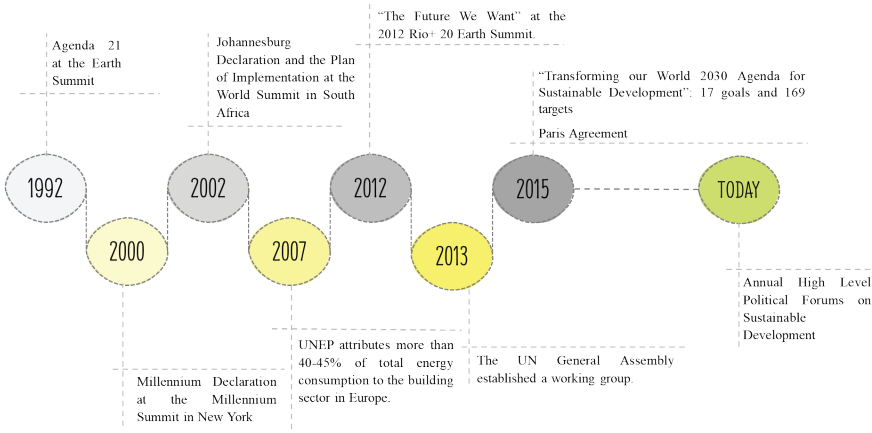


*Fig. 1 Historical background of sustainable development*

While the measures taken to address the climate crisis in the world are increasing day by day, it is seen that architectural education is falling behind these measures [5]. To overcome this problem, it is necessary to examine the curriculum, teaching methodologies, student experiences and knowledge acquisition, as well as other factors affecting the process and their interrelationships [6].

### A. The Role of the Instructor

In architectural education, there is a need to train course instructors in pedagogical theories and methods, especially in designing for climate change [5]. The term pedagogy used here refers to the teaching-learning relationship [7]. Teachers' personal skills and motivation to follow the sustainability agenda are effective in managing the learning process [5]. Part-time architects who are experienced in the field and share their experiences in the courses are of particular importance for students to master the subject [5].

In educational institutions, the skills and attitude of the instructor affect the learning process. In addition to being knowledgeable, the educator should have a grasp of ecological literature, be able to use and encourage the digital platform. It is also within the role of the educator to prepare the learning infrastructure by drawing a proper framework for students and providing the motivation they need [5].

### B. Curriculum Management

In architectural education, not only the role of the educators but also what and how they teach is important. Platforms such as the European

Council of Architects (ACE), the Royal Institute of British Architects (RIBA) and current developments should be closely followed and integrated into the architectural education process. These decisions should be followed and transferred in order to increase the competence, knowledge and skills of architects in the design of resilient and sustainable built environment against climate change and to implement the mandatory European Directives [8].

Various researchers have suggested adding topics such as "sustainability and resilience, disaster risk, climate change adoption" [9]; "urban planning, emergency evacuation, adaptive façade" [10]; "indoor environmental quality, eco-friendly materials, waste minimization" [11] and "energy efficiency, green architecture, conservation of natural and built heritage" [6] to the architectural curriculum.

**C. Teaching Methods**

In architectural education, various teaching styles such as design-oriented and science-oriented coexist. Examples of design-oriented learning include design studios and science-oriented learning includes vocational/technical courses [12]. Successful pedagogical methods are mentioned in a study on climate change curricula and carbon neutralization, which consists of a review of 87 publications [5]. Accordingly, it has been observed that more effective learning process is realized when student-oriented, collaborative and interdisciplinary working principles are handled together with digital tools in the adaptation of sustainable design to architectural education. In the student-oriented education approach, the student's self-awareness, self-evaluation and self-management are at the forefront instead of transferring information from the teacher to the student [5].

The interrelation of the parameters related to the architectural education process is indicated below (Fig. 2)

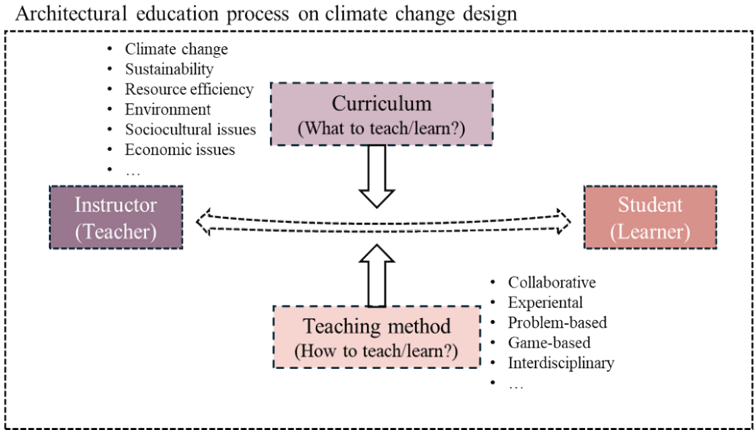


*Fig. 2 The inclusion of climate-resilient design in architectural education*

Review studies [3], [13] and case studies [4], [15] addressing the course contents, teaching techniques, and student-instructor perceptions regarding the dissemination of sustainability in higher education institutions are available in the literature. The aim of this study is to examine different teaching methods from different perspectives in transferring indispensable issues of today's architecture such as climate change and sustainability into practice.

## II. Materials and Method

Within the scope of the study, articles from the last 10 years obtained from Web of Science and Google Scholar databases were analyzed. The keywords searched were “climate” and “education*” and “architect*” and “practic*” and ‘teaching’ or “pedagogy”. Educational sciences and architecture disciplines were focused on as the research areas. In line with the information obtained, teaching methods were categorized under 5 headings and the literature review was continued under each heading. Subsequently, the definition, potentials, limits and/or gaps of each learning style were discussed. At the end of the study, these methods were summarized and recommendations were presented (Fig. 3).

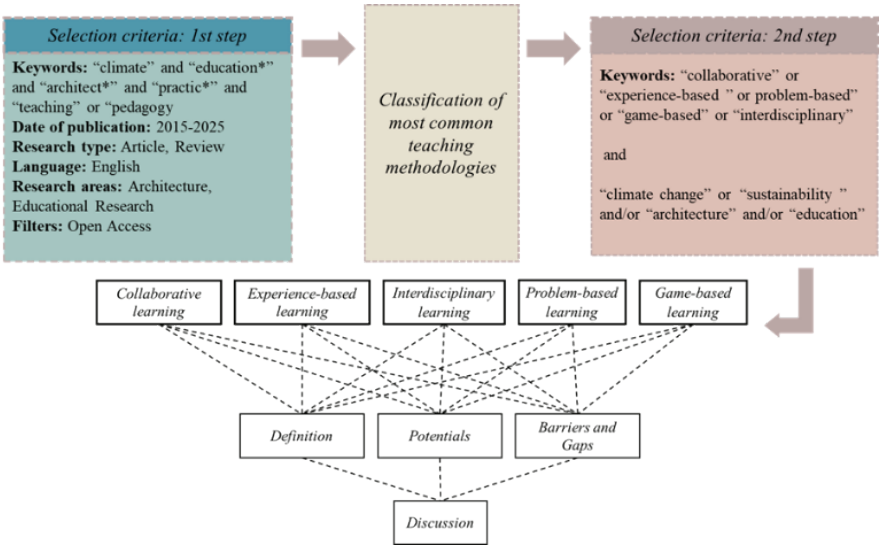


*Fig. 3 Workflow chart*

## III. Results

### A. Collaborative Learning

*-Definition*

Collaborative learning is a learning process in which students work together in small groups towards a common goal [16]. Co-production nurtures decision-making process while addressing sociocultural issues [9].

*-Potentials*

The involvement of students in a group increases motivation to learn and individual effort in the educational process. In addition, the assistance of technology supports the collaborative working environment and facilitates the learning process [17].

Collaboration not only between students but also between teacher and student contributes to the learning process. The design studio represents the real practice space, and the collaboration of like-minded individuals working together in the studio facilitates the development of sustainable design concepts and the exchange of ideas. Students and teachers contribute to the development of design concepts together by participating in critical discussions [12].

Digital platforms such as Metaverse bring together even individuals who are far away from each other, allowing them to work together and making the process fun. Such platforms have gained popularity especially during the pandemic period [18].

*-Gaps and Barriers*

Group work is one of the active learning methods that focuses on the student. However, according to studies, this method cannot be applied today, especially in science-based courses, and traditional instructor-oriented methods are still valid [16].

In this learning technique, in-group dynamics may be unpredictable by the teacher, and this may negatively affect the learning process. The lack of equal individual effort by group members is an important problematic of this learning method. The fact that students are not prone to group work and their skills in this area are not developed may cause lack of communication between group members [19].

**B. Experience-based Learning**

*-Definition*

Experiential learning is a form of learning in which knowledge is transformed into experience. This type of learning triggers a student-oriented learning process that encourages questioning knowledge through various application techniques and raises awareness by experiencing multiple parameters of sustainability together. Experiential learning can be supported by experimental and evidence-based learning techniques [9].

*-Potentials*

Especially in architectural education, experiential learning method can be successfully applied to address complex and multidimensional parameters. Methods such as live projects, inquiry-based learning, design-and-build, design studios, intensive workshops, and field research can be followed in applying this model [9]. In addition, the field experience approach, which is an application of this teaching technique, is an effective method in which the instructor shares his/her own experiences [9]. Experiential learning increases the interaction between students, teachers and social groups. It offers the opportunity to extend the decision-making process to the local community, stakeholders and various decision-makers [9].

Blended and distance learning methods can be utilized in architectural design studios to adapt to the social and technological needs of our age. When design studios, which are seen as the core of architectural educa-

tion, are reconsidered to include these methods, a participatory learning space can be created [20].

Constructivism is the structuring of new knowledge by associating it with previous knowledge and experiences and is unique for everyone [21]. Experiential learning method supports the current learning process by combining the most advantageous aspects of other learning theories such as constructivism [20].

*-Gaps and Barriers*

The learning-by-doing technique is a widely used experiential learning method in architectural design studios [22]. However, this method alone is not sufficient. The lack of regular inspections in the process of ensuring that students are adequately equipped in technical matters makes it difficult for students to practice in their professional lives. In addition, ignoring socioeconomic aspects and students' inability to digest what they have learned in the process by focusing too much on the end product are other points that should be emphasized [22].

Blended learning techniques can also be integrated into the experience-based learning process. However, delayed screen, audio problems, and internet connection lost may prevent the learning process temporarily [23].

### C. Interdisciplinary Learning

*-Definition*

Interdisciplinary learning refers to deepening learning by developing a holistic perspective on nature, society and real life [24].

*-Potentials*

Interdisciplinary education of architects supports creative processes on a global and local scale and contributes to the understanding of complexity [25]. Architecture and engineering are inherently intertwined. Therefore, it is inevitable that different disciplines feed on each other [21].

In interdisciplinary learning, the creation of non-hierarchical, small groups and the application of peer-to-peer learning promotes positive learning and enriches the student's learning experience [25]. Interdisciplinary education has a great impact on the maturity and dissemination of sustainability-related architecture courses. Because through this teaching method, it will be possible to develop multiple and holistic perspectives on the various challenges encountered. Interdisciplinary education plays an important role in training graduate architects who are competent

enough to find answers to environmental sustainability problems with their designs [3].

*-Barriers and Gaps*

The syllabus and management of the course need to support the learning phases [25]. In addition, the course instructor should have in-depth knowledge of the concepts and should not confuse the concept of sustainability with other concepts such as "green washing" [3].

**D. Problem-based Learning**

*-Definition*

A problem-based learning method starts with a real problem scenario given to the students. Students work together to develop a set of scenarios in which they can practice their learning. At this stage the teacher acts as a catalyst facilitating the process. He/she asks questions to guide the group members as they discuss the problem. What is essential in problem-based learning is that students identify their existing knowledge, reveal the gaps in their experience and knowledge, and search for new knowledge to fill these gaps. In this way, a holistic approach in which students take an active role in learning is adopted [26].

*-Potentials*

Problem-based learning enables the development of a holistic and systematic approach (Boarin 2022). It triggers creative thinking and improves students' drawing, conceptual and critical thinking skills during the design process [27]. Sustainability education that focuses on problem solving and group work is realized through experience, inquiry and reflection. Thus, theory is associated with experience [27].

Critical thinking is a cognitive system that is frequently used in problem-based learning, where the decision-making process is carried out by thinking about reasons and analyzing data. In this method, the decision maker checks himself/herself and makes judgments for the purpose [28].

Critical and creative thinking skills strengthen students' ability to make the right decision and lead to ideal solutions in the design process [28]. This is a kind of active learning method and improves an individual's problem-solving skills. Critical thinking skills can be developed later [29].

*-Barriers and Gaps*

In the implementation of this learning method, the role of the educator and the learner as well as factors such as equipment and environment need

to be well prepared. The process can be undermined if the academic staff is not skilled in conducting the problem-based learning process or is weak in using this skill to achieve the learning outcomes of the course. Therefore, the teaching staff should be trained and familiar with these issues [30].

Students' lack of experience, knowledge and questioning skills are among the obstacles to critical thinking. In addition to these, a number of cognitive, environmental, psychological and social barriers can also pose a problem for this way of thinking [31].

Individually, parameters such as fatigue, genetic factors, inability to be objective, memory problems, intelligence, and stress negatively affect critical thinking, while socially, parameters such as inadequate materials, crowded classroom environment, classroom layout, classroom atmosphere, traditional education method, course content, and educator's attitude can be effective on the learning process. Examples of environmental barriers include culture, expectations, prohibitions, beliefs, economic power, and loyalty to authority [31].

## E. Game-based Learning

*-Definition*

One of the most important outcomes of play is that it enables learning. It does this through fantasy, imagination and creativity [12]. The game-like playful nature of architectural design makes it easy to reinforce its theoretical narrative with game-based learning techniques [12].

*-Potentials*

Develops cognitive development towards philosophical thinking and symbolic thinking skills inherent in architecture [12]. It also helps to gain motivation, attention and awareness of sustainable development by following and using new technological developments. Augmented reality applications are known to contribute positively to architectural sustainability education [3]. Online group work provides students with additional skills to support distance learning and peer-to-peer learning [3]. Blended learning has the potential to bridge the gap between academia and practice [20]. In this method, face-to-face communication is combined with the flexibility of computer-assisted learning.

*-Barriers and Gaps*

Game-based learning has limitations such as lack of resources such as time, financial support, lack of interest in students, lack of knowledge, in-class dynamics, inappropriateness of the subject to the game environment [32].

## IV. DISCUSSION

Sustainability and climate change in architecture are issues that need to be addressed in a multifaceted manner and involve many parameters. Students are expected to establish a close relationship with these issues in the process of understanding the nature of architecture. However, it is known that the outputs of architecture students in the application stages are insufficient.

In architectural education, examining all factors together, from the attitude of the course instructors to the content of the subjects delivered and the method of delivery, will be effective in eliminating this deficiency. The strengths and gaps for improvement of the five different teaching techniques examined in this study are discussed within this framework.

According to the results, working in collaborative groups improves students' willingness to work and decision-making skills. This teaching method can be shaped in line with design studios, distance learning and critical thinking skills. However, lack of communication, compromise and equal distribution of tasks within the group can jeopardize the process.

Experiential learning supports participatory learning, increases students' attention and can be supported by various techniques such as workshops, field studies, evidence-based learning. However, handicaps such as lack of supervision, ignoring socio-economic aspects, and focusing on the outcome rather than the process may be encountered.

Interdisciplinary learning is closely related to multidimensional thinking and holistic approach. It is a form of learning inherent in architectural education and is conducive to practices such as deep learning, collaboration, project-based study. However, course content and management, adherence to the subject matter, efficient use of time and the ability of the instructor to manage the course should be at the forefront.

Problem-based learning emphasizes critical thinking, questioning, creative and conceptual thinking. It can be associated with the constructivist approach or collaborative work groups. In the process, it is important to ensure that the equipment is provided, the knowledge and skills of the facilitators are developed, and the psychological, environmental and social limitations of the students are eliminated.

Game-based learning is effective in increasing motivation, awareness and attention. In sustainable architecture, game-like approaches are exhibited in the design projects. Therefore, the subject and teaching style

are quite compatible with each other. However, time, financial resources, the level of desire in students and other environmental factors should be recognized.

As a result, all learning styles are influenced by everyone, from the teacher to the students, to those who prepare the curriculum and are responsible for the classroom environment. Therefore, these criteria should be recognized in advance and necessary precautions should be taken to implement appropriate teaching styles for the subject matter (Table 1).

*Table 1. Teaching methods, potentials and barriers*

| Teaching method | Advantages | Instructor's role | Student's role | Curriculum limitations | Others |
|---|---|---|---|---|---|
| Collaborative | •Entertaining | •Sufficient knowledge and skills<br>•Equal task sharing<br>•Sufficient inspection | •Motivation<br>•Group work ability<br>•Communication skills | •Not suitable for theoretical topics | •Equipment |
| Experiential | •Learning by doing<br>•Participatory | •Sufficient knowledge and skills<br>•Sufficient inspection<br>•Consolidating with case studies, workshops, field studies | •Broad decision-making process<br>•Overlooking the process<br>•Focusing on the final product | •Time | •Equipment<br>•Finance |
| Interdisciplinary | •Holistic<br>•Multiple perspectives | •Sufficient knowledge and skills<br>•Course management<br>•Wide concept knowledge | •Versatile thinking | •Time<br>•Compliance with the content | •Equipment<br>•Finance |
| Problem-based | •Holistic<br>•Systematic<br>•Inquiry-based | •Sufficient knowledge and skills<br>•Course management | •Psychological, environmental and social competence<br>•Critical and creative thinking | •Time | •Equipment |
| Game-based | •Entertaining<br>•Compatible with architecture | •Sufficient knowledge and skills<br>•Course management | •Motivation and aspiration<br>•Awareness<br>•Attention<br>•Cognitive skills | •Time<br>•Compliance with the content | •Equipment<br>•Finance |

## V. CONCLUSION

Sustainable development is a form of progress to which everyone, from officials to students, from city users to decision-makers, must contribute. The role of education in this cannot be denied. The discipline of architecture has the power to reduce the negative impacts of the construction sector. However, architects need to gain awareness and have education on the subject starting from the lowest level.

Studies have shown that various teaching methods are effective in providing students with design skills for climate change. In this study, the five teaching methods most frequently mentioned in the studies analyzed in the last 10 years are discussed through their strengths and weaknesses. In the architectural education process, the instructor, student, curriculum and teaching method should be examined holistically. Therefore, the characteristics of each teaching method are discussed within these components.

Collaborative learning, experiential learning, interdisciplinary learning, problem-based learning and game-based learning are among the methods discussed. Such methods can facilitate the process of transferring multi-disciplinary issues such as sustainability and climate change to architecture students. Increasing the student's motivation, developing the ability to make the right decision, developing critical thinking skills, thinking from different perspectives, being creative, thinking symbolically and developing a holistic approach are among the advantages that these methods add to education.

On the other hand, the knowledge and skills of course instructors, the relationship between process and outcome, the impact of social and economic parameters, the conduct of audits, the requirements of the classroom environment, the social, individual and psychological competencies of students, time management and the availability of financial resources are among the parameters that affect these teaching methods.

In future studies, different learning styles and their interrelationships can be examined. Differences in the delivery of the same subject through different teaching styles and the issues to be considered can be shared through case studies. The factors that stand out in the training of the teacher and the student can be evaluated. Findings from workshops organized with other disciplines related to the discipline of architecture can be shared. All kinds of parameters that facilitate the architectural education process and improve the sustainable practice skills of graduates should be focused on.

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# Academic Studies in ARCHITECTURAL SCIENCES



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# CHAPTER 4

# CULTURAL ROUTES AS A TOOL FOR HERITAGE GOVERNANCE: THE COUNCIL OF EUROPE PROGRAMME[1]

**EMRE KARATAŞ[2]**

## Introduction

Throughout history, numerous routes have existed worldwide serving purposes such as trade, communication, transportation, and pilgrimage. Along these routes, accommodation facilities and commercial structures were constructed to meet the needs of travelers, merchants, and pilgrims. Moreover, civilizations have been shaped around these routes (Karataş, 2025, p. 49).

In the early stages of the development of cultural tourism, the concept of a "route" was understood as a physical transportation

[1] a) This study is derived from the doctoral dissertation titled "An Integrated Methodology Proposal for the Design of Cultural Routes: The Revitalization of Historical Travelers' Itineraries Passing Through Safranbolu," prepared by Dr. Emre Karataş under the supervision of Prof. Dr. Aysun Özköse at Karabük University, The Institute of Graduate Programs, Department of Architecture. b) ChatGPT-5.2 and Gemini 3 were used for English language editing and paraphrasing (https://chatgpt.com/, accessed on 20 December 2025; https://gemini.google.com, accessed on 20 December 2025).

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corridor connecting destinations. Over time, it evolved into a network-based notion encompassing both tangible and intangible connections (ICOMOS, 2008; Pedrosa, Martins, & Breda, 2022). Within this framework, the concept of the "route" is evaluated as a boundary object. Boundary objects are tangible and intangible constructs that facilitate the connection between various factors possessing the potential for mutual interaction (Del Chiappa, Bregoli, & Kim, 2019).

A UNESCO report (1994) concerning cultural heritage routes underscores that the concept embodies a global vision, amalgamating tangible and intangible components alongside material and spiritual values. In this context, cultural routes, which evolve dynamically through the contributions of diverse components, possess multifaceted dimensions that transcend their apparent functions (UNWTO, 2015).

Cultural routes are utilized as instruments for sustainable site management and cultural heritage governance, aiming to highlight the shared elements of societies and foster cooperation, dialogue, and development (Iakovaki, Konstantakis, Teneketzis, & Konstantakis, 2023).

These routes may encompass monuments, archaeological remains, historical sites, and architectural and natural assets, as well as intangible or invisible elements such as vanished values. In this regard, the ICOMOS Charter (2008) underscores that cultural routes necessitate an interdisciplinary approach due to the diversity of cultural heritage and the complexities inherent in its management.

In the late 1980s, international organizations such as UNESCO, ICOMOS, UNWTO, and the Council of Europe (COE) undertook initiatives aimed at strengthening the tourism dimension of cultural routes. In this context, The Cultural Routes of the Council of Europe programme, which was launched by the COE in 1987 with

a single route, encompasses 49 routes as of 2025. Within the scope of this programme, the COE certifies cultural routes for various objectives (Council of Europe, 2025a).

In this study, 49 Cultural Routes certified by the COE by the end of 2025 were categorized in the context of their number of countries, spatial categories, thematic source, key theme, design structure, main purpose, and certification years. Multiple Correspondence Analysis (MCA) was applied to the categorized data of these examples using the IBM SPSS Statistics 27 software. Through this analysis, the relationships between categorical variables were analyzed multidimensionally. By positioning the route examples and categories on a two-dimensional plot based on similar combinations of characteristics, common profiles, distinct clusters, and outliers were identified.

The study aims to serve as a guide for new examples to be planned and registered by demonstrating the change and development of the theoretical approach to the concept of cultural routes within the COE certification process.

**Cultural Routes from a Tourism Perspective**

The negative impacts of mass tourism, such as environmental degradation, the deepening of social inequalities, and the decline of cultural diversity, have become more evident over time (Akis, 2011). Nevertheless, the accumulation of knowledge and the expansion of communication opportunities have heightened the level of interest in cultural heritage, leading to an increase in the number of individuals gravitating toward this field.

The World Tourism Organization defines cultural tourism as a type of tourism activity in which the visitor's essential motivation is to learn, discover, experience and consume the tangible and intangible cultural attractions/products. The primary elements of cultural tourism are identified as a society's art, architecture, history,

tangible cultural heritage, culinary culture, literature, music, crafts, and intellectual, spiritual, and emotional characteristics. It is further emphasized that the main purpose of cultural tourism is to promote and protect the cultural elements that make destinations attractive to visitors by preserving and promoting cultural assets such as living cultures, lifestyles, value systems, beliefs, and traditions (UN Tourism, 2025).

The concept of "route tourism" is widely embraced by both academic circles and industry stakeholders for the purpose of holistically organizing various approaches, such as cultural, natural, and rural tourism, within extensive areas possessing comprehensive and multidimensional values (UNWTO and ETC, 2017). Cultural routes, from a tourism perspective, are generally perceived as a tool that supports tourism (UNWTO, 2015).

The strategy of cultural routes lies in establishing networks between multiple heritage resources. By assessing heritage values holistically, it aims to create a tourism product that is more potent than the sum of its individual components. For instance, a modest archaeological site or a small rural place of worship may not possess sufficient attraction on its own. However, when these elements are integrated through a cultural route, a more effective and compelling tourism product can be generated through a common narrative, strategies, human resources, and management infrastructure (UNWTO, 2015, p. 52).

According to Gaweł, evaluating cultural routes merely as tourism products poses several problems (Gaweł, 2011, pp. 30-32). Examples of cultural, environmental, and social issues include cultural degeneration, damage to cultural and natural values resulting from overuse or misuse, depletion of resources, increased environmental pollution, and gentrification and the displacement of local residents due to excessive increases in real estate prices and the rising costs of basic necessities. Conversely, significant

opportunities may arise by fostering heritage conservation awareness, providing economic support for conservation activities, strengthening regulatory and monitoring processes, and promoting the sustainability of culture and tourism (Karataş, 2025, pp. 23-25).

At present, the development of cultural routes has emerged as one of the most widely adopted approaches in the planning of cultural tourism. Rooted in experiences of movement, exploration of diverse places, and knowledge acquisition, heritage routes are supported in various contexts by public institutions as well as non-profit national and international organizations, serving a wide range of objectives.

**Cultural Routes from a Heritage Perspective**

In the past, heritage management approaches primarily focused on the conservation of physical resources. However, the concept of "integrated conservation," prominently emphasized in the Amsterdam Declaration (1975), led to a shift from this approach toward a more comprehensive and multidimensional effort. The expansion of the scope of the heritage concept has also played a decisive role in this transformation.

Although advancing technical and technological capabilities have facilitated physical conservation, ensuring the sustainability of protection in areas possessing cultural heritage necessitates the pursuit of new solutions, broad participation in governance processes, societal support, and the integration of heritage with everyday social life (de la Torre, MacLean, Mason, & Myers, 2005, pp. 4-5). To achieve this integration, sustainability must be targeted across social, administrative, legal, physical, technical, and economic dimensions (ICOMOS, 1975). The resulting synergy should be aimed at contributing to sustainability in social, cultural, economic, and ecological terms.

UNESCO emphasizes the necessity of a qualified management approach for the protection and promotion of cultural heritage routes. It highlights the importance of keeping the level of tourism activities along these routes under control, as well as the imperative participation of local communities living in the regions through which the routes pass as key stakeholders in the process. Furthermore, the need to integrate land-use planning policies in line with sustainable development goals is also underscored (World Heritage Committee, 1994).

**Dataset and Variables of the Cultural Routes**

Launched in 1987, the Cultural Routes of the Council of Europe programme aims to promote intercultural dialogue, support the protection and promotion of natural and cultural heritage, and, in particular, foster cooperation and advance the notion of a common European heritage (Council of Europe, 2025b; Martens, 2022).

Established in 2010 to strengthen the programme, the Enlarged Partial Agreement on Cultural Routes of the Council of Europe (EPA) has developed the criteria for the Cultural Route of the Council of Europe certification (Council of Europe, 2025b).

These criteria are as follows (Council of Europe, 2025b):

- *Involve a theme that is representative of European values and common to at least three countries in Europe,*
- *be the subject of transnational, multidisciplinary scientific research,*
- *enhance European memory, history and heritage and contribute to interpretation of Europe's present-day diversity,*
- *support cultural and educational exchanges for young people,*

- *develop exemplary and innovative projects in the field of cultural tourism and sustainable cultural development,*
- *develop tourist products and services aimed at different groups.*

In this section, drawing on the approach proposed in the UNWTO Report (2015), the 49 Cultural Routes certified by the Council of Europe are analysed under seven variables (Council of Europe, 2025a): number of countries, spatial categories, thematic source, key theme, design structure, main purpose, and certification years (Table Appendix 1).

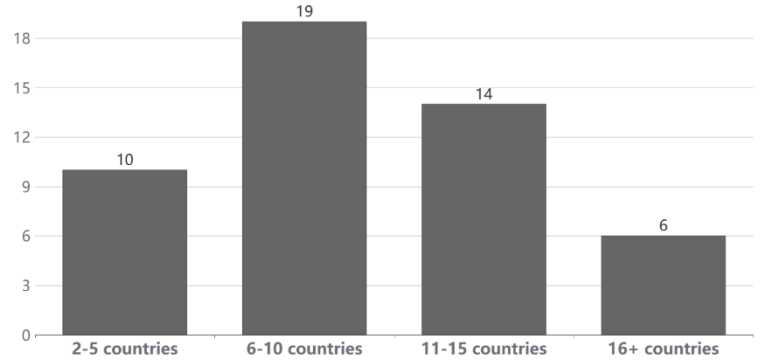
**Number of Countries:** The Council of Europe Cultural Routes extend across 45 Council of Europe member states and 12 non-member countries[3] (Council of Europe, 2025c).

According to 2025 data, France and Italy host the highest number of routes among Council of Europe member states, with 36 routes each; they are followed by Germany with 30 routes, Spain with 29 routes, and Poland with 21 routes (Council of Europe, 2025c).

Graph 1 presents the number of countries covered by each Cultural Route. Accordingly, routes spanning 6-10 countries constitute the largest group (19), followed by those spanning 11-15 countries (14) and 2-5 countries (10), while only six routes involve 16 or more countries (Council of Europe, 2025c).

[3] Among the Council of Europe member states, Monaco does not yet host a certified Cultural Route; similarly, no certified route has yet been established in the Holy See, despite its status as a Party to the Enlarged Partial Agreement on Cultural Routes of the Council of Europe (Council of Europe, 2025c).

*Graph 1. Number of Countries Participating in Cultural Routes.*



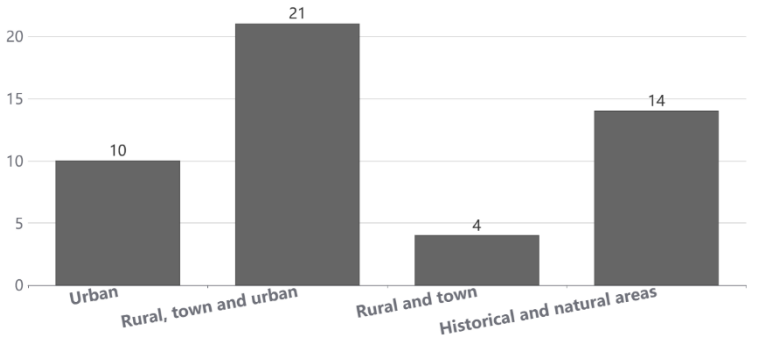

*Source: Prepared by E. Karataş based on data in Table Appendix 1.*

Based on the spatial overlap presented in Graph 1 and the 2025 dataset, certified Cultural Routes appear to be concentrated in the Mediterranean Basin and Western Europe, reflecting the combined influence of geographical, historical, cultural, and political factors, while Eastern and Northern European countries participate in comparatively fewer routes. Most routes extending beyond Europe predominantly include Mediterranean countries such as Algeria, Egypt, Jordan, and Morocco (Council of Europe, 2025c).

**Spatial Categories:** In this study, the routes are examined under four spatial categories: (1) urban, (2) rural, town and urban, (3) rural and town, and (4) historical and natural areas.

Of the 49 cases analysed, 21 fall within the "rural, town and urban" category, which constitutes the most prominent group. In addition, 14 routes are classified as "historical and natural areas", 10 as "urban", and 4 as "rural and town" (Graph 2).

*Graph 2 Spatial Categories of Cultural Routes.*




*Source: Prepared by E. Karataş based on data in Table Appendix 1.*

**Thematic Source:** Within the scope of the study, Cultural Routes are classified into two categories; "historical" and "fictional", according to the source of their themes in relation to physical use.

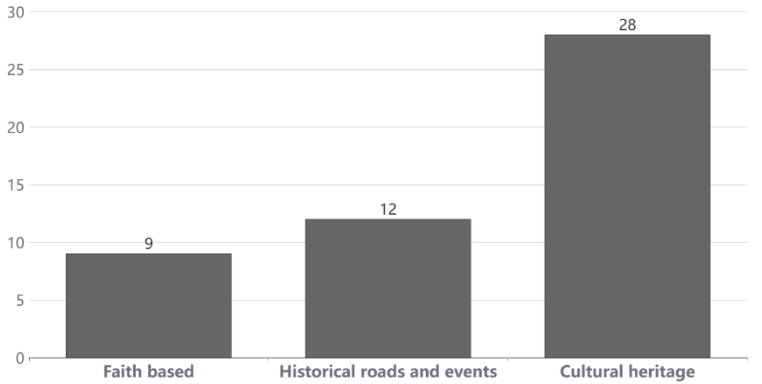
While historical routes are underpinned by strong historical linkages, fictional routes are brought together primarily through thematic similarities and narrative constructions. Among the 49 routes certified by the Council of Europe, 37 are identified as fictional and 12 as historical.

**Key Theme:** Each certified case is associated with a key theme and, in most instances, additional supporting themes. The key theme provides the overarching framework of the cultural route, and the tourism products offered within the route are generally aligned with this thematic framing. Supporting themes, by contrast, appear to be shaped by the meanings and modes of use that emerge from the spatial experiences provided by the routes, thereby complementing and enriching the key theme.

The key themes of the 49 cases were categorised. "Cultural heritage" emerges as the key theme in 28 cases, followed by "historical road and events" in 12 cases and "faith based" themes in

9 cases. This distribution indicates that cultural heritage constitutes the most dominant thematic framework within the programme, whereas more niche thematic domains remain comparatively underrepresented (Graph 3).

*Graph 3 Key Themes of Cultural Routes.*




*Source: Prepared by E. Karataş based on data in Table Appendix 1.*

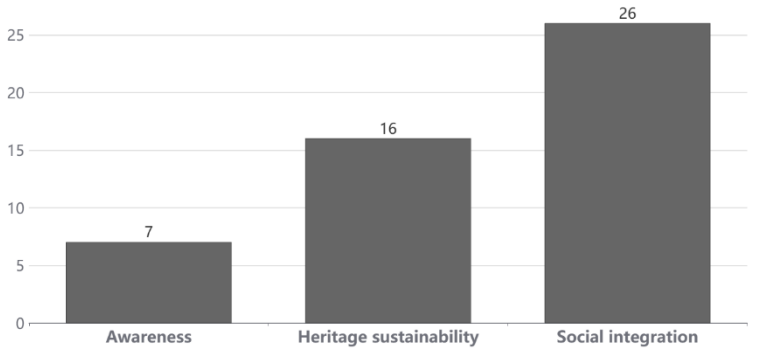
**Design Structure:** The design structures of Cultural Routes are classified into two types: "linear" and "network". Linear routes have defined starting and ending points, with destinations typically arranged along a continuous corridor. Network routes, by contrast, are multi-nodal configurations without a fixed origin or terminus, in which destinations are distributed across a wider geography in the form of a network.

Within the scope of this study, of the 49 cases analysed, 14 are identified as linear, whereas 35 exhibit a network structure.

**Main Purpose:** Cultural Routes are employed by the Council of Europe to serve a range of objectives. Each route is characterised by a primary aim, alongside secondary aims shaped by the route's scope and contextual setting.

Graph 4 illustrates the main purposes of the 49 routes analysed. Accordingly, social integration is identified as the primary aim in 26 cases, heritage sustainability in 16 cases, and awareness-raising in 7 cases.

*Graph 4 Main Objectives of Cultural Routes.*

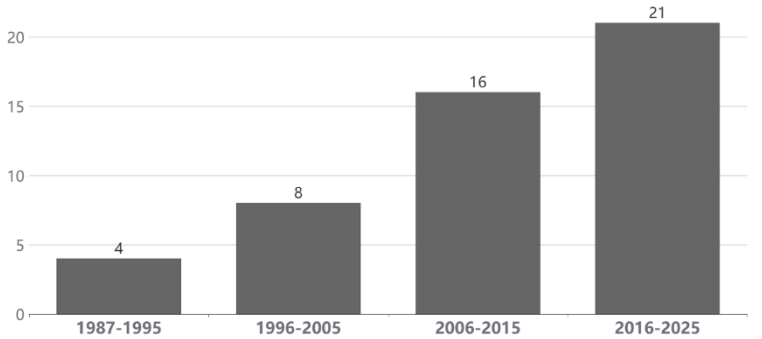



*Source: Prepared by E. Karataş based on data in Table Appendix 1.*

**Certification Years:** The Council of Europe certified cases are categorised by decade.

Graph 5 presents the number of Cultural Routes certified across these ten-year periods. The first certified case is the Routes of Santiago de Compostela in 1987, which also represents the only route certified during the 1986–1990 period. Overall, the figure indicates a steady increase in the number of certifications over time. The COE certified 4 routes in the first decade, 8 in the second, 16 in the third, and 21 in the fourth.

*Graph 5 Cultural Routes Certified by Decadal Periods.*



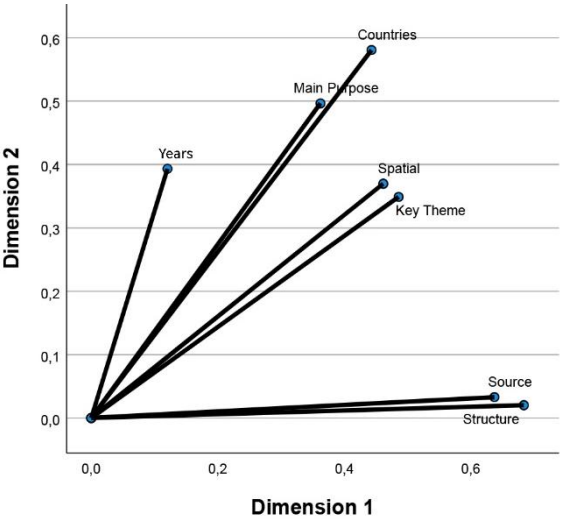

*Source: Prepared by E. Karataş based on data in Table Appendix 1.*

**Results**

In this study, the data of the Cultural Routes of the Council of Europe programme examples, classified into seven variables and twenty-two category levels, are presented in Table Appendix 1. The data obtained from this table were subjected to Multiple Correspondence Analysis (MCA) using IBM SPSS Statistics 27. Through this analysis, the profiles and combinations of the 49 routes certified up to the end of 2025 were examined, with the aim of identifying similar and divergent cases as well as clusters.

The discrimination measures plot illustrating the contributions of variables to the dimensions reveals that the two dimensions are characterized by different logics of differentiation. Accordingly, Dimension 1 is primarily defined by the categories of design structure, thematic source, key theme, and spatial categories, whereas Dimension 2 is mainly defined by the categories of number of countries, main purpose, and certification years (Graph 6).

*Graph 6. Discrimination Measures.*




*Source: Prepared using IBM SPSS Statistics 27.*

The matrix of correlations of the transformed variables indicates that the categories of structure, source, and key theme are strongly interrelated (Graph 7).

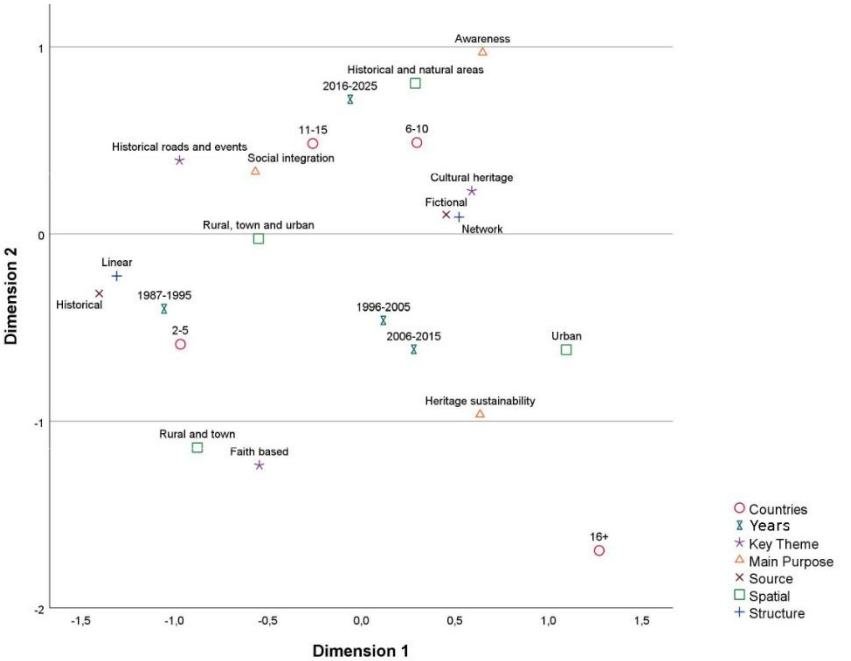
*Graph 7. Correlations of Transformed Variables.*

| | Countries | Spatial | Source | Key Theme | Structure | Main Purpose | Years |
|---|---|---|---|---|---|---|---|
| Countries | 1,000 | ,500 | ,445 | ,221 | ,383 | ,365 | ,212 |
| Spatial | ,500 | 1,000 | ,412 | ,298 | ,465 | ,297 | ,164 |
| Source | ,445 | ,412 | 1,000 | ,571 | ,690 | ,250 | ,158 |
| Key Theme | ,221 | ,298 | ,571 | 1,000 | ,541 | ,374 | ,147 |
| Structure | ,383 | ,465 | ,690 | ,541 | 1,000 | ,414 | ,187 |
| Main Purpose | ,365 | ,297 | ,250 | ,374 | ,414 | 1,000 | ,207 |
| Years | ,212 | ,164 | ,158 | ,147 | ,187 | ,207 | 1,000 |

*Source: Prepared using IBM SPSS Statistics 27.*

The joint plot of category points illustrates the configuration patterns of the category levels (Graph 8).

*Graph 8. Joint Plot of Category Points.*




*Source: Prepared using IBM SPSS Statistics 27.*

The cluster located in the mid-left section of Graph 8, consisting of the categories “linear, historical, 1987-1995, 2-5,” indicates that the early examples of the programme were generally linear and historically grounded, covering a limited number of countries.

The cluster positioned in the upper-right section, defined by “cultural heritage, fictional, network,” emphasizes that examples with a cultural heritage key theme are generally characterized by fictional narratives and network-based structures.

The convergence observed in the upper part of the graph around the categories “awareness, historical and natural areas, 6-10, 11-15, 2016-2025” suggests that routes certified in the most recent

period tend to be awareness-oriented, utilize historical and natural areas, and exhibit a relatively higher degree of internationalization.

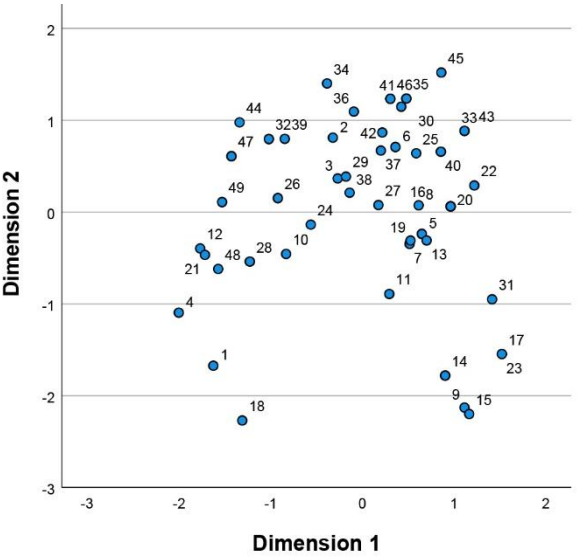
The positioning of the category levels “heritage sustainability, urban, 1996-2005, 2006-2015” in the lower section of the graph indicates that, during the middle period, heritage-focused objectives and an urban scale were more prominent.

The co-location of the “faith based” level with the “historical” and “linear” categories on the same side of the graph demonstrates that faith-themed route examples are generally shaped by historically grounded narratives and a linear itinerary logic. Moreover, the proximity of the “faith based” level to the “rural and town” category indicates that this theme predominantly draws upon rural and small-settlement contexts.

In Graph 8, the “16+” category level of the “number of countries” variable is clearly separated from the other country ranges. This suggests that routes with a very high level of international spread (16+) constitute a distinct profile in which objectives and spatial context components also diverge.

In Graph 9, the object points plot represents the 49 Cultural Routes as individual points. The proximity between case points indicates similarities in cultural route profiles based on the defined category levels, whereas greater distances reflect divergence or outlier characteristics.

*Graph 9 Object Points Labeled by Case Numbers.*




*Source: Prepared using IBM SPSS Statistics 27.*

In Graph 9, the majority of the cases are observed to cluster close to the centre, while a number of examples clearly diverge from this cluster. The differentiated cases indicate that some routes fall outside the dominant profile in terms of their variable combinations, suggesting that distinct governance and productization logics can coexist within the programme across different periods.

## Discussion and Conclusions

This study examines the 49 Cultural Routes certified under the Cultural Routes of the Council of Europe programme by the end of 2025 through a statistical analysis method, aiming to reveal the programme's development and prevailing trends. The accelerating increase in the programme's diffusion over time confirms its growing impact and influence. In the initial period (1987-1995), Cultural Routes were generally grounded in historical foundations, followed linear itineraries, and covered a limited number of countries. Over time, this approach has progressively given way to

multi-centred network structures shaped around fictional themes and niche topics. This shift confirms that the concept of the route has evolved beyond a purely physical transportation corridor into a form of "boundary object" and "thematic network" that integrates tangible and intangible heritage (Del Chiappa, Bregoli, & Kim, 2019).

The analysis results indicate that the primary objectives of the routes have diversified over time. While the first three periods (1987-1995, 1996-2005, and 2006-2015) were predominantly oriented toward heritage sustainability, the last decade (2016-2025) has seen "awareness" and "social integration" emerge as leading objectives. This trend demonstrates that cultural routes are positioned not only as tourism products, site management tools, or instruments of cultural heritage conservation, but also within a broader framework of cultural and political governance aimed at transmitting European values, strengthening a sense of Europeanness, and enhancing social awareness.

However, some characteristics that enable the Council of Europe's Cultural Routes to function as transnational heritage networks promoting common European values are also subject to criticism. According to Martens (2022), their configuration as multi-nodal networks instead of clearly defined itineraries is often considered to result in a limited "route" experience and a weakly connected European narrative.

Faith and cultural heritage continue to constitute the most dominant key themes of European heritage, while niche fields such as gastronomy, health, and landscape remain represented to a limited extent. The proximity of faith-based routes to the historical, linear, rural, and small-town category levels indicates a consistent profile in which religious heritage is typically articulated through historically grounded, linear itineraries associated with the landscapes of small settlements and rural areas.

Correlation patterns reveal a strong interrelationship among design structure, thematic source, and main purpose. This finding confirms that design choices, thematic foundations, and route objectives tend to emerge in conjunction rather than as independent variables.

The object point map shows that many routes cluster near the centre, while a small number clearly diverge from this central tendency. This pattern confirms that the programme accommodates both dominant configurations and differentiated route models.

In summary, this study addresses the 39-year transformation of the Cultural Routes of the Council of Europe programme. The findings indicate that the programme has followed a developmental trajectory evolving from historical and linear itineraries toward fictional and multi-centred network structures. This process also reflects a shift in objectives, extending from heritage sustainability toward social awareness and social integration. Accordingly, the programme does not regard cultural routes solely as tools for the protection and promotion of cultural heritage, but also operates as a multi-layered governance mechanism aimed at circulating European values and fostering a shared sense of Europeanness. In this respect, the programme offers a distinctive model that transforms place-based cultural narratives into a normative and social policy instrument at the European scale.

*Table Appendix 1 Analysis of Council of Europe–Certified Cultural Routes.*

| No | Name | Ctries. | Spatial | Source | Key Theme | Structure | Main Purpose | Years |
|---|---|---|---|---|---|---|---|---|
| 1 | Santiago de Compostela Pilgrim Routes | 2 | Rural, town and urban | Historical | Faith based | Linear | Heritage sustainability | 1987 |
| 2 | The Hansa | 9 | Historical and natural areas | Fictional | Historical roads and events | Network | Social integration | 1991 |
| 3 | Viking Route | 15 | Rural, town and urban | Fictional | Cultural heritage | Network | Social integration | 1993 |
| 4 | Via Francigena | 2 | Rural, town and urban | Historical | Faith based | Linear | Social integration | 1994 |
| 5 | Routes of El Legado Andalusí | 6 | Rural, town and urban | Fictional | Cultural heritage | Network | Heritage sustainability | 1997 |
| 6 | Phoenicians' Route | 14 | Historical and natural areas | Fictional | Cultural heritage | Network | Social integration | 2003 |
| 7 | Iron Route in the Pyrenees | 3 | Historical and natural areas | Fictional | Cultural heritage | Network | Heritage sustainability | 2003 |
| 8 | European Mozart Ways | 11 | Urban | Fictional | Cultural heritage | Network | Social integration | 2004 |
| 9 | European Route of Jewish Heritage | 24 | Urban | Fictional | Faith based | Network | Heritage sustainability | 2004 |
| 10 | Saint Martin of Tours Route | 12 | Rural, town and urban | Fictional | Faith based | Linear | Social integration | 2005 |
| 11 | Cluniac Sites in Europe | 8 | Rural, town and urban | Fictional | Faith based | Network | Heritage sustainability | 2005 |
| 12 | Via Regia | 5 | Rural, town and urban | Historical | Historical roads and events | Linear | Social integration | 2005 |
| 13 | Transromanica | 10 | Rural, town and urban | Fictional | Cultural heritage | Network | Heritage sustainability | 2007 |
| 14 | Iter Vitis Route | 22 | Rural and town | Fictional | Cultural heritage | Network | Heritage sustainability | 2009 |

| No | Name | Ctries. | Spatial | Source | Key Theme | Structure | Main Purpose | Years |
|---|---|---|---|---|---|---|---|---|
| 15 | European Cemeteries Route | 21 | Urban | Fictional | Faith based | Network | Heritage sustainability | 2010 |
| 16 | Prehistoric Rock Art Trails | 9 | Historical and natural areas | Fictional | Cultural heritage | Network | Heritage sustainability | 2010 |
| 17 | Route of Historic Thermal Towns | 17 | Urban | Fictional | Cultural heritage | Network | Heritage sustainability | 2010 |
| 18 | Route of Saint Olav Ways | 5 | Rural and town | Historical | Faith based | Linear | Heritage sustainability | 2010 |
| 19 | European Route of Ceramics | 14 | Rural, town and urban | Fictional | Cultural heritage | Network | Heritage sustainability | 2012 |
| 20 | European Route of Megalithic Culture | 10 | Historical and natural areas | Fictional | Cultural heritage | Network | Heritage sustainability | 2013 |
| 21 | Huguenot and Waldensian Trail | 4 | Rural, town and urban | Historical | Historical roads and events | Linear | Social integration | 2013 |
| 22 | ATRIUM | 6 | Urban | Fictional | Cultural heritage | Network | Awareness | 2014 |
| 23 | Réseau Art Nouveau Network | 16 | Urban | Fictional | Cultural heritage | Network | Heritage sustainability | 2014 |
| 24 | Via Habsburg | 4 | Rural, town and urban | Fictional | Historical roads and events | Network | Social integration | 2014 |
| 25 | Roman Emperors and Danube Wine Route | 10 | Historical and natural areas | Fictional | Cultural heritage | Network | Social integration | 2015 |
| 26 | European Routes of Emperor Charles V | 13 | Rural, town and urban | Historical | Historical roads and events | Network | Social integration | 2015 |
| 27 | Destination Napoleon | 12 | Urban | Fictional | Historical roads and events | Network | Social integration | 2015 |
| 28 | In the Footsteps of Robert Louis Stevenson | 3 | Rural, town and urban | Historical | Cultural heritage | Linear | Social integration | 2015 |
| 29 | Fortified Towns of the Grande Region | 3 | Rural, town and urban | Fictional | Cultural heritage | Network | Social integration | 2016 |

| No | Name | Ctries. | Spatial | Source | Key Theme | Structure | Main Purpose | Years |
|---|---|---|---|---|---|---|---|---|
| 30 | Impressionnisms Routes | 12 | Rural, town and urban | Fictional | Cultural heritage | Network | Awareness | 2018 |
| 31 | European Route of Industrial Heritage | 28 | Urban | Fictional | Cultural heritage | Network | Heritage sustainability | 2019 |
| 32 | Iron Curtain Trail-EuroVelo 13 | 14 | Rural, town and urban | Fictional | Historical roads and events | Linear | Social integration | 2019 |
| 33 | Le Corbusier Destinations: Architectural Promenades | 6 | Urban | Fictional | Cultural heritage | Network | Awareness | 2019 |
| 34 | Liberation Route Europe | 12 | Historical and natural areas | Historical | Historical roads and events | Network | Awareness | 2019 |
| 35 | European Route of Historic Gardens | 10 | Historical and natural areas | Fictional | Cultural heritage | Network | Social integration | 2020 |
| 36 | Aeneas Route | 7 | Historical and natural areas | Fictional | Cultural heritage | Linear | Social integration | 2021 |
| 37 | Alvar Aalto Route | 5 | Rural, town and urban | Fictional | Cultural heritage | Network | Awareness | 2021 |
| 38 | Cyril and Methodius Route | 10 | Rural, town and urban | Fictional | Faith based | Network | Social integration | 2021 |
| 39 | European Route d'Artagnan | 6 | Rural, town and urban | Fictional | Historical roads and events | Linear | Social integration | 2021 |
| 40 | Iron Age Danube Route | 8 | Historical and natural areas | Fictional | Cultural heritage | Network | Heritage sustainability | 2021 |
| 41 | Historic Cafés Route | 15 | Historical and natural areas | Fictional | Cultural heritage | Network | Social integration | 2022 |
| 42 | European Fairy Tale Route | 8 | Rural, town and urban | Fictional | Cultural heritage | Network | Social integration | 2022 |
| 43 | Women Writers Route | 7 | Urban | Fictional | Cultural heritage | Network | Awareness | 2022 |

| No | Name | Ctries. | Spatial | Source | Key Theme | Structure | Main Purpose | Years |
|---|---|---|---|---|---|---|---|---|
| 44 | Transhumance trails | 11 | Historical and natural areas | Historical | Historical roads and events | Linear | Social integration | 2023 |
| 45 | Leonardo Da Vinci Route | 6 | Historical and natural areas | Fictional | Cultural heritage | Network | Awareness | 2024 |
| 46 | Historic Pharmacies & Medicinal Gardens Route | 13 | Historical and natural areas | Fictional | Cultural heritage | Network | Social integration | 2024 |
| 47 | Romea Strata | 7 | Rural, town and urban | Historical | Historical roads and events | Linear | Social integration | 2025 |
| 48 | Saint Francis Ways | 13 | Rural and town | Historical | Faith based | Linear | Social integration | 2025 |
| 49 | Pyrenean Freedom Routes | 10 | Rural and town | Historical | Historical roads and events | Linear | Social integration | 2025 |

*Source: Compiled by the author using information obtained from: https://www.coe.int/en/web/cultural-routes (accessed on December 2025).*

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# Cumhuriyetin 100. Yılında Mimarlık Konuşmaları




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EĞİTİM YAYINEVİ GRUBU

# TARİHİ SÜREÇTE ÇUMRA KAMU YAPILARI: İSTASYON, SU İDARESİ VE HALKEVİ BİNALARI

Mehmet Mutlu[1]

## 1. Giriş

Konya ilinin güneydoğusunda yer alan ve tarihsel süreçte hem tarımsal üretim hem de kırsal kalkınma açısından stratejik bir öneme sahip olan Çumra, Osmanlı İmparatorluğu'nun son döneminden itibaren merkezi idarenin Anadolu'daki modernleşme politikalarının etkili bir uygulama alanı olmuştur. 20. yüzyılın başlarında, özellikle Konya Ovası Sulama Projesi'nin hayata geçirilmesiyle birlikte bölge, yalnızca tarımsal üretim bakımından değil, aynı zamanda mühendislik, şehircilik ve kamu altyapısı açısından da önemli dönüşümler yaşamıştır. Bu dönüşüm süreci, Cumhuriyet'in ilk yıllarından itibaren hız kazanmış; yeni devletin imar, kalkınma ve toplumsal dönüşüm hedefleri doğrultusunda Çumra'da birçok kamu yapısı inşa edilmiştir. Bu yapıların başında, 1912 yılında hizmete giren ve Konya-Adana demiryolu hattının bir parçası olan İstasyon binası; sulama ve altyapı faaliyetlerini yürüten Su İdaresi yapıları ile Cumhuriyet ideolojisinin kültürel ve sosyal yansımalarını taşıyan Halkevi binası gelmektedir.

Söz konusu kamu yapıları, yalnızca kendi işlevsel alanlarında hizmet sunmakla kalmamış, aynı zamanda dönemin mimari yaklaşımlarını, kamu yönetimi anlayışını ve yerel düzeydeki sosyo-ekonomik dönüşümleri temsil eden simgesel mekânlar haline gelmiştir (Onur, 2020). İstasyon binası, ulaştırma politikalarının ve demiryolu ağı üzerinden gerçekleşen ekonomik entegrasyonun bir parçası olarak öne çıkarken; Su İdaresi yapıları, devlet eliyle gerçekleştirilen büyük ölçekli sulama projelerinin yerel uygulama merkezleri olarak önemli bir rol üstlenmiştir. Halkevi binası ise, Cumhuriyet'in halkçı ve aydınlanmacı ideallerini taşra ölçeğinde topluma aktarmayı hedefleyen kültürel

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bir kurum olarak düşünülmüştür. Bu bağlamda, Çumra'daki bu üç yapı, sadece mimari miras açısından değil, aynı zamanda Türkiye'nin modernleşme sürecine dair çok katmanlı okumalar yapmayı mümkün kılan tarihsel belgeler niteliğindedir.

Bu bölümde, Çumra'daki söz konusu kamu yapıları tarihsel bağlamları içerisinde ele alınarak, inşa süreçleri, mimari özellikleri, işlevsel dönüşümleri ve günümüzdeki durumları incelenecektir. Aynı zamanda bu yapıların, bölgesel kalkınma politikaları ve yerel toplumsal yapılar üzerindeki etkileri değerlendirilecek; böylece Türkiye'nin erken Cumhuriyet dönemine özgü kamu mimarlığına dair yerel ölçekte bir analiz sunulacaktır.

## 2. Çumra'daki Tarihi Kamu Yapıları

### 2.1. Çumra Su İdaresi Binası

İlk çağlardan itibaren insanlar, su kaynaklarına yakın bölgelerde yerleşim kurarak, suyu hem içme hem de tarımsal faaliyetler için kullanmışlardır. Sulak alanların çevresinde tarım yapma arzusu, suya erişimin daha kolay olduğu göl ve nehir kenarlarında ilk tarımsal faaliyetlerin başlamasına neden olmuştur. Zamanla, suyun çeşitli kanallar aracılığıyla yerleşim birimlerine taşınması, tarımsal üretimde sürdürülebilirliği artırmıştır (Muşmal, 2015, s. 12). Osmanlı Devleti'nde geniş ve verimli topraklar bulunmasına karşın, tarımsal faaliyetler bu alanların sınırlı bir kısmında gerçekleştiriliyordu. Buna rağmen, devletin ekonomisi büyük ölçüde geçimlik üretime dayalı tarımsal faaliyetlere bağlıydı (Güran, 1998, s. 67). Osmanlı Devleti'nin son dönemlerinde nüfusun yaklaşık %80'inin tarımla uğraşıyor olması, tarımsal alanlarda sulama sorununun çözümünü hayati bir mesele haline getirmiştir (Muşmal, 2022, s. 10).

Karasal iklimin hüküm sürdüğü Konya Ovası'nda yıllık ortalama yağış miktarının yetersiz olması, tarımsal verimliliği sınırlamakta ve zaman zaman kuraklıkların yaşanmasına neden olmaktaydı (Altan, 1940, s. 131). Bu durumun sonucu olarak da Konya Ovası, su kaynaklarına duyduğu ihtiyaç nedeniyle tarih boyunca sulama projelerinin odağında olmuştur. Bölgenin tarımsal üretimini maksimize etmek amacıyla sulu tarım çalışmalarına ilk olarak 1819 yılında başlanmış, özellikle Sultan II. Abdülhamid döneminde proje çeşitli aşamalarda ele alınmış ve kanal açma gibi somut adımlar atılmıştır (Yılmaz, 2010, s. 5). Bu süreç, tarihsel olarak insanlığın su kaynaklarını yönetme ve tarımsal verimi artırma çabasının bir parçası olarak değerlendirilmektedir.

Avlonyalı Ferit Paşa, Konya Valiliği görevini yürüttüğü dönemde bölgenin imarı adına çeşitli çalışmalar gerçekleştirmiştir (Tahsin Paşa, 1931, s. 66). 1898 yılında Konya Valiliği'ne atanan Ferit Paşa, görevine başladıktan sonraki ilkyaz mevsiminde yaşanan kuraklık ve çiftçilerin karşılaştığı zorluklara tanık

olmuş, bu durumun olumsuz etkilerini gidermek amacıyla çeşitli girişimlerde bulunmuştur (Kırmızı, 2014, s. 104). Konya valiliği sonrasında II. Abdülhamid zamanında Sadrazamlığa atanan Ferit Paşa, İstanbul'da da konu ile ilgisini sürdürmüş ve Konya Ovası Sulaması Projesi'nin ihalesini gerçekleştirmiştir (Bildirici, 1994, s. 108-109; Turan, 1942, s. 54). Konya Ovası sulama projelerinin en kapsamlısı olan ve 1907 yılında ihale edilen bu proje (Yarıcı, 2010, s. 260), 1913 yılında tamamlanmıştır (Atam, 2020, s. 459). Proje, Türkiye'nin ilk modern sulama projelerinden biri olup, o dönemde dünyanın en önde gelen projelerindendir (Yılmaz, 2010, s. 5). Bu proje ile Beyşehir Gölü'nden alınan su, üç ana isale hattı, bağlı kanallar ve taksim merkezleri (regülatörler) ile 217 kilometre uzaklıktaki Konya Ovası'na ulaştırılmıştır (Bildirici, 1994, s. 108; Yılmaz, 2010, s. 6).

Konya Ovası Sulaması inşaatı, tüm fizibilite çalışmaları tamamlandıktan sonra ihaleye çıkarılmış ve %4 tenzilatla Anadolu Osmanlı Demiryolu Şirketi'ne 19 milyon 500 bin Frank, yani 850 bin Osmanlı altını keşif bedeli ile verilmiştir (Yılmaz, 2010, s. 5-6). Sözleşme 10 Kasım 1907 tarihinde İstanbul'da imzalanmıştır. Projenin yapımını üstlenen "Anadolu Osmanlı Demiryolu Şirketi" 1889 yılında Alman ve İstanbul'daki iş adamları ortaklığında kurulmuş olup, şirketin Fransızca ismi "Societe du Chemin de Fer Ottoman d'Anatolie"dir (Bildirici, 1994, s. 112). Şirket, hem yazışmalarda hem de projelerde Fransızca dilini kullanmıştır (Mutlu, 2024, s. 571).

Sulama kanalları ve sanat yapıları da dahil olmak üzere tüm projeler müteahhit firma tarafından hazırlanmış ve Osmanlı Hükümeti'nce onaylanmıştır. Müteahhit firma, iş sonunda bütün projelerin aydınger ve ozalitlerini, özgün ismi "İrva ve İska İdaresi" olan ve bu başlığın konusunu oluşturan yönetim binasının arşivine bırakmıştır (Bildirici, 1994, s. 126). Osmanlı İmparatorluğu'nun bir kurumu olan Konya Ovası İrva ve İska İdaresi, çalışma sahası ve yapılarıyla birlikte Cumhuriyet döneminde kurulan Devlet Su İşleri (DSİ) Çumra Şube Müdürlüğü'ne devredilmiştir (URL A).

DSİ Çumra İşletme Şefliği yerleşkesi içinde projenin idari merkezi olarak kullanılan bu merkez binasının dışında, bir adet başmühendis lojmanı, üç adet mühendis lojmanı ve bir adet de atölye binası olmak üzere altı farklı yapı yer almaktadır. 3 adet mühendis lojmanı, aynı plan tipinde inşa edilmiştir. Günümüzde tescil edilerek koruma altına alınmış bulunan yapıların bazı kaynaklarda 1901 yılında inşa edildiği bilgisi bulunsa da (Karpuz, 2009, s. 1595; Durdu, 2011a, s. 376), çalışmamız esnasında bu tarihi veren herhangi bir bilgi ya da belgeye rastlanmamıştır. Bununla beraber, inşaatın yer tesliminin 1 Temmuz 1908 tarihinde, kesin kabulünün de 1913 yılı aralık ayında yapıldığı göz önüne alındığında (Mutlu, 2014, s. 456) en azından yerleşkedeki

çalışmaların merkezi olan idari binanın bu tarihten daha önce, 20. yüzyılın başlarında yapılmış olduğu kesindir (Şekil 1).




Konya Ovası İrva ve İska İdaresi Yönetim Binası (URL B)



Yönetim Binası ve Lojmanlar (DSİ Çumra Şube Müdürlüğü Arşivi)

**Şekil 1.** Çumra Su İdaresi'nin 20. yüzyıl başında çekilmiş olan fotoğrafları

Yapıların bulunduğu alan, güncel tapu kayıtlarına göre, Baraj mahallesi, 241 ada ve 1 numaralı parsel üzerinde yer almaktadır. Yerleşke, günümüzde 47.770 m²'lik bir alan üzerindedir. Çumra'nın 1926 yılında ilçe statüsüne kavuştuğu düşünüldüğünde (Durdu, 2011c, s. 363) bu yapıların hemen hemen Çumra'nın ilçe statüsüne kavuşmasının çeyrek yüzyıl öncesinde inşa edilmiş olduğu anlaşılmaktadır. Yerleşkenin ilk fotoğraflarından görüldüğü kadarıyla alanda önce idare ve atölye binaları, daha sonra ise lojmanlar inşa edilmiştir (Şekil 1).

Tüm sulama projesinin maliyeti 19.500.000 frank olarak hesaplanmışken, bu bütçeden ne kadarlık kısmının İrva ve İska İdaresi yerleşkesinde bulunan yapılara ayrıldığı net olarak belli değildir. Başbakanlık Osmanlı Arşivi'nde kayıtlı 12 Şevval 1325 (18 Kasım 1907) tarihli ve İ.TNF. 17/35 sayılı belgenin 15. sayfasında proje bütçesinin harcamasınının öngörüldüğü iş kalemleri

sıralanmıştır (Muşmal, 2022, s. 67). Burada ilgili yapıların maliyeti ile ilgili doğrudan bilgi bulunmazken, "Memur ve müstahdemlerin ikametine mahsus binalar" işine ait ayrılan 150.000 franklık bütçe dikkati çekmektedir.

Konya Ovası İrva ve İska Projesi idari binası, günümüze ulaşan eski fotoğraflardan anlaşıldığı kadarıyla, merkez çalışmaları kapsamında inşa edilen ilk ve en erken yapılan binadır (URL B). İdari bina, yerleşke içindeki tarihi yapılar arasında kuzeybatı tarafında konumlanmıştır. Yapı, bodrum katı da dâhil olmak üzere üç katlıdır. Çatı arasıyla birlikte, kademelerle hareketlendirilen cepheler ve çatı örtüsü, yapıya dinamik bir görüntü kazandırmıştır. Kat yükseklikleri her katta farklılık göstermektedir; bodrum kattaki yükseklik 2,20 m, zemin katta 3,30 m, birinci katta ise 3,50 m olarak belirlenmiştir. Bu değişkenlik, üç kollu çeyrek döner merdivenle çözülen düşey sirkülasyonda her katta farklı merdiven ölçülerine yol açmıştır. Çatı katı, eğimin %120 gibi yüksek bir eğimde tutulmasıyla, alt katlarda kullanılan hacimlerin aynı şekilde çatı katında da kullanılabilir olmasına olanak sağlamaktadır (Şekil 2).

İdari binanın zemin katına, hem kuzeydoğu hem de kuzeybatı cephesinden giriş yapılabilmektedir. Her iki merdiven de +2,00 m kotundaki zemin kat döşemesine ulaşmakta olup, kuzeybatıdaki merdivenle doğrudan koridora ulaşılırken, kuzeydoğudaki merdiven ise bir merdiven evi aracılığıyla aynı koridora bağlanmaktadır (Şekil 2). Yığma sistem kurallarıyla inşa edilen yapıda, bodrum kattaki dış duvarlar 60-80 cm arasında değişen kalınlıklarda, iç duvarlar ise yaklaşık 50 cm kalınlığındadır. Zemin katta dış duvar kalınlıkları 60- 70 cm'ye, iç duvarlar ise 40 cm'ye düşürülmüştür. Birinci katta, dış duvarlar zemin kattakilerle benzerken, iç duvar kalınlıkları 20-40 cm arasında değişmektedir. Çatı katı planında da benzer şekilde 1. katla aynı kalınlıkta duvarlar kullanılmıştır. Yapının doğu köşesine yerleştirilen üç kollu çeyrek döner merdiven, binadaki düşey sirkülasyonu sağlamaktadır.

İki farklı şekilde ulaşılabilen, güneydoğu-kuzeybatı doğrultusundaki holün kuzeydoğu ucunda binaya girişin sağlandığı kapılardan biri yer alırken, güneybatı ucunda bir mazgal pencere yapılmak suretiyle holün aydınlatma sorunu çözülmüştür. Yaklaşık 13,35 m uzunluğundaki hol, ortada dişler yapılarak iki bölümlü hale getirilmiştir (Şekil 2). Zemin kat holünün güneybatı tarafında dört bağımsız oda bulunmaktadır. Bu odaların her biri, hem koridora hem de iç duvarlara açılan kapılarla birbirleriyle irtibatlandırılmıştır. Güneydoğu tarafındaki iki oda, aradaki taşıyıcı duvar büyük ölçüde boşaltılarak tek mekâna dönüştürülmüştür. Aynı şekilde, bitişiğindeki oda güneybatıya doğru yaklaşık 50 cm taşırılarak genişletilmiştir. Köşedeki odalar her iki yöne açılan birer mazgal pencereyle aydınlatılmaktadır (Şekil 2).

Holün kuzeydoğu tarafında, merdiven evi dâhil üç farklı mekân yer almaktadır. Merdiven evi, buraya açılan kapının güneydoğu tarafına yerleştirilen bir mazgal pencere ile aydınlatılmaktadır (Şekil 2). Merdivenin bitişiğinde bulunan ortadaki oda, günümüzde mutfak olarak kullanılmaktadır. Kuzeybatı tarafındaki yaklaşık 120 cm genişliğindeki mekân ise içten iki bölüme ayrılarak tuvalet ve lavabo olarak düzenlenmiştir. Bu bölüm, kuzeybatı yönüne açılan bir mazgal pencereyle, mutfak ise kuzeydoğu yönüne açılan bir mazgal pencereyle aydınlatılmaktadır (Şekil 2).

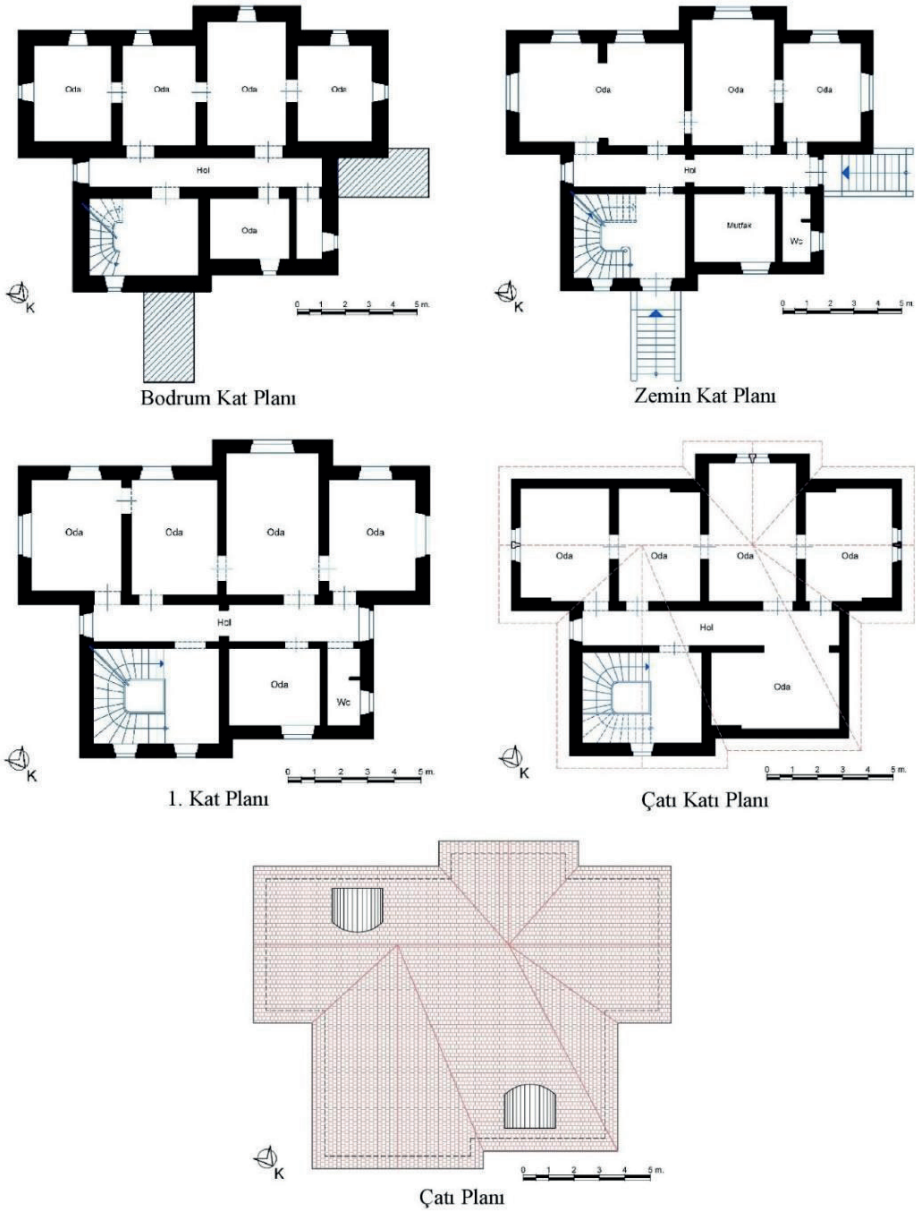
Yapıdaki mekân düzenlemesi, bodrum ve çatı katı da dâhil olmak üzere her katta çok küçük değişikliklerle tekrar edilmektedir. 20 rıhtla ulaşılan birinci kattaki merdiven evi, alt kata giriş kapısının izdüşümüne üst katta eklenen bir pencere ile aydınlatılmış ve pencere sayısı ikiye çıkarılmıştır. Aynı şekilde, alt katta doğrudan koridora ulaşılan kuzeybatı tarafındaki kapının olduğu bölüm de bu katta pencere olarak düzenlenerek koridorun her iki taraftan da ışık alması sağlanmıştır (Şekil 2).

Duvar kalınlığındaki değişikliklere bağlı olarak gözlemlenen küçük ölçü farklarının dışında, bu kattaki önemli farklardan biri, güneybatı tarafındaki dört odanın birbirleriyle bağlantı kurma şeklidir. Alt katta, aradaki duvar büyük bir açıklık oluşturularak iki oda tek bir mekân haline getirilmişken, bu katta odalar tamamen ayrılmış ve birbirlerine bir kapı ile bağlanmıştır. Holün kuzeydoğu tarafındaki mekânlarda ise, zemin kattaki düzenleme aynen korunmuştur. Tüm mekânların aydınlatılmasında, zemin kattaki pencereler de aynı şekilde tekrar ettirilmiştir (Şekil 2).

İdari binanın çatı katında, alt kattaki düzenleme büyük oranda benzer şekilde uygulanmıştır. Bu katta, hol güneydoğu tarafındaki mazgal pencere ile aydınlatılırken, alt kattaki holün kuzeybatı ucunda kullanılan pencere çatı katında kullanılmamıştır. Merdiven evinin ışıklandırılmasında ise, alt katta kullanılan iki pencere yerine, bu iki pencerenin ortasına yerleştirilen tek pencere tercih edilmiştir (Şekil 2).

Çatı katındaki holün güneybatı tarafında yer alan mekânlarda, konum ve büyüklük açısından çok büyük farklar gözlemlenmemekle birlikte, çatı sisteminden kaynaklanan zorunluluklar nedeniyle bu mekânların aydınlatmalarında teknik ve ustalık gerektiren çözümler uygulanmıştır. Çatının eğimli yüzeylerinin izdüşümünde bulunan mekânların dış duvarları yaklaşık 1 m yükseltilerek, çatı arasında sınırlanan yüksekliğin önüne geçilmeye çalışılmıştır. Alt katta her iki yönden pencereler açılmak suretiyle aydınlatılan köşe odalar, bu katta çatı eğimi nedeniyle yalnızca tek bir cepheden ışık alabilir olmuştur. Bu sebeple, güneydoğu ve kuzeybatı yönlerindeki odalar, duvar izdüşümünde alın duvarları olarak düzenlenmiş ve çatı kırma-beşik

çatı kombinasyonu oluşturulmuştur. Böylelikle, çatı alanında kullanılabilir alan artırılmıştır. Bu duvarlara daha dar çiftli pencereler yerleştirilerek, cephe estetiği de düzenlenmiştir. Aynı çözüm, dışa taşırılan büyük odada da uygulanmıştır. Çatı eğiminden dolayı ışık alabileceği tek yön olan güneybatı yönü kullanım dışı kalmış olan güneydoğu yönündeki ikinci odanın ışık sorunu ise, çatı üzerine yapılan bir kuş evi aydınlatmasıyla çözülmüştür (Şekil 2-3).

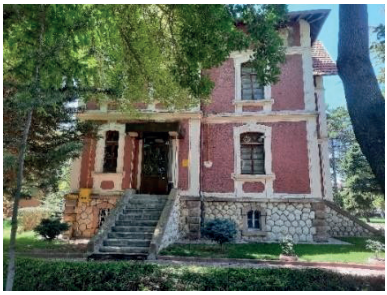



**Şekil 2.** İdare binasının planları (Mutlu, 2024)

Holün kuzeydoğu tarafında, merdiven evinin dışındaki iki mekân birleştirilerek geniş bir odaya dönüştürülmüştür. Merdiven evinin kuzeydoğu cephesinde kalkan duvar kullanılarak çatı arası yüksekliği sorunu çözülmüş ve bu kısım tek bir pencere ile aydınlatılmıştır. Kuzey köşede bulunan, birleştirilen odanın ışık sorunu çatı eğimi nedeniyle cephede çözülememiş ve burada uygulanan kuş evi sistemi ile mekânın ışık sorunu çatıdan çözülmüştür (Şekil 2).



Kuzeyden Görünüş



Kuzeydoğu (Giriş) Cephesi



Güneyden Görünüş



Güneydoğu Cephesi

**Şekil 3.** İdare binasının cephe görünüşleri (Mutlu, 2024)

Zemin kattan 12 rıhtla ulaşılan bodrum katta, üst katlarla benzer şekilde bir hol ile birbirine bağlanan altı birim bulunmaktadır. Güneydoğu-kuzeybatı doğrultusundaki hol, güneybatı tarafına açılan bir mazgal pencere ile aydınlatılmaktadır. Holün güneybatı yönüne sıralanan dört birim içten birbirlerine kapılarla bağlanmışken, yalnızca ortadaki iki odanın holden bağımsız girişi vardır. Bu odalardan kuzeybatıdaki bağımsız girişli oda, yaklaşık 50 cm dışarıya doğru genişletilmiştir. Bu kanatta, köşedeki odalar her iki cepheye açılan pencerelerle aydınlatılırken, aradaki odalar güneybatı yönüne açılan birer pencere ile aydınlatılmaktadır. Tüm pencereler mazgal pencere olarak tasarlanmıştır (Şekil 2).

Holün kuzeydoğu tarafında, merdiven haricinde iki bağımsız bölüm yer almaktadır. Kuzeybatı taraftaki küçük mekân, yaklaşık 110 cm genişliğinde

olup, yığma yapı inşa ilkeleri gereğince üst katlarda ıslak hacim olarak kullanılan birimlerin taşıyıcı fonksiyonlarını üstlenmek üzere tasarlanmıştır. Bu mekân, kuzeybatıya açılan mazgal pencere ile aydınlatılmaktadır. Merdivenle arasında bulunan oda, diğer odalarla benzer ölçülerdedir ve kuzeydoğu tarafındaki mazgal pencere ile aydınlatılmaktadır (Şekil 2).

İdari binanın genelinde, cepheyi etkileyen pencere düzenlemesi ve çatının yapı üzerindeki etkisi tüm cephelerde belirgin bir şekilde hissedilmektedir. Yapının kat izdüşümleri, cepheyi çevreleyecek şekilde profilli silmelerle vurgulanmış ve cepheyi çevreleyecek biçimde tasarlanmıştır. Yapının subasman seviyesini sınırlayan silmenin alt kısmı, farklı ölçülerdeki altıgen kabayonu taşlarla, köşe kısımları ise bosajlı (suyolu açılmış) prizmatik kesme taşlarla, bir miktar dışarı taşırılarak vurgulanmıştır. Köşe taşlarında, pencere denizlikleri, söve ve kemerlerinde andezit taş kullanılırken, diğer kısımlarda ise kireçtaşı tercih edilmiştir. Böylelikle, bu seviyede bir kontrast yaratılmıştır (Şekil 2-3). Bodrum kat pencereleri, hem genişlik hem de yükseklik açısından üst kat pencerelerinden daha küçük tutulmuştur.



Merdiven



Bodrum kat penceresinden detay



Zemin kat penceresinden detay

**Şekil 4.** İdare Binası merdiven ve cepheden detaylar (Mutlu, 2024)

Bodrum kat pencerelerinin denizlik kısmı, yekpare andezit taşından yapılmıştır. Her iki taraftaki söveler ise iki parçadan oluşmaktadır. Sövelerin, alt kısımdaki parça sade bir şekilde tasarlanırken, üst bölümde, söve ile kemer geçişini sağlayan kısımda basık kemere üzengi noktası oluşturacak biçimde şekillendirilmiştir. Bu üç parçadan oluşan basık kemer, dışa taşırılarak vurgulanan kilit taşının her iki tarafında bir çift kemer taşı ile tamamlanmıştır (Şekil 4). Binanın subasman üzerindeki her katı ve cepheler, benzer bir teknikle yapılmıştır. Pencere üstleri, katları sınırlayan profillerle birleşerek sonlanmaktadır. Hafif basık kemer formunda yapılan üst kısım, dışa taşırılmış ve ölçü olarak vurgulanan kilit ve üzengi taşlarının arasına yerleştirilen profilli birer kemer taşıyla geçiş sağlanmıştır. Söveler yekpare bir görünümde

tasarlanmışken, parapetin alt kısmı profillendirilmiştir. Pencerenin parapet altında kalan kısmı, pencere ile aynı renkte olup, alt kısımdaki kat silmesiyle birleşmektedir.

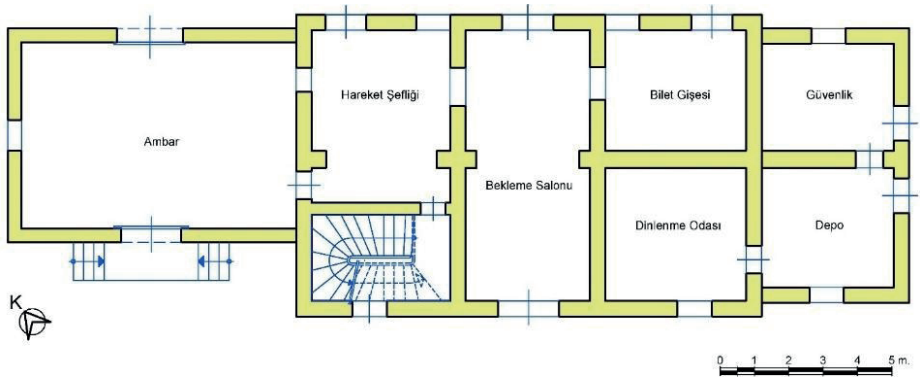
Yapının özgün tasarımında girişlerin üzerinde saçak bulunmamaktadır. Ancak günümüzde ana giriş kapısı olarak kullanılan kuzeydoğu girişinin üzerinde muhdes bir saçak yer almaktadır. Yapıldığı dönemde uzun yıllar boyunca Konya Ovası İrva ve İska İdaresi'nin idari binası olarak hizmet veren bu yapı, günümüzde Devlet Su İşleri 4. Bölge Konya Ovası Sulaması (KOS) Şube Müdürlüğü tarafından kamuya ve personele açık bir misafirhane olarak kullanılmaktadır.

### 2.2. Çumra Tren İstasyonu

Çumra Tarihi İstasyon Binası, ilçenin İzzetbey Mahallesi sınırları içerisinde, İstasyon Caddesi üzerinde bulunmaktadır. Yapı, Osmanlı Devleti tarafından Bağdat Demiryolu inşaatı için Almanlara verilen imtiyaz kapsamında, 13 Nisan 1903 tarihinde kurulan "Société Impériale Ottomane du Chemin de Fer de Bagdad" (Bağdat Demiryolu Şirketi) tarafından inşa edilen hat üzerinde yer almaktadır (Beydilli, 1991: 172). İstasyonun açılış tarihi kesin olarak belgelenememekle birlikte, 1912 yılında hizmete girdiği düşünülmektedir. Yapı, hattın ilk aşamada inşa edilen diğer istasyon yapılarıyla benzer tipolojik özellikler göstermekte olup, mimari tasarımına ilişkin belge veya isimlendirilmiş bir mimar bugüne kadar tespit edilememiştir (Mutlu, 2025, s. 68).

Demiryolu hattının başlangıçtaki güzergâhı, Çumra henüz ilçe statüsü kazanmamışken, İçeriçumra yerleşimi üzerinden geçecek şekilde planlanmıştı. Ancak yerel halkın demiryolu hattına ve istasyon yapısına gösterdiği tepki nedeniyle güzergâhta değişiklik yapılmış, bu doğrultuda bugünkü istasyon binası mevcut konumuna inşa edilmiştir (Durdu, 2011a, s. 369). Bu değişiklik, kısa sürede bölgenin sosyo-ekonomik cazibesini artırmış, yeni bir yerleşim dokusunun oluşmasına zemin hazırlamıştır. Demiryolunun ve istasyon yapısının bölgedeki bu yeni yapılanmadaki belirleyici etkisi, Çumra'nın ilçe merkezine dönüşümünde önemli rol oynamıştır. 1926 yılında, Türkiye Cumhuriyeti'nin kurucusu Mustafa Kemal Atatürk'ün Adana yönüne yaptığı seyahat esnasında Çumra'da mola verdiği ve bölgedeki sulama tesisleri ile bu yapılara bağlı olarak inşa edilen mühendis ve memur lojmanlarını yerinde incelediği bilinmektedir. Atatürk, gözlemleri neticesinde bölgenin gelişim potansiyeline dikkat çekmiş ve "Bu şirin beldeyi geliştirmek, buraya önem vermek lazımdır. Çumra ilçe olmaya layıktır." şeklindeki ifadesiyle bu kanaatini dile getirmiştir. Söz konusu değerlendirmeler doğrultusunda, 26 Haziran 1926 tarihinde Çumra, resmen ilçe statüsüne kavuşturulmuştur (Ulusoy; A. Erdoğan ve E. Erdoğan, 2010, s. 419–420).

İstasyon binası, kuzeydoğu-güneybatı doğrultusunda uzanan doğrusal bir plan şemasına sahiptir. Yapı, yaklaşık 26,25 x 8,75 m boyutlarındadır. İlk inşa edildiğinde üst katı lojman olarak tasarlanmış, bu kat bir süre istasyon şefi tarafından konut olarak kullanılmıştır. Ancak ilerleyen yıllarda yapının işlevselliği yeniden değerlendirilmiş ve söz konusu kat, Lojistik Şefliği, İstasyon Şefliği ve bazı ıslak hacimler gibi birimlere tahsis edilmiştir. Binanın kuzeybatı yönünde yer alan ve depo/ambar işlevi gören kanat, ana giriş cephesinden 2,15 m, peron cephesinden ise 0,40 m geri çekilerek inşa edilmiştir. Güneydoğu yönündeki kanat ise güvenlik ve depo birimlerine ev sahipliği yapmakta olup, bu kısım da her iki cepheden 0,40 m kadar geri planda konumlandırılmıştır (Şekil 5).




**Şekil 5.** Çumra Tren İstasyonu zemin kat planı (M. Mutlu, 2024)

İstasyon binasının güneybatı yönü ana giriş cephesi, kuzeydoğu yönü ise peron cephesi olarak düzenlenmiştir. Yapı, ortada konumlanan ana kütleye eklemlenmiş iki yan kanattan meydana gelmektedir. Orta bölümde yer alan iki girişten kuzeybatıdaki, doğrudan merdiven evine açılmaktadır. Bu mekânın kuzeydoğu duvarında yer alan bir kapı aracılığıyla istasyon şefinin çalışma odasına geçiş sağlanmaktadır. Orta aksın merkezine yakın konumda bulunan, 1,75 m genişliğindeki çift kanatlı ana giriş kapısı ise bekleme salonuna açılmaktadır. 3,60 m genişliğe ve 7,85 m derinliğe sahip bekleme salonu, peron cephesine kadar uzanmaktadır. Salon, peron cephesine açılan 1,50 m genişliğinde bir kapıya sahiptir. Bu mekânın kuzeybatı duvarında hareket şefliğine, güneydoğu duvarında ise bilet gişesine açılan birer iç pencere yer almaktadır. Salonun ortasında, karşılıklı yerleştirilmiş iki adet, 30 cm uzunluğundaki duvar dişi, üst kat duvarlarını taşıyan döşemenin mesnet açıklığını azaltmak amacıyla inşa edilmiştir (Şekil 5).

Orta bölümün peron cephesi, simetrik olarak düzenlenmiş üç adet kapıdan oluşmaktadır. Bu kapılardan kuzeybatı yönündeki, hareket şefliği odasına açılmaktadır. 5,00 x 4,05 m ölçülerine sahip olan bu mekân, güneydoğu yönünde yer alan bir pencere ile doğal ışık almaktadır. Aynı odanın güneydoğu duvarında bekleme salonuyla bağlantıyı sağlayan bir iç pencere yer alırken, kuzeybatı duvarındaki 70 cm genişliğindeki diğer bir iç pencere ise ambar mekânına açılmaktadır. Bu duvar üzerinde ayrıca, odanın kuzeybatı köşesine yakın konumlanmış bir kapı aracılığıyla doğrudan ambarla iç bağlantı sağlanmıştır. Hareket şefliği odasından merdiven evine geçiş ise güneybatı duvarındaki bir kapı ile gerçekleştirilmiştir. Bu bölümde, merdiven evine yakın kesimde yer alan kuzeybatı ve güneydoğu duvarlarda, üst kat taşıyıcı sistemine ait yükleri aktarmak amacıyla oluşturulmuş 30'ar cm uzunluğunda iki duvar dişi bulunmaktadır (Şekil 5).

Orta bölümün güneydoğu yönünde yer alan üçüncü kapı, bilet gişesi olarak işlev gören odaya açılmaktadır. 3,50 x 4,10 m ölçülerindeki bu oda, giriş kapısının bitişiğinde yer alan bir pencere ile aydınlatılmakta; kuzeybatı duvarında bulunan iç pencere vasıtasıyla ise bekleme salonuyla görsel ve işlevsel ilişki kurulmaktadır (Şekil 5).

İstasyon yapısının kuzeybatı kanadında depo/ambar işlevli büyük bir mekân yer almaktadır. 8,00 x 5,40 m boyutlarındaki bu bölüm, hareket şefliği odası ile iç mekânda doğrudan bağlantılıdır. Ayrıca hem kuzeydoğu hem de güneybatı cephelerde bulunan, 1,90 m genişliğindeki sürgülü sistemli kapılar, ambarın bağımsız erişimini sağlamaktadır. Mekân, kuzeybatı duvarın üst kotunda yer alan pencereyle aydınlatılmaktadır. Ambar kısmı döşemesiz asma çatı taşıyıcı sistemle örtülmüştür. Güneybatı cephesindeki kapının önünde her iki yandan çıkış sağlayan ve dört rıhtlı bir platform yer almakta; buna karşın kuzeydoğu cephesindeki kapının önünde herhangi bir platform bulunmamaktadır. Bu cephede hâlihazırda bir platform bulunmadığı için kapı yukarı kotta kalmıştır.

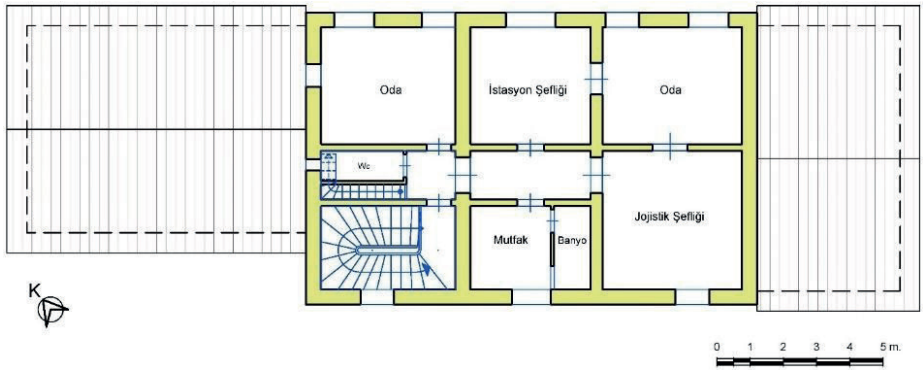
Yapının güneydoğu kanadı güvenlik ve depo işlevli bölümlerden oluşmaktadır. Bu kanadın güneydoğu cephesinde yer alan iki kapıdan kuzeydoğudaki, güvenlik birimine erişimi sağlamaktadır. 3,10 x 3,85 m ölçülerindeki oda, kuzeydoğu duvarında bulunan bir pencere ile gün ışığı almakta; güneybatı duvarında ise depo mekânına geçişi sağlayan bir kapı yer almaktadır (Şekil 5).

Söz konusu kanada yakın dönemde bir ilave oda eklenmiştir. Güneydoğu cephede yer alan kapılardan biriyle erişilen bu muhdes mekân, 3,85 x 3,45 m boyutlarındadır. Odanın kuzeydoğu duvarında güvenlik birimine; kuzeybatı duvarında ise yapının orta bölümünde yer alan dinlenme odasına geçiş sağlayan kapılar bulunmaktadır. 4,10 x 4,85 m ölçüsündeki dinlenme odası ve

depo birimleri, güneybatı yönlerine açılmış pencereler ile aydınlatılmaktadır (Şekil 5).

Yapının üst katına, giriş cephesinin kuzeybatısında konumlanan merdiven aracılığıyla ulaşılmaktadır. Toplam 21 basamaktan oluşan bu merdiven, birinci katta 1,45 x 1,45 m ebatlarında bir antreye açılmaktadır. Antre alanının kuzeybatısında bir adet WC bulunmakta; bu birimin hemen yanında ise yaklaşık 50 cm genişliğindeki iki kollu, çeyrek dönüşlü bir merdiven ile çatı katına çıkış sağlanmaktadır. Antrenin kuzeydoğusunda yer alan 4,05 x 3,50 m boyutlarındaki oda, kuzeydoğu cephesinde iki, kuzeybatı cephesinde bir olmak üzere toplam üç pencere ile aydınlatılmaktadır. Antreden, güneydoğu yönünde yer alan bir hol aracılığıyla birinci katın diğer birimlerine geçiş mümkündür (Şekil 6, 7).

Holün kuzeydoğu yönünde, günümüzde istasyon şefliği olarak işlev gören mekân yer almaktadır. 3,80 x 3,50 m ölçülerindeki bu oda, giriş holünden doğrudan erişilebilecek şekilde ortada konumlanmış bir kapı ile açılmaktadır. Bu birimin tam karşısında ise aynı ölçülere (3,80 x 3,50 m) sahip mutfak birimi yer almaktadır. Yapının üst katı, bir dönem lojman olarak kullanıldığı sırada, mutfağın güneydoğu yönündeki yaklaşık 1,10 m genişliğinde ayrılan bölüm banyo olarak düzenlenmiştir. Hem istasyon şefliği hem de mutfak birimi, dış cepheye açılan birer pencere ile doğal aydınlatma almaktadır.




**Şekil 6.** Çumra Tren İstasyonu zemin kat planı (M. Mutlu, 2024)

Holün güneydoğu ucunda bulunan kapı, günümüzde lojistik şefliği olarak işlev gören odaya açılmaktadır. 4,20 x 4,15 m ölçülerindeki bu mekân, güneybatı yönünde konumlanmış bir pencere ile aydınlatılmaktadır. Kat planının doğu köşesinde bulunan oda ise bağımsız bir girişe sahip olmayıp, yalnızca istasyon şefliği ve lojistik şefliği odalarında yer alan iç kapılar aracılığıyla erişilebilmektedir. Söz konusu oda, kuzeydoğu duvarında yer alan iki pencere ile aydınlatılmaktadır (Şekil 6).



Ambar bölümü



Ambarda sürme kapı sistemi



Wc girişi ve çatı çıkışı

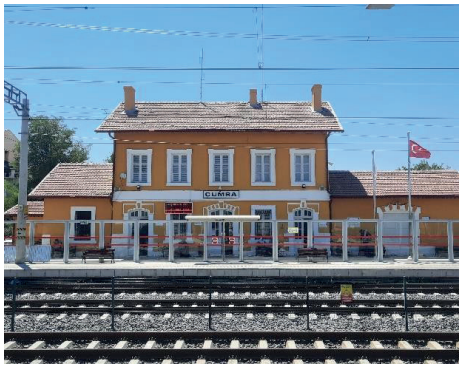
**Şekil 7.** İstasyonun depo mekânı ve üst kat ıslak hacim girişinden görünümler (M. Mutlu, 2024)

Yapının iki katlı olarak inşa edilen orta bloğu, her iki cephede de kat silmeleriyle yatayda bölümlendirilmiştir. Giriş cephesi olan güneybatı yönünde uygulanan silme profili, daha ince bir şekilde tasarlanmışken; peron cephesi olan kuzeydoğu yönündeki silme daha kalın tutularak görsel vurgusu artırılmıştır (Şekil 8). Bu durum, yapının peron yönüne bakan cephesine daha güçlü bir mimari ifade kazandırma amacını yansıtmakta olup, istasyon yapılarında işlevsel yönelimlerin estetik unsurlarla bütünleştirilmesine dair tipik bir örnek teşkil etmektedir.

Yapının kuzeybatı yönünde konumlanan ambar kısmının altı, bodrum kat düzeyinde depo alanı olarak değerlendirilmiştir. Bu depo mekânlarının doğal aydınlatma ve havalandırma gereksinimi, dış cepheye açılan pencereler aracılığıyla sağlanmıştır. Söz konusu pencerelerden ikisi kuzeybatı cephesine, biri ise güneybatı cephesine açılmaktadır. Bu açıklıklar, bodrum katının kullanım fonksiyonunu destekleyecek düzeyde aydınlatma ve havalandırma imkânı sunacak şekilde konumlandırılmıştır.




Güneybatıdan görünüm (ön ve sol yan cephe)




Peron cephesi (kuzeydoğu cephe)



Sağ yan ve giriş cephesi



Sağ yan cephe (güneydoğudan görünüm)

**Şekil 8.** Çumra Tren İstasyonu'nun cephelerinden görünümler (M. Mutlu, 2024)

İstasyon yapısının dış cephesinde yer alan orta bölüm, simetrik biçimde düzenlenmiş kapı ve pencere açıklıklarıyla dikkate değer bir düzenlemeye sahiptir. Zemin katta, güneybatı cephesinde yer alan iki kapıdan ortada bulunanı doğrudan bekleme salonuna erişimi sağlarken; kuzeybatı tarafındaki kapı, yapıdaki merdiven evine açılarak ikinci kata ulaşımı temin etmektedir. Aynı cephede, güneydoğu tarafında konumlanan pencerenin biçimsel özelliklerinden hareketle, bu açıklığın yapının özgün halinde bir kapı olduğu, ancak daha sonraki bir müdahale ile pencereye dönüştürüldüğü anlaşılmaktadır.

Orta bloğun her iki cephesinde, söz konusu dönüşüm geçirmiş pencere dâhil olmak üzere toplam altı adet kapı açıklığı bulunmaktadır. Bu kapıların tümü basık kemerli formda tasarlanmış olup, ortada yer alan ve doğrudan bekleme salonuna açılan çift kapılar, biçimsel farklılıklarıyla dikkat çekmektedir. Söz konusu kapıların kemerleri, altı adet kemer taşıyla oluşturulmuş olup; ortada daha büyük boyutta tasarlanmış bir kilit taşı ve iki yanda vurgulu şekilde biçimlendirilmiş üzengi taşları ile farklılaştırılmıştır. Buna karşın yanlarda bulunan diğer kapıların kemerleri, ortada yer alan kilit taşı ile birlikte üç taş bloğundan oluşmaktadır ve daha sade bir anlayışla düzenlenmiştir.

Zemin katta, yapı köşeleri ile kapı açıklıklarının söve kısımları, dört sıra halinde düzenlenmiş rustik tarzda işlenmiş bosajlı taşlarla belirginleştirilmiştir. Kuzeybatı kanadında yer alan ambar bölümünün her iki cephesindeki sürme sistemli kapılar, merkezdeki bekleme salonuna açılan kapılarla aynı teknik özelliklerde inşa edilmiştir; ancak bu kapılarda söve taşlarında örgü sıralarına yönelik herhangi bir vurgulama yapılmamıştır. Ayrıca, ambarın kuzeybatı yönünde konumlanan pencere açıklığı ile orta bölümün kuzeydoğu cephesinde, kapılar arasında yer alan iki pencere; benzer şekilde, güneydoğu kanadında

bulunan güvenlik biriminin giriş kapısı da, orta bölümdeki yan kapılarla aynı karakteristik düzenlemeye sahiptir (Şekil 8).

Yapının güneydoğu kanadını oluşturan ve kuzeydoğu ile güneybatı cephelere açılan güvenlik ve depo birimlerinin pencere açıklıkları dikdörtgen formdadır. Bu açıklıklarda, lentolar, söveler ve denizlik elemanları cephe düzleminden hafifçe taşırılarak oluşturulmuş; herhangi bir süsleme unsuruna yer verilmeden sade bir biçimde tasarlanmıştır.

İstasyon yapısının orta bloğunda, zemin katta kapı olarak düzenlenen açıklıkların tamamı, üst katta pencere olarak değerlendirilmiştir. Bu bağlamda, birinci katta güneybatı (giriş) cephesinde üç, kuzeydoğu (peron) cephesinde ise beş adet pencere açıklığı yer almaktadır. Tüm pencereler dikdörtgen formlu olup, lentoları, söveleri ve denizlikleri belirginleştirmek amacıyla yüzeyden dışa taşırılmıştır. Ayrıca, kuzeybatı cephesinde yer alan ıslak hacmin doğal havalandırmasını sağlayan pencere ile çatının kuzeybatı ve güneydoğu yönlerine bakan kalkan duvarlarına karşılıklı olarak açılmış ikili pencere grupları da aynı teknik anlayış çerçevesinde düzenlenmiştir.

İstasyon binasının inşasında dönemin yaygın yapım tekniklerine uygun olarak duvar malzemesi olarak tuğla tercih edilmiştir. Döşeme sisteminde ise çelik putreller (profil demir kirişler) kullanılmış; bu kirişlerin araları tuğla ile örülerek dolgu sistemi oluşturulmuştur. Duvar yüzeyleri, yapı tamamlandıktan sonra sıva ile kaplanarak düzgün bir görünüm elde edilmiştir (Ulusoy; A. Erdoğan ve E. Erdoğan, 2010, s. 421). Taşıyıcı duvarların kalınlıkları zemin katta ortalama 45 cm olup, üst kat iç bölme duvarlarında bu kalınlık yer yer 20 cm'ye kadar düşmektedir.

İstasyon binası, üç ayrı kitleden oluşmakta olup bu kitlenin her biri beşik çatı ile örtülmüştür. Çatı kaplamasında, erken 20. yüzyıl yapılarında sıkça karşılaşılan Marsilya tipi kiremit kullanılmıştır. Yapı, mimari özgünlüğünü büyük ölçüde korumakta olup, günümüzde de ilk inşa edildiği işlevi olan tren istasyonu olarak hizmet vermeye devam etmektedir.

### 2.3. Çumra Halkevi Binası

Halkevleri, Cumhuriyet'in ilanının ardından, Atatürk'ün Halkçılık ilkesi doğrultusunda modern, laik ve inkılapçı bir ulus-devlet inşası çabaları kapsamında, yaygın eğitim kurumları olarak önemli bir işlev üstlenmek üzere kurulmuştur. Cumhuriyet öncesinde benzer amaçlarla faaliyet göstermiş olan Türk Ocakları ile dönemin yönetimi arasında zamanla görüş ayrılıkları oluşmuş; özellikle halkla yeterli düzeyde etkileşim sağlanamaması, yeni bir kurumsal yapılanma ihtiyacını gündeme getirmiştir. 1930 yılında Serbest Cumhuriyet Fırkası deneyimi ve aynı yıl yaşanan Menemen Olayı, halk arasında inkılapların yeterince benimsenmediğini ortaya koymuştur.

Mustafa Kemal Paşa, 1930 yılı sonunda gerçekleştirdiği yurt gezisi sırasında bu durumu bizzat gözlemlemiş; bu gözlemler sonucunda halkın inkılaplarla daha yakından buluşturulabileceği yeni bir eğitim kurumu oluşturulması fikri ortaya çıkmıştır. Bu doğrultuda, Avrupa'daki halk eğitimi kurumları örnek alınarak, Türkiye'nin toplumsal yapısına uygun bir model geliştirilmiş ve Halkevleri'nin kurulmasına karar verilmiştir. Türk Ocakları, 10 Nisan 1931 tarihinde düzenlenen olağanüstü kongrede Cumhuriyet Halk Fırkası'na katılma kararı almış (URL C); Halkevleri'nin kurulması ise 10-18 Mayıs 1931 tarihlerinde toplanan Cumhuriyet Halk Fırkası'nın üçüncü büyük kongresinde kararlaştırılmıştır (Tunaya, 1952, s. 570). Bu kararın ardından, 19 Şubat 1932 tarihinde Halkevleri resmî olarak faaliyete geçmiştir (Çeçen, 1990, s. 111). Aynı gün yapılan açılış töreniyle Türkiye genelinde 14 Halkevi şubesi hizmete başlamıştır (Halkevlerinin Doğuşu, 1971).

Halkevi açma faaliyetleri kısa sürede adeta bir seferberlik halini almış ve ilk açılışa yetişemeyen bazı şubeler de zaman içerisinde hızla kurulmuştur (Toksoy, 2007, s. 42). Kuruluşunun ilk yılı sonunda faaliyet gösteren Halkevi sayısı 34'e ulaşmış, sonraki yıllarda ise bütün il ve ilçelere Halkevi kazandırılması hedeflenmiştir. 1951 yılında Halkevleri'nin resmî olarak kapatılmasına kadar geçen sürede ülke genelinde toplam Halkevi sayısı 478'e çıkmıştır (Çeçen, 1990, s. 129).

Atatürk döneminde Halkevleri, siyasi bir yapı olarak değil; halkın milli kültür ile buluşmasını, Cumhuriyet inkılaplarının halka benimsetilmesini ve okul çağını geçmiş bireylerin eğitilmesini hedefleyen kültürel kurumlar olarak tasarlanmıştır (Şeker, 2011, s. 24). Bu doğrultuda, milli kültürün unsurlarının ortaya çıkarılması, korunması ve aktarılması temel amaç olarak benimsenmiştir. Atatürk, gerçekleştirdiği yurt gezileri sırasında uğradığı Halkevi şubelerinde halkla doğrudan temas kurmuş ve ülke sorunlarına ilişkin değerlendirmelerde bulunmuştur (Çeçen, 1990, s. 116-117).

Halkevlerinin 19 yıl süren faaliyetleri, 1951 yılında Demokrat Parti tarafından önerilen ve halkevlerinin kapatılmasını öngören yasa tasarısının 8 Ağustos 1951 tarihinde yürürlüğe girmesiyle son bulmuştur (URL C). Bu süreçte, Halkevleri ve halkodalarının tüm mal varlıkları, yasal düzenleme ile hazineye devredilmiştir (Zürcher, 2014, s. 326).

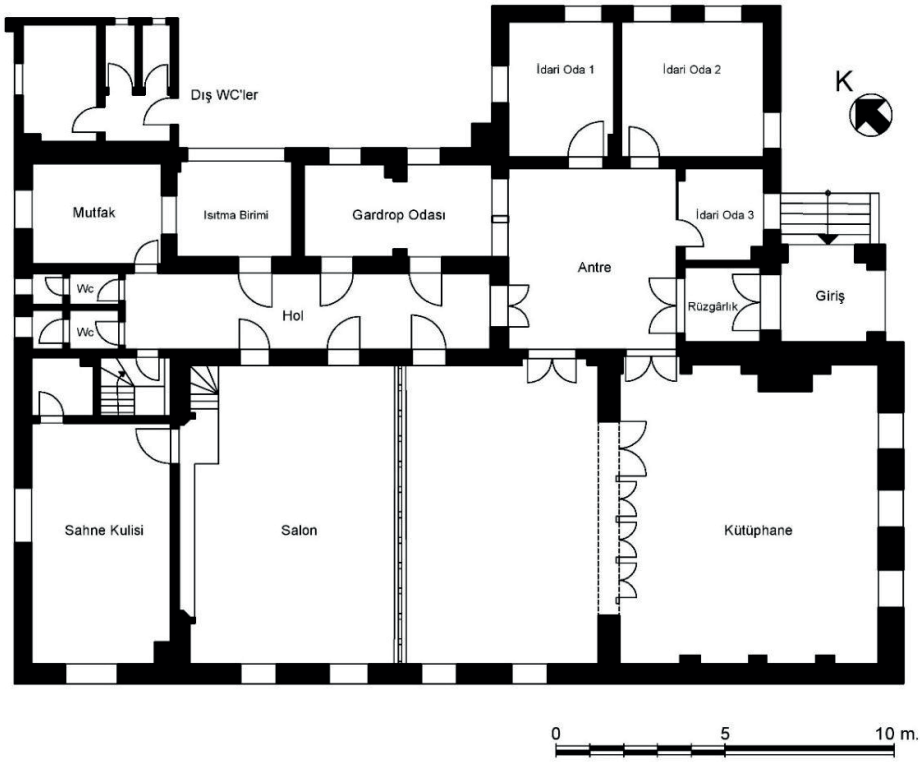
Ülkemizde bugüne kadar halkevleri ile ilgili çok sayıda çalışma yapılmıştır. Ancak bu çalışmalar çoğunlukla halkçılık düşüncesi bağlamıyla ilgili yapılan ve vilayetlerde kurulan halkevleri ile ilgilidir. İlçe ve kasaba ölçekli yerleşim yerlerinde kurulan halkevleri ile ilgili çalışmalar çok daha azdır (Karacakaya, 2023, s. 43). Çumra Halkevi hakkında detaylı bir çalışma bulunmamaktadır. Çumra Halkevi, ilçe merkezinde, İzzetbey mahallesi, (141458 nolu mahalle),

36 ada, 15 nolu parsel üzerinde bulunmakta olup, günümüzde yapının oturduğu parselin alanı 2.826,00 m²'dir.

Cumhuriyet Halk Fırkası (CHF), 1 Mart 1932 tarihinde yayımladığı bir genelge ile halkevlerine ilişkin örgüt içi bir bilgilendirmede bulunmuştur. Bu genelgede, her parti teşkilatının kendi bölgesinde bir halkevi açması gerektiği belirtilmiş; halkın gösterdiği ilginin devam ettirilmesi ve bu ilginin halkevlerine yönlendirilmesi gerektiği vurgulanmıştır. Aksi hâlde, toplumda yeni bir çalışma ve kaynaşma kurumu olarak teşkil edilen halkevlerinin, halk nezdinde cazibesini yitirerek işlevsizleşme tehlikesiyle karşı karşıya kalabileceği ifade edilmiştir (Çeçen, 1990, s. 119). Bunun üzerine CHF Konya Fırka Heyeti, Çumra idaresi ile koordineli bir şekilde genel merkezden bu amaçla kullanılmak üzere bütçe talebinde bulunmuş ve genel merkezden sağlanan bütçe ile bir bina satın alınmıştır. Bu bina bir süre kullanıldıktan sonra, CHP Çumra ilçe yönetim kurulu, 26 Ağustos 1937 tarihinde toplanarak, belediyenin tasarrufundayken satın alınan evin salonunun olmaması ve odalarının da küçük olması nedeniyle resmi bir müessese olarak kullanılmasına imkân görmediklerinden, parti için kullanılmak üzere çağa uygun ve modern bir binanın yaptırılması kararı almıştır. Bu amaçla mevcut binanın satılarak halkın ve genel merkezin desteği ile yeni bir bina inşa etmek düşüncesi genel merkeze iletilmiştir. Zaman içinde gerçekleştirilen çok sayıda yazışmanın akabinde 10 Ağustos 1945 tarihinde Çumra'dan genel merkeze çekilen bir telgrafla, halkevi binasının kazıklarının çaktırılıp temel hafriyatına başlandığı bildirilmiştir (BCA, 490-1/1751-1111-1, 10.08.1945, s. 181) (Şekil 9).



**Şekil 9.** Çumra Halkevi'nin temel atma töreninden fotoğraflar (BCA, 490-1/1751-1111-1, 21.09.1945, s. 143, 145-146)




**Şekil 10.** Çumra Halkevi planı (Mutlu, 2024; Karpuz, 2009, s. 1591'den işlenerek)

CHP Konya İl İdare Kurulunun, CHP Genel Sekreterliğine gönderdiği 8 Ekim 1946 tarihli yazıda, halkevinin açılışının 29 Ekim 1946 tarihinde yapılacağı bilgisi verilmiştir (BCA, 490-1/1751-1111-1, 08.10.1946, s. 102). 22 Ekim 1946 tarihli yazıda ise, halkevi inşaatının tamamlandığı ve 17 Ekim 1946 tarihinden itibaren de binaya taşınıldığı ifade edilmiştir (BCA, 490-1/1751-1111-1, 22.10.1946, s. 101).

Tek katlı olarak inşa edilen yapı, kütüphane, salon, idari odalar ve ıslak hacimlerden meydana gelmektedir. Yapıya güneydoğu cephede bulunan, üstü çatı ile birleşik bir saçakla koruma saçakla korumalı bir girişe sahip bölümden girilmektedir. Giriş öncelikle kare planlı bir rüzgârlık birimine açılmakta, Buradan da daha geniş bir antre bölümüne ulaşılmaktadır (Şekil 10-11).

Halkevlerinde belli standartları yakalamak için bazı şartlar getirilmiştir. Halkevlerinin en önemli açılış şartı, halkevinde bir kütüphane ya da en azından bir okuma odasının oluşturulmasıdır (Durukan ve Ulusu Uraz, 2008, s. 46). Her şeye rağmen halkevinde bir kütüphane ya da en azından bir okuma odası oluşturacak imkân yoksa hiç olmazsa bir kitaplık bulundurulması halkevi

açmak için zorunlu görülmüştür. Bu dönemdeki eğitim programları içerisinde kütüphaneler toplum ile bağdaşmak ve toplumun kültür seviyesini yükseltmek için araç olarak görülmüşlerdir (Erkoyuncu, 2020, s. 83). Çumra Halkevi de güneydoğu-kuzeybatı doğrultusunda uzunca bir hol ile iki kanattan meydana getirilmiş, güneybatı kanatta, halkevlerinin en önemli bölümlerini oluşturan kütüphane ve çok amaçlı salon birimleri yer alırken, kuzeydoğu kanatta ise tamamlayıcı birimlere yer verilmiştir (Şekil 10).

Halkevlerinin mimari kuruluşlarında halkevi başkanı ve sekreterine ayrılan, ayrıca halkevindeki çeşitli etkinlikleri organize eden ofisleri içeren idari kısım, halkevi binasını mimari açıdan tamamlayan unsurlardır (Durukan ve Ulusu Uraz, 2008, s. 45). Çumra Halkevi'nde, antreye bağlantılı olan, kuzeydoğu ve güneydoğuda bulunan üç oda, idari kısım olarak inşa edilmiştir. Antrenin kuzeybatı tarafındaki bir kapı ile hol bölümüne ulaşılırken, bu taraftaki açık birim ise gardrop odası olarak inşa edilmiştir (Şekil 10). Küçük ya da büyük neredeyse tüm halkevi binalarında yer alan gardırop odası bölümü, modern yaşam biçiminin vazgeçilmez bir alışkanlığını halka kazandırmayı amaçlamaktaydı. Organizasyonlara gelen davetlilerin salonlara dışarı kıyafetlerini çıkartarak girmesi, halkevleri aracılığıyla topluma kazandırılmaya çalışılan bir alışkanlıktı (Zeyrek, 2006, s. 38-40).

Holün kuzeybatı ucu, ıslak hacimlere ayrılmıştır. Holün kuzeydoğu bölümünde ise gardrop odasının yanı sıra binanın ısıtma ve mutfak ihtiyacına hitap eden birimler yer almaktadır.



a) Doğudan görünüş (URL D)



b) Kuzeydoğudan görünüş (URL E)

**Şekil 11.** Çumra Halkevi doğu ve kuzeydoğu görünüşleri

Çumra Halkevi binası, halkevlerinin faaliyetlerinin sona ermesinin ardından 1959 yılında Millî Eğitim Bakanlığı'na devredilmiş ve uzun yıllar boyunca bu bakanlık tarafından çeşitli eğitim kurumları kapsamında kullanılmıştır (Karpuz, 2009, s. 1591). Aynı yıl, yapı Akşam Kız Sanat Okulu olarak eğitim-

öğretim faaliyetlerine başlamış; 1975 yılında ise kurumun adı Pratik Kız Sanat Okulu olarak değiştirilmiş ve eğitim faaliyetleri aynı mekânda sürdürülmüştür. Yine 1975 yılının Mayıs ayında, Uygulama Ana Okulu da aynı binada hizmet vermeye başlamıştır. Millî Eğitim Bakanlığı'nın 13.12.1985 tarih ve 08146 sayılı emirleri doğrultusunda 1986-1987 öğretim yılında kurulan Kız Meslek Lisesi, ilk yılında 22 öğrenci kabul etmiş ve eğitim faaliyetlerini söz konusu binada gerçekleştirmiştir. Söz konusu yapı, 11.02.1998 tarihinde boşaltılmıştır (Bülbül, 2010, s. 316). Uzun bir süre metruk hâlde kalan ve Kültür Bakanlığı mülkiyetinde olan yapı (Durdu, 2011d, s. 376), 8 Aralık 2018 tarihinden itibaren Konya Büyükşehir Belediyesi'ne bağlı bir kütüphane olarak yeniden işlevlendirilmiş ve bu fonksiyonla hizmet vermeye devam etmektedir.

## 3. Sonuç

Çumra İstasyon Binası, Çumra Halkevi ve Çumra Su İdaresi yapıları, Konya'nın önemli ulaşım, kültür ve altyapı tarihinin izlerini taşıyan, dönemin mimari ve toplumsal yapısını yansıtan önemli yapılardır. Bu yapılar, 20. yüzyılın başlarından itibaren bölgenin gelişen sanayi ve tarım altyapısına paralel olarak inşa edilmiş, yerel halkın günlük yaşamını şekillendiren işlevsel ve kültürel alanlar sunmuştur. Bu yapılar, aynı zamanda Cumhuriyet dönemi mimarisinin izlerini de taşır, işlevselliği ve estetiği birleştirerek dönemin toplumsal ihtiyaçlarına cevap vermeyi amaçlamıştır.

**Çumra Su İdaresi Binası**, bölgedeki su altyapısının yönetimi ve düzenlenmesinin simgesi olarak inşa edilmiştir. Bu yapının tasarımında, işlevselliği ön planda tutarak, suyun dağıtımı ve yönetimiyle ilgili olarak yapıların gereksinimlerine odaklanılmıştır. Çumra Su İdaresi, hem idari hem de operasyonel işlevler sunarak, yerel halkın yaşam standardını iyileştirme amacını güdüyordu. Ayrıca, binanın mimari tasarımı ve kullanılan malzemeler, dönemin mimarlık anlayışını ve yerel yapı tekniklerini sergilemektedir.

**Çumra İstasyon Binası**, demiryolunun stratejik bir noktada yer almasının getirdiği önemin yanı sıra, bölgedeki ulaşım ağının gelişimiyle birlikte önemli bir toplumsal rol üstlenmiştir. İstasyon binasının tasarımında, gerek iç mekân düzeni gerekse dış cepheye yönelik yapılan estetik düzenlemeler, hem işlevselliği hem de mimari estetiği ön planda tutan bir yaklaşım sergilemektedir. Binadaki malzeme kullanımı ve yapı elemanlarının işçiliği, dönemin teknolojik ve estetik anlayışını yansıtmaktadır.

**Çumra Halkevi**, Cumhuriyet dönemi kültür ve eğitim politikalarının bir yansıması olarak, halkın eğitimine ve kültürel gelişimine katkı sağlamak amacıyla inşa edilmiştir. Bu yapı, mimari tasarımında halkla ilişkili kullanım alanlarına verdiği önemle dikkat çeker. Halkevi'nin iç mekân düzeni, toplumsal işlevin merkezine yerleştirildiği bir yaklaşım sunmakta olup, halkın sosyo-

kültürel gelişimi adına önemli bir yer tutmuştur. Yapının tasarımındaki sadelik ve işlevsellik, dönemin modernleşme çabalarıyla paralellik gösterir.

Bu üç yapı, Çumra'nın sosyal ve ekonomik gelişim sürecine paralel olarak inşa edilmiş, dönemin mimarisi ve toplumsal ihtiyaçlarını başarılı bir şekilde yansıtan örneklerdir. Yapılar, yalnızca fiziksel varlıklar değil, aynı zamanda toplumsal yaşamın şekillenmesinde önemli roller üstlenmişlerdir. Her bir yapı, kendi işlevi doğrultusunda toplumsal yaşama katkıda bulunmuş ve Konya Ovası'ndaki yaşamı dönüştürmüş önemli yapılar olarak tarihsel bir değere sahiptir.

Sonuç olarak, Çumra İstasyon Binası, Çumra Halkevi ve Çumra Su İdaresi yapıları, hem mimari açıdan hem de işlevsel olarak dönemin önemli örneklerindendir. Bu yapılar, yalnızca geçmişin izlerini taşıyan yapılar olmanın ötesinde, tarihsel bağlamda önemli birer kültürel miras olarak korunmalıdır. Çumra'nın yerel halkının yaşamını şekillendiren bu yapılar, mimarinin toplumsal işlevselliğini ve estetik anlayışını bir arada sunan, dönemin izlerini taşıyan örneklerdir. Bu tür yapılar, bölgesel tarihin birer tanığı olarak, hem korunmalı hem de geleceğe taşınmalıdır.

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# Cumhuriyetin 100. Yılında Mimarlık Konuşmaları




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EĞİTİM YAYINEVİ GRUBU

# 6 ŞUBAT 2023 KAHRAMANMARAŞ DEPREMİ SONRASINDA PLANLI ALANLAR İMAR YÖNETMELİĞİ'NDE YAPILAN DEĞİŞİKLİKLERİN DEĞERLENDİRİLMESİ

Mustafa Esat Güneş[1]

## 1. Giriş

Türkiye, dünyanın en etkin deprem kuşaklarından birinde yer aldığı için sık sık yıkıcı sismik olaylarla karşılaşmaktadır. Her büyük deprem sonrasında hem medya hem de akademik çevrelerde kapsamlı analizler ve tartışmalar yürütülse de, elde edilen bulguların süreklilik ve derinlik kazandıracak yapısal önlemlere dönüşmesi sağlanamamakta; böylece konu kısa süre içinde gündemden düşmektedir. Bu bağlamda, yapılan değerlendirmelerden edinilen derslerin hayata geçirilmemesi, yeni depremler benzer şiddette hasar ve can kaybına yol açmaktadır.

Cumhuriyet'in yüzüncü yılında, 6 Şubat 2023 tarihinde Kahramanmaraş merkezli olarak gerçekleşen iki büyük deprem, ülke tarihinin en yıkıcı ve ölümcül sismik olayları arasında yer almıştır. Resmi verilere göre bu sarsıntılar sonucunda 50 bini aşkın kişi hayatını kaybetmiş, on bir ilde yoğun yapısal hasar oluşmuş ve yaklaşık 13 milyon birey doğrudan etkilenmiştir.

Yapı ile ilgili yönetmelikler, yetkili resmi kuruluşlarca düzenlenmiş yasal dokümanlar olup güvenli ve fonksiyonel yapıların oluşturulmasında gerekli asgari koşulları belirler. Yönetmeliklerin temel amacı, mimar ve mühendislerin yapı güvenliğini tehlikeye sokacak büyük hatalar yapmasını önlemektir (Ersoy, 1987).

Bu çalışma, 6 Şubat 2023 Kahramanmaraş depreminin ardından 12.05.2023 tarihli 32188 numaralı ve 12.08.2023 tarihli 32277 sayılı Resmi Gazeteler'de "Planlı Alanlar İmar Yönetmeliğinde Değişiklik Yapılmasına Dair Yönetmelik"

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ismiyle yayınlanan yapı güvenliği mevzuatındaki değişiklikleri ele almakta ve bu değişikliklerin bina güvenliğine olan etkilerini analiz etmektedir. Bu değişiklikler ile daha önce 29 fıkra olan ilgili yönetmeliğin 5. Maddesine bir fıkra daha eklenerek 30 fıkraya çıkarılmıştır. Ayrıca 28. Maddenin 1. Fıkrasının (a) ve (ç) bendlerinde değişiklikler yapılmıştır. Deprem sonrası Planlı Alanlar İmar Yönetmeliği'nde gerçekleştirilen bu güncellemeler konut amaçlı inşa edilecek binalarda, özellikle kat yükseklikleri, yumuşak kat, kısa kolon, asma kat düzenlemeleri ve deprem derzleri gibi yapısal konuları kapsamaktadır. Çalışmada, bu yapısal hususların deprem dayanıklılığına etkileri açıklanmakta ve değişikliklerin bina güvenliğine olan katkıları incelenmektedir.

## 2. Yumuşak Kat Düzensizliği

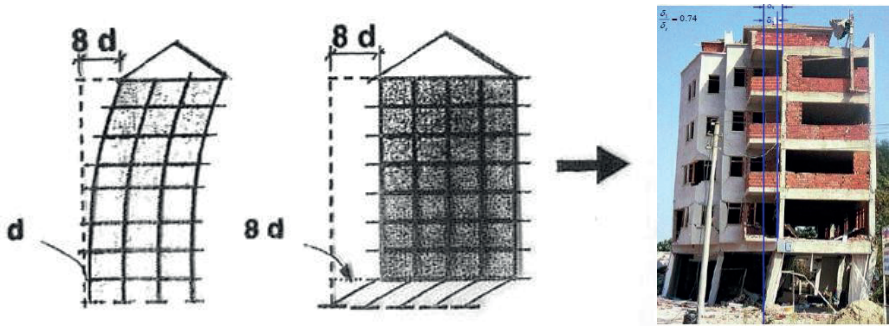
Binanın katlar arası yüksekliklerinin bina yüksekliği boyunca birbirine eşit ve üniform olması deprem güvencesi bakımından önemlidir. Bitişik katlar arası yüksekliklerin farklı olması, deprem sırasında katlar arası ötelenmeler farklı olacağından, yumuşak kat düzensizlikleri ortaya çıkabilir.

Konut tipi yapılarda zemin katın ticari amaçlara ayrılması ülkemizde sıklıkla karşılaşılan bir uygulamadır. Ancak bu ticari alanların kat yüksekliği ihtiyacının konutlardan daha fazla olması nedeniyle, tasarımda bu katların yüksekliği binanın diğer katlarına göre daha fazla olur. Bu durum yapı düzensizlikleri içinde ilk akla gelen ve depremlerde binaların göçmesine neden olan etmenlerin başında gelen yumuşak kat düzensizliğine yol açabilmektedir. Diğer katlara göre yüksek olmasının yanında, bu katların duvarsız ya da az duvarlı olmaları yumuşak kat oluşumu riskini daha da artırmaktadır (Şekil 1).



**Şekil 1.** Yumuşak kat oluşumuna örnek binalar (Topçu, 2014)

Yumuşak kat oluşumunda toplam yatay yer değiştirmelerin %70–80'i bu katta yoğunlaşır ve bu durum, kolon uçlarının ezilip malzemenin dağılmasına yol açarak diğer katlarda herhangi bir hasar oluşmazken yalnızca yumuşak katın çökmesine neden olur (Şekil 2).




(a) (b)

**Şekil 2.** Yana

l ötelenmelerin yumuşak katta yoğunlaşması: a) şematik (Arun, 2018), b) fotoğraf (Topçu, 2014)

Yumuşak kat tehlikesini önlemek için akla ilk gelen çözüm önerileri tasarımsal değişiklikler yapmaktır. Mal sahibi ve mimar arasında yapılacak görüşmelerde mümkünse zemin katta otopark ya da ticari alan oluşturma isteklerinden vazgeçmek en basit çözüm önerisi olarak sunulabilir. Zemin katın ticari olarak tasarlanması durumunda mümkünse vitrin yerine duvar örülmesi önerilebilir. Mal sahibinin istekleri ve tasarımsal kaygılar çoğunlukla yukarıda bahsedilen çözüm önerilerini mümkün kılmaz ve strüktürel anlamda önlemler almak elzem hale gelir. Bu noktada yapının taşıyıcı sisteminin salt çerçeve sistem olarak tanımlanan kolon+kiriş çerçeve sistem yerine karma sistem olarak tanımlanan perde+çerçeve sistemlerden oluşturulması gerekir. Bu sayede yapı rijitliği artıralarak yanal ötelenmelerin sınırlandırılması hedeflenir. Ayrıca yumuşak kat riski bulunan tasarımlarda betonarme hesap sırasında yatay yükler artırılır ve buna bağlı olarak eleman boyutları ve donatı miktarları çok artar. Normalde kolon kiriş birleşim bölgelerinde sıklaştırılan etriye uygulaması, yumuşak kat oluşumu durumunda zemin kattaki tüm kolonların sık etriye ile sarılmasını gerektirir.

Planlı Alanlar İmar Yönetmeliği'nin 5. maddesine eklenen 30. fıkranın (a) bendi aşağıdaki gibidir.

*"İçerisinde konut yer alan binaların zemin katlarında konut dışı fonksiyonların yapılabilmesi için; bu fonksiyonların yer aldığı zemin kat yüksekliğinin 4.50 metreden az olması, yapının tasarımında 18/3/2018 tarihli ve 30364 mükerrer sayılı Resmî Gazete'de yayımlanan Türkiye Bina Deprem Yönetmeliğinin eki Deprem Etkisi Altında Binaların Tasarımı İçin Esasların Tablo 4.1.'inde yer alan A12, A13, A14 veya A15 tipi taşıyıcı sistemlerin*

*kullanılması, kısa kolon oluşturulmaması, asma kat yapılmaması şartlarının tamamının sağlanması zorunludur."* (*Planlı Alanlar İmar Yönetmeliği*, 2017)

Öncelikle belirtmek gerekir ki bu maddede açık olarak "yumuşak kat" ifadesi geçmemektedir. Ancak ilgili bölümde getirilen kısıtlamalar ve yönlendirmeler üzerinde düşünüldüğünde düzenlemenin yumuşak kat düzensizliğini önlemeye yönelik olduğu anlaşılmaktadır. Zemin katların konut dışı amaçlarla kullanılması, zemin katın ticari ya da otopark gibi fonksiyonlara ayrılması durumunu ifade etmektedir. Bu uygulamalar yasaklanmamakla birlikte ilgili düzendeki binaların zemin kat yüksekliği 4.50 m ile sınırlandırılmıştır. İlgili bendin devamında 2018 yılında yürürlüğe giren Türkiye Bina Deprem Yönetmeliği'ne atıf yapılarak taşıyıcı sistem türü seçimine de sınırlama getirilmiştir. A12, A13, A14 veya A15 şeklinde sıralanan (Şekil 3) taşıyıcı sistem tiplerinden birinin kullanılması zorunlu kılınarak; salt çerçeve sistemlerin kullanılması, yumuşak kat riski olan binalar için yasaklanmıştır. Diğer bir deyişle, bu tip yapılarda perde kullanımı zorunlu hale getirilmiştir.

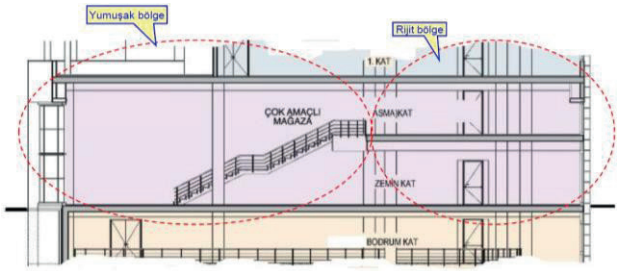
| **A. YERİNDE DÖKME BETONARME BİNA TAŞIYICI SİSTEMLERİ** | | | |
|---|---|---|---|
| **A1. Süneklik Düzeyi Yüksek Taşıyıcı Sistemler** | | | |
| **A11.** Deprem etkilerinin tamamının moment aktaran *süneklik düzeyi yüksek* betonarme çerçevelerle karşılandığı binalar | 8 | 3 | BYS ≥ 3 |
| **A12.** Deprem etkilerinin tamamının *süneklik düzeyi yüksek* bağ kirişli (boşluklu) betonarme perdelerle karşılandığı binalar | 7 | 2.5 | BYS ≥ 2 |
| **A13.** Deprem etkilerinin tamamının *süneklik düzeyi yüksek* boşluksuz betonarme perdelerle karşılandığı binalar | 6 | 2.5 | BYS ≥ 2 |
| **A14.** Deprem etkilerinin moment aktaran *süneklik düzeyi yüksek* betonarme çerçeveler ile *süneklik düzeyi yüksek* bağ kirişli (boşluklu) betonarme perdeler tarafından birlikte karşılandığı binalar (Bkz.**4.3.4.5**) | 8 | 2.5 | BYS ≥ 2 |
| **A15.** Deprem etkilerinin moment aktaran *süneklik düzeyi yüksek* betonarme çerçeveler ile *süneklik düzeyi yüksek* boşluksuz betonarme perdeler tarafından birlikte karşılandığı binalar (Bkz.**4.3.4.5**) | 7 | 2.5 | BYS ≥ 2 |
| **A16.** Deprem etkilerinin tamamının çatı düzeyindeki bağlantıları mafsallı olan ve yüksekliği 12 m'yi geçmeyen *süneklik düzeyi yüksek* betonarme kolonlar tarafından karşılandığı tek katlı binalar | 3 | 2 | – |

**Şekil 3.** Betonarme binalar için deprem yönetmeliğinde tanımlanmış taşıyıcı sistem tipleri (TBDY, 2018)

## 3. Asma Kat ve Kısa Kolon

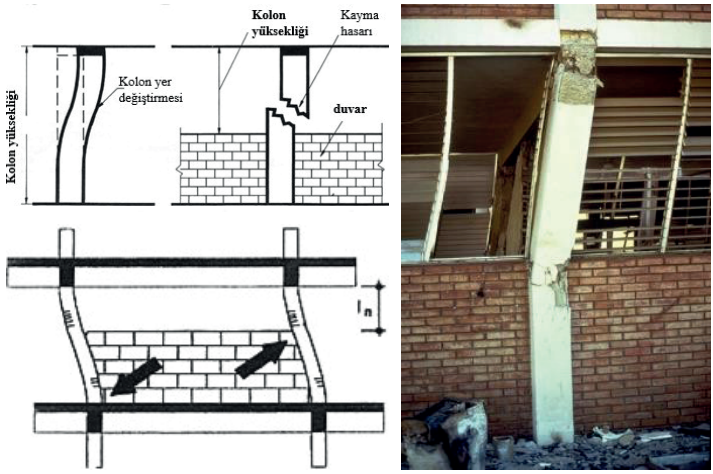
Asma katlar, yapıların genellikle iş yeri olarak kullanılan zemin katı ile birinci katı arasında yer almakta olup, plandaki alanları zemin kata kıyasla daha küçüktür ve bu katlardaki kolonlar üst kat kolonlarına göre daha uzun olabilmektedir. Bu tür kat düzenlemeleri, yapının taşıyıcı sisteminde döşeme süreksizliği yaratmakta; kısa kolon oluşumu, bölgesel yumuşaklık, burulma

davranışı ve deprem kuvvetlerinin kolondan kolona etkin biçimde aktarılmasında zorluk gibi çeşitli yapısal problemlere neden olabilmektedir. Bu bağlamda, asma katlar yumuşak kat düzensizliğine benzer bir davranış sergilemekte ve deprem performansını olumsuz yönde etkileyebilmektedir.




**Şekil 4.** Tipik bir asma kat uygulaması kesiti ve oluşan düzensizlikler (Topçu, 2014)

Yapılarda kısa kolon düzensizliği, taşıyıcı sistemde yer alan bazı kolonların diğerlerine göre daha kısa olması durumunda ortaya çıkar ve deprem güvenliği açısından önemli bir zayıflık oluşturur. Bu düzensizlik genellikle bodrum katlardaki bant pencereler, kat yüksekliğinde örülmemiş duvarlar (Şekil 5-a), kat ara kirişleri, tesisat katları, asma katlar, merdiven ara sahanlıkları, guseli (eğik) kiriş ve kolonlar ile kademeli temeller gibi mimari ve yapısal düzenlemeler sonucunda meydana gelir. Kısa kolonlar, daha uzun kolonlara kıyasla çok daha rijit davranır ve bu nedenle deprem anında daha büyük kesme kuvvetlerine maruz kalır. Bu durum, özellikle gevrek kesme kırılmalarına yol açarak kolonun taşıma kapasitesini kaybetmesine neden olabilir (Şekil 5-b). Taşıyıcı sistemde bu tür bir zayıflık oluştuğunda, yapı ciddi düzeyde hasar görebilir ya da tamamen çökmeye maruz kalabilir. Bu nedenle, kısa kolon oluşumuna yol açacak düzenlemelerden mümkün olduğunca kaçınılmalı; eğer bu tür uygulamalar kaçınılmaz ise, söz konusu kolonların tüm yüksekliği boyunca yeterli sıkılıkta enine donatı ile sarılması veya kolon ile bitişiğindeki duvar arasında boşluk bırakılması gibi mühendislik önlemleriyle kısa kolon etkisi minimize edilmelidir. Bu tür yapısal detaylara gösterilecek özen, özellikle sismik etkinin yüksek olduğu bölgelerde, yapı güvenliği açısından hayati önem taşımaktadır.




(a) (b)

**Şekil 5.** Kısa kolon oluşumu: a) şematik gösterim, b) hasar örneği (Arun, 2018)

Yönetmelik değişiklikleri bağlamında değerlendirildiğinde, fıkra 30 (a) bendinde yer alan "kısa kolon oluşturulmaması" ve "asma kat yapılmaması" yönündeki ifadelerin birbirleriyle doğrudan ilişkili olduğu söylenebilir. Özellikle asma kat döşemeleri, zemin kat kolonlarına rijit şekilde bağlandığında, bu kolonların serbest boylarının kısalmasına neden olarak kısa kolon oluşumuna zemin hazırlayabilir. Ayrıca, asma kat uygulamaları genellikle büyük kat yüksekliği gerektirdiğinden, yapı sisteminde yumuşak kat düzensizliği oluşma riskini de artırmaktadır (Şekil 4). Bu açıdan bakıldığında, ticari işlevli yapıların yüksek kat yüksekliği ihtiyacı, asma kat uygulamalarını teşvik edebilir; asma kat uygulamaları ise taşıyıcı sistemde kısa kolon davranışının ortaya çıkmasına yol açabilir. Dolayısıyla, yönetmelikte bu iki durumun birlikte ele alınması, sismik performans açısından oldukça yerinde ve bütüncül bir yaklaşımı yansıtmaktadır.

## 4. Kapalı Çıkmalar

Yapı çıkmaları, genel olarak taşıyıcı kolonların planda tanımladığı alanın dışına taşan mimari hacimler olarak değerlendirilmektedir. Bu bağlamda balkonlar, yapı çıkmalarının en yaygın örneklerini oluşturur. Statik açıdan değerlendirildiğinde, açık çıkma olarak tanımlanan ve genellikle konsol ya da ankastre sistemlerle çözümlenen bu öğeler, taşıyıcı sistemin sürekliliğini engellemedikleri için yapı davranışı açısından bir zafiyet oluşturmazlar. Ancak bazı durumlarda, bu çıkma alanlarının yapı içerisine dahil edilerek kapatıldığı ve kapalı bir hacim oluşturulduğu gözlemlenmektedir (Şekil 6). "Kapalı çıkma"

olarak adlandırılan bu uygulaması sırasında estetik kaygılarla çıkmayı teşkil eden kirişlerin yapı içinde devam eden kısımları kaldırılması çokça karşılaşılan bir durumdur (Şekil 7). Bu tarz bir tasarım deprem etkileri altında yapının davranışını olumsuz etkileyebilecek düzensizliklere yol açabileceğinden, depreme dayanıklı yapı tasarımında ilk aşamadan itibaren dikkatle ele alınması gereken unsurlar arasında yer almaktadır (Büyükyıldırım, 2001).



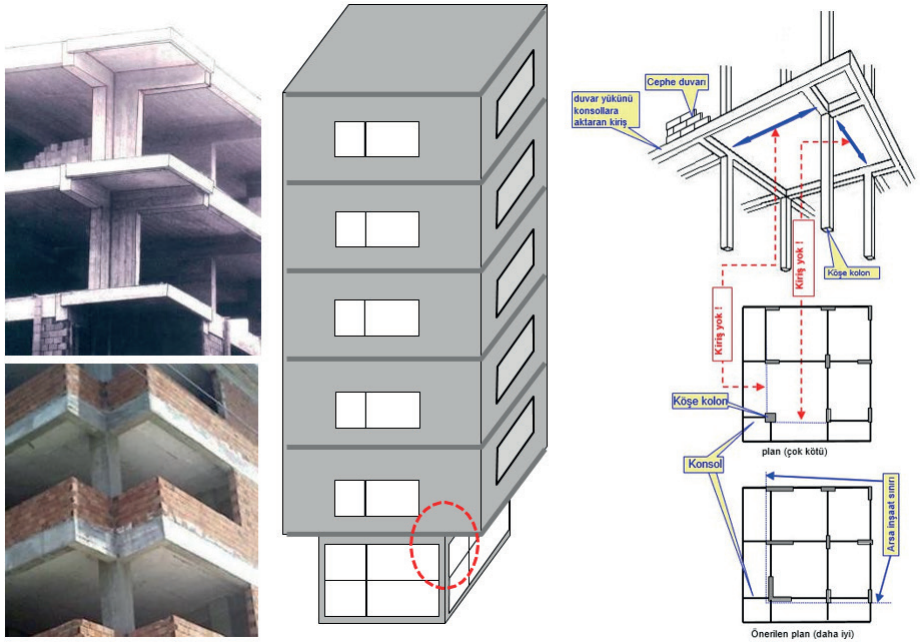
**Şekil 6.** Kapalı çıkması olan bina örnekleri

Apartman tipi çok katlı yapılarda maliklerin kapalı çıkma isteği, büyük oranda imar haklarını en üst düzeyde kullanma arzusundan kaynaklanır. KAKS ve TAKS sınırları, arsa sahibine sunulan maksimum inşaat alanını belirler. Kapalı çıkmalar her ne kadar bu katsayı hesabının dışında bırakılmasa da binanın sadece TAKS sınırları üzerinde yükseltilmesi durumuna göre "ilave" hacim elde etme imkânı sunar. Bu fırsat, maliklerde "kayıptan kaçınma" eğilimini tetikler; zira mevcut imar hakkının bir kısmını kullanmamak, hissedilen bir "kayba" dönüşür ve sahipler bu kaybı en aza indirmek için düzenleme boşluklarını zorlamaya yönelirler (Kahneman & Tversky, 2013). Buna ek olarak, yatırım değeri ve kira/konut satış geliri açısından her ekstra metrekare doğrudan finansal kazanca dönüştüğü için, mal sahibi veya yatırımcılar "maliyet–fayda" analizini kapalı çıkma lehine sonuçlandırır. Mimarlarsa, müşteri memnuniyetini sağlamak ve projeyi onaylatmak amacıyla bu baskıya direnmek yerine düzenlemenin sunduğu sınırları en verimli şekilde yorumlayarak tasarım sürecine entegre etmek zorunda kalır. Böylece, psikolojik olarak "emsalin sonuna kadar kullanılması" motivasyonu ile yasal düzenleme arasındaki etkileşim, mimar–yapı sahibi ilişkilerinde sürekli bir denge ve pazarlık dinamiği oluşturur.

Planlı Alanlar İmar Yönetmeliği'nin 5. maddesine eklenen 30. fıkranın (b) bendi aşağıdaki gibidir.

*"İçerisinde konut yer alan zemin hariç 7 kat ve üzeri binalarda kapalı çıkma yapılamaz. Ancak kapalı çıkma yapılamaması nedeniyle parselin plan ve bu Yönetmelikle verilen emsal haklarının kullanılamadığı durumlarda; arka bahçe mesafesi 2 metrenin altına düşmemek kaydı ile arka bahçeye en fazla 1 metre taşacak şekilde, sadece kolon ve/veya perdelerden (bunların*

*zemin altında temele kadar devam eden bölümleri dahil) oluşan kapalı çıkmasız bina uygulamalarında, belirtilen taşıyıcı sistemin çevrelediği alan bahçe mesafesi ve taban alanı ihlali sayılmaz. Emsal haklarının bu şekilde dahi tamamen kullanılamaması halinde, parselin yol sınırlarına 4 metreden fazla yaklaşmamak kaydı ile ön bahçeye en fazla 1 metre taşacak şekilde aynı uygulamaya müsaade edilir. Bu alanın hiçbir kenarı duvar veya herhangi bir malzeme ile kapatılmaz ve bahçe niteliği ortadan kaldırılamaz. Bu fıkra kapsamındaki uygulamalarda hiçbir şekilde çıkmalı olarak tasarlanmış olan binaya göre emsal artışı sağlanamaz. Kapalı çıkma yapılabilen yerinde dökme betonarme binalarda ise; çıkmayı teşkil eden konsolun mesnetlendiği/bağlantılı olduğu düşey taşıyıcı elemanların, Türkiye Bina Deprem Yönetmeliğinin eki Deprem Etkisi Altında Binaların Tasarımı İçin Esasların Tablo 4.1.'inde yer alan A12, A13 veya A32 tipi taşıyıcı sistemlerin kullanıldığı binalar hariç olmak üzere, kirişler ile birbirine bağlanması suretiyle çerçeve teşkil edilmesi zorunludur."*




**Şekil 7.** Kapalı çıkma örnekleri, sakıncaları ve çözüm önerisi (Topçu, 2014)

Yüksek katlı (zemin+7 kat ve daha yüksek) konut yapılarında kapalı çıkma kullanımını yasaklayan bu madde ile hem yapıların deprem güvenliğini artırmayı hem de imar haklarının dengeli kullanımını sağlamayı hedeflemektedir. Kapalı çıkma, özellikle taşıyıcı sistemin dışında ek moment ve kesme kuvveti oluşturması nedeniyle deprem davranışını karmaşıklaştırmaktadır.

Bu çerçevede, yüksek katlı yapılar bakımından kapalı çıkmanın tamamen yasaklanması, söz konusu riskleri en aza indirme niyetini yansıtmaktadır.

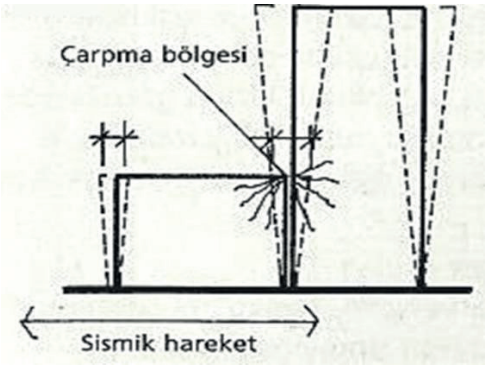
Madde metni, emsal kullanım hakkının pratikte tamamen ortadan kaldırılmaması amacıyla esneklikler öngörmektedir. Arka bahçe mesafesinin iki metreyi aşmamak koşuluyla, yalnızca taşıyıcı elemanlardan (kolon ve perde) oluşan "çıkmaya haiz olmayan" kapalı bölümlerin, emsal hesabında ihlal sayılmaması hükme bağlanmıştır. Bu istisnai düzenleme, parsel sahiplerinin emsal haklarını kısmen korurken, yapısal elemanlar dışında duvar veya dolgu malzemesi ile kapatma yasağı getirerek bu çıkmaların mekânsal geçirgenliğini ve bahçe niteliğini sürdürmeyi amaçlamaktadır.

Emsal haklarının arka bahçede dahi tam olarak kullanılamadığı durumlarda, yapının ön bahçesine benzer bir taşıma hakkı tanınmaktadır. Ancak burada da bitişik yol sınırına dört metreyi aşmama ve yalnızca taşıyıcı sistem elemanlarını (kolon/perde) içeren, duvarsız bir strüktür biçiminde kalma koşulu verilmektedir. Böylece, parsel cephesinden yürünebilir yeşil alan sürekliliği korunurken, yapılaşma yoğunluğu kontrol altında tutulmuştur.

Kapalı çıkma yapılmasına izin verilen yapılarda ise, çıkmayı oluşturan konsoldan düşey taşıyıcı elemanlara kadar uzanan kiriş bağlantılarının; Türkiye Bina Deprem Yönetmeliği'nde tarif edilen kuşatılmış kolon kriterlerini tam olarak sağlamasa da çerçeve oluşturacak biçimde tasarlanması zorunludur. Bu hüküm, taşıyıcı sistem elamanlarının bir bütün olarak çalışmasını sağlayarak, konsol çıkmalarından kaynaklanacak lokal düzensizlikleri önlemeyi ve deprem esnasında yük dağılımını kontrollü hale getirmeyi hedefler.

## 5. Deprem Derzleri

Yapılarda farklı derz tipleri bulunmakla birlikte, bu çalışmada ele alınan derzler; bitişik veya çok yakın konumdaki yapıların çarpışmasını ve düzensiz yapıların deprem sırasında hasar görmesini önlemek amacıyla uygulanan derzler olup, deprem derzi olarak adlandırılır. Bitişik nizam yerleşimde, kütle ve dinamik özellikleri farklı olan komşu yapılar deprem sırasında farklı genlik ve frekansta titreştikleri için birbirlerine çarparak "çekiçleme" etkisine yol açabilir (Şekil 8); bu tür hasarları önlemenin en etkili yöntemi, iki yapı arasında yeterli genişlikte bir derz bırakmaktır. Ayrıca bitişik nizamda yapılacak binaların kat döşemelerinin yanı seviyede olması çekiçleme sırasında oluşacak etkilerin düşey taşıyıcılara hasar vermesine karşı alınacak bir önlemdir (Şekil 9). TBDY-2018'e göre asgari derz boşluğu, 6 m yüksekliğe kadar 30 mm olacak ve bu değere 6 m'den sonraki her 3 m'lik yükseklik için en az 10 mm eklenerek hesap edilmelidir.

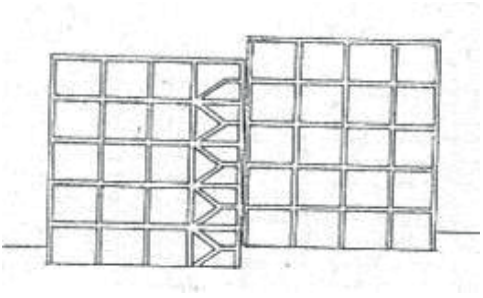





**Şekil 8.** Sismik hareketler nedeniyle oluşam çekiçleme etkisi (Arun, 2018)

Planlı Alanlar İmar Yönetmeliği'nin 5. maddesine eklenen 30. fıkranın (b) bendi aşağıdaki gibidir.

*"Bitişik nizam parsellerde bitişik yapılacak olan binaların arasında Türkiye Bina Deprem Yönetmeliği gereği bırakılması gereken deprem derz boşluğu kadar mesafenin parsel sınırından itibaren bırakılması zorunludur. Bu boşluğun dışarı bakan tüm cepheleri, yapıların salınım yapmasına engel olmayacak şekilde hafif malzemeler ile bina boyunca kapatılarak can ve mal güvenliği temin edilir."*





**Şekil 9.** Bitişik nizamda kat seviyeleri farklı binaların çarpışması (Arun, 2018)

Planlı Alanlar İmar Yönetmeliği'ne eklenen bu hüküm, bitişik nizam parsellerde inşa edilecek binalar arasında, Türkiye Bina Deprem Yönetmeliği'nde öngörülen deprem derz boşluğu kadar mesafenin boşluk olarak bırakılmasını zorunlu kılmaktadır. Bu düzenlemenin, deprem yönetmeliğinde daha önce tanımlanmış bir uygulamanın Planlı Alanlar İmar Yönetmeliği'ne de dahil edilmesi dikkat çekicidir. Böylece şehir plancıları, mimarlar ve inşaat ruhsatı veren birimler, inşaata başlama izni aşamasında deprem derzi mesafelerini

de değerlendirmek zorunda kalacak; farklı mevzuat kaynakları arasındaki uyumsuzluk azalacaktır. Ayrıca, uygulamada "deprem yönetmeliğinde var ama pratikte ihmal ediliyor" sorununa karşı ek bir kontrol mekanizması oluşturulur. Yasal çerçevenin genişletilmesi, inşaat sektöründe ve halk nezdinde deprem derzlerinin önemine dair farkındalığı artırır. Ruhsat alımından yapı denetimine kadar her aşamada derz detayları gündeme geleceğinden, zaman içinde uygulama kalitesinin ve proje tasarımının daha titiz yapılması beklenir. Bu değişiklik, deprem güvenliğine yönelik mevzuat bütünlüğünü güçlendirerek, bitişik nizam yerleşimlerde yapısal performansın artırılmasına katkı sunmaktadır.

Bu düzenleme bendinin son cümlesi, yapısal blokların deprem esnasında serbestçe salınım yapabilmesini temin etmek amacıyla, derz boşluğunun tüm cephelerinin hafif ve rijit olmayan malzemelerle kapatılmasını öngörmektedir. Böylece hem bloklar arası çarpışma riski ortadan kaldırılmakta hem de can ve mal güvenliği açısından kritik olan boşluklar açık halde tutulmadan –yapı bütünlüğü korunarak– gerekli hareket açıklığı sağlanmış olmaktadır (Şekil 10).



**Şekil 10.** Kapatılmayan bir derz boşluğuna sıkışan bir çocuk (Topçu, 2014)

## 6. Sonuçlar ve Değerlendirme

6 Şubat 2023 Kahramanmaraş merkezli depremler, Türkiye'de yapı güvenliğine ilişkin yönetmeliklerin hem teknik hem de uygulama boyutunda yeniden ele alınmasını zorunlu kılmıştır. Bu doğrultuda Planlı Alanlar İmar Yönetmeliği'nde yapılan 2023 yılı değişiklikleri, yapılaşma süreçlerinde daha sismik duyarlı bir yaklaşımın benimsenmesine yönelik önemli adımlar içermektedir. Özellikle yumuşak kat, kısa kolon, asma kat, kapalı çıkma ve deprem derzleri gibi yapısal düzensizliklerin doğrudan hedef alındığı düzenlemeler, bina davranışını olumsuz etkileyen zayıf halkaları azaltma amacı taşımaktadır.

Yeni düzenlemeler, yalnızca teknik önlemler içermekle kalmayıp; aynı zamanda ruhsat süreçlerinden tasarım kararlarına, mal sahibi beklentilerinden

mimar-yapı sahibi ilişkilerine kadar uzanan çok katmanlı bir dönüşüm potansiyeli barındırmaktadır. Bu bağlamda, mimar ve mühendislerin taşıyıcı sistem tasarımına yönelik karar alma süreçlerinde yönetmelik yönlendirmelerinin daha etkin bir rol oynaması beklenmektedir.

Özellikle yüksek katlı yapılarda kapalı çıkmaların sınırlandırılması, asma kat uygulamalarına getirilen kısıtlamalar ve yumuşak kat oluşumunun taşıyıcı sistem düzeyinde engellenmesi gibi hükümler; yalnızca teorik bir zemin değil, aynı zamanda uygulamada karşılaşılan sorunlara doğrudan müdahale niteliğindedir. Buna ek olarak, deprem derzlerinin Planlı Alanlar İmar Yönetmeliği kapsamına alınması ile daha bütüncül bir mevzuat çerçevesi oluşturulmuştur.

Ancak bu yönetmelik değişikliklerinin yalnızca kâğıt üzerinde kalmaması için denetim mekanizmalarının güçlendirilmesi, yerel yönetimlerin ve yapı denetim kuruluşlarının uygulama sürecinde yeterli donanıma sahip olması gereklidir. Aksi halde, teknik olarak doğru olan bu düzenlemelerin sahada istenilen etkiyi göstermesi güçleşecektir.

Sonuç olarak, Planlı Alanlar İmar Yönetmeliği'nde yapılan değişiklikler, Türkiye'nin deprem riskine karşı yapısal dayanıklılığı artırmak adına doğru yönde atılmış önemli adımlardır. Bu düzenlemelerin kalıcı ve etkili sonuçlar doğurabilmesi için ise mevzuatın uygulanabilirliği, denetlenebilirliği ve tüm paydaşlarca benimsenmesi büyük önem taşımaktadır.

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# TÜRKİYE VE DÜNYADA MİMARLIK

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yaz yayınları

758

yaz yayınları

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# TARİHİ TÜRBELERİN FOTOGRAMETRİK OLARAK BELGELENDİRİLMESİ: ERENLER (KİÇİ HATUN) TÜRBESİ ÖRNEĞİ

**Mustafa Haki ERASLAN**[1]

## 1. GİRİŞ

Türk-İslam mimarisindeki anıt mezar geleneği (türbe), ilk olarak 10. yüzyılda Horasan ve Türkistan bölgelerinde ortaya çıkmış ve İran üzerinden Anadolu coğrafyasına ulaşmıştır (Daş, 2003). Anadolu Selçuklu Devleti döneminde yaygınlaşan bu yapı tipi, genellikle bânisinin veya ailesinin defnedildiği, küçük ölçekli ve kişiye özel tasarımlar olması sebebiyle form, malzeme ve süsleme açısından büyük çeşitlilik göstermiştir (Kalınbayrak Ercan & Kalkan Açıkkapı, 2022). Mimari açıdan dikey formun vurgulandığı türbeler, aynı zamanda manevi ve sembolik yapılar olarak önem taşımıştır (Bates, 1971). Anadolu'daki türbe inşaatındaki artış, özellikle 13. yüzyılın ortasında gerçekleşen Moğol istilası sonrasında yaşanan siyasi, dini ve kültürel dönüşümlerle hız kazanmıştır (Bates, 1971). Bu süreçte göç dalgalarıyla Anadolu'ya gelen dini liderler, sanatkârlar ve mimarlar, bölge mimarisine, özellikle de türbe yapılarına yeni üslup ve motifler getirmiştir (Bates, 1978; Şaman Doğan, 2003). Geçmişi Orta Asya'ya dayanan bu gelenek, Selçuklu döneminde Anadolu coğrafyasında başlamış ve sonrasında Osmanlı döneminde belirginleşmiştir (Top, 1999; Mutlu, 2024).

Bu siyasi dönüşümlerin yaşandığı 14. yüzyılda Tokat ve çevresi, İlhanlı hâkimiyeti altında bulunmuş ve mimari açıdan

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Bizans mimarisinin, Anadolu Selçuklu geleneklerinin ve İran/Orta Asya'dan gelen sanatsal etkilerin harmanlandığı yaratıcı bir ortama sahne olmuştur (Açıkel, 2012; Kalınbayrak Ercan & Kalkan Açıkkapı, 2022). Tokat'ta 14. yüzyıla tarihlenen bağımsız türbeler arasında yer alan Erenler Türbesi (Kiçi Hatun Türbesi), bu dönemin mimari özelliklerini yansıtan önemli bir örnektir (Kalınbayrak Ercan & Kalkan Açıkkapı, 2022). Kitabesinden elde edilen bilgiye göre 1310 yılına tarihlenen Erenler Türbesi, baldaken tarzı türbelerin ilk örneklerinden biri olarak kabul edilmektedir (Kılcı, 2007; Kalınbayrak Ercan & Kalkan Açıkkapı, 2022). Baldaken formundaki bu yapının kare planı, sivri kemerli açıklıkları ve kemerlerinde kullanılan yarım yıldız oymaları gibi süsleme detayları, Anadolu Selçuklu mimarisindeki geleneklerin devam ettiğini göstermektedir (Kılcı, 2007; Ögel, 1966). Genel olarak bakıldığında bu dönem Tokat türbelerinde Anadolu Selçuklu geleneklerinin yanı sıra Moğol baskısıyla gelen grupların sanatsal etkileri de gözlemlenmektedir (Kalınbayrak Ercan & Kalkan Açıkkapı, 2022).

Tarihi olaylar, doğal afetler (deprem, sel gibi), yangın, savaş ve insan ihmali gibi çeşitli faktörler nedeniyle, Erenler Türbesi gibi paha biçilmez kültürel miras varlıkları zamanla tahrip olmakta, bozulmakta veya kısmen ya da tamamen yok olma riskiyle karşı karşıya kalmaktadır. Bu nedenle, bu yapıların korunması ve gelecek nesillere aktarılması için doğru ve hassas bir belgeleme yapılması vazgeçilmez bir zorunluluktur. Geçmişte el çizimi gibi geleneksel yöntemlerle yapılan belgeleme çalışmaları, hata olasılığını artırması ve zaman alması gibi dezavantajlar taşımaktaydı (Kaya & Temel, 2022). Ancak günümüzde, hızla gelişen dijital teknolojiler sayesinde dijital belgeleme yöntemlerinin kullanılması, bu tür kültürel miras eserlerinin korunması bağlamında kritik bir öneme ve aciliyete sahiptir (Yağcı & Bölükbaşı Ertürk, 2025).

Dijital belgeleme teknikleri, özellikle yakın resim fotogrametrisi (Close-Range Photogrammetry), İHA (İnsansız Hava Aracı) fotogrametrisi ve lazer tarama gibi yöntemlerle, yapıların geometrik özelliklerinin ve mevcut durumlarının son derece doğru ve hassas bir şekilde (milimetrik hassasiyette ölçümlerle) 3 boyutlu olarak kaydedilmesini sağlamaktadır (Pulat vd., 2022). Elde edilen bu zengin görsel ve metrik veriler, yapının dijital ikizinin (Digital Twin) oluşturulmasına olanak tanır ki bu da sadece bir arşivleme faaliyeti değil, aynı zamanda gelecekteki restorasyon, restitüsyon ve rekonstrüksiyon projelerine temel oluşturan, ölçülebilir referans veriler sunan bir sistemdir (Abdelalim, 2025; Kabadayı, 2023). Dijital belgeleme, tehlikeli veya erişilemeyen alanların ölçülmesinde kolaylık, hız ve personel güvenliği sağlaması gibi pratik avantajlarının yanı sıra (Yılmaz vd., 2007; Yiğit vd., 2020), üretilen fotogerçekçi 3B modeller aracılığıyla sanal müze, artırılmış gerçeklik (AG) uygulamaları ve dijital turizm gibi alanlarda kültürel mirasın erişilebilirliğini ve tanıtımını da desteklemektedir. Bu bağlamda Erenler Türbesi gibi tarihi ve mimari açıdan kritik öneme sahip eserlerin dijital ortama aktarılması, kültürel kimliğin ve tarihi anlatının sürdürülebilirliği için yüksek öncelikli olmaktadır.

## 2. METOT

Bu çalışma, somut kültürel mirasın dijital ortamda korunması ve sürdürülebilirliğinin sağlanması amacıyla, Tokat Erenler Türbesi örneği üzerinden Yersel Fotogrametri (Terrestrial Photogrammetry) tekniğinin uygulanabilirliğini inceleyen bir vaka analizidir.

Araştırmanın metodolojik altyapısı, "Görüntü Tabanlı Modelleme" (Image-Based Modeling - IBM) prensiplerine dayanmaktadır. Bu yöntem, nesnenin farklı açılardan çekilmiş iki boyutlu (2D) görüntülerinden, Hareketten Yapı (Structure from

Motion - SfM) algoritmaları kullanılarak üç boyutlu (3D) geometrik verinin ve doku bilgisinin elde edilmesi esasına dayanır. Geleneksel rölöve tekniklerinin (el ile ölçüm) zaman alıcı doğası ve Lazer Tarama (LIDAR) sistemlerinin yüksek maliyeti göz önüne alındığında; bu çalışmada mobil tabanlı fotogrametri yöntemi, "hızlı, ekonomik ve erişilebilir" bir alternatif olarak benimsenmiştir.

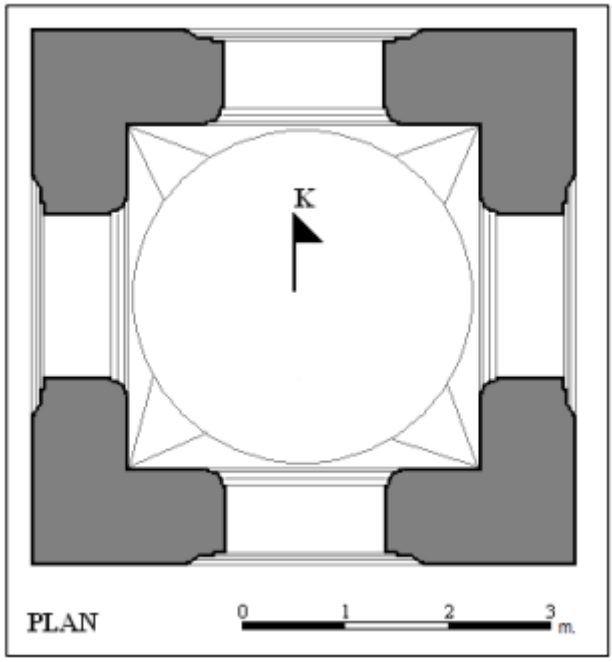
Veri toplama sürecinde, profesyonel DSLR kameralar yerine, günümüz mobil teknolojilerinin ulaştığı yüksek sensör kalitesini test etmek amacıyla iPhone 13 Pro cihazının entegre kamerası kullanılmıştır. Cihazın 12 MP çözünürlüğe sahip geniş açılı lensi, yapının yakın mesafe çekimlerinde detay kaybını önlemek için tercih edilmiştir.

Veri işleme ve modelleme aşamasında ise Epic Games tarafından geliştirilen RealityScan yazılımı kullanılmıştır. RealityScan, karmaşık fotogrametrik hesaplamaları bulut tabanlı (cloud computing) bir sistem üzerinde gerçekleştirerek, donanım gücünden bağımsız olarak yüksek poligonlu modeller üretilmesine olanak tanımaktadır. Çalışmanın iş akışı; (1) Sahada veri toplama, (2) Veri işleme ve modelleme ve (3) Modelin dışa aktarımı (export) olmak üzere üç aşamalı bir sistematikte kurgulanmıştır.

## 3. ERENLER (KİÇİ HATUN) TÜRBESİ ÖZELLİKLERİ

Tokat'ta, İlhanlı hâkimiyeti dönemine tarihlendirilen ve 14. yıla ait olduğu kabul edilen Erenler (Kiçi Hatun) Türbesi, Türk-İslam anıt mezar mimarisinin baldaken tarzı türbelerinin önemli bir örneği olarak dikkat çekmektedir (Kılcı, 2007; Kalınbayrak Ercan & Kalkan Açıkkapı, 2022). Baldaken tarzı yapılar, genellikle kare veya çokgen planlarda inşa edilmiş, üst örtüsü ayaklar veya sütunlar tarafından taşınan, üstü kapalı fakat

yanları açık anıt mezar tipini ifade etmektedir (Kılcı, 2007; Canbulat, 2021; Kalınbayrak Ercan & Kalkan Açıkkapı, 2022). Erenler Türbesi, yaklaşık 5,25 x 5,30 m ölçülerinde kare plan şemasına sahip olup, gövdenin dört köşesinde yer alan dört adet L formunda ayak üzerine oturtulmuş, dışa sivri kemerli açıklıklarla açılan bir kuruluşa sahiptir (Şekil 1).




**Şekil 1. Erenler Türbesi planı (Kılcı, 2007; Saka Akın, 2009)**

Türbenin bu formu, Anadolu'ya İran ve Orta Asya'dan gelen mimari ve sanatsal etkilerle yorumlanmış, İslamiyet öncesi ve sonrası yapı geleneklerinin bir yansıması olarak değerlendirilmektedir. Baldaken formu, Farsçada "dört kemer" anlamına gelen çār-ṭāḳ kavramının bir karşılığı olup, kökeni Mezopotamya'ya kadar uzanan bir yapı birimi olmakla birlikte, Anadolu Selçuklu döneminde kervansarayların köşk mescitlerinde yaygınlaşmış ancak türbe mimarisinde kullanımı Beylikler dönemine, dolayısıyla 14. yüzyıla tarihlenmektedir (Canbulat, 2021).

Yapının malzeme ve yapım tekniği incelendiğinde, kemerler kesme taştan inşa edilmişken, L formundaki kemer ayaklarının moloz taştan örüldüğü görülmektedir. Gövdenin dış cephesi kesme taş ile kaplanmış durumdadır; ancak bu kaplamanın büyük bir kısmının restorasyon öncesinde sadece 3-4 sıra halinde günümüze ulaştığı belirtilmiştir. Gövdenin üst kısmı ise tuğla malzeme kullanılarak inşa edilmiştir. Bu tuğla kullanımı, yapının dış üst örtü sisteminde de devam eden, İran geleneğinin bir uzantısı olarak kabul edilen bir özelliktir (Kalınbayrak Ercan & Kalkan Açıkkapı, 2022).

Cephe düzeni ve süsleme açısından bakıldığında, Erenler Türbesi'nin tüm cepheleri benzer şekilde tasarlanmış ve süslenmiştir, bu nedenle mimari olarak öne çıkan özel bir cephesi bulunmamaktadır. Kesme taştan yapılmış olan kemerler, dış yüzeylerinde üç silme ile zenginleştirilmiştir. Bu silmelerden ortada yer alanı, yere kadar inerek üç kollu yarım yıldız oymaları ile bezenmiştir.

Silmelerin ve oyma yarım yıldız motiflerinin kullanımı, Niğde Alaaddin Camii ve Konya Sırçalı Medrese gibi 13. yüzyıl Anadolu Selçuklu yapılarının portallerinde sıkça karşılaşılan geleneksel bir süsleme repertuarının devamı niteliğindedir (Ögel, 1966; Kalınbayrak Ercan & Kalkan Açıkkapı, 2022).

Türbenin üst örtü sistemi, içte bir kubbe ve dışta onu örten piramidal bir külah olmak üzere çift katmanlıdır. Kare planlı gövdeden kubbeye geçişte, Türk üçgenleri kullanılarak kübik gövde köşeleri pahlanmış ve sekizgen bir kasnak oluşturulmuştur. Kubbe ve kasnak, tuğladan örülmüştür. Kasnak yüzeylerinde, kemerlerin hizasına denk gelecek şekilde sivri kemerli nişlere yer verilmiştir. Yapının piramidal külahı orijinal olarak günümüze ulaşamamış olup, güncel durumu restorasyon sırasında kesme taştan yeniden inşa edilmiştir. Restorasyon sırasında, kübik gövde ile sekizgen kasnağın birleştiği köşelerdeki boşluklara, Nurettin

İbn-i Esentimur Türbesi'ndeki gibi üçgen prizma şeklinde dış tromplar yerleştirilmiştir (Şekil 2).



**Şekil 2. Erenler Türbesi mevcut durumu (Yazarın arşivinden).**

Türbenin mevcut durumu, yapıya ait rölöve, restitüsyon ve restorasyon projelerinin Tokat Vakıflar Bölge Müdürlüğü tarafından hazırlandığını ve yapının 2009 yılında kapsamlı bir restorasyon geçirdiğini göstermektedir. Restorasyon öncesinde türbe oldukça harap bir durumdaydı ve dış cephe kaplaması ciddi oranda kayba uğramıştı (Kalınbayrak Ercan & Kalkan Açıkkapı, 2022) (Şekil 3).

Akın (2009), yapının toprak altında kalan kısmında tonozlu bir kriptanın (mezar odası) açığa çıkarıldığını belirtse de, güncel Vakıflar projelerinde bu kriptanın varlığı belirtilmemiştir (Kalınbayrak Ercan & Kalkan Açıkkapı, 2022).



**Şekil 3. Erenler Türbesi restorasyon öncesi durumu (Tokat Vakıflar Bölge Müdürlüğü; Kalınbayrak Ercan & Kalkan Açıkkapı, 2022)**

## 4. DİJİTAL DOKÜMANTASYON

Erenler Türbesi'nin dijitalleştirilmesi süreci; veri toplama (arazi çalışması), veri işleme (modelleme) ve dışa aktarma olmak üzere üç temel aşamada gerçekleştirilmiştir. Bu süreçte geleneksel lazer tarama yöntemlerinin aksine, erişilebilirliği ve maliyet etkinliği nedeniyle mobil tabanlı fotogrametri yöntemi tercih edilmiştir.

### 4.1. Veri Toplama ve Arazi Çalışması

Arazi çalışması kapsamında, yapının geometrik bütünlüğünü ve doku detaylarını eksiksiz kaydedebilmek amacıyla iPhone 13 Pro cihazının kamerası kullanılmıştır. Çekimler, fotogrametrik hesaplamaların doğruluğu için kritik olan "diffüz ışık" koşullarının sağlandığı öğle saatlerinden sonra güneşli bir günde yapılmıştır. Yapının çevresinde dairesel yörüngeler izlenerek, zemin seviyesinden ve farklı yüksekliklerden toplam 450 adet fotoğraf çekilmiştir (Şekil 4).

Görüntü hizalama (alignment) başarısını artırmak adına, ardışık fotoğraflar arasında %60 ile %80 oranında bindirme

(overlap) sağlanmasına özen gösterilmiştir. Özellikle türbenin cephe detayları, malzeme geçişleri ve köşe birleşim noktaları gibi karmaşık geometrik alanlarda çekim sıklığı artırılarak veri kaybının önüne geçilmiştir.



**Şekil 4. Veri toplama esnasındaki görüntüler (Yazarın arşivinden).**

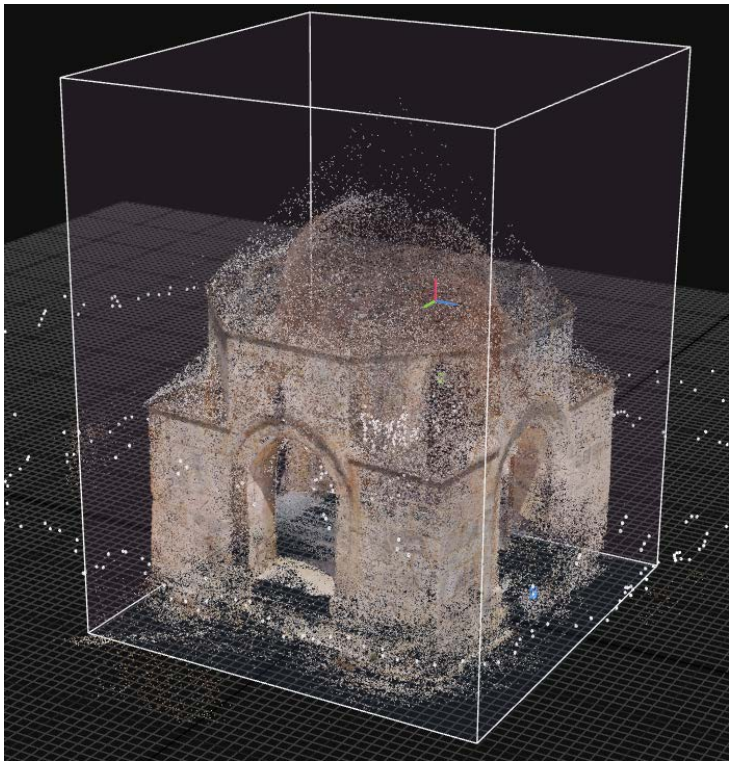
### 4.2.RealityScan ile Veri İşleme ve Modelleme

Elde edilen ham görüntü verileri, Epic Games tarafından geliştirilen bulut tabanlı fotogrametri yazılımı RealityScan ortamına aktarılmıştır. İşlem süreci şu adımları izlemiştir:

Hizalama ve Seyrek Nokta Bulutu (Alignment & Sparse Cloud): Yazılım, fotoğraflardaki ortak öznitelik noktalarını (feature matching) tespit ederek kamera pozisyonlarını hesaplamış ve yapının ilk 3 boyutlu iskeletini oluşturan seyrek nokta bulutunu üretmiştir (Şekil 5).

Yoğun Nokta Bulutu ve Ağ Model (Dense Cloud & Mesh): Tanımlanan noktalar sıklaştırılarak yapının hacimsel geometrisini oluşturan poligon örgü (mesh) model elde edilmiştir. Bu aşamada, yapının çevresindeki gereksiz veriler (bitki örtüsü, çevre elemanları) "cropping" aracı ile temizlenmiştir.

Doku Kaplama (Texturing): Yapının fotorealistik görünümünü sağlamak amacıyla, yüksek çözünürlüklü fotoğraflardan elde edilen renk ve malzeme bilgisi, geometrik model üzerine giydirilmiştir.



**Şekil 5. Modelin nokta bulutu**

### 4.3.Modelin Dışa aktarımı

İşlem sonucunda elde edilen yüksek poligonlu 3B model, .OBJ formatında dışa aktarılmıştır (Şekil 6).

Erenler Türbesi özelinde yapılan bu çalışma, RealityScan ve mobil fotogrametrinin, milimetrik hassasiyet gerektiren ileri mühendislik ölçümleri haricindeki rölöve, belgeleme ve görselleştirme çalışmalarında yeterli doğruluk payına sahip olduğunu göstermiştir. Elde edilen dijital ikiz (digital twin),

yapının mevcut koruma durumunun tespiti ve olası restorasyon projeleri için güvenilir bir referans kaynağı niteliğindedir.



**Şekil 6. Modelin görüntüsü**

## 5. SONUÇ

Tokat Erenler Türbesi özelinde yürütülen bu çalışma, tarihi yapıların belgelenmesinde mobil tabanlı yersel fotogrametri yönteminin uygulanabilirliğini, hızını ve elde edilen verilerin güvenilirliğini ortaya koymuştur.

Araştırma sonuçları, güncel mobil cihaz sensörlerinin ve bulut tabanlı görüntü işleme yazılımlarının, yüksek maliyetli lazer tarama sistemlerine erişimin kısıtlı olduğu durumlarda etkili bir alternatif sunduğunu göstermiştir. Erenler Türbesi'ne ait

üretilen yoğun nokta bulutu, ağ model (mesh) ve yüksek çözünürlüklü doku haritaları, yapının mevcut geometrik ve malzeme özelliklerini hassasiyetle dijital ortama aktarmayı başarmıştır. Elde edilen ortofotoların, geleneksel rölöve çizimlerine ve restorasyon projelerine altlık oluşturabilecek nitelikte ve ölçekte olduğu tespit edilmiştir. Ayrıca, bu yöntemin geleneksel ölçüm tekniklerine kıyasla sahada geçirilen süreyi minimize ettiği ve iş gücü maliyetlerini önemli ölçüde düşürdüğü gözlemlenmiştir.

Bu çalışma, dijital belgelemenin sadece bir arşivleme faaliyeti olmadığını, aynı zamanda yok olma riski taşıyan kültür varlıklarının dijital ikizlerinin (digital twin) oluşturulması adına kritik bir adım olduğunu kanıtlamıştır. Üretilen 3 boyutlu modeller, yapının fiziksel bütünlüğünün bozulması durumunda başvurulacak birincil referans kaynağı olma özelliği taşımaktadır.

Çalışmadan elde edilen dijital veri setinin potansiyelini artırmak amacıyla, gelecek araştırmalar ve uygulamalar için şu öneriler geliştirilmiştir:

Sanal ve Artırılmış Gerçeklik (VR/AR) Uygulamaları: Üretilen fotogerçekçi modellerin oyun motorlarına entegre edilerek, fiziksel erişimin mümkün olmadığı durumlarda ziyaretçilere sanal gezinti imkânı sunan etkileşimli platformların geliştirilmesi önerilmektedir.

Tarihi Yapı Bilgi Modellemesi (HBIM): Nokta bulutu verilerinin anlamsal (semantik) verilerle zenginleştirilerek HBIM ortamına aktarılması, yapının bakım-onarım süreçlerinin ve malzeme bozulmalarının zaman içinde takip edilmesini kolaylaştıracaktır.

Turizm ve Eğitim Entegrasyonu: Elde edilen dijital modellerin QR kod ve mobil uygulamalar aracılığıyla turizm rotalarına dahil edilmesi, yapının görünürlüğünü artıracak ve kültürel miras bilincinin yaygınlaşmasına katkı sağlayacaktır.

Sonuç olarak; Erenler Türbesi örneği, mobil fotogrametrinin kültürel mirasın korunması, belgelenmesi ve gelecek nesillere aktarılması sürecinde hızlı, ekonomik ve sürdürülebilir bir araç olarak kullanılabileceğini doğrulamaktadır.

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# TÜRKİYE VE DÜNYADA MİMARLIK

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**Editör**

Dr.Öğr.Üyesi Şerife ÖZATA

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*Selda Cansu CEYLAN*

# MEKÂNSAL PERFORMANS VE KAMUSAL DAVRANIŞ: MİMARLIKTA GÖRÜNÜRLÜK VE ÇEVRE PSİKOLOJİSİ

**Selda Cansu CEYLAN**[1]

## 1. GİRİŞ

Kamusal alan, yalnızca bireylerin bir araya geldiği fiziksel bir yüzey değil; aynı zamanda toplumsal ilişkilerin, görünürlük pratiklerinin ve iktidar biçimlerinin mekânsal olarak üretildiği bir düzenleme biçimidir. Bu bağlamda kamusal alanlar, üretildikleri kültüre ve döneme ait toplumsal yaşam pratiklerinden bağımsız olarak düşünülemez. Toplumsal yaşam pratikleri içerisinde kamusal alanların düzenlenmesine ilişkin temel olgulardan biri ise "mahremiyet" kavramıdır.

Literatürdeki pek çok çalışma, modernitenin birey ile toplum, mahrem ile kamusal ve görünen ile gizlenen arasındaki sınırları giderek geçirgenleştiren bir mekânsal deneyim ürettiğini ortaya koymaktadır. Duerr (2004; 217), mahremiyetin bedenin ve davranışın denetimiyle içselleştirilen bir toplumsal mit olduğunu, modern dönemde ise hazcılığın bir tüketim biçimine dönüşmesiyle esneklik kazandığını belirtmektedir. Vincent (2020; 63-213) ise 19. yüzyılda meydana gelen teknolojik gelişmelerin mahremiyet anlayışını kökten değiştirdiğini vurgulamaktadır. Ulaşım ve iletişim teknolojilerindeki ilerlemeler, bireyler arasındaki kamusal karşılaşma biçimlerini dönüştürmüş; radyo, sinema ve dans salonları gibi yeni eğlence ortamları kamusal yaşamın sınırlarını yeniden tanımlamıştır.

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Bununla birlikte televizyonun yaygınlaşması, ev içi eğlencesinde çeşitli değişiklikler yaşanmasına neden olarak, ev birimi içinde daha fazla yakınlık sağlamıştır. Bu yakınlık ile mahrem alanın içine kamusal imgeler taşınırken; özel ve kamusal arasındaki sınır hem genişlemiş hem de bulanıklaşmıştır.

20. yüzyıla gelindiğinde medya ve gözetleme pratikleri ışığında bireyin mekansal davranışları yeniden tanımlanmaya başlanmıştır. Sennett (1992), Gözün Vicdanı adlı çalışmasında modern kentin geçirdiği dönüşümle beraber ortaya çıkan görünürlük rejimine dikkat çekmektedir. Bu rejim ışığında Sennett (1992; 237) modern kentlerin, kamusal alandaki karşılaşmalara ve kolektif deneyimlere olanak tanıyacak şekilde karmaşık ve açık sınırlar yaratması gerektiğini belirtmiştir. Mekansal davranış biçimlerinde meydana gelen bu gelişmelere rağmen Harvey (1996; 58), modernist kent planlamacıların bilinçli olarak bir kapalı biçim tasarımı aracılığıyla metropol üzerinde bir bütünsellik ve hakimiyet kurmayı hedeflediklerini ifade etmektedir. Benzer biçimde Jacobs (1961), gündelik yaşamın kamusal sokaklarda sürdürülmesinin toplumsal denge açısından önemini vurgularken, modernist planlamanın bu canlı kamusallığı ortadan kaldırdığını belirtmektedir. Modern planlamadaki bu üretim biçiminin, kentsel ideolojinin bir sonucu olduğunu ifade eden Lefebvre'ye (2016; 147) göre kapitalist tüketim merkezi oluşturmak buradaki en temel amaçtır.

Dijitalleşmenin hız kazanmasıyla birlikte, tüketim merkezinin kavramsal çerçevesi de dönüşüme uğramıştır. Günümüz toplumunda bireyler, fiziksel mekândan bağımsız biçimde, tüm gereksinimlerini karşılayabilecekleri kapsamlı bir sanal tüketim ekosistemine kolaylıkla erişebilmektedir. Byung-Chul Han (2020; 28), bu yeni dönemi "şeffaflık toplumu" kavramıyla tanımlamakta ve kapitalist ekonominin her şeyi sergilenme zorunluluğuna tabi kıldığını ileri sürmektedir. Han'a (2020; 53) göre bu sergilenme yalnızca nesnelere değil,

mahremiyete de sirayet etmiş; birey, özel alanına ait unsurları görünür kılarak onları da tüketim döngüsüne dahil etmiştir. Böylece mahremiyet, korunması gereken bir değer olmaktan çıkıp, sergilenen ve dolaşıma sokulan bir gösteri nesnesine dönüşmüştür. Colomina (2020; 12) ise bu değişimin mimari planlamaya etki ederek; geleneksel anlamda içerisi, yani dışarısı ile açık bir karşıtlık içinde kurulmuş bir kapalı mekan olarak içerisi kavramının yerinden edildiğini ve tüm sınırların şeffaflaştığını belirtmektedir.

Bu tartışmalar, çağdaş toplumda mahremiyetin artık sabit bir koruma alanı olmaktan çıkıp, görünürlüğü kışkırtan kültürel ve teknolojik dinamiklerle sürekli yeniden tanımlanan akışkan bir deneyime dönüştüğünü göstermektedir. Dijital platformlar, tüketim ağları ve medya teknolojileri aracılığıyla birey, hem kendini sunma biçimlerini hem de mekânsal davranışlarını görünürlüğün kurallarına göre düzenlemekte; böylelikle kamusal olanla özel olan arasındaki sınırlar tarihsel bir kopuş yaşayarak hem genişlemekte hem de çözülmektedir. Bu dönüşüm yalnızca kentsel ve mimari mekânlarda izlenen bir fenomen değildir; aynı zamanda çağdaş temsil biçimlerinde de güçlü bir şekilde ifadesini bulmaktadır. Özellikle sinema, mahremiyetin nasıl görünür hâle geldiğini, kamusal davranış normlarının nasıl dönüştüğünü ve birey–mekân etkileşiminin nasıl yeniden kurgulandığını görsel bir anlatı diliyle kayda geçiren ayrıcalıklı bir gözlem alanı sunmaktadır. Dolayısıyla sinema, kuramsal çerçevenin ortaya koyduğu bu mekânsal ve toplumsal dönüşümlerin kültürel temsillerini takip edebilmek için önemli bir analitik imkân sağlamaktadır.

## 2. GOFFMAN'IN PERFORMANS KURAMI: KAMUSAL YAŞAMIN SAHNELEME DÜZENİ

Mahremiyet alanında meydana gelen dönüşümün mekansal izdüşümünü, mimarlık ve kentsel planlama pratikleri üzerinden değerlendiren pek çok araştırmacı bulunmaktadır. Bu araştırmacıların öncüllerinden biri olan Erving Goffman'ın, kamusal yaşamı "sahneleme" metaforu üzerinden açıklayan yaklaşımı; bireylerin kamusal mekânlarda nasıl görünür hâle geldiklerini, etkileşim ritüellerini nasıl yönettiklerini ve mekânın bu süreçte nasıl bir düzenleyici unsur olarak işlediğini anlamak açısından güçlü bir kuramsal araç sağlamaktadır.

Gündelik Yaşamda Benliğin Sunumu (The Presentation of Self in Everyday Life) adlı kitabında Goffman (2021), kamusal yaşamın bir sahneye benzer bir düzen içerisinde işlediğini öne sürmekte ve bireyin kendilik sunumunu tiyatro kuramıyla açıklamaktadır. Bu kuramda toplumsal ilişkiler, performansa dayalı bir etkileşim olarak ele alınmakta ve bu performans esnasında gözler önüne eylem kalıpları ise "rol" ve "rutin" olarak tanımlanmaktadır (Goffman, 2021; 13-27). Goffman'ın (2021) rol ve rutinlere bağlı olarak tanımladığı benlik sunumunda "performans" ve "vitrin" kavramları önemli bir yere sahiptir. Performans kavramı, bir kimsenin belirli bir gözlemci kümesi önünde sürekli bulunduğu, bir süredir gerçekleştirdiği ve gözlemci üzerinde de etkisi bulunan tüm faaliyetleri içermektedir. Vitrin kavramı ise, performans esnasında bireyin istemli ya da istemsiz olarak kullandığı standart ifade biçimleri olarak tanımlanmaktadır (Goffman, 2021; 33). Goffman'a göre (2021; 234) sahnelenen benlik bireyin başkalarına vermeye çalıştığı bir imajdır. Bu imajlar mimari mekanların sunduğu çerçeveler içerisinde sergilenmekte ve bireyler davranışlarını bu çerçevelere göre düzenlemektedir.

Goffman (2017), "Kamusal Alanda İlişkiler, Toplu Yaşamın Mikro İncelemeleri" başlıklı yapıtında, sahnelenen performansların mekansal düzenini kapsamlı biçimde tartışmaktadır. Bu tartışmada Goffman (2017); kişisel alan, benlik sınırları, etkileşim biçimleri, ritüeller, ve toplumsal jestler üzerinden kamusal mekanın kareografisini analiz etmektedir. Goffman'a (2017) göre modern kamusal yaşam, bireylerin birbirini tanımadan ama farkında olarak bir arada bulundukları bir davranış rejimi üretmektedir. Bu rejim ise; görme, duyma, dokunma ve yaklaşma gibi bedensel eylemlerin sınırlarını belirler. Söz konusu sınırlar, mimari düzenle doğrudan ilişkili olmakla birlikte mekanın ölçeği, şeffaflığı, erişilebilirliği ve akış biçimi, bireyin kamusal performansını yönlendirmektedir. Bu bağlamda Goffman'ın (2017) çalışmasında mimarlık, kamusal ilişkilerin yalnızca sahnesi değil, aynı zamanda senaryosunu da belirleyen bir düzenleyici olarak ele alınmaktadır.

Bu çalışma, kamusal mekânın dönüşümü ile mahremiyetin görünürleşmesini incelemek üzere Erving Goffman'ın etkileşim sosyolojisini hem kuramsal bir temel hem de analitik bir yöntem olarak kullanmaktadır. Goffman'ın kamusal yaşamı bir "sahneleme düzeni" olarak ele alan yaklaşımı, bireyin görünürlük stratejilerini, etkileşim ritüellerini ve mekânın bu süreçlerdeki yönlendirici rolünü analiz edebilmek için güçlü bir araç sunar. Bu doğrultuda çalışma, Goffman'ın performans temelli kavramlarını sinemasal temsil aracılığıyla işleyen bir nitel çözümleme yöntemi geliştirmektedir. Sinemanın da toplumsal yaşam gibi bir sahneleme mantığına dayanması, Goffmancı kavramların sinematik mekânın çözümlenmesine uyarlanmasını mümkün kılmakta; böylece kamusal-mekânsal etkileşimin film aracılığıyla nasıl temsil edildiğini incelemek için sağlam bir kuramsal zemin oluşturmaktadır.

## 3. YÖNTEM: GOFFMAN'IN PERFORMANS KURAMINA DAYALI SİNEMATİK MEKAN ANALİZİ

Bu çalışma, kamusal mekânın dönüşümünü ve mahremiyetin görünürleşmesini incelemek amacıyla nitel bir analiz yöntemi benimsemekte; Erving Goffman'ın performans kuramını sinemasal temsilin çözümlenmesine uyarlamaktadır. Sinemanın toplumsal yaşam gibi bir "sahneleme düzeni" kurması, Goffman'ın kavramlarının mekânsal temsilleri okumak için elverişli bir analitik çerçeve sunmasını sağlamaktadır. Bu nedenle yöntem, sinema sahnelerini yalnızca estetik bir anlatı olarak değil, toplumsal etkileşimlerin mimari mekân aracılığıyla düzenlendiği bir davranış alanı olarak değerlendirmeyi amaçlamaktadır.

Çalışmanın yöntemi üç temel aşamadan oluşmaktadır: (1) filmin seçimi, (2) Goffman'ın kavramlarına göre sahneleme çözümlemesi, (3) mekansal performansın yorumlanması. İlk aşamada, kamusal yaşamı, görünürlük rejimlerini ve mahremiyet–kamusallık sınırlarının dönüşümünü temsil eden sinema filmleri taranmış; özellikle kamusal mekânın aktif bir etkileşim yüzeyi olarak kurgulandığı ve bireylerin kamusal davranış kalıplarının belirgin biçimde görünürleştiği yapımlar değerlendirilmiştir. Bu tarama sonucunda çalışma, tek bir film üzerinden derinlemesine bir analiz yürütmeyi amaçlamış ve Playtime (Jacques Tati, 1967) bu bağlamda özel olarak seçilmiştir.

Filmin tercih edilmesinin temel nedeni, modern kentin kamusal mekânını şeffaflık, sürekli gözlenebilirlik ve davranışların mimari tarafından düzenlenmesi ilkeleri üzerinden olağanüstü düzeyde görünür kılmasıdır. Playtime'da cam yüzeylerin hâkimiyeti, gridal mekânsal organizasyon, modüler ofis katları, havalimanı ve fuar gibi modern kamusal mekân

tipolojileri, Goffman'ın "ön sahne/arka sahne" ayrımının neredeyse tamamen çözüldüğü bir düzen üretmektedir. Bu mimari kurgu, bireylerin kamusal performanslarının kesintisiz bir görünürlük alanında gerçekleşmesine, gündelik ritüellerin mekânsal normlarla standartlaşmasına ve mahremiyetin fiziksel olarak askıya alınmasına yol açmaktadır. Bu nedenle Playtime, kamusal etkileşimin mimari tarafından nasıl biçimlendirildiğini hem mekânsal hem davranışsal hem de temsil düzeyinde açık biçimde gösteren ender sinemasal örneklerden biridir. Filmin anlatısının büyük ölçüde kamusal mekânlarda gerçekleşmesi, Goffmancı kavramların sahneleme pratikleri içinde izlenebilirliğini artırmakta; böylece tek-film odaklı yaklaşım, derinlikli ve çok katmanlı bir çözümleme gerçekleştirmeye olanak tanımaktadır.

Filmin analizi; Playtime'daki kamusal sahnelerin Goffman'ın performans, rol, ritüel, izlenim yönetimi ve görünürlük düzenine ilişkin kavramları üzerinden çözümlenmesini; mekânın toplumsal performansı nasıl düzenlediğine ilişkin mekân–beden–bakış ilişkilerinin incelenmesini; modern mimarinin mahremiyet/kamusallık sınırlarını nasıl yeniden ürettiğinin yorumlanmasını içermektedir. Bu doğrultuda analiz; sahne tanımlama, Goffman temelli kodlama ve mekânsal performansın yorumlanması olmak üzere üç aşamalı bir çözümleme kurgusuna dayanmaktadır:

**Sahne Tanımlama:** Playtime'da kamusal mekânı doğrudan sahneleyen ve mimarinin etkileşim düzenini görünür kılan bölümler arasından üç temel mekânsal sekans analiz için seçilmiştir: havalimanı, ofis kompleksi ve sergi alanı. Bu sahneler, Goffman'ın performans kuramının farklı boyutlarını mimari ölçekte en belirgin şekilde görünür kıldıkları için çalışmanın analitik odağını oluşturmaktadır.

- Havalimanı sekansı, modern kamusal mekânlarda bireylerin birbirleriyle düşük yoğunluklu, mesafeli ve geçişken etkileşimler kurduğu bir davranış düzenini görünür kılmaktadır. Playtime'daki havalimanı; geniş görüş alanları, sürekli hareket hâlindeki kalabalık, cam yüzeylerin yarattığı yüksek görünürlük ve akışkan mekânsal organizasyon ile bireyleri hem sürekli izlenebilir kılmakta hem de karşılaşmaları yüzeysel bir ritme indirgemektedir. Bu mimari düzen, modern kamusal yaşamda anonimliği, geçiciliği ve mesafeyi yeniden üreten bir etkileşim modeli oluşturmaktadır. Bu nedenle havalimanı sekansı, kamusal davranış kalıplarının modern mimarlık aracılığıyla nasıl düzenlendiğini sinematik bir kompozisyon içinde göstermesi bakımından analize dâhil edilmiştir.
- Ofis kompleksi sekansı, Goffman'ın (2021) ön sahne, rutin ve rol dağılımı kavramlarının mekânsal olarak en belirgin şekilde kurulduğu bölümdür. Filmdeki modüler ofis düzeni, her bireyin kendine ait küçük bir sahne içinde tekrar eden performanslar sergilediği, mimari olarak belirlenmiş davranış alanları oluşturmaktadır. Bu nedenle ofis kompleksi sekansının, mimarinin sosyal role nasıl yön verdiğini gözlemlemek için temel bir analitik katman sağladığı düşünülmektedir.
- Sergi alanı sekansı, kamusal mekânın teatral bir vitrine dönüştüğü bağlamı temsil etmesi açısından önemlidir. Burada bireyler yalnızca birbirlerine görünmez, aynı zamanda mekânın görsel tüketim ritminin parçası hâline gelmektedir. Bu durum Goffman'ın (2021) performans ve vitrin kavramlarının, modern kültürel mekânlarda nasıl estetikleştiğini sinematik bir düzen içinde göstermektedir. Bu yüzden sergi sahnesi, görünürlük rejiminin üretiliş

biçimini analiz etmek için çalışma kapsamında önemli bir örneklem oluşturur.

**Goffman Temelli Kodlama:** Sahnelerin çözümlenmesinde Goffman'ın çalışmaları temel alınmış ve mekânsal davranışın nasıl örgütlendiğini görünür kılmak amacıyla üç ana kavramsal kategori belirlenmiştir: (1) görünürlük düzenleri, (2) rol ve performans, (3) etkileşim ritüelleri**.**

- *Görünürlük düzenleri,* mekânın etkileşim üzerindeki belirleyiciliğini analiz etmede kritik bir başlangıç noktasıdır. Bu kategori altında; mekânsal örgütlenme ve organizasyonun, bireylerin kamusal etkileşim biçimlerine etkileri araştırılmıştır. Bu bağlamda seçili sekanslarda yer alan mekanlarda bireylerin birbirlerini nasıl gördüğü, göründüğü ve izlenebilirlik üzerinden davranışlarını nasıl ayarladığı araştırılmıştır.
- Rol ve performans, bireylerin bu görünürlük koşulları içinde üstlendikleri işlevsel ya da geçici kimlikleri ve bu kimlikleri mekânın sunduğu sahnelerde nasıl sürdürdüklerini incelemeye olanak tanımaktadır.
- *Etkileşim ritüelleri*, Goffman'ın karşılıklı davranış düzenlerini açıklayan temel kavram seti olarak; bireylerin birbirleriyle kurdukları mikro temasların (nazik geçişler, kaçınma, selamlaşma, telafi jestleri) mekânsal koreografiye nasıl dönüştüğünü analiz etmeyi mümkün kılmaktadır.

**Mekânsal Performansın Yorumlanması:** Goffman temelli kodlama sürecinin ardından, bu aşamada elde edilen bulgular mekânsal performans kavramı çerçevesinde yorumlanmıştır. Bu yorumlama süreci, mekânın toplumsal etkileşimleri nasıl yönlendirdiğini, bireylerin kamusal ve mahrem alanlar arasındaki sınırları hangi mimari düzenekler aracılığıyla deneyimlediğini ve görünürlük rejiminin mekânsal temsil

stratejileriyle nasıl kurulduğunu ortaya koymayı amaçlamaktadır. Böylece kodlama yoluyla tanımlanan davranış örüntülerinin, belirli mekânsal koşullar altında nasıl üretildiği ve sürdürüldüğü analiz edilmiştir.

Bu bağlamda mekân, yalnızca etkileşimlerin gerçekleştiği pasif bir arka plan olarak değil; bireylerin rollerini, hareketlerini ve karşılaşma biçimlerini çerçeveleyen, hatta yönlendiren aktif bir sahneleme aygıtı olarak ele alınmıştır. Kamusal mekânın mimari organizasyonu; görüş alanları, sınır geçirgenlikleri, dolaşım şemaları ve şeffaflık düzeyleri üzerinden, hangi davranışların mümkün, hangilerinin bastırılmış ya da görünmez kılındığını belirleyen bir düzen üretmektedir. Bu düzen, kamusal ve mahrem alanlar arasındaki sınırların kimi zaman keskin biçimde tanımlandığı, kimi zaman ise bilinçli olarak muğlaklaştırıldığı bir mekânsal performans alanı yaratmaktadır.

Bu yorumlama süreci, Playtime'ın sinemasal temsili aracılığıyla modern kentin mimarisinin, toplumsal performansın üretildiği ve denetlendiği aktif bir düzenek olarak nasıl işlediğini görünür kılmayı hedeflemektedir. Tek-film odaklı bu yöntem, kamusal alanın güncel dönüşümlerini; mekânsal kurgu, davranış kalıpları ve temsil stratejileri arasındaki karşılıklı ilişkiyi dikkate alarak bütüncül biçimde değerlendirme imkânı sunmaktadır.

## 4. BULGULAR

Bu bölümde elde edilen bulgular, Goffman temelli kodlama sürecinde tanımlanan üç ana analitik kategori doğrultusunda sunulmuştur: görünürlük düzenleri, rol ve performans ile etkileşim ritüelleri. Bu kategorilere ilişkin her bir başlık altında, Playtime filminden seçilen üç temel mekânsal sekans (havalimanı, ofis kompleksi ve sergi alanı) ayrı ayrı ele alınarak; farklı kamusal mekân tipolojilerinin toplumsal

davranışları nasıl farklı biçimlerde yapılandırdığını görünür kılmak amaçlanmıştır.

### 4.1. Görünürlük Düzenleri

**Havalimanı:** Geniş açıklıklar, sürekli akış hâlindeki kalabalık ve cam yüzeylerin yarattığı yüksek geçirgenlik, bireyleri istemsiz biçimde görünür kılarken; aynı zamanda etkileşimin düşük yoğunluklu ve mesafeli bir ritim içinde sürdürülmesine olanak tanımaktadır. Bu koşullar Goffman'ın (2017;32) "tarama" olarak tanımladığı -mekândaki katılımcı bireylerin birbirlerinin varlığını kısa bir bakışla tanıyıp, ardından dikkatini geri çekerek anonimliği koruduğu- normun işlemesi için ideal bir mekânsal zemin oluşturmaktadır. Böylece havalimanı, yüksek izlenebilirlik ile düşük etkileşim arasındaki modern kamusal dengeyi mimari düzeyde yeniden üretmektedir.




**Şekil 1. Filmdeki havalimanı iç mekânının kamusal etkileşim ve görünürlük ilişkisi**

**Ofis Kompleksi:** Bu sekans, Goffman'ın (2021) performans ve vitrin kavramlarını belirgin biçimde görünür kılmaktadır. Modüler ofis düzeni, her çalışanı işlevsel olarak ayrışmış ancak sürekli görünür olan küçük "ön sahneler"e (set) yerleştirerek; her bireyi kendisine tahsis edilmiş mikro sahnede rutinleşmiş rolünü kesintisiz biçimde sürdürmek zorunda bırakmaktadır. Bu mimari örgütlenme, görünürlüğü yalnızca

mekânsal bir özellik olmaktan çıkararak; performansın sürekliliğini, rolün istikrarını ve davranışın denetlenebilirliğini sağlayan bir kontrol mekanizmasına dönüştürmektedir.




**Şekil 2. Çalışanları sürekli görünür olan modüllere yerleştirerek performansın sürekliliğini ve rol istikrarını mekânsal olarak zorunlu kılan mimari kurgu**

**Sergi Alanı:** Bu sekans, görünürlüğün bir düzenleme ilkesinden çok bir gösteriye dönüştüğü mekânsal bir sahneleme sunmaktadır. Sergi mekânının görsel tüketime dayalı organizasyonu, bireyleri aynı anda hem izleyen hem izlenen konumuna yerleştirerek Goffman'ın (2021) "vitrin" ve "gösterim alanı" kavramlarını sinematik ölçekte somutlaştırmaktadır. Bu bağlamda görünürlük, yalnızca kamusal davranışı düzenleyen bir norm olmaktan çıkarak; mekânın kendisini kuran, estetik olarak dramatize edilen temel bir unsura dönüştürmektedir. Böylece sergi alanı, modern kamusal mekânın performatif doğasının en açık şekilde teşhir edildiği bir görsel sahne hâline gelmektedir.




**Şekil 3. *Playtime*'da sergi alanı: Görünürlüğün vitrinsel bir gösteriye dönüştüğü, bireylerin aynı anda hem izleyen hem izlenen konumunda yer aldığı performatif kamusal mekân**

### 4.2. Rol ve Performans

**Havalimanı:** Bu sekansta yolcular, kişisel öznellikten çok mekânın yönlendirdiği akışlara uyum sağlayan geçici ve anonim roller üstlenmektedir. Bu roller, büyük ölçüde yürüme, bekleme, yön bulma gibi minimum performans gerektiren rutin hareketlerden oluşmaktadır. Goffman'ın (2017) kamusal alanlarda gözlenen düşük yoğunluklu performans repertuvarına karşılık gelen bu durum, bireylerin kamusal görünürlük içinde var olsalar da etkileşimsel olarak nötr ve geçişken bir davranış düzeni benimsemeleriyle karakterizedir.




**Şekil 4. Havalimanı mekânında düşük yoğunluklu kamusal performansların mimari akışlar ve roller aracılığıyla örgütlenmesi**

**Ofis Kompleksi:** Bu sekansta, ofis içinde çalışanlara görevleri doğrultusunda atanan rollerin, mekânın mimari yerleşimiyle örtüşerek düzenli bir işleyiş ürettiği görülmektedir. Her bir çalışan, Goffman'ın (2017;54) kişisel mekan olarak tanımladığı şekilde, kendisine ait çalışma alanında belirli bir davranış repertuvarını tekrarlamaktadır. Böylece mekân, rolün sürekliliğini ve performansın istikrarını destekleyen bir sahneleme düzeni hâline gelmektedir.




**Şekil 5. Sekreter ve danışma pozisyonu ile modüler ofis birimlerine hizmet veren çalışan**

**Sergi Alanı:** Sergi alanında roller, mekânın estetik çerçevesi tarafından yönlendirilmekte ve spontane performanslara açık hale gelmektedir. Bu tarz mekanlarda Goffman'ın (2017;60) "kullanım mekanı" olarak tanımladığı; bireyin hemen etrafında veya önünde bulunan ve oradaki hak iddiasının görünür araçsal ihtiyaçlar dolayısıyla tanındığı bölgeler, ziyaretçilerin rol ve mekan ilişkisini biçimlendirmektedir. Playtime filmindeki sergi alanı sekansında; sergilenen ürünlere ilişkin standların giriş bölgelerinin kullanım mekanı olarak işlevlendiği görülmektedir.




**Şekil 6. Standların giriş bölgelerinin "kullanım mekânı" olarak işlev gördüğü sahne**

### 4.3. Etkileşim Ritüelleri

**Havalimanı:** Yolcular arasındaki nazik yönelme, yol verme, hız ayarlama gibi davranışlar Goffman'ın (2017) destekleyici etkileşim ritüellerinin tipik örnekleri olarak bu sekansta görülmektedir. Burada bireyler, kısa jestlerle akışı sürdürmektedir. Ayrıca havalimanındaki yoğun hareket, çarpışma ihtimalini yükseltmektedir. Bu nedenle geri çekilme, yön değiştirme, sıra bekleme gibi telafi edici ritüeller de bu sekansta dikkat çekmektedir. Film bunları mizahi bir abartıyla sergilemektedir. Bu mekandaki insanların birbirini tanımayan yabancılar olmasına rağmen ortak bir ritim içinde hareket etmesi ise, Goffman'ın (2017) tarif ettiği zayıf bağ işaretlerinin (bakış kaçırma, beden hizalama, sırayı koruma) mekansal bir kareografiye dönüştüğünü göstermektedir. Son olarak Tati'nin mizahı, havalimanındaki bu düzenin içerisine küçük norm sapmaları (yanlış yönelenler, aynı anda dönen kalabalıklar, ritmin bozulması) ekleyerek, normalin kırılganlığını görünür kılmaktadır.




**Şekil 7. Mekan içerisinde yol bulmaya çalışan bir turist kafilesinin bekleme ve sıraya girme davranışı**

**Ofis Kompleksi:** Ofis çalışanları arasındaki baş selamı, nazik geçişler ve kapı tutma davranışları, Goffman'ın (2017) karşılıklılık temelli olumlu ritüellerinin mekân tarafından nasıl standartlaştırıldığını açıkça göstermektedir. Buna karşılık, yanlış kapıya yönelme, çarpışma ihtimali veya masalar arasındaki kaçınma gibi durumlar ise telafi edici ritüelleri devreye sokmaktadır. Özellikle cam yüzeylerin ve modüler mobilyaların hâkim olduğu düzen, hata payını artırarak bu telafi anlarını daha görünür kılmaktadır. Çalışanların birbirini tanıma biçimlerinde ortaya çıkan mekanikleşmiş tokalaşmalar, kısa işaretleşmeler ve içsel hiyerarşiyi belirleyen küçük jestler ise "bağ işaretleri"nin ofis bağlamındaki karşılıklarıdır. Tüm bu pratikler, ofis düzeninin normalliği otomatik tekrarlarla sürekli yeniden ürettiğini; buna karşın Tati'nin, yanlış kişiyle konuşmak, mekânı yanlış okumak ya da cam duvarlara çarpmak gibi norm sapmalarını görünür kılarak; bu mekânsal performansın ne denli kırılgan olduğunu açığa çıkardığını göstermektedir.




**Şekil 8. Filmin ana karakteri Mösyö Hulot'un mekanı yanlış okuyarak bir toplantı salonuna davetsiz girişi**

**Sergi Alanı:** Sergi alanı sekansı, bireyin mekânla kurduğu görünür ve görünmez ilişkilerin teatral bir çerçeveye oturduğu bir düzen sunmaktadır. Bu mekânda birey, sergilenen nesnelerle birlikte adeta bir "gösteri objesi"ne dönüşmekte; yönelimler ve duruşlar vitrin mantığıyla biçimlenmektedir. Buradaki etkileşim pratikleri nazik durma, ürün inceleme ve diğer ziyaretçiye alan açma gibi destekleyici ritüellerle estetikleşirken; sergi mekânı, Goffman'ın olumlu ritüellerinin daha gösterişli ve koreografik hâline sahne olmaktadır. Kalabalığın yoğunlaştığı anlarda çarpışmadan kaçınma, çarpışma sonrası küçük özür jestleri ya da geri çekilme davranışları ise telafi edici ritüelleri belirginleştirmektedir. Ayrıca, satıcı–ziyaretçi temasları, bakış alışverişleri ve stand çevresinde oluşan geçici kümelenmeler, bu alanda anlık ve kırılgan bağ işaretleri üretmektedir. Ancak mekânın vitrinsel düzeni, "normal davranış"ı bile teatral bir gösteriye dönüştürmektedir. Tati, yanlış standı inceleme, nesneyi yanlış yorumlama veya gösterim ritminin bozulması gibi küçük sapmalarla bu yapay düzeni kırarak sergi alanının performatif doğasını görünür kılmaktadır.




**Şekil 9. Sergi mekanındaki bir ürünün tanıtımı esnasında oluşan rastlantısal topluluk**

### 4.4. Mekânsal Performansın Yorumlanması

Playtime'da görünürlük düzenleri, rol ve performans ile etkileşim ritüelleri üzerinden elde edilen bulgular birlikte ele alındığında, modern kamusal mekânın nötr bir kullanım alanı olmaktan ziyade, toplumsal davranışları üreten ve denetleyen bir sahneleme aygıtı olarak işlediği görülmektedir. Filmde mimari, bireysel eylemlerin yalnızca gerçekleştiği bir zemin değil; hangi davranışların mümkün, hangilerinin "normal" ya da sapma olarak algılanacağını belirleyen kurucu bir düzenek olarak ortaya çıkmaktadır. Bu yönüyle mekân, Goffman'ın gündelik yaşamı sahnelenmiş bir etkinlik olarak tanımlayan yaklaşımının somutlaştığı temel aktörlerden biri hâline gelmektedir.

Playtime filminde yer alan havalimanı, ofis kompleksi ve sergi alanı, kamusal performansın farklı yoğunluklarda ve farklı denetim biçimleriyle üretildiği mekânsal sahneler sunmaktadır. Havalimanı sekansında görülen iç mekânlar, akışkan ve geçirgen yapısı ile bireyleri sürekli görünür kılarken; etkileşimi yüzeysel ve geçici bir düzeyde tutmaktadır. Ofis kompleksinde yer alan çalışma birimleri ise modüler ve tekrarlı mimari dokusuyla, rol dağılımını sabitleyerek adeta performansın sürekliliğini zorunlu kılmaktadır. Son olarak sergi alanı sekansında oluşturulan vitrinsel mimari kurgu, görünürlüğü estetikleştirerek; gündelik

davranışları teatral bir gösteriye dönüştürmektedir. Bu bağlamda incelenen bu üç mekân, kamusal performansın tek tip değil, mimari organizasyonun biçimine göre farklılaşan bir üretim süreci olduğunu incelikli bir şekilde ortaya koymaktadır.

Seçili sekanslardaki kamusal ve mahrem alanlar arasındaki sınırların ise fiziksel ayrımlardan ziyade, görünürlük dereceleri ve davranışın izlenebilirliği üzerinden kurulduğu görülmektedir. İç mekânlardaki cam yüzeyler, açık planlar ve süreklilik arz eden dolaşım şemaları, bireyin geri çekilme olanağını sınırlayarak mahremiyetin mekânsal olarak aşındığı kamusal bir düzen üretmektedir. Bu durum, bireyleri yalnızca görünür kılmakla kalmayarak; aynı zamanda davranışlarını sürekli olarak ayarlamaya, düzeltmeye ve normlara uyumlu hâle getirmeye zorlayan bir performans baskısı yaratmaktadır. Böylece mekân, davranışın hem sahnesi hem de denetim aracına dönüşmektedir. Ancak Tati'nin sinemasal yaklaşımı, bu düzeni doğal ya da sorunsuz bir yapı olarak sunmak yerine, sürekli olarak küçük kırılmalar üzerinden görünür kılmaktadır. Yanlış yönlenen bedenler, cam duvarlara çarpan figürler, senkronize olamayan kalabalıklar ve vitrinsel mantığı bozan jestler, mekânsal performansın ne kadar kırılgan ve yapay olduğunu açığa çıkarmaktadır. Bu sapmalar ile Tati, modernizmin oluşturduğu bu kamusal düzenin kendiliğinden değil; aksine sürekli tekrar, uyum ve disiplin gerektiren bir sahneleme olduğunu alaycı bir dille ifşa etmektedir.

Bu çerçevede Playtime, modern kamusal mekânın rasyonel, şeffaf ve düzenli olduğu varsayımını eleştirel bir biçimde tersyüz etmektedir. Mimarlık, burada ilerleme ve verimlilik ideallerinin taşıyıcısı olduğu kadar, bireysel öznelliği bastıran ve davranışı standartlaştıran bir mekanizma olarak da görünür hâle gelmektedir. Mekânsal performans, bireyin bilinçli temsiline değil; mimarinin dayattığı görünürlük rejimleri, rol

çerçeveleri ve etkileşim ritimleri içinde otomatikleşen bir gündelik yaşama işaret etmektedir.

## 5. SONUÇ

Playtime üzerinden elde edilen bulgular, Erving Goffman'ın gündelik yaşamı "sahnelenmiş bir faaliyet dizisi" olarak kavramsallaştıran yaklaşımının, modern mimarlık ve kamusal mekân bağlamında güçlü bir mekânsal karşılık bulduğunu göstermektedir. Goffman'ın bireyler arası etkileşime odaklanan mikro-sosyolojik çerçevesi, bu çalışma kapsamında mimari düzenekler aracılığıyla genişletilerek; kamusal davranışların yalnızca kişiler arası ilişkilerle değil, mekânsal organizasyonlar tarafından da üretildiğini ortaya koymaktadır. Böylece performans, bireysel niyetlerden çok, mimarinin sunduğu görünürlük koşulları, dolaşım şemaları ve davranış normları içinde şekillenen bir toplumsal pratik olarak okunmaktadır (Goffman, 2017; 2021).

Bu okuma, Henri Lefebvre'in mekânın toplumsal olarak üretildiği yönündeki yaklaşımıyla doğrudan ilişkilendirilebilir. Lefebvre'e (2014) göre mekân, edilgen bir kap değil; toplumsal ilişkilerin üretildiği, yeniden düzenlendiği ve ideolojik olarak yüklü bir yapıdır. *Playtime*'da havalimanı, ofis ve sergi alanı gibi modern kamusal mekânlar, tam da bu anlamda, belirli davranış biçimlerini mümkün kılan ve diğerlerini dışlayan mekânsal pratikler üretmektedir. Filmde mimari, görünürlüğü artıran ancak etkileşimi yüzeyselleştiren bir düzen kurarak, modern kentsel yaşamın rasyonelleşmiş ve denetimli doğasını görünür kılmaktadır.

Buna paralel olarak, Michel Foucault'nun gözetim ve disiplin kavramları da *Playtime*'daki mekânsal performans rejimlerini anlamak için önemli bir teorik arka plan sunmaktadır. Cam yüzeyler, açık planlar ve kesintisiz görüş alanları, bireyin

sürekli izlenebilir olduğu bir kamusal düzen üretirken; bu durum davranışların içselleştirilmiş bir denetim altında sürdürülmesine yol açmaktadır (Foucault, 2012). Ancak *Playtime*, bu gözetim rejimini açık bir baskı mekanizması olarak değil, gündelik yaşamın "normal" akışı içinde görünmezleşen bir düzen olarak temsil etmektedir. Bu yönüyle film, disiplini zorlayıcı değil; alışkanlıklar ve tekrarlar yoluyla işleyen bir mekanizma olarak ele almaktadır. Öte yandan, sergi alanında belirginleşen vitrinsel mekânsal kurgu, Guy Debord'un "gösteri toplumu" kavramıyla ilişkilendirilebilir. Debord'a (1996) göre modern toplumda toplumsal ilişkiler giderek temsiller aracılığıyla kurulmakta; bireyler hem izleyici hem de gösterinin bir parçası hâline gelmektedir. *Playtime*'daki sergi sekansı, görünürlüğün yalnızca davranışı düzenleyen bir norm değil, başlı başına estetikleştirilmiş bir gösteri unsuruna dönüştüğünü ortaya koymaktadır. Bu bağlamda kamusal mekân, gündelik hayatın teatralleştirildiği bir vitrin işlevi görmektedir.

Bu kuramsal çerçeve içinde *Playtime*, modernist mimarlığın rasyonellik, şeffaflık ve düzen ideallerini sorgulayan eleştirel bir temsil sunmaktadır. Film, mimarlığı ilerleme ve verimlilik söylemleriyle ilişkilendirirken, aynı zamanda bu düzenin bireysel öznelliği nasıl bastırdığını ve davranışları nasıl standartlaştırdığını görünür kılmaktadır. Goffman'ın performans kavramı, bu bağlamda yalnızca kişiler arası etkileşimleri değil; mimari aracılığıyla kurulan daha geniş bir kamusal disiplin rejimini okumak için işlevsel hâle gelmektedir.

Sonuç olarak bu çalışma, Goffman'ın mikro ölçekte geliştirdiği etkileşim kuramını, sinemasal temsil ve mimari analiz yoluyla mekânsal bir düzleme taşımaktadır. *Playtime*, modern kamusal mekânın yalnızca toplumsal yaşamın gerçekleştiği bir alan değil; bu yaşamı biçimlendiren, sınırlayan ve yeniden üreten bir performans rejimi olduğunu göstermektedir. Bu yönüyle film, modern kent deneyimine dair eleştirel bir düşünme zemini

sunarken, mimarlığın toplumsal davranış üzerindeki kurucu rolünü yeniden tartışmaya açmaktadır.

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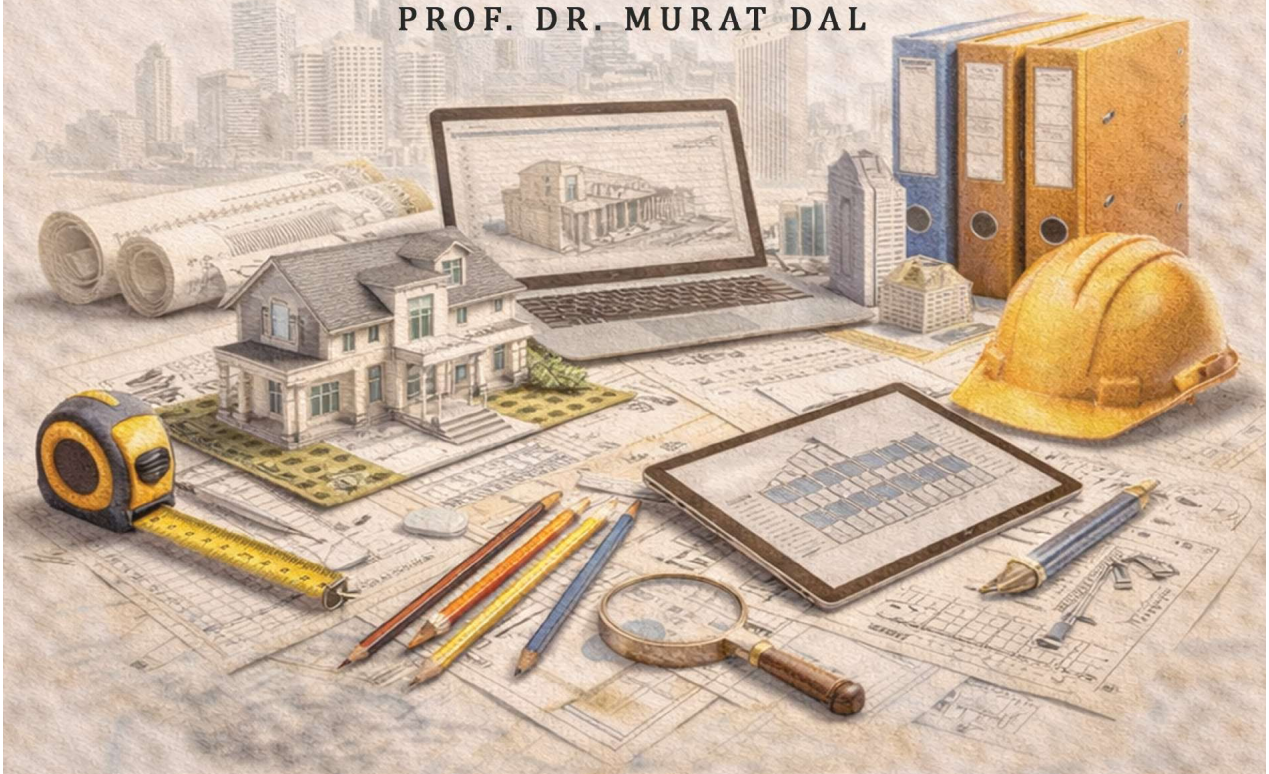

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# MİMARLIK PLANLAMA VE TASARIM ALANINDA ULUSLARARASI DERLEME, ARAŞTIRMA VE ÇALIŞMALAR

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## YAPAY ZEKANIN GÖRÜNTÜ TABANLI MODELLEMEDE KULLANIMI ÜZERİNE BİR İNCELEME: ADOBE FIREFLY ÖRNEĞİ

*Osman Ziyaettin YAĞCI[1], Omar FARS[2]*

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## GİRİŞ:

Günümüzde yapay zekâ temelli araçlar, birçok farklı disiplinde olduğu gibi mimarlık alanında da üretim, analiz ve belgeleme süreçlerini kolaylaştıran önemli olanaklar sunmaktadır. Bu çalışma kapsamında, tarihi yapıların mimari dokusunun dijital ortamda yeniden canlandırılması ve söz konusu mimari mirasın gelecek kuşaklara aktarılmasına yönelik yöntemlerin araştırılması amaçlanmaktadır. Bu doğrultuda gerçekleştirilen çalışmaların, restorasyon ve koruma projelerine veri altyapısı oluşturabilecek nitelikte katkılar sağlaması hedeflenmektedir.

Tarihi yapılar, ait oldukları dönemin kültürel, sosyal ve teknolojik birikimini yansıtan önemli belgeler niteliğindedir. Ancak zaman içerisinde maruz kaldıkları doğal etkenler ve insan kaynaklı müdahaleler nedeniyle bu yapılar fiziksel bozulma, kısmi kayıp ya da tamamen yok olma riskiyle karşı karşıya kalmaktadır. Bu durum, mimari mirasın belgelenmesini ve korunmasını güncel ve acil bir gereklilik haline getirmektedir. Bu bağlamda, yapay zekâ destekli dijital üretim teknikleri, tarihi yapıların korunması ve yeniden yorumlanmasına yönelik yenilikçi yaklaşımlar sunmaktadır.

Özellikle görüntü üretimi ve görsel tamamlama alanında geliştirilen yapay zekâ tabanlı araçlar, tarihi yapıların mevcut veriler ışığında yeniden canlandırılmasına olanak tanımaktadır. Adobe Firefly gibi üretken yapay zekâ teknolojileri, tarihi fotoğraflar, çizimler ve arşiv materyalleri üzerinden yapıların mimari karakterinin dijital ortamda yeniden yorumlanmasını mümkün kılmaktadır. Bu tür dijital uygulamalar, geleneksel mimari miras değerlerini çağdaş teknolojilerle bir araya getirerek hem koruma süreçlerine hem de dijital arşivleme çalışmalarına katkı sunmaktadır. Bu yaklaşım, kültürel mirasın erişilebilirliğini artırmakla birlikte sürdürülebilir turizm ve mimarlık tarihi araştırmaları açısından da önemli bir potansiyel taşımaktadır.

Söz konusu teknik yaklaşım, tarihi ve eski yapıların fotoğraflar aracılığıyla yeniden üretilmesine dayanmakta olup, Görüntü Tabanlı Modelleme (Image-Based Modeling) yönteminin bir parçası olarak değerlendirilmektedir. Bu yöntem, yapıların günümüze ulaşan fotoğrafları, çizimleri veya fiziksel kalıntıları gibi heterojen verilerden yararlanarak mimari belgeleme sürecine katkı sağlamaktadır. Yapay zekâ destekli üretim teknikleri, kısa sürede yapı hakkında ön bir tasarım ve temel bir görsel temsil sunarak daha ayrıntılı üç boyutlu modelleme süreçleri için bir başlangıç zemini oluşturmaktadır.

Bu süreç, büyük ölçüde görsel veriler ve yapay zekâ algoritmaları üzerine kuruludur. Bu yönüyle, daha fazla zaman, uzmanlık ve ekipman

gerektiren ayrıntılı üç boyutlu belgeleme ve modelleme çalışmalarına destekleyici bir altlık sunmakta; kültürel mirasın korunması ve yeniden yorumlanması süreçlerinde etkin bir araç olarak öne çıkmaktadır.

Kültürel mirasın üç boyutlu modellemesinde, Fotogrametri tekniklerinin gelişmesi, yüksek çözünürlüklü kameralar sayesinde hassas görüntüler yakalamak için yaygın olarak kullanılan insansız hava araçları (İHA) kullanılarak veri üretilmesini mümkün hale getirerek, onları 3 boyutlu haritalama ve modelleme uygulamaları için ideal hale getirmiştir. (Güler, M. E.2019)

*Tablo.1. Görüntü Tabanlı Modelleme Aşamaları (Güler, M. E.2019)*

| | |
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| 1. | Çalışma Alanı Belirleme |
| 2. | Donanım ve Kamera Kalibrasyonu |
| 3. | Yer Kontrol Noktalarının Belirlenmesi |
| 4. | İHA Uçuş Planı Hazırlama |
| 5. | İHA ile Fotoğraf Çekimi ve Veri Toplama |
| 6. | Hava Fotoğraflarının Seçilmesi ve Yazılıma Aktarılması |
| 7. | Hava Fotoğraflarından Özelliklerin Çıkarılması |
| 8. | Özelliklerin Eşleştirilmesi |
| 9. | Demet Dengelemesi |
| 10. | Seyrek ve Yoğun Nokta Bulutlarının Oluşturulması |
| 11. | Koordinatlandırma |
| 12. | Yüzey Modeli Oluşturulması |
| 13. | Görselleştirme |
| 14. | Sonuç Ürünlerinin Elde Edilmesi |

Görüntü Tabanlı modelleme **(Image Based Modeling IBM),** zamanla yok olabilecek karmaşık tarihi kültürel mirası anlamanın etkili bir yolunu sağlar. Geçmişte büyük emeklerle inşa edilen tarihi eserlerin korunmasına, belgelenmesine ve gelecek nesillere aktarılmasına da önemli katkı sağlıyor. (Turan, 2004)

### 1.1. Yapay Zeka Kavramı

2022 ve 2023 yıllarında yapay zekâ (AI) kavramı; endüstriyel uygulamalar, kamu kurumları ve akademik araştırmalar bağlamında belirgin bir görünürlük kazanmış olsa da, kavrama ilişkin standart ve uzlaşıya dayalı tanımların hâlen sınırlı olduğu görülmektedir. Mevcut tanımların büyük bir bölümü, yapay zekâyı insan zekâsına özgü bilgi işleme, öğrenme ve karar verme süreçleriyle ilişkilendirerek açıklamaktadır (Nitzberg

ve Zysman, 2022). Bu bağlamda yapay zekâ, insan zihninin bilişsel işleyişini referans alarak, bilgisayarların belirli görevleri daha akıllı ve özerk biçimde yerine getirmesini sağlayan sistemler bütünü olarak tanımlanmaktadır (Shahkarami vd., 2014).

### 1.2. Yapay Zekanın Tarihi

Cansız nesnelerin akıllı varlıklara dönüştürülmesi fikri, kökenlerini antik çağ düşüncelerine kadar uzanan bir geçmişe sahiptir. Ancak yapay zekâ kavramı, bilimsel ve kuramsal bir çerçevede ilk kez 1950'li yıllarda ele alınmaya başlanmış; bu dönemde edebiyat ve sinema aracılığıyla da toplumsal bir görünürlük kazanmıştır. 1950 yılında Claude Shannon, bir bilgisayarın satranç oynayabilecek biçimde programlanmasına yönelik yayımladığı çalışmasıyla, makinelerin karmaşık karar süreçlerini gerçekleştirebileceğini ortaya koymuştur. Aynı yıl Alan Turing, makinelerin düşünme yetisine sahip olup olamayacağına ilişkin görüşlerini paylaşarak, yapay zekâ tartışmalarının kuramsal temelini atmıştır.

Yapay zekâ alanı, bu erken dönem düşünsel ve deneysel çalışmalarına rağmen, 1956 yılına kadar bağımsız ve tanımlı bir araştırma alanı olarak kurumsallaşmamıştır. Bu yıl düzenlenen ilk yapay zekâ konferansı ile alan resmî olarak tanımlanmış ve disiplinlerarası bir araştırma sahası haline gelmiştir (Javatpoint, 2023). 1965 ile 1970 yılları arasındaki dönem, teknik sınırlılıklar ve beklentilerin karşılanamaması nedeniyle yapay zekâ araştırmaları açısından durgunluk dönemi olarak değerlendirilmekte; literatürde bu süreç "karanlık dönem" olarak tanımlanmaktadır. Buna karşın, 1970–1975 yılları arasında yaşanan ve "Rönesans Dönemi" olarak adlandırılan süreçte, özellikle tıp gibi uygulamalı alanlarda elde edilen somut başarılar sayesinde modern yapay zekâ yaklaşımlarının temelleri atılmıştır (Mijwil, 2015).

### 1.3. Safranbolu Tarihi

Paleolitik Çağ'dan itibaren farklı medeniyetlere yerleşim alanı olmuş Safranbolu, bol su kaynaklarına ve verimli tarım alanlarına sahip bir vadi yamacında konumlanmaktadır. Coğrafi avantajları sayesinde tarih boyunca önemli bir yerleşim merkezi olma özelliğini sürdüren kent, Hititler'den Roma'ya, Bizans'tan Osmanlı'ya kadar pek çok uygarlığın izlerini bünyesinde barındırmaktadır. Safranbolu'ya ilişkin bilinen en erken yazılı belgeler Roma İmparatorluk Dönemi'ne tarihlenmekte olup, kentin tarihsel süreç içerisinde farklı kültürlerin etkileşim alanı olduğu anlaşılmaktadır (Oral, 2019).

Batılı kaynaklarda Safranbolu'nun tarihsel kökenlerine ilişkin çeşitli görüşler ileri sürülmekle birlikte, Bizans döneminde bölgenin Dadybra

adıyla anıldığı bilinmektedir. 1100 yılında Danişmentoğulları'nın hâkimiyetine giren Safranbolu, bu dönemde Türk kültürüyle tanışmıştır. 13. yüzyılda Çobanoğulları'nın, 14. yüzyılda ise Candaroğulları'nın yönetimi altına giren kent, 1392 yılında Osmanlı Devleti'nin Candaroğulları ile gerçekleştirdiği savaşın ardından Osmanlı topraklarına katılmıştır. Osmanlı egemenliğiyle birlikte kentin adı zaman içerisinde değişime uğramış; önce Zalifre, ardından Borlu ve Taraklıborlu olarak anılmış, 18. yüzyılda Zağfiran-ı Bolu, 19. yüzyılda Zağfiranbolu adını almış ve Cumhuriyet döneminde Safranbolu olarak kesinleşmiştir. Kent, 1927 yılında Zonguldak'a, 1955 yılında ise Karabük'e bağlı ilçe statüsüne kavuşmuştur (Oral, 2019).

Safranbolu'nun tarihsel çekirdeğini oluşturan Şehir Merkezi (Eski Çarşı), Akçasu ve Gümüş derelerinin birleştiği üçgen alan içerisinde yer almakta olup, kentin en yoğun tarihsel ve mimari değerlerini barındıran bölgesi konumundadır. Safranbolu, 8 Ekim 1976 tarihinde Kültür ve Turizm Bakanlığı Gayrimenkul Eski Eserler ve Anıtlar Yüksek Kurulu tarafından koruma altına alınarak kentsel sit alanı ilan edilmiştir. 2 Mayıs 1985 tarihinde ise Bağlar ve Çarşı bölgelerinde yer alan kentsel sit alanları ile doğal sit sınırları içerisindeki 810 sivil mimari yapı ve 165 anıt eser, Taşınmaz Kültür Varlıkları Yüksek Kurulu tarafından tescil edilmiştir. Kentin Koruma Amaçlı İmar Planı 1991 yılında kabul edilmiş ve Safranbolu, 1994 yılında UNESCO Dünya Kültür Mirası Listesi'ne dâhil edilmiştir (Oral, 2019).

Safranbolu'nun tarihi dokusu, Osmanlı dönemi sivil mimarisinin özgün ve nitelikli örneklerini yansıtan geleneksel konut yapıları ile öne çıkmaktadır. Ahşap karkas sistemle inşa edilen, taş temeller üzerine oturan ve cumbalı cephe düzenlemeleriyle karakter kazanan bu yapılar, estetik değerlerinin yanı sıra işlevsel çözümleriyle de dikkat çekmektedir. Dar sokak dokusu, hanlar, camiler, hamamlar ve çeşmelerle birlikte Safranbolu, bütüncül bir tarihsel çevre niteliği taşımakta ve açık hava müzesi görünümü sunmaktadır. Korunmuş kentsel doku ve mimari miras, kentin tarihsel sürekliliğini günümüze taşıyarak kültürel kimliğinin temel bileşenlerinden biri olmayı sürdürmektedir (Oral, 2019).

### 1.4. Safranbolu Evleri'nin Genel Özellikleri:

Safranbolu evlerinin cephe düzenlemelerinde cumbalı çıkmalar, kentsel silueti tanımlayan en karakteristik mimari öğeler arasında yer almaktadır (Eraslan & Mutlu, 2024). Çıkmalar; yapı köşelerinde, cephe ortasında ya da üçgen formda gelişen ve literatürde "gönye çıkma" olarak adlandırılan biçimlerde uygulanabilmektedir. Üst katların kütlesel bi-

çimlenişini belirleyen bu öğeler, yapı ile sokak arasında ölçekli ve uyumlu bir geçiş sağlamaktadır (Eraslan & Mutlu, 2024).

Cephelerde pencere düzenlemeleri, Safranbolu konutlarının hem işlevsel hem de estetik özelliklerini yansıtan önemli unsurlar arasında yer almaktadır. Yapılar genellikle çok sayıda pencereye sahip olup, köşe odalarında altı, çıkmalarda dört ya da beş, çardak eyvanlarında ise ikişer pencerenin yer aldığı düzenlemeler görülmektedir (Eraslan & Mutlu, 2024).

Safranbolu evleri, Türk konut mimarisinin geleneksel plan tipolojileri kapsamında değerlendirilen dış sofalı, iç sofalı ve orta sofalı plan düzenlerine uygun örnekler sunmaktadır (Bozkurt & Altınçekiç, 2013; Şahin & Dinçer, 2024). Bu yapılarda, odaların bir sofa etrafında dizildiği ya da karşılıklı konumlandığı plan şemaları yaygın olarak görülmekte; mekânsal kurguda simetrik düzen anlayışı belirgin bir biçimde öne çıkmaktadır (Bozkurt & Altınçekiç, 2013; Bozkurt, 2013; Şahin & Dinçer, 2024). Sofa, hem dolaşım alanı hem de ortak yaşam mekânı olarak konutun mekânsal organizasyonunda merkezi bir rol üstlenmektedir.

Safranbolu evlerinde kat düzeni genellikle zemin kat, ara kat (kışlık kat) ve üst kat olmak üzere üç kademeli bir yapı göstermektedir (Bozkurt & Altınçekiç, 2013). Zemin kat daha çok servis mekânlarını barındırırken, ara kat gündelik kullanım ihtiyaçlarına cevap veren yaşam alanları olarak düzenlenmiştir. Üst kat ise evin en önemli ortak yaşam alanı olarak kabul edilmekte ve konutun sosyal işlevlerinin yoğunlaştığı bölümünü oluşturmaktadır (Bozkurt & Altınçekiç, 2013; Bozkurt, 2013). Orta kat odaları gündüz kullanımına ayrılırken, üst kat odalarının misafirler veya yeni evliler için planlandığı görülmektedir (Bozkurt, 2013).

Safranbolu konutlarında odalar, evin en temel mekânsal birimi olarak tasarlanmış olup, bir ailenin tüm yaşamsal gereksinimlerini karşılayabilecek niteliktedir. Bu mekânlar genellikle kare ya da kareye yakın dikdörtgen planlı olarak düzenlenmiş; üst katlarda oda yükseklikleri 3 metrenin üzerine çıkarken, orta katlarda bu yüksekliklerin 2,30–3,00 metre aralığında değiştiği gözlemlenmiştir (Bozkurt, 2013). Odaların konumlandırılmasında gün ışığından azami ölçüde yararlanılması ve manzara ile görsel ilişkinin güçlendirilmesi temel tasarım ilkeleri arasında yer almaktadır (Şahin & Dinçer, 2024).

İç mekân donanımı açısından Safranbolu evleri, zengin ahşap işçiliği ve işlevsel detaylarıyla dikkat çekmektedir. Odalarda ocaklar, çiçeklikler, sedirler, gusülhaneler, yüklükler, dolaplar, oyma raflar (gözgöreler) ve paravanlar gibi çok sayıda mimari eleman yer almaktadır (Karataş & Özköse, 2025). Özellikle Barok ve Ampir sanat akımlarının etkisiyle

ahşap süslemelerde eğrisel hatlar, üçgen alınlıklar, S ve C kıvrımları ile daire ve düz kemer formlarının kullanıldığı görülmektedir (Bozkurt, 2013). Tavan yüzeylerinde ise çıtakâri tekniğiyle oluşturulmuş bezemeler, mekânın estetik niteliğini güçlendiren önemli unsurlar arasında yer almaktadır (Karataş & Özköse, 2025).

Safranbolu evlerinde sıra odalar nadiren bulunur. Daha çok köşe odalar yaygındır ve merkezi plan tipi hâkimdir. Bu evler, çevredeki plan tipolojisiyle uyum içindedir. Dış duvarların bazıları sıvalı, bazıları ise sıvasız bırakılmıştır. Evlerin çıkmaları ahşap eli böğründeler ve payandalarla desteklenmiştir. Safranbolu konaklarının iç mekânlarında sedir, eyvan, seki, dolap, gusülhane, oymalar ve sergenler gibi unsurlar bulunur. Evlerin cephelerinde ise pencereler, kara kapaklar, ev çeşmeleri, kazan ocakları, kapılar, kilitler, sofalar, eyvanlar, oda girişleri ve ocaklar geleneksel yapı unsurlarıdır(Oral,2019).

## 2. Adobe Firefly

Adobe Firefly, Adobe tarafından geliştirilen ve çevrim içi ortamda çalışan yapay zekâ destekli bir üretken tasarım sistemidir. Sistem, metin ve görsel tabanlı içerik üretimine yönelik araçlardan oluşmakta olup, özellikle yaratıcı iş akışlarının hızlandırılmasını ve kullanıcı müdahalesinin azaltılmasını hedeflemektedir. Firefly; metinden görüntü oluşturma, metin efektleri üretme ve vektör grafiklerin yeniden renklendirilmesi gibi işlevleriyle görsel üretim süreçlerinde esnek ve hızlı çözümler sunmaktadır.

Firefly, Adobe'nin Photoshop, Illustrator ve Lightroom gibi yaygın olarak kullanılan tasarım yazılımlarına entegre bir biçimde çalışmakta; bu sayede kullanıcıların mevcut üretim süreçleriyle uyumlu bir deneyim sağlamaktadır. Özellikle Photoshop ortamında yer alan Üretken Dolgu (Generative Fill) ve Üretken Genişletme (Generative Expand) gibi araçlar sayesinde, görsellerin bağlamsal bütünlüğü korunarak daha zengin, tutarlı ve gerçekçi görsel çıktılar elde edilebilmektedir. Bu özellikler, görsel tamamlama, eksik alanların yeniden üretilmesi ve sahne bütünlüğünün güçlendirilmesi gibi işlemlerde yapay zekânın aktif bir üretim aracı olarak kullanılmasına olanak tanımaktadır (URL1).

### 2.2. Adobe Firefly Arayüzü

Şekil 1'de şematik olarak gösterildiği üzere, Adobe Firefly aracılığıyla görsel üretim süreci belirli aşamalardan oluşmaktadır. Bu süreçte ilk olarak, oluşturulmak istenen görsele ilişkin betimleyici metin (prompt) girilmektedir. Ardından programın kullanılacak sürümü belirlenmekte, görselin boyutları seçilmekte ve üretilecek çıktının türü (fotoğraf gerçek-

liğinde görüntü ya da sanatsal çizim) tanımlanmaktadır. Son aşamada ise kompozisyon düzeni ile çekim açısı belirlenmekte; girilen metnin, yapay zekâ tarafından benzer görseller üretilebilmesi için referans oluşturması sağlanmaktadır (URL2).




**Şekil 1.** *Metinden Görüntü*

Adobe Firefly platformunda fotoğraftan ya da metinden görsel üretimi için iki temel yöntem bulunmaktadır. İlk yöntemde, metin girdisi kullanılarak doğrudan görsel üretimi gerçekleştirilmekte; ikinci yöntemde ise Üretken Dolgu (Generative Fill) aracı kullanılarak elde edilen görsel üzerinde bağlamsal düzenlemeler yapılabilmektedir. Bu çalışma kapsamında, görsel üretim sürecinin potansiyelini değerlendirmek amacıyla özellikle "Metinden Görüntü" sekmesi üzerinden denemeler gerçekleştirilmiştir. "Metinden Görüntü" sekmesi kullanılarak Adobe Firefly Image Modeli sayesinde, daha iyi kompozisyonlar, fotoğraf gerçekliğinde ayrıntılar, iyileştirilmiş ortam ve aydınlatma ile daha yüksek kalitede görseller oluşturulabilmektedir.

"Metinden Görüntü" sekmesi kullanılarak Adobe Firefly Image Modeli aracılığıyla, gelişmiş kompozisyon seçenekleri, fotoğraf gerçekliğine yakın ayrıntılar, iyileştirilmiş çevresel bağlam ve aydınlatma koşulları ile yüksek çözünürlüklü görseller üretilebilmektedir. Buna ek olarak, "Üretken Dolgu" sekmesi, Adobe Firefly Image Modeli'nin en güncel sürümüyle birlikte sunulan gelişmiş üretken dolgu özellikleri sayesinde, mevcut görsellerin bağlamsal bütünlüğü korunarak daha zengin ve gerçekçi görsel çıktılar elde edilmesine olanak tanımaktadır (URL2).

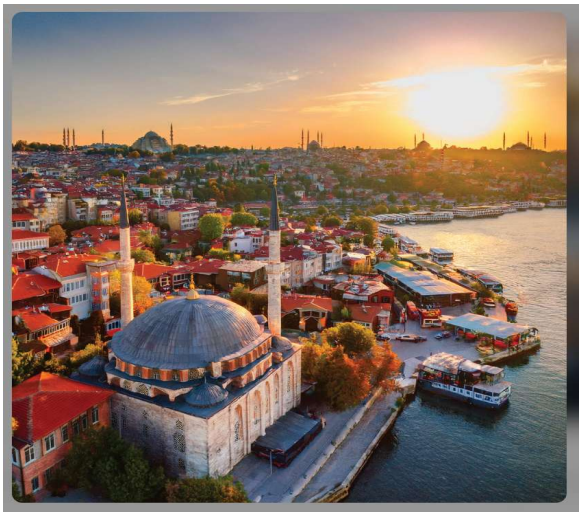
Uygulama sürecine örnek teşkil etmesi amacıyla, Adobe Firefly platformunda "Metinden Görüntü" alanına İngilizce olarak "Drone view of a historic Turkish neighborhood with Turkish houses and a mosque in the middle on the river bank. Photographed during the golden hour in

the evening." ifadesi girilmiştir. Bu komut doğrultusunda elde edilen görsellerden biri Şekil 2'de sunulmaktadır. Komut girildikten sonra sistem, kullanıcıya dört farklı görsel alternatif sunmakta; bu seçenekler arasından tercih edilen görsel üzerinde ek düzenlemeler yapılabilmektedir.

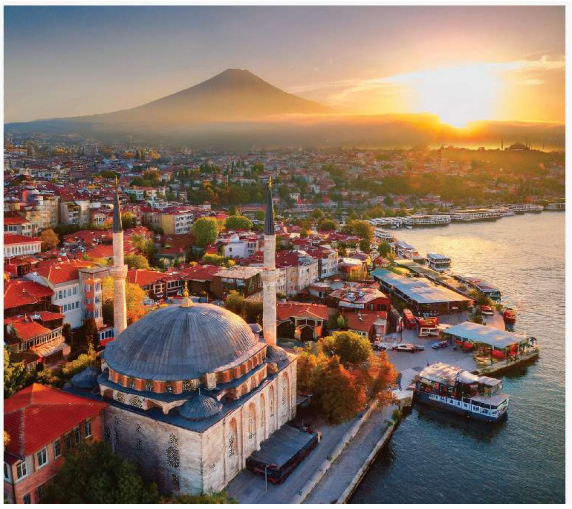
Bu kapsamda, Şekil 2'de yer alan dört görsel arasından Şekil 3'te gösterilen çıktı seçilmiş ve Üretken Dolgu (Generative Fill) aracı kullanılarak yeniden düzenlenmiştir. Seçilen görselin arka planına "mountain with active volcano" ("aktif volkanik dağ") komutu girilerek, sahneye yeni bir çevresel öğe eklenmiş ve elde edilen sonuç Şekil 4'te sunulmuştur. Bu işlem, Adobe Firefly'nin bağlamsal üretim ve görsel bütünlük oluşturma kapasitesini ortaya koyması açısından önemli bir örnek teşkil etmektedir.



**Şekil 2.** *Metinden Görüntü Özelliğiyle Elde Edilen Görüntü*



**Şekil 3.** *Metinden Görüntü İşleminden Sonra Seçilen Fotoğraf*



**Şekil 4.***Üretken Dolgu Özelliğinde Yapılan Eklenti*

Adobe Firefly ile görsel üretim sürecinde, kullanıcıya çeşitli kişiselleştirme olanakları sunulmaktadır. Bu kapsamda içerik türü sanat veya fotoğraf olarak belirlenebilmekte; referans fotoğrafı eklenerek kompozisyonun yönlendirilmesi sağlanabilmektedir. Ayrıca stil yoğunluğu ayarlanabilmekte ve referans görseller aracılığıyla üretilecek görselin biçimsel karakteri kontrol edilebilmektedir. Efekt seçenekleri arasında "Hareketler" kategorisinden Fantezi, "Temalar" başlığı altından ise Dijital Sanat gibi tercihler yapılabilmektedir. Renk ve ton ayarlarında pastel renkler seçilebilirken, aydınlatma sürreal bir atmosfer oluşturacak biçimde düzenlenebilmekte; kamera açısı ise alan derinliği sığ tutulacak

şekilde tanımlanabilmektedir. Bu parametreler doğrultusunda, yüksek düzeyde kişiselleştirilmiş ve ayrıntı açısından zengin görsel çıktılar elde edilebilmektedir (URL1).

Uygulama çalışması kapsamında, Karabük il sınırları içerisinde yer alan bazı tarihi yapılar üzerinde Adobe Firefly'nin cephe dokusu oluşturma ve görsel yorumlama potansiyeli test edilmiştir. Bu doğrultuda incelenen ilk örnek, Konarı Köyü'nde bulunan geleneksel bir konut yapısıdır. Yapıya ait cephe çizimi, kompozisyon referansı olarak sisteme eklenmiş (Şekil 5) ve "old Turkish traditional house" ("eski geleneksel Türk evi") ifadesi prompt olarak girilerek görsel yeniden üretim süreci başlatılmıştır. Bu işlem sonucunda sistem tarafından dört farklı görsel alternatif üretilmiş; elde edilen çıktılar Şekil 6'da sunulmuştur.



*Şekil 5. Konarı Köyü'nde geleneksel konut rölöve cephesi*



*Şekil 6. Metinden Görüntü verilen 4 sonuç*

Bu uygulama, Adobe Firefly'nin çizim temelli referanslardan yola çıkarak cephe dokusu üretme ve geleneksel mimari karakteri görsel olarak yorumlama kapasitesini ortaya koyması açısından değerlendirilmiştir.

### 2.3. Tabakhane Binası'nın Uygulanması

Yapı, 429 ada 2 ve 3 numaralı parseller üzerinde konumlanmakta olup, özgün işlevi deri imalathanesi olarak tasarlanmıştır. Günümüzde yapı iki farklı şahsın mülkiyetinde bulunmaktadır. Taşınmaz Kültür ve Tabiat Varlıkları Yüksek Kurulu tarafından, 3 Mayıs 1985 tarihli ve 997 sayılı karar ile tescil altına alınan yapı, korunması gerekli kültür varlığı statüsü kazanmıştır. Ayrıca Ankara Kültür ve Tabiat Varlıkları Koruma Kurulu'nun 27 Kasım 1990 tarihli ve 1500 sayılı kararı doğrultusunda, yapının tescil durumunun devamına hükmedilmiştir. Yapının tescil numarası E69A olarak kayıt altına alınmıştır (Fidan, 2011).

İkinci uygulama örneğinde, Şekil 7'de yer alan görsel kompozisyon referans alınarak tabakhane yapısının mevcut durumunun, özgün hâline yakın bir görsel temsili oluşturulması amaçlanmıştır. Bu doğrultuda, referans görsel Adobe Firefly platformuna yüklenmiş ve aşağıda yer alan betimleyici metin (prompt) kullanılarak yeniden üretim süreci gerçekleştirilmiştir: "tannery building in Safranbolu, 12 meters high. It is built of cut stone with many windows" ("Safranbolu'da 12 metre yüksekliğinde, kesme taştan yapılmış ve çok pencereli tabakhane binası").

Sonuç olarak, görsel üretim sürecinde yapının cephe kenarlarında yer alan pencere ve taş elemanlarda biçimsel değişikliklerin meydana geldiği gözlemlenmiştir. Bununla birlikte, duvar yüzeylerinde bulunan bitkisel dokuların kısmen gizlendiği ve çatıda eksik olduğu tespit edilen bölümlerin yapay zekâ tarafından tamamlandığı görülmektedir. Bu müdahaleler sonucunda, mekânın özgün fiziksel görünümünün kısmen değişime uğradığı anlaşılmaktadır.



**Şekil 7.** *Tabakhane Binası Mevcut Durum (Korumaz & Özeren, 2019)*



**Şekil 8.** *Adobe Firefly'danElde Edilen Sonuç*

Üçüncü uygulama örneğinde, Tabakhane binası (Şekil 9) mevcut bir görselden yeni bir görüntü üretilmesi amacıyla kompozisyon referansı olarak kullanılmıştır. Bu doğrultuda, referans görsele "tannery building in Safranbolu, 12 meters high. It is built of cut stone with many windows" ("Safranbolu'da 12 metre yüksekliğinde, kesme taştan yapılmış ve çok pencereli tabakhane binası") ifadesi prompt olarak eklenmiştir. Elde edilen bu çıktı, daha önce üretilmiş olan görselin (Şekil 8) referans alınmasıyla yeniden işlenmiş ve yeni bir görsel üretim süreci gerçekleştirilmiştir.

Bu aşamada amaç, farklı üretim adımlarına rağmen görseller arasında zamansal ve bağlamsal bir süreklilik hissi oluşturmak, sanki aynı zaman diliminde çekilmiş izlenimi veren bir bütünlük sağlamaktır. Üretim süreci sonucunda, görsellerin biçimsel özellikleri, renk paleti ve cephe karakteri açısından tutarlı bir görsel dil oluşturduğu; böylece özgün yapının stilistik özelliklerini referans alan bütüncül bir görsel kimliğin korunduğu görülmektedir. Bu yaklaşım, elde edilen çıktıların kendi içinde uyumlu olduğunu ve orijinal stilin (Şekil 11) yeniden üretilebildiğini ortaya koymaktadır.

Sonuç olarak, görsel üretim sürecinde yapının tavan ve çatı elemanlarında eksik olduğu belirlenen bölümlerin yapay zekâ tarafından tamamlanarak özgün konumlarına yeniden yerleştirildiği gözlemlenmiştir. Bununla birlikte, kapı üstü gibi bazı kemerli açıklıklarda, görsel üretim sırasında "gün doğumunda çekim" seçeneğinin tercih edilmesine bağlı olarak biçimsel ve algısal değişiklikler meydana gelmiş; bu durum, görüntü aydınlatmasının belirgin biçimde daha parlak bir hâl almasına neden olmuştur. Söz konusu müdahaleler, yapının genel mekânsal algısını etkilemekte ve üretilen görselin özgün duruma kıyasla farklı bir atmosfer sunmasına yol açmaktadır.



**Şekil 9.** *Tabakhane Binası Mevcut Durum (Korumaz & Özeren, 2019)*



**Şekil 10.** *Elde edilen sonuç*

Dördüncü uygulama örneği olarak, Safranbolu Barış Mahallesi'nde yer alan ve 103 ada 9 parselde bulunan konut yapısı ele alınmıştır. Çalışma kapsamında, yapının güney cephesine ait Google Earth üzerinden elde edilen fotoğraf, görsel üretim denemelerinde temel veri olarak kullanılmıştır (Şekil 11). Bu süreçte, Safranbolu'da hasar görmüş eski bir yapı görseli, binanın mevcut durumunu temsil edecek biçimde kompozisyon referansı olarak değerlendirilmiştir. Buna karşılık, aynı sokak üzerinde yer alan, restorasyonu tamamlanmış ve hasarları giderilmiş bir konut yapısı ise referans görsel olarak sisteme tanımlanmıştır (Şekil 13).

Bu iki veri seti üzerinden gerçekleştirilen görsel üretim sürecinde amaç, hasarlı yapının mevcut durumundan yola çıkarak, çevresel bağlam ve sokak dokusu ile uyumlu, stilistik açıdan tutarlı bir cephe temsili elde etmektir. Uygulama sonucunda, referans alınan yapı ile benzer mimari karakteristikleri yansıtan, aynı yapı stilini koruyan bir görsel çıktı üretilmiş; elde edilen sonuç Şekil 12'de sunulmuştur. Bu örnek, yapay zekâ destekli görsel üretim araçlarının, yakın çevredeki korunmuş örnekleri

referans alarak hasarlı yapıların olası özgün cephe karakterini yorumlama potansiyelini ortaya koymaktadır.



**Şekil 11.** *Safranbolu Barış Mahallesinde Bulunan Hasar Gören Eski Konut Yapı*



**Şekil 12.** *Elde Edilen Sonuç*



**Şekil 13.** *Aynı Sokaktan Referans Olarak Kullanılan Restore Edilmiş Bir Yapı*

Görsel üretim süreci sonucunda, yapının cephe yüzeylerine sıva eklendiği, pencere açıklıklarının yenilendiği ve birinci katta çıkma oluşturulduğu gözlemlenmiştir. Bununla birlikte, çatı düzenlemelerinde de-

ğişiklikler yapılmış; giriş kapısı özgün konum ve biçiminden farklı bir elemanla değiştirilmiştir. Cephe kompozisyonunda sol tarafta yeni pencere açıklıkları eklenmiş, ayrıca zemin katta yapının mevcut durumunda bulunmayan yeni pencerelerin oluşturulduğu tespit edilmiştir. Bu müdahaleler sonucunda, yapının cephe karakteri ve açıklık düzeninin özgün durumuna kıyasla belirgin ölçüde dönüştüğü anlaşılmaktadır.

**Sonuç**

Adobe Firefly, yapay zekâ temelli bir üretim aracı olarak, fikirlerin ayrıntılı biçimde görselleştirilmesini amaçlayan tasarımcılar ve mimarlar için önemli bir katkı sunmaktadır. Görselleri yüksek düzeyde gerçekçilik ve bağlamsal tutarlılık ile yeniden üretebilme yeteneği sayesinde, mimari tasarım süreçlerinde bir referans aracı olarak kullanılabilmekte; aynı zamanda görüntü tabanlı modelleme (Image-Based Modeling – IBM) çalışmalarına altlık oluşturabilecek nitelikte görsel veriler üretebilmektedir.

Adobe Firefly'nin sunduğu en önemli avantajlardan biri, tasarım ve görselleştirme süreçlerinde sağladığı zaman tasarrufudur. Çok sayıda modelleme, görsel üretim ve yardımcı araca duyulan ihtiyacı azaltarak, tasarım sürecini hızlandırmaktadır. Sistem, eski fotoğraflar, mimari cephe çizimleri ya da tahrip olmuş yapıların mevcut görselleri üzerinden hareketle, gerçekçi ve bütüncül görsel temsiller oluşturabilmektedir. Ayrıca benzer mimari üsluplara ya da aynı mimara ait yapılara referans verilmesi durumunda, yapay zekâ aracılığıyla bu stilistik özellikler analiz edilerek yeni bir mekânın tasarımının görsel olarak yeniden yorumlanması mümkün olmaktadır.

Adobe Firefly kullanılarak üretilen görsellerin yüksek düzeyde gerçekçi olması, tasarımcının yapı ya da cepheye ilişkin nihai biçimi daha net bir şekilde öngörebilmesine ve farklı tasarım senaryolarına yönelik görsel öneriler geliştirebilmesine olanak tanımaktadır. Bu yönüyle söz konusu araç, özellikle restorasyon ve koruma süreçlerinde değerli bir destek aracı olarak öne çıkmaktadır. Üretilen görseller, özgün mimari detayların yeniden okunmasına ve yorumlanmasına katkı sağlamakta; böylece yapının tarihsel ve mimari dokusunun korunmasına yönelik karar süreçlerini destekleyici bir rol üstlenmektedir.

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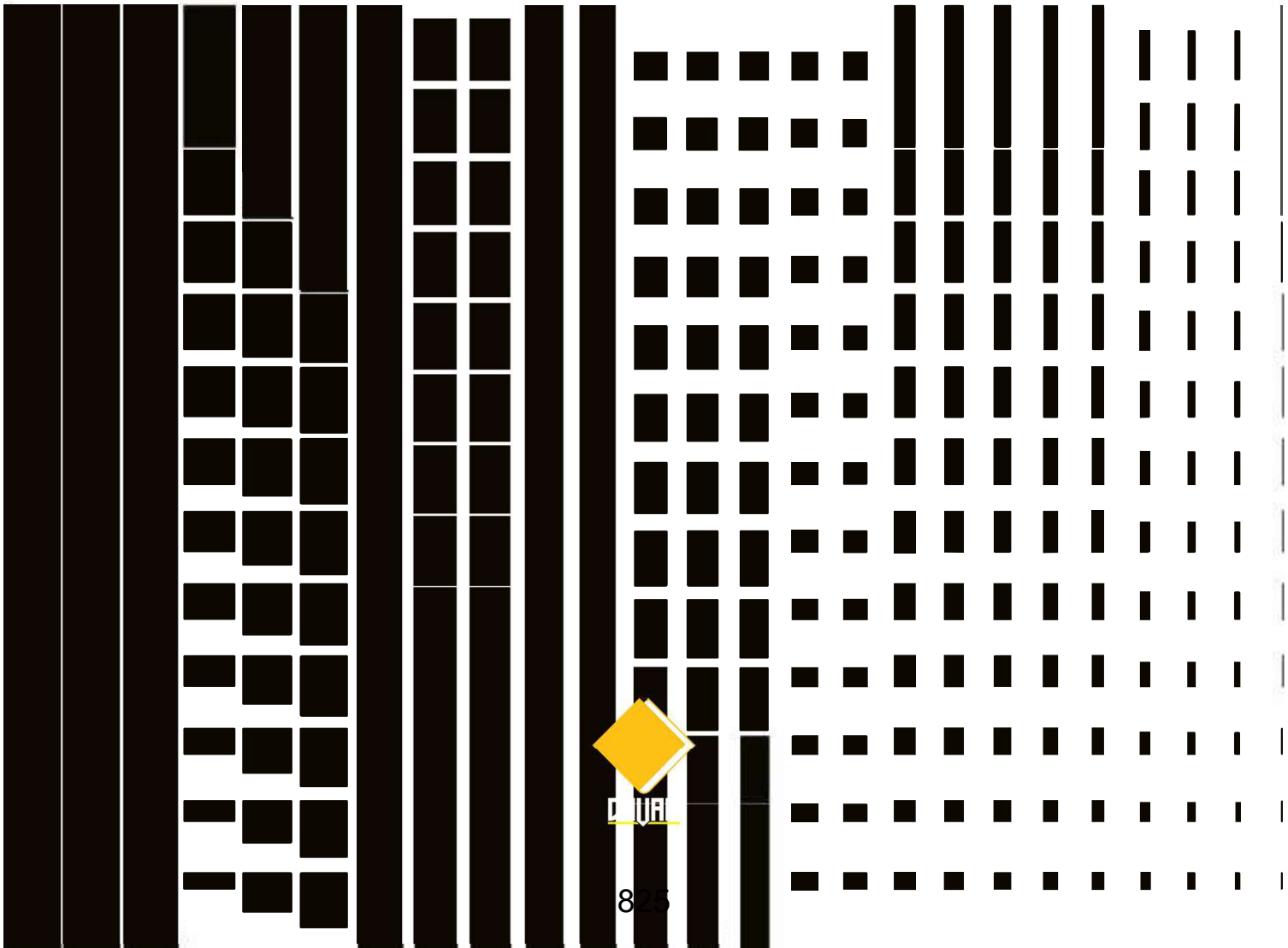
# MİMARLIK PLANLAMA VE TASARIMDA KURAM VE UYGULAMALI ÇALIŞMALAR

# THEORETICAL AND APPLIED RESEARCH IN ARCHITECTURE, PLANNING, AND DESIGN

Editör
Doç. Dr. ZUHAL ÖZÇETİN



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*Aslıhan COŞKUN, Nurcihan AKDAĞ, Halil İbrahim ÇELİK*

# Chapter 1

# A Comparative Analysis of Accredited Architecture Programs in Turkey: A Content Analysis Based On MIAK Reports

**Selda Cansu CEYLAN**[1]

## 1. INTRODUCTION

The increasing number of architecture programs worldwide has amplified the importance of quality assurance systems. In this context, accreditation processes carried out by certain institutions and/or organizations have gained prominence, enabling periodic evaluations of architecture programs in line with the standards set by these bodies. NAAB, RIBA, MIAK-MAK, and UNESCO-UIA are among the prominent institutions that define and assess the quality standards of architectural education, providing national and/or international accreditation to relevant programs.

The accreditation processes conducted by these organizations are based on multidimensional criteria, such as curriculum design, academic staff qualifications, infrastructure resources, student engagement, and mechanisms for continuous improvement. The evaluation reports prepared at the end of these independent accreditation processes not only provide feedback for the applicant programs but also offer valuable insights into the general state of architectural education.

This study seeks to examine the overall condition of architectural education in Turkey, focusing specifically on the architecture programs accredited by MIAK-MAK. A review of the existing literature reveals a lack of studies that perform content analysis of MIAK-MAK reports or offer comparative evaluations across institutions. This gap in the literature highlights the need for a comprehensive inquiry.

Accordingly, the aim of this study is to analyse the evaluation reports of seven architecture programs that have been accredited for a six-year period by MIAK-MAK, using content analysis methodology, and to compare the institutional strengths and weaknesses of these programs. Through the analysis of the selected

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reports, the study will identify the current state of architectural education in Turkey, including recurring themes, differences, and structural challenges.
The research questions guiding and shaping this study are as follows:

- What are the common strengths and weaknesses highlighted in MIAK evaluation reports for the selected programs?
- According to MIAK's evaluation criteria, which areas receive the most criticism?
- What recommendations are offered in the reports for the improvement of architectural education?

By addressing these questions, this study aims to provide a critical assessment framework that can inform both other institutions and policymakers, while also contributing to the academic literature.

### 1.1. CURRENT DISCUSSIONS ON ARCHITECTURAL EDUCATION

The continuous evolution and transformation of the world inevitably influences the curriculum structure and learning paradigms adopted by professional education institutions. Architectural education is no exception to this phenomenon. According to Yürekli and Yürekli (2004), during the 1960s and 1970s, architectural education functioned within a closed system focused on transmitting established norms [1]. By the 1980s, however, this rigid framework began to loosen, giving way to an educational model that prioritized the individual learning process of the student. This pedagogical shift emphasized the cultivation of intellectual individuals within architectural education [1].

From the 1980s to the present, architectural education has witnessed a variety of traditional and contemporary pedagogical approaches—many of which continue to be explored. Despite the diversity of these approaches, Kurt (2011) outlines several core attributes that architectural education institutions must possess [2]:

- Providing students with experiential learning to build foundational design knowledge,
- Encouraging students to approach design problems from multiple perspectives and to generate alternative solutions,
- Embedding learning within realistic and relevant contexts,
- Fostering students' ownership of the design process and cultivating a sense of responsibility,
- Employing process-oriented learning strategies,
- Viewing learning as a social activity,
- Encouraging the use of diverse representation tools,
- Promoting students' development of self-awareness.

Nicol and Pilling (2005) argue that for learning to be effective, students must be actively engaged, think critically, collaborate with others, experience authentic learning processes, and participate in both self and peer assessment [3]. Turan (2021, pp. 129–130) underscores the importance of equipping learners with 21st-century skills in contemporary learning environments [4]. Accordingly, institutions should emphasize skills such as critical thinking, problem-solving, communication, collaboration, aesthetic sensitivity, and adaptability. In addition to these competencies, digital transformation has necessitated students' proficiency in various information technologies.

A central concern in many contemporary debates about education is how to effectively integrate emerging and ever-evolving technologies into curricula. One architectural example of such discussions is the 2007 Lisbon workshop titled *"Teaching and Experimenting with Architectural Design: Advances in Technology and Changes in Pedagogy."* This event focused on the integration of digital design tools in architectural education and sought to answer the following questions [5]:

- How have developments in information technology impacted the teaching and learning of architecture?
- What are the prevailing methods, processes, strategies, and tools that shape contemporary architectural education?
- What challenges must be addressed by new pedagogical experiments in education?

These debates surrounding contemporary learning environments and architectural education can certainly be further diversified. However, to summarize, current discussions largely center on equipping students with the knowledge, skills, and competencies necessary for lifelong learning and for adapting to the demands of the present era. In this process, various institutions, organizations, and associations engage in shaping educational systems globally by contributing to the establishment of standards.

One such organization is the Organisation for Economic Co-operation and Development (OECD), which published a report in 2015 to help countries prepare their education systems for the future. This report identified seven core elements: acquisition of basic educational competencies, transferability of these competencies, teamwork, knowledge (disciplinary, interdisciplinary, epistemic, procedural), skills (cognitive, metacognitive, social, emotional, practical, physical), values and beliefs, and the expectation–action–reflection cycle [6]. Another organization, the International Society for Technology in Education (ISTE), published a report in 2014 discussing future-focused components of education through a framework of technological learning outcomes. These

outcomes include: leadership, digital citizenship, knowledge construction, innovative design, critical thinking, creative communication, and global collaboration [7].

In the specific context of architectural education, the European Association for Architectural Education (EAAE) published a report in 2006 that sought to build an interactive network to foster dialogue, change, and shared policy. This report emphasized the importance of equipping students not only with architectural knowledge and methods but also with interdisciplinary connectivity. Key competencies highlighted include problem-based thinking, creative thinking, openness to research and experimentation, communication, and collaboration [8]. The standards set by these institutions help shape and enhance the curricula of educational institutions, playing a critical role in the structure of education. Alongside these standards, the quality assurance and accreditation processes conducted by various organizations contribute significantly to evaluating and improving educational institutions.

### 1.2. QUALITY AND ACCREDITATION IN ARCHITECTURAL EDUCATION

Evaluating and improving architectural education is of critical importance for maintaining professional standards. Quality assurance systems in higher education ensure the sustainability of education quality by subjecting programs to periodic evaluations based on specific criteria. In this context, accreditation processes have become one of the foundational elements of higher education both nationally and internationally. Below are some international organizations that accredit architectural education and the key competencies emphasized in their recent reports:

The National Architectural Accrediting Board (NAAB) is an independent and international organization with the mission of "developing and maintaining an accreditation system for professional degree education that enhances the value, significance, and effectiveness of the architectural profession." In its most recent report published in 2020, NAAB identifies the competencies students are expected to acquire under the following categories: *critical thinking/representation, building practices/technical skills/knowledge, integrated architectural solutions,* and *professional practice knowledge* [9].

Founded in 1924, the Royal Institute of British Architects (RIBA) evaluates and approves the quality and adequacy of certain architectural programs both in the United Kingdom and internationally, listing them as validated programs. According to its 2021 report, RIBA expects graduates to acquire the following competencies [10]:

- Applying analytical techniques and problem-solving skills to various types of architectural challenges, and understanding a complex body of knowledge from both disciplinary and interdisciplinary perspectives.
- Critically assessing evidence, arguments, and assumptions, and reaching sound judgments through creative and effective use of collaborative and interdisciplinary working principles.
- Developing ethically responsible design proposals addressing the climate crisis, guided by an understanding of building physics that shapes zero-carbon design standards.

Supported by RIBA, UNESCO-UIA is a commission that aims to define an international standard of excellence in architectural education and to ensure the prestige and integrity of accredited schools. The 2023 report by UNESCO-UIA outlines the following core competencies students are expected to acquire [11]:

- The ability to work collaboratively with other architects and interdisciplinary team members.
- The capability to exchange and communicate ideas through collaboration, speech, writing, drawing, modelling, and assessment.
- Proficiency in using the tools and methods necessary to explore, develop, define, and communicate design proposals.
- Understanding the tools and methods used in evaluating the performance of built environments.

The institution featured in the sample of this study is The Architectural Accrediting Board of Turkey (MIAK-MAK), a national and independent body responsible for determining the accreditation process and evaluating the quality of architecture undergraduate programs in Turkey. MIAK-MAK defines its main and sub-objectives on its official website as follows [12]:

- “Contributing to the improvement of architectural education quality by conducting accreditation, external quality evaluation, and information activities for architectural education programs.”
- “Promoting the development of the architectural profession through education, evaluating architectural education, and contributing to its improvement via competency initiatives in cooperation with official educational institutions.”
- “Ensuring inclusiveness and participation in the formation and/or activities of its governing body, all committees, and teams by providing broad representation of stakeholders such as educators, academics, students, alumni, employers, and professional organizations.”

To begin the accreditation process, a program must submit a letter of intent to MIAK-MAK's official channels. If the letter receives a positive response, the relevant program is expected to prepare a self-assessment report in accordance with the "MIAK-MAK Accreditation Requirements" document [13]. The self-assessment report consists of two main sections: general information about the program and the program's educational and learning features. The first section includes details about the institution offering the program, program characteristics, the relationship between the program and institution, educational approach, human resources, learning environment resources, and financial resources. The second section covers degree programs and curriculum, learning environment and achievement levels, learning culture, and the knowledge, skills, and competencies that graduates are expected to acquire [14].

In addition to the self-assessment report, the MIAK-MAK review team conducts an on-site visit and assessment of the program through observation and interviews. Following the evaluations made based on both the report and the site visit, programs that receive a positive outcome are granted one of four types of accreditation, each representing a different evaluation result [13]:

- 6-Year Accreditation: Indicates that the program has no significant issues or only minor issues that can be easily resolved with existing efforts.
- Conditional 6-Year Accreditation: Indicates specific challenges in meeting the conditions; a focused evaluation on these issues will be conducted in the first, second, or third years.
- 3-Year Accreditation: Suggests the presence of core issues affecting the program's quality, requiring a new evaluation process at the end of three years.
- 2-Year Supervised Accreditation: Implies that existing issues negatively impact the program's quality and are difficult to resolve in a short period. Programs receiving this type of accreditation are expected to qualify for at least 3-year accreditation in their next application. Otherwise, another 2-year supervised period may be granted.

## 2. METHOD

This study is a qualitative research that comparatively examines architectural programs in Turkey which have been accredited by MIAK-MAK for a duration of six years. A stratified sampling method was used to determine the sample group for the research. Stratified sampling is a method employed when a population is divided into distinct groups or strata. This method allows researchers to obtain separate results for each stratum while also enabling comparisons between different strata [15].

According to the most recent data published on the official MIAK website, the number of accredited architectural programs in Turkey currently stands at 29 [16]. These institutions hold different types of accreditation, including 2-year supervised, 3-year, 6-year conditional, and 6-year full accreditation. For the purpose of this thesis, institutions with MIAK accreditation were categorized into various strata based on their accreditation durations, and those with 6-year full accreditation were selected from among these strata.

Due to their 6-year accreditation status, it can be inferred that these programs have met MIAK-MAK's established standards to a greater extent than other programs. In this context, it was considered that these programs hold the potential to serve as guiding and inspiring examples for both other programs and for architectural educators and students. Therefore, this limitation was deliberately applied. The programs that constitute the sample of this study are listed in the table below:

**Table 1.** Undergraduate Architecture Programs in Turkey with 6-Year MIAK Accreditation [16]

| Institution Name | Program Language | Accreditation Period |
|---|---|---|
| Dokuz Eylül University | Turkish | 7 September 2023 - 7 September 2029 |
| Yıldız Technical University | % 30 English | 6 September 2024 - 6 September 2030 |
| Eastern Mediterranean University | English | 6 September 2024 - 6 September 2030 |
| Mimar Sinan Fine Arts University | Turkish | 27 March 2023 - 27 March 2029 |
| İzmir Institute of Technology Institution | English | 18 November 2022 - 18 November 2028 |
| Özyeğin University | English | 3 October 2022 – 3 October 2028 |
| Middle East Technical University | English | 3 October 2022 – 3 October 2028 |

The publicly available accreditation reports published by MIAK-MAK serve as the primary data source for the sample group in this study. These reports focus on both the strengths and the areas in need of improvement as identified by MIAK-MAK for each respective program. The analysis of the accreditation reports was carried out using the content analysis method. Frequently employed in qualitative research designs, content analysis enables the decoding of messages, symbols, and meanings in a text beyond their literal expressions [17].

Content analysis involves the following stages: data collection, unitization, sampling, coding guideline development, analysis, interpretation, and reporting of findings [18]. The data collection and sampling phases resemble those in other research methods. However, the coding guideline and analysis stages gain

significance due to the need for precise measurement and systematic coding procedures [18]. During the coding stage, the text must be carefully reviewed, and its primary words, symbols, or messages must be systematically converted into quantifiable metrics. This process involves two coding strategies: manifest (explicit) and latent (implicit) coding. While manifest coding deals with visible and surface-level content in the text, latent coding seeks to uncover the underlying, hidden meanings [17]. In the coding phase, researchers may either use a predefined codebook or create one based on insights derived from the data itself [19].

In this study, an inductive approach was adopted, and no codebook was created before beginning the coding process. The texts were first examined to identify shared codes, followed by a detailed coding and analysis phase. To enhance the study's reliability and the validity of its codes, both manifest and latent coding techniques were applied. The codebook developed from the analysis process, along with the frequency values associated with each code, is presented in Table 2.

**Table 2.** Codebook

| Theme | Category | Code | Frequency Values |
|---|---|---|---|
| Strengths | Program Structure | Quality of teaching staff and diversity of academic staff | 6 |
| | | Geographical opportunities: location, region, city | 2 |
| | | Spatial facilities: studio, workshop, digital laboratories | 4 |
| | | Participatory pedagogies: student feedback, self-assessment | 5 |
| | | Institutional identity and culture | 5 |
| | Learning Environment | Interdisciplinary work culture | 3 |
| | | Interactive learning environments | 3 |
| | | Rich curriculum structure and content | 6 |
| Weaknesses | Program Structure | Spatial inadequacies / Insufficient facilities | 3 |
| | | Balance between academic staff and student numbers | 4 |
| | | Assessment and evaluation processes | 3 |
| | Learning Environment | Knowledge, skills, and competencies that graduates must acquire | 4 |
| | | Deficiencies in course content | 4 |

## 3. FINDINGS

The findings obtained were presented under two main headings: the strengths of the programs and their areas for improvement or identified weaknesses. For readability purposes throughout the text, only abbreviations were used instead of the full names of the respective programs.

### 3.1. FINDINGS ON THE STRENGTHS OF THE PROGRAMS

When analysing the findings related to the strengths of the programs, eight distinct codes emerged. These codes were organized under two main categories: program structure and learning environment. A visual representation showing the presence or absence of these codes across all programs is provided in Figure 1.

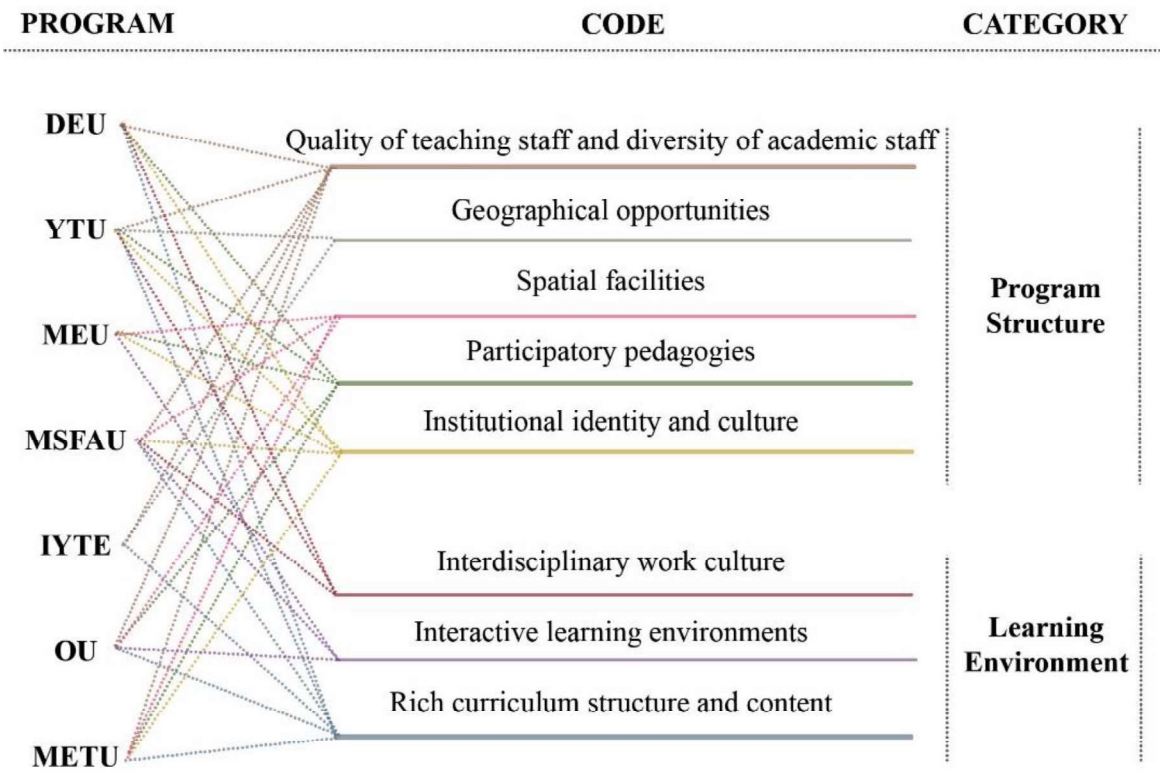


**Figure 1.** Distribution of codes in programs

The codes with the highest frequency values under this theme were faculty qualifications and diversity of academic staff (n=6), along with a rich curriculum structure and content (n=6). In this context, it is evident that MİAK has assessed the majority of the programs as having a well-developed curriculum and a highly qualified teaching staff. Among all the programs, only EMU's reports did not include references to these two codes.

Other codes that stood out in this category, each with a frequency value of 5, were participatory pedagogies: student feedback and self-regulation, and

institutional identity and culture. Notably, MSFAU and IYTE's reports did not contain references to participatory pedagogies. Furthermore, no reference to institutional identity was found in the reports of IYTE and OU.

Some representative quotes from the reports that highlight these codes are as follows:

**Table 3**. Key excerpts on participatory pedagogies and institutional identity and cultural codes

| Code | Highlights from the speeches |
|---|---|
| Participatory pedagogies: student feedback, self-assessment | "It was reported that there is a project to create a database capable of automatic updates electronically for monitoring and tracking graduates." (OU) |
| | "(…) it is seen to have the potential and experience to diligently handle self-assessment and the anticipated revisions in maintaining the quality it provides in education in future periods." (DEU) |
| Participatory pedagogies: student feedback, self-assessment | "Emphasis on quality and accreditation within the institutional culture and the continuity of necessary regulations and documentation related to these efforts." (YTU) |
| | "By establishing its own unique culture, it has consistently maintained a research-focused architectural education for many years." (METU) |

Another high-frequency code following these was spatial facilities (n=4), with references to this code found in the reports of EMU, METU, MSFAU, and OU. Some notable excerpts from these statements include:

**Table 4.** Key excerpts on the spatial possibilities code

| |
|---|
| "The spatial facilities of the Department of Architecture, the technical equipment of the studio spaces, and their interconnectivity are of high quality. All studios receive natural light, are spacious and well-ventilated, and include both natural and artificial ventilation systems. The presence of safety measures such as fire-preventive sprinklers is also considered a positive aspect. The department's research and application laboratories are adequately equipped and diverse." (OU) |
| "Physical spaces that contribute to the culture of learning (…)" (MSFAU) |
| "The quality of physical spaces, the presence of rich research opportunities, information resources, and a well-stocked library collection." (METU) |

Codes outside of these include interdisciplinary work culture (n=3), interactive learning environments (n=3), and geographical advantages: location, region, city (n=2).

The interdisciplinary work culture code was found in the reports of DEU, MSFAU, and YTU; the interactive learning environments code in DAU, MSFAU, and OU; and the geographical advantages code in IYTE and YTU reports.

**Table 5.** Key excerpts on interdisciplinary work culture, interactive learning environments and geographical possibilities code

| Code | Highlights from the speeches |
|---|---|
| Interdisciplinary work culture | "The program questions the relationship between research and education environments; by creating a discussion environment on how teaching at a research university can create a difference and a unique model, it is seen that it can determine its potentials by focusing on interdisciplinary work potential." (DEU) |
| | "(…) cooperation with other departments of the unit (…)" (MSGSU) |
| Interactive learning environments | "The institution has started joint projects with countries and programs outside the island to strengthen relationships with internal and external stakeholders; the number of activities outside of classes at the faculty has significantly increased, and social responsibility projects have been developed (…)" (DAU) |
| Geographical opportunities | "Being located on an inward-focused campus provides intellectual concentration due to a calm environment." (IYTE) |
| | "The Architecture Program is located on the city campus, in a special position with historical and natural qualities." (YTU) |

### 3.2. FINDINGS RELATED TO THE AREAS WHERE PROGRAMS NEED STRENGTHENING/WEAKNESSES

When examining the findings related to the areas where programs need strengthening or have weaknesses, five codes emerged. These codes were grouped under two main categories: program structure and learning environment. A visual representation indicating the presence or absence of these codes across all programs is shown in Figure 2.

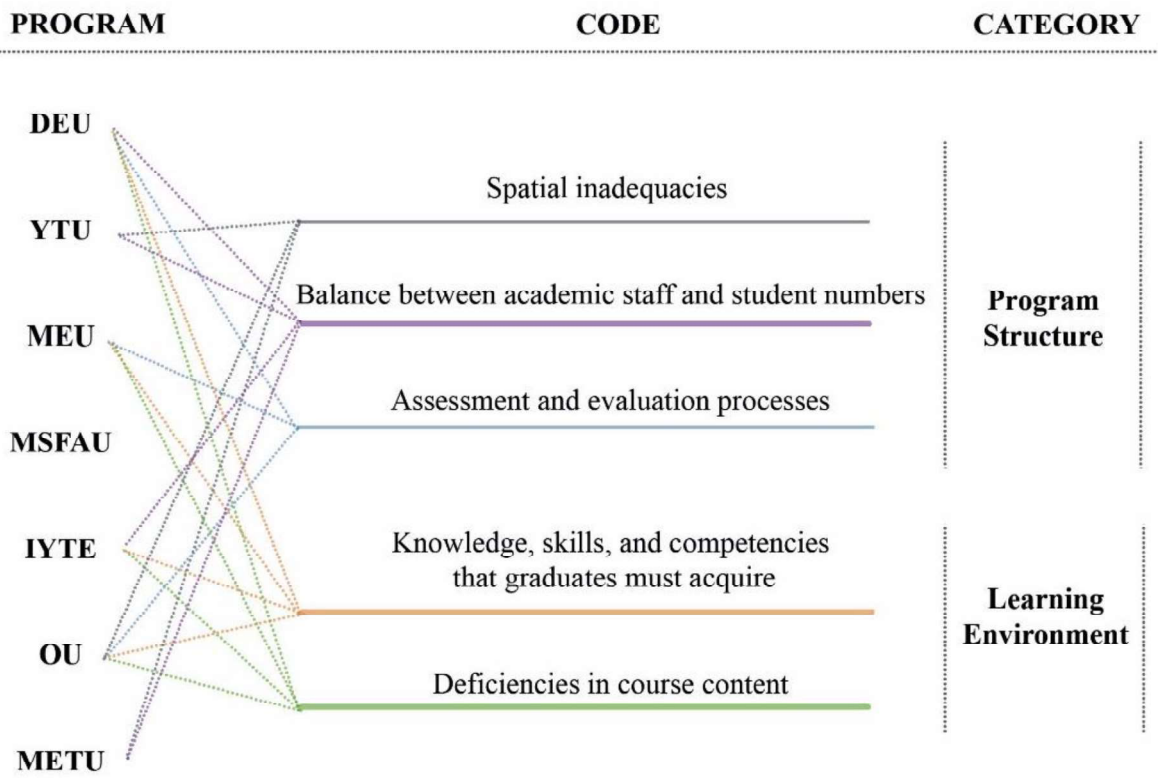


**Figure 2.** Distribution of the codes across the programs

Within the category of program structure, the code "ratio of academic staff to student enrollment" had the highest frequency (n=4). Statements related to this code were found in the reports of the architecture programs at DEU, YTÜ, İYTE, and ODTÜ. The following are some excerpts regarding this code:

**Table 6.** Prominent quotes from the statements regarding the balance code for academic staff and student numbers

| |
|---|
| "In recent years, the increasing number of students poses a threat (…) The distribution within the hierarchical structure of the academic staff has been disrupted due to the inability to hire new staff." (METU) |
| "Excessive workload on academic staff." (IYTE) |
| "The institution's research and publication capacity are negatively affected due to burdens caused by staff shortages." (YTU) |

The frequency values for the other codes in this category are as follows: The code assessment and evaluation processes has a frequency of 3, with related statements found in the reports for the programs at Dokuz Eylul University (DEU), Eastern Mediterranean University (EMU/DAÜ), and Uludağ University (UÜ/OÜ). The code spatial inadequacies also has a frequency of 3, with expressions related to this code identified in reports for the programs at Yildiz Technical University (YTU), Uludağ University (UÜ/OÜ), and Middle East

Technical University (METU/ODTÜ). Some notable quotes related to these codes are as follows:

**Table 7.** Key excerpts on measurement and evaluation processes and spatial inadequacies code

| Code | Highlights from the speeches |
|---|---|
| Assessment and evaluation processes | "More systematic efforts should be made to measure and evaluate the success of the education-teaching system, and the issue of low student participation in surveys can also be addressed within this framework." (DAU) |
| | "A common grading scale distribution followed in courses and design studio groups has not been achieved. The grading systems applied by groups in each course and studio differ from one another." (ÖU) |
| Spatial inadequacies | "Physical space facilities have become insufficient due to increasing student numbers." (METU) |
| | "Problems such as spatial inadequacies, accessibility of spaces, and the functioning of service areas continue." (YTU) |

In the learning environment category, the codes for deficiencies in course content (n=4) and the knowledge, skills, and competencies that graduates should acquire (n=4) have the same frequency value. Statements related to both codes were found in the reports of the programs at DEU, DAU, IYTE, and OU. Some excerpts related to these codes are as follows:

**Table 8.** Prominent quotes from codes and related statements

| Code | Highlights from the speeches |
|---|---|
| Gaps/deficiencies in course content | "Especially strengthening the course contents in the areas of physical environment control (PEC) and construction management would be beneficial (...)" (DAU) |
| | "It was observed that coordination between courses and some course groups is not strongly established. The contribution of professional architecture and service courses to studio courses is limited in visibility for some learning outcomes." (ÖU) |
| Knowledge, skills, and competencies graduates need to acquire | "The knowledge, skills, and competencies that graduates need to acquire are fully or partially met. There are no unmet conditions. The four partially met conditions are: research, broad project development, teamwork and collaboration, project management." (ÖU) |
| | "The issue of interdisciplinary communication and interaction with other programs within the university and the ability to train architects who follow current technological developments, which the program itself emphasized in the self-assessment report, has been observed to be open to development." (DEU) |

## 4. DISCUSSION

Under this heading, the results obtained from the findings are discussed in order to answer the research questions.

The first research question was determined as: “What are the common strengths and weaknesses highlighted in the MIAK reports regarding the programs?” The prominent codes and concepts presented in the findings section provide the answer to this question. In light of the findings, the common strengths of the related programs were identified as the quality of the teaching staff and diversity of the academic team, along with a rich curriculum structure and content. Besides these, it was observed that most programs pay attention to participatory pedagogies and possess a strong institutional identity and culture, which was positively evaluated by MIAK.

When examining the common weaknesses of the programs, it was understood that the increasing student numbers are regarded as a problem by MIAK, and there are concerns about the adequacy of the academic staff to handle these numbers. Additionally, it was also noted that lack the spatial capacity to accommodate the growing student population. The knowledge, skills, and competencies that students are expected to acquire—an area of importance for MIAK—were largely met by all programs; however, some programs showed areas requiring development across various topics.

The second research question was: “According to MIAK’s evaluation criteria, what are the most criticized areas of the programs?” Upon examining the reports, the most criticized areas were found to be:

1. Interdisciplinary relations: It was emphasized that interdisciplinary interaction is a topic open to development in some institutions, highlighting the importance of implementing necessary corrections and initiatives.
2. Alignment of course outcomes and graduate competencies: For some programs, the knowledge, skills, and competencies that graduates are expected to gain did not fully align with the course outcomes; therefore, it was stressed that course content should be better adapted to professional practice.
3. Curriculum coordination: While some programs were noted to lack coordination between theoretical courses and design studios, others were pointed out to have insufficient interconnectedness among design studios themselves.

The final research question was: “What recommendations are presented in the reports for improving architectural education?” Reviewing the relevant reports, it appears that MIAK places importance on interdisciplinary interaction in

education, student-centred approaches, balancing theory and practice, and developing innovative and critical learning environments. In this context, elements such as program improvements based on student feedback, fostering social responsibility awareness, and interaction with experts from different disciplines are emphasized by MIAK in architectural education. Accordingly, MIAK encourages the institutions to adopt lifelong learning philosophies, process- and performance-oriented learning approaches, and the development of skills that prepare students for professional practice.

In addition to these general encouragements, some specialized recommendations identified in certain program reports are as follows:

1. Dokuz Eylul University (DEU): It is suggested that the program improve its interdisciplinary interaction with other university programs and more effectively capture technological developments to prepare its graduates accordingly [20].
2. Yıldız Technical University (YTU): It is recommended to establish a holistic relationship between technology-focused learning outcomes and design studios, enriching course content related to the technology-design relationship to avoid redundancy [21].
3. Eastern Mediterranean University (EMU/DAÜ): The program is advised to make adjustments considering the opinions of instructors and students. Some feedback from the visiting team's meetings indicated expectations for design studios to be more experimental and open to current approaches. Additionally, students noted insufficient courses on presentation techniques and digital design and requested these courses be offered earlier. Furthermore, students called for more transparent project evaluations and practical activities preparing them for professional life [22].
4. Özyeğin University (ÖU): The visiting team report highlights qualitative differences among branches and groups in studio learning outcomes, except for first-year studios. Therefore, it recommends ensuring horizontal and vertical coordination of all design courses and making studio courses distinctly different from each other. Moreover, the report advises the institution to play an active role outside the curriculum to foster a competitive environment among students [23].

## 5. EVALUATION

This study comprehensively revealed the strengths and weaknesses, criticized areas, and aspects needing improvement of architecture programs based on MIAK accreditation reports. The findings indicate that architectural education in

Turkey generally has solid foundations in terms of faculty and curriculum. However, structural issues such as infrastructure and staffing inadequacies caused by increasing student numbers emerge as significant factors threatening the quality of education.

MIAK's critiques, particularly regarding interdisciplinary collaboration, alignment of course outcomes, and curriculum coordination, highlight the need for education programs to become more responsive to contemporary demands. Deficiencies in these areas are critically important considering the multidisciplinary nature of architectural education and the necessity to balance theory and practice.

Among the limitations of this study is the exclusive analysis of MIAK reports; therefore, the direct evaluation of other stakeholders' (students, alumni, employers) perspectives is lacking, which may restrict the scope of the findings. Future research is recommended to include these stakeholders' perspectives through field studies and qualitative data collection methods.

In conclusion, ensuring sustainable quality in architectural education requires careful consideration of the recommendations put forth by MIAK and continuous improvement of programs accordingly. Additionally, physical and academic resources must be strengthened in light of increasing student numbers and technological changes. In this context, the widespread adoption of interdisciplinary education models, student-centred and performance-based approaches should be regarded as fundamental strategies to advance architectural education into the future.

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ARALIK 2025

# Mimarlık Planlama ve Tasarım Alanında

## Uluslararası Derleme, Araştırma ve Çalışmalar

EDİTÖRLER:
PROF. DR. SERTAÇ GÜNGÖR
PROF. DR. MURAT DAL



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# MİMARLIK PLANLAMA VE TASARIM ALANINDA ULUSLARARASI DERLEME, ARAŞTIRMA VE ÇALIŞMALAR

Editörler
PROF. DR. SERTAÇ GÜNGÖR
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# Bölüm 16

## KENTSEL ÖLÇEKTE YANGIN RİSKİ ÜZERİNE BİR İNCELEME: SORUNLAR, FIRSATLAR VE GELECEĞE YÖNELİK ARAŞTIRMA YÖNELİMLERİ

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## 1. Giriş

Kentleşme, modernleşme süreçleri ve ekonomik kalkınma, her ülkenin gündeminde öncelikli bir yer tutmaktadır. Şehirler, giderek artan bir şekilde konut, ulaşım, endüstriyel üretim, ticari faaliyetler, sağlık hizmetleri ve eğitim gibi birçok kritik işlevi üstlenmekte ve bu fonksiyonların çeşitliliği, kentsel alanların karmaşıklığını artırmaktadır. Bunun sonucunda, şehir sorunları daha kapsamlı bir hal almakta ve bu karmaşıklık, özellikle güvenlik ve istikrarı sağlamaya yönelik şehir planlama ve inşa süreçlerinde belirginleşmektedir (Bai & Liu, 2023).

Birleşmiş Milletler'in projeksiyonlarına göre, 2030 yılına kadar dünya nüfusunun %60'ından fazlasının kentsel alanlarda yaşayacağı tahmin edilmektedir. Halihazırda, dünya genelinde 4 milyardan fazla insan şehirlerde ikamet etmekte olup, bu nüfusun yaklaşık 863 milyonu resmi olmayan yerleşim bölgelerinde yaşamaktadır (Rezvani, Falcão, Komljenovic, & de Almeida, 2023). Kentsel nüfusun her 10 günde 1 milyon kişi artacağı öngörülmektedir (Acuto, Parnell, & Seto, 2018). Bu hızlı artış, kentsel altyapıya olan talebi artırırken, özellikle yangın gibi afet risklerini yönetme ihtiyacını daha da kritik hale getirmektedir. Her ne kadar uluslararası topluluk, risk altındaki bölgeleri belirleme ve yangın riski değerlendirme ile azaltma stratejilerinin geliştirilmesi konusundaki farkındalığını artırmış olsa da, yangınların ölümcül etkileri hâlâ endişe verici düzeydedir. Dünya Sağlık Örgütü'ne (WHO) göre, dünya genelinde her yıl 180.000'den fazla kişi yangınlar veya yanıkla ilgili yaralanmalar sonucu hayatını kaybetmektedir ve bu ölümlerin %95'i, hızlı kentleşmenin getirdiği risklerin yoğun olarak yaşandığı düşük ve orta gelirli ülkelerde meydana gelmektedir (Bickenbach, 2011; Noori, Mohammadi, Miguel Ferreira, Ghaffari Gilandeh, & Mirahmadzadeh Ardabili, 2023).

Kentsel alanlarda yangın çıkma ve yayılma potansiyelini artıran başlıca etmenlerden biri, yangın güvenliği konusunda yetersiz planlama, altyapı eksiklikleri ve uygunsuz yapı uygulamalarıdır. Özellikle yangın güvenliği ele alınırken, bu sorunlara özel bir dikkat gösterilmesi gerekmektedir (Granda & Ferreira, 2021). Giderek karmaşıklaşan kentsel yangın önleme ve kontrol durumu, yangın güvenliği yönetiminin yeterli olmadığını ve yangınların kontrol edilemeyen faktörleri ile belirsizliklerinin sürekli arttığını göstermektedir (J. Liu, Ma, Song, & Dong, 2023; X. Zhang, Yao, Sila-Nowicka, & Jin, 2020). Yangın güvenliği yönetiminin etkin bir şekilde gerçekleştirilmesi ve yangın önleme stratejilerinin iyileştirilmesi, kentsel dayanıklılığı artırılmasını, toplumun ekonomik ve sosyal istikrarını da desteklenmesini sağlar. Bu bağlamda, mevcut yangın güvenliği uygulamalarının ve araştırmalarının derinlemesine incelenmesi ve geliştirilmesi büyük önem taşımaktadır.

Bu çalışma, kentsel yangınların anlaşılmasına yönelik temel kavramlar, ana temalar ve kullanılan metodolojileri ele alarak, "Kentsel alanlardaki yangın felaketlerinin anlaşılmasında kullanılan temel kavramlar, ana temalar ve uygulanan metodolojiler nelerdir?" sorusuna yanıt aramaktadır. Bu doğrultuda, mevcut literatür detaylı bir şekilde incelenmiş, yangın risk analizi, büyük veri, itfaiye istasyonu haritalama, kentsel yangın yayılım modellemesi üzerine çalışmalar değerlendirilmiştir. Kavramsal çerçeve, yangınların mekânsal ve zamansal dinamiklerini anlamak için kullanılan teorik ve pratik yaklaşımları kapsamaktadır. Aynı zamanda, teorik çerçeve kentsel yangın yönetimine dair bilgi birikimini analiz ederek, bu alandaki metodolojik çeşitliliği gözler önüne sermekte ve yangın risklerinin daha etkin bir şekilde yönetilmesine yönelik öneriler sunmaktadır. Bu araştırma, hem teorik hem de uygulamalı yaklaşımları bir araya getirerek, kentsel yangın güvenliğinin iyileştirilmesi amacıyla kapsamlı bir çerçeve oluşturmayı hedeflemektedir. Bu bağlamda, literatürdeki boşlukları doldurmayı ve kentsel yangınlarla başa çıkma stratejilerinin daha etkili bir hale getirilmesine katkı sunmayı amaçlamaktadır.

## 2. Güvenli Dirençli Kent

### 2.1. Güvenli Dirençli Kent Kavramı

Dirençlilik kavramı, başlangıçta fizik ve mekanikte bir nesnenin dış kuvvetler tarafından deforme edildikten sonra orijinal şekline geri dönme yeteneğini ifade etmek için kullanılmıştır. Daha sonra ekoloji alanında, bilim insanı Holling tarafından ekosistemlerin dengelerini yeniden kazanma kapasitesini ölçen bir gösterge olarak tanımlanmıştır (Holling, 1973). O zamandan beri dayanıklılık teorisi, basit ekosistemlerden karmaşık çok katmanlı sistemlere kadar geniş bir yelpazede uygulanmış ve yaygın olarak benimsenmiştir (Bai & Liu, 2023).

Şehirler ise sadece karmaşık sosyo-ekolojik sistemler değil, aynı zamanda afetlere karşı güvenli olma işlevlerini sürdürebilen ve bu işlevlerin esnekliğini koruyan yapılar olarak karşımıza çıkar. Güvenlik yönetimi ve afet önleme bağlamında şehirler, kritik hedefler arasında yer alır. Bu nedenle, çalışma kentsel güvenlik araştırmalarına odaklanarak "güvenli dirençli kent" kavramını ortaya koymaktadır. Bu kavram, çevresel, ekonomik ve ekolojik dayanıklılıktan farklı olarak, şehirlerin afetler karşısında güvenlik işlevlerini koruma kapasitelerini vurgulamaktadır (Z.-G. Liu, Li, & Jomaas, 2022).

### 2.2. Güvenli Dirençli Kent Modelleri

"Güvenli Dirençli Kent" kavramı için birçok tanım bulunmakla birlikte, bu konuda sistematik modellerin tartışılması sınırlıdır. Fan (2022), güvenli dirençli kent kavramına yönelik bir çerçeve oluşturmak amacıyla "kamu güvenliği üçgeni" adını verdikleri teorik modeli geliştirmişlerdir. Bu model, acil durumlar, afet taşıyıcıları ve acil durum yönetimi olmak üzere üç ana bileşene dayanmaktadır. Chen, Xu, Zhao, Xu, and Lei (2020) ise güvenli dirençli kent yaklaşımını, uyum sağlama, direnç gösterme ve toparlanma yetenekleri açısından değerlendirmiş ve bu modelin farklı afet senaryolarında şehirlerin dirençliliğini simüle etmek için kullanılabileceğini ortaya koymuştur. Bruneau et al. (2003) ise güvenli dirençli kent kavramını dört ana boyutta ele almışlardır: ekonomik, sosyal, örgütsel (veya çevresel) ve teknolojik.

Güvenli dirençli kent kavramını risk değerlendirmede temel bir yaklaşım olarak kullanmak için, afet unsurları, dirençlilik kapasitesi ve müdahale yöntemleri arasındaki ilişkiyi ortaya koyan bir model geliştirmek gereklidir. Bu doğrultuda, güvenli dirençli kent modeli, güvenlik ve dirençlilik yönetimi ile yapısının ana çerçevesini netleştirmeye yardımcı olabilir. "Kamu güvenliği üçgeni" teorisinin Fan (2022) güvenli dirençli kent modeline uyarlanması hem teorik hem de pratik açıdan uygulanabilirlik sunmaktadır. Huang et al. (2023), bu modeli güvenlik ve dirençlilik sistemleri üzerine uygulayarak, kamu güvenliği olayları ve kentsel afetler bağlamında dirençlilik çalışmalarında kullanmışlardır.

Şekil 1›de gösterilen model, kamu güvenliğini tehdit eden olayları, kentsel afet taşıyıcı sistemlerini ve acil durum yönetimini, üçgenin üç kenarı olarak konumlandırmaktadır. Bu modelde dirençlilik aşamaları; yanıt verme, kurtarma ve uyum sağlama süreçleriyle ilişkili temel unsurları içermektedir (Bai & Liu, 2023).




*Şekil 1. Kentsel güvenlik dayanıklılığının üçgen teorik modeli (Huang et al., 2023)*

### 2.3. Kentsel Yangında Başlıca Temalar ve Yöntemler

#### 2.3.1. Risk Analizi ve Değerlendirmesi

Yangın risk değerlendirmesi, kentsel yangın felaketinin etkilerini azaltmada temel bir bileşen olarak değerlendirilmektedir ve bu analizlerin doğruluğu, yangın hasarını önlemeye yönelik çabaları daha da etkili hale getirmektedir (Aiyou, Shiliang, Runqiu, Deming, & Xiafang, 2014). Wang, Yuan, Chen, and Wang (2021), yangınların sosyo-ekonomik ve çevresel etkileri, son yıllarda yangın risk değerlendirme çalışmalarına olan ilginin önemli ölçüde artmasına neden olmuştur. Özellikle kentleşmenin hız kazanmasıyla birlikte, şehirlerin hem yatay hem de dikey genişlemesi, motorlu taşıt sayısındaki artış ve endüstriyel gelişme, kentsel bölgelerde yangın riskini daha da artıran faktörler olarak ön plana çıkmaktadır. Bu sosyo-ekonomik değişimlerin sonucunda, hızlı gelişen kentlerde yangın riskinin de benzer oranda yükseldiği gözlemlenmiştir (Wang et al., 2021).

Kentsel yangın riskini kavramsal olarak ele alan Y. Zhang (2013), bu riski; kamu güvenliği üzerinde tehdit oluşturabilecek, ekonomik faaliyetleri kısıtlayabilecek ve çevreye zarar verebilecek yangın olayları ile kentsel kırılganlık arasındaki etkileşim olarak tanımlamaktadır. Bu çerçevede, yangın risk değerlendirmeleri özellikle ekonomik yoğunlaşma, yüksek nüfus, yoğun yapılaşma ve karmaşık kent dokusu gibi kentsel karakteristikler nedeniyle daha da karmaşık bir hale gelmektedir (Wang et al., 2021). Dolayısıyla, kentsel yangın risk değerlendirmesi, bu faktörleri göz önünde bulundurarak şehirlerdeki risklerin öngörülmesi ve yönetilmesi için kritik bir noktadır.

Son yıllarda, geleneksel istatistiksel yöntemlerin yanı sıra, Coğrafi Bilgi Sistemleri (GIS) gibi mekansal analiz tekniklerinin kentsel yangın riski değerlendirmelerinde artan bir rol oynadığı görülmektedir. İlk dönem çalışmalarında parametrik yaklaşımlar daha yaygın olarak kullanılmaktayken, günümüzde yangın riskinin mekansal dağılımını daha etkili analiz edebilmek için GIS tabanlı yöntemlerin tercih edildiği gözlemlenmiştir (Kaplan & Watts, 1999). Bu geçiş, yalnızca bina seviyesinde değil, kentsel doku bütününde risk değerlendirmesine olanak sağlayarak kapsamlı analizlere zemin hazırlamaktadır.

Çalışmalar, kentsel yangın olaylarının özellikle yerleşim alanlarında yoğunlaştığını göstermekte ve bu nedenle en yüksek riskin konut bölgeleri ile ticari veya pazar alanlarında olduğunu ortaya koymaktadır (Rahman Tishi & Islam, 2019; Xia, Li, Chen, & Yu, 2019). Bu bulgular, şehir yetkililerinin, kentsel alanlarda yangın çıkma ihtimalinin yüksek olduğu bölgeleri tespit etmesine ve böylece acil durum hizmetlerini daha etkin yönetmesine yardımcı olmaktadır. Ayrıca, yüksek riskli alanlarda müdahale kapasitesinin artırılması ve mevcut güvenlik açıklarının kapatılması, yangın kaynaklı potansiyel hasarın azaltılmasında büyük önem taşımaktadır (Z.-G. Liu, Li, & Jomaas, 2022).

Yangın risk değerlendirmeleri, kentsel alanlarda belirgin riskli bölgelerin ortaya konmasını sağlayarak, bu bölgelerde yoğunlaşan risk faktörlerinin daha iyi analiz edilmesine ve bu doğrultuda stratejik planların oluşturulmasına katkı sunmaktadır. Özellikle şehir merkezlerine yakın, yüksek nüfuslu ve ekonominin gelişmiş olduğu bölgelerde riskin daha yüksek olduğu belirtilmektedir (Guo et al., 2022; Juliá, Ferreira, & Rodrigues, 2021).

### 2.3.2. Büyük Veri

Büyük verinin yangın riski yönetiminde sunduğu belirgin avantajlara rağmen, bu tür projelerin yalnızca sınırlı sayıda şehirde başarılı olduğu görülmektedir. Büyük veri uygulamaları, özellikle farklı veri kaynaklarıyla ilgili çeşitli zorluklarla karşı karşıyadır. Yangın riski yönetimi için büyük veri analizi genellikle farklı hükümet sektörlerinden elde edilen verilere ihtiyaç duyar; ancak veri paylaşımı, organizasyonel koordinasyon eksiklikleri ve birleşik büyük veri yönetim platformlarının olmaması gibi engeller nedeniyle sınırlı kalmaktadır (Clark & Guiffault, 2018; Lima et al., 2021).

Ek olarak, bazı büyük veri türlerinin (örneğin video verileri ve yazılı veriler) toplanması ve işlenmesi, belirli dijital altyapılara—veri merkezleri, bulut platformları ve video izleme sistemleri gibi—gereksinim duyar

(Goel, Datta, & Mannan, 2017; Lima et al., 2021). Veri toplama, paylaşma, işleme ve kullanım konularını dikkate almadan güvenilir performansa sahip büyük veri projeleri geliştirmek oldukça zordur. Böyle bir durumda, kentsel itfaiye teşkilatları, yangın riski yönetiminde veri değer yaratımını maksimize etmek için büyük verilerin etkili bir şekilde toplanması, yönetilmesi ve kullanılması konusunda veri yönetişimine yönelmektedir (Thompson, Ravindran, & Nicosia, 2015).

Veri yönetimi, kuruluşların yaşam döngüsü boyunca yüksek kaliteli verilerin mevcut olmasını sağlamak için yürüttüğü bir dizi yönetim faaliyetini ifade eder ve iş hedeflerini desteklemek amacıyla veri kontrolleri uygulanır. Yangın risk yönetimi bağlamında, veri yönetimi genellikle itfaiye hizmetlerini geliştirmek için yüksek kaliteli veri tedarikine ve etkili veri yönetimine dayanır (Z.-g. Liu, Li, & Zhu, 2022). Örneğin, Guiyang şehir itfaiyesi, kamu hastaneleri ve konferans merkezleri gibi birçok tesiste bulunan yakın alan iletişimi (NFC) çipleri aracılığıyla sağlanan sıcaklık, elektrik akımı ve voltaj gibi verilerle olası yangın risklerini uzaktan izlemek için Nesnelerin İnterneti (IoT) teknolojisini kullanmaktadır (Z.-G. Liu, Li, & Jomaas, 2022). Yangın riski üzerindeki veri yönetiminin etkileri üzerine yapılan birkaç çalışma, konuyu daha kapsamlı bir şekilde niteliksel verilere dayanarak çoğunlukla belirli şehirlerle sınırlı kalarak incelemiştir (Cumbie & Sankar, 2012; Granda & Ferreira, 2019).

Büyük veri teknolojilerinin kısıtlamaları nedeniyle, veri yönetişim istatistikleri yüksek kentleşmeye sahip şehirlerde yangın riski yönetimi için daha yararlı olabilir. Tablo 1'de büyük veri teknolojilerinin farklı yangın riski yönetimi görevlerindeki avantajları ve dezavantajları verilmektedir. Bu teknoloji genellikle insan davranışlarının getirdiği risklerle başa çıkmada zayıf performansa sahiptir. Bu nedenle, yangın önlemenin zayıf olduğu şehirler için, veri yönetişiminin yangın riski yönetimine daha az katkıda bulunması muhtemeldir, çünkü bu şehirlerdeki ana endişe genellikle binalarda yangın riskini azaltmaktır. Öte yandan, mevcut büyük veri teknolojileri, gerekli verileri toplamak için çeşitli altyapılara ve cihazlara güvenir. Ancak, daha az bina ve daha az nüfusun olduğu şehirlerin kırsal kesimlerinde, alanların her yerinde altyapı ve cihaz bulundurmak hem gereksizdir hem de gerçekçi değildir. Dolayısıyla, bu alanlar için, ilgili verilerin eksikliği nedeniyle veri yönetişimi daha az etkili olabilir (Z.-G. Liu, Li, & Jomaas, 2022).

| Yangın risk yönetimi aşamaları | Büyük veri teknolojilerinin avantajları | Büyük veri teknolojilerinin dezavantajları |
|---|---|---|
| *Yangın riski tespiti* | • Sensörler ile gerçek zamanlı tanımlama<br>• Çeşitli yangın tehlikelerinin belirlenmesi<br>•Kesin tanımlama sonuçları | • Kapalı alandaki insan davranışlarıyla ilgili riskleri belirlemek zordur<br>• Altyapılara ve cihazlara güvenmek |
| *Yangın risk analizi* | • Çok kaynaklı verilerin entegrasyonu ile kapsamlı analiz<br>• Gerçek dünya verilerine dayalı yararlı yangın riski göstergelerinin keşfi | • Veri toplama, paylaşma ve güvenliği de dahil olmak üzere veri yönetimi zorlukları<br>• İlgili verilerin eksikliği nedeniyle iç mekandaki insan davranışlarıyla ilgili risklerin analizi zordur |
| *Yangın risk değerlendirmesi* | • Verimli değerlendirme ve güvenilir sonuçlar<br>• Gerçek zamanlı veri paylaşımı ile dinamik değerlendirme | • Bazı göstergeler niceliksel olarak belirlenemez ve bu nedenle değerlendirme için kullanılamaz<br>• Hassasiyet veri miktarına bağlıdır |
| *Yangın riskinin iyileştirilmesi* | • Etkileşimli ve gerçek zamanlı iletişim<br>• Farklı bölümler tarafından ortak iyileştirme | • Altyapılara ve cihazlara güvenmek<br>• Veri yönetimi zorlukları |

**Tablo 1.** *Büyük veri teknolojilerinin farklı yangın riski yönetimi görevlerindeki avantajları ve dezavantajları (Z.-G. Liu, Li, & Jomaas, 2022; Xin & Huang, 2013)*

### 2.3.3. İtfaiye İstasyonu Haritalama

Kentsel yangınlarla ilgili literatürde öne çıkan önemli bir alan, itfaiye istasyonlarının şehir içinde konumlandırılmasıdır. İtfaiye istasyonları, şehirlerde acil durumlarda güvenliğin sağlanmasında kritik bir role sahip olup, konumları ve işlevsel kapasiteleri, yangın afet yönetimi kapsamında tartışılması gereken temel konulardan biridir (Habibi, Lotfi, & Koohsari, 2008). İtfaiye istasyonu haritalama çalışmaları, acil durum ve kurtarma tesislerinin ideal yerleşimlerini simüle etmek ve analiz etmek amacıyla yürütülmektedir. İtfaiye istasyonlarının sayısı ve yerleşimi, özellikle yangın yayılmasını kontrol altına alma sürecinde belirleyici bir etkiye sahiptir, çünkü yangına müdahale süresi, kentsel yangınlar için kritik bir

parametre olarak öne çıkmaktadır (Aktaş, Özaydın, Bozkaya, Ülengin, & Önsel, 2013).

Yangın risk değerlendirmesi çalışmalarında olduğu gibi, itfaiye istasyonlarının haritalanmasında da en uygun bölgeleri belirlemek amacıyla çeşitli yöntemler kullanılmaktadır. GIS bu alanda yaygın bir araç olup, şehirlerin karmaşık dinamiklerini dikkate alarak mekansal analiz yapılmasını sağlamaktadır. Örneğin, bazı çalışmalar, itfaiye istasyonlarının en uygun konumlarını belirlemek için GIS ile birlikte Analitik Hiyerarşi Süreci (AHP) yöntemini kullanmaktadır (Habibi et al., 2008). Bu yöntemlerin kombinasyonları, Çin'in Pekin (Lai, Han-Lun, Qi, Jing-Yi, & Yi-jiao, 2011) ve Tainan (Chang, Lai, & Hwang, 2012) şehirleri ile Türkiye'deki İstanbul (Nyimbili & Erden, 2020) gibi büyük kentsel alanlarda da uygulanmıştır. Optimizasyon yazılımları, GIS platformları ve programlama dillerinin entegrasyonu gibi yöntemler, itfaiye istasyonlarının ideal yerleşimini belirlemeye yönelik modeller geliştirmek için yaygın olarak kullanılmaktadır (Yao, Zhang, & Murray, 2019). Kentsel dönüşüm ve sosyo-ekonomik dinamiklerin, şehirlerde güvenlik önlemlerini planlarken dikkate alınması gereken kritik yönler olduğu gözlemlenmiştir. Yakın zamanda Hindistan'da gerçekleştirilen bir çalışma, müdahale süresini temel bir kriter olarak belirlemiştir. Bu çalışma, itfaiye istasyonlarının şehir genelindeki maksimum kapsama alanını sağlamak amacıyla GIS destekli bir konum tahsis modeli kullanarak optimum yerleşimlerin belirlenmesini sağlamıştır (Tali, Malik, Divyashree, Nusrath, & Mahalingam, 2017).

Tüm bu çalışmalar, ele alınan şehirlerde mevcut yangınla mücadele altyapısının yetersizliğine işaret etmektedir. Bu eksiklikler, kentsel alanlardaki finansal kısıtlamalara ve yoğun nüfuslu bölgelerdeki sınırlı arazi kaynaklarına bağlanabilmektedir. Bu bağlamda, itfaiye istasyonu haritalama çalışmaları, kentsel ekonomiye ve arazi yönetimine ilişkin sorunları da dikkate alarak kapsamlı bir analiz yapılmasını gerektirmektedir. Böylelikle, şehirlerin yangın acil durum hizmetleri açısından mevcut durumlarının daha bütünsel bir resmini sunmak ve gelecekteki stratejik planlamalara rehberlik etmek mümkün olacaktır (Z.-G. Liu, Li, & Jomaas, 2022).

### 2.3.4. Kentsel Yangın Yayılım Modellemesi

Kentlerde yangın riski mekansal olarak eşit dağılım göstermemekte ve bazı alanlarda yoğunlaşarak acil durum altyapısının stratejik bir şekilde planlanmasını gerektirmektedir. Özellikle altyapının zayıf olduğu ve mevcut kentsel dokunun savunmasız kaldığı yoğun yapılaşmış bölgelerde, yangının bitişik yapılara kolaylıkla yayılma riski artmaktadır (Hi-

moto & Tanaka, 2012). Bu tür kitlesel yangın yayılımlarına dair tarihte birçok örnek mevcuttur: 1871'deki Chicago Yangını 17.000 binayı yok ederek 300'den fazla kişinin hayatını kaybetmesine neden olmuş; 1906'da San Francisco Deprem Yangını 700 kişinin ölümüne yol açmış; 1926'daki Kanto Yangını ise bina stokunun %70'ini yok etmiştir (Himoto & Tanaka, 2008). Bu olaylar geçmişte yaşanmış olsalar da, geliştirilen modellerle günümüzde yangın yayılımını anlamak ve önlem almaya yardımcı olmaktadır.

Yangın yayılımını daha iyi modellemek amacıyla, çeşitli yaklaşımlar geliştirilmiştir. Örneğin, Himoto and Tanaka (2008) yangının bireysel binalarda ve binalar arası yayılımını ele alan bir model önerse de, literatürde acil itfaiye müdahalelerini dahil etmeyen bu tür modellere yönelik eksiklikler dikkat çekmiştir. Li and Davidson (2013) ise itfaiye departmanının müdahale çabalarını da içeren bir model sunarak bu eksikliği gidermiş ve kentsel yangın yayılımının depremlerden bile daha büyük ölçekli yıkıcı etkiler yaratabileceğini göstermiştir. Bagchi, Sprintson, and Singh (2013), bu tür yayılımların yalnızca doğrudan etkilenen alanı değil, aynı zamanda su, elektrik ve doğal gaz (Cheng, Li, Ma, Li, & Ma, 2015) hattı gibi kentin altyapılarını da tehdit edebileceğini ortaya koymuştur.

Yangına dayanıklı olduğu düşünülen yanıcı olmayan malzemelerden tasarlanan yapılara sahip şehirlerdeki yangın yayılım simülasyonları da eksik bir alan olarak karşımıza çıkmaktadır. Bununla birlikte, Sekizawa, Ebihara, and Notake (2003) tarafından yapılan araştırmalar, sismik olayların tetiklediği yangınların bu tür binaları ciddi şekilde etkileyebileceğini göstermiştir. Shaham and Benenson (2018), yanıcı olmayan malzemelerden tasarlanan yapılardan oluşan sanal şehirlerde yangın yayılımını simüle eden bir model geliştirmiş ve bitki örtüsünün bu yayılım üzerindeki etkisini vurgulamıştır. Bu gibi unsurlar, önceki modellerde göz ardı edilen ancak yangın yayılımını anlamada önemli parametreler olarak öne çıkmaktadır. Hücresel otomat şeması gibi yeni yaklaşımlar ise düzensiz bir şebeke düzeninde bireysel binaları temsil eden modeller geliştirmiş ve yangına dayanıklılığı artırmaya yönelik insan faktörlerini de bu modellere entegre etmiştir (Goswami, Kumar, & Pipralia, 2022; Rafi, Aziz, & Lodi, 2020).

Rüzgar özellikleri, yapılar arası mesafe, bina malzemesi, bina ölçekleri ve yanıcı yük, yangın yayılım modellerinde öne çıkan ana parametreler olarak belirlenmiştir (Himoto & Tanaka, 2008; Li & Davidson, 2013). Aynı zamanda, arazi kullanım türü, bina yükseklikleri ve su kaynaklarının mevcut durumu, yangının kapsamını ve etkisini belirlemede önemli rol oynarken, bitki örtüsü de yanıcı olmayan yapılara sahip şehirlerde dikkate alınması gereken bir faktör olarak ortaya çıkmıştır (Shaham &

Benenson, 2018). Özellikle büyüme baskısıyla mücadele eden kentteki merkezi alanlar, kitlesel yangın yayılım olaylarına karşı yüksek derecede savunmasız olup bu alanlarda yangın yayılım modellerinin kullanılması, doğru risk azaltma stratejilerinin belirlenmesi için gereklidir. Bu tür alanların yenilenmesi uzun ve karmaşık bir süreç gerektirdiğinden, yangın riskine dair doğru stratejik önlemler, bu modellerin ışığında geliştirilmelidir (Goswami et al., 2022).

### 3. Sonuç ve Tartışma

Kentsel alanlarda yangın felaketleri, ihmal edilmemesi gereken bir afettir. Hem gelişmiş hem de gelişmekte olan ülkeler, artan kentleşmenin bir sonucu olarak yangın riskleri ile karşı karşıya kalmaktadır. Bu bağlamda, yangın güvenliğinin arttırılmasına yönelik stratejilerin geliştirilmesi, kaçınılmaz bir gereklilik haline gelmektedir. Tablo 2, kentsel yangınların yönetimiyle ilgili mevcut sorunları, fırsatları ve gelecekteki araştırma alanlarını kapsamlı bir şekilde özetlemektedir.

| Sorunlar | Fırsatlar | Gelecekteki Araştırma Alanları |
|---|---|---|
| Kentsel büyüme ve yoğunluk nedeniyle yangın riskleri artmaktadır. Yoğun nüfuslu bölgeler, dar sokaklar ve plansız yapılaşma yangın müdahalesini zorlaştırmaktadır. | Yangın güvenliği yönetiminde kullanılan yeni teknolojiler (sensör, nesnelerin interneti, büyük veri vb.) ve algoritmalar (yapay zekâ, bulut modeli vb.), yangın risklerinin daha iyi tahmin edilmesine ve yönetilmesine olanak tanımaktadır.<br>GIS tabanlı mekânsal-zamansal analizler, yüksek riskli bölgelerin belirlenmesini sağlamaktadır. | Yangın yayılma modellerinin üç boyutlu yapılandırılması ve kaynak tahsisine yönelik simülasyon tekniklerinin geliştirilmesi. Yapay zeka tabanlı dinamik modelleme tekniklerinin yangın yayılım simülasyonlarına entegre edilmesi. |
| Eski binalar, modern yangın güvenliği standartlarına uyumlu değildir. | Yenileme projeleri ve modern güvenlik ekipmanlarının uygulanması, kent merkezlerindeki riskleri azaltabilir. | Eski binalar için yenilikçi yangın güvenliği stratejilerinin geliştirilmesi. |
| Halkın yangın güvenliği konusunda farkındalığı ve eğitimi yetersizdir. | Eğitim programları ve toplumsal farkındalık kampanyaları, yangın öncesi ve sonrası riskleri azaltabilir. | Yangın sonrası davranış modelleri ve müdahale süreçlerini analiz eden sosyal dayanıklılık çalışmaları. |
| İtfaiye istasyonlarının yanlış konumlandırılması ve yetersizliği, acil müdahale sürelerini uzatmaktadır. | GIS tabanlı analizler, itfaiye istasyonlarının optimal yerleşimini belirlemede etkili bir yöntemdir. | İtfaiye istasyonlarının optimizasyonu için matematiksel modellerin ve mekânsal analizlerin geliştirilmesi. |

| | | |
|---|---|---|
| İnsan hataları ve ihmal, yangın riskini artırmaktadır. | Güçlü politikalar, önleyici tedbirlerin uygulanmasını teşvik edebilir. | Yangın denetim süreçlerinde hesap verebilirlik ve denetim mekanizmalarının geliştirilmesi. |
| Yanıcı bitki örtüsü ve çevresel faktörler, yangınların yayılmasını hızlandırmaktadır. | Bitki örtüsü yönetimi ve mekânsal analizlerle yangın önleme stratejileri geliştirilebilir. | Ajan tabanlı modelleme ve karar destek sistemlerinin geliştirilmesi. |
| Kentsel alanların planlamasında yangın güvenliği standartlarının göz ardı edilmesi, yangınların yayılma hızını artırmaktadır. | Yangın risk haritalarının hazırlanması ile müdahale stratejileri geliştirilebilir. | İklim değişikliği ve yangın yayılımı arasındaki ilişkiyi analiz eden disiplinler arası modeller. |
| Yangın güvenliği verilerinin eksikliği, etkili risk değerlendirme ve strateji geliştirilmesini zorlaştırmaktadır. | Kamu-özel sektör iş birlikleri, veri paylaşımını artırabilir. | Veri paylaşımının ve iş birliğinin artırılması için yenilikçi platformların geliştirilmesi. |
| Küresel ısınma, yangın riskini artırmaktadır. | İklim odaklı simülasyonlarla önleyici politikaların geliştirilmesi mümkündür. | İklim değişikliği ve yangın yayılımı arasındaki ilişkinin detaylı modellenmesi. |
| Yangın güvenliği politikalarının eksikliği, risklerin artmasına neden olmaktadır. | Kamu-özel sektör iş birlikleri, yangın güvenlik önlemlerinin yaygınlaştırılmasını destekleyebilir. | Yangın risk yönetiminde politika etkisi ve uygulama performansını analiz eden çalışmalar. |

**Tablo 2.** *Kentsel yangınların yönetimiyle ilgili mevcut sorunları, fırsatları ve gelecekteki araştırma alanları*

GIS tabanlı mekânsal-zamansal analizler, yapay zeka, büyük veri ve IoT gibi teknolojilerin entegrasyonu, yangın riski değerlendirmesi ve yönetimi için güçlü araçlar sunmaktadır. Bu bağlamda, yangın güvenliği denetim birimleri ile kamu kurumları arasındaki işbirliği ve koordinasyonun artırılması, yangın güvenliği yönetimini önemli ölçüde iyileştirebilir. Yeni teknolojiler ve algoritmaların entegrasyonu, yangın risklerinin daha doğru bir şekilde tahmin edilmesine ve etkin bir şekilde yönetilmesine olanak tanımaktadır. Yangın yayılma dinamiklerini anlamaya yönelik geliştirilecek yeni modelleme teknikleri, alandaki bilgi eksikliklerini gidermede yardımcı olacaktır. Yangın güvenliği alanında proaktif, veri destekli ve teknoloji tabanlı yönetim stratejilerinin önemi vurgulanmakta ve kent güvenliğinin sağlanması için yangın riski yönetiminin çok yönlü bir yaklaşım ile ele alınması gerekmektedir.

Ancak, yangın olaylarının çoğu insan hataları ve ihmal sonucu meydana gelmektedir; bu durum, önleyici tedbirlerin yetersiz kalmasına yol açmaktadır. Yangın güvenliği ile ilgili daha güçlü politikaların geliştirilmesi, önleyici tedbirlerin alınmasını teşvik edebilir. Kentsel alanlarda

yangına karşı halk bilincinin artırılması, düzenli eğitim ve tatbikatlarla toplumsal hazırlığı güçlendirmek, yangına bağlı can ve mal kayıplarını önlemek açısından kritik adımlardır. Yangın yayılımına dair verilerin eksikliği ve mevcut modellerin yetersizliği, yangın güvenliği yönetimini olumsuz yönde etkilemektedir. Ayrıca, kentsel bitki örtüsünün yangın yayılımı üzerindeki etkisini daha iyi anlamak, yangın risk haritalarının hazırlanmasıyla birlikte etkili müdahale stratejileri geliştirilmesine katkı sağlayabilir.

Sonuç olarak, kentsel yangın yönetimi karmaşık ve çok boyutlu bir süreçtir. Kentsel alanların güvenliğini sağlamak için yangınların mekansal analizi, yangın güvenliği standartlarının artırılması ve yeni teknolojilerin entegrasyonu büyük bir önem taşımaktadır. Gelecek araştırma alanları, kentsel alanların planlamasında yangın güvenliği standartlarının göz önünde bulundurulmasını sağlayacak ve yangın olaylarının mekânsal ve ekolojik ilişkilerini derinlemesine inceleyerek, yangın yayılımı ile kentsel fiziksel ortam arasındaki ilişkilerin daha iyi anlaşılmasına katkıda bulunabilir. Yangın risklerinin daha iyi anlaşılması ve yönetilmesi için gerekli araçları geliştirmeye odaklanmalıdır. Bu doğrultuda, toplumun yangın güvenliği konusundaki farkındalığını artırmak ve afet öncesi ile sonrası yönetim süreçlerini iyileştirmek için kritik adımlar atılmalıdır. Deneysel yangın çalışmalarının entegrasyonu ve hesap verebilirlik ile denetim mekanizmalarının geliştirilmesi, yangın denetim süreçlerini iyileştirecek ve toplumda yangın güvenliği bilincini artıracaktır.

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# SAFRANBOLU TARİHİ ÇARŞIDA YAPAY ZEKÂ DESTEKLİ KÜLTÜREL MİRAS YÖNETİMİ

**Çiğdem BOGENÇ**[1]

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## 1. GİRİŞ

Yüzyıllar boyunca Doğu-Batı ticaret rotasında önemli bir kervan durağı olan Safranbolu binaları ve sokaklarıyla tipik bir Osmanlı şehridir. Safranbolu, Çukur, Kıranköy bölgesi ve Bağlar (Üzüm Bağları) olmak üzere üç ayrı tarihi mahalleden oluşur; şehrin iç kesimindeki pazar yeri alanı olan Çukur, şehrin alt kısmında yer alır ve iki nehrin belirlediği üçgen bir şekle sahiptir. Merkezi, zanaatkarların evleri ve atölyeleriyle çevrili bir pazar yerine de sahiptir. Bağlar'daki (Üzüm Bağları) yerleşim düzeni, büyük bahçelerin içine yerleştirilmiş tek evlerden oluşur. Şehrin kuzeybatı yamacında, güneye bakan bu bölge, şehrin yazlık beldesi olarak kullanılırken Kıranköy ise eskiden gayrimüslim bir mahalleydi ve çağdaş Avrupa kasabalarındakine benzer bir sosyo-mimari yapıya sahipti; zanaatkarlar ve esnaf dükkanlarının üstünde yaşıyordu. Bu mahalledeki evler, Çukur'daki ahşap evlerin aksine taş malzemeden yapılmıştır. Bu durum Osmanlı döneminde farklı toplulukların kendi geleneklerine göre yaşamasına duyulan saygının önemli bir göstergesidir. Unesco

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Dünya miras listesine sağlamış olduğu üstün evrensel değerleri ile kabul edilen Safranbolu aşağıdaki kriterler bağlamında listeye alınmıştır. Kriter (II)'ye göre Safranbolu, yüzyıllar boyunca kervan ticaretindeki kilit rolü sayesinde büyük bir refaha kavuştu. Sonuç olarak, Osmanlı İmparatorluğu'nun geniş bir alanında kentsel gelişim üzerinde büyük bir etki uygulayan kamusal ve evsel mimaride bir standart oluşturdu. Kriter (IV)'e göre Kervan ticareti yüzyıllar boyunca Doğu ile Avrupa arasındaki başlıca ticari bağlantıydı. Sonuç olarak, güzergahı boyunca karakteristik kasabalar gelişti. 19. yüzyılda demiryollarının ortaya çıkmasıyla, bu kasabalar aniden varlık nedenlerini kaybettiler ve çoğu başka ekonomik amaçlara uyarlandı. Kervan ticaretinin çöküşünden sonra, Safranbolu'nun Karabük çelik fabrikalarına yakınlığı ona yeni bir sosyo-ekonomik rol verdi, ancak orijinal biçimini ve binalarını dikkate değer ölçüde korudu. Kriter (v)'e göre de Safranbolu, topografyası ile tarihi yerleşimi arasında ilginç bir etkileşim gösteren tipik bir Osmanlı kentidir. Safranbolu barındırdığı mimari özellikleri, sokak düzeni ve özgün yerleşim dokusu ile mülkün olağanüstü Evrensel Değerini aktarmaya devam etmektedir. Günümüz kentsel tasarımlarına örnek bir model olabilecek Safranbolu sahip olduğu bilge yerleşim kültürü ile dünya kentsel yerleşimleri için önemli bir rol model niteliğindedir.

## 2. KENTSEL TASARIM İLKELERİ VE HEDEFLERİ

Mekân düzenleme araçlarından biri olarak kullanılan kentsel tasarım 1950'lerde üniversitelerde bir bilim dalı olarak yer almaya başlamıştır. Normatif, pragmatik ve pozitivist düşüncenin temelini oluşturan disiplinlerarası bir alan olan kentsel tasarım modern dönemin pozitivist düşüncesinin temelini oluşturmaktadır (Çetintahra 2011). Postmodern dönem kentsel


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tasarım ise katılımcı bir eylem olarak tanımlanmaktadır (Cömertler, 2003: 217). Kentsel tasarım, şehirlerin fiziki, estetik ve fonksiyonel özelliklerini belirlemenin yanı sıra kentleri düzenlemek ve iyileştirmek amacını kullanan bir planlama ve tasarım sürecidir (Öztürk vd., 2020). Bu süreç, yerleşim alanlarının yalnızca fiziksel yapısına değil, aynı zamanda çevresel, sosyal ve kültürel faktörlerine de odaklanarak, insan yaşamını iyileştirmeyi de hedeflemektedir (Lynch, 1960). Kentsel tasarım, geniş bir yelpazede yer alan öğeleri kapsar; bunlar arasında altyapı, ulaşım, açık alanlar, yerleşim yapıları ve sosyal etkileşim alanları yer almaktadır. Kentsel tasarımın temel amacı şehirlerin estetik ve işlevsel olduğu kadar daha uyumlu, yaşanabilir, sürdürülebilir olmasına hatta toplumun tüm ihtiyaçlarına cevap veren mekanlardan oluşmasına hizmet etmesi gerekmektedir (Gehl, 2010; Dönmez ve Türkmen, 2019). Kentsel tasarım aynı zamanda insanların yaşadığı alanları şekillendirirken estetik ve işlevsel dengeyi de korumalıdır. Bu çerçevede, tasarım süreci genellikle birkaç temel ilkeye dayandırılır. İşlevsellik ilkesi ilk ilke olup her bir alanın fonksiyonel ihtiyaçlarına uygun olarak tasarlanmasına hizmet eder. Örneğin, konut bölgeleri ulaşılabilir ve güvenli olması gerektiği gibi ticaret ve hizmet alanlarının da kullanıcı ihtiyaçlarını karşılaması gerekir (Alexander, 1977). İkinci prensip olan estetik ilkesi çevresel algıyı ve insan duygularını şekillendirir. Şehirlerin görsel kimliğini ve insanlar üzerindeki duygusal ve psikolojik etkileri yaratır. Bu nedenle, estetik tasarım unsurlarının bir araya getirilmesi, şehre özgün bir karakter kazandırmaktadır (Kaplan & Kaplan, 1989; Yılmaz vd., 2023). Bir diğer önemli ilke ise sosyal etkileşim alanlarının yaratılmasıdır. Kentsel tasarım, bireyler arasındaki etkileşimi artırmak ve toplumun farklı kesimlerini bir araya getirmek amacıyla sosyal alanlar oluşturmayı hedefler (Gehl, 2010). Bu noktada, kamusal alanların erişilebilirliği, güvenliği ve çeşitliliği, kentsel tasarımın en önemli unsurları arasında olarak yorumlanır.


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## 3. KENTSEL TASARIMDA KORUMA, KULLANMA VE GELİŞTİRME ARASINDAKİ DENGE

Kentsel tasarımlarda yer alan tarihi mekanların özellikle koruma ve geliştirme arasındaki dengenin iyi bir şekilde kurulması büyük bir önem taşımaktadır. Tarihi değerlerin korunması, kent kimliğinin sürdürülebilirliğini sağlarken kültürel mirasın gelecek nesillere aktarımında da kritik bir rol üstlenir (Türkmen ve Dönmez, 2015; Öztürk vd., 2021a; Uğur ve Dönmez, 2021). Ancak bu koruma çabalarının yanı sıra modern yaşamın ihtiyaçları ve gelişen şehircilik anlayışıyla da uyumlu projelerin geliştirilmesi gerekmektedir (Dönmez ve Türkmen, 2015; Yılmaz vd., 2022). Bu bağlamda, tarihî yapılar ile modern yapıların bir arada kullanılabilmesi için uygun restorasyon yöntemleri ve yeniden işlevlendirilmesi için projeler geliştirilmelidir (UNESCO, 2011; Öztürk vd., 2021b). Safranbolu örneğinde olduğu gibi, eski yerleşim alanlarının korunması, sadece estetik bir değer değil aynı zamanda sosyal ve kültürel kimliğin korunması açısından da hayati bir öneme sahiptir (Dönmez ve Türkmen, 2018; Aydın, 2018; Altay ve Aydın, 2020). Safranbolu gibi tarihî bir mekânın kentsel tasarımında, hem geçmişin hem de günümüzün ihtiyaçlarını karşılayacak bir yaklaşım gerekmektedir. Kentsel tasarım sürecinde koruma, yerel kültürün ve mimarinin izlerinin kaybolmaması için kritik bir unsurken, gelişen şehircilik anlayışıyla da uyum içinde olması gereken dinamik bir süreçtir. Safranbolu, UNESCO Dünya Mirası Listesi'ne dâhil edilerek bu dengenin korunmasının uluslararası ölçekte örnek teşkil ettiğini göstermektedir. Burada önemli olan, tarihi yapıları sadece geçmişin bir yansıması olarak değil, aynı zamanda bugünün ve geleceğin ihtiyaçlarına göre uyarlanmış şekilde ele almaktır (Başaran, 2020).

Kentsel tasarımda koruma ve geliştirme arasındaki bu dengeyi sağlamak için kullanılan yöntemler arasında, dijital


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teknolojiler ve yapay zekâ destekli analizler büyük bir potansiyele sahiptir. Bu teknolojiler, mevcut yapıları ve sokak dokusunu analiz etmek ve restorasyon süreçlerini optimize etmek için kullanılabilir (Cao, 2021). Safranbolu'da da bu tür teknolojilerin kullanılması, kentsel tasarım sürecine katkı sağlayarak, tarihi ve modern yapılar arasında uyumlu bir geçişi de sağlamaktadır.

## 4. SAFRANBOLU'DA TARİHİ ÇEVRE TASARIMINDA YAPAY ZEKÂ UYGULAMA FIRSATLARI

Yapay zekâ (YZ), kentsel tasarım ve şehir planlamasında giderek daha fazla yer almakta ve bu teknolojinin kullanımı, şehirlerin daha sürdürülebilir, estetik ve işlevsel hale gelmesinde önemli bir rol oynamaktadır. Safranbolu, Osmanlı dönemine ait eşsiz yapıları ve geleneksel yerleşim düzeni ile tarihi bir değer taşırken, aynı zamanda modern ihtiyaçlarla uyumlu bir kentsel dönüşüm sürecine de dahil olması gerekmektedir. Oysaki yapay zekâ bu dönüşümde önemli bir araç olarak kullanılabilir. Yapay zekanın kentsel tasarımda başlıca kullanım alanları arasında simülasyonlar, restorasyon projeleri, ve veri analizi yer almaktadır. Yapay zekâ Safranbolu'nun tarihi dokusunu korurken, modern gereksinimlere de uygun tasarımlar geliştirilmesine olanak sağlar. Yapay zekâ büyük veri analizi ve karar destek sistemlerinde kendini göstermektedir (Farooq vd. 2018). Safranbolu'da, kentleşme ve altyapı gelişimi ile ilgili veri toplamak ve analiz etmek, şehrin tarihî dokusuna zarar vermeden gelişim planları yapmak için kritik bir adımdır. Yapay zekâ, trafik yoğunluğu, enerji tüketimi ve çevresel faktörler gibi verileri analiz ederek (Papageorgiou 2021), kentsel tasarım kararlarını optimize edebilir. Yapay zekâ tabanlı algoritmalar, farklı tasarım senaryolarını test ederek en uygun çözümü bulma sürecini


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hızlandırır ve daha sürdürülebilir bir kentleşme stratejisini oluşturur (Koutamanis, 2016).

Safranbolu gibi tarihi bir bölgenin modern teknolojilerle korunması ve tasarımının iyileştirilmesi, yapay zekanın sunduğu fırsatlar ile mümkün hale gelmektedir. Yapay zekâ simülasyonlar, restorasyon projeleri, veri analizi ve görselleştirme gibi farklı alanlarda kullanılabilir ve bu süreçler, tarihi dokunun korunmasına katkı sağlarken, şehrin sürdürülebilir gelişimine de olanak tanır. Yapay zekânın kentsel peyzaja entegre edilmesi sadece Safranbolu'nun tarihi kimliğini yaşatmakla kalmaz aynı zamanda modern dünyanın gereksinimlerine uygun, verimli ve estetik açıdan tatmin edici bir kent yapısının ortaya çıkmasına da olanak sağlayacaktır.

## 5. GELECEĞE YÖNELİK PERSPEKTİF: SAFRANBOLU'DA YZ DESTEKLİ KENTSEL TASARIMIN ROLÜ

Gelecekte Safranbolu'nun kentsel tasarımı hem tarihi dokuyu koruyarak hem de modern yaşam ihtiyaçlarına cevap verecek şekilde şekillenecektir. Bu süreçte yapay zekâ teknolojilerinin kentsel tasarım süreçlerine entegrasyonu, şehrin gelişiminde önemli bir rol üstlenecektir. Safranbolu Tarihi Çarşının UNESCO Dünya Mirası Listesi'nde yer alması, şehrin tarihi yapısını korumanın yanı sıra, modern yaşamın gereksinimlerini de karşılayacak sürdürülebilir planlama stratejilerinin geliştirilmesi gerekliliğini de zorunlu kılmaktadır. Yapay zekâ bu süreçte hem koruma hem de gelişim aşamalarında kullanılarak şehrin tarihi kimliği ile uyumlu, sürdürülebilir ve akıllı bir tasarım stratejinin temelini de oluşturacaktır. Kamusal alan niteliği itibari ile Safranbolu Tarihi Çarşısı farklı kullanıcı kesimlerinin ihtiyaçlarına hitap ettiğinden dolayı yılın her ayı çok sayıda ziyaretçiyi ağırlamaktadır. Safranbolu'nun turizm


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açısından ön plana çıkan bu özellikleri çalışmada üç ana başlık altında incelenmiş olup bunlar; (I) Eski Çarşı Meydanı'nın fiziksel özellikleri, (II) Kullanıcı deneyimleri ve (III) Ekolojik planlama yaklaşımları açısından iyileştirmesi gereken yönlerden oluşmaktadır. Unutulmamalıdır ki Safranbolu Eski Çarşısı UNESCO Dünya Miras Listesi'nde yer alan ve Osmanlı dönemine ait kent dokusu niteliğini en iyi koruyan tarihi bölgelerden biridir. Safranbolu tarihi ve mimari özellikleri, anıtsal yapıları, Cinci Han ve Hamamı, modern şehirler alan bağlantısı, ticaret ve gündelik yaşamı bir arada yürütebilen 1994 yılında UNESCO Dünya Mirası Listesine girerken "Kriter II, Osmanlı kent kültürünün mimari ve sosyal yaşamını evrensel ölçekte temsil etmesi; Kriter IV, Ahşap işçiliği, cumba detayları ve sokak dokusu gibi özgün mimari unsurların bozulmadan korunması" maddelerinin yanı sıra turizmi kültürel mimarisine entegre edebilen turistik bir alandır. Bu özelliklerinin yanı sıra pek çok turistik çekim noktasına da sahiptir. Safranbolu'nun turizm açısından eşsiz bulunan özellikleri restorasyon çalışmaları ve çeşitli koruma statülerinden yararlanarak 21. Yüzyıla kadar yaşatılması bu alanı günümüzde hala değerli kılarken farklı kentsel planlama stratejileriyle birlikte tekrardan ele alınması gerekliliğini gündeme getirmektedir. Safranbolu modern şehirlerin "bulvar -cadde -sokak" aksine dar ve dolambaçlı sokaklardan oluşmakta olup yaya odaklı bir ulaşım sistemine sahip olması nedeniyle önerilecek kentsel tasarımların bu bağlamda ele alınması gerekmektedir. Ayrıca 2000'li yıllardan bu yana 600'den fazla tarihi ev, kültür ve Turizm Bakanlığı'nın denetimlerinden geçerek aslına uygun bir şekilde restore edilmiştir. Bu süreçte yeni inşaatların yasaklanması ve otelcilik faaliyetlerinde geleneksel konakların kullanılmasıyla birlikte kentin doğal dokusu korunabilmiştir.


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Safranbolu Kent Dokusunda “Ulaşım-Yeşil Yollar”

Safranbolu Eski Çarşı bölgesi modern kentsel planlama yaklaşımlarından oldukça uzaktadır. Modern şehir planlamaları içerisinde yer alan “bulvar-cadde-sokak” örüntüleri Safranbolu kenti içerisinde yer almamaktadır. Geleneksel Osmanlı mimarisini barındıran şehir merkezinde ana arterler ile ikincil yollar arasında keskin bir ayrım yoktur. Şehir merkezinde dar ve organik bir şekilde gelişen sokak sistemi hâkim olup konut alanlarını birbirine bağlayan daracık sokaklardan oluşmaktadır. Dar sokaklarda tarihi dükkanlar ve konakların sıralandığı, yaya odaklı yapılar sergilenmektedir. Bunun yanı sıra 11 mahalleden oluşan tarihi mekanlardaki sokaklar mahalle kimliğini yansıtacak şekilde isimlendirilmiştir. Sokakların yönlenmesi topografyaya uyumlu olup eğimli araziye kademeli olarak yerleştirilmiştir. Modern geniş bulvarların olmayışı bölgenin tarihi karakterini koruması açısından önemli bir etkendir.

Safranbolu Eski Çarsıya Yönelik Yapay Zekâ Algoritma Yaklaşımlarından Beklentiler

Yaşamın doğal bir akışta devam ettiği Safranbolu Eski Çarsısı bir yandan tarihi dokusunu korurken bir yandan da modern yaşamın gerekliliklerine ayak uyduran ender tarihi mekanlarımızdan biridir. Uzun bir süre devam eden bu süreç yapay zekanın kentsel planlama ve tasarımlarda kullanılmaya başlanması nedeniyle tarihi ve modern kent dokusunun birbirine entegrasyonu ile dikkat çekmeye başlamıştır. Bu bağlamda alanın hem kültürel yapısının korunarak devam ettirilebilmesi hem de modern kente entegrasyonunun yapılabilmesi için yapay zekâ algoritmalarının ekolojik planlamalarda kullanılabilirliğini gündeme getirmiştir.

Çalışmada Safranbolu Eski Çarşısının modern kentle ilişkisinin kurulmasında yeşil koridor yaklaşımlarından yararlanılmıştır. Bu yaklaşımlarda akıllı trafik ve ulaşım


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yönetimi, turist deneyimlerinde iyileştirmeler, enerji verimliliği ve sürdürebilirlik kavramlarının yanı sıra yerel ekonomi ve güvenlik kavramları da irdelenmiştir. Her bir kavram mevcut durum dikkate alınarak yapay zekâ algoritmalarıyla yorumlanmaya çalışılmıştır. İlk önce akıllı trafik ve ulaşım yönetiminde gerçek zamanlı trafik optimizasyonu önerisinde de bulunulmuştur. Böylece araç uygunluğunu analiz eden yapay zekâ algoritmaları ile trafik ışıkları dinamik olarak izlenerek tıkanıklıkların anında önlenebilmesi için dar sokaklarda araç sirkülasyonu için acil durumlarda öncelikle geçiş algoritmalarının uygulanabilir olması sınırlı sayıda bulunan araç için park yerlerinde yapay zekâ destekli mobil uygulamalarla boş park yerlerinin anlık tespit edilerek park sorunu içinde bir çözüm önerisi getirilmelidir. Ayrıca kullanılacak yapay zekâ tabanlı mobil uygulamalarla turistlere kişiselleştirilmiş rotalar da sunulabilir. Arttırılmış gerçeklik ile tarihi binaların orijinal halleri 3D modellenmelerle hazırlanarak farklı dillerde hazırlanmış tanıtım çevirileriyle birlikte ziyaretçilere hizmet verebilir. Yapay zekâ asistanları çalışmanın her aşamasında kullanılabilir. Mevsimsel yoğun kullanımları ön gören yapay zekâ algoritmalarıyla esnaf stok ihtiyaçlarının yanı sıra personel planlamasını yapacak olup anlık ziyaretçi sayısı verilerini restoran /otel rezervasyon sistemine entegre edilebilecektir. Bunun yanı sıra LED aydınlatmaların kullanıldığı hareketli sensörler sayesinde yapay zekâ ile tespit edilen yaya hareketliliğine göre aydınlatmaların parlaklık seviyeleri otomatik ayarlanarak enerji tüketiminde %40'a varan bir enerji tasarruf elde edilebilecektir. Turistlerin hem hedef kitlesini hem de sosyal medya trendlerini takip eden yapay zekâ algoritmalarının önerilerine göre yöresel el sanatlarına olan ilgileri belirlenerek ana hedef kitle oluşturulabilecektir.

Safranbolu Eski Çarşı için Yeşil Aks Planlama Stratejilerine Yönelik Yapay Zekâ Önerileri


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Safranbolu Eski Çarşı'ya yönelik yeşil aks planlamaları kültürel mirası korurken aynı zamanda iklim dirençli şehircilik arasında da bir denge kurabilmelidir. Yerel ekosisteme uyumlu bitkilerin seçiminden toplumsal katılım mekanizmalarına kadar yenilikçi tüm finansman modeller bu sürecin temel taşlarını oluşturacaktır. UNESCO kriterlerine uygun olarak geliştirilecek tüm bu stratejiler Safranbolu'yu "yaşayan bir eko-müze" haline getirecektir. Yapay zekâ algoritmaları kullanılarak Safranbolu Eski Çarşına yönelik yapılan tasarım yaklaşımı Şekil 1'de ele alınmıştır.




**Şekil 1. Safranbolu Eski Çarşı'ya yönelik planlama çalışmaları**

Safranbolu eski çarşısının organik dokusuna uyumlu dar sokaklarında ince dokulu bitki grupları kullanılarak taş kaplamalar bozulamadan yeşille temas ettirilmiştir. Dar sokaklarda kullanılan çalı gruplarıyla (kekik, lavanta vb.) yaya yolları vurgulanırken geleneksel Safranbolu evlerine yönelik iç akslar oluşturulmuştur. Bu kullanımlar Safranbolu Eski Çarşı'ya hem estetik hem de ekolojik süreklilik sağlarken İnce Kaya Su Kemeri gibi tarihi su koridorlarının etrafı için önerilen bitkilendirme koridorları vasıtasıyla su kaynaklarına uyumlu yeşil koridor aksları ekolojik planlama yaklaşımlarını


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destekleyecek niteliktedir. Bu bitkilendirme stratejileri ziyaretçiler için alternatif bir botanik rotası oluşturacak olup bu rotaya ek olarak önerilecek "Safran Rotası" ile de hem eğitim hem de doğa temelli turizm etkinliklerine yönelik çalışmalar kurgulanabilecektir. Yeşil aks planlamaları 3194 sayılı İmar Kanunu ile uyumlu olarak Safranbolu Çevre Düzeni Planı'nda belirlenen kademeli koruma zonlarına göre kent planlamasını destekleyecek niteliktedir. Kısacası 1. derece koruma statüsünde bulunan alanlara minimal müdahaleler yapılarak şehir merkezleri planlanabilecektir.

Safranbolu Eski Çarşıda Kültürel Miras Unsurlarının Korunarak Yapay Zekâ Algoritmaları Doğrultusunda İrdelenmesine Yönelik Sonuç ve Öneriler

Safranbolu Eski Çarşı da yapay zekâ algoritmalarının kullanılabilir olmasında koruma kullanma dengesinin yanı sıra yapılacak turizm faaliyetlerine de birbirine entegre olması gerekmektedir. Bu neden yapılacak veri analiziyle birlikte sürdürülebilir yönetim politikasının bir arada planlanması gerekmektedir. Kurgulanacak bu metodoloji programı UNESCO'nun "dijital miras" hedefleri ile de örtüşecek niteliktedir. Unutulmamalıdır ki yapay zekâ algoritma kullanımlarıyla kentsel mekanlar devrim niteliğinde dönüştürülebilmektedir. Bu süreç şehirlerdeki yaşamı etkileyeceği için insan etkileşimini de köklü bir şekilde değiştirecek niteliğe sahiptir (Şekil 2). Şehirlerin karmaşık yapılarına yönelik geliştirilecek planlama ve tasarım yaklaşımlarının simülasyonlarla görselleştirilmesi politika yapıcılara referans olacak olup kaynak tahsisinin optimize edilebilmesine de olanak sağlayacaktır.


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**Şekil 2. Safranbolu Eski Çarşısının Kültürel Miras Alanlarına Yönelik Kentsel Tasarım Önerileri**

Yapay zekanın özellikle Safranbolu gibi UNESCO Dünya Mirası Listesi'nde yer alan tarihi bölgelerdeki yerleşim alanlarına yönelik koruma ve geliştirme süreçlerini iyileştirmeye yönelik potansiyelleri büyüktür. Bu çalışmada ele alınan Safranbolu Tarihi Çarşısının kentsel tasarım detayları gelecekteki şehircilik süreçlerinin daha veri odaklı ve analizlere dayalı olarak tasarlanacağını bize göstermektedir. Yapay zekâ algoritmaları sayesinde şehrin büyümesi, altyapının geliştirilmesi, sosyal ve kültürel etkinliklerin daha önceden tahmin edilebilir olmasıyla şehrin tasarımına yansıyan eksiklikler ve gereksizlikler ortadan kaldırılabilecektir. Ayrıca yapay zekâ teknolojilerinin


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restorasyon süreçlerine entegre edilmesi ile de Safranbolu'nun tarihi yapılarının daha doğru ve güvenli bir şekilde korunmasına da olanak sağlanacaktır.


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# Cumhuriyetin 100. Yılında Mimarlık Konuşmaları




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EĞİTİM YAYINEVİ GRUBU

# MODERN MİMARLIK MİRASINDA YENİLİKÇİ YAPI MALZEME VE SİSTEMLERİNİN UYGULANMASI

Ebru Kılıç Bakırhan[1]

## 1. Giriş

Toplumlar gelişmeye ve ilerlemeye mahkûmdur. Özellikle bilim ve sanat alanındaki gelişmeler, sadece toplumun kendi içerisinde değil, toplumlar arası ilişkilerde de önemli rol üstlenir. Türk toplumu, tarih boyunca dünyaya önemli eserler miras bırakmıştır (Yorgancılar ve Ecer, 2022). Hem bilim hem de sanat dalı olarak görülen mimarlık disiplini, kültürel mirasların temel araştırma alanını oluşturur. Kültürel miraslar, kültürlerini benimseyen, yüksek eğitim düzeyine sahip olan ve tarihine saygı duyan toplumlar tarafından korunarak gelecek kuşaklara aktarılır (Tekeli, 2018).

Kültür ve Tabiat Varlıklarını Koruma Kanunu'nda 'kültür varlığı' kavramının tanımında 'tarih öncesi ve tarihi devirlere ait' tanımlaması geçmektedir. Bu kanuna göre, bahsi geçen dönemlerde ortaya çıkan bilim, din, kültür ve güzel sanat eserleri özgün değer taşımaları halinde tescillenerek koruma altına alınır (Kültür ve Tabiat Varlıklarını Koruma Kanunu, 1983; Kültürel Miras, t.y.). Böylece devamlılığı sağlanan kültür varlığı üzerinden geçmiş dönemlere ait bulgular geleceğe aktarılmış olur. Ancak öncelikle anıt ve sonrasında kültür varlıklarını kapsayan bu koruma yaklaşımı, yakın zamana kadar 20. yüzyıla ait kültürel mirası göz ardı etmiştir. Modern mimarlık mirası, yakın geçmişe ait olması nedeniyle koruma açısından yeterince incelenmeye değer bulunmamasının sonucunda bir köşede yıpranmaya terk edilmektedir (Parlak ve Yaldız, 2022). ICOMOS (Uluslararası Anıtlar ve Sitler Konseyi)'un 2001 yılındaki raporuna göre 20. yüzyıla ait kültür mirasları en çok risk altında olan yapı grupları arasındadır (Özkaban, 2014). Tekeli'ye göre modern mimarlık mirasının korunamamasında toplum bilincinin eksikliği ve bu tür yapıların

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değerinin anlaşılamaması yatmaktadır. Tekeli, tarihsel mimarlık mirasına yönelik gösterilen koruma bilincinin bilhassa 1935-2000 yılları arasındaki modern mimarlık eserlerini kapsamamasına değinerek önemli bir soruna işaret etmektedir (Tekeli, 2018).

1970'li yıllarda Amerika'da bulunan ve modern mimari döneme ait bir toplu konut projesi olan Pruitt- Igoe'nin yıkımı, modern mimarlığın korunmasına yönelik tartışmaları başlatan önemli bir hadise olmuştur (Omay Polat ve Can, 2008). Ayrıca ülkemizde modern mimariye dair yapılan yakışıksız müdahaleler, İstanbul Manifaturacılar Çarşısı'nda olduğu gibi özgün halini kaybeden yapının yıkılabileceği düşüncesini aşılayarak kültür miraslarımıza zarar vermektedir (Tekeli, 2018). Ayrıca en sürdürülebilir yapının halihazırda var olan yapı olduğu düşünüldüğünde, mimarlık mirasımıza ait yapı stoğunun önemi bir kez daha gözler önüne serilmiş olacaktır.

### 1.1. Uluslararası platformlarda modern mirasın korunması

UNESCO (Birleşmiş Milletler Eğitim, Bilim ve Kültür Örgütü), DOCOMOMO (Modern Hareketin Yapıları, Siteleri ve Mahallelerinin Belgelendirilmesi ve Korunması), ICOMOS ve Avrupa Konseyi gibi kurum ve kuruluşlar modern mimarinin korunmasına yönelik çeşitli atılımlar yapmışlardır. Bu eksende kurulan DOCOMOMO ile 20. yüzyıla damgasını vuran modern mimarlık ürünlerine ilgi çekmek, bu ürünleri belgelemek ve korumak amaçlanmıştır (Docomomo Türkiye, t.y.). ICOMOS Türkiye, Mimari Mirası Koruma Bildirgesi (2013)'nde belirtildiği şekliyle modern mimari miras, 20. yüzyılın başlarından itibaren ortaya çıkan, uluslararası ve ulusal akımları ile yenilikçi teknoloji ve teknikleri barındıran yapı, yapı grupları veya yerleşimlerdir.

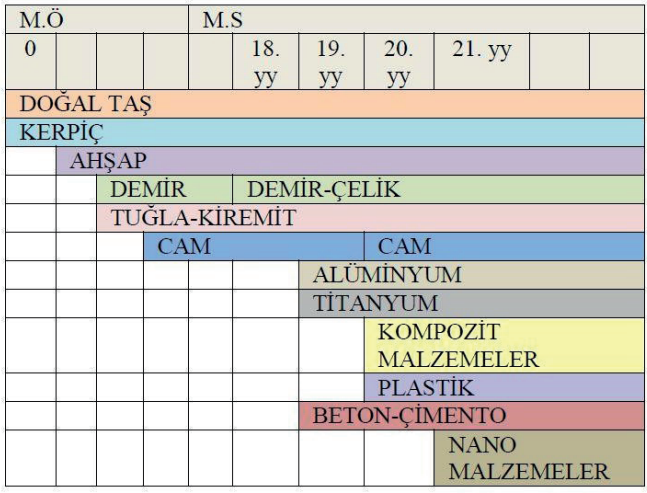
Modern yapıların kültürel miras olarak sayılabilmesi için tarihi bir öneme sahip olmaları, bulundukları tarihi bölgenin gelişimine katkı sunmuş olmaları, estetik açıdan değerli bulunmaları, yapıldıkları döneme yönelik veri sağlamaları, kendilerine has bir tipoloji, yapım sistemi veya tasarıma sahip olmaları ya da bir döneme adını yazdıran meşhur bir mimarın eseri olmaları gerekmektedir (Ahunbay, 2018). Ülkelere göre kabul edilen modern mimarlık mirasının tanımı Şekil 1'de verilmiştir.




**Şekil 1.** Modern mimarlık mirasının tanımlanması (Parlak ve Yaldız (2022)'den alınarak yeniden uyarlanmıştır)

## 1.2. Modern mimarlık mirasında malzeme kullanımı

Tarih boyunca insanlığın gelişimi ile yapılarda kullanılan malzeme ve teknolojiler de değişime uğramıştır. Sanayi Devrimi ile 19. yüzyılda metaller yapıda kullanılmaya başlanmış, Portland çimentosu keşfedilmiş ve beton bir dizi kimyasal yenilikle inşaat sektörüne giriş yapmıştır. Teknolojik gelişmelerin yaşandığı 20. yüzyıl aynı zamanda yapı sektöründeki gelişmelerin ve hafif malzemelerin gelişine zemin hazırlamıştır (Gökalp Atan ve Solak, 2023). Bu yüzyılda cam teknolojileri gelişmiş, kompozit ve plastik malzemelere yoğunlaşılmıştır. 21. yüzyıl ise nano boyuttaki malzemelerin ve daha pek çok yeni teknolojinin yaşamımıza girdiği bir çağdır (Yıldız ve Seçkin, 2019) (Şekil 2).



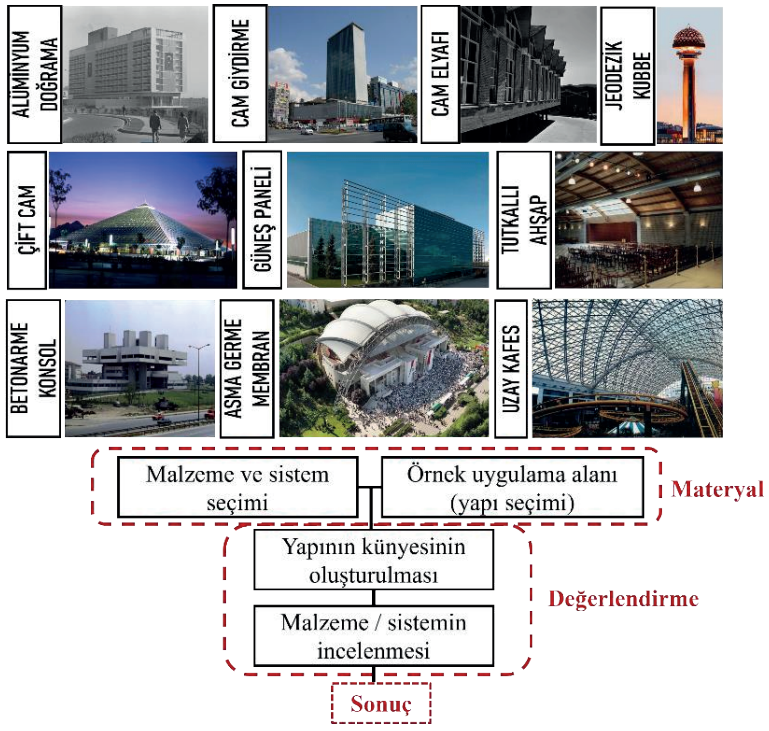

**Şekil 2.** Malzemelerin tarihsel gelişimi (Yıldız ve Seçkin, 2019)

Türkiye'deki modern mimarlık üzerine gerçekleştirilen çalışmalar genelde yapının biçimsel unsurları ile ilgilenmekte olup yapı malzemelerine yönelenler oldukça azınlıktadır (Uz, 2019). Bu çalışmada, 20. yüzyılda inşa edilmiş kültür mirasları arasından, üretildiği döneme göre yenilikçi yapı malzeme ve sistemleri kullanmasıyla öne çıkan 10 adet yapı seçilerek incelenmiştir. Çalışmanın amacı, modern mimarlık mirasında yenilikçi malzeme kullanımının niteliklerini ve katkılarını açığa çıkarmaktır. Böylece modern mirasın korunmasının önemine bir kez daha değinmek ve bu eserlerin korunmasına yönelik atılacak yeni adımların teşvik edilmesi amaçlanmıştır. Çalışmanın hedef kitlesini mimarlar, çağdaş mimarlık tarihi ile ilgilenen araştırmacılar, malzeme üreticileri ve koruma uzmanları oluşturmaktadır.

## 2. Materyal ve Metot

Literatür araştırmasından elde edilen dönemin yenilikçi malzemeleri örnek yapılar üzerinden incelenmiştir. Malzemelerin uluslararası yapı sektöründe kendine yer bulduğu zaman dilimine göre Türkiye'de uygulanma durumları tespit edilmiştir. Buna göre 20. yüzyılda inşa edilen ve kültürel miras açısından öneme sahip bir yapıda ilk kez kullanılan, yeni bir sistem önerisi sunan ve dönemine göre yenilikçi malzeme kategorisinde değerlendirilebilecek yapı malzemeleri çalışmanın ana materyallerini oluşturur.

Malzeme kategorileri alüminyum doğrama, cam giydirme, cam elyafı, çift cam, betonarme konsol, jeodezik kubbe, uzay kafes, tutkallı ahşap, membran ve güneş paneli sistemlerinden oluşmaktadır. Türkiye'de uygulanan ilk veya çarpıcı örnekler arasından seçilen 10 farklı yapı özelinde, altı farklı ana malzemenin kullanım yöntemleri, avantajları, kullanıldıkları yapı bileşenleri ve kullanım nedenleri araştırılmıştır (Şekil 3).




**Şekil 3.** Çalışmanın metodolojisi

## 3. Bulgular ve Değerlendirme

Bu bölümde döneminin yenilikçi malzemelerini kullanması yönüyle öne çıkan 20. Yüzyıla ait modern miras yapıları incelenmiştir. Yapılar özgün malzeme kullanımlarına göre alüminyum, cam, betonarme, çelik, ahşap, membran sistemler ve güneş panelleri olmak üzere yedi başlık altında ele alınmıştır.

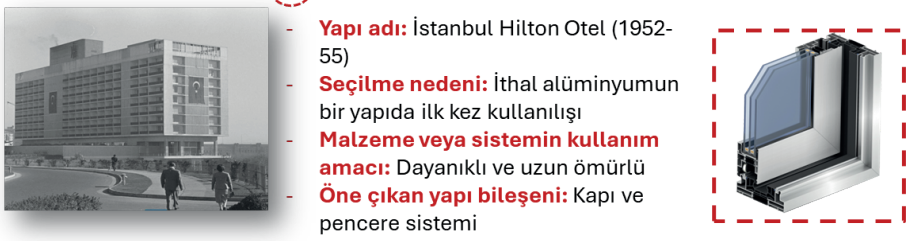
### 3.1. Malzeme ve yapı özelliklerinin incelenmesi

*Alüminyum*

Alüminyumun mimari alanda kullanımına yönelik ilk denemeler 19. yüzyılda başlamıştır. Bu malzemenin yapıda kullanılmasında hafif olması, kolay işlenebilmesi ve korozif olmaması etkili olmuştur (Uz, 2019).

İstanbul Hilton Otel, mimarları Sedad Hakkı Eldem & SOM (Skidmore, Owings and Merrill) olan ve Şişli, İstanbul'da bulunan döneminin gözde yapılarındandır. Yapı 1952-55 yılları arasında inşa edilmiştir. Otelin kapı ve pencereleri alüminyum doğramadan oluşmaktadır. Bu, ithal alüminyumun bir yapıda ilk kez kullanılışıdır (Uz, 2019). Yapı 21 m genişliğinde, 100 m

uzunluğundadır (Arkitera, 2015). Otelin mimarisi Amerikan tarzı kentsel konaklama yapılarına benzer (Şekil 4). Malzeme ve yapı sistemleri açısından dönemin şartlarını zorlayan bir yapı olmuştur. Otel yapıldığı dönemde modernizmin bir başyapıtı olsa da sonradan yapılan yakışıksız müdahaleler iç mekânda niteliksiz alanların oluşmasına yol açmıştır (Hasol, 2017). Yapı günümüzde halen otel olarak kullanılmaktadır.

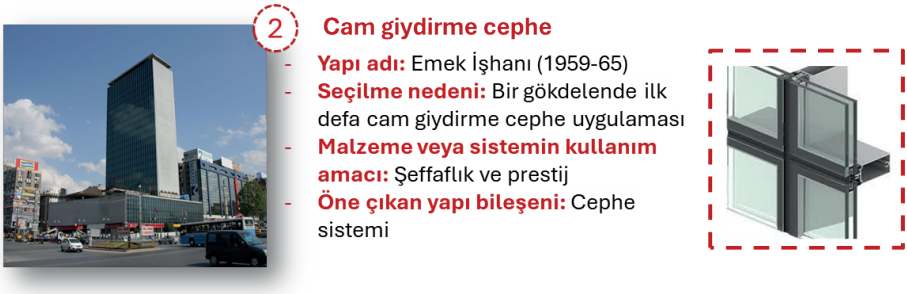



**Şekil 4.** Alüminyumun örnek yapıda kullanımı ve özellikleri.

### *Cam*

Cam giydirme cephe, yüksek miktarda doğal ışığı iç mekâna alması ve estetik görünümü sebebiyle günümüzde özellikle ofis binaları gibi prestij gerektiren yapılarda halen tercih edilmektedir. Cam giydirme cephenin dünyadaki ilk örneği, 1909 yılında Kansas'ta bulunan Boley Binasında uygulanmıştır (Washington Eyalet Arkeoloji ve Tarihsel Koruma Departmanı, t.y.).

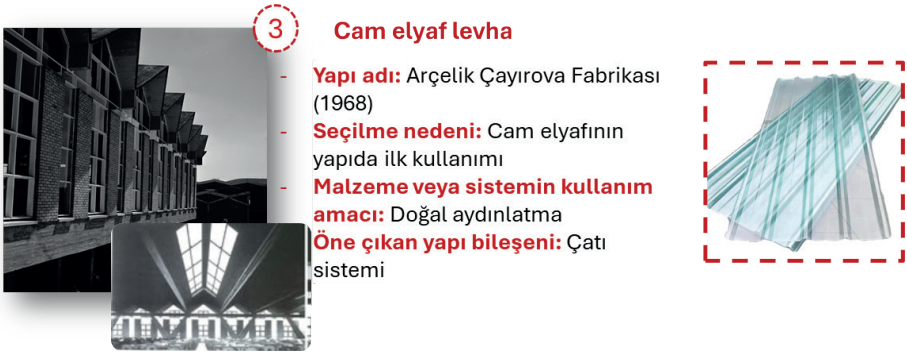
Emek İşhanı (Gökdelen), cam giydirme cephenin ülkemizde uygulanan ilk örneklerinden birini teşkil etmektedir. Yapı, 1959-65 yılları arasında inşa edilmiş olup mimarı Enver Tokyay'dır. Ankara'nın merkezi Kızılay'da yer alan yapı, cam giydirme cephe, brüt beton, pleksiglas ve alüminyum güneş kırıcılardan meydana gelmektedir (Uz, 2019). Ayrıca ülkemizde perde duvar teknolojisi de bu yapı ile tanınırlık kazanmıştır. Yapı, zemin üzerinde 22 kattan oluşmaktadır (Bayraktar, 2020). Şeffaf, hafif ve modern duruşa sahip olmasının yanı sıra kentsel bellekte önemli bir yer tutan Emek İşhanı, Ankara'nın simge yapılarındandır (Şekil 5). Rasyonel ve uluslararası mimari akımdan etkilenmiş Türkiye'nin ilk gökdelenidir (Türkiye Mühendislik Haberleri, 2006).




**Şekil 5.** Cam giydirme cephenin örnek yapıda kullanımı ve özellikleri

Cam elyafı kompozit malzeme üretiminde yıllık 10 milyon tonu bulan üretim miktarıyla yüksek performansı ve hafifliği nedeniyle tercih edilen bir yapı malzemesidir (Thomason, 2019). Taş yünü, cam köpüğü, boşluklu tuğla ve genleştirilmiş perlit ile cam elyafı gibi yalıtım sağlayan yapay malzemelerin üretimi 19. yüzyılda gerçekleşmiştir (Bozsaky, 2009).

Türkiye'nin ilk cam elyaf üreticisi Şişecam'dır ve üretime 1975 yılında başlamıştır (Şişecam, t.y.). Arçelik Çayırova Fabrikası cam elyafının yapıda kullanıldığı ilk örneklerdendir. 1968 yılında inşa edilen yapının mimarı Aydın Boysan'dır. Yapı, Gebze, Kocaeli'de yer almaktadır. Ana strüktür betonarmeden oluşmakta olup çatıda çelik makaslar ve fiberglas (cam elyafı) oluklu levhalar kullanılmıştır (Şekil 6). Çatıda kullanılan ve çatı yüzeyinin %30'unu oluşturan ışıklıklar yardımıyla üretim sahasına doğal gün ışığı sağlanmıştır (Hasol, 2017).

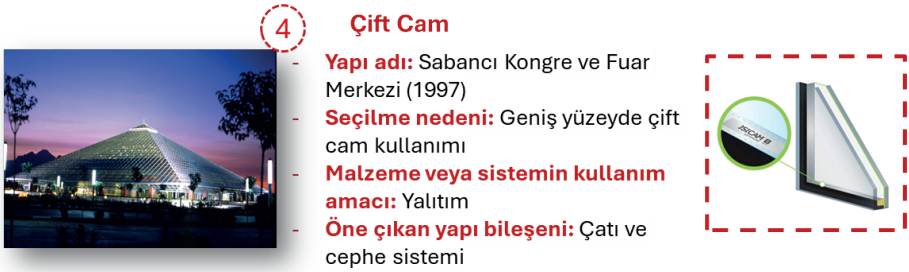



**Şekil 6.** Cam elyafının örnek yapıda kullanımı ve özellikleri

20. yüzyılda yapıda kullanımı yaygınlaşmaya başlayan bir diğer malzeme ise ısı yalıtımını sağlayan çift cam teknolojisidir. 1970'lerde çift camın kullanılmaya başlanmasıyla iki cam arasına hapsedilen durgun ve kuru hava sayesinde yalıtım sağlanarak ısı kaçışında yarı yarıya düşüş sağlanmıştır.

Ülkemizde Şişecam'ın kurulmasıyla 1974'te ısıcam (çift cam) üretimine başlanmıştır (Görücü, 2003).

Bu teknolojinin ilk örneklerinden biri Sabancı Kongre ve Fuar Merkezi, diğer adıyla Cam Piramit'te yer almaktadır. 1997 yılında hizmet vermeye başlayan yapının mimarları UMO Mimarlık'ın kurucuları olan Yaşar Marulyalı ve Levent Aksüt'tür. Yapı Antalya'da yer almaktadır. Bu binada kullanılan uzay çatı sistem yerden 22,6 m yüksekliktedir ve titanyum mavisi ısıcam ile kaplı yüzey alanı 5710 m²'dir (Sabancı Vakfı, t.y.). Yapının mimarlarından Yaşar Marulyalı, yapının tamamının cam ile kaplanma nedenini arka plandaki dağlarla uyumun sağlanması olarak açıklamıştır (Toki Haber, t.y.). Boyalı cam kullanımı yapıya estetik değer katmanın yanı sıra içeriye giren ışık ve ısının kontrolünü sağlamada etkilidir (Şekil 7).




**Şekil 7.** Çift camın örnek yapıda kullanımı ve özellikleri

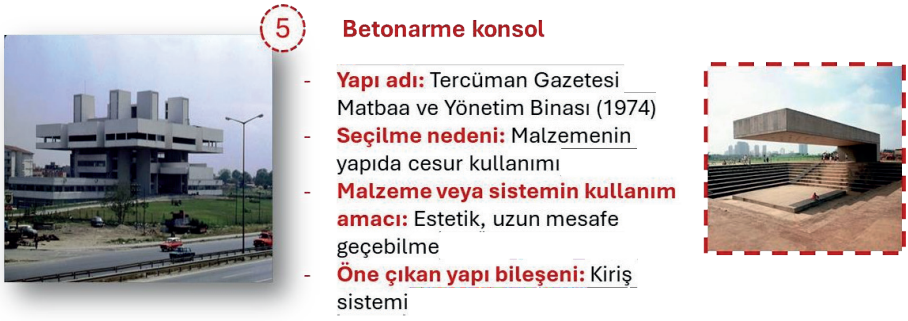
### *Betonarme*

Son 150 yıldır betonarme, dünya çapında dayanımı ve şekil vermedeki kolaylığı ile bilinen bir malzeme haline gelmiştir (Mosoarca ve Victor, 2013).

Tercüman Gazetesi Matbaa ve Yönetim Binası, betonarme konsolları ile öne çıkan simgesel yapılar arasında bulunmaktadır. Yapının mimarları Günay Çilingiroğlu ve Muhlis Tunca'dır. 1974 yılında inşa edilen yapı Topkapı, İstanbul'da bulunmakta idi. Brütalist mimarinin etkileri görülen yapı form ve taşıyıcı sistem özellikleri bakımından cesur olarak tabir edilen bir yapıdır. Cepheye dik olarak uzunluğu 7 metreyi bulan konsollar ve bunları taşıyan 8 kule bu tabiri desteklemektedir (Şekil 8). Yapıdaki en uzun diyagonal açıklık 20 metre civarındadır. Köşe konsolları, boşlukta asılı kalan kütleleri ve şerit pencereleri ile hem dış mekânı hem de ışığı adeta içine çeken bu yaklaşım yapının kilit özelliklerindendir (Yücel, 1985; Mimdap, 2023).

Yapıya yönelik eleştirilerden bazıları arasında yapının yüksek inşaat maliyetlerine ve sınırlı kullanım alanlarına sahip olması yer almaktadır. Bu ve

benzeri gerekçelerle 2010'da yapılan tescil işlemi 2012'de sonlandırılmıştır. Yapı, "2863 sayılı Yasa'nın 6. maddesinin a, c ve d fıkralarında belirtilen niteliklere sahip olmaması ve 1974 yılında inşa edilen betonarme yapının tarihi, arkeolojik, çevresel ve diğer yönleriyle herhangi bir önem taşımaması" gibi gerekçelerde 2023 yılında yıkılmıştır (Arkitera, 2023).

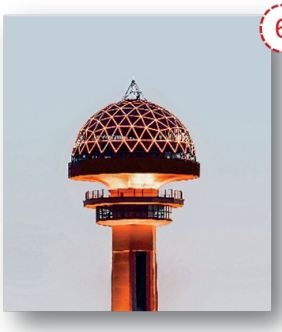



**Şekil 8.** Betonarme konsolun örnek yapıda kullanımı ve özellikleri

### *Çelik*

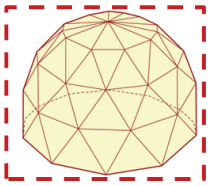
İlk olarak 1922 yılında Almanya'da tasarlanan jeodezik kubbe sistemi daha sonra Buckminister Fuller tarafından iki tabakalı olarak geliştirilmiştir. Fuller, 1954 yılında jeodezik kubbenin patentini almış (Demirbaş ve Girgin, 2019) ve 1960'lı yıllarda Expo Fuarı için eşkenar üçgen formundaki çelik birimlerden meydana gelen bir jeodezik kubbe tasarlamıştır. Bu kubbe dinamik, yenilikçi, işlevsel ve estetik yönleriyle ön plana çıkmıştır (Kuzulugil vd. 2020).

Ankara'nın Çankaya'ya ilçesinde yer alan Atakule Alışveriş Merkezi betonarme konstrüksiyon üzerine çelik konstrüksiyondan oluşan jeodezik kubbesi ile ünlüdür (Şekil 9). Yapı, 1989 yılında inşa edilmiş olup mimarı Ragıp Buluç'tur. Reflektif cam giydirme cepheye sahip olan 125 metre yüksekliğindeki yapı 1990 yılında Mimarlar Odası tarafından verilen Ulusal Mimarlık Ödülü'nü kazanmıştır (Hasol, 2017; Mimarizm, 2023).



6 **Jeodezik kubbe**

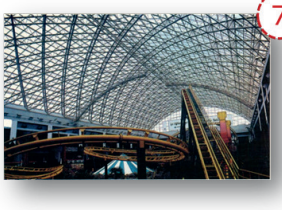
- **Yapı adı:** Atakule (1989)
- **Seçilme nedeni:** Sistemin yapıya değer, şehre silüet kazandırması, ödüllü yapı
- **Malzeme veya sistemin kullanım amacı:** Daha az malzeme kullanımı, rijit form
- **Öne çıkan yapı bileşeni:** Çatı sistemi



**Şekil 9.** Jeodezik kubbenin örnek yapıda kullanımı ve özellikleri

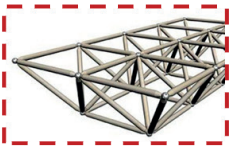
Çelik malzeme ile geniş açıklıkların geçilmesine imkân tanıyan dönemin yenilikçi malzemelerinden bir diğeri uzay kafes sistemlerdir. Deniz kabuklularının geometrik yapısından esinlenilerek ortaya çıkan uzay kafes sistemi, yapılarda 1940'lı yıllarda kullanılmaya başlanmıştır. Bu sistemler hafiflik ve maliyetleri ile ön plandadırlar (İMO Sakarya Şubesi, t.y.).

Uzay kafes sisteminin uygulandığı modern kültür miraslarından biri, 1997 yılında Avrupa Çelik Birliği'nin vermiş olduğu ödülünü kazanan Tatilya'dır (Mimarizm, 2023). Yapı 1996 yılında hizmete girmiştir ve Mimarı Oktay Nayman'dır. Yapı Beylikdüzü, İstanbul'da yer almaktaydı. Çapraz kemerli çelik tonoz ve camdan oluşan uzay kafes sistemi sayesinde yapının üstünü örten çelik tonozun boyutları 52x115 metreye ulaşabilmektedir. Çatının zeminden itibaren ölçülen en yüksek noktası 35 metredir (Şekil 10). Ancak yapı 2006 yılında, yerine alışveriş merkezinin yapılacağı gerekçesi ile yıkılmıştır (Hasol, 2017).



7 **Uzay kafes**

- **Yapı adı:** Tatilya (1996)
- **Seçilme nedeni:** Ödüllü yapı
- **Malzeme veya sistemin kullanım amacı:** Geniş açıklık geçebilme
- **Öne çıkan yapı bileşeni:** Çatı sistemi



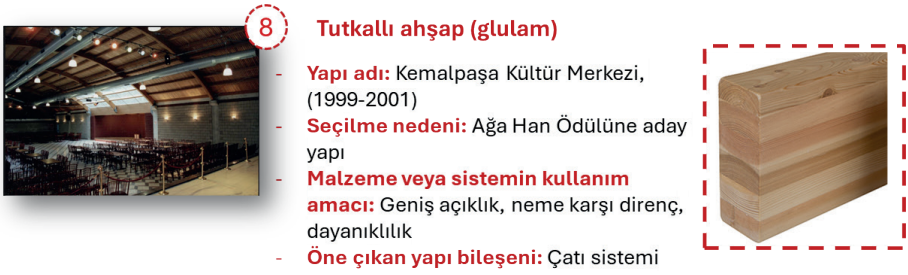
**Şekil 10.** Uzay kafesin örnek yapıda kullanımı ve özellikleri

### *Ahşap*

Tutkallı ahşabın bir yapıda kullanıldığı ilk örnek 1934'te ABD'deki bir okula ait spor yapısında karşımıza çıkmaktadır (Yesügey vd. 2019). 20. yüzyılın

başlarında gelişen ahşap teknolojileri arasında tutkallı ahşabın öne çıkma nedeni, bu tür endüstriyel ahşabın geleneksel ahşapta var olan dezavantajları giderebilmesidir. Tutkallı ahşap, neme karşı dirençli bir bağlayıcı madde ile uzun ahşap şeritlerin birbirine yapıştırılması yöntemi ile oluşturulur. Böylece geniş açıklıklar geçilebilmekte ve içeriğindeki kimyasallar sayesinde ahşabın küflenmesinin önüne geçilebilmektedir (Haddadi, 2023).

Kemalpaşa Kültür Merkezi, 1999-2001 yılları arasında İzmir'in Kemalpaşa ilçesinde inşa edilmiştir. Oran Mimarlık'ın kurucuları Vedat Tokyay, Funda Mutlubaş ve Sertaç Bilgici tarafından tasarlanmıştır. Yapıda tutkallı ahşap (glulam), taş ve tuğla kullanılmıştır. Tabakalı tutkallı ahşap teknolojisi çatı strüktürünü; taş ve tuğladan oluşan çift duvarlı blok sistem ise cepheyi oluşturur (Şekil 11). Yapı 2004'te Ağa Han Mimarlık Ödülleri'ne aday olarak gösterilmiştir (Arkiv, t.y.).




**Şekil 11.** Tutkallı ahşabın örnek yapıda kullanımı ve özellikleri

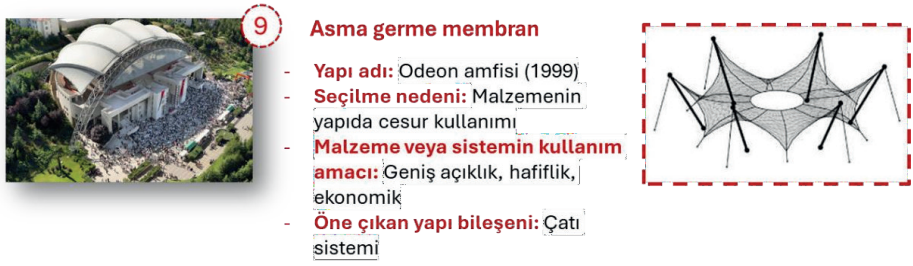
### *Membran sistemler*

Asma germe membran sistemler geniş açıklıkların geçilebilmesi, geometrik formların elde edilebilmesi, rijitliğin sağlanması ve ekonomik açıdan verimli olmaları nedeniyle yapı alanında tercih edilmektedir (Priadko vd. 2020). Ancak bu tür sistemler rüzgâra karşı dayanım düşüklüğü nedeniyle yırtılabilir veya zedelenebilir (Uematsu vd. 2021). Ayrıca yuvarlak plana sahip olan asma membranların membran çatılara göre daha efektif olduğu bilinmektedir (Krivoshapko, 2017).

Asma germe membran yapılar ilk olarak 1950'lerde Almanya'da üretilmeye başlanmıştır (Vural, 2019). Türkiye'de ise Bilkent Üniversitesi Odeon Amfisi, bu sistemlerin yakın modern zamana ait en göz alıcı örneklerindendir. 1999 yılında Erkut Şahinbaş ve Alpay Güleyen tarafından tasarlanarak inşa edilen amfi Ankara'da yer almaktadır. Yapı çelik kafes ve öngerilme uygulanmış membran sistemden oluşmaktadır. Amfinin yarıçapı 48 metre olup çelik kemerin geçtiği açıklık 118 metreyi aşmaktadır (Şekil 12). Bu kemer, kendi ağırlığının yanı sıra

rüzgâr ve kar yüklerini taşımaktadır. Yapının mantığı, klasik Roma tiyatrolarına ait olan amfitiyatro ve çağdaş teknolojiyi temsil eden çelik üst kabuğu bir arada kullanarak bir tür sentez önerisi sunmaktır (Hasol, 2017).

Günümüzde yapı içerisinde Odeon Konserleri adı altında bir dizi etkinlik düzenlemektedir. Yapı, Fazıl Say, Bilkent Senfoni ve daha birçok sanatçı ve gruba ev sahipliği yapmaktadır (Bilkent Üniversitesi, t.y.).

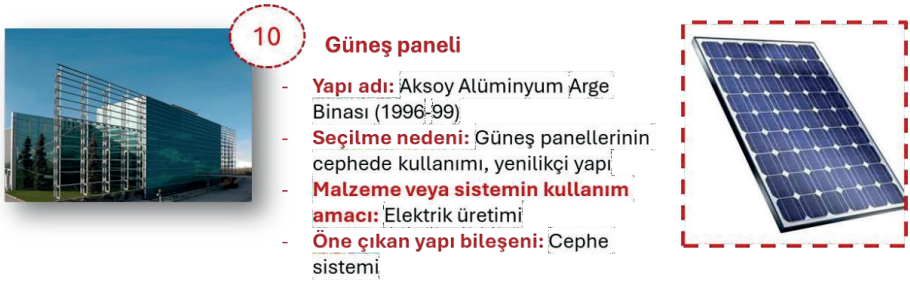



**Şekil 12.** Asma germe membranın örnek yapıda kullanımı ve özellikleri

### *Güneş panelleri*

Dünyada güneş enerjisi 1950'li yıllardan itibaren ilk olarak Amerika ve Japonya'da su ısıtıcıları ile başlamıştır. Ancak ilk yatırım maliyetlerinin yüksek olması sebebiyle ilk aşamada yeterince ilgi çekemese de 1970'li yıllardaki enerji krizinden sonra yeniden gündeme gelmiştir (Avcıoğlu, 2017).

Aksoy Alüminyum Arge Binası, güneş panellerini küresel enerji krizinden hemen sonra kullanması ve bir dizi farklı malzemeyi barındırması ile ilgi çeken bir 20. yüzyıl yapısıdır. Yapı, 1996-99 yılları arasında İzmit, Kocaeli'de inşa edilmiştir. Yapının mimarları Gökhan Avcıoğlu ve GAD Mimarlık'tır. Aksoy firması cephe elemanları ürettiğinden ötürü bu yapıda da birçok malzemenin bir arada uygulanması istenmiştir. Döşemeler betonarme, kolonlar çelik, cephe sistemi cam elemanlardan oluşan güneş panellerinden meydana gelmektedir (Şekil 13). Yapı 1999 Kocaeli depreminde hasar almamıştır (Hasol, 2017). Bu yönüyle depreme karşı dayanıklılığı kanıtlamıştır.




**Şekil 13.** Güneş panellerinin örnek yapıda kullanımı ve özellikleri

### 3.2. Değerlendirme

İncelenen Türkiye'nin modern mimarlık dönemine ait 10 adet kültür mirası incelendiğinde altı ana malzemenin öne çıktığı görülmektedir. Bunlar alüminyum, cam, betonarme, çelik, endüstriyel ahşap ve membran sistemlerdir.

Alüminyum kapı ve pencere sistemlerinin yanı sıra cephe profil elemanı olarak da kullanılabilmektedir. Yapıya sağladığı hafiflik, korozyona karşı dayanım ve uzun ömürlü olma gibi özellikler neticesinde ünlü mimari eserlerde tercih edilen önemli bir yapı malzemesidir.

Diğer yandan modern dönem yapılarında en gözde malzemelerden birinin cam olduğu görülmektedir. Cam, farklı işlevlerde, cephe ve çatıda sıklıkla kullanılmaktadır. Camın şeffaf olması, ısı ve ışığı hapsedebilme gibi özellikleri yapılara estetik değer ve doğal aydınlatma gibi avantajlar sunmaktadır. Bunun yanı sıra çift cam teknolojisi ile malzeme yalıtılabilmekte, güneş panellerinde cam kullanımı ile yapıya enerji kazanımı sağlanabilmektedir. Şişecam gibi yerel firmaların camın üretimi ve kullanılmasında önemli katkıları bulunmaktadır.

Betonarme, yapılara brütalizm akımını getiren, kolay şekillenebilen ve uygulamada geliştirilen sistemler ile geniş açıklık geçebilen bir malzemedir. Yapıların taşıyıcı sistemini oluşturmanın yanı sıra iyi işçilik ile planlandığında Tercüman Gazetesi Binasında olduğu gibi ağır kütlelerin havada asılı kalmasına katkı sunarak mimariye estetik değer katmaktadır.

Çelik, endüstriyel bir yapı malzemesidir. Modern döneme ait yapılarda genelde çatı sistemlerinde öne çıkmaktadır. Uzay kafes, çelik kemer, jeodezik kubbe gibi çeşitli kullanım teknikleri ile geniş açıklıkların geçilmesinde, daha az malzeme ile daha çok dayanımın elde edilmesinde kendisinden faydalanılmaktadır. Bu yönüyle sürdürülebilir mimariye etki eder.

Asma germe membran sistemler yapıya hafif bir görünüm katar. Genellikle çelik sistemlerle birlikte kullanımı tercih edilen bu sistem, ekonomik olması,

öngerme ile dayanımı artırması ve yapı formunu oluşturması yönüyle yapılara değer katmaktadır (Tablo 1).

**Tablo 1.** İncelenen yapı malzemelerinin değerlendirilmesi

| Malzeme | Yapı Bileşeni | Kullanım Amacı |
|---|---|---|
| Alüminyum | Kapı-pencere, cephe | Dayanıklılık, uzun ömre sahip olma, hafiflik, korozyona karşı dayanım |
| Cam | Cephe, çatı | Şeffaflık, estetik, yalıtım, doğal aydınlatma, enerji üretimi |
| Betonarme | Kiriş | Geniş açıklık, brütalizm, estetik |
| Çelik | Çatı | Geniş açıklık, az malzeme ihtiyacı |
| Tutkallı ahşap | Çatı | Geniş açıklık, neme karşı direnç, doğallık, estetik |
| Membran | Çatı | Ekonomik, hafiflik, geniş açıklık, form oluşturmada etkili |

Bu incelemeler sonucunda çalışmadan elde edilen çıkarımlar şu şekilde özetlenebilir:

- Modern mimari miras geniş bir malzeme çeşitliliğine sahiptir. Bu malzemelerden kimi ithal olarak kimi ise yerli firmalar tarafından üretilerek kullanılmıştır.
- Yenilikçi malzemeler, binaların çeşitli bileşenlerinde kendisine kullanım alanı bulabilmektedir. Özellikle bina kabuğunu oluşturan çatı, cephe ve açıklıklarda bu malzemelerden faydalanıldığı görülmüştür. Yapı bileşenleri arasından yenilikçi malzeme kullanımına en çok çatı elemanlarında rastlanmaktadır.
- Malzemelerin uluslararası inşaat sektöründe kullanılmaya başlanmasının ardından yerel mimaride kullanılmaya başlanması arasındaki zaman diliminin 20 ila 100 yıl arasında değiştiği görülmektedir.
- Yapılarda kullanılabilmeleri amacıyla metal, cam, ahşap, plastik gibi temel ve geleneksel malzemelerin dezavantajları zaman içinde gelişen teknoloji yardımıyla giderilmiştir. Bu malzemelerden yenilikçi malzeme üretimlerinin gerçekleştirildiği ve yapıda kullanım alanlarının bu sayede genişletilebildiği saptanmıştır.
- Yenilikçi yapı malzemelerin büyük çoğunluğu endüstriyel işleme tabi tutulmaktadır.
- Uluslararası sektörde üretilen yenilikçi malzemeler ile ülkemizdeki modern mimarlık eserlerinin buluşması yaklaşık 1950'li yıllara tekabül etmektedir. Bu süreç 20. yüzyıl başlarına kadar devam etmiştir.

- Malzeme tercihinde estetik, dayanıklılık ve işlevsellik kadar daha az malzeme kullanımı, enerji tasarrufu, doğal aydınlatmadan faydalanma ve maliyet etkinliği gibi sürdürülebilir ilkeler de gözetilmiştir.
- Modern zamanda geniş açıklıkların geçilebilmesi bir itibar meselesi haline gelmiş olup çelik ve endüstriyel ahşap gibi yenilikçi malzemelerden bu alanda faydalanılmıştır.

## 4. Sonuç ve Öneriler

Peter Zumthor, yapıyı tasarlamaya malzemeden başladığını ve bunun mimarlık açısından önemli olduğunu belirtir. Bunun yanı sıra mimarlığı mekân ve malzeme ile ilişkilendirir. Ünlü mimarın bu görüşü mimarlık ve malzeme arasındaki kuvvetli ilişkiyi desteklemektedir. Mimarlık, malzeme ile hayat bulur. Malzemenin imkânları dâhilinde mimari şekillenir. 20. yüzyıla ait modern miras yapılarının yenilikçi malzeme kullanımları üzerinden şekillenen bu çalışmada, malzemelerin özellikleri, yapıya kattığı avantajlar, yapıda kullanım alanları ve imkânlarına değinilmiştir.

On farklı yapı ve altı temel malzeme üzerinde şekillenen çalışma sonucunda yenilikçi malzemelerin bina kabuğunda yaygın kullanım alanına sahip olduğu, modern yapılara teknolojik anlamda değer kattıkları ve bir dizi çözüm önerisi sunabildikleri görülmüştür. Bu çözüm önerileri mimarlığın temel ilkeleri olan işlevsellik, estetik ve dayanım kadar 21. yüzyıl yapılarının temel problemi olan sürdürülebilirlik alanındaki çözümleri de içermektedir.

Çalışmada alüminyum doğrama, tutkallı ahşap, cam elyaf panel gibi yapı malzemelerinin yanı sıra çift cam, cam giydirme cephe, asma germe membran, jeodezik kubbe ve uzay kafes gibi yapı sistemleri mercek altına alınmıştır. Yapı malzeme ve sistemlerinin seçiminde geniş açıklık geçebilme, yalıtım sağlama, enerji üretimi gerçekleştirme gibi modern yaklaşımların benimsendiği görülmektedir. Bu durum mimarlıkta yenilikçi malzeme kullanımının işlevsellik ilkesi ile büyük oranda örtüşmesi anlamına gelmektedir.

Gelecekte yapılacak çalışmalarda 21. yy yenilikçi malzemelerine odaklanılması, Türkiye'nin mimarlık disiplinindeki gelişiminin takip edilebilmesi açısından faydalı olacaktır. Dünyada yapı malzemeleri yankı bularak adından bahsettiren seramik ve metalikten elde edilen ileri malzemeler, kompozit malzemeler, nano boyuttaki malzemeler, termal enerji depolayıcılar, akıllı malzemeler, doğal olup da farklı kombinasyonlar ile yapıda kullanımlarının önü açılar malzemeler bu kapsamda değerlendirilebilir. Bor, şeker kamışı, kenevir gibi ham maddelerden elde edilen yapı malzemeleri bunlara örnektir. Ayrıca malzeme özelliklerin iyileştirilmesi dayanarak geliştirilen kendini onarabilen beton, yarı saydam ahşap, ferrock (çelik tozundan beton), miselyum tuğlası, solar kiremit gibi malzemeler de yeni yüzyılda yapılarda kullanımı

tartışılan malzemeler arasındadır. Yenilikçi malzeme alanında bahsi geçen malzemelerin tümünün yapı örneği veya örnekleri ile ele alınarak çalışılmaya değer olduğu düşünülmektedir.

Yerli ve milli yapı malzemelerin üretimi dikkate alınması gereken bir başka konudur. Günümüzde duymaya sıkça alıştığımız boykot faaliyetlerinin milli hamlelerle desteklenebileceği unutulmamalıdır. Bunun için her sektörde olduğu gibi inşaat sektöründe de yenilikçi hareketleri önceden takip etmek, hatta öncü ve takip edilen konumuna gelmek her araştırmacı ve çalışanın temel vazifesi olmalıdır.

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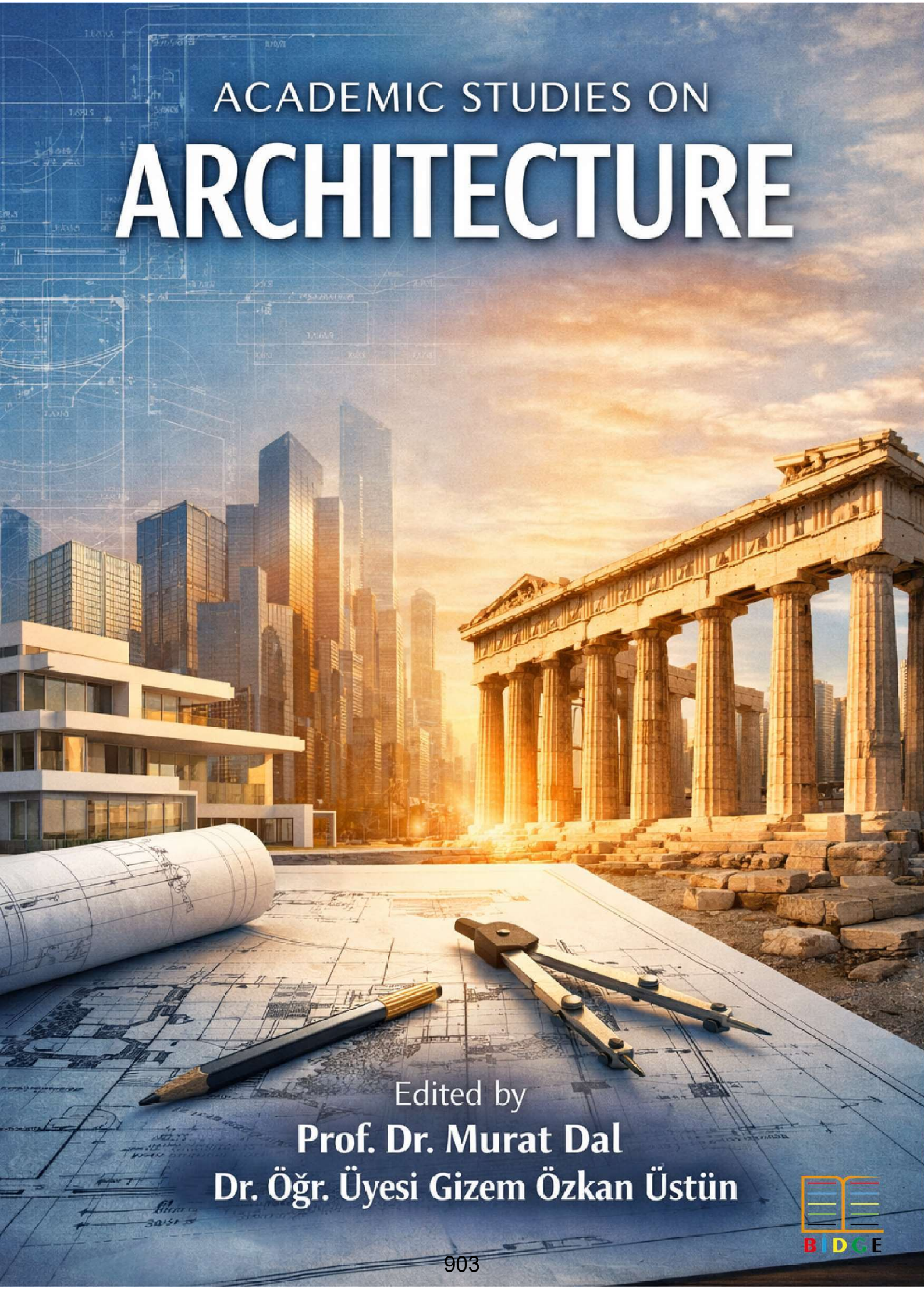
# ACADEMIC STUDIES ON
# ARCHITECTURE



Edited by
**Prof. Dr. Murat Dal**
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BİDGE

# CHAPTER 7

# OFF-SITE PRODUCTION IN THE CONSTRUCTION INDUSTRY: A CRITICAL REVIEW

**DAMLANUR İLİPINAR**[1]

## Introduction

The construction sector is a critical area of the global economy and one of the largest sectors in the world. Each year, almost $10 trillion is spent on goods and services connected to building (Barbosa et al., 2017). It is also seen as one of the most important areas that directly helps countries grow and build their economies (Maskuriy et al., 2019). In industrialized countries, the construction industry is estimated to contribute an average of 10% annually to gross domestic product (Azimi et al., 2011). However, despite this high economic volume, the sector faces long-standing problems of low productivity and predictability compared to manufacturing industries (Barbosa et al., 2017). The construction industry has a lot of problems, such as broken structures and management, no leadership, bad education, financing, and implementation models, a small and low-quality workforce, no

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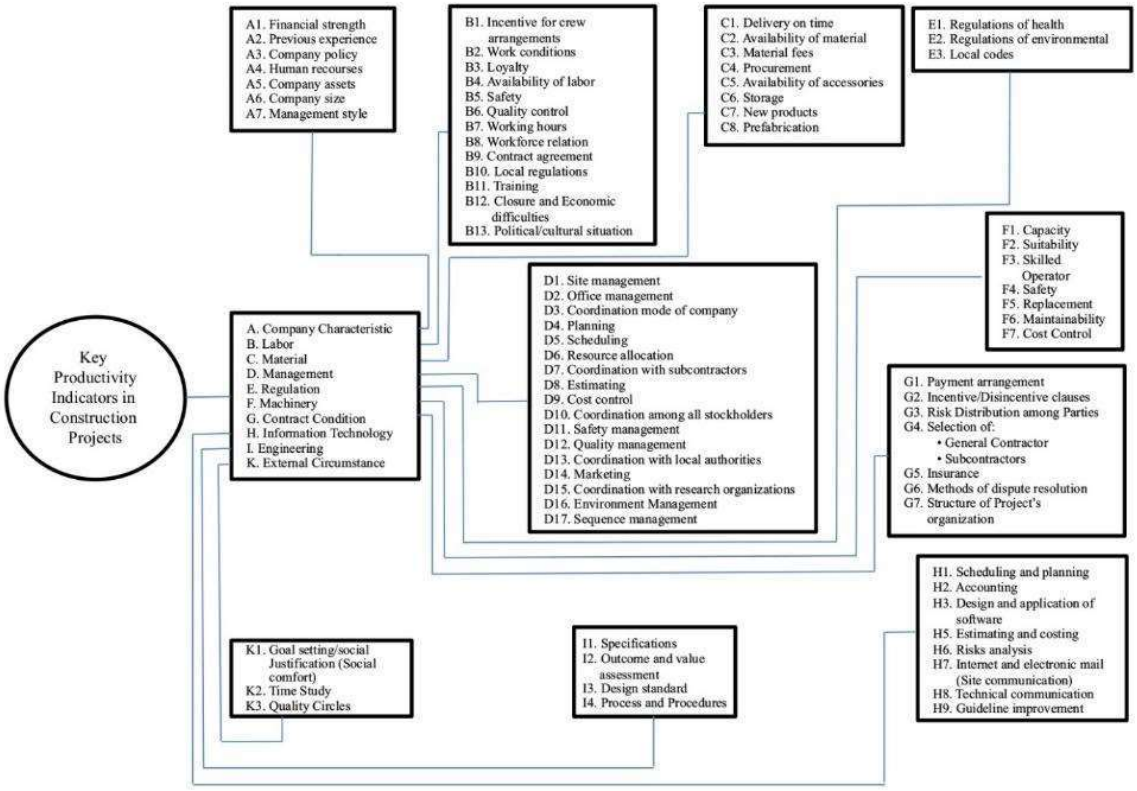
cooperation among stakeholders, and not enough money spent on new ideas (Farmer, 2016). These structural problems clearly demonstrate that conventinal construction techniques have attained their limitations, making it imperative to utilize mechanization and industrial production approaches more effectively in the sector (Bock, 2015). Complex and fragmented activities, difficulties in identifying professions with the right skills, insufficient coordination, lack of cooperation and safety between contractors and suppliers, and inadequate data flow are some of the reasons why the engineering and construction sector cannot keep pace with the manufacturing industry (Maskuriy et al., 2019). One of the biggest problems that people in the construction industry have always had to deal with is low productivity on construction sites (Ghasemi Poor Sabet, P & Chong, 2019). Under current socio-economic conditions, a broad range of factors can be identified that influence productivity in both developing and developed countries. Systematically defining and analyzing these indicators is critical for achieving lasting improvements in construction productivity. Figure 1 gives a summary of the key groups and subgroups of indicators that measure productivity in building projects (Hasan et al., 2018). Within this conceptual framework, factors like the workforce, company characteristics, materials, management, regulations, machinery, contract terms, information technologies, engineering, and external environmental conditions show how many different things can affect productivity on construction projects. A thorough and comprehensive understanding of these factors makes it possible to identify areas for intervention to increase productivity in the sector and maximize improvement potentials (Hasan et al., 2018).

*Figure 1 Conceptual framework illustrating the key productivity factors influencing project success*




*Source: Ghasemi Poor Sabet & Chong, 2019*

According to a survey carried out in 2017, 90% of respondents representing diverse professional backgrounds—such as construction contractors, designers, manufacturers, and academic researchers—anticipated a future increase in the number of off-site construction projects (Fenner et al., 2017).

## Off-site Construction

In recent decades, the construction sector has endeavored for higher productivity (Zhang et al., 2020). In 1998, the Rethinking Construction Report of Egan remarked on the need for performance improvements, and for this, supply chain partnerships, standardization, and off-site production have an important role (Blismas, Pasquire & Gibb, 2006). Shifting works from on-site to off-site with innovations and improvements, including methods, tools, and machines, provides higher productivity and quality (Zhang et al., 2020).

Off-site construction refers to an approach in which activities traditionally performed on site are relocated to climate-controlled production facilities, enabling the efficient use of advanced machinery and manufacturing technologies (Liu et al., 2017). It is a mix of manufacturing and construction that happens in regulated industrial settings without outside interference, as opposed to at a construction site (Goulding et al., 2015). Off-site construction is a new approach for the building industry to work. It involves making and putting together parts, elements, and/or modules in a place other than the site where they will be installed (Hu et al., 2019). Off-site fabrication or off-site construction is recognized as both prefabrication (the process of making and combining parts) and pre-assembly (the process of putting parts together) at a factory (Killingsworth et al., 2021). When the off-site construction is compared with the conventional stick-built construction, it has three main construction steps: (i) making building parts (panels or modules) in a controlled setting, (ii) moving the parts to the site, and (iii) putting the modules together on-site (Zhang et al., 2020).

The idea of off-site construction has been around since the 1800s, when it was known by names like manufactured construction, off-site production (OSP), off-site construction (OSC), off-site manufacturing (OSM), modern methods of construction, modular construction, and construction prefabrication. However, only a small percentage of construction activities in both developed and developing countries use off-site construction (Goulding et al., 2015). However, off-site construction has become more popular in the last 20 years. The popularity of off-site construction is widely observed in China, Hong Kong, Australia, Germany, and the Netherlands (Ferdous et al., 2019; Kamali et al., 2016; Lawson et al., 2014). Off-site manufacturing is thought to be a different way to boost construction productivity (Durdyev & Ismail, 2019). But most construction sectors only use off-site construction a small amount of

the time (Goulding et al., 2015), and off-site construction still makes up a small part of the national and international construction industry (Suliman & Rankin, 2021).

On the other hand, advanced technologies used in off-site construction projects can provide effective solutions to the sector (Hou et al., 2020). To illustrate, information and communication technology regulates the ways of collecting, analyzing, and communicating on project data, providing for effective supply chain management and quality control in off-site construction workmanship (Zhang et al.2017). Nonetheless, if the construction manufacturing domain follows the traditional on-site construction process approach, it may not take full advantage of modular construction and lean implementation (Zhang et al., 2020).

**Mapping the Literature Knowledge for Off-site Construction**

The construction industry has long suffered from poor productivity or inefficiencies (Hu et al., 2019). Wang, Li, Zhang, and Li (2016) say that the main reason people feel inadequate in the construction business is because the work is done outside and requires a lot of physical labour. Because of the nature of the construction activity, the weather can alter the work conditions. Workers can change the quality of the products, and there are usually a lot of people working at the same time on the site (Jang et al., 2021). Therefore, off-site construction has evolved from advancements in the traditional construction process. Off-site construction, an industrialized construction method, is different from traditional construction in terms of project goals, design, permits, supply chain configuration, stakeholder composition, and delivery chains. This includes new processes, techniques, technologies, and methods (Wuni et al., 2021).

Off-site construction encompasses multiple levels of production, ranging from non-volumetric preassembled elements,

such as exterior and interior wall panels, to fully preassembled volumetric units and even complete finished modules. Gibb and Pendlebury (2006) identify several categories of off-site construction, including component sub-assembly, non-volumetric and volumetric pre-assembly, hybrid configurations, panel-based systems, and fully modular construction. Because off-site construction is closely associated with manufacturing-oriented building processes, a range of terms—such as panelized, manufactured, prefabricated, preassembled, industrialized, and standardized—are frequently used interchangeably in the literature to describe these approaches (Killingsworth, Mehany, & Ladhari, 2021).

Off-site fabrication, thought of as the future of the construction industry by many researchers (Bendi et al., 2021), achieves greater productivity and quality of both design and construction while reducing construction cost, time, and resource waste (Suliman & Rankin, 2021). Industrialized construction has its benefits, but there are still problems that need to be solved. These include poor communication between stakeholders, a lack of strong quality inspection systems for manufacturing and installation, low efficiency throughout the supply chain (Qi et al., 2021), and a slow uptake of new technologies (Suliman & Rankin, 2021). One reason why off-site construction isn't spreading or being accepted more is that it's still a new area for comparing new ideas (Suliman & Rankin, 2021). The construction industry is still behind other industries when it comes to using new technologies (Oesterreich & Teuteberg, 2016). You and Feng (2020) said that new technologies are only being used in certain areas, and there aren't many big studies on how to combine construction and technology. Another big problem with off-site construction projects is that they can cause problems with the supply chain and make it hard to coordinate. The off-site construction supply chain includes a long and complicated value chain that

includes things like bidding, design, engineering, manufacturing, transportation, storage, and assembly on site. Clients, main contractors, designers, manufacturers, transport providers, and assembly subcontractors all need to work together and coordinate their efforts at a high level for these processes to work. Because these stakeholders are spread out and their management is becoming more complicated, they need strong communication tools and good ways to share data (Wuni, Shen, & Mahmud, 2019). Also, off-site construction brings in more people with different goals, values, and operational needs, especially when it comes to moving big parts of the building and putting them together on site. In this situation, industrialized construction has many benefits, but it also has its own set of problems. This shows how important it is to set best practices to help everyone involved in the project reach the goals they set for themselves (Wuni et al., 2021).

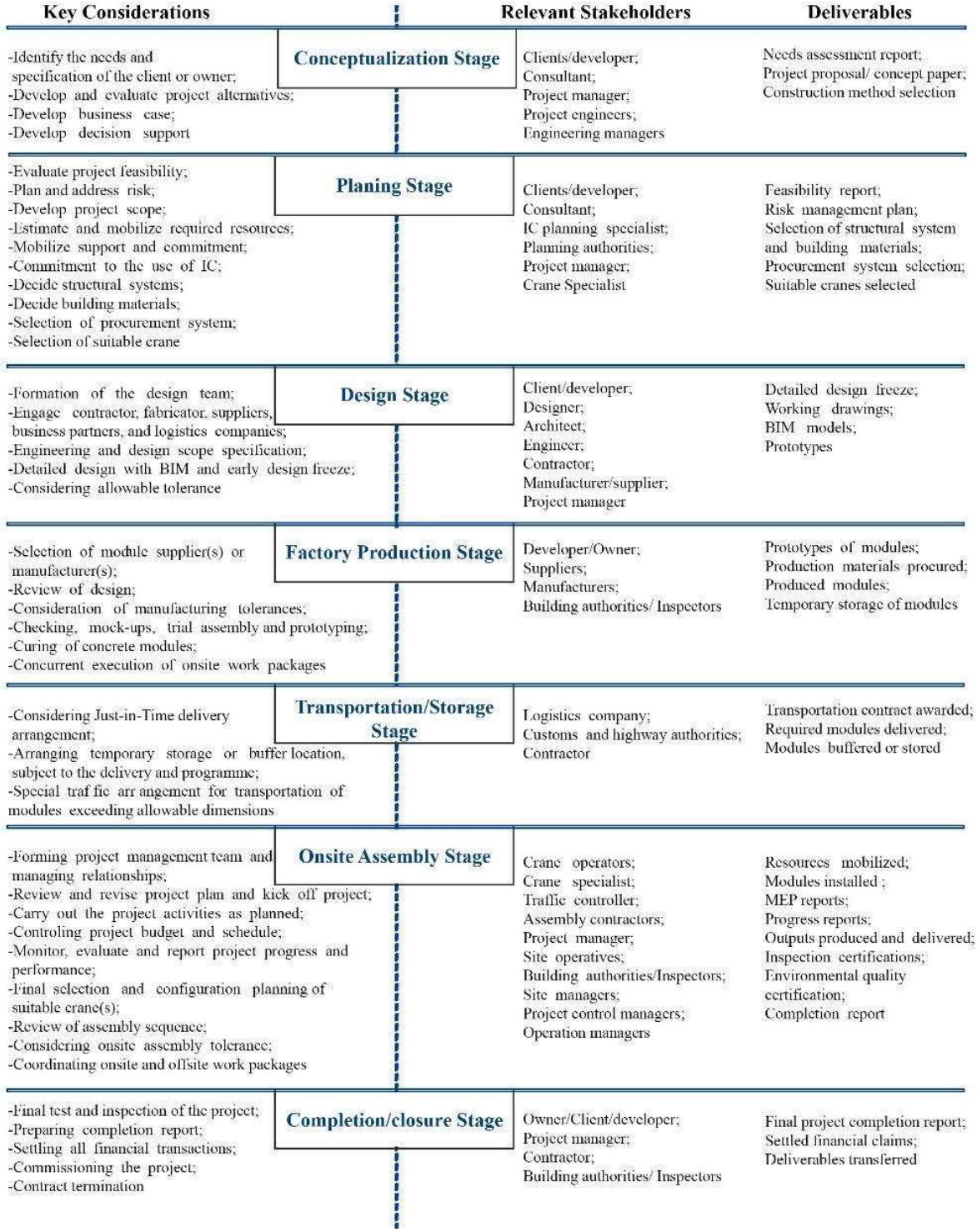
**A Framework for Off-site Construction Projects**

Adopting a workflow-oriented perspective is essential for understanding the logic of industrialized construction projects, as it enables a structured and comprehensive analysis of their processes (Wuni et al., 2021). Project workflow frameworks provide valuable insights into both the nature and the inherent complexity of off-site construction operations. In developing an effective workflow framework for industrialized construction, Wuni, Shen, and Darko (2021) examined nine representative case studies encompassing a wide range of project types—including housing, hotels, educational facilities, transportation infrastructure, and stadiums—across Australia, Hong Kong, and Singapore. For each case, the researchers documented key project considerations, principal stakeholders, typical deliverables, and best practices, including challenges encountered, lessons learned, and performance indicators.

The synthesized findings are presented in Figure 2, which illustrates the life cycle phases of industrialized construction projects, the critical decision points within each phase, and the key project participants involved at different stages. A notable observation from this framework is the strong interconnection between work packages and stakeholders throughout the project phases, resulting in a complex, multidisciplinary network of actors, each with distinct objectives, value systems, and roles (Luo et al., 2019). As a result, successful project delivery depends on using collaborative procurement strategies that let stakeholders with different interests work together, communicate, and coordinate their efforts (Wuni et al., 2021).

Furthermore, robust monitoring and control systems are essential to manage the wide range of interdependent and complex activities involved in off-site construction processes (Azimi et al., 2011). As depicted in Figure 2, multiple inputs and contextual factors influence the workflow of off-site construction projects, underscoring the importance of developing decision-support frameworks that enable multidisciplinary evaluation and informed selection of appropriate off-site construction systems (Amer, Mustafa, & Attia, 2019). These projects are particularly challenging because of many of interrelated processes and sub-processes, the involvement of numerous actors across different project phases and locations, and the significant levels of uncertainty—especially during early project stages. Moreover, the increasing demand for customization adds another layer of diversity and complexity to industrialized construction projects (Perrier et al., 2020).

*Figure 2 Project phases of the industrialization constructions with key consideration, key project stakeholders, and typical outputs from each phase*




*Source: Adopted from Wuni et al. (2021)*

## Actors in Off-site Construction

In construction projects, the number of stakeholders can vary considerably; however, it is generally large, and the interactions

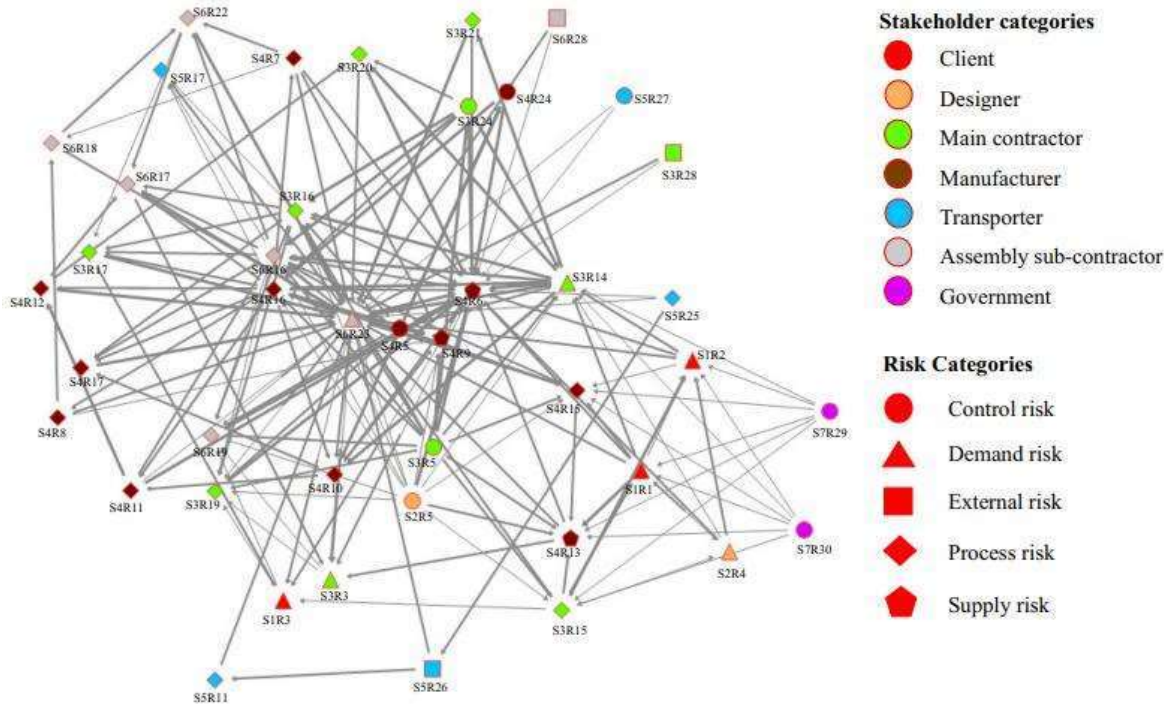
among them are highly complex (Karlsen, 2002). As a result, establishing collaborative relationships within this project-based industry is inherently challenging, often leading stakeholders to operate independently as separate organizational entities pursuing their own interests (Gan et al., 2018). This fragmented organizational structure hinders effective process management in off-site construction projects. Nevertheless, off-site construction requires a seamless transition of workflows between off-site manufacturing and on-site assembly environments. Consequently, addressing management-related challenges in construction projects necessitates a thorough examination and understanding of the digital capabilities offered by technological innovations (Hou et al., 2020).

A lot of people are involved in off-site construction projects, such as clients, end-users, contractors, consultants, labor unions, line groups, public authorities, financial institutions, and insurance firms, all of whom are closely interconnected (Karlsen, 2002). For instance, Xue et al. (2007) illustrated the relationships among stakeholders and the flows between them in prefabrication projects, identifying exchanges of information, materials, services or products, and financial resources. These interactions collectively form a complex supply chain network. During the design, manufacturing, transportation, and assembly stages, key project participants like clients, major contractors, designers, manufacturers, transport providers, and assembly subcontractors are involved in many processes that are connected to each other. It's important to remember that these actors are only a subset of the whole project team, as additional parties may be involved at different stages of the construction process.

Accordingly, supply chain risks in off-site construction are closely linked to how stakeholders interact with each other, showing a high level of interdependence (Luo et al., 2019). Luo et al. (2019) examined stakeholder-related risks and their interrelations through a

case study of a prefabricated building project in Hong Kong. In their study, stakeholders were selected from full-time front-line employees and managerial staff who had been involved in the project from its inception and possessed a thorough understanding of its processes. This dual perspective enabled the identification of critical risks from both operational and managerial viewpoints. The ten most significant risks and their interconnections are seen in Figure 3.

*Figure 3 Stakeholder-related risk network*




*Source: Luo et al., 2019*

The case study interviews identified three primary risks: delays in the assembly schedule associated with assembly subcontractors, labor shortages on the manufacturer's side, and insufficient labor resources within assembly companies. These risks appear in nine of the most critical interconnections within the network, indicating that they require careful management in order to reduce overall network complexity. Furthermore, large-scale construction projects often involve hundreds of participants with diverse roles and responsibilities (Oesterreich & Teuteberg, 2016).

This highlights the necessity of adopting a systematic approach to effectively identify, prioritize, and engage stakeholders with high levels of salience (Bal et al., 2013).

## Conclusion

This research concentrates on an automated and integrated construction system that bridges the construction and manufacturing sectors: off-site construction. The chapter has examined off-site construction from a comprehensive perspective, outlining its typologies, underlying principles, key processes, application sectors, and the actors involved across the project life cycle. By positioning off-site production within a broader industrial and organizational context, the chapter highlights how construction differs from, yet can learn from, more mature manufacturing industries in terms of productivity, process integration, and standardization.

The analysis indicates that although off-site construction has considerable potential to mitigate persistent problems in the construction industry—such as low productivity, fragmented processes, and coordination challenges—its effective application largely depends on the successful integration of diverse stakeholders and interconnected processes. The complexity of extended supply chains, the diversity of actors involved, and the need for seamless transitions between off-site and on-site environments underscore the importance of structured workflow frameworks and collaborative project delivery approaches. Furthermore, the analysis demonstrates that off-site construction should not be understood solely as a technical or production-oriented solution, but rather as a systemic transformation of construction practices. Its effectiveness relies on organizational alignment, early-stage decision-making, and the establishment of clear communication and coordination mechanisms across the project life cycle. In this sense, off-site construction represents a critical step toward the industrialization of construction,

providing a foundational platform upon which more advanced digital and automated technologies can be built.

Overall, this chapter contributes a critical synthesis of the existing research on off-site production in the construction sector, clarifying its core concepts, structures, and challenges. By framing off-site construction as an integrated industrial approach rather than an isolated technique, the study provides a conceptual basis for both researchers and practitioners seeking to understand, evaluate, and implement off-site production strategies.

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EĞİTİM YAYINEVİ GRUBU

# BATI DİLLERİNDE HAZIRLANMIŞ TARİHİ HARİTALARA GÖRE SAFRANBOLU'NUN YOL AĞI VE ÇEVRESİNDEKİ HAN ÖRNEKLERİ

Emre Karataş*

## GİRİŞ

Geçmişte ticaret, haberleşme ve askeri sevkiyat tarihi yol ağları vasıtasıyla gerçekleştirilmiştir. Bu yollar üzerinde bulunan konaklama, güvenlik ve ticaret yapıları ile pazarlar ve limanlar bu sistemin önemli birer parçası olmuştur. Modern ulaşım ve iletişim araçlarının yaygınlaşmasına kadar inanç, kültür-sanat ve bilim-teknik de bu yollar aracılığıyla medeniyetler arasında aktarılmıştır (Erdem, 2020: 9).

Anadolu, doğusundaki kara yolları ve batısındaki deniz yollarının son durağı olması nedeniyle, Dünya ticaret coğrafyasında her zaman önemli bir yere sahip olmuştur. Hitit, Akad ve Asur medeniyetlerine ait ticaret koloni yolları, Pers Kral Yolu ve Roma'nın askeri ve ticari yolları, Anadolu'nun antik dönemlerindeki önemli ulaşım ağları arasında sayılabilir. Bu yollar Doğu Roma döneminde de geliştirilerek askeri ve ticari amaçlarla kullanılmıştır. Daha sonra bu ticaret güzergâhlarından bir kısmı İpek Yolu olarak adlandırılmıştır (Tuncer, 2007: 23-36).

Homeros, doğu sınırını Kızılırmak'ın oluşturduğu bir bölgenin Paflagonya olarak adlandırıldığından bahsetmektedir (Herodotos, 2010: 37). İçerisinde Safranbolu'nun da bulunduğu bu geniş coğrafyanın batı sınırını Safranbolu yakınlarındaki Filyos Çayı, kuzey sınırını Karadeniz ve güney sınırını Işık, Elden ve Aydos dağları (Çerkeş ve Gerede'nin Kızılcahamam ile olan sınırı) oluşturmaktadır (Gökoğlu, 1952: 9). Roma ve Bizans dönemlerinde, Paflagonya ile Bitinya'nın önemli merkezleri ve İstanbul arasında güçlü ticari ilişkiler kurulmuştur (Bounegru, 2014: 13-14).

Paflagonya'da, Safranbolu'nun yaklaşık 40 km güneybatısında bulunan Hadrianapolis kenti, ortaya çıkan bulgulara göre Roma ve Bizans dönemde

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yöredeki en önemli ticari merkezdir (De Tchihatchef, 1854: 102-103; Kılavuz ve Çelikbaş, 2013: 161).

İnalcık'a göre özellikle 15. yüzyıldan sonra önem kazanan Bursa-Tebriz İpek Yolu'nun kuzey güzergâhı Bolu ve Kastamonu'dan geçmekteydi (İnalcık, 1960: 51). Bu yolun Kuzeybatı Anadolu'dan geçen en önemli güzergâhının 1334 yılında İbn Battûta'nın İznik'ten Kastamonu'ya giderken kullandığı, Safranbolu (Borlu) üzerinden geçen yol olduğu anlaşılmaktadır (Taeschner, 2010: 227-228).

16. yüzyıldan sonra Safranbolu bu yol üzerinde önemli bir ticari merkez olarak öne çıkmaya başlamıştır. Safranbolu yöresi aynı zamanda Anadolu'nun iç kesimleriyle Batı Karadeniz'deki Bartın, İnebolu ve Sinop gibi limanları birbirine bağlayan yolların üzerinde bir kesişim noktasında bulunmaktaydı. Ayrıca Safranbolu yöresinin İstanbul, Ankara, Kastamonu ve Sinop gibi önemli merkezlerin yakınında bulunmasının bölgedeki ticaretin gelişmesini sağladığı düşünülmektedir. Safranbolu şehri ve yöresi, kervanlar için bir yol ve bir konak olmasının yanı sıra, ticaretinin kaynağı olan ürünlerin üretilip işlenerek, bunların başta İstanbul olmak üzere çeşitli merkezlere ihraç edildiği bir merkezdir (Nowack, 1931: 78-79, 86-87; Tunçözgür, 2002: 26-37; Günay, 1981: 95-96). Bu sayede Safranbolu yöresinde üretim ve ticaretin hızlı bir biçimde geliştiği anlaşılmaktadır.

Yöredeki yol ağları hakkında 19. yüzyıldan önceki kaynaklar oldukça kısıtlıdır ve yolların güzergâhlarını ortaya koymaktan uzaktır. Bölgenin, Ankara, İstanbul ve Bursa gibi önemli merkezlere yakın bir konumda bulunmasına rağmen ancak Osmanlı Devleti'nin son döneminde araştırmacıların ilgisini çektiği görülmektedir. Bir dönem yörede ikamet etmiş bir seyyahın ifadesiyle "büyülü bir inziva yeri" olan Anadolu'nun bu köşesi (Princesse Belgiojoso, 1858: 10), 19. yüzyılın ikinci çeyreğinden 20. yüzyılın başlarına kadar Batılı araştırmacı ve seyyahların incelemelerine konu olmuştur. Bu incelemeler yöredeki ulaşım güzergâhlarını, kültürel mirası ve yerleşim tarihini ortaya koymasının yanı sıra dönemin toplumsal yapısını göstermekte ve bölgesel tarihe de ışık tutmaktadır (Ainsworth, 1842; Von Diest ve Anton, 1895; Woods, 1908; Leonhard, 1915; Mordtmann, 1925).

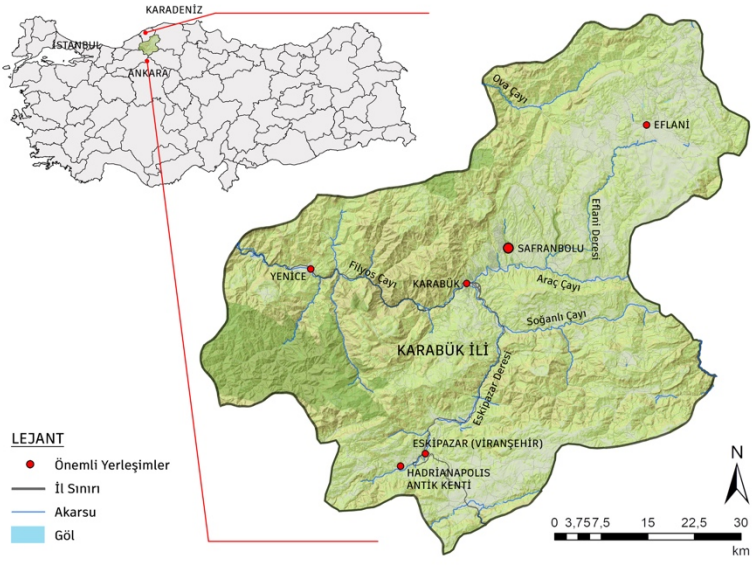
Tarihi yol güzergâhlarının en önemli yapısal kanıtlarından ve kültürel miras unsurlarından biri olan han yapıları, yolcuların ve hayvanlarının konaklayıp dinlenebilmeleri için tasarlanmıştır ve aynı zamanda tarihi bir belge niteliğindedir. Anadolu'da bu yapıların geçmişte askeri ve ticari

amaçlarla da kullanıldığı bilinmektedir. Günümüzde bu yapıların birçoğu işlevini kaybettiği için terkedilmiş ya da yıkılmış durumdadır (İlter, 1969). Bu tür yapıların tespiti ve belgelenmesi, kültürel mirasın sürdürülebilirliği açısından da çok büyük bir önem arz etmektedir.

Safranbolu şehir merkezinde farklı ölçeklerde yapılmış han yapılarının bulunduğu bilinmektedir. Örneğin Cinci han 17. yüzyılda yapılmış, iki katlı ve avlulu, tipik bir şehir içi Osmanlı hanıdır (Kalfazade, 1993). Çalışma kapsamında, özellikle 19. yüzyılda Safranbolu'nun yol ağı üzerinde de çok sayıda han inşa edildiği anlaşılmaktadır. Farklı ölçeklerde ve mimari biçimlerde yapılan bu hanların bazıları, dönemin Osmanlı aristokrasisinde önemli yere sahip kişiler tarafından, bazılarının ise yerel halk içerisindeki girişimciler tarafından yaptırılıp işletildiği tespit edilmiştir.

Çalışma başlıca iki aşamadan oluşmaktadır. (1) İlk aşama tarihi haritalara göre Safranbolu yöresindeki yol ağlarının tespit edilmesi ve haritalandırılmasını, (2) ikinci aşama ise bu yol ağları üzerindeki konaklama yapıları olan han örneklerinin tespit edilmesini içermektedir.

Çalışma alanı Karabük il sınırlarını kapsamaktadır (Şekil 1).




**Şekil 1.** Çalışma alanı haritası. (Kaynak: ArcMap 10.8'de hazırlanmıştır).

Çalışma kapsamında batı dillerinde (Almanca ve Fransızca) hazırlanmış, bölgenin coğrafyası ve yol ağları hakkında kendi dönemlerine göre özgün ve detaylı bilgiler veren genel amaçlı haritalar incelenmiştir (Kiepert, 1844; De Bolotoff ve De Tchihatchef, 1853; Kiepert, 1884; BOA. HRT. h. 1985, 1886; Kiepert, 1914). Belirli bir seyyahın güzergâhını gösteren veya bölgenin jeolojik yapısı ve madenleri gibi konulara odaklanan tematik haritalar ise sık kullanılan ulaşım ağlarının açığa çıkartılmasında yanılgıya yol açabileceği için kapsam dışında bırakılmıştır.

Haritalardaki güzergâhları belirleyebilmek için tarihi kaynaklar, alan çalışmaları ile elde edilen veriler ve tapu-kadastro verileri birbirleriyle çapraz olarak karşılaştırılmıştır (Tablo Ek 1). Bu aşamada, Batılı araştırmacıların yer isimlerini kendi anladıkları şekliyle kaydetmiş olmaları, dillerinin farklı fonetik yapıları içermesi, bazı yerleşimlerin isimlerinin zaman içerisinde değiştirilmiş olması ve bazı yer isimlerinin günümüzde sadece yerel halk tarafından bilinir hale gelmesi eşleştirmenin temel zorlukları olmuştur.

Yol ağı yakınındaki mevki ve yerleşimler tespit edilerek bir coğrafi bilgi sistemi yazılımı (CBS) olan ArcMap 10.8 içerisinde arşivlenmiştir. Tarihi haritalarda gösterilen yolların güzergâhları hakkında, bölge coğrafyası, eskiden kullanılan yollar ve mevcut yollar dikkate alınarak fikir geliştirilmiş ve CBS yardımıyla haritalanmıştır.

Çalışmanın ikinci aşamasında, haritalanan yol ağlarının bir kısmında örnekleme dayalı alan çalışması yapılarak, han örnekleri tespit edilmiş ve CBS dosyasına işlenmiştir. Tespit çalışmalarından, bu yapılardan bazılarının günümüze ulaşamayarak yıkıldığı, bazılarının ise ciddi koruma sorunlarının bulunduğu anlaşılmaktadır.

Özellikle Türkistan coğrafyasında ve Çin'de bulunan İpek Yolu güzergâhları ve bu güzergâhlar üzerindeki şehirler UNESCO tarafından Dünya Miras Listesi'ne dahil edilmiştir (URL-1). Safranbolu'nun da ticari yapısı ve kervan yolları üzerinde yer alması UNESCO Dünya Miras Listesi'ne dahil olması konusunda etkili olmuştur. Bu etki güçlü bir şekilde vurgulanmaktadır (URL-2). Bu durum, Safranbolu'nun tarihi yol ağının ve bu ağlar üzerinde bulunan belge niteliğindeki kültürel mirasın tespit edilmesinin ve korunmasının, tarihi, kültürel ve bilimsel açıdan son derece önemli olduğunu ortaya koymaktadır.

Bu çalışma, 19. yüzyıl ve 20. yüzyıl başlarında Safranbolu yöresindeki yol ağlarının belgelenmesine katkı sunmaktadır. Ayrıca, bu ağlar üzerindeki han

yapılarının korunması konusunda tarihî, kültürel ve bilimsel açıdan önemli bir temel oluşturmaktadır.

## XIX. YÜZYILA KADAR SAFRANBOLU YÖRESİNDE YOL AĞI

Yöredeki ilk sistemli taşımacılığın Roma İmparatorluğu'nun bölgedeki siyasi birliği ve dolayısıyla deniz ve kara yolu güvenliğini sağlanmasıyla geliştiği düşünülmektedir (Bounegru, 2014: 8-10). Ramsay Doğu Roma İmparatorluğu'ndaki yolları anlatırken, Safranbolu yöresinde bulunan Dadybra, Sora[1] ve Hadrianapolis yerleşimlerinden bahsederek, bu yerleşimlerin güneyinden ilerleyen Gerede-Çankırı yolunun askerî açıdan önemli olduğunu anlatmaktadır (Ramsay, 1960: 67, 216).

Hadrianapolis antik kenti, Karabük ili Eskipazar ilçe merkezinin 3 km batısında bulunmaktadır. Bu şehir Roma ve Doğu Roma İmparatorluğu'nun bölgedeki en önemli yerleşmelerindendi. Hadrianapolis'te 2011 yılında yapılan çalışmalarda kentin Roma döneminde önemli bir pazar yeri olduğundan bahseden bir yazıt bulunması ve yöreye 1853 yılında gelen Tchihatchef'in Eskipazar Çayı vadisi boyunca antik yol kalıntılarını ve kilometre taşı olabileceğini düşündüğü taşları tespit etmesi, kentin ticari önemini göstermektedir (Kılavuz ve Çelikbaş, 2013: 161; De Tchihatchef, 1854: 102-103). Aynı dönemde Safranbolu şehrinin ise nispeten önemsiz bir yerleşim olduğu düşünülmektedir (Emecen, 2003: 16).

Deniz taşımacılığının kara taşımacılığına göre daha hızlı ve ekonomik olması, Paflagonya bölgesinde de ticaret yollarının limanlara yönelmesine neden olmuştur. Roma İmparatorluğu döneminde bu bölgedeki limanların, Bitinya bölgesindeki liman kentleriyle ticari bağlarının olduğu bilinmektedir (Bounegru, 2014: 13-14). Gökoğlu, Roma ve Doğu Roma döneminde bölgede bulunan önemli limanları Amasra, Kurcaşile, Timne (Uğurlu Köyü/Cide), İnebolu ve Sinop olarak saymaktadır (Gökoğlu, 1952: 9). Dolayısıyla Roma ve Bizans döneminde, Safranbolu yöresindeki kervan yollarının; Gerede-Çankırı posta (transit) yolundan ayrılarak ya da French'in haritasına göre Mengen üzerinden Hadrianapolis şehrine ulaşarak, bölgenin limanlarına yöneldiği söylenilebilir (French, 2016: 8-9).

Türkler'in Safranbolu yöresini fethi, Kastamonu ve çevresinin fethiyle birlikte gerçekleşmiştir. Bölge bir süre Doğu Roma ve Anadolu Selçuklu

[1] Dadybra: Turan, Dadybra'nın tarihi Safranbolu şehrinin bulunduğu yerde olduğunu belirtirken, Yazıcıoğlu da bu görüşü desteklemektedir. (Turan, 1958: 157; Yazıcıoğlu, 2001: 38). Sora: Sora'nın bugün Karabük ili Merkez ilçesine bağlı olan Zopran köyü yakınlarında yer alan bir antik yerleşim olduğu düşünülmektedir (Gökoğlu, 1952: 33).

kuvvetleri arasında çekişmelere sahne olmuştur (Merçil, 2003: 1-2; Uluçay, 1976: 188). Keçiş, 1179 yılında gerçekleşen Bolu'nun fethinden, 1291'de Eflani'nin Candar Bey tarafından fethine kadar yöredeki ticaret yollarının zaman zaman kapandığından ve bu yollar yerine alternatif yolların kullanıldığından bahsetmektedir (Keçiş, 2013: 850).

Safranbolu şehrinin 1190'lı yıllarda Türkler tarafından fethedilmesinden sonra, 1334 yılında şehre Seyyah İbn Battûta gelmiştir. Seyyah, Safranbolu'yu, "etrafında hendekler olan tepe üzerinde kurulmuş küçük bir şehir" şeklinde nitelemektedir. İbn Battûta'nın Safranbolu'dan hemen önce bahsettiği şehir ise Gerede'dir (İbn Battûta Tanci, 2000: 436-440). İbn Battûta'nın bu iki durak arasında başka bir yerleşimden bahsetmemesi, seyyahın yöreye geldiği dönemde Hadrianapolis kentinin yakınlarında bahsedilmeye değer yeni bir yerleşimin gelişmediği kanaatini ortaya çıkartmaktadır. Bölgenin uzun yıllar savaşlara ve çekişmelere sahne olduğu düşünüldüğünde bir kale yerleşimi olan Safranbolu'nun, o dönemde yörenin en önemli merkezi haline gelmiş olması kuvvetli ihtimaldir.

İbn Battûta Kastamonu'dan, "yaşamak için her türlü kolaylık var. Eşya fiyatları çok ucuz, bugüne kadar dolaştığım bunca şehir arasında Kastamonu kadar ucuzunu görmedim" şeklinde bahsetmektedir (İbn Battûta Tanci, 2000: 439). Keçiş ise bu dönemde Batı Karadeniz bölgesinde üretilerek limanlar aracılığıyla ihracı yapılan ürünlerin arasında Safranbolu yöresinde geleneksel olarak üretilen safranı da saymaktadır (Keçiş, 2013: 857). Bu durum, 1330'lardan önce bölgede kara ve deniz yolları güvenliğinin sağlanarak ticaret için uygun bir ortamın oluşturulduğu kanaatini desteklemektedir.

14. yüzyılın ikinci yarısından 15. yüzyılın başlarına kadar Safranbolu yöresi Candaroğlu ve Osmanlı devletleri arasında bir hudut bölgesi olarak kalmıştır. Yörenin iki güç arasında birkaç kez el değiştirdiği bilinmektedir. Bu mücadelenin temel nedeni bölgenin güneyinden geçen yolların kontrol altına alınması olmuştur (İnalcık, 1960: 51). Yöre, 1423 yılında kalıcı olarak Osmanlı Devleti'ne bağlanmıştır (Emecen, 2003: 17).

Bundan sonra Gerede-Çerkeş yolu hem askerî açıdan hem de haberleşme açısından önemini korumaya devam etmiştir. Nitekim bu güzergâhın düzenlenen bazı askeri seferlerde kullanıldığı ve güzergâh üzerindeki Bayındır köyünde (Eskipazar/Karabük) haberleşme için bir menzilhane[2] tertip

[2] Menzilhane: Osmanlı Devleti'nde haberleşmenin hızlı ve sağlıklı olarak gerçekleştirilebilmesi için arazinin durumuna göre çeşitli mesafelerde oluşturulan merkezlerdir. (Halaçoğlu, 2014: 1).

edildiği görülmektedir (Tuncer, 2007: 23-36; Halaçoğlu, 2014: 72). Evliya Çelebi de Bayındır'dan 300 haneli zengin bir köy ve bir konaklama yeri olarak bahsetmektedir (Evliya Çelebi, 2003: 206). Taeschner ise, Bayındır ve yakınındaki Hamamlı köylerinin, aralarında seçim yapılabilecek bir durak çifti olduğunu belirtmektedir (Taeschner, 2010: 235-236).

15. yüzyılın sonlarında Karadeniz kıyılarında siyasi birliğin Osmanlılar tarafından sağlanmasıyla birlikte Kastamonu şehri ticari olarak daha fazla öne çıkmaya başlamıştır. Bu dönemden sonra Kastamonu'ya çeşitli merkezlerden malların getirilerek pazarlandığı görülmektedir (Kankal, 2004: 197-202).

Özellikle 17. yüzyılda Safranbolu-Kastamonu arasındaki en kısa yol olan Safranbolu-Araç-Kastamonu yolunun önem kazandığı tahmin edilmektedir. 17. yüzyılın ortalarında yazılan Kâtip Çelebi'nin Cihannüma adlı eserinde, Eskipazar yakınlarından geçerek Hacılarobası ve Araç üzerinden Kastamonu'ya ulaşan bu güzergâhın gösterilmesi ve Taeschner'in bu güzergâhın Mehmed Âşık ve Evliya Çelebi tarafından da kullanmış olabileceğini belirtmesi bu durumun delilidir (Taeschner, 2010: 256-258). Nitekim içerisinde 17. yüzyılda inşa edildiği düşünülen bir han ve dükkanlar bulunduran Toprakcuma köyü, bu yol üzerindeki önemli bir pazar ve konaklama yeridir. Safranbolu'daki iki büyük han yapısı olan Cinci Han ve Tuzcu Hanı'nın da 17. yüzyılda inşa edildiği bilinmektedir. Hanların inşa edilmesiyle birlikte şehirde konaklayan kervanların şehir ticaretine ve şehrin büyümesine büyük bir katkısı olmuştur (Yazıcıoğlu, 2001: 93; Abdulkadiroğlu, 1998: 17-20).

İbrahim Hamdi Efendi'nin 1729-1730 (H. 1142) yılından sonra kaleme aldığı Atlas isimli eserinde Safranbolu, Eflani ve Bartın coğrafyasına geniş bir yer ayırılmıştır (URL-3; Yaman, 1940: 4-6). Bu çalışmadan, o yıllarda Safranbolu ve Eflani yöresinin, Ulus ve Bartın yöresiyle yoğun ticari ilişkileri olduğu anlaşılmaktadır. İbrahim Hamdi ayrıca, Eflani'de her pazartesi[3] kurulan pazarın bölge için önemini "etraftan develer ve katarlar ile gelip zahire alırlar" şeklinde belirtmekte ve Eflani'deki ticaret ve konaklama yapılarını fırın, kasap dükkanları ve han olarak saymaktadır (Yaman, 1940: 5-7).

Sonuç olarak bölgenin zorlu coğrafi kalıplarına rağmen, 19. yüzyıla kadar Safranbolu yöresindeki yol güzergâhlarının siyasi, askeri ve ekonomik gerekçelerle değişimler geçirdiği anlaşılmaktadır. Yörede önem kazanan ya

[3] Eflani'de pazartesi günleri pazar kurma geleneği hâlâ devam etmektedir.

da kaybeden yerleşimler ve limanlar ile tarihi yol güzergâhlarının karşılıklı olarak birbirlerini yeniden şekillendirdikleri görülmektedir. Bu şekilde, tarihi yol ağı, bölgedeki yerleşim tarihinin araştırılmasında da dinamik ve önemli bir faktör olarak öne çıkmaktadır.

## BATI DİLLERİNDE HAZIRLANMIŞ HARİTALARA GÖRE SAFRANBOLU YÖRESİNDE YOL AĞI (1844–1914)

18. yüzyılın sonu ve 19. yüzyılın başlarında yayınlanan bazı haritaların Safranbolu yöresindeki yerleşimleri, akarsuları ve coğrafi şekilleri önceden hazırlanmış haritalara göre daha detaylı olarak gösterdiği görülmektedir (Lopez, 1784; Zürner, 1808).

19. yüzyılda Batılı araştırmacıların yöreye olan ilgisinin artmasıyla birlikte Heinrich Kiepert tarafından çizilen Karte von Klein-Asien, yöredeki yolları ve önemli coğrafi şekilleri detaylı bir biçimde gösteren ilk harita olmuştur (Kiepert, 1844). H. Kiepert bu çalışmasını geliştirerek, sonraki yıllarda farklı ölçeklerde de haritalar yayınlamıştır (Kiepert, 1884).

Bölgeyi ziyaret ederek çeşitli alanlarda önemli bilimsel çalışmalar yapmış bir diğer araştırmacı ise Pierre de Tchihatchef'tir. Tchihatchef'in gezilerini kaynak alarak, 1853'te Bolotoff ve Tchihatchef tarafından hazırlanan harita, Safranbolu yöresi hakkında önemli bilgiler içermektedir (De Bolotoff ve De Tchihatchef, 1853).

Osmanlı Arşivi'nde bulunan 1886 tarihli, Fransızca olarak hazırlanmış haritanın ise incelenen diğer haritalardan farklı olarak özgün bazı bilgiler içerdiği görülmektedir (BOA, HRT. h. 1985, 1886).

Geleneksel taşımacılığın devam ettiği dönemde, yöredeki en kapsamlı haritalama çalışması ise Richard Kiepert tarafından gerçekleştirilmiş ve ilk baskısı 1907, daha sonra ise 1914 yılında yayınlanmıştır (Kiepert, 1914).

Çalışmanın bu bölümünde 19. yüzyıl ile 20. yüzyıl başlarını kapsayan dönemde, yöredeki geleneksel yol ağı hakkında detaylı ve özgün bilgiler veren Batı dillerinde hazırlanmış genel haritalar başlıklar halinde incelenmektedir.

### Karte von Klein-Asien (1844)

Bölge hakkında ilk detaylı haritalama çalışması coğrafyacı Heinrich Kiepert tarafından 1843-1845 tarihinde, Karte von Kleinasien (Küçük Asya Haritası) çalışmasının bir parçası olarak 1:1.000.000 ölçeğinde hazırlanmıştır. H. Kiepert bu haritayı seyyahların haritaları ve kendi seyahatlerinden edindiği bilgiler yardımıyla oluşturmuştur (Kiepert, 1844; URL-4), (Şekil 2).




**Şekil 2.** Karte von Klein-Asien'e göre Safranbolu yöresinde yol ağı. (Kaynak: Kiepert, 1844).

Bu harita bölge coğrafyası hakkında da pek çok bilgi içermektedir. Soğanlı Çayı (Soghanlu Tschai), Araç Çayı (Aradsch Su), Ova Çayı (Ördeiri Su), Turna Yaylası (Durna Jailassi), Sorkun Yaylası (Sarchun Jailassi), Karakaya Dağı (Karakaja Dagh) ve Kuzyaka Dağı (Kus Jatscha) haritada adı geçen bazı önemli coğrafi yer isimlerdir. Haritada yolların yanı sıra yolların yakınında bulunan pek çok önemli yerleşim yeri de işaretlenmiştir (Kiepert, 1844).

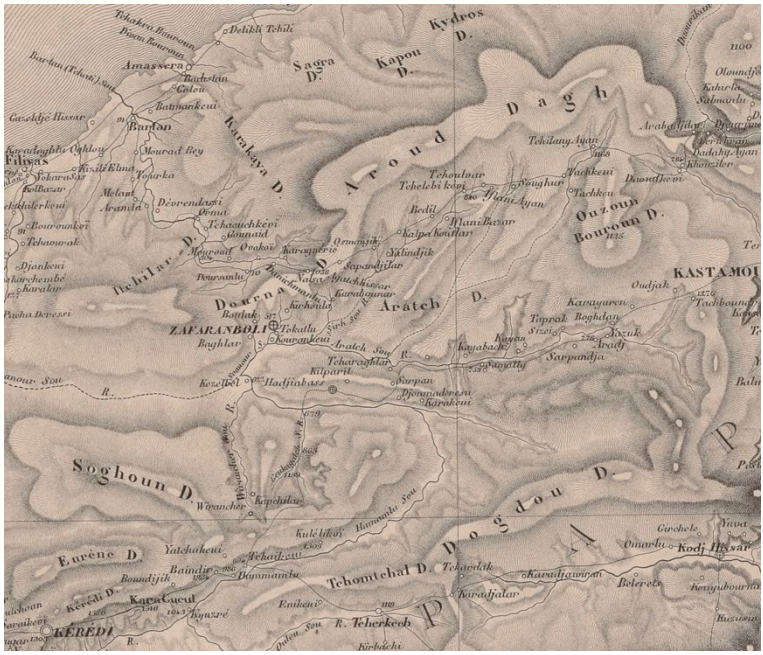
Safranbolu'nun güneyinde işaretlenen iki yoldan biri, İstanbul-Tebriz posta yolu üzerindeki Bayındır (Baindir) ve Hamamlı (Hammamlü) köylerinden başlayarak Karabük (Karabuk) köyünden Safranbolu'ya (Safaramboli) ulaşmaktadır. Diğeri ise Hamamlı köyünden ayrılarak Hacılarobası (Hadschi Abbas), Çıraklar (Tscharaghlar) köyü ve Araç (Aradsch) üzerinden Kastamonu'ya ilerlemektedir. Bu ikinci yolda, Hacılarobası ile Safranbolu arasında herhangi bir bağlantı gösterilmemiştir. Safranbolu'nun kuzeyinde ise yol, İnceçay (Naghsar) köyünün biraz doğusunda ikiye ayrılmaktadır. Buradan kuzeydoğuya ilerleyen yol, Esencik (Iflani Ajan) köyü üzerinden Daday'a, kuzeybatıya ilerleyen yol ise İnceçam (Orma) köyü üzerinden Bartın'a ulaşmaktadır (Kiepert, 1844).

Haritada görülen en önemli coğrafi hata, Soğanlı Çayı ve Araç Çayı yataklarının ve kavuşma yerinin yanlış bir konumda işaretlenmesidir. Haritada Kuzyaka Dağı hatalı çizilmiş, Eskipazar Çayı ile birleşen Soğanlı Çayı'nın yatağı o bölgede Kuzyaka Dağı yokmuş gibi en kısa yoldan Karabük köyünün bulunduğu mevkiye ulaştırılmıştır (Kiepert, 1844).

Haritada ayrıca "Wiran Schehr" ve "Adrianopolis" isimlerinin yanlarına "?" konulmuştur. Buradan anlaşılacağı üzere; Viranşehir ve Hadrianapolis yerleşimlerinin bölge yakınlarında bulunduğu o tarihte çizer tarafından tespit edilmiş fakat tam olarak konumlandırılamamıştır. Haritanın çizildiği dönemde Hadrianapolis Antik Kenti'nin bulunduğu yere dair tartışmalar devam ederken, H. Kiepert ilk defa kentin bugün bilinen konumuna yakın bir yeri işaret etmiştir (Kiepert, 1844).

**Carte Géographique De L'Asie Mineure (1853)**

Pierre de Tchihatchef, 1847 yılında İstanbul Rus Büyük Elçiliği'ndeki ataşelik görevinden ayrılarak Anadolu'daki bilimsel çalışmalarına yaklaşık 15 yıl boyunca ağırlık vermiştir. Anadolu'yu fiziki coğrafya, jeoloji, botanik, zooloji, paleontoloji ve arkeoloji kapsamında incelemiş ve bu alanlarda eserler vermiştir (Arslan, 2019). Tchihatchef'in çalışmalarından yararlanarak 1:1.000.000 ölçekli olarak hazırlanan Carte Géographique De L'Asie Mineure (Küçük Asya Coğrafi Haritası), 1844 tarihli Karte von Klein-Asien'e göre daha doğru coğrafi tespitler içermektedir. Haritada ulaşım güzergâhları ile ilgili eksiklikler bulunmaktadır. Örneğin önemli bir yerleşim yeri olarak ifade edilmiş Safranbolu'nun hiçbir yol bağlantısı gösterilmemiştir (De Bolotoff ve De Tchihatchef, 1853), (Şekil 3).




**Şekil 3.** Carte Géographique De L'Asie Mineure'e göre Safranbolu yöresinde yol ağı. (Kaynak: De Bolotoff ve De Tchihatchef, 1853).

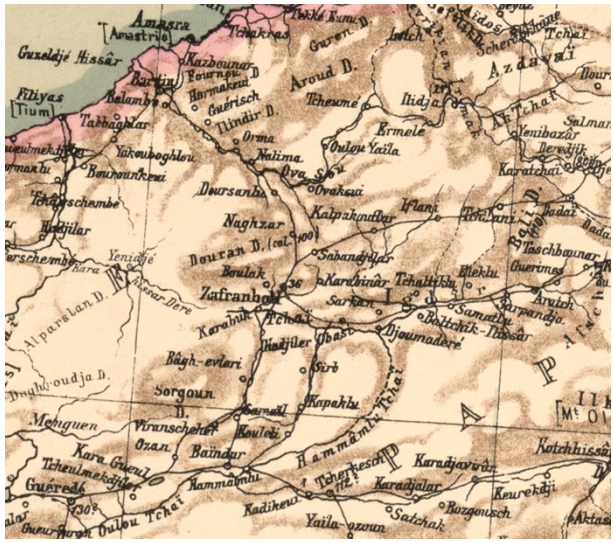
Haritada Safranbolu yöresinden geçen sadece 2 güzergâh gösterilmiştir. Bu iki güzergâhtan bir tanesi Safranbolu'nun kuzeyindeki, Bartın-Dursanlı-Bedil-Daday (Bartan-Doursanlu-Bedil-Dadahy) yolu, diğeri ise Safranbolu'nun güneyindeki Bayındır-Hamamlı-Hacılarobası-Araç (Baindir-Hammamlu-Hadjiabass-Aradj) yoludur[4] (De Bolotoff ve De Tchihatchef, 1853).

**Nouvelle Carte Generale des Provinces Asiatiques de L'empire Ottoman (1884)**

Nouvelle Carte Generale des Provinces Asiatiques de L'empire Ottoman (Osmanlı İmparatorluğu'nun Asya Eyaletlerinin Yeni Genel Haritası), Henri Kiepert tarafından 1:1.500.000 ölçekli olarak Osmanlı Devleti'nin Asya Kıtası'ndaki vilayetlerini gösterecek şekilde hazırlanmıştır. Haritaya düşülen notta güzergâhların çizimi için farklı seyyahlardan yararlandığı da belirtmektedir. Harita Safranbolu yöresindeki önemli coğrafi şekilleri,

[4] Bu haritada diğer haritalardan farklı olarak Zopran köyünün Kızılbel (Kezelbel) ismiyle haritaya eklendiği görülmektedir. Bunun yanı sıra haritada dağ ismi olarak ifade edilen Soghoun D. (Sorkun Yaylası) ve Dourna D. (Turna Düzü) isimleri günümüzde de kullanılmaya devam edilmektedir. Kızılbel kazası günümüzdeki Karabük ilinin batı kesimini kapsayan, 1811 yılında kurulan Viranşehir sancağına bağlı, merkezi Zopran köyü olan bir kadılıktır (Ersoy, 2011: 106-107; De Bolotoff ve De Tchihatchef, 1853).

dönemin ulaşım güzergâhlarını ve yollar üzerindeki pek çok yerleşmeyi göstermektedir (Kiepert, 1884), (Şekil 4).




**Şekil 4.** Nouvelle Carte Generale des Provinces Asiatiques de L'empire Ottoman'a göre Safranbolu yöresinde yol ağı. (Kaynak: Kiepert, 1884).

Haritada Safranbolu yöresinin güney bölümünde yer alan Bayındır (Baindur) ve Hamamlı (Hammamlu) yerleşimleri, Gerede-Çerkeş ana güzergâhı üzerindeki iki kavşak noktası olarak işaretlenmiştir. Ayrıca bu kavşakların batısında bulunan, Ozan (Ozan) köyü ve Eskipazar (Viranscheher) yerleşimi üzerinden yöreye ulaşmanın da mümkün olduğu gösterilmiştir (Kiepert, 1884).

Haritaya göre Safranbolu'nun güneyinde işaretlenmiş ana güzergâhlar; Bayındır-Karabük-Safranbolu (Baindur-Karabuk-Zafranboli) ve Hamamlı-Hacılarobası-Safranbolu'dur (Hammamlu-Hadjiler Obasi-Zafranboli). Safranbolu'nun doğusunda işaretlenmiş ana güzergâhlar; Safranbolu-Hacılarobası-Araç (Zafranboli- Hadjiler Obasi-Aratch) ve Safranbolu-Eflani-Daday (Zafranboli-Iflani-Dadai), Safranbolu'nun kuzeyinde işaretlenmiş ana güzergâh ise Safranbolu-Dursanlı-Bartın'dır (Zafranboli-Doursanlu-Bartin) (Kiepert, 1884).

H. Kiepert'in bu haritası günümüz haritalarıyla kıyaslandığında, haritada akarsu vadilerinin ve kavuşma noktalarının çiziminde bazı hataların olduğu, Araç ve Soğanlı çaylarının birleşerek oluşturduğu Filyos çayının ise diğer haritalarda rastlanılmayan ve günümüzde bilinmeyen bir biçimde "Hissar

Dere" olarak isimlendirildiği görülmektedir. Diğer taraftan Yenice (Yenidje) yerleşimi haritada işaretlenmiş fakat Safranbolu ile herhangi bir yol bağlantısı gösterilmemiştir (Kiepert, 1884).

**Carte Generale Vilayet de Castamoni (1886)**

Osmanlı Devlet Arşivleri'nde bulunan vilayet haritaları içerisinde, Fransızca olarak hazırlanmış Carte Generale Vilayet de Castamoni (Kastamonu Vilayeti Genel Haritası), yöredeki yolları, akarsuları ve kısmi olarak da yer şekillerini göstermektedir. Özgün bilgiler içermekle birlikte haritada verilen yer isimlerinden, haritanın hazırlanması sırasında Mordtmann'ın çalışmalarından da yararlanıldığı anlaşılmaktadır (BOA, HRT. h. 1985, 1886), (Şekil 5).




**Şekil 5.** Carte Generale Vilayet de Castamoni'e göre Safranbolu yöresinde yol ağı (1886). (Kaynak: BOA, HRT. h. 1985, 1886).

Haritada Gerede-Çerkeş (Guerede-Tcherkech) posta (transit) yolu ve bu yol üzerindeki Bayındır (Baindir) ve Hamamlı (Hamamli) köyleri işaretlenmiştir. Haritaya göre Safranbolu'nun güneyindeki ana güzergâhlar; Hamamlı-Hacılarobası-Safranbolu (Hamamli-Hadjiabaş-Safranboli) ve Bayındır-Eskipazar-Karabük-Safranbolu (Baindir-ViranCheir-Cou'abiekti-

Safranboli) istikametleridir. Safranbolu'nun doğusundaki ana güzergâhlar; Safranbolu-Eflani-Daday (Safranboli-Eflani-Dadai) ve Safranbolu-Hacılarobası-Araç (Safranboli- Hadjiabaş-Aradj), Safranbolu'nun kuzeyindeki ana güzergâhlar; Safranbolu-Derbent-Bartın (Safranboli-Kiraz Devrent-Bartin) ve Safranbolu-Kızılelma-Bartın (Safranboli-Kizil Elma-Bartin) istikametlerini izlemektedir (BOA, HRT. h. 1985, 1886).

Özgün olarak gösterilen en önemli yol ise Safranbolu'nun batısındaki Safranbolu-Üçburgu-Devrek (Safranboli-Uch Bourgou-Devrek) yoludur. Bu yolun diğer kaynaklar tarafından gösterilmemesinin sebebinin zorlu coğrafi şartları olduğu düşünülmektedir. Bunun yanı sıra haritadaki yollar üzerinde önemli yer ve mevkilerin isimleri yer almaktadır. Bunlardan bazıları; Cildikısık mevki (Djild. Kesseghi), Kavlakdibi mevki (Cavlak Dibi) ve Kalecik (Ilındır) köyüdür. Haritada ayrıca Kavlakdibi mevkisinin güneybatısındaki yol üzerinde "Yeni-Han" adıyla bir konum işaretlenmiştir. Haritada bazı yer adları (Filyos Çayı'nın başlangıcında gösterilen Soğanlı gibi) ve güzergâhlar (Hacılarobası-Safranbolu güzergâhı gibi) hatalı olarak verilmektedir (BOA, HRT. h. 1985, 1886).

**Karte von Kleinasien (1914)**

Anadolu'nun tamamını içine alan Karte von Kleinasien (Küçük Asya Haritası), 24 pafta halinde, 1/400.000 ölçekli olarak hazırlanmıştır. Safranbolu yöresi AIII. Zafaranboli paftasında gösterilmiştir (Kiepert, 1914).

Haritada ana ulaşım güzergâhları ve pek çok tâli güzergâh çizilmiş ve dönemin yolları açısından önem taşıyan hemen hemen bütün yerleşimler işaretlenmiştir. Haritada, dağ, dere, yöre, coğrafi ve idari alan isimlerine yer verildiği, yerleşim yerlerini gösteren işaretlerin yerleşimlerin nüfuslarıyla orantılı olarak büyüdüğü, bazı yerleşim isimlerinin yanına o yerleşimin eski ya da kullanılan diğer isimlerinin yazıldığı, bazı antik alanların ve önemli köprülerin işaretlendiği görülmektedir. Ayrıca yol üzerinde bulunan bazı camiler ve hanlar gösterilmiştir. Haritada gösterilen güzergâhlar üzerinde bu güzergâhları kullanan seyyahların isimleri de yazılmıştır (Kiepert, 1914), (Şekil 6).




**Şekil 6.** Karte von Kleinasien'e göre Safranbolu yöresinde yol ağı. (Kaynak: Kiepert, 1914).

Haritada Bayındır (Ba'yndyr) ve Hamamlı (Hammamly) köyleri yörenin güneyinde, Gerede-Çerkeş ana güzergâhı üzerinde işaretlenmiştir. Haritaya göre Bayındır köyü nüfusu 2000'in üzerinde olan bir yerleşimken Hamamlı köyü kuzeye ayrılan yolların kavşak noktasıdır. Ayrıca Bayındır köyünün batısında, Gerede-Çerkeş güzergâhı üzerinden kuzeye ayrılan iki yol daha görülmektedir. Bu yolların buluşma noktası Eskipazar (Viranshehr Bazar) yerleşimidir. Bu iki yoldan batıda bulunanının Hadrianapolis antik kentinin (Hadrianop) yakınından geçmektedir.

Haritaya göre Safranbolu'nun güneyindeki ana güzergâhlar; Hamamlı-Üçbölük-Safranbolu (Hammamly-Ilbaryt-Zafaranboli), Çerkeş-Karakoyunlu-Üçbölük-Safranbolu (Tsherkesh-Kara Kojunlu-Ilbaryt-Zafaranboli),

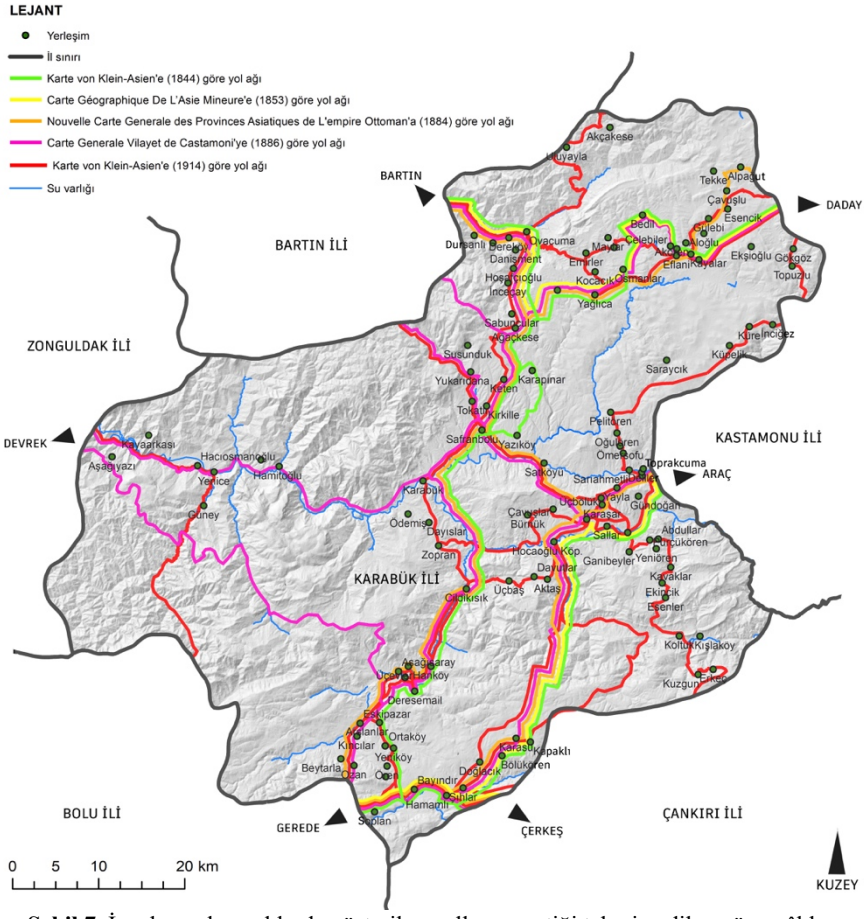
Bayındır-Eskipazar-Karabük-Safranbolu (Ba'yndyr- Viranshehr Bazar-Karabuk-Zafaranboli) ve Bayındır-Eskipazar-Zopran-Üçbölük-Safranbolu'dur (Ba'yndyr- Viranshehr Bazar-Sobran-Divan-Ilbaryt-Zafaranboli). Safranbolu'nun doğusundaki ana güzergâhlar; Safranbolu-Üçbölük-Araç (Zafaranboli-Ilbaryt-Aratsh), Safranbolu-Üçbölük-Pelitören-Meyre (Aktaştekke)-Daday (Zafaranboli-Ilbaryt-Pelitviren-Me'ire-Dadai) ve Safranbolu-Ovacuma-Eflani-Daday'dır (Zafaranboli-Ova Djuması-Eflani Bazar-Dadai). Safranbolu'nun kuzeyindeki ana güzergâhlar ise; Safranbolu-Ovacuma-Bartın (Zafaranboli-Ova Djuması-Bartın) ve Safranbolu-Susunduk-Ören (Bahçecik)-Bartın (Zafaranboli-Susandyk-Merkebören-Bartın) istikametlerini izlemektedir (Kiepert, 1914).

Haritada Hamamlı'dan Hacılarobası'na (Hadjilar Obasy) giden yol üzerinde "Sirp" adında bir yerleşim işaretlenmiştir. Burası "Sirb" ve "Serb" isimleriyle daha önce çizilen bazı haritalarda da gösterilmiştir (Şekil 4 ve Şekil 5). Yapılan çalışmalarda bölgede bu isme benzer bir yerleşim adı tespit edilememiştir. Fakat günümüzde bu yeri de kapsayan coğrafyaya (Eskipazar'ın doğusunda Ovacık ve Çerkeş sınırına kadar uzanan dağlık alan) halk tarafından "Sırt" ismi verilmektedir (URL-5).

Haritada Safranbolu'nun batısında Karabük-Yenice arasında herhangi bir güzergâh gösterilmezken, Mengen-Yenice-Devrek (Mengen Bazar-Bazar-Devrek) yolu işaretlenmiştir. Diğer birçok haritanın aksine Safranbolu-Araç arasındaki yolu Safranbolu-Toprakcuma-Araç istikametinde göstermek yerine Safranbolu-Üçbölük-Araç istikametinde, daha uzun bir güzergâh olarak işaretlemiştir. Ayrıca Filyos Çayı'nın (Soghanly/Karabuk Ts.) Yenice'ye kadar olan bölümü kesinlik ifade etmekten kaçınılarak, kesikli çizgilerle çizilmiş olmasına rağmen, yörede çizilen coğrafi unsurların ve yerleşim yeri gösterimlerinin günümüzdeki haritalarla büyük oranda tutarlı olduğu görülmektedir (Kiepert, 1914).

**Haritaların Sentezi**

Önceki bölüm kapsamında incelenen 5 adet tarihi harita alan incelemeleri ile elde edilen verilerle çapraz olarak kıyaslanmıştır. Bu sayede haritalarda yolların üzerinde ya da yakınında olduğu işaret edilen yerleşimlerin konumları tespit edilmiştir. Bu yerleşimler ve güzergâhlar Ekler bölümünde bulunan Tablo Ek 1'de ve Şekil 7'de gösterilmektedir.

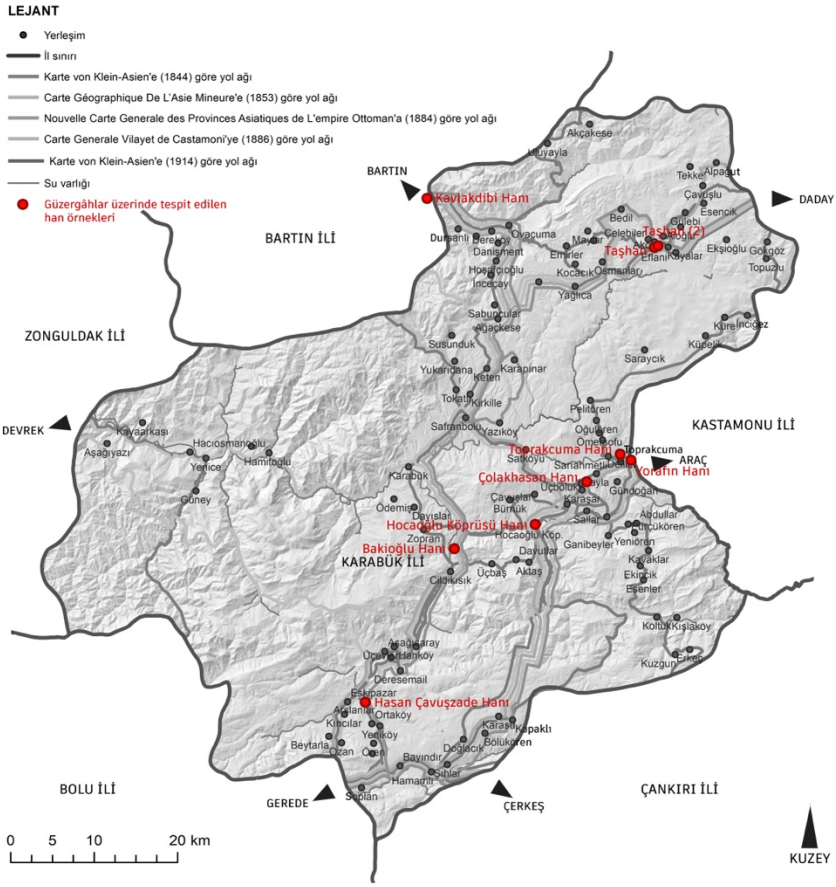



**Şekil 7.** İncelenen kaynaklarda gösterilen yolların geçtiği tahmin edilen güzergâhlar. (Kaynak: ArcMap 10.8'de hazırlanmıştır).

Tarihi yol ağının ulaştığı, alanın dışındaki başlıca 6 yerleşim ile farklı düzeylerde bağlantılı olduğu görülmektedir. Bunlar, güneybatı ve güneydoğuda Gerede ve Çerkeş, batıda Devrek, kuzeyde Bartın, kuzeydoğuda Daday ve doğuda Araç yerleşimleridir. Bölgenin güneyinde yer alan Gerede-Çerkeş yolu ve üzerindeki Hamamlı köyünden ayrılarak Hacılarobası'na kadar ulaşan yol ve Sabuncular'dan itibaren Bartın yolu en çok atıf yapılan iki güzergâhtır. Bunun yanı sıra Eskipazar-Karabük-Safranbolu, Safranbolu-Eflani-Daday ve Hacılarobası-Safranbolu yolunun oldukça sık bir biçimde kullanıldığı anlaşılmaktadır. Devamında Devrek'e ulaşan Karabük-Yenice yolu ise zayıf bir bağlantı içermektedir. Hamamlı, Hacılarobası, Safranbolu ve Sabuncular yerleşimleri bölgedeki yollar üzerinde önemli kavşaklardır.

## TARİHİ YOL AĞI ÇEVRESİNDEKİ HAN ÖRNEKLERİ

Çalışma kapsamında belirlenen güzergâhların bir bölümünde örnekleme dayalı alan taraması ile tespitler gerçekleştirilmiştir (Şekil 8).




| Konumu | Yapı adı | Durumu (İşlevi) | Koord. |
|---|---|---|---|
| Eskipazar İlçe Merkezi | Hasan Çavuşzade Hanı | Tamamaen yok olmuş (-) | 40.944, 32.530 |
| Cumayanı köyü (Karabük) | Bakioğlu Hanı | Koruma sorunları mevcut (Depo) | 41.095, 32.675 |
| Boyalı köyü (Ovacık) | Hocaoğlu Köprüsü Hanı | İzi var (Yıkıntı) | 41.129, 32.789 |
| Kadıbükü köyü (Safranbolu) | Çolak Hasan Hanı | Koruma sorunları mevcut (Konut) | 41.197, 32.868 |
| Toprakcuma köyü (Safranbolu) | Toprakcuma Hanı (Yorafın Hanı) | Restore edilmiş (Âtıl) | 41.201, 32.910 |

| Konumu | Yapı adı | Durumu (İşlevi) | Koord. |
|---|---|---|---|
| Çıraklar köyü (Safranbolu) | Yorafın Hanı | Koruma sorunları mevcut (Konut) | 41.198, 32.910 |
| Eflani İlçe Merkezi | Taşhan | Restore edilmiş (Dükkân-Âtıl) | 41.423, 32.955 |
| | Taşhan (2) | Koruma sorunları mevcut (Dükkân-Âtıl) | 41.423, 32.957 |
| Bahçecik köyü (Ulus) | Kavlakdibi Hanı | Koruma sorunları mevcut (Âtıl) | 41.481, 32.633 |

**Şekil 8.** Örnekleme dayalı alan taramasının yapıldığı alanda bulunan hanlar. (Kaynak: Harita ArcMap 10.8'de hazırlanmıştır).

Bu çalışma ile güzergâhlar üzerinde farklı dönemlerde ve farklı tekniklerle yapılmış çok sayıda han yapısının geçmişte kullanıldığı anlaşılmıştır. Mimarisine dair görsel materyal ya da iz bulunan yapılar belgelenmiştir. Tespit edilen toplam 9 adet han yapısından 2 tanesinin günümüze ulaşamadığı, 5 tanesinin ciddi koruma sorunlarının bulunduğu, 2 tanesinin ise restore edilmesine rağmen büyük oranda âtıl kaldığı anlaşılmıştır. Tespit edilen han yapılarının konumları ve isimleri Şekil 8'de gösterilmektedir.

Hasan Çavuşzade hanının Eskipazar ilçe merkezinde, 1835 tarihinden önce yapıldığı anlaşılmaktadır. Elde edilen fotoğraflardan yapının Osmanlı dönemi iki katlı ve avlulu han mimarisi özelliklerini gösterdiği anlaşılmaktadır. Yapı yaklaşık 43 m x 23 m boyutlarında, orta avlulu bir plan şemasına sahipti ve zemin katı taş olmak üzere iki kattan oluşmaktaydı. Bu yapı 1996 yılında yıkılarak yerine yeni binalar inşa edilmiştir (Şekil 9).



**Şekil 9.** Hasan Çavuşzade hanının 20. yüzyıl başlarında kuzeybatıdan görünüşü. (Kaynak: Groupe Suédo-Danois, 1937'den düzenleme).

Bakioğlu hanı Karabük'ün Merkez ilçesine bağlı Cumayanı köyünde bulunmaktadır. Yapının duvarına yapım yılı olduğu düşünülen "1926" tarihi kazınmıştır. Alt ve üst kat olmak üzere 2 kattan oluşan yapı avlusuz olarak inşa edilmiştir ve 18 m x 8 m boyutlarındadır. Yapının zemin katı yığma taş, üst katı ise ahşap iskelet sistem ile inşa edilmiştir. Bakioğlu hanının alt katında ahır ve çay ocağı, üst katında ise geniş bir sofa, odalar ve hela bulunmaktadır. Yapıda hela haricinde cumba ya da çıkma mevcut değildir. Yapının pencereleri 1/2 oranında ve kara kapaklıdır. Hanın doğu bölümünde yer alan duvarlardan bir kısmı ahşap çatkı arası tuğla dolgu ile onarım gördüğü anlaşılmaktadır. Yapı günümüzde kuzey ve güney cephelerinde bulunan muhdes eklerle birlikte depo olarak kullanılmaktadır. Hatalı uygulamalar ve bakımsızlık sebebiyle özellikle üst örtüsünde koruma sorunları mevcuttur (Şekil 10).




**Şekil 10.** Bakioğlu hanının batı (solda) ve güney (sağda) cephesi. (Kaynak: E. Karataş, 2022).

Hocaoğlu Köprüsü hanı, Ovacık ilçesi Boyalı köyü Hocaoğlu Köprüsü mevki sınırları içerisinde, Tarihi Hocaoğlu Köprüsü yolu üzerinde bulunmaktadır. Günümüzde yapının üst katı tamamen yıkılmış durumdadır. Avlusuz mimariye sahip olan hanın iki kattan oluştuğu, alt katında dükkân ve kahvehane, üst katında ise çardak ve üç adet oda bulunduğu, zemin katının yığma taş, üst katının ise ahşap iskelet sistem ile inşa edildiği tahmin edilmektedir.

Tespit edilen bir diğer yapı olan Çolak Hasan hanı Safranbolu ilçesi Kadıbükü köyündedir. Avlusuz ve iki katlı olan yapının zemin katı yığma taş, üst katı ise ahşap iskelet sistem ile inşa edilmiştir. Yapının batı cephesi boyunca uzanan bir çıkma bulunmaktadır. Pencereleri bölgedeki klasik konut mimarisinde görülen 1/2 oranında yapılmıştır ve kara kapaklıdır. Hanın kuzey yarısı hatalı onarımlar sebebiyle özgünlüğünü büyük oranda yitirmiştir. Yapının diğer bölümünde ise özellikle üst örtüden kaynaklı koruma sorunları mevcuttur (Şekil 11).



**Şekil 11.** Çolak Hasan hanının güneybatı perspektifi. (Kaynak: E. Karataş, 2022).

Toprakcuma hanı, Safranbolu ilçesinin Toprakcuma köyünde pazar yeri, dükkânlar ve handan oluşan ticari bir dokunun içerisinde bulunmaktadır. Halk arasında "Yorafın hanı" adıyla da bilinmektedir. Doku içerisindeki dükkânlar harap vaziyettedir. Han ise daha önce üst katı tamamen yıkılmış durumdayken 2014 yılında restore edilmiştir. Taş yığma sistem ile inşa edilmiş alt katın çeperinde tonoz üst örtüsüne sahip dükkânlar bulunmaktadır. Yapının üst katı ise ahşap iskelet sistem kullanılarak inşa edilmiştir. Yapıda cumba mevcut değildir. Han halihazırda kullanılmamaktadır (Şekil 12).



**Şekil 12.** Toprakcuma hanının güneybatı perspektifi (solda) ve Toprakcuma köyünün ticari dokusu içerisinde han yapısının kuzeyden görünümü (sağda). (Kaynak: E. Karataş, 2022).

Yorafın hanı, Safranbolu ilçesinin Çıraklar köyündedir. Taş yığma sistem ile inşa edilmiş zemin kat ve ahşap karkas olarak yapılmış üst kattan oluşmaktadır. Yapı Kadıbükü köyünde bulunan Çolak Hasan hanına benzer bir biçimde ikiye bölünerek kullanılmaktadır ve yapının bir kısmı onarım görmüştür. Hanın biçimlenmesi yöredeki konut mimarisi ile benzerlik göstermektedir. Muhdes ekler, onarımlar ve yıpranma sebebiyle koruma sorunları vardır. Yapı günümüzde konut olarak kullanılmaktadır (Şekil 13).



**Şekil 13.** Yorafın hanının kuzeybatı perspektifi. (Kaynak: E. Karataş, 2022).

Eflani ilçe merkezi Çelebiler caddesinde han olarak kullanıldığı belirtilen, malzeme ve yapım tekniği açısından birbirine benzerlik gösteren iki yapı ve 1 veya 2 katlı tarihi dükkânlar bulunmaktadır. İki han yapısından büyük ölçekli olan Taşhan, doku içerisinde öne çıkmaktadır.

Taşhan iki katlı olarak yığma taş yapım sistemi ile inşa edilmiştir. Yapının kitabesinden 1884-1885 (H. 1302) tarihinde inşasının tamamlandığı anlaşılmaktadır. Yapı yaklaşık 29,5 m x 14 m boyutlarına sahiptir. Taşhan bir ilk yapı ve daha sonra ona eklenen dönem ekinden oluşmaktadır. İlk yapının özgün durumunda, alt katta tonoz üst örtü ile inşa edilmiş dükkanlar ve ahırlar, üst katta ise bir orta sofanın iki yanına dizilmiş aynalı tonoz üst örtüye sahip sekiz oda ve bir eyvan bulunmaktadır. İlk yapıya eklenen dönem ekinin alt katının özgün durumunda dükkân ve ahırlar bulunmaktaydı. Bu bölümün üst katı ilk yapının plan şemasına benzer bir biçimde, bir orta sofa etrafına dizilmiş odalardan oluşmaktadır. İlk yapılan kısımdaki pencereler küçüktür ve dikdörtgen biçimindedir. Dönem ekindeki pencereler ise daha geniş ve kareye yakın ölçülere sahiptir. Yapıda cumba bulunmamaktadır. Bu yapı 2014 yılında restore edilmiştir. Günümüzde yapının alt katlarının dükkân olarak kullanıldığı, üst katın ise halihazırda kullanılmadığı görülmektedir (Şekil 14).

Çelebiler caddesi üzerinde bulunan, yığma taş sistem ile inşa edilmiş diğer han yapısı ise henüz restore edilmemiştir. Bu yapının zemin katında bulunan dükkânların bir bölümü kullanılırken üst katı ise âtıl bir durumdadır (Şekil 14). Aynı cadde üzerinde yer alan diğer tarihi dükkânlar ise bakıma muhtaç vaziyettedir.



**Şekil 14.** Taşhan (solda) ve aynı cadde üzerinde bulunan diğer han yapısı (sağda). (Kaynak: E. Karataş, 2022).

Kavlakdibi hanı, Bartın'ın Ulus ilçesine bağlı Bahçecik köyünün Kavlakdibi mevkisinde, Karabük-Bartın il sınırına çok yakın bir konumda, 19.

yüzyılda oldukça işlek olduğu anlaşılan Safranbolu-Bartın yolu üzerinde bulunmaktadır. İki kattan oluşan yapının alt katı yığma taş, üst katı ise ahşap iskelet sistemle inşa edilmiştir. Üst kat dış duvarları daraba adı verilen tahtalar ile kaplanmıştır. Alt katta ahır ve konaklama mekânları, üst katta ise uzun bir sofa etrafındaki odalar ve hela bulunmaktadır. Yapının güney cephesi giriş aksına göre simetrik olarak tasarlanmıştır. Bu simetriye uygun bir biçimde zemin kattaki girişin üzerinde bir cumba bulunmaktadır. Yapının gördüğü hatalı onarımlar ve zamanın yıpratıcı etkisi sebebiyle koruma sorunları mevcuttur. Yapı halihazırda âtıl durumdadır (Şekil 15).



**Şekil 15.** Kavlakdibi hanının güney perspektifi. (Kaynak: E. Karataş, 2023).

**Han Örneklerinin Değerlendirilmesi**

Örnekleme dayalı alan çalışması sonucunda, belirlenen rotalar üzerinde dokuz adet han yapısı tespit edilmiştir. Bu hanların mimari özellikleri, mevcut kullanım ve koruma durumları Tablo 1'de karşılaştırılmıştır.

İncelenen hanlar içerisinde Eskipazar ve Eflani gibi ticari merkezlerde bulunan Hasan Çavuşzade Hanı ve Taşhan gibi yapıların tamamen taş yığma, kırsal alanlarda yollar üzerinde bulunan hanların ise yörenin konut mimarisinde sıkça rastlanan bir biçimde taş yığma zemin kat üzerinde ahşap iskelet sistem kullanılarak inşa edildiği anlaşılmaktadır.

Dokuz adet han içerisinden sadece Eskipazar'da bulunan Hasan Çavuşzade hanının, şehir içi Osmanlı dönemi hanlarında sıklıkla görülen 2 katlı ve avlulu mekân düzenine sahip olduğu görülmektedir.

**Tablo 1.** Haritalarda yol ağının üzerinde ya da yakınında konumlandırılmış yerleşimlerin günümüzdeki idari durumları

| Yapının adı | Malzeme ve yapım sistemi | Mimari niteliği | Kullanım durumu | Koruma durumu |
|---|---|---|---|---|
| Hasan Çavuşzade Hanı | Taş yığma | 2 katlı ve açık orta avlulu plan | - | Tamamen yıkılmış |
| Bakioğlu Hanı | Taş yığma zemin kat üzeri ahşap iskelet sistem | 2 katlı ve üst katı orta sofalı plan | Depo | Orta (Hatalı onarımlar mevcut) |
| Hocaoğlu Köprüsü Hanı | Taş yığma zemin kat üzeri ahşap iskelet sistem | 2 katlı ve sofalı plan | - | Tamamen yıkılmış (izi mevcut) |
| Çolak Hasan Hanı | Taş yığma zemin kat üzeri ahşap iskelet sistem | Girilemedi | Konut | Orta (Hatalı onarımlar mevcut) |
| Toprakcuma Hanı | Taş yığma zemin kat üzeri ahşap iskelet sistem | 2 katlı ve sofalı plan | Âtıl | Restorasyon görmüş |
| Yorafın Hanı | Taş yığma zemin kat üzeri ahşap iskelet sistem | 2 katlı ve üst katı orta sofalı plan | Konut | Orta (Hatalı onarımlar mevcut) |
| Taşhan (1) | Taş yığma | 2 katlı ve üst katı iç sofalı plan | Âtıl | Restorasyon görmüş |
| Taşhan (2) | Taş yığma | 2 katlı ve sofalı plan | Âtıl | Orta (Hatalı onarımlar mevcut) |
| Kavlakdibi Hanı | Taş yığma zemin kat üzeri ahşap iskelet sistem | 2 katlı ve orta sofalı plan | Âtıl | Orta (Hatalı onarımlar mevcut) |

Günümüze ulaşmış yedi han yapısından beş tanesinin âtıl vaziyette bulunduğu ya da depo olarak ikisinin ise konut olarak kullanıldığı görülmektedir. Bu yapılar içerisinden Eflani'de bulunan Taşhan'ın ve Toprakcuma köyünde bulunan hanın restore edilmiş olmasına rağmen işlevlendirilemediği tespit edilmiştir.

İncelenen dokuz adet han örneğinin yedisi günümüze ulaşabilmiştir. Ancak günümüze ulaşan yapılarda da ciddi koruma sorunları gözlemlenmektedir ve çoğu yasal koruma altında bulunmamaktadır.

**SONUÇ**

Yöredeki antik kalıntıların güzergâhlar üzerinde yoğunlaşması bu yolların en azından Roma ve Bizans dönemlerinden itibaren kullanıldıklarını göstermektedir. Bölgedeki tarihi yollar genellikle dağların ve akarsuların oluşturduğu zorlu coğrafyayı referans alarak şekillenmiştir. Bu nedenle yolların güzergâhları için alternatifler sınırlı olsa da tarihi süreç içerisinde yolların işlerliklerinde değişiklikler meydana geldiği anlaşılmıştır. Bölgede ulaşım güzergâhları bir taraftan ulaşım kolaylığı, zaman tasarrufu, güvenlik, konaklama ve pazar yerlerinin durumuna göre şekillenirken diğer taraftan yerleşimlerin ticaretini, üretim biçimlerini, demografisini ve sosyokültürel yapısını da biçimlendirmiştir.

İncelenen haritaların ve saha çalışmalarının sentezi sonucunda, Safranbolu'nun tarihi yol ağının ona komşu olan altı yerleşimle farklı düzeylerde bağlantılı olduğu tespit edilmiştir. Bu yerleşimler Gerede, Çerkeş, Devrek, Bartın, Daday ve Araç'tır.

En sık atıf yapılan güzergâhlar, Gerede-Çerkeş yolu ve bu yol üzerindeki Hamamlı köyünden ayrılarak Hacılarobası'na ulaşan yoldur. Ayrıca Eskipazar-Karabük-Safranbolu, Safranbolu-Eflani-Daday ve Hacılarobası-Safranbolu yollarının da oldukça yoğun bir biçimde kullanıldığı anlaşılmaktadır. Dönemin haritalarına göre Hamamlı, Hacılarobası, Safranbolu ve Sabuncular gibi yerleşimler, bu ağ üzerinde önemli birer kavşak noktası işlevini görmüştür. Diğer yandan Karabük-Yenice-Devrek hattındaki yol bağlantısının diğer güzergâhlara göre daha zayıf olduğu görülmektedir.

Tablo Ek 1 tarihi haritalarda adı geçen 126 yerleşim yerinin günümüzdeki idari durumlarını ve tarihi isimlerini eşleştirmektedir. Bu eşleştirme yol ağları açısından önemli bir veri seti oluşturmakta ve bölgedeki yerleşimlerin tarihi hakkında da bilgiler içermektedir.

Irmak-Filyos Demiryolu hattı üzerindeki Karabük istasyonunun 1932 yılında açılmasıyla yörenin ilk defa modern ulaşım ağına dahil olduğu bilinmektedir. Eskipazar-Karabük-Yenice istikametini bağlayan demiryoluyla birlikte yöredeki sanayi ve ticaretin de bu güzergâh üzerinde geliştiği ve özellikle daha önce birkaç haneden ibaret olan bu yerleşimlerin

nüfuslarının hızla arttığı görülmektedir. Karabük'e yapılan ağır sanayi yatırımlarıyla birlikte bölgedeki karayolları da geliştirilmiş ve zamanla geleneksel yol ağları önemlerini kaybetmiştir.

Safranbolu'nun UNESCO Dünya Miras Listesi'ne dahil edilmesinde, şehrin ticari yapısı ve tarihi kervan yolları üzerindeki konumu güçlü bir şekilde vurgulanmaktadır. Bu çalışma, UNESCO'nun bu vurgusunu bilimsel verilerle destekleyerek, şehrin Dünya Mirası statüsünü pekiştirmektedir.

Tarihi yol ağları ve üzerinde bulunan han yapıları ise, bölgenin tarihini, sosyoekonomik yapısını ve kültürel zenginliğini ortaya koyan birer belge niteliğindedir. Bu nedenle, bu yapıların tespit edilmesi, belgelenmesi ve sürdürülebilirliklerinin sağlanması bölge açısından büyük bir öneme sahiptir.

Daha önce dinamik bir sistemin parçası olan hanlar tarihi yol ağlarının önemini kaybetmesiyle birlikte işlev değiştirmek zorunda kalmış ya da terkedilmiştir. Günümüze ulaşan yapıların sürdürülebilirlikleri ciddi anlamda tehdit altındadır. Öyle ki restorasyonu gerçekleştirilen yapıların dahi yeniden işlevlendirilemediği görülmektedir. Bu durum restorasyon projelerinin, yapıların fiziksel korunmasını amaçlamanın yanı sıra, çağdaş bir yeniden işlevlendirme stratejisiyle bütünleştirilmesi gerektiğini işaret etmektedir.

Bu kapsamlı araştırma, Safranbolu'nun tarihi yol ağlarının, yol güzergâhındaki kültürel mirasın ve hanların tespiti, korunması ve sürdürülebilirliği için çok katmanlı bütünleşik bir koruma stratejisine ihtiyaç duyulduğunu göstermektedir.

Bu çalışma, dönemin farklı kaynaklardan elde edilen bilgileri bir araya getirip alan çalışmaları ve coğrafi bilgi sistemi (CBS) metodu ile destekleyerek Safranbolu'nun tarihi yol ağını daha önce eksik kalmış bir bütünlük içinde ortaya koyan temel bir adım niteliğindedir.

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# EKLER

**Tablo Ek 1.** Haritalarda yol ağının üzerinde ya da yakınında konumlandırılmış yerleşimlerin günümüzdeki idari durumları

| İlçe | NO | Yerleşim, Köy (K.) veya Mahalle (Mah.) | Ünite (Ü.) veya Mevki (M.) | Kaynakta Geçen İsim | Kaynak İsmi (Tarihi) |
|---|---|---|---|---|---|
| Eflani | 1 | Eflani İlçe Merkezi | - | Iflani | Kaynak 3 (1884) |
| | | | | Eflani | Kaynak 4 (1886) |
| | | | | Eflani Bazar | Kaynak 5 (1914) |
| | 2 | Abakolu K. | Ekşioğlu Ü. / Eriş Tarla M. | Gerish | Kaynak 5 (1914) |
| | 3 | Akçakese K. | Merkez Ü. | Aktshe Kese | Kaynak 5 (1914) |
| | 4 | Akören K. | Merkez Ü. | Akviren | Kaynak 5 (1914) |
| | 5 | Akören K. | Kayalar Ü. | Kajalar | Kaynak 5 (1914) |
| | 6 | Alpağut K. | Merkez Ü. | Kalpakutlar | Kaynak 1 (1844) |
| | | | | Kalpa Koutlar | Kaynak 2 (1853) |
| | | | | Kalpakoutlar | Kaynak 3 (1884) |
| | 7 | Bedil K . | Merkez Ü. | Bedil | Kaynak 1 (1844) |
| | | | | Bedil | Kaynak 2 (1853) |
| | | | | Bedil | Kaynak 4 (1886) |
| | 8 | Çavuşlu K . | Merkez Ü. | Tschulmar | Kaynak 1 (1844) |
| | 9 | | Tekke (Terke) Ü. | Tekiehköi | Kaynak 1 (1844) |
| | 10 | Çelebiler Mah. | - | Tchelebikeui | Kaynak 2 (1853) |
| | 11 | | Toygaraltı M. | Tchoulvar | Kaynak 2 (1853) |
| | 12 | Demirli K. | İnciğez Ü. | Indjuvas | Kaynak 5 (1914) |
| | 13 | | Kütpelik Ü. | Pellik | Kaynak 5 (1914) |
| | 14 | | Küre M. | Küre | Kaynak 5 (1914) |
| | 15 | Emirler K . | Merkez Ü. | Emiler | Kaynak 5 (1914) |
| | 16 | Esencik (Kılvar) K. | Merkez Ü. | Iflani Ajan | Kaynak 1 (1844) |
| | | | | Iflani Ayan | Kaynak 2 (1853) |
| | | | | Kylvar | Kaynak 5 (1914) |
| | 17 | | Gülebi Ü. | Güleb | Kaynak 5 (1914) |
| | 18 | Gökgöz K . | Merkez Ü. | Gokgözdiler? | Kaynak 5 (1914) |
| | 19 | | Topuzlu Ü. | Topuzly K. | Kaynak 5 (1914) |
| | 20 | Güngören K. | Mahmutlar M. | Mahmud Oglu | Kaynak 5 (1914) |
| | 21 | | Maylar Ü. | Müşdi K. | Kaynak 5 (1914) |
| | 22 | Kocacık K. | Merkez Ü. | Chodjadjyk | Kaynak 5 (1914) |
| | 23 | Koltucak K. | Merkez Ü. | Goltshitshek | Kaynak 5 (1914) |
| | 24 | | Aloğlu Ü. | Ala K. | Kaynak 5 (1914) |
| | 25 | Osmanlar K. | Merkez Ü. | Osmanjik | Kaynak 2 (1853) |
| | 26 | Saraycık K. | Merkez Ü. | Seraitshik | Kaynak 5 (1914) |
| | 27 | Yağlıca K. | Merkez Ü. | Janglydja | Kaynak 5 (1914) |
| | 28 | ? | ? | Bolebramihakini K.? | Kaynak 5 (1914) |
| | 29 | ? | ? | Soughur | Kaynak 2 (1853) |
| | 30 | ? | ? | Tshelik K. | Kaynak 5 (1914) |
| Eskipazar | 31 | Eskipazar İlçe Merkezi | - | Viranscheher | Kaynak 3 (1884) |
| | | | | Viran-Cheir | Kaynak 4 (1886) |
| | | | | Viranshehr Bazar | Kaynak 5 (1914) |
| | 32 | Arslanlar K. | Merkez Ü. | Arslan | Kaynak 5 (1914) |
| | 33 | Bayındır K. | Merkez Ü. | Baindir | Kaynak 1 (1844) |
| | | | | Baindir | Kaynak 2 (1853) |
| | | | | Baindur | Kaynak 3 (1884) |
| | | | | Baindir | Kaynak 4 (1886) |
| | | | | Ba'yndyr | Kaynak 5 (1914) |
| | 34 | Beytarla K. | Merkez Ü. | Sherifeddin | Kaynak 5 (1914) |
| | 35 | Böltükören K. | Merkez Ü. | Belegüren | Kaynak 5 (1914) |
| | 36 | Deresemail K. | Merkez Ü. | Samajil Köi | Kaynak 1 (1844) |
| | | | | Samail | Kaynak 3 (1884) |
| | | | | Semail | Kaynak 4 (1886) |
| | | | | Samail | Kaynak 5 (1914) |
| | 37 | Deresoplan K. | Soplan M. | Sobalar | Kaynak 5 (1914) |
| | 38 | Doğlacık K. | Merkez Ü. | Dauladjyk | Kaynak 5 (1914) |
| | 39 | Gözlü K. | Kadılar Ü. | Kadilar | Kaynak 5 (1914) |
| | 40 | | Ören Ü. | Ören K. | Kaynak 5 (1914) |
| | 41 | Hamamlı K. | Merkez Ü. | Hammamlü | Kaynak 1 (1844) |
| | | | | Hammamlu | Kaynak 2 (1853) |
| | | | | Hammamlu | Kaynak 3 (1884) |
| | | | | Hamamli | Kaynak 4 (1886) |
| | | | | Hammamly | Kaynak 5 (1914) |
| | 42 | Hanköy K. | Merkez Ü. | Tschanköi | Kaynak 1 (1844) |
| | | | | Han K. | Kaynak 5 (1914) |
| | 43 | Yenimahalle Mah. | Kıncılar M. | Gündjular | Kaynak 5 (1914) |
| | 44 | Kapaklı K. | Merkez Ü. | Kapaklu | Kaynak 3 (1884) |
| | | | | Cabaklar | Kaynak 4 (1886) |
| | | | | Kapa K. | Kaynak 5 (1914) |
| | 45 | Karahasanlar K. | Merkez Ü. | Karasemur | Kaynak 5 (1914) |
| | 46 | | Aşağısaray Ü. | A. Serai | Kaynak 5 (1914) |

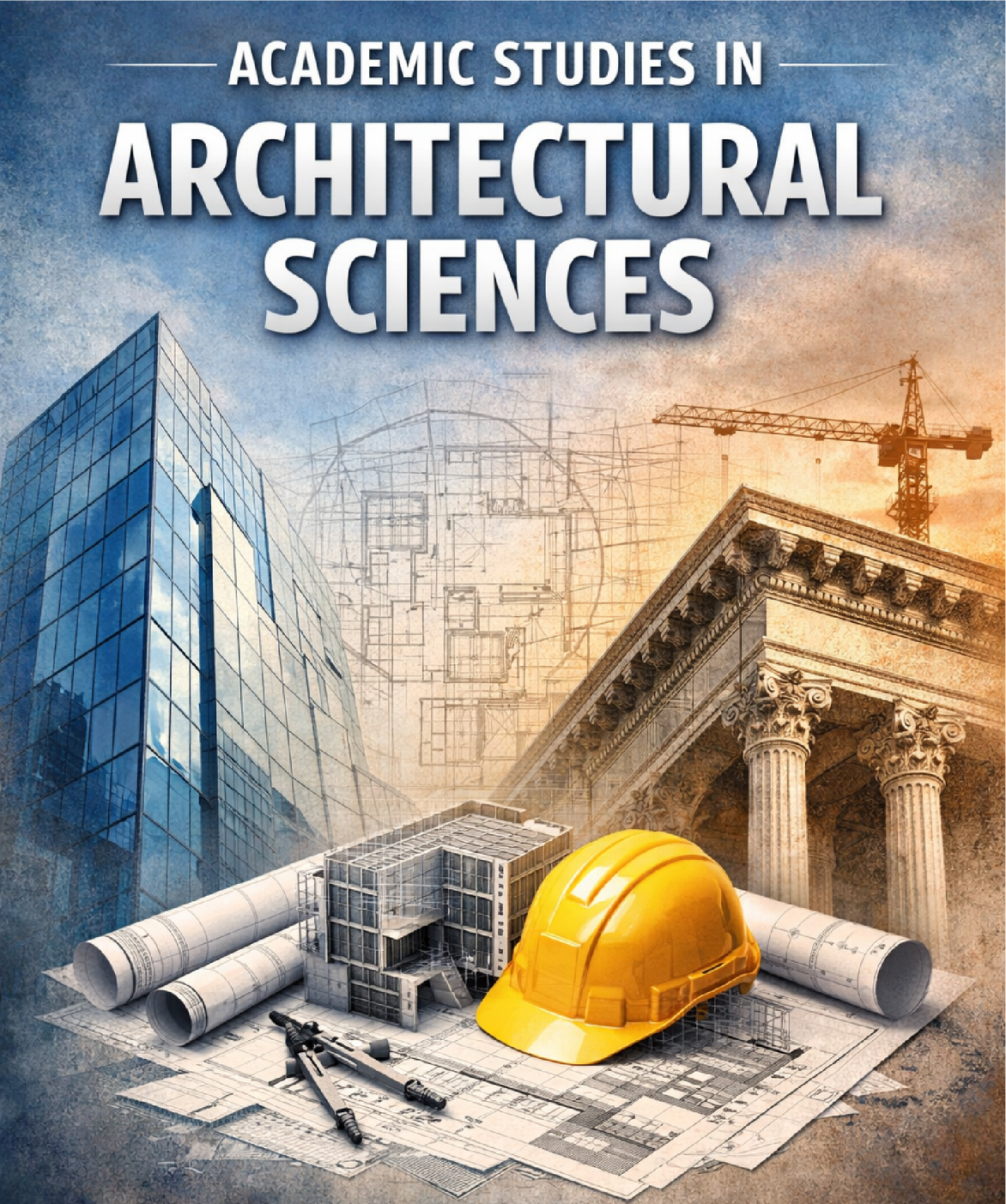
| İlçe | NO | Yerleşim, Köy (K.) veya Mahalle (Mah.) | Ünite (Ü.) veya Mevki (M.) | Kaynakta Geçen İsim | Kaynak İsmi (Tarihi) |
|---|---|---|---|---|---|
| Merkez (Karabük) | 61 | Kamış K. | Aktaş Ü. | Aktash | Kaynak 5 (1914) |
| | 62 | Ödemiş K. | Merkez Ü. | Odamish | Kaynak 5 (1914) |
| | 63 | Üçbaş K. | Merkez Ü. | Üshbash | Kaynak 5 (1914) |
| | 64 | Zopran K. | Merkez Ü. | Sobran Divan | Kaynak 5 (1914) |
| | 65 | ? | ? | Bagh-evleri | Kaynak 3 (1884) |
| | | | | Bagh-evleri | Kaynak 4 (1886) |
| | 66 | ? | ? | Uchuflik | Kaynak 4 (1886) |
| | 67 | ? | ? | Soghanly | Kaynak 4 (1886) |
| Ovacık | 68 | Abdullar K. | Merkez Ü. | Abdullar | Kaynak 5 (1914) |
| | 69 | Boyalı K. | Hocaoğlu Köprüsü M. | Hodja Köprü | Kaynak 5 (1914) |
| | 70 | Ekincik K. | Merkez Ü. | Ekindjik | Kaynak 5 (1914) |
| | 71 | | Esenler Ü. | Esener | Kaynak 5 (1914) |
| | 72 | Erkeç K. | Merkez Ü. | Erketsh | Kaynak 5 (1914) |
| | 73 | | Kuzgun Ü. | Kisgun | Kaynak 5 (1914) |
| | 74 | Ganibeyler K. | Merkez Ü. | Chanibeyler | Kaynak 5 (1914) |
| | 75 | Kavaklar K. | Merkez Ü. | Kavakly | Kaynak 5 (1914) |
| | 76 | Kışlaköy K. | Merkez Ü. | Kyshla | Kaynak 5 (1914) |
| | 77 | Koltuk K. | Merkez Ü. | Goltuk | Kaynak 5 (1914) |
| | 78 | Pürçtükören K. | Merkez Ü. | Birtshik Ören | Kaynak 5 (1914) |
| | 79 | | Karakoyunlu Ü. | Kara Kojunlu | Kaynak 5 (1914) |
| | 80 | Yeniören K. | Merkez Ü. | Okus Ören | Kaynak 5 (1914) |
| | 81 | ? | ? | Kadiboderler | Kaynak 5 (1914) |
| Safranbolu | 82 | Safranbolu Tarihi Yerleşim Merkezi | - | Safaramboli | Kaynak 1 (1844) |
| | | | | Zafranboli | Kaynak 3 (1884) |
| | | | | Safranboli | Kaynak 4 (1886) |
| | | | | Zafaranboli | Kaynak 5 (1914) |
| | 83 | Ağaçkese K. | Merkez Ü. | Aghatsh Kilise | Kaynak 5 (1914) |
| | 84 | | Sabuncular Ü. | Sapandschilar | Kaynak 1 (1844) |
| | | | | Sapandjilar | Kaynak 2 (1853) |
| | | | | Sabandjilar | Kaynak 3 (1884) |
| | | | | Sabondjilar | Kaynak 4 (1886) |
| | 85 | Akkışla K. | Uluyayla M. | Oulou Yaila | Kaynak 3 (1884) |
| | | | | Oulou-Yaila | Kaynak 4 (1886) |
| | | | | Ulu Jaila | Kaynak 5 (1914) |
| | 86 | Çavuşlar K. | Merkez Ü. | Tshavushlar | Kaynak 5 (1914) |
| | 87 | Çıraklar K. | Merkez Ü. | Tscharaghlar | Kaynak 1 (1844) |
| | | | | Tsherekler | Kaynak 5 (1914) |
| | 88 | Danişment K. | Merkez Ü. | Danischmanlü | Kaynak 1 (1844) |
| | | | | Danichmanlu | Kaynak 2 (1853) |
| | 89 | Dereköy K. | Merkez Ü. | Madjin Oglu K. | Kaynak 5 (1914) |
| | 90 | | Delifazlıoğlu Ü. | Deli Fazlo K. | Kaynak 5 (1914) |
| | 91 | Gündoğan (Sarıyan) K. | Merkez Ü. | Sarpan | Kaynak 2 (1853) |
| | | | | Sarjan | Kaynak 3 (1884) |
| | | | | Sarujan | Kaynak 5 (1914) |
| | 92 | Hacılarobası K. | Merkez Ü. | Hadschi Abbas | Kaynak 1 (1844) |
| | | | | Hadjiabbass | Kaynak 2 (1853) |
| | | | | Hadjiler Obasi | Kaynak 3 (1884) |
| | | | | Hadji-abaş | Kaynak 4 (1886) |
| | | | | Hadjilar Obasy | Kaynak 5 (1914) |
| | 93 | | Sallar Ü. | Salar | Kaynak 5 (1914) |
| | 94 | İnceçay (Nağza) K. | Merkez Ü. | Naghzar | Kaynak 1 (1844) |
| | | | | Nalsa | Kaynak 2 (1853) |
| | | | | Naghzar | Kaynak 3 (1884) |
| | | | | Naghzar | Kaynak 5 (1914) |
| | 95 | | Hoşafçıoğlu M. | Hochafdji | Kaynak 4 (1886) |
| | 96 | ? | ? | JalAsi | Kaynak 1 (1844) |
| | 97 | Kadıbükü K. | Yayla Ü. | Jaila | Kaynak 5 (1914) |
| | 98 | Karacatepe K. | Merkez Ü. | Karadja Tepe | Kaynak 5 (1914) |
| | 99 | | Ömersofu Ü. | Ömer Sofi | Kaynak 5 (1914) |
| | 100 | Karapınar K. | Merkez Ü. | Kara Binar | Kaynak 1 (1844) |
| | 101 | Kirkille Mah. | - | Kirkulla | Kaynak 1 (1844) |
| | | | | Kirkirler | Kaynak 5 (1914) |
| | 102 | Nebioğlu K. | Dursanlı Ü. | Dursanlü | Kaynak 1 (1844) |
| | | | | Doursanlu | Kaynak 2 (1853) |
| | | | | Doursanlu | Kaynak 3 (1884) |
| | 103 | Oğulören K. | Merkez Ü. | Ulviren | Kaynak 5 (1914) |
| | 104 | Ovacuma K. | Merkez Ü. | Ovakoui | Kaynak 3 (1884) |
| | | | | Ova-Han | Kaynak 4 (1886) |
| | | | | Ova Djumasi | Kaynak 5 (1914) |
| | 105 | Örencik K. | Osmansöktü Ü. | Osmansiki | Kaynak 1 (1844) |

| İlçe | NO | Yerleşim, Köy (K.) veya Mahalle (Mah.) | Ünite (Ü.) veya Mevki (M.) | Kaynakta Geçen İsim | Kaynak İsmi (Tarihi) |
|---|---|---|---|---|---|
| Eskipazar | 47 | Ortaköy K. | Merkez Ü. | Orta K. | Kaynak 5 (1914) |
| | 48 | | Yeniköy Ü. | Jeni K. | Kaynak 5 (1914) |
| | 49 | Ozan K. | Merkez Ü. | Ozan | Kaynak 3 (1884) |
| | | | | Cozan | Kaynak 4 (1886) |
| | | | | Kozan | Kaynak 5 (1914) |
| | 50 | Sadeyaka K. | Şıhlar M. | Tchaikeui | Kaynak 2 (1853) |
| | | | | Tshai K. | Kaynak 5 (1914) |
| | 51 | Üçevler (Yürük) K. | Merkez Ü. | Jürük | Kaynak 5 (1914) |
| | 52 | Yeşiller K. | Karasu Ü. | Gumisu K. | Kaynak 5 (1914) |
| | 53 | ? | ? | Bojuklar | Kaynak 5 (1914) |
| | 54 | ? | ? | Sirb | Kaynak 3 (1884) |
| | | | | Serb | Kaynak 4 (1886) |
| | | | | Sirp | Kaynak 5 (1914) |
| | 55 | ? | ? | Kouleli | Kaynak 3 (1884) |
| | | | | Couleli | Kaynak 4 (1886) |
| | | | | Kuleli | Kaynak 5 (1914) |
| Merkez (Karabük) | 56 | Bürnük K. | Merkez Ü. | Bürnük | Kaynak 5 (1914) |
| | 57 | Çerçiler K. | Dayıslar M. | Daislar | Kaynak 5 (1914) |
| | 58 | Çukurca K. | Cildıkısık M. | Djild Kessighi | Kaynak 4 (1886) |
| | 59 | Davutlar K. | Merkez Ü. | Divan (Da'udlar) | Kaynak 5 (1914) |
| | 60 | Karabük Mah. | - | Karabuk | Kaynak 1 (1844) |
| | | | | Karabuk | Kaynak 3 (1884) |
| | | | | Cou'abiekti | Kaynak 4 (1886) |
| | | | | Karabuk | Kaynak 5 (1914) |

| İlçe | NO | Yerleşim, Köy (K.) veya Mahalle (Mah.) | Ünite (Ü.) veya Mevki (M.) | Kaynakta Geçen İsim | Kaynak İsmi (Tarihi) |
|---|---|---|---|---|---|
| Safranbolu | 106 | Pelitören K. | Merkez Ü. | Pelitviren | Kaynak 5 (1914) |
| | 107 | Sarıahmetli K. | Merkez Ü. | Sary Ahmedli | Kaynak 5 (1914) |
| | 108 | Satköyü K. | Merkez Ü. | Sadi K. | Kaynak 5 (1914) |
| | 109 | Tokatlı K. | Merkez Ü. | Tokat | Kaynak 5 (1914) |
| | 110 | Toprakcuma K. | Merkez Ü. | Toprak Djüma | Kaynak 5 (1914) |
| | 111 | | Deliler Ü. | Deliler | Kaynak 5 (1914) |
| | 112 | Üçbölük (Ilbarıt) K. | Merkez Ü. | Ilbaryt | Kaynak 5 (1914) |
| | 113 | | Karaşar Ü. | Karashehr | Kaynak 5 (1914) |
| | 114 | Yazıköy K. | Merkez Ü. | Jazy K. | Kaynak 5 (1914) |
| | 115 | Yukarıçiftlik K. | Keten Ü. | Keten K. | Kaynak 5 (1914) |
| | 116 | Yukarıdana K. | Merkez Ü. | Dana K. | Kaynak 5 (1914) |
| | 117 | | Susunduk Ü. | Susandyk | Kaynak 5 (1914) |
| Yenice | 118 | Yenice İlçe Merkezi | - | Bazar | Kaynak 5 (1914) |
| | 119 | Gökbel K. | Hamitoğlu (Hamdioğlu) Ü. | Amdioglou | Kaynak 4 (1886) |
| | 120 | Güney (Camiiyanı) K. | Merkez Ü. | Gunei | Kaynak 5 (1914) |
| | 121 | İsmetpaşa Mah. | Hacıosmanoğlu M. | Hadji Osman Oglu | Kaynak 5 (1914) |
| | 122 | Kayaarkası K. | Merkez Ü. | Koyou sou | Kaynak 4 (1886) |
| | 123 | Satuk K. | Karşıhamdioğlu Ü. | Hamedaga | Kaynak 4 (1886) |
| | 124 | Yamaçköy (Sekse) K. | Aşağıyazı Ü. | A. Sekdje | Kaynak 5 (1914) |
| | 125 | ? | ? | Hadji Kalif Oglu | Kaynak 5 (1914) |
| | 126 | ? | ? | Jazilkaya | Kaynak 5 (1914) |

Kaynak 1: Karte von Klein-Asien (1844), Kaynak 2: Carte Géographique De L'Asie Mineure (1853), Kaynak 3: Nouvelle Carte Generale des Provinces Asiatiques de L'empire Ottoman (1884), Carte Generale Vilayet de Castamoni (1886), Karte von Kleinasien (1914)

# ACADEMIC STUDIES IN
# ARCHITECTURAL SCIENCES



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2025

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# CHAPTER 2

# THE TRANSFORMATION OF ARCHITECTURAL VISUALIZATION PROCESSES WITH GENERATIVE AI: AN EXPERIMENTAL APPROACH

**MUSTAFA HAKİ ERASLAN**[1]

## Introduction

The discipline of architecture has undergone a parallel evolution with technological advancements, transitioning from basic drawing instruments to sophisticated computer-aided design (CAD) systems over centuries (El Moussaoui, 2025; 1). Significant breakthroughs in design processes have occurred since the integration of computer technologies into architectural practice, starting in the 1960s (Sancak, 2023; 47). Particularly in recent years, with the maturation of artificial intelligence (AI) and machine learning techniques, generative design approaches previously limited to experimental domains have begun to integrate into mainstream architectural practice (Akdağ & Künyeli, 2025; 675). This transformation has been highlighted by the emergence of probabilistic methods, such as neural networks (Zeytin et al., 2024;

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3), and has accelerated with the development of systems like Generative Adversarial Networks (GANs) (Goodfellow et al., 2014; 3) and diffusion models (Zeytin et al., 2024; 3). Generative AI fundamentally reshapes architectural design through its capacity to create diverse content, including text, visuals, music, and 3D models (Li et al., 2024; 760). Specifically, since early 2022, the widespread adoption of large visual models like DALL-E 2, Midjourney, and Stable Diffusion has propelled the use of AI in architecture into a "deployment phase" (Maslej et al., 2023; 3; Li et al., 2024; 760).

The role of AI in the architectural discipline is multifaceted, offering the potential to enhance both creativity and efficiency. AI is integrated into various stages of the architectural design process, ranging from conceptual phases to construction detailing (El Moussaoui, 2025; 1). In this digital transformation, technologies such as Computer-Aided Design (CAD), Building Information Modeling (BIM), 3D modeling, Virtual Reality (VR), and Augmented Reality (AR) are increasingly being incorporated into architectural education (Söylemez et al., 2025; 398; Özeren et al., 2024; 167). In the realm of planning and layout generation, tools like Maket can analyze project constraints, such as plot size and room relationships, to produce thousands of early-stage design options within minutes (El Moussaoui, 2025; 9). Generative design algorithms assist architects by exploring numerous design variations based on predefined criteria. In the field of energy analysis and sustainability, AI models support performance-based designs; for instance, tools like Digital Blue Foam rapidly conduct wind and solar analyses, providing critical information for environmental impact and sustainability assessment (El Moussaoui, 2025; 9). AI systems have been observed to achieve a 40% reduction in energy consumption in data centers (El Moussaoui, 2025; 11). For form-finding and 3D form design, AI enables the exploration and refinement of building volumes and fundamental spatial

configurations (Li et al., 2024; 768). Tools that transform text-to-3D models, such as DreamFusion (Poole et al., 2023; 4) and Magic3D (Lin et al., 2023; 304), facilitate the rapid creation of architectural 3D models (Li et al., 2024; 767).

One of the most notable areas in architectural practice where these developments manifest is in architectural visualization (rendering) processes. Traditional rendering engines (V-Ray, Lumion, etc.) generally require complex geometric models and are time-consuming. However, AI-supported image processing techniques, particularly Image-to-Image and Text-to-Image approaches, have revolutionized this process. Architects can now produce visually compelling and hyper-realistic visuals from text descriptions (prompts) or quickly obtain visual results using AI-supported image processing based on inputs like screenshots of 3D mass models or hand-drawn sketches. This capability offers designers the opportunity to rapidly create visual depictions of spatial ideas without the necessity of complex geometric modeling (El Moussaoui, 2025; 2). The rapid visualization of ideas and hypotheses is vital in the iterative nature of architectural design, as the speed of AI in the visualization phase far exceeds human capability. The instantaneous transformation of keywords or sketches into visual representations helps designers quickly examine and experience their concepts, thus shortening design cycles and reducing project delivery times (Li et al., 2025; 2; Akdağ & Künyeli, 2025; 676). This speed and flexibility enable designers' decisions to be data-driven, rational, and focused on creative solutions (Kurtuluş, 2025; 122).

The purpose of this study is to reveal the role of AI in the process of generating renders from a prepared 3D model, utilizing accessible and established AI visual generators: Rerender AI, Archivinci, and MyArchitect AI. The usability of these AI-supported models compared to traditional rendering engines and their role in

architectural design are evaluated. In this context, a villa structure modeled in SketchUp was used to obtain rendered images from three different generative AI applications, and the outputs were comparatively analyzed. The study compares the data obtained from different AI platforms using identical prompts.

## Material and Method

This study relies on a comparative analysis model examining the performance and interpretative differences of various artificial intelligence infrastructures (algorithms) used in architectural visualization processes when applied to the same input data. The research methodology is structured in three stages: “Preparation of the Base Model,” “Selection of Tools,” and the “Controlled Experiment Process.”

## Preparation of the 3D Base Model

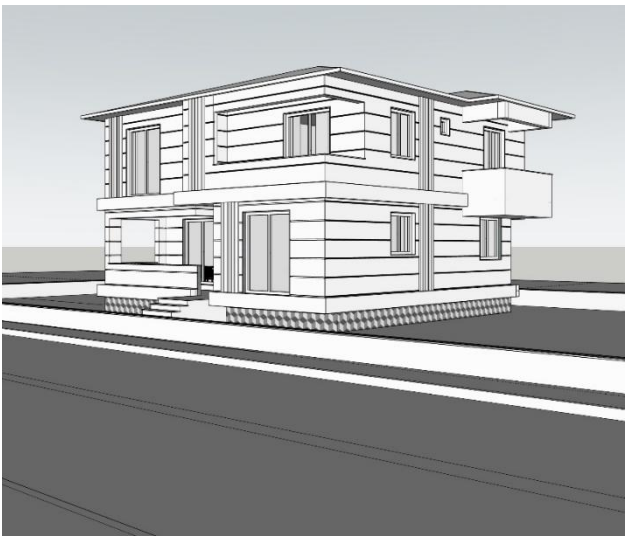
Trimble SketchUp, one of the most widely used software in architectural design offices, particularly during concept and preliminary design phases, was chosen to create the experimental basis of the study (Figure 1). The primary factors for selecting SketchUp include the ability to rapidly produce massing studies, its intuitive interface allowing designers to quickly transfer ideas into the third dimension, and its capability to cleanly export the clear edges required by AI tools.

The designed model represents a detached villa typology with a two-story, modern architectural style. In the mass composition, the perception of depth is enhanced through cantilevered overhangs created on the upper floor, recessed terrace areas, and vertical decorative elements on the facade. To define the structure’s relationship with the ground and to test the AI’s ability to distinguish between the “built environment” and the “natural environment,” the model was not limited to the building alone. A defined driveway at the front facade and a planar garden area

(landscape base) surrounding the structure were included in the modeling using simple geometric forms (Figure 1).

As preparation for the rendering phase, the model was exported as a "raw" (clay mode) structure, completely stripped of texture, color, and shadow details, defining only the volumetric form, solid-void ratios, and environmental boundaries (road-garden). This approach was adopted to observe whether AI tools could correctly assign different textures, such as asphalt, grass, and facade materials, to the appropriate surfaces using only form and perspective information, without being influenced by color data.

*Figure 1 View of the Raw Model.*



**Selection of Artificial Intelligence Tools**

In this study, three different web-based AI platforms were identified, standing out for their accessibility in architectural design offices and visualization processes. These tools were selected as Rerender AI, Archivinci, and MyArchitectAI.

All selected platforms utilize "Image-to-Image" technology and operate on a browser-based principle. The selection of these

tools was influenced by their capacity to understand architectural terminology (Natural Language Processing), user-friendly interfaces, and specialized algorithms for converting raw sketches into photorealistic visuals.

**Application Method: Standardized Prompt Test**

A standardized single text command (Master Prompt) was used to objectively measure the tools' capabilities in "semantic interpretation" (understanding the text) and "geometric fidelity" (adhering to the model).

During the experiment, the following prompt was entered into the Rerender AI, Archivinci, and MyArchitectAI platforms without any modifications:

"A contemporary 2-story modern villa architecture. Facade materials include white concrete, large floor-to-ceiling glass windows, and natural wood cladding accents. Located in a lush landscaped garden. Bright sunny daytime, clear blue sky, warm natural light. Architectural photography style, photorealistic, highly detailed textures"

In all three tools, the "Image Strength/Influence" parameter was kept constant at an optimum level (ranging between 0.6 - 0.8) to preserve the geometry of the model while allowing for texture assignment. Thus, the aim was to compare the three different results produced with the same mass and the same prompt in terms of material quality, light-shadow consistency, and architectural aesthetics.

**Findings**

In this section, the visual results obtained by processing the raw (clay) model generated in the Trimble SketchUp environment (Figure 1) using standardized text prompts on the MyArchitectAI

(Figure 4), Rerender AI (Figure 2), and Archivinci (Figure 3) platforms are analyzed comparatively.

The analyses were conducted based on three main parameters: “Geometric Fidelity,” “Material Interpretation,” and “Environmental Context/Atmosphere.”

*Figure 2 ReRender AI image*




*Figure 3 Archivinci image*



*Figure 4 MyArchitect AI image*



**Geometric Fidelity and Form Perception**

The raw model used as input data, seen in Figure 1, features a modern mass configuration with two stories, cantilevered overhangs, and a pitched roof.

- Rerender AI (Figure 2): It produced one of the results most faithful to the geometric boundaries of the structure. It clearly defined window mullions and balcony railings, presenting a sharp architectural expression by preserving the linear edges of the raw model.
- Archivinci (Figure 3): While successfully maintaining mass proportions, it emphasized verticality on the facade. It processed the wooden finishes around the windows in a way that added depth to the model's geometry.
- MyArchitectAI (Figure 4): It handled the geometry with a softer language. Although it preserved the main contours of the building, it blurred the boundaries by blending the structure with vegetation, especially at the junction points with the ground.

**Material and Texture Interpretation**

The commands "White concrete facade" and "Natural wood cladding" specified in the Master Prompt were interpreted differently by each artificial intelligence tool:

- Rerender AI: It presented material transitions with high contrast. It processed wood claddings as horizontal panels and also used initiative by detailing the structure's plinth level (base) with stone cladding, although not specifically mentioned in the prompt.
- Archivinci: It handled the wood texture in a warmer and more saturated tone. The plaster texture on the white facades

is perceptible. Reflections on glass surfaces were adjusted with a transparency that slightly reveals the interior space.

- MyArchitectAI: It exhibited a more artistic approach in the material palette. Wooden elements were presented in a brighter and reddish tone under the effect of sunlight. Glass surfaces were depicted with a strong mirror effect reflecting the surrounding landscape.

**Atmosphere and Environmental Context (Hallucinative Interpretation)**

The most distinct difference among the AI tools emerged in their "context generation" capabilities. The phrase "Lush landscaped garden" in the prompt transformed into three different scenarios:

- Urban/Street Interpretation (Rerender & Archivinci): Both Rerender AI (Figure 2) and Archivinci (Figure 3) preferred to position the structure along a roadside. The pavement and asphalt textures added to the foreground shifted the structure to a more "urban" scale. This indicates a tendency of the AI to fill voids with a logical urban texture (pavement, road).
- Pastoral/Villa Interpretation (MyArchitectAI): MyArchitectAI (Figure 4), unlike the others, constructed a more dramatic atmosphere. Although not specifically requested in the prompt, it exhibited the behavior of filling voids with creative objects, termed "AI Hallucination," by adding an ornamental pool/water feature to the foreground. "Golden Hour" was chosen as the lighting condition, adding a warmer and more inviting atmosphere to the visual.

## Conclusion

In this study, the process of transforming a raw mass model generated in the Trimble SketchUp environment into photorealistic visuals using web-based generative artificial intelligence tools—specifically Rerender AI, Archivinci, and MyArchitectAI—was experimentally examined. The obtained findings indicate that a fundamental paradigm shift is occurring within the architectural visualization discipline and that artificial intelligence technologies have become an undeniable reality of architectural production practice.

Comparative analyses demonstrated that "Image-to-Image" technologies eliminate the constraints of "time and technical expertise," which constitute the most significant barriers in traditional rendering processes. Processes such as material assignment, lighting adjustment, and rendering, which could take hours or even days using traditional methods (e.g., V-Ray, Corona), have been reduced to the order of seconds thanks to AI-supported platforms. The ability of all three platforms used in the study to impart distinct and high-quality atmospheres to the same raw model within seconds concretizes the speed and efficiency advantages this technology offers to design offices.

The most critical outcome of the study is the fact that artificial intelligence is transforming the role of the architect. The architectural designer is evolving from a "technical practitioner" who processes every single pixel, into a "curator" or "director" who guides the AI tool with precise commands (prompts), selects the optimal results, and manages the overall process. As observed in the MyArchitectAI example, the AI's ability to autonomously fill voids (e.g., landscape, water features) offers inspiring new perspectives to the architect during the early stages of design.

In conclusion, AI-supported visualization tools are of critical importance not only for the presentation of the final product (final render) but also for generating rapid variations during the design maturation process and supporting decision-making mechanisms. It is evident that in the architectural practice of the future, designers capable of collaborating with AI and possessing "Prompt Engineering" competence will stand out in professional competition. This study demonstrates that artificial intelligence is not a threat supplanting the architect; rather, it is an indispensable "design assistant" that unlocks creative potential and alleviates technical burdens.

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# Mimarlık: Teori, Metodoloji ve Uygulama

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Prof. Dr. Fürüzan Çelik



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# Postmodern Teori ve Mekânsal Okumalar

***Selda Cansu Ceylan***[1]

## Giriş

Postmodern kavramını tanımlamadan önce, bu kavramın temelini oluşturan modernizm akımını anlamak gerekmektedir. Descartes ile başlayıp Aydınlanma'ya kadar uzanan modernlik söylemlerinde akıl, hem bilgi ve toplumdaki ilerlemenin kaynağı hem de hakikatin ve sistematik bilginin temeli olarak görülmüştür (Best ve Kellner, 1998). Modernlik, özellikle ulaşım, iletişim ve teknoloji alanındaki gelişmelerle birlikte gündelik hayatın içine entegre olmuş; sekülerleşme, bireyselleşme, metalaşma ve kentleşme gibi kavramlarla yeni bir dünya tasavvurunu şekillendirmiştir.

David Harvey (1997), moderniteyi açıklamak için "yaratıcı yıkım" metaforunu kullanmış, İkinci Dünya Savaşı sonrası Paris'i yeniden düzenleyen Haussmann'ın çalışmalarını örnek göstermiştir. Ancak modernizme yönelik eleştiriler, özellikle bu dönemin kentlerinde ortaya çıkan makinevari estetik, sert sınırlar ve işlevsellik odaklı düzenlemelere yönelmiştir. Modernlik, ruhsuzluk, yaşanmamışlık ve katı sınırlara sahip olması nedeniyle eleştirilirken; bu eleştirilerin karşılığı olarak ortaya çıkan postmodernizm, muğlaklık, belirsizlik, oyunculuk ve merkezsizlik gibi kavramlarla yeni bir söylem geliştirmiştir. Scherzinger (1995)'e göre modernizm, akıl ve mantığı merkeze alarak simetri, doğrusallık, düzen ve kesinlik gibi değerlerle şekillenirken; aynı zamanda dışlayıcı bir hakimiyet mekanizması geliştirmiştir. Buna karşılık postmodern düşünce, belirsizlik, görecelik ve çoğulculuk üzerinden bu baskıya karşı çıkarak yeni anlamlandırmalar üretmiştir.

Postmodern düşüncede dil-gerçeklik-temsil üzerine yoğunlaşan anlam eleştirisi, Saussure tarafından ortaya konulan yapısal teoride yer alan gösterge sistemini mutlaklığından başlamaktadır. Dilde gerçekleşen postyapısalcı çalışmalar, gerçekliğin söylemde inşa edildiğini ve bu doğrultuda anlam ile nesnenin özdeş olamayacağını savunmaktadır (Küçükalkan, 2020). Teori alanında ortaya çıkan postmodern söylemler ise, günümüzün yüksek teknolojili medya dünyasında meydana gelen değişim ve dönüşümleri, yeni kültürel ve toplumsal oluşumlar çerçevesinde ele almaktadır. Lyotard ve Baudrillard gibi teorisyenler bu yeni dönemdeki gelişmeleri teknoloji ve bilgi çerçevesinde ele alırken; Harvey ve Jameson gibi neomarksist tabanlı teorisyenler, sermayenin

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dünya çapında kazandığı nüfus ve kapitalizm konularında derin çalışmalar gerçekleştirmektedir (Best ve Kellner, 1998).

Bu çalışmada, postmodern dönemin mekânsal düşünceye olan etkileri kapsamlı bir şekilde incelenecektir. Özellikle Derrida'nın yapısöküm yaklaşımı, Foucault'nun biyopolitika ve panoptikon kavramları ile Baudrillard'ın simülasyon teorisi temel alınarak, mekânın anlamlandırılma biçimleri ve iktidar ilişkileri irdelenecektir. Bu üç kuramsal yaklaşımın seçilmesinin nedeni, postmodern mekânın çok katmanlı yapısını ve bu yapının kültürel, toplumsal ve politik dinamiklerle nasıl şekillendiğini birbirini tamamlayan perspektiflerle ortaya koyabilmeleridir. Böylece, postmodernliğin mekânsal yansımalarını anlamak ve mimarlık ile kent deneyimlerindeki dönüşümleri kavramak amaçlanmaktadır. Bu sayede, mimarlık alanında postmodern teorilerin pratik karşılıkları ve mekânsal deneyimlere etkileri daha derinlemesine tartışılacaktır.

**Derrida ve Yapısöküm**

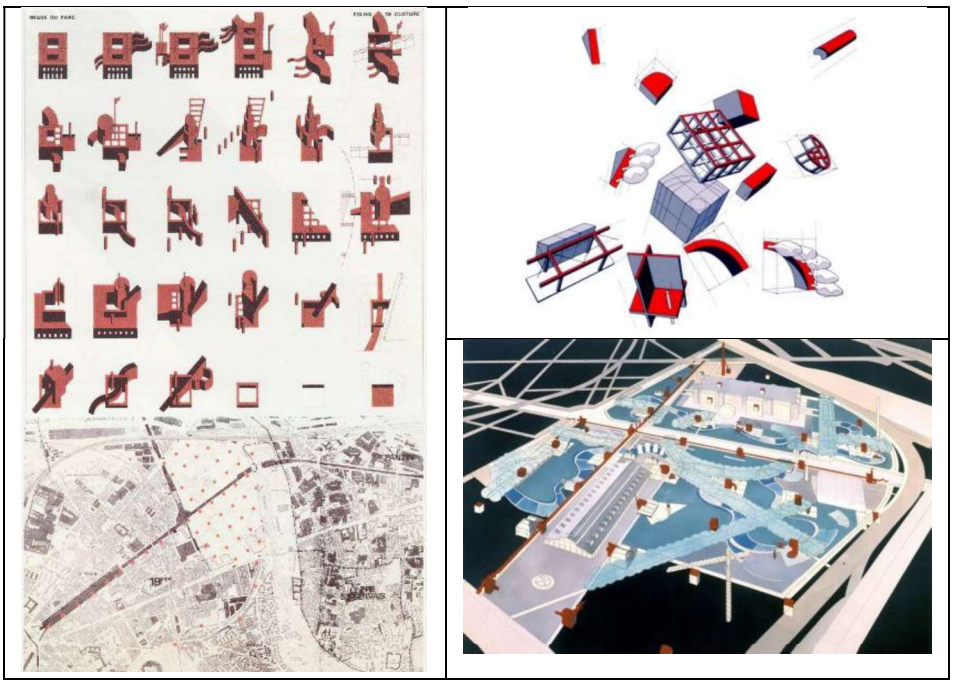
Yapısalcı teorisyenler metnin derin yapılarını ve metinle ilgili gerçekleri ortaya çıkarmayı hedeflerken, postyapısalcı çalışmalar söylemlere yerleşen yorumların izini sürmektedir. Postyapısalcı görüşlere göre artık tek bir doğrudan söz edilememektedir. Postyapısalcı teorisyenlerden biri olarak Derrida ise anlamın inşaasında metnin katı kabullerini yapısöküme uğratma çabasındadır. Yapısalcılar tarafından merkezde konumlandırılan gösterge sistemi merkeziliğini kaybetmekte ve sayısız anlam barındıran bir oyunu mümkün kılmaktadır. Her gösteren başka bir gösterene atıfta bulunurken, metin sürekli yeni metinlere açılım yapmaktadır. Böylece metinden metine değişen anlam, göçebe bir konumda kalmaktadır (Küçükalkan, 2020).

Derrida ve yapısöküm felsefesi, mimarlık dünyasında da güçlü bir kavramsal araç olarak yer almaktadır. Mimaride yapısökümün yalnızca tersine çevrilmiş bir yöntem olmadığını belirterek, bir yaşam biçimi olduğu görüşünde olan Derrida, mutlak bir nesneleştirmenin imkansızlığını anlatmak için Babil kulesinin yapımından söz etmektedir. Derrida'ya göre Babil kulesinin inşaası tamamlanmış olsaydı felsefe, mimari ve yazından söz edilemezdi. Bu durumda felsefenin gerekliliği Babil kulesinin tek anlamlı bir figür olarak inşaasının bitmesinde değil, asla tamamlanamamış olmasında yatmaktadır. Babil kulesi örneğinde belki de keşfedilmesi gereken, sürekli olarak metamorfoza uğrayan bir sınırsızlığın mimarisine göndermedir (Derrida, 1997).




**Şekil 1.** Turris Babel, Athanasius Kircher (1679) (Arkeoloji ve Sanat, t.y.)

Derrida, yalnızca görüşleri ile mimariye yön vermekle kalmamış, Bernard Tschumi'nin teşvikiyle, Parc De La Villette projesinin bir bölümünde Peter Eisenman ile birlikte mimari sürece de dahil olmuştur. Tschumi'nin olay mimarlığında Derrida'ya göre esas olan, mimari aygıtın tam içerisinde yer alan sekans, açık dizi, anlatı, sinematografi, dramaturji ve kareografidir (Derrida, 1986). Parc De La Villette projesinde yer alan 'folie'ler her şeyden önce bir isimdir. Tschumi, belirsiz permütasyonlar ile yeni oluşumlar kurabilecek ve içerisini doldurmadığı bir ızgarada mekansal bir yer kaplayan bu öğeleri adlandırmıştır. Bu özel adlandırma ile 'folie'ler, programlanmış bir yapılaşmanın en büyük ortak paydası haline gelmiştir. İlave olarak, her folie'nin kırmızı noktası kendi içerisinde bölünebilir veya diğer folie'ler ile ilişkilendirilerek yeni olasılıklar sunabilir. Kurduğu ilişki biçimi ile her bir folie merkezinde yer alan kırmızı nokta, açık ve kapalı olarak tanımlanabilir. Folie'lerin açık, kapalı veya parça, bütün ilişkisi Derrida tarafından metonomik olarak tanımlanmaktadır. Kendini dışarı açarak bütünle ilişkilenen folie, bir yandan da bir durumun içine girmekte ve anlambilimsel bir söküm oluşturmaktadır (Derrida, 1997). Park De La Villette'de ızgara üzerinde yerleştirilen söz konusu kırmızı noktalar (veya küpler), sabit bir işlev barındırmadığı gibi sabit bir temsil aracı da değildir. Derrida (1997)'ye göre, bu boş/çılgın/deli yapılar bir yerinden etme edimini başlatarak, mimarlığa yer üzerinden tanımlanan anlamları yeniden düşündürmeyi hedefler.



**Şekil 2.** Bernard Tschumi, Park de la Vilette, 1992-1998 (Arkitektuel, t.y.)

Mimarlık alanındaki etkili metinlerinden biri olan 'Point de folie – Maintenant I'Architecture'da Derrida, yapısında bozulma gerektiren geleneksel mimarlığı dört değişmez sabit kural ile tanımlayarak bir yasa oluşturmaktadır (Derrida, 1997). Birinci sabit kural, mimarlık ve mesken meselesi ile ilgili olarak, Heidegger'in 'inşa etmek, iskan etmek, düşünmek' makalesine gönderme yapmaktadır. *"Heidegger evsizliği (Heimatlosigkeit) onto-teoloji, daha özenli söylemek gerekirse, modern teknolojinin bir semptomu olarak yorumladığında halen işte buna [birinci kurala] değinir. Konut krizinin arkasındaki gerçek sorun hakkında, (die eigentliche Not des Wohnen), daha temel sıkıntı, yoksulluk ve meskensizlik hakkında gerçekten düşünmeye davet eder bizi. Ölümlüler önce mesken tutmayı öğrenmelidir (sie das Wohnen erst lernen müssen), kendilerini meskene çağıran şeye kulak vermelidir. Bu bir yapıbozum değil, bizi yerleştiğimiz mimarlığın temellerini tekrarlamaya çağırmak demektir; yerleşmeyi, anlamın kökenini tekrar öğrenmemiz gerektiğine işaret etmektir"* (Derrida, 1997). Derrida'ya göre folie'ler mesken tutulan Heideggerci çağdan farklı olarak, kopuşu meydana getirerek bireyi özgürleştirmektedir. İkinci sabit kural, merkezi ve hiyerarşik bir yapıya sahip olan mimari biçimlerin bir köken üzerine temellenmesi üzerinedir. *"Mimarlık taş ve ahşapla (hyle) hiyerarşiyi cisimleştirir"* (Derrida, 1997). Mimariyi kentin mitleri, kahramanları, tanrıları, dini kitapları ve hafızasını korumakla yükümlü bir gardiyan olarak tanımlamaktadır. Üçüncü sabit kural, kökeni koruyan ve ona bağlı kalma sorumluluğunu bir görev gibi üstlenen mimari için kaçınılmaz bir ideal son inancını anlatmaktadır. *"Etik-politik bir son, dini görev, işlevselci ya da işe yarar bir görev: soru her zaman mimarlığı bir şeylerin servisine koşmak, bir şeylerin servisinde tutmakla ilgili olmuştur."* Bahsedilen bir şeylerin servisine koşma

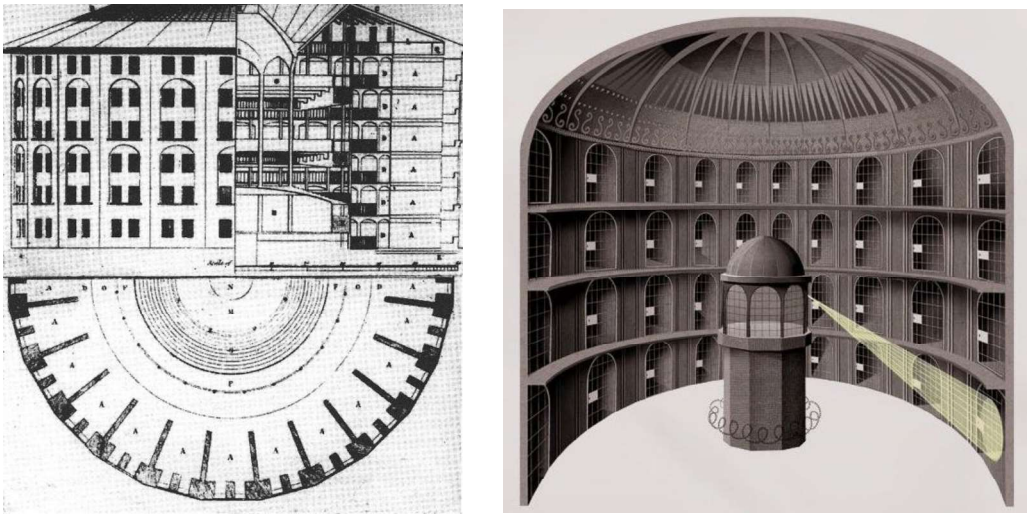
görevi, modern çağda baskın bir akım olarak işlevsellik ile karşılık bulmaktadır. Tschumi'nin olay mimarlığında yapısöküme uğratmayı hedeflediği işlevselci programlama konusu, Derrida'nın bu maddesi ile örtüşmektedir. Tschumi'nin mimarisinde gerçekleştirdiği çapraz programlama, geçişli programlama ve programsızlaştırma gibi kavramlar, mimarlığın yeniden düşünülmesi noktasında deneysel bir örnek olarak gösterilebilir. Dördüncü sabit kural, *'"Mod, dönem ve hakim üsluptan bağımsız olarak, bu (mimarlık) düzeni hep güzel sanatlara bağımlıdır."* (Derrida, 1997). Bu dört değişmez kural, birbiri ile bütünleşik değildir ve her biri ayrı bir çerçevede geleneksel mimarlığı tasvir ederler. Temel yasa, yapı yapma eylemini aynı bir dil gibi çevirebilir ve temsil edilebilir bir mit ile tanımlamaktır. Derrida için dil ve mimarlık bu bakış açısı ile pek de farklı değildir. Tschumi'nin folie'leri anlamı, anlamın geldiği topluluğu ve anlamlandırıcı kılma zorunluluğunu belirsiz sınırlarla istikrarsızlaştırmaktadır. Oluşturduğu tüm konfigürasyonun yapısını adına 'delilik' denilen nesnelerle sorgulamakta ve yapısızlaştırmaktadır.

**Foucault ve Biyopolitika**

Biyopolitika, Michel Foucault ile birlikte daha sık anılmaya başlanarak siyasi tarihe kazandırılmış ve ardından Giorgio Agamben, Antonio Negri ve Michael Hardt gibi isimler tarafından da ele alınmış bir kavramdır. İnsan bedeninin manipülasyonu ve nesneleştirilmesi Foucault'un, biyopolitika kavramından önce de çalışma konuları kapsamındadır. Deliliğin tarihi, cinselliğin tarihi, hapishanenin doğuşu gibi eserlerinde beden ve arzu politikalarının, iktidar ve disiplin kurumlarının kontrolünde olduğunu anlatmaktadır. Genel anlamı ile biyopolitika, egemen gücün (devletin) bedenleri denetim alarak kurduğu ve cinsellik, nüfus, beslenme ve sağlık politikaları gibi pek çok aracı kullanan iktidar sistematiğine verilen addır (Revel, 2012). Kavram, eğitimden işçi çalışmalarına, mimariden sinemaya, şehircilikten toplumsal cinsiyet çalışmalarına kadar pek çok alanda tartışılmakta ve çalışılmaktadır (Özcan, 2019).

Foucault, biyopolitika kavramını mimari ile anlatırken baskıcı modeller olarak panoptik oluşumlardan söz etmektedir. Baskıcı iktidar bu doğrultuda disiplini, panoptik mimari aracılığı ile sağlamaktadır. Panoptikon kelimesinin kökenine bakmak gerekirse; "bütün" anlamına gelen "pan" ile bakış anlamına gelen "optik" sözcüklerinden oluştuğu görülmektedir. Panoptik model, iktidarın yararı gözetilerek oluşturulmuş bir mimari biçimin ötesinde, zihinsel bir denetim mekanizmasıdır (Özmakas, 2018). İktidarın faydasına dayalı panoptik mimari modelde, az sayıda gözetleyici ile gözetlenen denetimi sağlanabilmektedir. Panoptik mimari ilkesi; halka biçiminde, hücrelere ayrılmış bir binanın çevrelediği, merkezine ise halka binayı denetlemek amacıyla çevrel pencereleri olan bir kulenin konumlandırıldığı bir sisteme dayanmaktadır. Merkezdeki kulede yer alan görevli, geniş ve her yöne bakan pencereler sayesinde, halka

binayı sürekli olarak gözetleyebilmektedir. Gözetleyici sayısını düşüren bu sistemde, iktidarın yararı düşünülmektedir. Özmakas (2018)'e göre, gözetlendiğinin farkında olmayan birey, hayali bir iktidar ilişkisi üreterek bu bakışı içselleştirme ve artık bir gözetim toplumu gündeme gelmektedir.



**Şekil 3.** Jeremy Bentham, Panoptikon, 1785 (Aytun, 2020)

Biyopolitika, bir iktidar politikası olarak ortaya çıkmakta ve çok boyutlu bir güçler birliğini nitelemektedir (Baştürk, 2013). Yalnızca beden üzerindeki baskılayıcı denetimsellikle anılsa da aslında çok yönlü bir politik görüştür. Özmakas (2018)'e göre, Foucault'un özellikle beden konusuna yoğunlaşmasının esas nedeni, iktidarın bedenler düzeyinde işlediğini düşünmesidir. Denetim toplumuna giden yolun bedenin şekillendirmesi ilkesine bağlı olduğu öne süren Foucault, bedeni olayların kaydolma yeri olarak görmektedir. Beden, olayların nesnel bir biçimde kayda geçirildiği tarafsız bir yazıt değil, siyasi güçler arasındaki mücadelenin yaşandığı bir alandır. Bu nedenle beden ve iktidar bağımlıdır, bedeni düşünmek iktidarı düşünmektir (Özmakas, 2018).

Foucault'un beden ve mekân odaklı iktidar analizleri, modern disiplin toplumunun nasıl işlediğini ve gözetim mekanizmalarının mimari düzeyde nasıl şekillendiğini ortaya koymaktadır. Panoptikon modeli, sadece fiziksel bir mimari tasarım olmanın ötesinde, zihinsel denetim ve içselleştirilmiş gözetim pratiklerini temsil eder. Bu bağlamda, bedenin ve mekânın iktidar ilişkilerinin temel aracı olduğu görülür. Ancak, günümüzde medya ve teknoloji aracılığıyla geliştirilen yeni denetim biçimleri, Foucault'nun önerdiği klasik panoptik modelin ötesine geçmektedir. Baudrillard (2004), medyayı ve reklamları modern panoptik aygıtlar olarak değerlendirirken, kurgulanmış hipergerçekliklerin insan algısını şekillendirerek iktidar ilişkilerini daha da görünmez kıldığını ifade eder. Bu noktada, Foucault'nun mekânsal ve bedensel denetim analizleri, Baudrillard'ın simülasyon teorisiyle birleşerek, postmodern dünyada gerçeklik, temsil ve iktidarın yeni boyutlarını kavramamıza olanak tanımaktadır.

**Baudrillard ve Simülasyon**

Baudrillard'ın simülasyon kuramı, özellikle günümüz batı toplumlarındaki gerçeklik kavramının sorgulanmasına dayanmaktadır. Baudrillard (2003)'e göre, belirttiği toplumlarda gerçeklik ortadan kalkmış ve yerini simülasyona bırakmıştır. Gerçek veya hakikat ile bir ilişkimizin kalmadığı ve tüm gönderen sistemlerin tasfiye edildiği bir simülasyon çağına girilmiştir (Baudrillard, 2003). Baudrillard (2003)'ün "Simülakrlar ve Simülasyon" adlı kitabında simülakr, "*bir gerçeklik olarak algılanan görünüm"* olarak tanımlanmaktadır. Simüle etmek, "*gerçek olmayan bir şeyi gerçekmiş gibi sunmak, göstermeye çalışmak"* olarak tanımlanırken simülasyon ise; "*bir araç, bir makine, bir sistem, bir olguya özgü işleyiş biçiminin incelenme, gösterilme ya da açıklanma amacıyla bir maket ya da bir bilgisayar programı aracılığıyla yapay bir şekilde yeniden üretilmesi"*dir. Bahsedilen simülasyon evreninde, simüle edilecek olan bir 'gerçek' olmasına ihtiyaç duyulmamaktadır. Gerçeğin yerini zaten 'simülakrlar' almıştır. Bu bir taklit ya da suret ifadesi değildir, gerçek ve taklitin arasındaki farkın ortadan kalkması ve gerçeklik değerinin kalmaması durumudur.

Simüle etmek '-mış' gibi yapma durumundan daha karmaşık olarak aslında bir yokluğa göndermedir. Baudrillard (2003) kitabında, bu durumu daha iyi anlatmak için hasta olan bir kişi üzerinden örnekleme gerçekleştirmektedir. Hastaymış gibi yapan kişi, yatağa uzanıp bizi hasta olduğuna inandırmaya çalışırken, bir hastalığı simüle eden kişi kendinde bu hastalığa ait semptomlar gösterir. Hastaymış gibi yapmak, hasta olmayan kişinin gerçekliğine zarar veremez. Çünkü bu durumda gerçeklik ve sahtelik arasındaki fark her zaman bulunmakta ve görünür olmaktadır. Oysa simülasyon tam tersine, gerçek ile sahte arasındaki durumu kesinlikle yok etme üzerine çalışmaktadır. Hastalığı simüle eden kişinin semptomlara sahip olup olmadığı hiçbir zaman net olarak bilinememektedir (Baudrillard, 2003).

Tanrı'nın bile simüle edildiğini, Tanrıya olan inanç ve göstergelerine indirgenebildiğini belirten Baudrillard (2003), simülasyon çağında imge ve görüntülerin ölümcül bir güce sahip olduğunu belirtmektedir. Bu doğrultuda, bütün sistem devasa bir simülakra dönüşmekte ve gönderenden yoksun ve nerede başlayıp biteceği belirsiz simülakrlar söz konusu olmaktadır. Baudrillard (2003) gerçekleşen bu simüle etme eylemini, imgeye özgü aşamalara ayırmaktadır:

- Derin bir gerçekliğin yansıması olarak imge
- Derin bir gerçekliği değiştiren ve gizleyen imge
- Derin bir gerçekliğin yokluğunu gizleyen imge
- Gerçekliğin hiçbir çeşitiyle ilişkisi olmayıp, yalnızca kendi kendinin simülakrı olan imge

Birinci aşamadaki imge olumlu bir niteliğe sahiptir, çünkü gerçeklik ilkesi korunmaktadır. İkinci aşama ve sonrasında, imge olumsuz bir niteliğe sahiptir. Artık gerçeklik kaybolmaya başlamaktadır. Baudrillard (2003) kitabında banka soygunu örneğini vermektedir. Gerçek bir banka soygunu ile simüle edilen arasında nesnel olarak hiçbir fark bulunmamaktadır. Gerçek soygunda yapılan her şey simüle edilen (sahte) soygunda da gerçekleştirilmektedir. Ayrıca polisin, simüle edilmiş bir soyguna gerçeğinden daha fazla tepki verebilme ihtimali bile bulunmaktadır. İlave olarak gerçek soygun yalnızca düzeni/yasayı bozmaya yönelirken, simüle edilen soygun gerçeklik ilkesinin kendisine de saldırmaktadır. Kimi bakış açılarına göre bu daha tehlikeli bir saldırı modeli olabilmektedir.

Disneyland barındırdığı tüm oyunlar, illüzyonlar ve düzenler ile Baudrillard (2003)'ün simülasyon olarak tanımladığı düşsel bir evrendir. Disneyland'ı ilgi çekici kılan ve cazibe merkezi haline getiren şey ise barındırdığı kalabalık, bireylerin morfolojik yapısı ve heterojenlik ile gerçek Amerika'nın minyatürleştirilmiş bir mikro-kozmosuna benzemesidir. Disneyland'ın her noktasında nesnel bir Amerika modeli ile karşılaşılabilmektedir. Baudrillard (2003)'e göre, Disneyland, büyük bir tezgahtır ve aslında gerçek Amerika'nın bir Disneyland'a benzediğini gizlemek amacıyla yapılmıştır. Disneyland'ı çevreleyen Los Angeles ve Amerika, bir hipergerçekliğe, simülasyon evrenine aittir (Baudrillard, 2003).



**Şekil 4.** Disneyland (Disneyland Paris News, 2023)

**Sonuç**

Postmodern dönemin düşünsel zemininde yer alan Jacques Derrida, Michel Foucault ve Jean Baudrillard, mekânın okunma, üretilme ve deneyimlenme biçimlerine farklı açılardan yaklaşarak, mimarlık ve kent çalışmalarına derinlik kazandıran üç önemli kuramsal eksen sunmaktadır. Derrida'nın yapısöküm yaklaşımı, mekânı yalnızca statik bir fiziksel form olarak değil, anlam katmanlarının sürekli çözüldüğü, yeniden kurulduğu ve sorgulandığı dinamik bir metin olarak görmemize olanak tanır. Bu yaklaşım, mimari tasarımın ardındaki

varsayımları, söylemleri ve iktidar ilişkilerini görünür kılar; böylece mimarlık, eleştirel düşüncenin bir aracı hâline gelir.

Foucault'nun biyopolitika kavramı ise, mekânın yalnızca barınma, üretim veya dolaşım işlevleri üzerinden değil, aynı zamanda disiplin, gözetim ve denetim süreçleri aracılığıyla toplumsal bedenleri şekillendiren bir iktidar aracı olarak nasıl işlediğini ortaya koyar. Panoptikon modeli üzerinden yaptığı çözümlemeler, modern ve postmodern kentlerin görünmez gözetim mekanizmaları ile nasıl örüldüğünü anlamamıza yardımcı olur. Böylece mekân, pasif bir sahne olmaktan çıkar; bizzat toplumsal düzenin inşa edildiği, bedenin ve davranışın yönlendirildiği bir iktidar alanına dönüşür.

Baudrillard'ın simülasyon teorisi ise, günümüz dünyasında mekânın yalnızca maddi değil, aynı zamanda temsiller ve imajlar aracılığıyla üretildiğini, hatta kimi zaman gerçekliğin yerini aldığını gösterir. Hipergerçeklik kavramı, kentlerin ve mimari yapının artık yalnızca işlevsel veya estetik değil, aynı zamanda medya, reklam, dijital teknolojiler ve kültürel imgelem aracılığıyla kurgulanan yeni bir "gerçeklik" yarattığını vurgular. Bu noktada, mimarlık, salt bir fiziksel tasarım pratiği olmaktan çıkar; algı yönetimi, imaj üretimi ve sembolik güç ilişkilerinin başlıca sahnesi hâline gelir.

Bu üç yaklaşımın kesişiminde ortaya çıkan temel çıkarım, mekânın postmodern bağlamda yalnızca "inşa edilen" değil, aynı zamanda "kurgulanan" ve "denetlenen" bir olgu olduğudur. Derrida'nın eleştirel çözümleme perspektifi, Foucault'nun iktidar-mekân ilişkisine dair çözümlemeleri ve Baudrillard'ın temsil-gerçeklik tartışmaları, mekânın hem düşünsel hem de deneyimsel boyutlarının birbirinden ayrılamayacağını göstermektedir. Bu çalışma, söz konusu üç kuramsal çerçeveyi bir araya getirerek, postmodern dönemde mekânsal üretimin ardındaki güç ilişkilerini, söylemsel yapılarını ve algısal inşalarını anlamaya yönelik bütüncül bir okuma sunmayı hedeflemiştir. Böylece, mimarlık ve kent çalışmalarında eleştirel kuramın, hem tasarım sürecine hem de mekânsal deneyimin yorumlanmasına yön verebilecek güçlü bir araç olduğu ortaya konmaktadır.

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# ACADEMIC STUDIES ON
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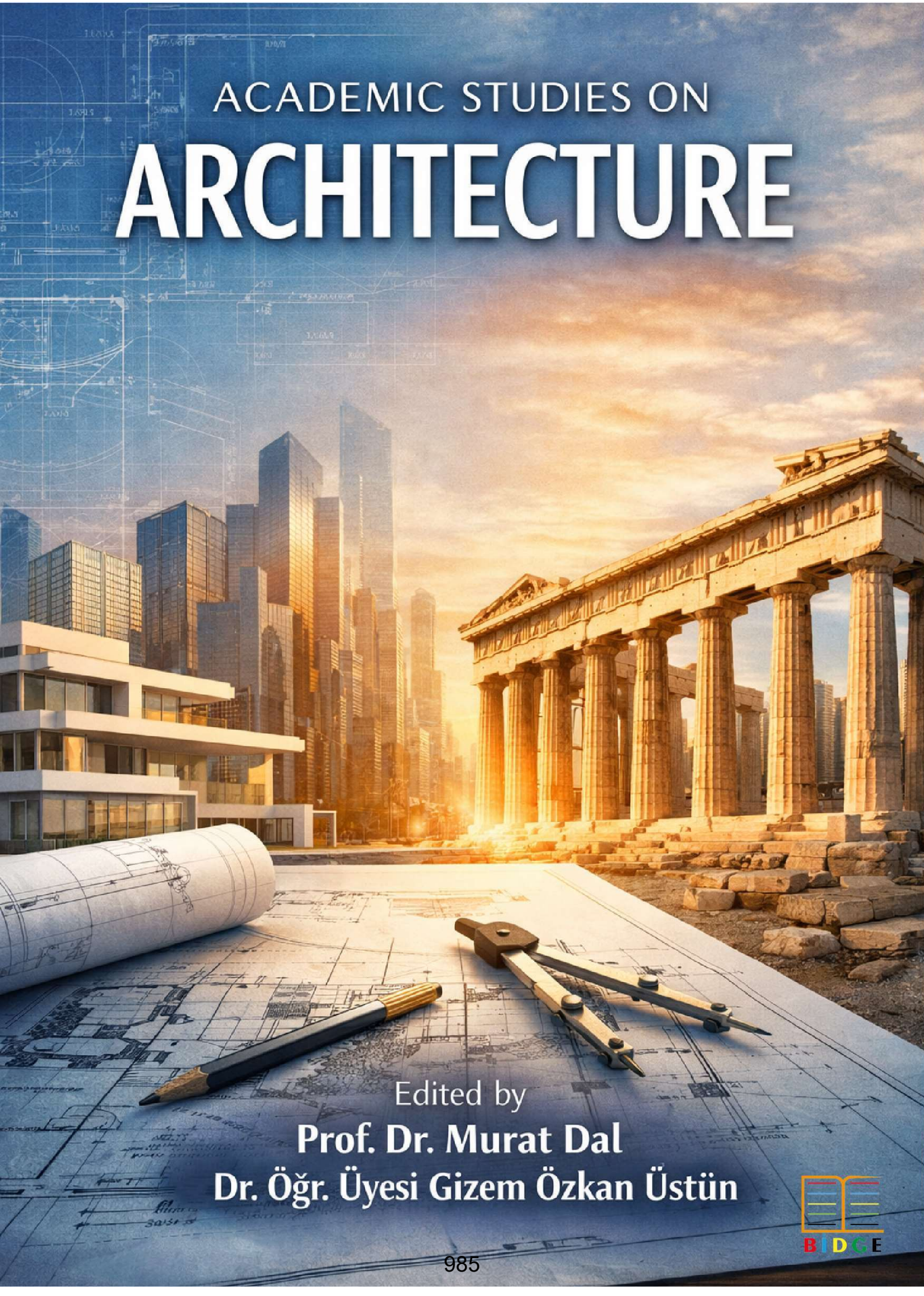

Edited by
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**Dr. Öğr. Üyesi Gizem Özkan Üstün**

BİDGE

# CHAPTER 6

# DIGITAL FABRICATION PATHWAYS IN OFF-SITE CONSTRUCTION: FROM INDUSTRY 4.0 TO 3D PRINTING

**DAMLANUR İLİPINAR**[1]
**SEMAHAT MERVE TOP**[2]

## Introduction

Manufacturing and construction are long-established sectors that, over time, developed along separate but parallel trajectories, ultimately becoming distinct industries. The manufacturing sector has made great strides so far, but the construction industry has not kept up (Lou et al., 2021). This is because the construction industry has distinct problems than the manufacturing industry when it comes to boosting productivity. There are a lot of problems in the sector, such as interrelated processes, sub-processes, and a lot of stakeholders at different stages at different building locations. This makes things very unclear (Dallasega et al., 2018). Also, the construction industry must employ a great number of workers due to

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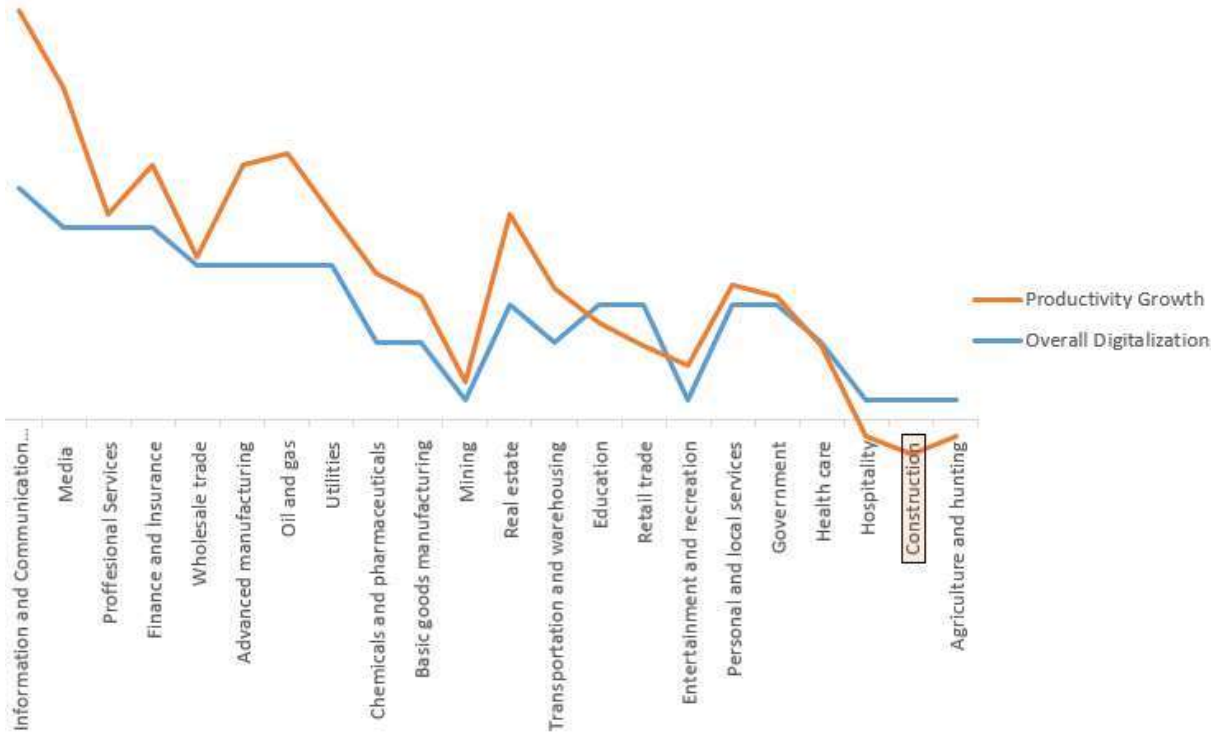
the nature of the industry, unlike other manufacturing industries, thereby the productivity of the construction sector is mainly predicated on human effort and performance. As a result of this, many construction projects face time delays and cost overruns on account of poor productivity rates (Hasan et al., 2018). Conversely, the manufacturing industry has proceeded with a more efficient production process and met client needs by going entirely digital (Osunsanmi et al., 2018). This digitalization approach is a part of the Industry 4.0 principles, which are expected to positively affect today's production processes (Demirkesen & Tezel, 2021). Industry 4.0 describes the digital transformation of industry in which physical and informational domains are merged through cyber-physical system technologies (Maskuriy et al., 2019). The main goal of Industry 4.0 is to establish a manufacturing process that is integrated, customized, optimized, service-oriented, and interoperable, in conjunction with algorithms, big data, and advanced technologies (Lu, 2017). It changed the direction of the present tendencies toward digitalization, automation, and the extensive use of information and communication technology (ICT) (Kozlovska et al., 2021). It is also talked about using words like "smart manufacturing," "the industrial internet," and "integrated industry" (Maskuriy et al., 2019). The concept was introduced by the German government in 2011. The next version 5.0 is expected in the near future (Kozlovska et al., 2021). The reviewed literature regarding Industry 4.0 application showed that there are a number of publications concentrating on almost the whole manufacturing industries like the computer science, engineering sector, business management, decision science, material science, electronic, industrial, manufacturing, and mechanical industries, and more (Lu et al., 2017; Zabidin et al., 2020; Kozlovska et al., 2021). In the construction industry, however, Industry 4.0 principles are only used in a limited way. This shows that Industry 4.0 is still being formed and needs more research (Oesterreich & Teuteberg, 2016). Construction projects necessitate a

significant level of customization and standardized specifications for processes, materials, labor, and teams, owing to their distinctive and time-sensitive characteristics, in contrast to other sectors such as business services, manufacturing, finance, transportation, and utilities (Dallasega, Rauch & Linder, 2018; Schoemaker, 2022). In today's world, companies are more interested in using automation systems to connect all of the systems used in manufacturing with the systems that will be used in the future. To illustrate, the old way of delivering goods by truck is being replaced by unmanned aircraft delivery. Amazon has launched a rapid last-mile delivery option that brings eligible orders to customers' doors in about 30 minutes, provided the package weighs less than 5 kg (Naseem & Yang, 2021). Similarly, many different technologies and innovations provided by Industry 4.0 are being implemented in many different sectors like healthcare and medical, education, logistics, agriculture, energy, media, textile and clothing, computer science, engineering sector, business management, decision science, material science, mathematics, social science, electrical, electronic, industrial, and mechanical, etc. Construction has also gained from these advancements; however, the sector's inherent complexity has contributed to a comparatively slower pace of industrial development (Kozlovska, Klosova, & Strukova, 2021). In other words, as Faltinsky & Tokunova (2018) remarked, over the last few decades, most industrial sectors have undergone immense alterations with digital and process innovations. However, the practical application of the potential of these transformations cannot be observed in the construction industry. As seen in Figure 1, the construction business has a low level of penetration of digital technology or a low digitalization ratio compared to other industries. Besides, the productivity growth between the years 2005-2014 of the sectors is also visible in Figure 1.

*Figure 1 Penetration of digitalization ratio and productivity growth of different sectors*




*Source: Generated from McKinsey Global Institute (MGI)'s digitization index, Manyika et al., 2015*

One observation from the figure is that the productivity growth line for the industries is generally parallel to the digitalization ratio of the industries. Another and more specific observation from Figure 1 is that one of the lowest digitalization rates is in the construction industry, and its productivity growth goes down when the value is less than zero.

Wang et al. (2020) explored benefitting digital technologies and their ratio in off-site construction to overcome industry problems by reviewing the literature. These studies on digital technology utilization in off-site construction started in 2016, and it has been maintained to increase steadily to 2020. The results showed that only 12.8% of total papers on off-site construction from 2010- 2020 generated published papers on digital technology utilization in off-site construction. This ratio shows that not enough research has been done on how digital technology is used in off-site construction, and

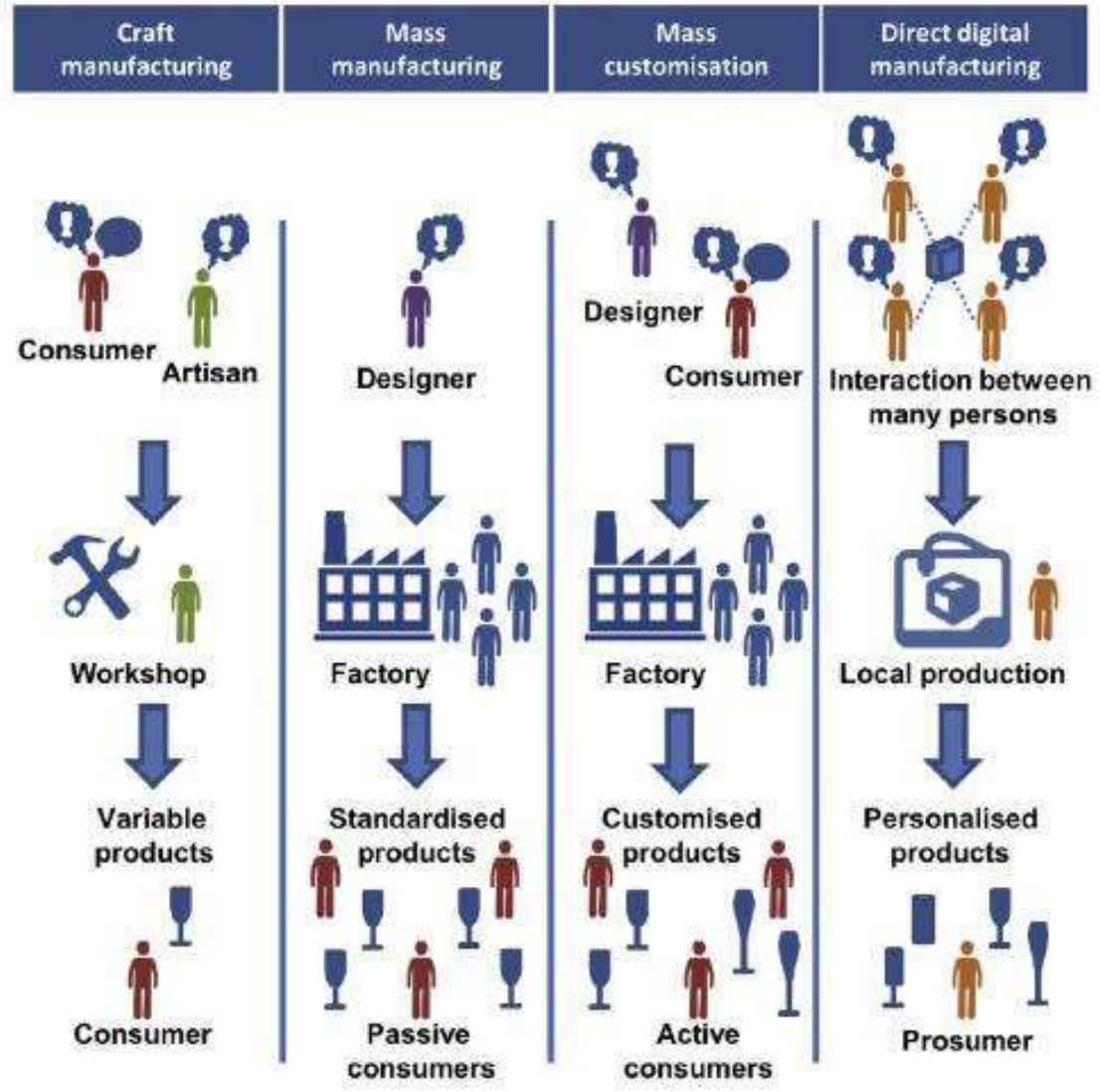
that the amount of digital technology use is low. For these reasons, off-site manufacturing is promising to be an alternative means of improving construction productivity. As a result, there is a necessity for comprehensive examinations of the factors influencing individuals, processes, and technology within the context of off-site construction (Bendi et al., 2021).

**Manufacturing Logic for Off-site Construction**

People have long criticized the building sector for not adopting new technologies and innovative methods as quickly as other industries (Bendi et al., 2021). When investigating the manufacturing industry development (observed from Figure 2), it starts with manual crafting at a very slow pace and reaches the 20th-century industrial revolution and mass production. With increasing technological developments, manufacturing systems have evolved to lean manufacturing, which allows highly standardized products with high quality and produces economically smaller batch sizes, and so the premises of customization are offered. In this direction, consumers wanted low-cost products with high quality, and that's why mass customization was initiated through fragmented demand and homogeneous niches. Mass customization is comparable to mass manufacturing in many ways, but customers have a say in how the items are made. But digital manufacturing is a new thing. This trend is quite similar to mass customization. Products are made in the spirit of mass customization, but each one has a unique trait that is linked to the customer. In this sense, the niches are not the same; they are different in terms of mass personalization. So, the system's flexibility needs to be able to meet this need (Chen, 2015). Technological developments entice several industries and individuals, subsequently resulting in direct digital production, characterized by the integration of dispersed additive manufacturing equipment with contemporary information and communication technology (ICT) (Trollman et al.,

2019). Figure 2 shows that many different persons are needed to design the digital design manufacturing process.

*Figure 2 The evolution of the manufacturing paradigms and their main actors*




*Source: Chen et al., 2015*

Thanks to adopting technology into the industries with various benefits, the prosumer manufactures personalized products for local demand. Digital design manufacturing can make tailored, high-quality items with a batch size of one by combining the best parts of several manufacturing methods. As a way of making things in the 20th century, it has a lot of promise to revolutionize the world of manufacturing. In addition, digital manufacturing can reshape

production workflows, improve material efficiency within product-oriented business models, and even transform how products relate to end users (Chen et al., 2015).

Additionally, the features of manufacturing paradigms for design and production differ based on their classification. To understand the organizational structure of the manufacturing paradigms, some questions have been asked and summarized in the following table in Chen et al.'s study (2015).

*Table 1 Characteristics paradigms for design and manufacturing*

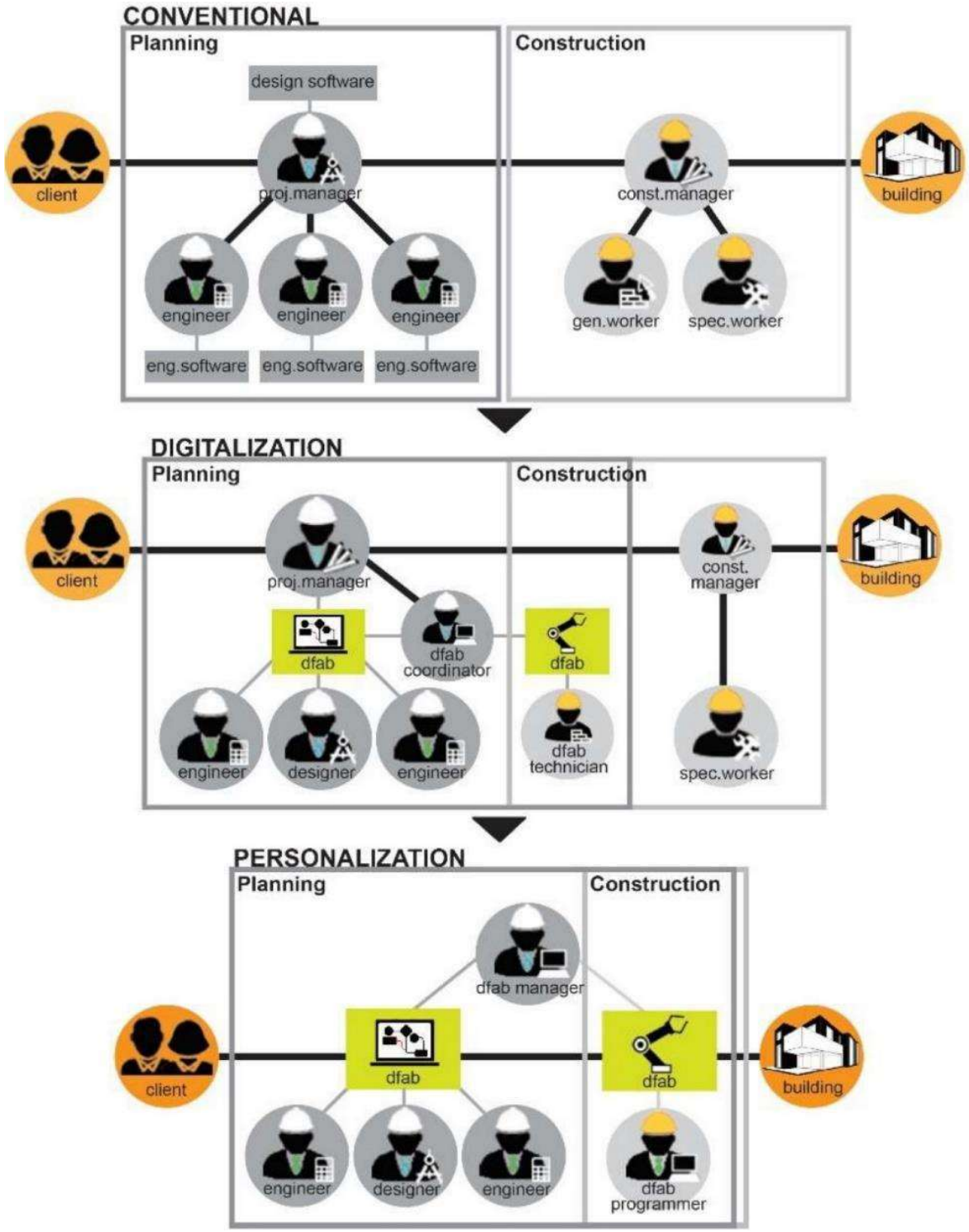
| | Craft Production | Mass Production | Mass Customization | Direct Digital Manufacturing |
|---|---|---|---|---|
| *Who* | Craftsmen | Designer and Specialists | Designer and Specialists | Network of different people |
| *How* | Experience based | Receive design | Receive design | Create and/or download design |
| *Where* | In a workshop | In a factory | In a factory | On an Additive Manufacturing machine |
| *What* | Variable products | Standardized, high quality products | Standardized, high quality products with predetermined variants | Personalized and variable, high quality products |
| *How many* | Lot size of one | In large batches | In small batches | Lot size of one |
| *For whom* | Consumer (few to few) | Passive consumers (few to a large group) | Active consumers (few to many small groups) | Prosumer (Network to individuals) |

*Source: Chen et al., 2015*

## Digital Manufacturing and Its Implications for Off-site Construction

Digital technologies—enabling innovative, computer-controlled production processes—have transformed many sectors, including automotive, aerospace, and shipbuilding. In construction, however, adoption has progressed more slowly than in these industries, even though digitalization is widely viewed as essential for improving productivity. In order to cope with the construction sector's problems, digital fabrication (dfab) procedures and emerging technologies represent promising avenues for automation and digitization (García De Soto et al., 2019). In other words, the use of digital technology in the Architectural Engineering Construction and Operation (AEC/O) field, especially in construction., improves operating and sharing data, eliminates human intervention, and increases efficiencies by mechanized automation (Axelsson et al., 2019). In this context, Figure 3 shows how the construction organizational structure could change if digital technologies were used. This diagram includes three phases: traditional, digitalization (short-term), and personalization (long-term). To relate these three phases to the construction industry: The traditional phase represents the existing traditional, fragmented organizations of the construction sector. The second phase, the digitalization scenario (short-term phase), provides digital platforms for planning and automated processes in construction. In the digitalization phase, all data from engineers in the planning phase is placed on a central digital platform, and the architect uses this shared information to finalize the building's design. In the construction phase, the digital manufacturing specialist takes control of robotic production on-site. This is an attempt to create a link between traditional projects and new digital technologies, and it is expected that project timelines will be shortened through digitalization and the use of robotics on-site (De Schutter *et al*., 2018).

*Figure 3 Representation of the evolution of the construction structure resulting from the digitalization of the construction industry*




*Source: De Schutter et al., 2018*

The final step—the personalization scenario (long-term phase)—positions the owner as an active participant in the building

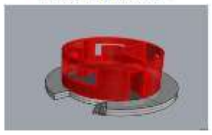
process, taking on responsibilities related to coordination and management. However, owners usually lack specialized technical knowledge. This shift, therefore, requires a new role for the owner's representative, while the traditional roles of designers and project managers evolve into consultancy and co-creation to stay accessible to owners and end users. In practice, construction experts would design and put up the digital fabrication solutions that are part of the online platform and help owners or users through the customisation process. Consequently, these service providers may emerge as essential stakeholders in the construction sector (De Schutter et al., 2018; García De Soto et al., 2019). Other industries also advance personalization enabled by digital technologies. For example, 3D printers allow users to create physical versions of self-designed objects, promoting the rise of personalized products (Chen et al., 2015). In the construction field, additive manufacturing provides a clear way to turn personalization into off-site delivery by changing where fabrication occurs and how components move through the supply chain. Therefore, the next section focuses on 3D Printing and Off-site Construction.

**3D Printing and Off-site Construction**

Three-dimensional (3D) printing, which is sometimes called additive manufacturing, helps the manufacturing industry change to digital. Additive manufacturing uses a digital design file to make parts by adding material one layer at a time (Khajavi et al., 2021). In recent years, the construction industry has increasingly explored this approach because it can accelerate the transition from design to fabrication and enable rapid production of customized elements (Ituarte et al., 2016). Additive manufacturing can also shorten building supply chains by making parts from a digital model with little help from people (Khajavi et al., 2021).

In concrete 3D printing, material is pumped to a printing head and deposited at a controlled rate to form the desired geometry. This technology can be used in both industrialized prefabrication and work done on site. To print on-site, the robotic printer and concrete pump are brought to the site, set up, and utilized to print right there. Alternatively, printing can be performed in a factory; in that case, printed components are transported to the site for assembly. From a supply-chain perspective, on-site printing typically reflects a decentralized configuration, as production resources and inputs are delivered to the site where fabrication occurs. In contrast, a centralized configuration represents factory-based production, followed by transportation and on-site assembly of fabricated components. These alternative configurations are feasible; however, they lead to different time and cost outcomes (Khajavi et al., 2021). In this context, Khajavi et al. (2021) conducted a case study using two design options and seven scenarios; the scenario details are presented in Figure 4.

*Figure 4 Seven scenarios for the time and cost analysis and comparison*

| | | Technologies | |
|---|---|---|---|
| | **Supply chain configuration** | 3DCP | Conventional construction |
| **Round house**  | On-site | **Scenario 1** (On-site printing of round house: **ONP-RND**) | **Scenario 3** (On-site conventional construction of round house: **ONC-RND**) |
| | Off-site | **Scenario 2** (Off-site printing of round house: **OFP-RND**) | - |
| **Rectangular house**  | On-site | **Scenario 4** (On-site printing of rectangular house: **ONP-RECT**) | **Scenario 6** (On-site conventional construction of rectangular house: **ONC-RECT**) |
| | Off-site | **Scenario 5** (Off-site printing of rectangular house: **OFP-RECT**) | **Scenario 7** [1] (Off-site conventional construction of rectangular house: **OFC-RECT**) |

[1] Scenario is not fully comparable to others, since the numbers include the profit margin of the prefabrication company.

*Source: Khajavi et al., 2021*

Two design options were compared to assess how geometry affects the feasibility and performance of alternative construction

scenarios. The round house represents a more flexible and geometrically demanding option, whereas the rectangular design reflects a conventional layout typically associated with cast-in-place concrete work using formwork. Seven scenarios were then defined by combining supply chain configuration (on-site vs off-site) with construction method (3D concrete printing vs conventional on-site construction). One scenario was excluded because producing the round house through an off-site workflow was considered impractical due to clear limitations in execution.

Cost and completion-time analyses were conducted for the construction of both exterior and interior concrete walls under each scenario. The cost model included construction machinery and equipment, raw materials, transportation, and labor. The pre-construction stage was omitted on the assumption of a completed architectural design, except for Scenario S7 (prefabrication), which requires assembling wall components and carrying out joint concrete works. For conventional on-site scenarios, the scope covered formwork installation, reinforcement placement, concrete casting, demolding, and mold cleaning. For 3D printing scenarios, the construction stage included wall printing as well as reinforcement activities up to the completion of printing. The post-construction stage for 3D printing accounted for printer disassembly and relocation, and, where printing was performed off-site, the drying of printed walls, transportation to the site, and assembly of wall modules. Using these inputs, total project costs (transportation, labor, material, and machinery) and durations across the pre-construction, construction, and post-construction stages were calculated and summarized in Table 2.

*Table 2 Schedule and Cost Analysis Results*

| **Scenarios** | **Total Duration** | **Total Cost (EUR)** |
|---|---|---|
| S1 (ONP-RND) | 4 days 8.5 h | 3477.5 |

| | | |
|---|---|---|
| S2 (OFP-RND) | 15 days 13.16 h | 5112.77 |
| S3 (ONC-RND) | 29 days 12.4 h | 8197.16 |
| S4 (ONP-RECT) | 4 days 14.3 h | 4410.31 |
| S5 (OFP-RECT) | 15 days 16.96 h | 5960.99 |
| S6 (ONC-RECT) | 29 days 13.8 h | 7943.25 |
| S7 (OFC-RECT) | 6 months 2 days 7 h | 12,865.51 |

*Source: Generated from Khajavi et al., 2021*

The comparison shows that 3D printing is cheaper than traditional building and takes less time than traditional methods. When comparing on-site versus off-site options, off-site 3D printing definitely takes longer to finish the whole project, mostly because the post-construction process is lengthier. In addition, 3D printing remains more economical for both the round and rectangular designs, while on-site printing is cheaper than off-site printing because it avoids the additional transportation and assembly costs associated with moving printed components. Overall, the findings suggest that 3D printing can reduce both project cost and completion time compared to conventional construction. Importantly, it also enables the delivery of complex geometries at lower cost: the round-house option produced by 3D printing is less expensive than its conventional counterpart. This supports the broader literature suggesting that 3D-printed solutions may offer cost advantages over traditional construction methods for geometrically complex designs.

Khajavi et al. (2021) also note that concrete printing still requires substantial labor for operating and managing the system, including robot movement, calibration, alignment, and the coordination of supporting subsystems. The on-site monitoring of printing operations—typically performed by a trained operator—remains a critical, technology-intensive task. These data suggest that

increased automation may diminish labor intensity and enhance the competitiveness of 3D printing within the construction sector.

**Conclusion**

Digital manufacturing is making it easier for the construction business to get a lot of information about new trends, approaches, and procedures. For practitioners, identifying which approaches are both suitable and beneficial for real projects remains challenging, and innovation therefore becomes difficult to implement in practice. For this reason, a clear roadmap is needed to guide the adoption of digital technologies and digital manufacturing methods in construction.

As a key outcome of this broader transformation, off-site construction is closely linked to the digital evolution of the sector. Successful implementation depends heavily on effective technology use; however, transportation and assembly remain critical determinants of both cost and project duration in off-site delivery. Accordingly, the impacts of supply chain configurations—particularly off-site versus on-site alternatives—need to be clarified when evaluating and adopting digital manufacturing technologies.

Another major barrier to adoption is the limited availability of experienced labor. Compared with traditional project phases, digitalized workflows introduce substantial changes, especially in planning and execution. At present, digital manufacturing still requires considerable human input for managing and operating systems, and human–machine interaction can hinder full process and technology integration. Further automation, therefore, offers potential to reduce labor intensity and increase competitiveness. Nevertheless, not all construction tasks can be fully automated. As digitalization levels increase, workforce size may decrease while roles evolve toward monitoring, supervision, and control of

automated processes, with construction know-how progressively transferred into robotic and digital systems.

Finally, improving automation in off-site construction will likely require tighter integration between complementary technologies, particularly robotics and 3D printing. Despite growing interest, the literature still shows limited evidence on how different digital technologies can be effectively bridged and integrated within off-site construction processes.

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# SANAYİYE BAĞLI KONUT ÜRETİMİNDE BEKARLARIN İKAMETİ: KARABÜK YENİŞEHİR ÖRNEĞİ

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## 1. GİRİŞ

Türkiye'nin erken Cumhuriyet dönemindeki sanayileşme hamlesinin bir parçası olarak ortaya çıkan bekar pavyonları, sadece bir barınma ihtiyacını karşılamanın ötesinde, dönemin sosyal, kültürel ve mekânsal dinamiklerini yansıtan önemli yapılar olarak dikkat çekmektedir. Genellikle fabrika yerleşkeleri içinde veya yakınında inşa edilen bu yurtlar, kırsaldan sanayi kentlerine göç eden genç ve bekar erkek işçilerin konaklaması için tasarlanmıştır. Bu yapılar, modernleşme projesinin bir parçası olarak hem işgücünü disiplin altına almayı hem de onlara yeni bir yaşam tarzı sunmayı hedeflemiştir.

Türkiye'de bekar pavyonları üzerine yapılan akademik çalışmalar, bu mekanları genellikle endüstri mirası, mimarlık tarihi, toplumsal cinsiyet ve sosyal tarih bağlamında ele almaktadır. Erhan Berat Fındıklı'nın Karabük özelindeki çalışması, bu yurtları Erwing Goffman'ın "total kurum" kavramı çerçevesinde analiz ederek, mekanın disipliner bir araç olarak nasıl kullanıldığını ve bekar işçilerin toplumsal cinsiyet normları içinde nasıl konumlandırıldığını incelemektedir. Fındıklı'ya göre bu pavyonlar, bekar erkeklerin "tekinsiz" olarak algılandığı bir ortamda hem kontrol altında tutulmasını sağlamış hem de onları mekânsal olarak toplumun geri kalanından ayrıştırmıştır. Bu ayrıştırma pratiği, sadece Karabük'e özgü olmayıp, Kayseri Sümerbank Bez Fabrikası ve Nazilli Basma Fabrikası gibi diğer sanayi yerleşkelerinde de benzer uygulamalarla görülmüştür (Fındıklı, 2017).

Ayşe Durukan Kopuz'un Alpullu Şeker Fabrikası üzerine yaptığı çalışma, bekar pavyonlarını da içeren işçi konutlarının, modern Türk toplumunun ve çekirdek aile yapısının oluşmasındaki rolünü vurgulamaktadır. Kopuz, bu mekanların geleneksel Türk evinden farklı olarak modern yaşam pratiklerine referans verdiğini ve çalışanların endüstriyel rolleri ile kırsal alışkanlıkları arasında bir denge kurmaya çalıştığını belirmektedir (Durukan Kopuz, 2018). Benzer şekilde, Nazilli Basma Fabrikası üzerine yapılan bir diğer çalışmada, bekar pavyonlarının, işçiler arasındaki dayanışma ve iş birliği duygusunu artırmak, bilgi ve kültür paylaşımını teşvik etmek amacıyla aynı bölümde çalışan veya aynı yaş grubunda olan işçileri bir araya getiren bir işletmecilik stratejisi olarak da kullanıldığını ortaya koymaktadır (Doğan vd., 2011).

Osmanlı dönemindeki bekar odaları geleneği ise bu yapıların tarihsel kökenlerine ışık tutmaktadır. Osmanlı şehirlerinde mahallenin dışında tutulan ve potansiyel olarak "suça meyilli" görülen bekar erkeklerin, hanlarda veya dükkân üstlerindeki odalarda yaşadığı belirtilmektedir. Bu tarihsel dışlanma pratiği, Cumhuriyet döneminde endüstriyel yerleşkeler bağlamında farklı bir formda yeniden üretilmiştir (Güneş Yağcı, 2015).

Genel olarak literatür, bekar pavyonlarının çift yönlü bir işleve sahip olduğunu göstermektedir: Bir yandan sanayinin ihtiyaç duyduğu işgücünü barındırarak üretimin devamlılığını sağlarken, diğer yandan bu işgücünü modern yaşam pratikleri, hijyen kuralları ve fabrika disiplini çerçevesinde denetim altında tutan mekanizmalar olarak işlev görmüşlerdir (Göncü Berk, 2016). Erken Cumhuriyet döneminin modernleşme politikalarının izlerinin de görülebildiği bekar pavyonları, bu çalışmada sanayiye bağlı konut yerleşkelerindeki konumları ve tasarım kriterleri bağlamında incelenmiştir. Çalışma alanı olarak seçilen günümüzde Karabük ili sınırlarında yer alan Yenişehir bölgesi, Sümerbank'ın sanayi adımlarını attığı yedi ilden biri olma özelliğini taşımaktadır.

## 2. ENDÜSTRİYEL MİRASIN MEKANLARI: BEKAR PAVYONLARI

Erken Cumhuriyet döneminin en önemli hedeflerinden biri olan sanayileşme, sadece ekonomik bir kalkınma projesi değil, aynı zamanda yeni ve gelişmiş bir toplum idealini de içermektedir. Bu idealin mekânsal yansımalarından biri de sivil mimarlık örnekleri olan sanayiye bağlı konut üretimleridir. Anadolu'nun çeşitli yerlerinde kurulan fabrika yerleşkeleri ve bu yerleşkelerin ayrılmaz bir parçası olan lojmanların araziye yerleşim kararlarında, çalışanların statüleri ve medeni durumları değerlendirilmiştir. Bu yapılar arasında yer alan bekar pavyonları da kırsal kesimden fabrikalarda çalışmak üzere gelen, ailesinden uzakta yaşayan genç erkek nüfus için tasarlanmış ve sosyal mühendisliğin bir aracı olarak kullanılmıştır.

Bekar pavyonları, bir yandan işçilerin barınma, beslenme ve temizlik gibi temel ihtiyaçlarını karşılayarak onları sanayi yaşamına entegre etmeyi amaçlarken, diğer yandan katı kurallar ve yönetmeliklerle onların günlük yaşamlarını sıkı bir denetim altına almıştır. Sümerbank'ın Vazife Evleri Yönetmeliği gibi belgeler, bu yurtlara kabul edilecek işçilerin uyması gereken hijyen ve disiplin kurallarını net bir şekilde ortaya koymaktadır (Fındıklı, 2017). Bu mekanlar, işçilerin fabrika dışındaki zamanlarını da kontrol altında tutarak, onları "eğitilmesi" ve "disipline edilmesi" gereken bir grup olarak görmüştür.

Aynı zamanda bu pavyonlar, toplumsal cinsiyet rollerinin ve aile yapısının yeniden tanımlandığı bir dönemin izlerini taşır. Evli ve aile sahibi işçiler için tasarlanan lojmanlardan mekânsal olarak ayrıştırılan bekar pavyonları, bekar erkeğin toplumdaki "tekinsiz" ve denetlenmesi gereken konumunu pekiştirmiştir. Bu ayrım, sadece medeni duruma göre değil, aynı zamanda ustabaşı, kalifiye işçi ve vasıfsız işçi gibi hiyerarşilere göre de şekillenmiş, en vasıfsız bekar işçiler yerleşkenin en kuytu köşelerine yerleştirilmiştir. Bu mekanların mimari özelliklerinin yanı sıra, işçi sınıfının oluşumu, modernleşme pratikleri, toplumsal cinsiyet algıları ve devletin emek gücü üzerindeki denetim mekanizmaları açısından taşıdığı anlam ve önemlerin

incelenmesi önemsenmektedir. Böylece, endüstriyel mirasımızın bu özgün ancak sıklıkla göz ardı edilen yapıları, tarihsel ve toplumsal bağlamları içinde bütünün bir parçası olarak yer bulmuş olacaklardır.

Sümerbank'ın genel konut politikası çerçevesinde, bekar pavyonlarının planlanmasında dikkate alınan temel prensipler şunlardır (Sümerbank, 1944):

· Fabrikaya Yakınlık: İş verimliliğini artırmak ve ulaşım sorununu ortadan kaldırmak amacıyla bekar pavyonları, genellikle üretim tesislerine en yakın noktalara konumlandırılmıştır. Bu yerleşim, işçilerin fabrika disiplinine ve çalışma saatlerine tam uyumun sağlanması hedeflenmektedir.

· Evli Lojmanlarından Ayrıştırma: Aile yaşantısının mahremiyetine verilen önem ve bekar erkek nüfusun potansiyel bir "düzensizlik" unsuru olarak görülmesi nedeniyle, bekar pavyonları evli işçilerin ve memurların yaşadığı konut bloklarından bilinçli olarak ayrılmıştır. Sümerbank raporlarında, bu pavyonların "mahallenin mümkün olduğu kadar kuytu bir yerinde" inşa edilmesi gerektiği bu ifadeyle açıkça belirtilmiştir.

· Statüye Göre Ayrım: Bekar işçiler kendi içlerinde de bir hiyerarşiye tabi tutulmuştur. Nitelikli ve daimi statüdeki ustalar için tasarlanan konutlar daha elverişliyken, özellikle "ihtisası olmayan amelelere ait pavyonlar" en izole alanlara yapılmıştır.

## 3. YENİŞEHİR'DEKİ BEKAR PAVYONLARI

Erken Cumhuriyet döneminin bir sanayi kenti olarak planlanan Karabük'te, özellikle Demir-Çelik Fabrikaları'nın (DÇİ) kurulmasıyla ortaya çıkan yoğun işgücü ihtiyacı, beraberinde kapsamlı bir konut politikası geliştirilmesini zorunlu kılmıştır. Sümerbank'ın öncülüğünde yürütülen bu politika, fabrikanın daimi ve düzenli bir işgücüne sahip olabilmesi hedefiyle şekillenmiştir. Bu politikanın en belirgin unsurlarından biri, kırsal kesimden gelen ve çoğunluğu bekar olan erkek işçiler için tasarlanan "bekar pavyonları" veya "bekar lojmanları" olmuştur (Turgay, 2022).

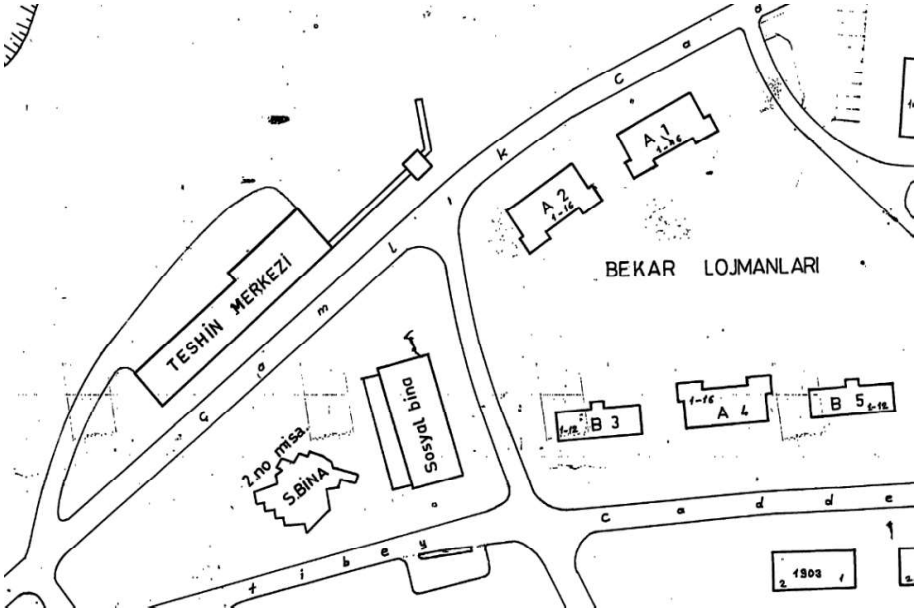
Karabük'te bekar işçiler için tasarlanan lojmanlar, şehrin ilk kuruluş yıllarında artan konut sorununa bir çözüm olarak ortaya çıkmıştır. Fabrika kurulduktan sonra Türkiye'nin dört bir yanından gelen ve önemli bir kısmı bekar olan işçiler, ilk başlarda sağlıksız ve elverişsiz koşullarda barınmak zorunda kalmıştır. Bu duruma çözüm olarak inşa edilen bekar lojmanları, Yenişehir'in genel planlama anlayışına uygun olarak, ancak sosyal statülerine göre ayrıştırılmış bir biçimde yerleştirilmiştir.

Bu yapılar genellikle yurt tipi, koğuş sisteminde tasarlanmış basit ve fonksiyonel birimlerdir. Amaç, minimum alanda maksimum sayıda işçiyi barındırmak ve temel yaşam ihtiyaçlarını (yatma, yıkanma, beslenme) merkezi bir kontrol altında karşılamaktır. Bu yapılar, işçilerin sadece barınma

ihtiyacını karşılamakla kalmamış, aynı zamanda onların fabrika dışındaki yaşamlarını da düzenleyen ve denetleyen bir araç işlevi görmüştür.

Karabük Yenişehir'in planlanması, dönemin modern şehircilik anlayışını yansıtmakla birlikte, katı bir sosyal hiyerarşiyi de mekâna işlemiştir. Ünlü Fransız şehir plancısı Henri Prost tarafından hazırlanan ilk imar planı ve Sümerbank İnşaat Fen Heyeti'nin raporları doğrultusunda, konut alanları çalışanların statülerine göre titizlikle ayrıştırılmıştır. Bu hiyerarşinin en alt basamağında yer alan bekar işçiler için yapılan pavyonlar hem mekânsal hem de sosyal olarak diğer yaşam alanlarından ayrı tutulmuştur.

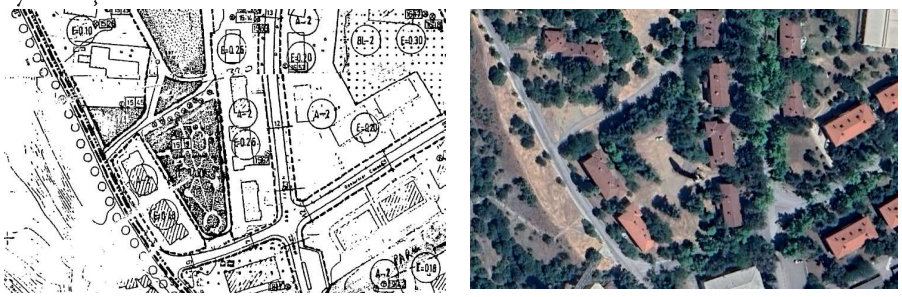
Zamanla, Karabük'teki konaklama ihtiyacının artmasıyla birlikte, sadece işçiler için değil, şehre ticari ve sosyal faaliyetler için gelen misafirler için de konaklama birimleri inşa edilmiştir. 1960 yılında "Sosyal Bina" adıyla bir misafirhane ve 1977'de buna ek olarak yapılan ve sonradan "Pelenkoğlu Otel" olarak bilinen yapı, şehrin konaklama kapasitesini artırmıştır. Ancak bu yapılar, işçi pavyonlarının aksine, daha merkezi ve sosyal donatılara yakın bir konumda yer alarak, bekar işçilerin yaşadığı alanlarla aradaki statü farkını bir kez daha ortaya koymuştur (Saraçoğlu Gezer vd., 2023).




**Şekil 1.** *Sosyal binalar ve bekar lojmanları arasındaki ilişki (Kardemir arşivi).*

Yenişehir'de Çamlık ve Necatibey Caddeleri arasında yer alan ve Göktürk Caddesiyle birbirinden ayrılan sosyal binalar ve bekar lojmanları, evli ailelerden uzak olacak şekilde bölgenin çeperinde yer almaktadırlar. Şekil 1'de 1971 tarihli hazırlanan vaziyet planından alınan kesitte, bekar lojmanlarının A ve B tipinde olacak şekilde iki tipte uygulandığı görülmektedir. A tiplerinde

16 daire, B tiplerinde 12 daire yer almakta olup, 72 kişilik bir ikamet bekarlara ayrılmıştır.



**Şekil 2.** *Bekar lojmanlarının vaziyet planı (Kardemir arşivi) ve hava fotoğrafı (Google Earth).*

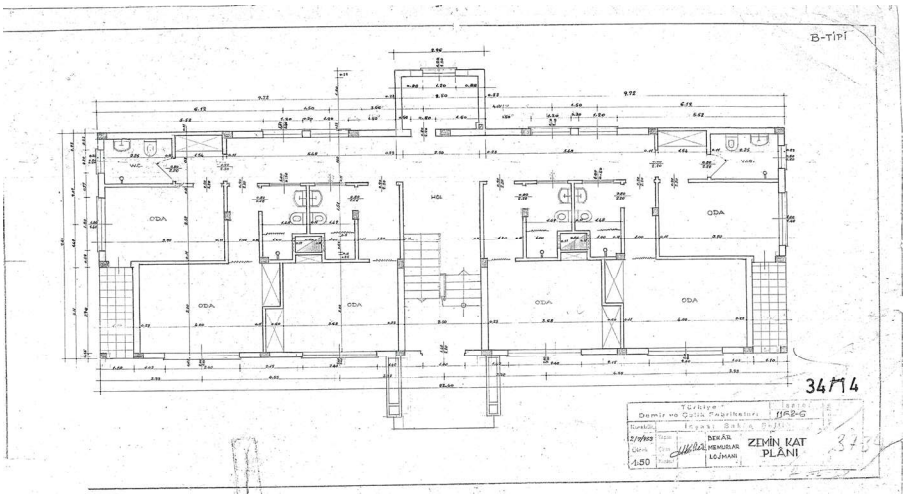
Kardemir arşivlerinde planlarda belirtilen A tipine rastlanamamıştır. Yalnızca B tipi bekar lojmanları tespit edilebilmiştir. Vaziyet planı ve hava fotoğraflarına bakıldığında A tipinin B tipinden daha fazla metrekareye sahip olduğu görülebilmektedir (Şekil 2). Şekil 1'deki bilgilere göre A tipinin B tipinden 4 oda fazla olduğu anlaşılmaktadır. Bu yapıların içlerine giriş için izin alınamamıştır. Arşiv kayıtlarında ayrıca 1014 kişilik Bekar Pavyonu antetli çizimler de bulunmaktadır. Bu yapı günümüzde Yenişehir ya da fabrika arazisinde yer almamaktadır.



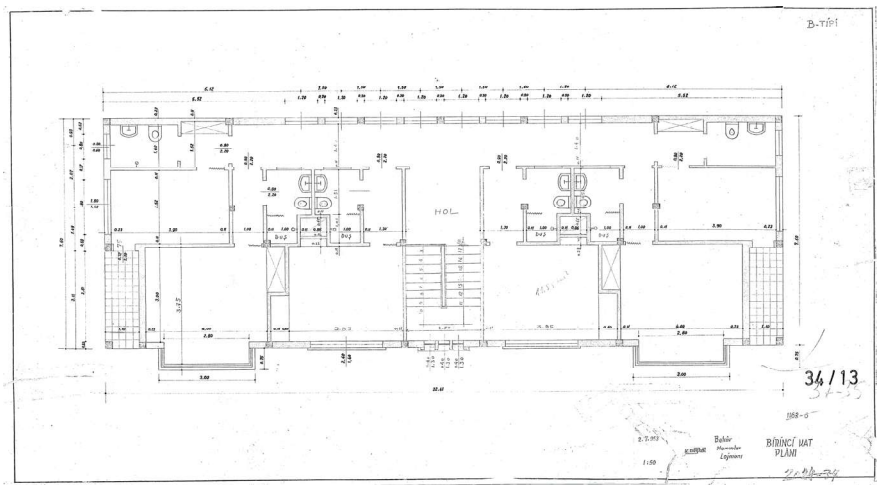
**Şekil 3.** *B tipi bekar lojmanları.*

Kardemir'in arşivinde 1953 yılına ait çizimlerine ulaşılan B tipi bekar lojmanları, ana sınırlarında 7.60 x 22.40 bir dikdörtgen formunda olup, balkon

ve oda çıkıntılarıyla hareketlendirilerek betonarme olarak tasarlanmıştır. Dış duvarlar 23 cm, iç duvarlar 11 cm olarak uygulanmıştır. Zemin kat ve birinci kattan oluşan iki katlı yapıda, her katta 6 adet oda olmak üzere toplamda otel plan tipinde 12 adet oda bulunmaktadır. Her oda bir kişiye aittir. Odalarda mutfak ya da benzeri bir yemek hazırlama alanı olmayıp, her oda kendisine ait ıslak hacim içermektedir. Ön cepheye bakan dört odada ıslak hacimler sırt sırta verilmiş ve havalandırma bacayla sağlanmıştır. Arka cephede kalan iki odanın ıslak hacimleri cephelere yerleştirilerek, havalandırma pencereleri yan cephelere açılmıştır. Ayrıca bu iki odaya eklenen balkonlarla bu odaların ön cepheyle görsel ilişki kurabilmeleri sağlanmıştır. Odaların büyüklükleri 10 ila 12 m$^2$ arasında değişkenlik göstermektedir (Şekil 4 ve 5).

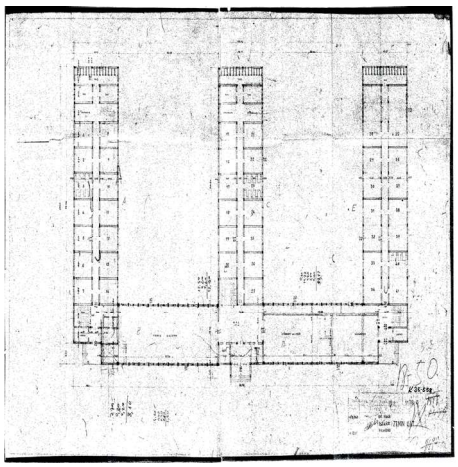



**Şekil 4.** *B Tipi bekar lojmanları zemin kat planı.*

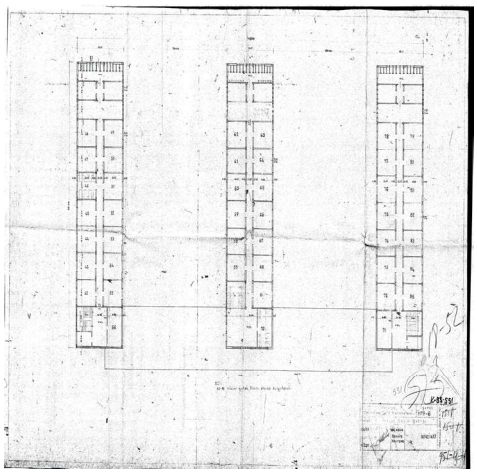



**Şekil 5.** *B Tipi bekar lojmanları 1. kat planı.*

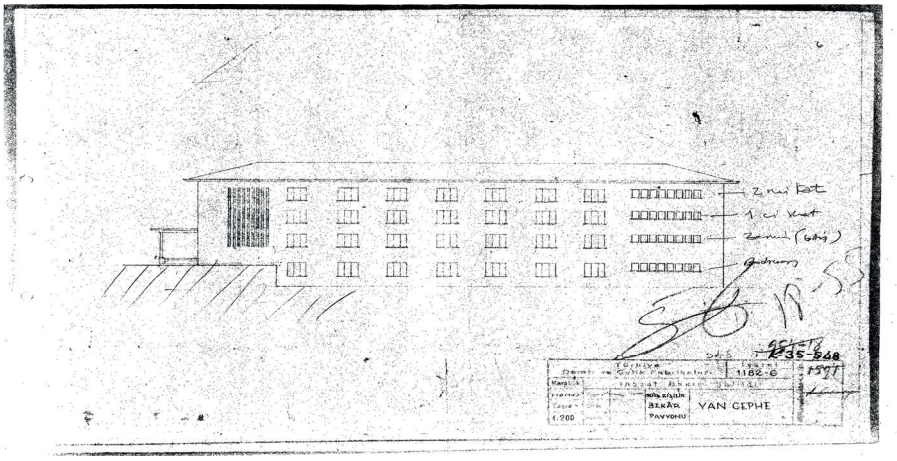
1955 yılında tarihlenen bir bekar pavyonu projesi daha tespit edilmiştir. Bu projenin konut bölgesinde ve fabrika arazisinde yer almadığı gibi, geçmiş tarihli fotoğraflarda da görülmemesi nedeniyle inşa edilmediği, yalnızca proje olarak arşiv kayıtlarında kaldığı düşünülmektedir. Koğuş plan tipinde hazırlanan bu proje 1014 kişilik olarak planlanmıştır. Ön cephede bir dikdörtgenler prizmasına eklenen üç kol şekilde tasarlanmıştır. Giriş birimi tek katlı olup, eklemlenen üç kol dört katlıdır (Şekil 8). Girişte yemek salonu, istirahat ve oyun salonu, kütüphane gibi ortak kullanım için ayrılan mekanlar yer almaktadır (Şekil 6). 5 ila 8 kişiden oluşan 129 adet yatak odasına hizmet edecek olan ıslak hacimler yine ortak kullanıma göre hesaplanmış, sırasıyla lavabolar, duşlar ve tuvaletler olacak şekilde kolların uçlarına yerleştirilmişlerdir (Şekil 6 ve 7). Bu birimlerde doğal ışık ve havalandırmadan yararlanılmıştır.



**Şekil 6.** *İnşa edilmemiş 1014 kişilik bekar pavyonunun zemin kat planı.*



**Şekil 7.** *İnşa edilmemiş 1014 kişilik bekar pavyonunun ikinci kat planı.*




**Şekil 8.** *İnşa edilmemiş 1014 kişilik bekar pavyonunun yan cephesi.*

## 4. DEĞERLENDİRME VE SONUÇ

Karabük Yenişehir'deki bekar lojmanları Cumhuriyet'in sanayileşme ve modernleşme projesinin bir mikro kozmosu olarak okunabilmektedir. Bu mekanlar, bir yandan ülkenin kalkınması için gerekli olan emeği fabrikalara bağlayan pragmatik bir çözüm sunarken, diğer yandan dönemin sosyal hiyerarşisini, disiplin anlayışını ve toplumsal kontrol mekanizmalarını somutlaştıran mimari anlayışın ürünleridir. Cumhuriyet'in sanayileşme rüyası ile toplumu yeniden şekillendirme idealinin kesiştiği noktada duran birer "mekânsal manifestodur". Bu yapılar, bir yandan ülkenin kalkınma hamlesi için kırsaldan şehre gelen genç iş gücünü fabrikalara bağlayan pragmatik bir barınma çözümü sunarken, diğer yandan o iş gücünü "yeni rejimin ideal vatandaşı" haline getirmeyi hedefleyen, derin bir sosyal mühendislik projesinin en somut araçları olarak işlev görmüştür.

Yenişehir'in mekânsal kurgusu, bu ideolojiyi kusursuz bir şekilde yansıtmaktadır. Bekar işçilerin, yerleşkenin en uç noktalarından birindeki çepere, evli ve aile sahibi çalışanların mahrem alanlarından bilinçli bir şekilde ayrıştırılarak yerleştirilmesi, dönemin toplumsal hiyerarşisinin ve ahlak anlayışının mekâna kazınmış halidir. Bu ayrıştırma, sadece medeni duruma göre değil, aynı zamanda vasıflı ve vasıfsız işçiler arasında da kendini göstererek, fabrikanın düşey hiyerarşisini sosyal yaşama taşımıştır.

Mimari planlar ise bu kontrol mekanizmasının farklı stratejilerini gözler önüne sermektedir. Hayata geçirilen bekar lojmanları, her işçiye tek kişilik bir oda sunarak modern bireyciliğe bir gönderme yapsa da mutfak gibi otonom bir yaşamı sağlayacak imkanları ortadan kaldırarak işçiyi yine de fabrika yönetimine bağımlı kılmaktadır. Arşivlerde kalan ancak inşa edilmemiş

1014 kişilik devasa pavyon projesi ise, koğuş sistemi, ortak kullanılan sosyal alanlar ve ıslak hacimleriyle çok daha kolektif, gözetimin ve denetimin zirveye çıktığı bir yaşam modeli önermektedir. Bu iki proje arasındaki fark dahi, dönemin bekar iş gücünü kontrol altında tutmak için farklı ölçeklerdeki mimari çözümleri nasıl tartıştığını göstermesi açısından son derece anlamlı bulunmaktadır.

Sonuç olarak, Karabük Yenişehir'deki bekar pavyonları, sadece endüstriyel mirasın mimari örnekleri değil, aynı zamanda erken Cumhuriyet döneminin toplumsal mühendislik projesinin, iş gücü üzerindeki disipliner pratiklerinin ve sosyal hiyerarşinin mekândaki somut izlerini yansıtmaktadır. Bu yapıların incelenmesi, Türkiye'nin modernleşme sürecinin sosyal ve mekânsal katmanlarını anlamak için önemli veriler sunmaktadır. Dolayısıyla bu yapılar, sadece geçmişin bir barınma tipolojisini değil, bir ulusun kendini inşa ederken kurguladığı yöntemleri anlamak için birer tarihsel kaynaktır.

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Bölüm 9

# EMRE AROLAT'IN MÜZELERİ VE MÜZECİLİĞE YAKLAŞIMI

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## 1. GİRİŞ

Müzeler, bilim veya sanat eserlerinin ya da bu eserlerle ilişkilendirilebilen nesnelerin bir araya getirilmesini sağlamakta ve yalnızca 'sergileme' değil 'koruma' kavramıyla ön plana çıkmaktadırlar. Var olmaya başladıkları ilk zamanlardan beri, kendi dönemleri için her zaman 'çağdaş' olabilmeyi başarmışlardır. Bu da müzelerin ve müzeciliğe bağlı yaklaşımların gelişime açık olduklarını ve yenilikleri takip ettiklerini göstermektedir. Gelişmelerin son evresinde, günümüzde, 'yeni müzecilik' / 'modern müzecilik' olarak karşımıza çıkmaktadırlar. Yalnızca eser ya da nesne sergileyerek değil, kişileri eğitme, iyileştirme, sosyalleşme ortamı yaratma, bir araya getirme ya da toplanma alanları olarak da düşünülmektedir. Sergilemenin de sadece eser ya da nesne ile değil, yapının kendisinin de 'sergilenecek ürün' olduğu örnekler olarak karşımıza çıkmaktadırlar. Bu kapsamda büyük işlere imza atan, çağdaş Türk mimarları arasında yer alan ve 'star mimar' (starchitect) olarak da anılan mimarlardan Emre Arolat'ın bürosundan çıkan müzeler incelemeye alınmıştır. Burada amaç, kamusal bir yapı olarak katılımcılara farklı 'deneyim'ler yaşatabilen 'müze'nin bir mimar tarafından nasıl yorumlandığını izleyebilmektir.

Sergileme ve toplayıcılık en eski çağlarda bile görülüyor olsa da mevcut anlamıyla 'müze' kavramına Orta Çağ'a kadar rastlanmamaktadır. Daha çok din adamları tarafından toplanan nesneler de yine aynı şekilde dini mekanlarda tutuluyor, ancak halk tarafından görülemiyordu. Antik Çağ'ın tapınakları gibi Orta Çağ'ın kiliseleri de eserleri 'koruma'nın yanında 'saklama' görevi üstlenmişlerdir.

Ulisse Androvandi (1552-1605) adlı İtalyan bir doktorun, doğadaki çeşitli canlıları seçerek bir tür müze kurmaya çalıştığı bilinmektedir. Rönesans dönemiyle birlikte (16.-17. yy) sanat eserlerine verilen önem artmış ve bu eserlerin bir araya getirildiği galeriler meydana getirilerek günümüzdeki anlamıyla ilk müzeler oluşturulmaya başlanmıştır [1]. Böylece, müzeciliğin tarihlendirilmesinde ilk olarak kişisel koleksiyonların etkili olduğunu söylemek yanlış olmayacaktır.

Müze kavramını 'sanat ve bilim', 'koruma ve sergileme', 'tarihsellik ve çağdaşlık' gibi birçok kavram da desteklemektedir. Geçmişten günümüze sergileme yöntemleriyle birlikte müzeciliğe bakış açısı da gelişmiştir. Müze yapıları, literatürde kendisine yer bulan ve mimarları/tasarımcıları açısından ayrı bir uzmanlık gerektiren bir yapı türü olarak karşımıza çıkmaktadırlar [2]. Müzelerin ortaya çıkışı ve kendisiyle birlikte 'koruma' kavramını da beraberinde getirdiği döneme bakıldığındaysa, müzeler 'çağdaş bir kurum' olarak var olmaktadırlar [3].

Değişen müzeler artık 'modern müzecilik' anlayışını benimsemektedir. Okan (2015), çalışmasında günümüzde bu yeni yapı tipini 'kültür ünitesi' olarak tanımlamakta ve bünyesinde kütüphanenin, toplantı salonlarının, la-

boratuvarların ve eğitim birimlerinin de yer aldığından bahsetmektedir [4]. Müzelerin sergilemenin yanında 'müze eğitimi' görevini de üstlendiğini anlatmakta, bu olguyu da ICOM'un 'müze' tanımındaki 'eğitim' ve 'toplumun gelişmesindeki temel amaç' ifadeleriyle ilişkilendirmektedir [5]. Müzeler salt sergilemenin dışına çıkarak, insanları eğitmenin de yanı sıra rahatlatma, ruh sağlığını iyileştirme, bir araya getirme ve geliştirme gibi amaçlar da edinmiştir.

Müzelerin amacında eser ya da nesnelerin sergilenmesi vardır. Katılımcıların bilgilendirilmesi, gelişimlerine katkı sağlanması ya da yalnızca hoş vakit geçirmesi de bu amacın beklenen sonuçlarındandır. Ancak 'müze' dendiğinde artık yalnızca bu kurumların iç mekan tasarımları akla gelmemekte, müze yapısının kendisi de başlı başına bir sergilenecek ürün olma konumuna gelmiştir.

20. yüzyılın getirdiği tasarım anlayışıyla müzelerin mimarileri de önem kazanmıştır. Yapının kendisi de 'müze' algısını destekler hale gelmiştir. Bu sayede katılımcı/kullanıcının da 'müze' kavramıyla olan ilişkisinde yeni bir dönüm noktasına gelinmiştir [6].

Bu çalışmada müzelerin amaçlarının dışında, kamusal bir yapı olarak katılımcılara farklı 'deneyim'ler yaşatabilen 'müze'nin bir mimar tarafından nasıl yorumlandığını izleyebilmektir. Bu kapsamda büyük işlere imza atan, çağdaş Türk mimarları arasında yer alan ve 'star mimar' (starchitect) olarak da anılan mimarlardan Emre Arolat'ın bürosundan çıkan müzeler incelemeye alınmıştır. Santral İstanbul Çağdaş Sanatlar Müzesi ile birlikte mimarlık çevreleri dışında da tanınmış olması ve adından söz ettirmesi bu seçimdeki belirleyici faktörlerden birisi olmuştur.

## 2. EMRE AROLAT VE EAA

Emre Arolat Architecture (EAA) 2004 yılında Emre Arolat ve Gonca Paşolar ortaklığında kurulmuştur. Firmanın baş tasarımcısı olan Emre Arolat, çeşitli kurumlarda mimarlık eğitimi de vermektedir. Yalnızca ülkemiz sınırlarında kalmayıp, Londra ve New York'ta da çalışmalarına devam eden, küresel olarak da üretim yapan bir mimarlık firmasıdır.

Firmanın tasarım yaklaşımlarını kendi sitelerinde şu şekilde anlatmaktadırlar [7].:

*"Projenin kolektif ve psikolojik özelliklerini ortaya çıkarmak için okuma, araştırma ve anlama konusunda çok katmanlı bir çaba gösterilmektedir. Tabii ki bu aynı zamanda sosyal, ekonomik ve ideolojik faktörleri de içeren bir okuma. Farklı ölçeklerde ve konularda üretime sahip bir mimarlık stüdyosunda, her bir projenin ve bireysel durumun spesifik sorularını tanımlamak, özel koşulları analiz etmek ve verilen durumun çok katmanlı bir tanımını içeren yanıtları aramak önemlidir."*

Çevremizde birbirine benzeyen birçok yapı görebilmekteyiz. Hatta kamuya hizmet eden işlevlere sahip yapı türlerinin, sorumlu oldukları kurumlar tarafından tek tip üretime geçildiği dönemlerdeyiz. Bu listeye devlet eliyle yapılan toplu konutları da dahil etmek mümkündür. Ancak bu kalıplardan sıyrılmak ve modern mimarlığın getirilerini değerlendirmek önemsenmelidir. Emre Arolat'ın tasarım anlayışıyla ilgili, 'durum' odaklı çalışmalar gerçekleştirdiğini ifade etmesi ve her yapıyı kendi özel ve özgün durumuna göre değerlendiriyor olması önemli görülmektedir [8].

Bu çalışmada da EAA firmasından çıkan, Emre Arolat imzalı yapıların içinden, bir kültür yapısı olan müzeler derlenecektir. Her müzenin üretim öncesi hikayelerine de mümkün olduğuca yer verilmesi planlanmakta ve gününüz müzecilik anlayışına mimarın bakış açısı ve katkısı değerlendirilecektir.

## 3. EMRE AROLAT İMZALI MÜZELER

Firma tarafından, ülkemiz sınırlarında, tasarlanmış 4 (dört) adet müze inşa edilmiştir. Bu müzelerin ikisi İstanbul ilinde, diğerleri de Kayseri ve Hatay illerindedir. Ayrıca 2 (iki) adet de yarışma projeleri için tasarlanan müzeleri bulunmaktadır.

Müzelerin isimleri, yapım yılları ve bulundukları illerle ilgili bilgiler Çizelge 1'de verilmiştir.

**Çizelge 1.** *EAA tarafından tasarlanan müze yapılarına ait bilgiler.*

| | SIRA | MÜZENİN ADI | YAPIM YILI | BULUNDUĞU İL/ ÜLKE |
|---|---|---|---|---|
| İNŞA EDİLENLER | 1 | SantralİstanbulEnerji Müzesi | 2009 | İstanbul/Türkiye |
| | 2 | İstanbul Resim ve Heykel Müzesi | 2011 | İstanbul/Türkiye |
| | 3 | Abdullah Gül Cumhurbaşkanlığı Müze ve Kütüphanesi | 2016 | Kayseri/Türkiye |
| | 4 | Antakya Müze-Otel | 2019 | Hatay/Türkiye |
| YARIŞMA PROJELERİ | 5 | Guggenheim Helsinki Müzesi | 2014 | Helsinki/Finlandiya |
| | 6 | Budapeşte Etnografya Müzesi | 2016 | Budapeşte/ Macaristan |

### 3.1. SantralİstanbulEnerji Müzesi, Eyüpsultan / İstanbul

Emre Arolat ve Nevzat Sayın'ın birlikte tasarladıkları bir yapıdır. 20.Yüzyılın ilk yarısında kurulan modern bir endüstri yerleşkesi olan Silahtarağa Elektrik Santrali'ne ait çeşitli binalar arasında yer alan, yıllar önce yıkılmış ancak temel izleri bulunan iki büyük kazan dairesinin yeniden inşa edilmesiyle oluşturulmuş bir müzedir. Bu iki yapı, yerleşkedeki diğer yapılardan uzakta, birbirleriyle yakın olarak konumlanmaktadır (Şekil 1).



**Şekil 1.** *SantralİstanbulEnerji Müzesi [7].*

Silahtarağa Elektrik Santrali, Haliç'in kuzeyinde, Alibeyköy ve Kağıthane derelerinin arasında konumlanmaktadır. 1913 yılında inşa edilmiş, bir yıl sonra da işletmeye açılmıştır. 70 yıl boyunca hizmet eden santral, önceleri saray, caddeler ve tramvay hattını beslemiş, daha sonraları İstanbul ilinde ikamet edenlere abonelik vermeye başlamıştır ve 1983'te kapatılmıştır. Bu yerleşkede bulunan yapı grupları 1991 yılında tescillenmiştir [9].

Yapıların temel izlerinden yola çıkarak hacimsel olarak eski işlevlerine uygun halde inşa edilmiştir. Cephesi ise 'zamansızlık' yaklaşımıyla yeniden yorumlanarak, tarihsele çağdaş mimari müdahale uygulanarak yeni işleve uygun hale getirilerek şeffaflaştırılmıştır. Müze içerisinde sadece beton kullanımı ile sade ve yenilikçi tasarlanmıştır. Yapı genel anlamda bir iç çekirdek ve ona dokunmayan yarı geçirgen bir kabuk ile oluşturulmuştur. Hafif, yarı saydam bir dış kılıf olarak mesh kaplanmıştır.

### 3.2. İstanbul Resim ve Heykel Müzesi, Beyoğlu/İstanbul

1960 yılında Sedad Hakkı Eldem tarafından inşa edilen antrepo binasının yerine, kent hafıza dikkate alınarak, eskiye benzeyen ama güncel yorumlar eklenen bir yapıdır. Eski yapının kent hafızası açısından cephe özelliklerinin tekrar edilmesi ve Karaköy limanının halka açılması açısından önemli görülmektedir (Şekil 2).



**Şekil 2.** *İstanbul Resim ve Heykel Müzesi [7].*

Eski yapıda da olduğu gibi müze cephesinde gözlemlenebilen yapısal beton, kent belleği anlamında düşünüldüğünde, antrepo binalarının en önemli karakteristik özelliği. Eski binanın tasarımcısı Sedad Hakkı Eldem'e göre antrepolardaki bu betonarme ızgara sistemi, Türk mimarisinin temel yapı unsuru olan "karkas"a referans veriyor.

Yapının bir müzeye dönüştürülmesi sürecinde de müze birimlerini barındıracak ve müzenin taşıyıcısını oluşturacak bu yapısal betonarme grid, eski yapının sahip olduğu betonarme taşıyıcı esas alınarak kurgulanmış. Müzenin bu betonarme taşıyıcı gridi arasında sanat objelerini kategorize edilerek saklayabilecek ver sergi salonları olarak kullanılabilecek konteynırlar ekleniyor.

Izgara sistemin dışına hareketli bir şekilde farklı uzunluklarda çıkan bu konteynır birimler, rampalar ve köprülerden oluşan bir ağ ile yapının içerisinde birbirine bağlanmış. Köprülerden oluşan ve sergi mekanları arasında geçiş sağlayan koridorlar, dört cephesi de şeffaf yapı sayesinde her açıdan farklı bir bakış ve manzaraya sahip olmaktadır.

### 3.3. Abdullah Gül Cumhurbaşkanlığı Müze ve Kütüphanesi, Kocasinan/Kayseri

Erken Cumhuriyet Dönemi'ndeki sanayileşme ve modernleşmenin bir sonucu olarak inşa edilen Sümerbank Tekstil Fabrikası'nın eski elektrik ve buhar binalarının korunması ve yenilenmesiyle oluşturulmuş bir müzedir.

Rus bir ekip tarafından tasarlanan ve uygulanan yerleşkede mevcut nitelikler korunarak çağdaş eklemeler yapılmıştır (Şekil 3).



**Şekil 3.** *Abdullah Gül Cumhurbaşkanlığı Müze ve Kütüphanesi [7].*

Fabrika yerleşkesinde yapılar betonarme inşa edilmiş, cephelerinde yerel malzeme olan taş tercih edilmiştir. Yerleşkedeki yapılarda Sovyet mimarlığı, konstrüktivizm, etkileri açıkça görülmektedir. Elektrik santrali binasının iki adet ince kolon üzerinde yükselmesi, makineleşmenin etkisinde cephe izleri bu akımın göstergeleridir [10].

Yapısal sağlamlılık ve bina fiziği için gerekli görülen müdahalelerde bulunulmuştur. Ancak binalar, zaman içinde eklenen tüm katmanlarla bir bütün olarak kabul edilir. Bunun bir sonucu olarak, yapının kullanım sürecinde gördüğü diğer tüm işlemler yapıyla bir bütün kabul edilerek korunmuştur [7].

Mevcut binanın izlerine sadık kalınmış, yapıldığı ya da tadilat gördüğü dönemlerde kullanılan eski kaplama malzemeleri de kısmen korunmuş ama çağdaş malzemelerle yeni işleve dönüştürülmesi sağlanmıştır. Yapının farklı bölgelerinde geçmiş malzemeler ve tespit edilen katmanlar da bulundukları yerlerde ayrıca sergilenmektedir.

### 3.4. Antakya Müze Otel, Antakya/Hatay

Otel inşaatı olarak başlayan kazılar sırasında ortaya çıkan buluntular ile işlev değişikliğine gidilen ve karşımıza müze-otel olarak çıkan bir yapıdır. Yapının tasarımı 'müze' fikriyle başlamamış olsa da 'müzecilik' yaklaşımı ilgi çekicidir (Şekil 4).



**Şekil 4.** *Antakya Müze-Otel [7].*

Hristiyanlar için önemli bir hac bölgesi olan St. Pierre Kilisesi yakınlarında yer alan Antakya'daki proje alanında, o bölgede yaşayan ilk Hristiyan topluluğuna ait olduğu düşünülen bir arkeolojik alan bulunmuştur. Bu bulguyla birlikte otel binasının tasarım girdileri değişmiş, otel işlevinin özel alan algısıyla, müze işlevinin kamusallığı entegre edilmeye çalışılmıştır.

Yapının tasarımında antik ile modern iç içe geçirilerek, mekanın kendine ait özellikleriyle otel işlevi '*belli bir yere ait olmayan ve kendi program ağına sahip*' şeklinde tanımlanmıştır. Geleneksel otel yapılarının kompakt, içe dönük olmasının aksine arkeolojik kazıların üzerini örten koruyucu bir gölgelik gibi düşünülmüştür. Yapı dört katmandan oluşturulmuştur [7]:

1. Kalıntılara en yakın seviyede açık hava müzesi,

2. Otelin ortak kullanım alanları, arkeolojik kalıntıları seyreden lobi ve restoran,

3. Otel odaları ve kazı alanlarını gören açık hava sirkülasyonu

4. Kanopi (Tüm alanı örten çatı)

Taşıyıcı strüktürlerin yerleri arkeolojik kazılarla elde edilen bulgulara göre belirlenmiştir. Bulgulara en az zarar verecek şekilde, eski bir nehir yatağı olarak tespit edilen hat üzerinde, elle kuyular kazılarak konumlandırılmıştır. Otel odaları ve diğer birimler prefabrike olarak saha dışında imal edilip, yerlerine yerleştirilmiştir.

Bir kanopinin örttüğü ve tamamı yarı açık alanlardan oluşturulan yapıda doğal hava sirkülasyonu sağlanarak, arkeolojik kazılara zarar verebilecek mekanik havalandırma sistemleri kullanılmadan Antakya'nın iklim koşullarına uygun bir yapı oluşturulmuştur. Çevresel etkilerden korumak için yalnızca kazı alanı şeffaf bir cepheyle kapatılmıştır.

### 3.5. Guggenheim Helsinki Müzesi, Helsinki/Finlandiya

Helsinki Guggenheim Müzesi (Şekil 5), kentin ızgarası ile liman alanının doğrusal karakteri, kentsel doku ve doğa, Park ve deniz kıyısı arasında ve yine de kültür ve eğlence arasında bir "menteşe" olarak algılanıyor. Yerleşme, tipik Helsinki bloklarının kentsel şebekesinin daha az yoğun bir bileşime dönüşmeye başladığı bir eşikte yer almaktadır [11].



**Şekil 5.** *Guggenheim Helsinki Müzesi [7].*

Helsinki'nin kendine özgü özelliklerinden biri olan 'kaya adaları' tasarım fikrinde etkili olmuştur. Yapının farklı bakı noktalarında inşa edilmesi düşünülen yapay kayaların içinden adalara bakmak mümkün kılınmıştır. Kentsel dokunun sahip olduğu manzara hakkında da fikir vermektedir. Bina, referansları olan iki ayrı katmandan oluşmaktadır:

1. Yerden yükselen yatay "uçan kutu" sınırları kentsel blokların ızgara çizgileri ve sahil şeridi ile belirlenir;

2. Bu kutunun altındaki altyapı Helsinki'nin kayalık adalarıyla diyalog halinde olan parçalanmış parçalarla ve kırık yüzlerle ifade edilir.

### 3.6. Budapeşte Etnografya Müzesi, Budapeşte/Macaristan

19. yüzyılın başlarında tasarlanan ve Avrupa'da ilk önemli Kent Parkı olma özelliğine sahip olan Liget Park'taki Etnografya Müzesi Projesi'nin tasarımı, mekanın sosyal çevresi dahilindeki karmaşıklığı ve iç çelişkileri dikkate alınarak ele alınmıştır. Yapısal bir manzara olması hedeflenmiştir [12].



**Şekil 6.** *Budapeşte Etnografya Müzesi [7].*

Parkın doğal dokusuyla birlikte var olma, sakinlik, dinginlik kavramları yapının yalnızca cephesini değil iç mekanlarını da etkilemiştir. Parktan bakıldığında dokunun devamı gibi algılanan, içine girildiğinde kırılmalar yaşayan bir tasarımdır.

## 4. DEĞERLENDİRME VE SONUÇ

Müzeler, bulundukları yerin 'hafıza'sı haline gelen, şehirle birlikte anılmaya başlayıp şehrin tanıtımına dahi katkı sağlayabilen, 'kültür' ögeleridir. Sergiledikleri eser ya da nesneler haricinde mimari yapılarıyla da kültür ve sanatı yönlendiren birer üründürler ve mimarisiyle sanat ile estetik algıya yön vermektedirler [13].

Mimarinin kent belleğindeki yerini önemseyen ve tasarımlarında 'durum' odaklı planlama yaptığını belirten mimar Emre Arolat'ın müze tasarımlarında da bu etkiler görülebilmektedir. Bunun yanında 'tarihselliğin' de ön plana çıkarıldığını söylemek gerekmektedir. Müze gibi bir kültür yapısında, 'durum' ve 'tarihsellik' kavramlarının vurgulanması, tasarımların buna göre planlanması ve uygulanabilmiş olması mimarlık ve müzecilik adına önemli görülmektedir.

Emre Arolat kendi kaleme aldığı bir yazısında, "Bir ürünün söylemi, onun hakkında yazılanlarda değil, ürünün kendisinde aranmalıdır. Başka bir deyişle, 'Söylem' ile 'Tasarım'ı birbirinden ayırmak anlamsızdır. Yapılar zaten tüm günahları ve sevapları ile göz önünde durmakta ve tasarımlar kendi söylemlerini oluşturmaktadır." demektedir [14]. Mimarın tasarladığı yapılar, kendisinin belirtilen görüşüyle de ilişkilendirilerek yorumlanmaya çalışılmıştır.

**Çizelge 2.** *Emre Arolat imzalı müzelerin tasarım girdileri ve kavramsal yaklaşım.*

| YURTİÇİ (TÜRKİYE) | | | | YURTDIŞI (AVRUPA) | |
|---|---|---|---|---|---|
| **2009** | **2011** | **2016** | **2019** | **2014** | **2016** |
| Santral İstanbul Enerji Müzesi | İstanbul Resim ve Heykel Müzesi | Abdullah Gül Cumhurbaşkanlığı Müze ve Kütüphanesi | Antakya Müze-Otel | Guggenheim Helsinki Müzesi | Budapeşte Etnografya Müzesi |
| Yerine inşa etme | | Dönüşüm | Yeni yapı | Fikir projesi | |
| ***"TARİHSELLİK"*** | | | | ***"DOĞA İLE ETKİLEŞİM"*** | |

Çizelge 2'de mevcut 6 proje bir araya getirilmeye çalışılmıştır. Burada veriler şu şekilde derlenebilmektedir; tasarımların 4'ü yurtiçi örnekleri olup inşa edilmişlerdir, 2'si ise yarışma projeleri için hazırlanmış ve fikir projeleri olarak yurtdışı örneklerini oluşturmaktadırlar. İnşa edilmiş müzelerin 2'si 'yerine inşa etme' ile daha önce var olmuş yapılara ithafta bulunma, 1'i mevcut yapının dönüşümü ve 1 diğeri de yeni yapı tasarımı olarak karşımıza çıkmaktadır.

Emre Arolat için 'kentsel bellek', 'durum' ve 'tarihsellik' kavramları önemlidir. Yapıların sahip oldukları çevre ve içerdiği kültürel değerlere tüm yapı örneklerinde saygı duyulmuştur. Tasarım kararları da her bir yapının kendine özgü, özgün gelişim göstermiştir.

Santral İstanbul Enerji Müzesi ile İstanbul Resim ve Heykel Müzesi yapılarında, daha önce var olan ancak sonradan bir sebeple yıkılmış yapıların yerlerine 'aslına uygun' biçimde kütleler öneren çözümler tercih edilmiştir. 'Kentsel bellek' kavramı burada mimarın tasarım kararlarını yönlendirmede etkili olmuştur. Her iki müze örneğinde de hacim açısından 'yere ait' olan, böylece 'tarihsellik' kavramının desteklediği, ancak 'çağdaş' dokunuşlarla da 'kültür ögesi'nin dönemine hitap edebilmesini sağlayan tasarım özellikleri açıkça görülebilmektedir.

Abdullah Gül Cumhurbaşkanlığı Müze ve Kütüphanesi ise mevcut bir yapının dönüşümü ile müzeye çevrilmiştir. Burada 'dönüşüm' gerçekleştirilirken mevcut yapının özgün özelliklerine saygı duyulması yine bu tasarımda da 'tarihsellik' kavramıyla bağdaştırılabilmektedir. Yapının kullanıldığı dönemlerdeki geçirdiği tüm tadilatları dahi kabullenen, 'korumacı' bir yaklaşım

söz konusudur. Müze kurumuna ait eser ya da nesnelerle birlikte yapının iç ve dış katmanları da birer sergileme ögesi olarak ziyaretçilere sunulmuştur.

Antakya Müze-Otel'de ise mimarın kendi tabiri ile 'belli bir yere ait olmayan ve kendi program ağına sahip' yeni tip bir müzecilik anlayışı görülmektedir. Hem otel inşası için yapılan kazılarda ortaya çıkan arkeolojik buluntular korunmuş, hem de otel işlevi devam ettirilmiştir. 'Tarihsellik' kavramına zarar gelmesinin önüne geçilmeye çalışmıştır. Diğer müze örneklerindeki gibi 'durum' odaklı çözümler geliştirilmiştir.

İnşa edilen müze yapılarında görülen bu korumacı yaklaşımın aksine yurtdışındaki yarışma projeleri önerilerinde daha cesur tercihlerde bulunduğu görülmektedir. 'Tarihsellik' kavramı bu tasarımlarda bulunmamaktadır. Onun yerine 'doğa ile etkileşim'in ön planda olduğu söylenebilmektedir. Bu yarışmalarda derece elde edilememiştir.

Tüm bu değerlendirmeler sonucunda, Emre Arolat'ın tasarımlarına başlamadan önce kavramsal çerçeveyi çok iyi kurduğu söylenebilmektedir. Yaptığı müze tasarımlarında, bir kültür yapısı olarak müzeyi çağdaş ve modern olgularla yorumlayabilmiştir. Her mimari tasarımdan önce yapılması gereken analizler hazırlanırken, yapıların fonksiyon özellikleri, çevre verileri ve 'kentsel bellek' bakışımları ile yapıların tasarımları 'durum' odaklı gerçekleştirilmiştir. Bu çalışma prensibi ve estetik öngörüsüyle de katılımcı, kullanıcı ya da seyirci tüm herkesi kapsayıcı etkiye sahip başarılı müze örneklerini literatürümüze kazandırmıştır.

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# ACADEMIC STUDIES ON
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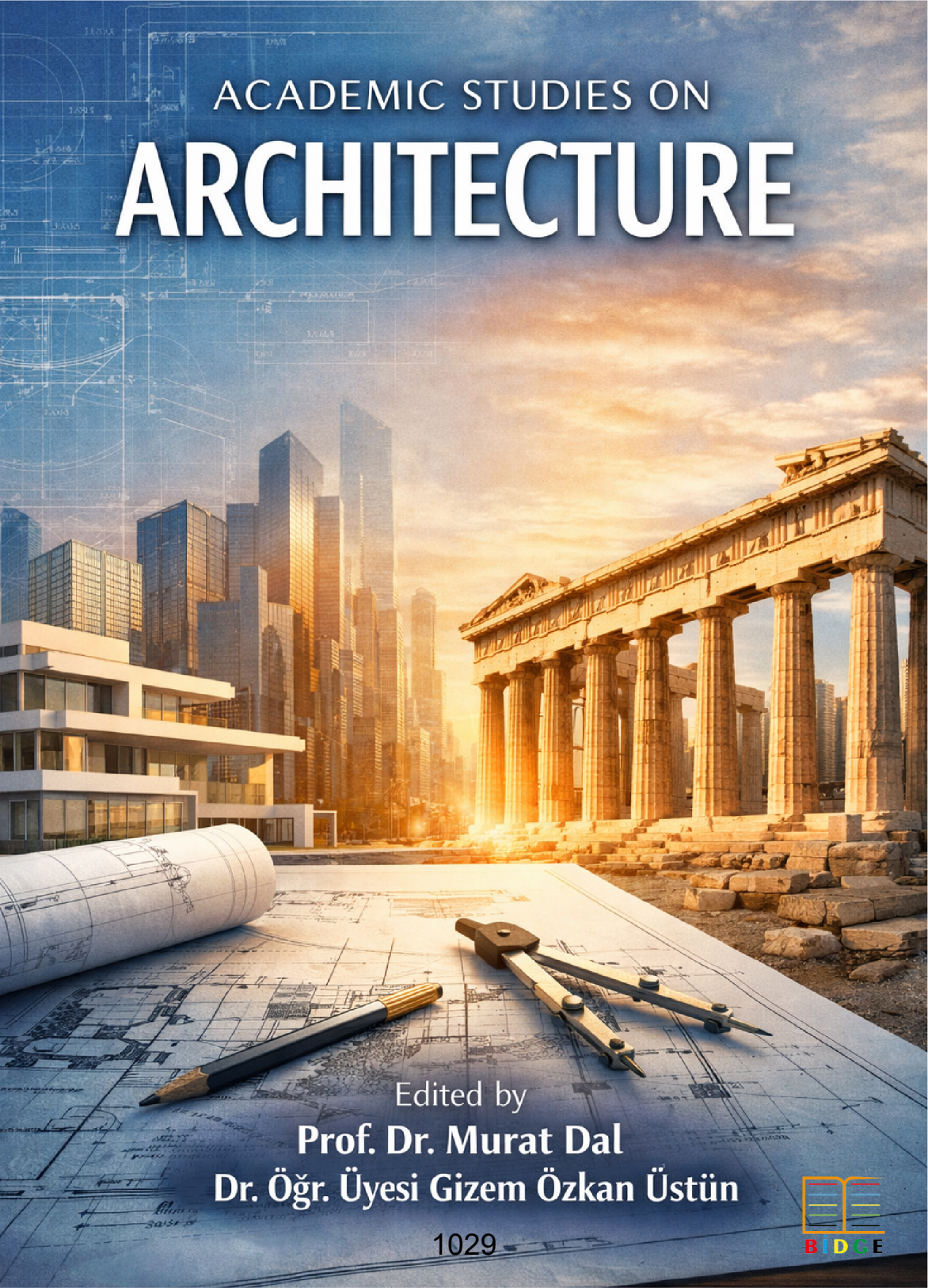

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**Dr. Öğr. Üyesi Gizem Özkan Üstün**

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# CHAPTER 10

# OPEN-SOURCE APPROACHES IN INTEGRATED BUILDING SCIENCE PROCESSES: IFC-BASED SEMANTIC DATA MANAGEMENT WITH BLENDERBIM

**MUSTAFA HAKİ ERASLAN**[1]

## Introduction

Due to its inherently fragmented nature, the construction industry necessitates the continuous generation, revision, and interdisciplinary transmission of vast quantities of data throughout the entire project lifecycle, ranging from inception to decommissioning. Consequently, driven by this need for intensive and complex communication, data lifecycle management has assumed paramount importance (Bucher et al., 2024). In conjunction with the digitalization process that has gained momentum in recent years, Building Information Modeling (BIM) has positioned itself at the core of this transformation. The primary potential of BIM applications lies in their ability to establish a reliable, shared knowledge resource for all project stakeholders (Borrmann et al., 2018). However, the traditional structural fragmentation within the

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construction sector leads to the formation of “information silos” or “islands of automation,” stemming from the use of specialized, proprietary software by different stakeholders (Bucher et al., 2024; Lai & Deng, 2018). The reliance of commercial software on proprietary formats creates a “black-box” problem that restricts data flow, thereby subjecting users to vendor lock-in and compelling them to engage in high-cost, complex data migration processes. This situation causes severe bottlenecks in data integration both across project phases and among interacting parties.As a remedy to these entrenched problems, the OpenBIM approach—based on open standards and independent of software vendors—and its fundamental data standard, Industry Foundation Classes (IFC), have been developed. The OpenBIM paradigm aims to reclaim data ownership from software firms, restoring it to project authors, while ensuring interoperability (Lai & Deng, 2018; Prikhodko, 2024). A review of the literature reveals that BIM applications predominantly focus on geometric modeling and visualization. However, within Building Science processes, the management of non-geometric “physical data” (such as thermal conductivity, specific heat, fire resistance, and acoustic transmission of materials) is of critical importance (Borrmann et al., 2018). Particularly for energy performance and comfort analyses, it is imperative that building elements evolve from mere geometric shells into “semantic objects” embedding physical properties (Van Treeck et al., 2018; Parekh & Trabucco, 2024). In current commercial software, the management of such data is often confined to closed libraries, precluding transparent data auditing.The objective of this study is to demonstrate the potential of open-source approaches in semantic data management, a fundamental requirement of building science. In this context, using BlenderBIM—a flexible and customizable open-source software tool—this study investigates how critical building physics parameters, such as thermal conductivity ($\lambda$), fire resistance, and material density ($\rho$), can be integrated into a

geometric building model on an IFC basis. The implementation concretely demonstrates that a BIM model can transcend being a mere repository of geometry to become a rich source of semantic information supporting advanced engineering analyses.

## Theoretical Framework

The discipline of Building Science encompasses not merely construction and fabrication processes, but rather the management process of rich semantic data required throughout the entire building lifecycle (Koch & Konig, 2018). The element that renders a BIM model "intelligent" is not the geometric data it contains, but rather the semantic information assigned to this geometry that defines the model's behavior. This information includes parameters critical for the operation and performance analyses of the structure, such as material layers, thermal properties, cost data, maintenance schedules, and logical relationships between components (Belsky et al., 2016).

In engineering calculations requiring expertise—particularly energy performance simulations, fire safety scenarios, and acoustic analyses—the consistency of this semantic data gains precedence over geometric accuracy (Mazzoli et al., 2021). Consequently, within the context of Building Science, the modeling process should be conceptualized not as drawing production, but as a process of "Database Management" and "Semantic Enrichment."

## Open BIM and the Industry Foundation Classes (IFC) Standard

Developed by buildingSMART to overcome data sharing challenges in the sector, Industry Foundation Classes (IFC) is an object-oriented data model that has achieved international standardization under ISO 16739. IFC utilizes the EXPRESS data modeling language to define data and presents a hierarchical structure. Through this structure, a wall is defined not merely as a

3D box, but as a qualified object belonging to the IfcWall class, associated with sub-components such as IfcMaterial and IfcPropertySet (Yu et al., 2023).

The most significant technical advantage of IFC is its extensible nature. The requirements of various disciplines (static, mechanical, energy) can be met through custom property sets (Psets) added to the standard schema (Dai et al., 2024). This neutral and open data structure ensures that data is liberated from software vendor dependency (vendor-neutral) and guarantees sustainable digital archiving, ensuring data remains readable even decades later, considering the long economic lifespans of buildings (Noardo et al., 2021).

**Data Management via Native IFC Authoring and BlenderBIM**

Prevalent commercial BIM tools in the sector typically store models in their proprietary internal formats and employ complex mapping processes to transform data during export to IFC. This "translation" operation constitutes a fundamental problem causing data loss and data corruption, particularly regarding semantic relationships and parametric data (Gerbino et al., 2021).

To overcome this issue, the "Native IFC Authoring" approach has been developed, which allows reading and writing directly onto the IFC schema without converting data into an intermediate format. This approach eliminates the software's dependency on proprietary internal schemas, thereby ensuring the preservation of the IFC file's original data structure (Lai & Deng, 2018; Bucher et al., 2024). Open-source tools such as BlenderBIM act as pioneering platforms offering this native authoring capability. Based on the IfcOpenShell library, BlenderBIM enables geometric modeling and semantic data assignment processes to be performed directly on IFC entities (Diara, 2025). This technical superiority provides the necessary infrastructure for the lossless integration of

building physics parameters (thermal conductivity, density, etc.) into a geometric model, thus maximizing data quality within the OpenBIM ecosystem (Zhu et al., 2023).

## Material and Method

The methodology of this study is predicated on the premise that the "black-box" data structures of proprietary BIM software constrain the transparent and auditable management of physical parameters, which constitute the fundamental components of building science. Consequently, the study is constructed upon open-source platforms. The research is grounded in the principle of "Semantic Enrichment," which refers to the transformation of a purely geometric model into information by enriching it with data regarding building physics, material science, and performance metrics.

In this context, the primary objective of the research is to experimentally demonstrate the implementation of physical and semantic data entry on a basic building element within an environment compliant with IFC standards.

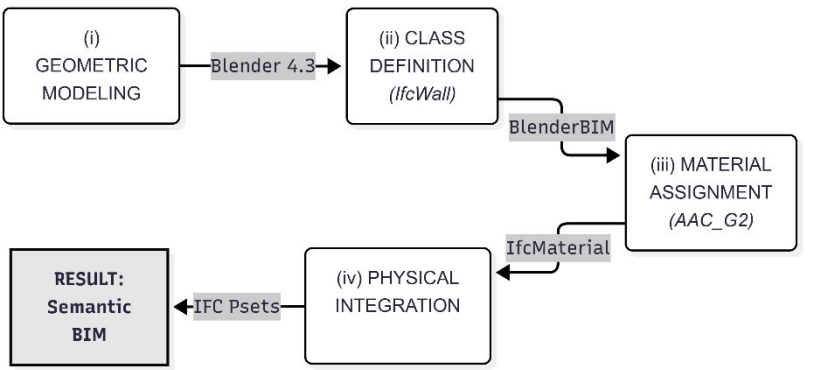
## Tools and Software Infrastructure

The open-source 3D modeling software Blender (v4.3) and the integrated BlenderBIM add-on were utilized as the study environment. BlenderBIM was selected for its capability for "native authoring" directly onto the Industry Foundation Classes (IFC) schema, distinguishing it from commercial BIM software. This approach eliminates potential information loss during data conversion, thereby enabling the production of building information in a manner that is portable and compliant with international standards.

## Workflow and Implementation Process

The experimental process was structured into four fundamental stages, ranging from the generation of raw geometry to the integration of numerical data related to building physics (Figure 1). These stages were configured as follows: (i) Geometric modeling, (ii) Class definition, (iii) Material assignment, and (iv) Integration of physical parameters.

*Figure 1 The semantic enrichment workflow followed within the scope of the study.*



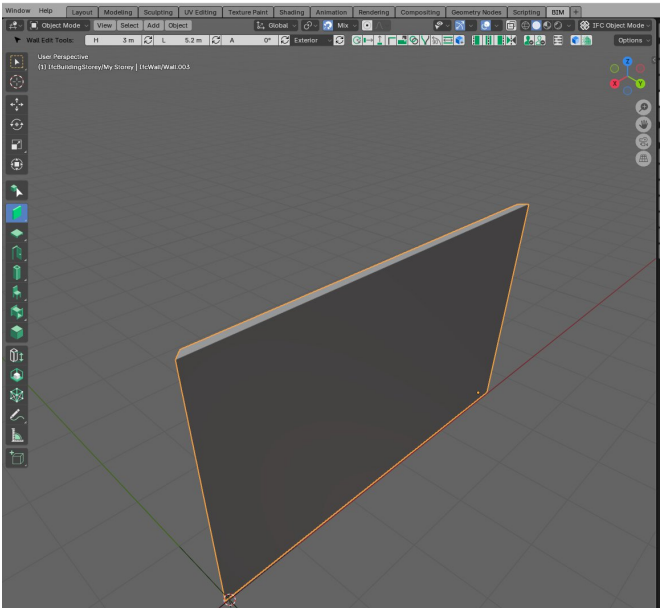

**Data Entry Simulation**

Within the scope of the implementation, a standard exterior wall element was modeled to represent IFC-based data entry. The geometric properties of the wall were determined based on typical dimensions widely used in architectural practice.

- Geometric Modeling and Classification

In the initial phase, a prismatic wall model with dimensions of 320 cm in width, 320 cm in height, and 20 cm in thickness was generated within the Blender environment. Using the BlenderBIM interface, this raw geometry was assigned to the IfcWall class, thereby acquiring a structural identity within the framework of IFC standards (Figure 2). Consequently, the model was transformed from a mere 3D object into a semantically defined building element.

*Figure 2 Assignment of the wall element to the IfcWall class.*



- Material Assignment and Semantic Association

Following the class definition, material information was assigned to the structural element. In this context, the nomenclature AAC_G2 was employed to represent Autoclaved Aerated Concrete (AAC), a material frequently cited in building physics literature due to its porous structure and thermal performance characteristics. Particular attention was paid to ensuring that material nomenclature complied with academic and technical standards.

- Integration of Physical Parameters

In this step, which constitutes the most critical phase of the study, numerical data related to building physics were integrated into the digital identity of the building element. For this purpose, the Pset_MaterialThermal and Pset_MaterialCommon (and/or Pset_WallCommon) property sets, defined within the scope of IFC

standards, were utilized. The following physical parameters were embedded into the model (Figure 3, 4):

Fire Rating: F120

Acoustic Rating: 50dB

Thermal Conductivity (λ): 0.13 W/mK (For heat loss and energy performance calculations)

Specific Heat Capacity (c): 1000 J/kgK (For thermal inertia and phase shift calculations)

Mass Density (ρ): 600 kg/m³ (For static load, acoustic performance, and material behavior analyses)

Through these data, the generated wall model was transformed into a semantic building element capable of providing direct input for energy analysis, acoustic evaluation, and building physics-based simulations.

*Figure 3 Entry of values within Pset_WallCommon for the wall element.*

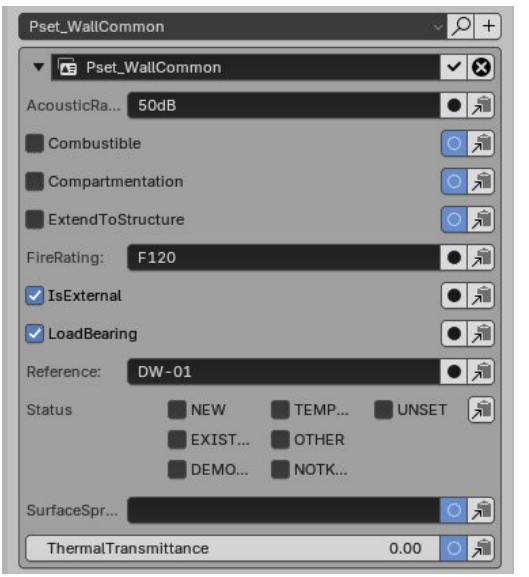


*Figure 4 Entry of Material Property values for the wall element.*




**Findings and Discussion**

The implementation carried out within the scope of this study has demonstrated, through concrete data, the potential of open-source software regarding the generation and management of building information. The findings obtained are evaluated under the headings of semantic data integrity and interoperability.

**Semantic Data Integrity**

As a result of the simulation conducted, it was determined that the physical parameters entered via the BlenderBIM interface were embedded into the model not merely as text tags, but as numerical and computable data types (Double, Real). Building physics data processed onto the IfcWall element via Pset_MaterialThermal and Pset_MaterialCommon sets—specifically Thermal Conductivity ($\lambda$ =0.13) and Density ($\rho$ =600)—were recorded in the Pset (Property Set) format in accordance with the international IFC schema.

Through this method, material, which consists of a mere "visual texture" in traditional modeling approaches, has been transformed into a structural component exhibiting "physical behavior." This substantiates that the architect can manage decisions regarding the building's energy performance during the design

phase without any additional cost or requirement for proprietary licensed software.

**OpenBIM and Interoperability**

The findings indicate that the most significant advantage of open-source approaches is Interoperability. Since the entered data (e.g., ThermalConductivity) adhere to the IFC standard, when the model is transferred to energy analysis engines such as EnergyPlus or OpenStudio, these software tools automatically recognize and utilize these values. Contrary to data confined within the proprietary formats of commercial software, the data generated in this study possess the quality of being preservable throughout the building lifecycle, independent of any specific software vendor.

**Evaluation and Conclusion**

The discipline of Building Science has evolved from merely the physical assembly of building elements into a multi-layered structure encompassing the processes of generation, management, and dissemination of information pertaining to these elements. The case study conducted within the scope of this research, utilizing Blender and BlenderBIM tools, has demonstrated that open-source OpenBIM approaches present not merely an experimental but a professional and reliable alternative in the management of building information.

In light of the findings obtained, the primary outcomes of the study can be summarized as follows:

- Accessibility: The process of establishing the fundamental database required for building physics analyses can be comprehensively executed entirely through open-source tools, without reliance on commercial software necessitating high licensing costs.
- Data Auditing: Users are capable of directly manipulating material properties such as thermal conductivity, density,

and specific heat, without being confined to the default and closed parameter sets frequently encountered in commercial software; thereby, they can audit the source and accuracy of the generated data.

- Academic Freedom and Reproducibility: Particularly in graduate research and academic studies, the transparent generation of data and its storage within the framework of IFC standards enhances the reproducibility, verifiability, and reliability of scientific studies.

In this context, the role of the designer in future architectural practice is evolving from that of a modeler solely producing geometric forms to that of a "data curator" orchestrating the physical, digital, and semantic data of the structure. Open-source initiatives such as BlenderBIM occupy a critical position in this transformation process regarding the democratization of building science in both architectural education and professional practice.

In line with the findings of this study, the following research and application areas are recommended for future studies aimed at developing the open-source OpenBIM ecosystem:

- IFC-Based Open Material Libraries: The development of IFC-compliant open material libraries containing verified physical parameters suitable for different building types and climatic zones on open-source platforms would fill a significant gap for both academic and professional use.
- OpenBIM Approaches for Historic Structures: In the documentation and conservation of cultural heritage structures, it is proposed to develop HBIM (Historic Building Information Modeling) focused studies using open-source tools instead of the restrictive structure of commercial BIM software. In this regard, integrating original material and

deterioration parameters into the IFC schema will contribute to the creation of digital twins of historic structures.

- Integration of Artificial Intelligence and Open Source: Integrating open-source BIM environments with Large Language Models (LLMs) and machine learning-based tools may enable the development of automatic material identification, damage classification, and physical parameter recommendation systems. Such hybrid approaches have the potential to reduce human error while accelerating data generation processes.
- Education-Oriented Open BIM Platforms: To reduce dependency on commercial software in architectural and engineering education, it is recommended to develop building physics and performance-based learning scenarios constructed upon open-source BIM tools.

In conclusion, the open-source OpenBIM ecosystem offers not merely a software alternative, but an ethical, transparent, and sustainable approach to the generation and dissemination of building knowledge. The widespread adoption of this approach will both enhance the quality of academic research and guide the digital transformation of the architectural discipline.

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# MEKANIN GÖZLEMİ: CAMERA OBSCURA'DAN SANAL GERÇEKLİĞE

**Selda Cansu CEYLAN**[1]

## 1. GİRİŞ: GÖRME REJİMLERİ VE MİMARLIK İLİŞKİSİ

Mimarlık, yalnızca fiziksel yapılar üretmeye yönelik bir meslek değil, aynı zamanda görme biçimlerinin mekânsal karşılıklarını üreten bir disiplindir. Dolayısıyla her tarihsel dönemde hâkim olan görme rejimleri, mimarlığın temsil araçlarını, tasarım yöntemlerini ve mekân deneyimlerini doğrudan etkilemiştir. Bu çalışmanın temel motivasyonu, görsel algının tarihsel dönüşümleri ile mimarlık arasındaki bu dinamik ilişkiyi tartışmaya açmaktır.

Jonathan Crary'nin Gözlemcinin Teknikleri: On Dokuzuncu Yüzyılda Görme ve Modernite Üzerine (2004) başlıklı çalışması, görsel algının yalnızca bireysel bir duyumsama değil, aynı zamanda teknik, kültürel ve tarihsel koşulların ürünü olduğunu ortaya koyarak bu tartışmaya kuramsal bir zemin sunmaktadır. Crary (2004) çalışmasında, hakim görme biçimlerinde meydana gelen dönüşümü "gözlemci" kavramı üzerinden okumakta ve bu dönüşümün nasıl bir gözlemci ürettiğine yönelik çeşitli sorulara yanıt aramaktadır. Crary (2004)'ün çalışmasından farklı olarak bu çalışmada ise gözlemci kavramına ilave olarak gözlemcinin konumlandığı ve deneyimlediği "mekan" meselesi tartışmaya açılmaktadır. Bu

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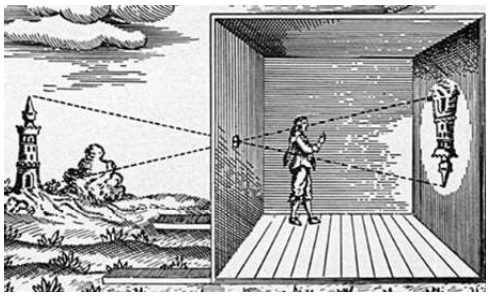
bağlamda görsel rejimlerin farklı mimari temsiller, deneyimler ve tasarım paradigmaları üretebileceği ön kabulü ile tarihsel bir okuma gerçekleştirilmektedir. Görme tekniklerindeki dönüşümlerin mimarlığa yansımalarının inceleneceği dört tarihsel bağlam ise şu şekildedir:

1. Camera Obscura: Merkezi Bakışın Mimari Temsili
2. 19. Yüzyıl: Hareketli Bakışın Kentsel Mekana Yansıması
3. Modernizm: Yönlendirilmiş Mekan Algısı
4. Dijital Çağ: Çoklu Perspektifler ve Sanal Mekanlar

## 2. CAMERA OBSCURA: MERKEZİ BAKIŞIN MİMARİ TEMSİLİ

Camera obscura, bir kutu ya da odanın bir yüzüne açılan küçük bir delikten ışığın içeri girmesiyle çalışan optik bir aygıttır. Karanlık oda mantığına dayanan bu düzende dışarıdaki görüntü delikten geçerek iç yüzeye düşer ve kaynağın ters çevrilmiş yansımasını oluşturur. Küçük ölçekli camera obscura'larda bu görüntü, aynalar aracılığıyla düzeltilir ve gözlemci tarafından algılanabilir hale getirilir. Bu düzende esas olan, gözlemci ile dış dünyanın tekil ve bütünlüklü görüntüsü arasındaki ilişkidir. Ancak bu ilişki, gözlemcinin kendi bedenini temsilin bir parçası olarak görmesini engeller; görme eylemi bedenden bağımsızlaştırılarak adeta bedensiz bir deneyime dönüştürülür (Şekil 1).



**Şekil 1. Camera obscura, 1646 (Crary, 2004)**

Camera obscura, görme sürecini geometrik ve sabit bir perspektife dayalı olarak yeniden tanımlamıştır. Bu optik aygıt, nesnel dünyanın tek bir merkezi bakış noktasından doğrusal perspektif kuralları çerçevesinde temsil edilmesini mümkün kılarak Rönesans sonrası Avrupa'nın görsel kültürünü derinden etkilemiştir (Kemp, 1990). Mimarlıkta ise bu anlayış, cephe düzenlemeleri, oran sistemleri ve plan kurgularında kendini göstermiştir. Tek bakış noktasına göre tasarlanmış mekânlar ve norm haline gelen merkezi perspektif bu dönemin belirgin özellikleridir. Andrea Palladio'nun villaları, simetri ve aksiyaliteye dayalı mekânsal organizasyonlarıyla bu optik rejimin mekânsal karşılıklarından biridir (Şekil 2).



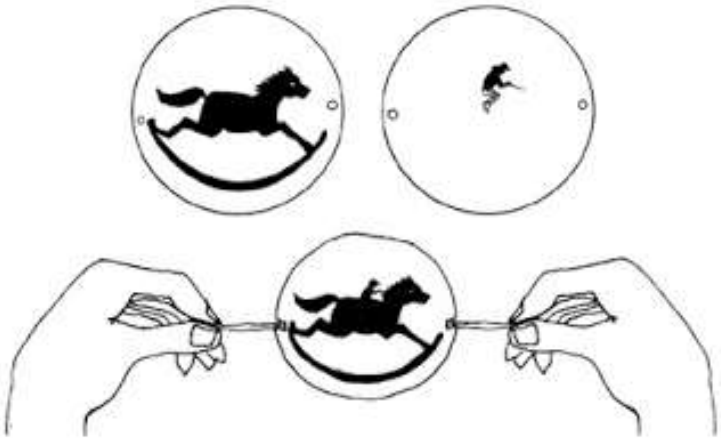
**Şekil 2. Palladyan Villaları, Veneto (Tripomatic, t.y.)**

## 3. 19. YÜZYIL: HAREKETLİ BAKIŞIN KENTSEL MEKANA YANSIMASI

19. yüzyılda meydana gelen değişimler ile birlikte yeni bir gösterge türü ortaya çıkmıştır. Bu yeni göstergeler, seriler halinde sürekli olarak üretilen ve birbirinin birebir aynısı olması istenilen nesnelerdir. Nesneler arasında kurulan yeni ilişki biçimi Baudrillard'ın simülasyon kuramındaki gibi bir orijinal ve onun kopyası olma durumundan uzaklaşarak, nesnel ve göstergesel

eşitlik konumuna gelmiştir. Sermayenin küresel gelişimi ile gündeme gelen bu durum moda, medya, reklam, bilgi ve iletişim teknolojilerini kapsayan bir dizi ilişkiyi ilgilendirmektedir. Bu yeni iktidar mekanizması içerisinde toplum, seyir halindeki gözlemci konumundadır (Crary, 2004).

Bu yeni dönemde, görüntü ediminin yanı sıra zihinde kalma süresi de önem kazanmaya başlamış ve yeni bir kavram olarak art imge ön plana çıkmıştır (Crary, 2004). Art imge kısaca, görmenin ardından zihinde kalmaya devam eden görüntüdür. Bu görüntünün oluşmasına olanak tanıyan en basit makinelerden biri ise Thaumatrope'dur. Thaumatrope, her iki tarafında birer çizim yer alan ve yanlardan iplikler ile tutturulmuş küçük, daire biçimli bir disktir ve bu disk, iplerin elle çekilmesiyle döndürülebilmektedir. Örneğin bir yüzünde kuş resmi, diğer yüzünde kafes resmi olan bir disk döndürüldüğünde, kafes içinde bir kuş imgesi üretilmektedir. Bu basit aygıt, görmenin sürekliliği ve hareketin yanılsamasını ortaya koymaktadır (Şekil 3).



**Şekil 3. Thaumatrope (AnimationCKC, t.y.)**

Bu gelişmeler ışığında 19. yüzyıl, gözlem pratiğinin durağanlıktan çıktığı, panoramalar ve dioramalar aracılığıyla hareketli bir algı rejiminin yaygınlaştığı bir dönem olmuştur (Oettermann, 1997). Georges Eugene Haussmann adlı politikacı ve şehir plancısı tarafından 19. yüzyıl ortalarında Paris'te gerçekleştirilen kentsel dönüşüm, bu yeni görsel mantığın

mekansal karşılığına bir örnektir. Bu dönüşüm sürecinde Paris'te oluşturulan geniş bulvarlar, perspektifin sürekli olarak değiştiği yürüyüş deneyimlerini olanaklı hale getirmiştir. Bir başka ifadeyle geniş Paris bulvarları, kamusal alanın görsel deneyim kurgusuna bağlı olarak tasarlandığı yenilikçi bir görme biçiminin öncül örneklerinden biridir (Şekil 4).



**Şekil 4. Paris bulvar düzeni (Gündüz, 2025)**

Mekan deneyiminde gözlemcinin aktif katılımını açığa çıkaran bu yeni anlayışın mimariye yansımalarından bir diğeri de ışığın ve mekanın sürekli dönüşen ilişkisidir. Joseph Paxton tarafından 1851 yılında tasarlanan Crystal Palace, demir ve cam kullanımıyla bu ilişkinin kurulduğu öncül örneklerden biridir (Şekil 5).



**Şekil 5. Crystal Palace ait iç mekan görünümü (Arkitektuel, 2025)**

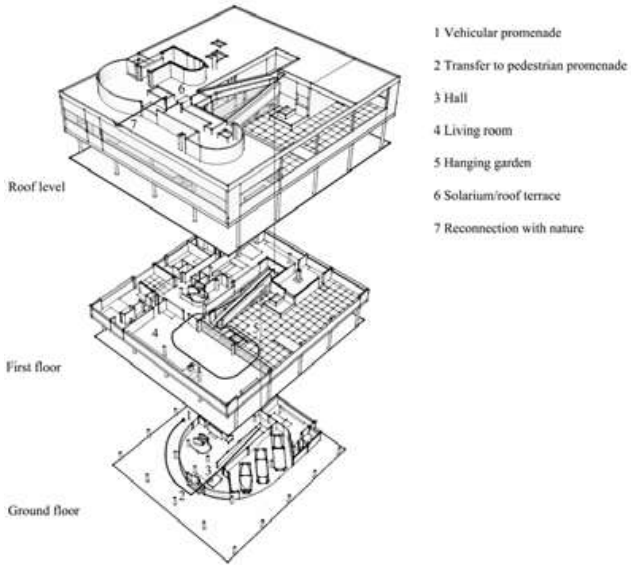
## 4. MODERNİZM: YÖNLENDİRİLMİŞ MEKAN ALGISI

20. yüzyıl başlarında mimarlık alanında meydana gelen gelişmeler ile birlikte yeni bir kentli kimliği ortaya çıkmıştır. Benjamin (1936), Paris pasajlarının inşası ile ortaya çıktığını belirttiği bu yeni kentliyi flaneur olarak tanımlamaktadır. Flaneur kavramı, burjuva sınıfı içerisinde yer alan, ancak yerleşikliği kurulmamış bir gezgini tanımlamaktadır (Benjamin, 1936: 131). Kentin kalabalık mekanlarında boy gösteren flaneur, gözlemleri doğrultusunda edindiği deneyimlere dayalı olarak öznel bir mekansal deneyime sahiptir (Çetinkaya, 2012: 24). Kentte yaşanan değişimlerin doğrudan içinde olan flaneur'ün mekan deneyimini yönlendiren temel aygıtı ise yürüme eylemidir.

Tüm duyuların tetiklendiği bu yürüme hali ve mekana ilişkin katılımcı gözlemcilik, hem modern mimarlık hem de gündelik yaşama yönelik yenilikçi adımlardan biridir. Yürüme eylemi esnasında kentin görünmeyen alanlarını sabit görünümlerin parçaları halinde keşfeden flaneur, bu imgeleri zihninde çoklu ve devingen biçimde birleştirmektedir. Bu deneyim mimariyi sinemayla yakınlaştıran temel kavramlardan biri olan 'montaj'ı akla getirmektedir. Montaj, modern dünyanın hız alanında kazandığı yeniliklerin bir sonucu olarak; sanayi, mimarlık, sinema gibi disiplinlerde etkisi görünen bir kavramdır. Bader (2018)'e göre pasajlar, demiryolları, büyük mağazalar ve sergi salonları gibi geçiş mekanları yeni bir mekansal görsellik üretmektedir. Özünde hareket bulunan bu üretim, modernliğin yeni coğrafyasını sunarken, sinemanın ve montajın icadını da hızlandırmıştır (Bader, 2018). Baker (2016) ise tren yolculuklarının montaj kuramının öncüsü olduğunu belirtmektedir. Bu yolculuk esnasında manzaranın nasıl göründüğü ve zihinde imgelerin algılanış biçimi bir montajlama edimidir. İlave olarak Baker (2016), "Çalışma montajdır, kent montajdır, metropol montajdır ve sanat da montaj olmaya

meyleder.” diyerek modern dünyanın tümünü montaj kavramı ile ilişkilendirmektedir. Ancak bu montajlar dünyasında yine de sanatsal çerçevede kenti parçalayıp, yeniden birleştirmede en başarılı aygıt sinema sanatıdır (Baker, 2016).

Yeniden flaneur kimliğine dönecek olursak; bu kentlinin gündelik yaşama ilişkin deneyimi ve mekanı algılama biçimi sinematografik montaja oldukça benzerdir. Bu benzerlik, mimarlık kuramcılarına ve öncü mimarlara ilham olmuştur. Özellikle Le Corbusier, hareket halindeki gözlemcinin mekanı deneyimleme biçimini doğrudan tasarım sürecinin parçası haline getiren öncü isimlerden biridir. Corbusier’in “promonade mimarlığı”nda, kullanıcının yapıda izleyeceği güzergah ve bu güzergah boyunca algılayacağı mekansal sekanslar bilinçli olarak kurgulanmıştır (Le Corbusier, 1929). Promenade mimarlığının okunabildiği kült yapılardan biri olan Villa Savoye projesinde Corbusier, sirkülasyon kelimesi yerine gezinti kelimesini kullanmakta ve bu gezintinin sürekli ve beklenmedik olduğundan söz etmektedir (Şekil 6). Gezinti esnasında deneyimleyen kişinin gözü, bir kamera göz gibidir ve hareketi süresince edindiği deneyimi tıpkı sinemadaki gibi montajlayarak algılamaktadır (Keleş, 2019).




**Şekil 6. Villa Savoye gezinti rotası (Louw, 2016)**

Promenade mimarlığı örneğinde görüldüğü üzere bu yeni dönemde, gözlemcinin algısal olarak yönlendirilmesine dayalı bir mekan deneyimi söz konusudur. Bu bağlamda mekan içerisinde kullanıcı deneyimi beden-göz koordinasyonuyla yönlendirilmekte ve bu yönü ile söz konusu deneyim, fotoğrafın ötesinde sinemaya daha yakınsak bir konumda yer almaktadır.

## 5. DİJİTAL ÇAĞ: ÇOKLU PERSPEKTİFLER VE SANAL MEKANLAR

Bilişim ve teknoloji alanındaki gelişmelerle birlikte 21. yüzyılda yer ve mekân ile kurulan ilişki biçimleri yeniden tanımlanmaya başlanmıştır. Dijitalleşmenin belirleyici olduğu bu yeni dönemde mekân, fiziksel koşullardan bağımsız, soyut biçimde deneyimlenebilen ve yer değiştirmeden erişilebilen bir olgu haline gelmiş; bu bağlamda "sanal mekân" kavramı giderek daha sık kullanılmaya başlanmıştır.

Bilginin depolandığı, temsil edildiği ve deneyimlendiği düzlemler olan sanal mekânlar; bilişim, enformasyon ve iletişim teknolojileri aracılığıyla üretilen, hızlı, dinamik, değişken ve esnek yapılar olarak tanımlanmaktadır (Girginkaya, 2006). Günümüzde bilgisayar ortamında geliştirilen sanal gerçeklik uygulamalarıyla birlikte "siberuzay" kültürü doğmuştur. Bu sanal gerçeklik, birey–mekân–zaman ekseninde tamamen yeni bir deneyim alanı sunmaktadır. Gerçek mekânın sunduğu işlevleri barındırabilen sanal mekânlar, deneyime yönelik yenilikçi potansiyelleriyle mimarlık ve kent planlamasında yeni bir dünyanın kapılarını aralamıştır. Bu dönemde ortaya çıkan sanal gerçeklik (VR) ve artırılmış gerçeklik (AR) gibi dijital tasarım teknolojileri, henüz inşa edilmemiş mekanların üç boyutlu olarak deneyimlenmesini ve gerçek zamanlı olarak değiştirilmesini mümkün kılmaktadır (Oxman, 2017). Tüm bu gelişmeler ışığında

gözlemci, artık yalnızca algılayan değil, aynı zamanda mekanın oluşum sürecine katılan bir aktör haline gelmiştir.

Fiziksel mekan ile sanal mekan arasındaki bedensel etkileşime olanak tanıyan bu yeni araçlar, kullanıcı ve/veya gözlemciye daha yüksek düzeyde bilgi ve iletişim desteği sağlamaktadır. Bu destek ise bireyin daha büyük sosyal mevcudiyet duygusu yaşamasına ve kendini sunma üzerinde kontrol sağlamasına olanak tanımaktadır. Ayrıca bu deneyim, paylaşıma dayalı etkileşimi ve mekan tasarımında ekip çalışmasını artırıcı potansiyele sahiptir (Van der Land vd. 2011). Bu durumu, dijital çağın gözlemciyi katılımcı haline getirdiğinin bir göstergesi olarak okumak mümkün görünmektedir.

## 6. SONUÇ

Bu çalışmada, farklı tarihsel dönemlerde ortaya çıkan görme rejimlerinin mimarlık ile kurduğu çok katmanlı ilişki incelenmiştir. Görme rejimlerindeki her dönüşüm, yalnızca temsil tekniklerini değil; mekanın nasıl algılandığını, kurgulandığını ve yaşandığını da dönüştürmüştür. Mimarlık ise sabit ve değişmez bir tasarım pratiği olmaktan çok, sürekli olarak yeniden tanımlanan bir görsellik rejiminin mekansal karşılığı olarak bu dönüşümden kaçınılmaz olarak etkilenmiştir. Camera obscura'nın merkezileşmiş bakışından, 19. yüzyılın art imgesine; modernizmin yönlendirilmiş mekansal deneyimlerinden, dijital çağın çoklu perspektiflerine kadar uzanan bu tarihsel okuma, mimarlığın yalnızca fiziksel bir üretim alanı olmadığını, aynı zamanda görsel algının kültürel ve teknik dönüşümlerine doğrudan bağlı bir temsil ve deneyim sahası olduğunu ortaya koymaktadır.

Buradaki tartışma, Crary'nin gözlemci kavramı ekseninde başlamış olup; mimarlığın gözlemci ile kurduğu ilişki üzerinden şekillenen bir yönü olduğunu düşündürmeyi amaçlamıştır.

Gerçekleştirilen irdelemede, 17. yüzyılda bedenin dışlandığı bedensiz bir bakış rejimi hakimken, 19. yüzyılda hareketin sürekliliği ve kentteki yeni görsellik biçimlerinin deneyime dahil olduğu görülmüştür. Modern döneme gelindiğinde, gözlemcinin flaneur figürü üzerinden öznel deneyim ve sinematografik montajla yeniden tanımlandığı; dijital çağda ise mekanın pasif alımlayıcısı olmaktan çıkarılarak, sanal ortamda etkin bir katılımcıya dönüştüğü anlaşılmıştır. Bu bağlamda mimarlığın, her dönemde görsel kültürün üretim ve deneyimleme biçimleriyle ilişkilenen bir bilgi alanı olarak ortaya çıktığını söylemek mümkün görünmektedir.

Sonuç olarak, mimarlık ile görme rejimleri arasındaki ilişki, yalnızca temsil tekniklerinin değil; aynı zamanda mekanın deneyimlenme biçimlerinin de tarihsel bağlamda değiştiğini göstermektedir. Bu değişim, mimarlığın disipliner sınırlarını aşarak; sinema, teknoloji ve kültürel kuramlarla kesişen zengin bir tartışma alanı yaratmaktadır. Günümüzde, dijital teknolojiler aracılığıyla gözlemcinin mekanın üretim sürecine aktif biçimde dahil olması, gelecekte mimarlık düşüncesinin ve pratiğinin daha da katılımcı, esnek ve çok boyutlu bir zemine evrileceğinin işaretlerini vermektedir. Ayrıca bu evrim, yalnızca mekansal deneyimin niteliğini dönüştürmekle kalmamakta; aynı zamanda mimarlığın epistemolojisini, temsil anlayışını ve toplumsal işlevini yeniden düşünmeye davet etmektedir.

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# Cumhuriyetin 100. Yılında Mimarlık Konuşmaları




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EĞİTİM YAYINEVİ GRUBU

# CUMHURİYET'İN KONUTTA MODERNLEŞME HİKÂYESİ: YENİŞEHİR, KARABÜK

Ayşe Merve Saraçoğlu Gezer[1]

## 1. Giriş

Cumhuriyet'in ilanıyla birlikte Türkiye, yalnızca siyasal yapısını değil, toplumsal, kültürel ve mekânsal yapılanmasını da köklü biçimde dönüştürmeyi hedefleyen bir modernleşme sürecine girmiştir. Bu dönüşümün en görünür alanlarından biri konut politikaları ve konut mekânlarının biçimlenişidir (Onur, 2018). Özellikle erken cumhuriyet döneminde, sanayileşme politikalarıyla eş zamanlı olarak gelişen konut üretimi, yalnızca fiziksel bir barınma ihtiyacına yanıt vermekle kalmamış, aynı zamanda yeni toplumun inşasında temel bir araç olarak değerlendirilmiştir. Bu bağlamda, sadece üretim faaliyetleriyle değil, aynı zamanda çalışanlarına yönelik kapsamlı yaşam alanları planlayarak modernleşme ideolojisinin somutlaştırıldığı örnekler sunulmuştur. Sümerbank'ın yürüttüğü konut üretim faaliyetleri; işçilerin sınıfsal farklılıklarına göre planlanan yerleşim düzenleri, sosyal donatı alanları, kadınların da çalışma hayatına dâhil olabilmesi için düşünülen kreşler, diğer seviyedeki eğitim yapıları, kültür ve sağlık yapıları, spor alanları ile bütüncül bir yaşam kurgusunu içermektedir. Tüm bu uygulamalar, Cumhuriyet'in yalnızca ekonomik değil, toplumsal yaşamı da dönüştürme iradesinin birer yansımasıdır (Onur ve Duggan, 2017).

Aynı dönemde Türkiye'yle birlikte Avrupa ülkelerinde de benzer kaygılarla çeşitli toplantılar ve görüşmeler yapılmaktadır. Barınma, yalnızca çatısı olan bir mekânla sınırlı görülmemiş, aynı zamanda hijyen, mahremiyet, doğayla ilişki, konfor ve sosyalleşme gibi kriterler de önem kazanmıştır. Bu nedenle 1923–1950 arasındaki konut anlayışı, hem fiziksel hem ideolojik hem de kültürel bir reform çabası olarak değerlendirilmelidir. 1933 yılında Atina'da düzenlenen Modern Mimarlık Uluslararası Kongresi'nde (CIAM IV) "İşlevsel Şehir" teması

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çerçevesinde konut alanlarına ilişkin önemli ilkeler belirlenmiştir. Bu ilkeler, ağırlıklı olarak fiziksel çevre faktörleri ve teknolojik olanaklar temelinde ele alınmıştır. Konut alanlarının planlanmasında topografya, iklim ve güneş ışığı gibi doğal faktörlerin dikkate alınması gerektiği vurgulanmıştır (Mumford, 1992: 391-417). Kentin ikamet, dinlenme ve eğlence, iş, ulaşım olarak dört işlevinin olduğundan bahsedilmiş (II. madde) ve ikamet başlığı altında (A fıkrası) yedi maddeyle (23.-29. bentler) konutların ve konut bölgelerinin nasıl olması gerektiği karara bağlanmıştır. Bu maddeler şu şekildedir:

1. İkamet alanları, topoğrafya, iklim, gün ışığı ve yeşil alanlar bakımından en iyi yerlere kurulmalıdır.
2. İkamet bölgelerinin seçimi sağlık koşulları göz önünde bulundurularak yapılmalıdır.
3. Konut tipi ve inşaat alanındaki koşullarla ilgili olarak makul yoğunluklar uygulanmalıdır.
4. Her bir konut için asgari gün ışığı alma saati koşulu getirilmelidir.
5. Ana yol kenarlarına konut dizilimi yasaklanmalıdır.
6. Yüksek apartmanların inşasında çağdaş inşaat tekniklerinden tam olarak yararlanılmalıdır.
7. Geniş açık alanların oluşturulması için yüksek apartmanlar aralıklarda konumlandırılmalıdır.

Mimarlığı bir 'uzlaşma sanatı' olarak tanımlayan Kırcı, değişen insan taleplerinin geçmişle bugün arasındaki farklılıklardan kaynaklandığını belirtmektedir. Bu durumun geçmişin doğrudan tekrarıyla değil, geçmiş deneyimlerin, kimliğin ve kolektif hafızanın çağdaş yorumlarla ele alınmasıyla aşılabileceğini belirtmiştir (Kırcı, 2018: 37). Bireylerin yaşam mekânlarını seçerken ve düzenlerken nasıl bir tavır geliştirdiklerini anlamada önemli bir anahtar sunmaktadır.

Konut ve yaşam üzerine çalışmaları olan Bozdoğan, mimarlığı 'medeniyet taşıyıcısı' olarak tanımlamıştır. Bu tanım, yalnızca kamu yapıları için değil, aynı zamanda en mahrem aile mekânı olan konutlar için de geçerlidir. Aile yaşamındaki her değişim, kültürel dönüşümlerin bir yansımasıdır (Bozdoğan, 2001: 212-216). İç mekânda kullanılan mobilyalar, renkler, desenler ve mekânsal organizasyonlar zaman içinde toplumun değişen değerlerini yansıtmaktadır.

Demir Çelik Fabrikası ile paralel gelişen Yenişehir yerleşimi, Cumhuriyet'in modern konut anlayışını, planlı şehircilik ilkeleriyle birleştiren özgün bir örnek olarak değerlendirilebilir. Yenişehir Mahallesi, erken cumhuriyet dönemi mimarisinde görülen bahçe kent (garden city) modelinin Türkiye'deki

uygulamalarından biri olarak öne çıkar. Sümerbank'ın Karabük'te üstlendiği rol yalnızca sanayi tesislerini inşa etmekle sınırlı kalmamış, aynı zamanda modern kent dokusunun ve yaşam biçiminin oluşturulmasında da belirleyici olmuştur (Onur, 2023). Kurumun bu hamiliği, Cumhuriyet'in devletçilik politikalarının kentleşme süreçlerine etkisini somut biçimde ortaya koymuştur. Bu çalışmada, Karabük Yenişehir Mahallesi özelinde Cumhuriyet döneminin konut modernleşmesi mimari, sosyolojik ve kültürel açılardan ele alınacaktır. Sanayi yerleşimi bağlamında geliştirilen bu konut üretimi, dönemin mekânsal stratejileri ile ilişkilendirilerek değerlendirilecektir.

## 2. Erken Cumhuriyet Döneminde Konut Anlayışı

Erken cumhuriyet döneminde konut yalnızca barınma amacı taşıyan bir yapı olmaktan ziyade, bireyin toplumsal konumunu, devletle olan ilişkisini ve modernleşme sürecine katılımını belirleyen bir araç olarak değerlendirilmiştir. Bu dönemde konut üretimi, tekil evlerin yanı sıra apartmanlaşma biçiminde de gelişmiştir. Ancak konutun anlamı, zamanla bireysel yaşam alanı olmaktan çıkarak finansal ve sembolik bir değere dönüşmüş; bu da mimarın rolünü yalnızca tasarımcı değil, sürecin yönlendiricisi haline getirmiştir (Koca, 2015: 21-23). Apartmanlaşma süreci sadece fiziksel bir dönüşümü değil, aynı zamanda barınma kültürünün evrimi olduğunu da ortaya koyar (Onur, 2021). Cumhuriyet'in ilanı ile birlikte geleneksel Türk evinin mekânsal organizasyonu yerini işlevsel olarak ayrılmış, modern yaşamı yansıtan plan şemalarına bırakmıştır. Bu geçişte toplumsal rollerin yeniden tanımlanması, özellikle kadınların ev içindeki ve kamusal alandaki pozisyonunun değişmesi belirleyici olmuştur (Mutdoğan, 2021: 3-7).

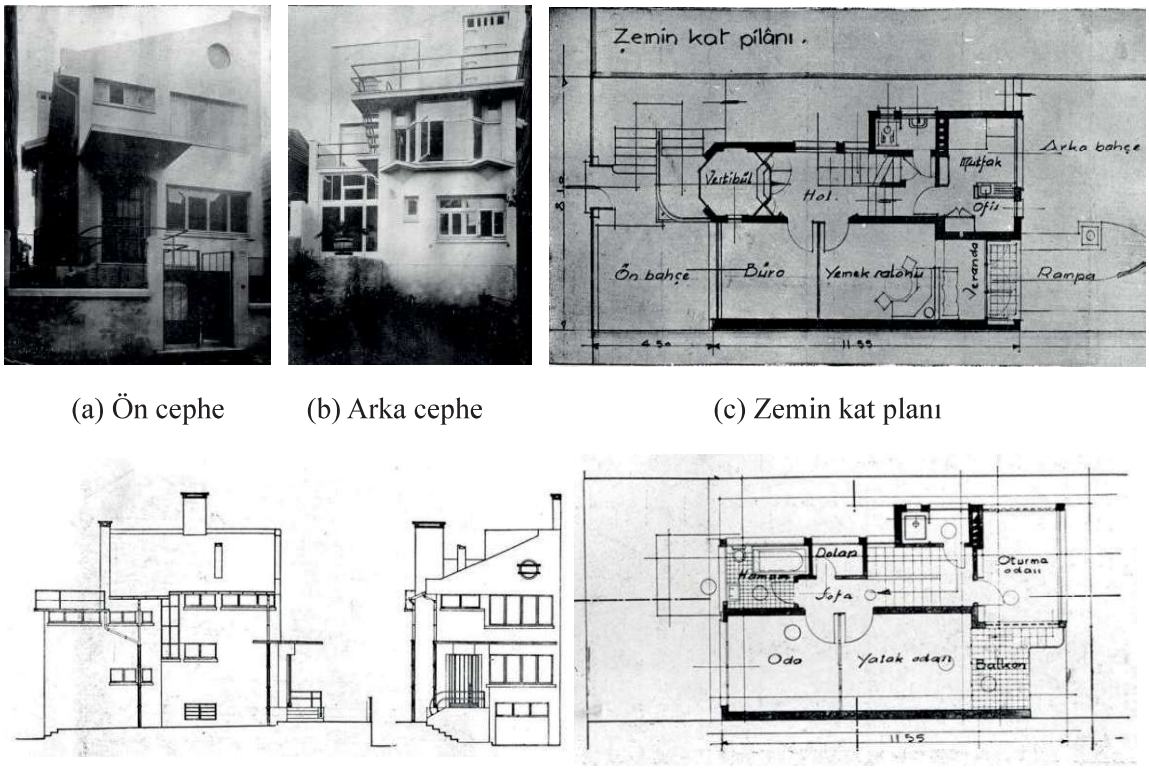
Bu dönemdeki mimari arayışlar "modernin millileştirilmesi" olarak tanımlanmaktadır. Modern mimarinin biçimsel öğeleri, yerel unsurlarla harmanlanarak ulusal bir üslup oluşturulmaya çalışılmıştır. Sedad Hakkı Eldem'in geleneksel Türk evini çağdaş plan şemalarıyla yeniden yorumlaması bu anlayışın mimari yansımasıdır. Bu sentez, modernleşmenin ithal bir kavram değil, yerli değerlerle bütünleşmiş bir süreç olduğu savını desteklemiştir (Ulubay, 2019: 389-391). Bu nedenle erken cumhuriyet dönemi konut anlayışı, sadece fiziki yapılarla değil; aynı zamanda yaşam kültürü, toplumsal rol dağılımı ve ulus kimliği inşasıyla yakından ilişkili bir modernleşme pratiği olarak ele alınmalıdır.

1920-1934 yılları arasında resmi gazete olarak çıkarılan Hâkimiyet-i Milliye gazetesinin 1930 yılındaki sayılarından birinde, dönemin mimarlıktaki modernleşme hareketleri hakkında "Şimdi, birkaç seneden beri, dünyanın her tarafında yeni asrın yeni mimarisi inkişafa başlamıştır. Genç mimarlar artık eski zihniyet ve ananeleri kırarak hakikate doğru yürümektedirler. Şayan-i

memnuniyettir ki Ankara'da yapılan bazı yeni inşaat bu mimarinin tezahüratıdır." cümleleri yer almaktadır (aktaran; Bozdoğan, 1998: 135). Asrın yeni mimarisi denilerek bahsedilen bu yapılar günümüzün betonarme yığınlarından farklı olarak rasyonalizmi ve işlevselliği bir arada görebildiğimiz yapı örnekleridir.

1935 yılında Türkiye Büyük Millet Meclisi'nin beşinci dönem açılış toplantısında da Mustafa Kemal Atatürk'ün yaptığı konuşmada şu ifadeler geçmektedir (aktaran; Tekeli, 2012: 32): "Türk'e ev bark olan her yer sağlığın, temizliğin, güzelliğin, modern kültürün örneği olacaktır." Konuşmada köy ya da şehir fark etmeksizin tüm ülkede imar çalışmalarının yürütülmesinin amaçlandığı da belirtilmiştir. Hem sağlığa hem de estetiğe vurgu yapılarak konut üretimine olan yaklaşım ifade edilmiştir.

Ülkemizde sivil mimarlık alanında yaşanan gelişimleri, 1931-1980 yılları arasında yayın hayatına devam etmiş olan Arkitekt dergisi üzerinden de takip edebilmekteyiz. Derginin ilk sayısında 1929 yılında yapıldığı belirtilen bir Sırrı Arif (Bilen) projesi 'Bekir Beyin Evi' olarak yer almaktadır (Şekil 1). "Bir mimarın yapabileceği eseri, mimar olmayan hiç kimse yapamaz." diyerek yapının tanıtımına geçen mimar, dönemin bütün konforlarının yapıda kullanıldığını, ısıtma, su ve elektrik tesisatının da bulunduğunu belirtmiştir. Bodrum katında odun ve kömürlük, çamaşırlık, kazan dairesi ve bir oda, zemin katında salon, yemek salonu, veranda ile kot farkı kullanılarak oluşturulan mutfak, birinci katında iki yatak odası, banyo, sandık odası ve yine kot farkı kullanılarak oturma alanı ve wc, çatı katında ise bir yüzeyi bir çatı arası birimleri şeklinde planlanan yapı 4 ay gibi bir sürede tamamlanmıştır (Bilen, 1931: 5-8). Özelleşmiş mekânlar ve çağdaş malzeme kullanımlarının yanında yine dönemin tasarım anlayışı olan kübik mimarinin izleri yapıda okunabilmektedir. Kot farkının da kullanıldığı görülmekte, işlevsel ilişkileri kadar grafiksel çizgileri de başarılı bir ev ortaya konmuştur.

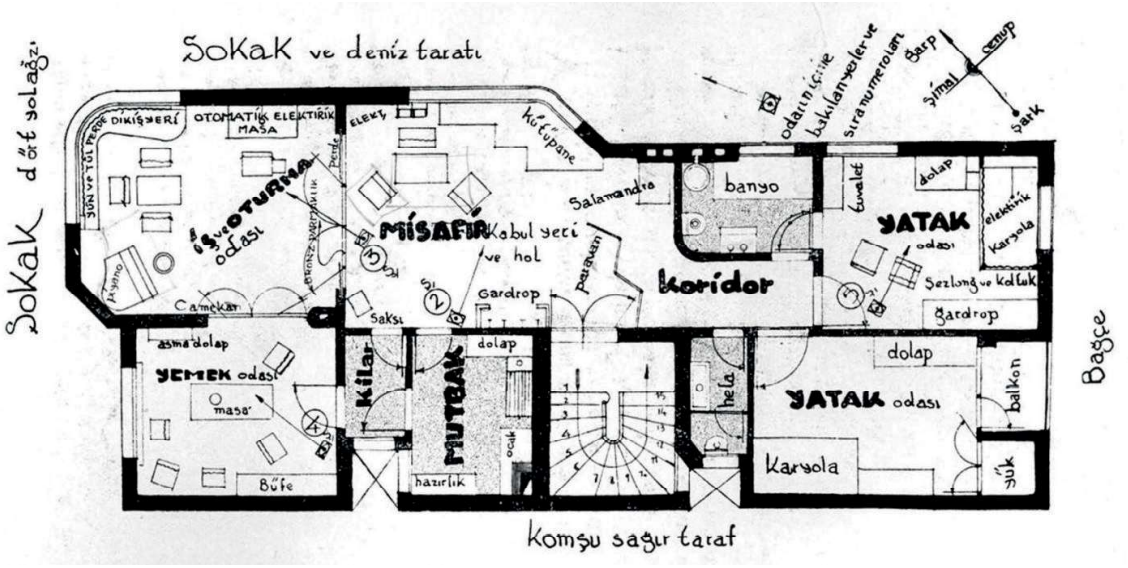



(a) Ön cephe (b) Arka cephe (c) Zemin kat planı

(d) Sol yan ve ön cepheler (e) Birinci kat planı

**Şekil 1.** Bekir beyin evine ait kat planları, cephe çizimleri ve fotoğraflar (Bilen, 1931: 5-9).

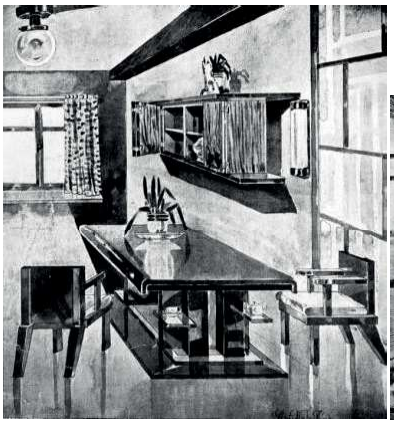
Aynı sayıda derginin de kurucularından olan Aptullah Ziya Kozanoğlu da 'Binanın İçinde Mimar' başlıklı bir yazı hazırlamıştır. Apartman hayatına dair tanımlamalar içeren yazıda, geleneksel evlerden farklı olarak özelleşmiş mekânların neler olduğu, nasıl bir hayatın bizi beklediği sorularına cevap vererek, misafirin nereye alınacağı, çalışma ve oturma odasının nasıl olacağı, yemek odası ve yatak odasının nasıl tefrişleneceğine dair detaylı bir açıklama sunulmuştur. Plan ve eskiz olmak üzere çeşitli görsellerle de anlatılmak istenilenler resmedilmiştir (Şekil 2). Yazının sonunda dönemin mimarlarının artık süslemelerle ilgilenen kişiler olmadığından, insanlara rahat, temiz ve sıhhatli yaşamlar sunan düşünürler olduğundan bahseden mimar, "Bugünün mimarı düşünür, her ihtimali görür ve yaptığı, icat ettiği eseri de kendisinden başka kimse yapamaz." diyerek mimarların detaylardan çok fikir ve düşüncelere önem verdiğinde büyük kitlelere ulaşacağını söylemiştir (Kozanoğlu, 1931: 14-20; Onur Işıkoğlu, 2019).



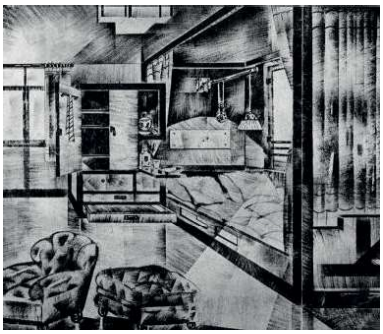

(a) Apartman kat planı



(b) Misafir odası



(c) Yemek odası



(d) Yatak odası

**Şekil 2.** Mimar Aptullah Ziya Kozanoğlu'nun apartman hayatı çizimleri (Kozanoğlu, 1931: 14-20).

Ev içi kültürün değişimi aslında Cumhuriyet'in ilanından öncesinde yaşanmıştır. İç mekânda harem-selamlık ayrımının ortadan kalkması ve mobilyalardaki dönüşümler bürokrat ve asker aileleri gibi üst sınıfın arasında görülmektedir. Evin modernleşmesi, bu kavramın Cumhuriyet'in bir yansıması olarak yaygınlaşması ve modern hayatın tüm kesimlerce erişilmesi fikriyle sunulmuştur (Bozdoğan, 2001: 212-216).

## 3. Sümerbank ve Sanayiye Bağlı Konut Üretimi

Erken cumhuriyet döneminde Türkiye'de sanayileşmeye büyük önem verilmiş ve sanayi girişimlerine yönelik önemli adımlar hızla atılmıştır. Bu

kapsamda ilk adım olarak 1923'te İzmir'de İktisat Kongresi düzenlenmiş ve Birinci Beş Yıllık Sanayi Planı uygulanmıştır. 1925'te Sanayi ve Maadin Bankası kurulmuş, 1927'de ise Teşvik-i Sanayi Kanunu ile girişimcilerin hakları güçlendirilmiştir. Ancak 1929 Dünya Ekonomik Bunalımı'nın ardından Sanayi ve Maadin Bankası tasfiye edilmiş, 1933'te sanayi için Sümerbank, madencilik için ise Etibank kurulmuştur. Sümerbank, henüz kentleşmemiş ancak gelişmeye açık yedi ayrı bölge belirleyerek[1] sanayi girişimlerine başlamıştır. Sümerbank, bu bölgeleri seçerken iklim koşulları, topografya ve yerel inşaat malzemelerine erişim gibi faktörleri dikkate almıştır. Sanayi toplumuna geçiş sürecinde, bireylerin tarım toplumundan kopmadan yeni yaşam biçimlerine uyum sağlamaları hedeflenmiştir. Bu nedenle yatay yerleşim düzeni tercih edilmiş ve bahçeli evler tasarlanarak bireylerin toprakla olan bağlarını tamamen kaybetmemeleri sağlanmaya çalışılmıştır. Bu bağlamda Karabük, ağır sanayi için seçilen bölge olmuş ve yeni kurulan devletin konut modernleşme hareketleri bu kapsamda incelenmiştir.

Sümerbank'ın sanayiye bağlı konut yerleşkeleri için hazırladığı geniş programı, Sümerbank İnşaat Fen Heyeti 1944 tarihli Arkitekt dergisinde paylaşmışlardır. Bu bağlamda konut bölgelerinin fabrika sahasına yakın olmasının; işçilerin uzak mesafelerden gelerek yorgun bir halde çalışmaya başlamaları nedeniyle ortaya çıkan randıman düşüklüğünün önüne geçilmesi, evlerde bütün ihtiyacı karşılayacak sıhhi tesisat bulunduğu için işçi ailelerinin temiz ve rahat bir şekilde yaşaması ve bunun da kişilerin sağlık durumlarında etkili olması, her eve kendisine ait asgari 250 $m^2$ bahçe bulundurularak işçilerin boş zamanlarında toprakla uğraşmasının kişilere hem iktisadi hem de sağlıklı bir beden olanağının sağlanması, evlerin içinde ve dışında hijyen ve estetik olanağı sunulduğundan işçi ailelerinin toplumsal seviyelerinin gün geçtikçe yükselmesi ve fabrikalara ait spor sahaları, toplanma ve sinema salonları gibi alanlarla işçi ailelerinin yaşamlarında faydalı değişiklikler görülmesi gibi faydalar sıralanmaktadır (Sümerbank İnşaat Fen Heyeti, 1944: 9). Böylece modernleşme hareketleri önce konuta, oradan aileye, en son olarak da topluma etki edecek ve işçi ailelerinin fabrikaya aidiyetleri sağlanarak kalıcı bir yaşam şekli meydana gelecektir.

İşçi mahallelerinin kuruluşu için vaziyet planının hazırlanması, yapılacak bina tiplerinin tespiti ve projelerinin izahı, binaların inşası ve fabrika idarelerine teslimi, iskâna verilen binaların bakım işleri olmak üzere dört ana adım uygulanmıştır. Yerleşkelerde işçi evleri, kadın ve erkek bekâr pavyonları, ilkokul, hal, kreş ve çocuk bahçesi, spor sahaları, genel banyo ve işçi pavyonları

1 Kayseri Bez Fabrikası (1935), İzmit Kâğıt Fabrikası (1936), Ereğli Bez Fabrikası (1937), Nazilli Bez Fabrikası (1937), Bursa Merinos Fabrikası (1938), Gemlik Suni İpek Fabrikası (1938), Karabük Demir-Çelik Fabrikası (1939), Malatya Bez Fabrikası (1939).

yer alacak şekilde planlamalar yapılmıştır. Burada işçi evlerinin inşasında dikkat edilen durumlar şu şekilde sıralanabilmektedir:

1. Yerinde temini mümkün olan inşaat malzemesinden azami derecede istifade edilmesi (Kayseri-taş),
2. Arazide yer altı su seviyesinin yüksek olması halinde bodrumsuz binalar, yer altı suyu aşağıda olması halinde kesinlikle bodrum katı olan binalar yapılması,
3. Rutubetli bölgelerdeki evlerin mümkün olduğu kadar iki katlı inşa edilmesi (Ereğli),
4. Sahanın geniş olması durumunda tercihen sıra evler (Karabük sıra evleri), dar olması durumunda blok apartmanlar inşa edilmesi (Hereke işçi apartmanı).

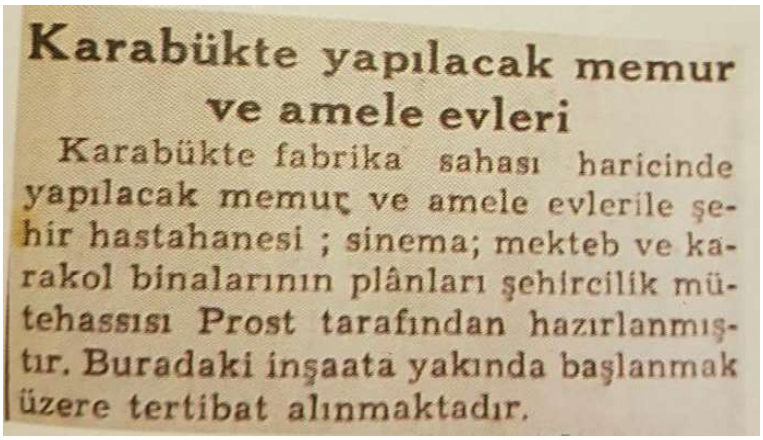
Vaziyet planında yapıların yerleştirilmesinde de yine bir program söz konusudur. Burada dikkat edilen yönler Cumhuriyet'in modernleşme hareketlerinin özünü içermektedir. Bu çalışmaların ülkenin büyük şehirlerinde değil taşrada uygulanması da ayrıca dikkat çekici bir hamledir. Tarım toplumundan sanayi toplumuna geçişte işçilerin değişime adapte olma süreci hızlandırılmış, modern toplum oluşumunun tohumları sanayiye bağlı konut yerleşkelerinin planlama sürecinde atılmıştır. Planlamada dikkat edilecek hususlar şu şekilde listelenmiştir (Sümerbank İnşaat Fen Heyeti, 1944: 10-13):

1. İşçi evlerinin konumlandırılmasında işçi sınıfları arasındaki farka dikkat edilecektir. Çevre köylerden fabrikaya çalışmaya gelecek işçilere ait pavyonlar mahallenin mümkün olduğu kadar kuytu bir yerinde inşa edilecektir.
2. Bekâr pavyonlarının mahallenin evli işçilere ait binalarından ayrı ve imkân dâhilinde fabrikaya yakın bir yerde inşasına dikkat edilmelidir.
3. Mevcut ilkokulların fabrikalara uzak olduğu ya da işçi çocuklarının fazla olduğu bölgelerde işçi mahallesinin uygun bir yerinde ihtiyacı karşılayacak şekilde ilkokul yaptırılmakta ve gerekli görülmesi halinde ortaokul inşası için ilkokul civarında boş arsa bırakılmalıdır.
4. İşçi ailelerinin beslenme ve giyim ihtiyaçlarının ucuz ve temiz malzeme temini için işçi mahallelerinde birer hal binası inşa edilmelidir.
5. Küçük çocuklu kadın işçilerin çalıştıkları sırada çocuklarının bakılması için her işçi mahallesinde bir kreş ve çocuk bahçesi kurulmalıdır.
6. İşçilerin spor ihtiyacının giderilmesi için fabrika sahasında ve işçi mahallesinin çeşitli yerlerinde tenis, voleybol sahaları oluşturulmaktadır.

7. Her işçi evinde banyo bulunmasına rağmen bazı zorunlu hallerde işçi mahallesinin uygun yerlerinde hamam yaptırılması gerekebilmektedir.

Bu dönemin konut politikaları yalnızca mekânsal düzenlemeleri değil, aynı zamanda ideolojik bir kurguyu da içermiştir. Ulus-devlet inşasının bir parçası olarak modern konutlar, yurttaşın yeni yaşam tarzına hazırlanmasında önemli rol oynamıştır. Devletin doğrudan konut üretiminde rol almasa da, yönlendirici aktör olarak mimari söylemi şekillendirdiği ve dönemin konut pratiğini belirlediği açıktır. Karabük'te Sümerbank'ın hamlelerinin de kentleşme politikalarında önemli bir etkisi olmuştur. Yenişehir Mahallesi'nin kentsel gelişimi, hem dönemin mimarlık anlayışını hem de toplumsal yapının mekâna nasıl yansıdığını göstermesi açısından da önemlidir. Yenişehir Mahallesi, Karabük'ün ve Türkiye'nin modern kentleşme tarihinde önemli bir noktasıdır. Cumhuriyet'in modern kent planlama vizyonu, DÇİ'nin kuruluş sürecinde işçiler için konut inşasını da içermiştir. 1938'de yaklaşık 400 tuğla işçisi ve İngiliz mühendisler için barınma sorunu ortaya çıkmış, geçici çözümler üretilmiş, fabrika arazisine tahta evler inşa edilmiş ancak zaman geçtikçe fabrika büyümeye başlamış ve kalıcı bir yerleşim politikası ihtiyacı belirginleşmiştir.

1938 yılında ünlü şehir plancısı ve mimar Henri Prost'tan Yenişehir Mahallesi'nin planları hazırlanması istenmiştir. Bugün Prost'un orijinal planı arşiv yangınları ve sel felaketleri gibi nedenlerle hasar gören arşiv nedeniyle mevcut değildir; ancak çizim için kendisine yapılan ödemeyle ilgili resmi yazışmalar ve gazete küpürleri (Şekil 3) bulunmaktadır. Mahalle, Henri Prost'un bahçe kent ilkelerine dayanan planlamasıyla, farklı gelir ve görev statüsündeki çalışanlar için ayrı ayrı konut tipolojileri içerecek şekilde tasarlanmıştır (Çabuk, Demir ve Gökyer, 2016: 23-24). Genel müdür, mühendis, memur ve işçi lojmanları gibi farklı kullanıcı gruplarına hizmet eden bu konutlar, sosyal hiyerarşiyi mekânsal düzlemde yansıtmış; konutlar arası konum, büyüklük ve donatı farkları bu durumu açıkça ortaya koymuştur.



**Karabükte yapılacak memur ve amele evleri**

Karabükte fabrika sahası haricinde yapılacak memur ve amele evlerile şehir hastahanesi ; sinema; mekteb ve karakol binalarının plânları şehircilik müteahassısı Prost tarafından hazırlanmıştır. Buradaki inşaata yakında başlanmak üzere tertibat alınmaktadır.

**Şekil 3.** 18 Ekim 1938 tarihli gazete haberi.

## 4. Karabük Yenişehir Bölgesi

Karabük, Türkiye'nin Karadeniz Bölgesi'nin Batı Karadeniz Bölümü'nde yer alan, kuruluşu ve gelişimi mimarlık tarihi açısından dikkat çeken bir ildir. İdari olarak günümüzde toplamda 6 ilçe, 80 mahalle ve 277 köyden oluşmaktadır (TÜİK, 2025). 1930'lu yıllarda Karabük, Türkiye'nin sanayileşme çabalarının önemli merkezlerinden biri hâline gelmiştir. Erken cumhuriyet döneminde, sanayi işletmelerinin yaygınlaştırılması yönündeki ulusal hedefler doğrultusunda Demir Çelik İşletmeleri'nin (DÇİ) temelleri atılmış ve bu durum kentin gelişimini hızlandırmıştır. O dönemde Karabük, Safranbolu ilçesine bağlı Öğlebeli isimli küçük bir köy konumundaydı. DÇİ'nin kurulmasıyla birlikte bölgenin nüfusu ve ekonomik canlılığı artmış, Karabük 1941 yılında Safranbolu'ya bağlı bir bucak olmuş, 3 Mart 1953 tarihinde ise 6068 sayılı Kanun ile ilçe statüsü kazanmıştır (T.C. Resmi Gazete, 1953). 6 Haziran 1995 tarihinde ise 22305 sayılı Kanun ile Türkiye'nin 78. ili ilan edilmiştir (T.C. Resmi Gazete, 1995).

Yenişehir'deki konutlar yalnızca yapı ölçeğinde değil, mahalle bütününde işleyen bir sistemin parçası olarak düşünülmüştür. Evlerin cephe oranları, iç mekân organizasyonları, bahçeye yönelimleri ve doğal aydınlatma ilkelerine uygunlukları dönemin sağlıklı ve modern yaşam ideallerine hizmet edecek şekilde tasarlanmıştır. Mahallede bulunan konut harici tüm birimlerle, Cumhuriyet'in hedeflediği sosyalleşme ve kamusal kültürün inşası amacıyla da düzenlenmiştir (Onur, 2021: 675-677). Sümerbank İnşaat Fen Heyeti, konut alanlarının planlamasını detaylı olarak gerçekleştirirken, çalışanların sosyal ve kültürel ihtiyaçlarını gözetmiş ve modern yaşamın gereklerini yerine getirecek şekilde altyapıyı oluşturmuştur. Bu çerçevede Karabük'te Yenişehir Mahallesi'nde de işçi evleriyle birlikte eğitim yapıları, çocuk bahçeleri, spor alanları, sinema, lokaller, cami, misafirhane ve umumi banyolar gibi sosyal donatılar bulunmuştur (Şekil 4).



(a) Sinema (b) Sosyal bina (c) Stadyum

**Şekil 4.** Yenişehir'de bulunan çeşitli yapı örnekleri.

Yenişehir'deki konutlarda modern mimari üslubu benimsenmiş, sosyal sınıflara göre işçi pavyonlarından yönetici konutlarına kadar bir hiyerarşi oluşturulmuştur. Tek işçi yurtları, aile konutlarından ayrı inşa edilmiştir. Konutların tasarımı, işçilerin konforunu artırmaya ve sosyal yaşamlarını desteklemeye odaklanmıştır. Ayrıca bahçeli evler, ailelerin tarımsal faaliyetlere devam etmelerine ve kent yaşamına adapte olmalarına olanak sağlamıştır. Karabük'teki inşaat faaliyetleri 1936'da 6 adet kübik tarzda apartman binası ve 150 yataklı işçi yurdu ile başlamış; 1939-1948 yılları arasında 920 konutluk bir yapılaşmaya ulaşılmıştır (Şekil 5). Altyapı, yeşil alan, kanalizasyon ve su tesisleri gibi unsurlar da planlamaya dâhil edilmiştir. Yenişehir'de merkezi ısıtma sisteminin kullanılması, dönem için önemli bir yenilik olmuştur.

Genel Müdür Evleri (Şekil 5.a) 220 metrekarelik planlanmış olup hem dubleks hem de müstakil konutlardır. Yalnızca 3 adet bulunan bu yapılar, üst düzey fabrika yöneticilerinin konaklaması için yapılmıştır. Geniş bahçeleri bulunmaktadır. Kübik planlanan yapıların üst katında bir odaları kolonlar üzerinde taşıtılarak ileri çıkartılmıştır. Dört basamakla zemin kata ulaşılmakta olup, çıkmaların altında kalan alanlar veranda olarak kullanılmaktadır. Giriş kapıları üzerinde yine çıkmanın sahip olduğu gibi köşeli kolonlarla taşıtılan saçaklar uzatılmıştır.

Müdür evleri (Şekil 5.b) 140 metrekarelik planlanmış, dubleks konutlardır. Beş adet ikiz, üç adet sıra evden oluşan bu konutlar merkezi ısıtma sistemine bağlıdır ve bahçeleri diğer evlere göre daha büyüktür. Girişleri verandadan olup, alt katlarında oturma odası, yemek odası ve mutfak, üst katlarında yatak odaları ve banyo bulunur. Genel müdür evlerinde olduğu gibi, verandanın üzerinde kolonlar ile taşınan çıkmaları bulunmaktadır.

Memur evleri (Şekil 5.c, 5.d) ilk yapılan evler arasındadır. Öncelikle üst düzey memurların oturması için yapılan bu evler, ikiz evler olarak düşünülmüş ve tek katlı yapılmıştır. 90, 95 ya da 100 metrekarelik tipleri vardır ve merkezi ısıtma sisteminden faydalanmışlardır. Aynı mekânlara sahip olan Memur Evleri, cephede bir odanın ileri çıkartılmasıyla farklı kütlesel hareketler ile farklılaşmaktadırlar.

Memur Apartmanları (Şekil 5.e) iki odalı olarak planlanmış olup, oturma odası haricinde yemek odası için de yer ayrılmıştır. Her katta iki daire olmak üzere, iki katta dört daire olarak çözülmüştür. Yatak odaları ile banyo oturma kısmından bir hol ile ayrılır. Cephede yuvarlak pencere kullanımı ile birlikte Fransız balkonu ve balkonların içeri çekilmesiyle kütlesel hareket görülmektedir.

Bekâr Lojmanlarının (Şekil 5.f) yapımına 1953 yılında başlanmış olup, üst düzey memur ve mühendislerden bekâr olanlar için düşünülmüştür. Bu konutlar bekârlar için olduğundan metrekareleri çok düşük tutulmuş (18 ve 27

metrekare arası) ve mutfak konulmamıştır. Bu sebeple sosyal tesise yakın iki çeşit beş bina olarak konumlandırılıp, yemek ihtiyacını yakından gidermeleri sağlanmıştır.



(a) Genel müdür evleri (b) Müdür evleri (c) Memur evleri

(d) Memur evleri (e) Memur apartmanları (f) Bekâr lojmanları

(g) Çamlık evleri (h) Beyaz apartmanlar (i) Kübanalar

**Şekil 5.** Yenişehir bölgesinden çeşitli yapı örnekleri.

Çamlık evleri (Şekil 5.g) 1945 yılına tarihlenen, ustabaşılar için ikiz evler olarak düşünülmüş, üç ya da dört odalı olarak planlanmış, tek katlı evlerdir. Memur evleri gibi, sahip oldukları mekânlar aynı olsa da farklı birimlerin ileri çıkartılmasıyla kütle hareketi sağlanarak farklı tipte evler oluşturulmaya çalışılmıştır. Girişleri verandadan olan Çamlık evleri, diğer işçi evlerine nazaran daha büyük (75 metrekare) yapılmıştır. Ancak merkezi ısıtma sistemine bağlı değillerdir. Zaman içinde bir oda ve bir de ıslak hacim eklenerek evler büyütülmüştür.

Beyaz Evler (Şekil 5.h), her katta iki daire bulunan dört katlı, bir bodrum katı olan, her binada sekiz daire bulunan apartmanlardır. Konut stokunun yetersiz kalması nedeniyle barınma sorunu sınırlı arazide çok katlı bina yaparak çözülmeye çalışılmıştır. Ön cephelerinde saçaklı bir giriş ve giriş aksını

tanımlayan düşey olarak cephe boyunca süren betonarme öğeler mevcuttur. Günümüzde Karabük Üniversitesi tarafından lojman olarak kullanılmaktadır.

Kübana Evleri (Şekil 5.i), 1959 yılında tasarlanmış, her katta iki dairesi olan dört katlı, sekiz daireli, en üstteki iki dairesi dubleks olan apartmanlardır. Bu tarihe kadar 3 katın geçilmediği yerleşim alanındaki en yüksek binalar da Kübana Evleri olmuştur. Cephede mozaik kaplamaları, cephe boyunca devam eden balkonları, yere kadar pencereleri bulunmaktadır. Daha önceki konutlarda yapılar arası mesafeler daha fazlayken, Kübana Evleri yerleşkedeki diğer konutlara göre daha sıkışık inşa edilmiştir.

Tüm zorluklara rağmen (savaşlar, ekonomik krizler) erken cumhuriyet döneminde toplum ve birey odaklı kararlar önceliklendirilmiş; sanayileşme hamleleriyle birçok bölgede modern yerleşim planları uygulanmıştır. Bu çalışma, Karabük Yenişehir'deki konut üretimini, dönemin modernleşme ilkeleri çerçevesinde ele almakta, tarihi, mimari, sosyolojik ve kültürel değerlerin analiz edilmesini ve nicel verilerle desteklenmesini amaçlamaktadır.

Yenişehir'in fiziksel dokusu kadar, mahalle sakinlerinin gündelik yaşam ritmi de bu planlamanın bir parçasıdır. Evlerin plan tipolojileri, yalnızca teknik ve estetik ölçütlerle değil; ailenin yapısı, kadın-erkek ilişkileri, mahremiyet, sosyalleşme ve kamusal-kentsel ilişki dengesi üzerinden şekillenmiştir. Bu açıdan bakıldığında Yenişehir, sadece bir yerleşim alanı değil; cumhuriyet ideolojisinin mekânda vücut bulmuş biçimidir.

## 5. Sonuç ve Değerlendirme

Bugün Yenişehir Mahallesi, modern konut alanı olarak önemini korumaktadır ve 1996 yılında sit alanı ilan edilmiştir. Fabrika alanının kuzeyinde ve Karabük Kent Ormanı'nın eteklerinde yer alan Yenişehir, sosyal, kültürel ve ekonomik bir merkez olma işlevini sürdürmektedir. Ayrıca, Sümerbank tarafından belirlenen yedi bölge arasında orijinal işleviyle hâlâ varlığını sürdüren tek bölge olma özelliğine sahiptir.

Yenişehir, Henri Prost'un planlama vizyonuyla yalnızca fiziksel çevre açısından değil; sosyal yaşamın örgütlenmesi bakımından da örnek teşkil eden bir yerleşim olmuştur. Konutların fiziksel özelliklerinden mahalle bütünündeki donatılara kadar her unsur, bireyleri modern yaşam biçimine hazırlamak amacıyla kurgulanmıştır. Bu yaklaşım, dönemin modernleşme söyleminin sadece ideolojik düzeyde kalmayıp mekânsal stratejilerle hayata geçirildiğini göstermektedir.

Sümerbank'ın bu süreçteki rolü ise sadece yatırımcı olmakla sınırlı kalmamış, aynı zamanda kullanıcı davranışlarını şekillendiren bir rehberlik fonksiyonu üstlenmiştir. Karabük'teki konut politikası, mimarların geleneksel

Türk evini yeniden yorumlayarak modern ile millî olanı harmanlamaya çalıştıkları dönemde hayata geçirilmiştir. Sedad Hakkı Eldem'in ve diğer mimarların çalışmalarıyla eşzamanlı olarak Karabük'te uygulamaya dökülen bu anlayış, erken Cumhuriyet döneminin kentleşme vizyonunu başarılı bir şekilde yansıtmaktadır.

Günümüzde konut, farklı sosyal sınıfların taleplerine göre şekillenen, sembolik ve ekonomik anlamlar yüklenen bir varlık haline gelmiştir. Ancak Karabük Yenişehir örneği, Türkiye'de modernleşmenin başlangıcında konutun nasıl ulus inşa sürecinin bir parçası haline geldiğini anlamak için kritik bir tarihsel örnektir. Dolayısıyla bu çalışma, mimari üretimin yalnızca fiziksel çevre değil, aynı zamanda ideolojik ve sosyolojik bağlamlarda da ele alınması gerektiğini vurgulamaktadır.

Modernleşme, sosyal ve kültürel değişimlerin yanı sıra, mimari yapının dönüşümüne de zemin hazırlamıştır. Mimari yapı, yalnızca biçimiyle değil, kullanıcının ihtiyaçlarını karşılamasıyla değer kazanır. Erken cumhuriyet döneminde, mimarlık alanındaki yenilikler sadece estetik değil, fonksiyonellik ve kullanıcı ihtiyaçlarına yönelik çözümleri de içermektedir. Cumhuriyet'in ilanıyla birlikte Türkiye'de toplumsal yapıda önemli değişimler yaşanmış ve bu değişimler konut alanında da kendini göstermiştir. Teknolojik ilerlemeler sayesinde, 1930'lu yıllarda inşa edilen bu yapılarda sıhhi tesisat, elektrik ve merkezi ısıtma gibi çağdaş donatılar yer almıştır. Bu dönemde hayata geçirilen projeler, kullanıcı ihtiyaçlarının etkin bir şekilde karşılanmasını hedefleyerek, mimariyi günlük yaşamla iç içe geçmiş bir disiplin olarak tanımlamıştır. Bu özellikler, o dönemin konut üretim anlayışında modernleşmenin açık göstergeleri olmuştur. Bu durum, özellikle Karabük Yenişehir bölgesi gibi, sanayi tesislerinin çevresinde oluşan konut alanlarında daha belirgin olarak ortaya çıkmaktadır.

Yenişehir Mahallesi'nde geliştirilen konutlar, erken cumhuriyet döneminin modernleşme hedefleri doğrultusunda, fonksiyonel, insan merkezli ve kullanıcı ihtiyaçlarına duyarlı şekilde tasarlanmıştır. Bu tasarım anlayışı, bireylerin yeni sanayi toplumuna adaptasyonunu kolaylaştırmış ve sosyal yapının sürekliliğini sağlamıştır. Sonuç olarak, bu tür konut yerleşimlerinde kullanıcı taleplerinin doğru analiz edilmesi, kent planlama ve konut üretimi süreçlerinde büyük önem taşımaktadır. Gelecekte yapılacak benzer çalışmalarda, konut kullanıcılarıyla daha kapsamlı anket ve gözlem çalışmaları yapılarak mekânsal organizasyonun toplumsal etkilerinin daha ayrıntılı biçimde incelenmesi önerilmektedir.

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# BİR KONUT POLİTİKASI ÖNERİSİ OLARAK YATAY MİMARİ: KARABÜK ÖRNEĞİ[11]

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## ÖZET

Kent dokusunun insan ölçeğinde biçimlendirilmesini esas alan ve doğal çevreyle bütünleşik bir yapılaşma modeli sunan yatay mimari yaklaşımı, yaşam kalitesini artıran, insan ekolojisiyle uyumlu ve sosyal etkileşimi teşvik eden bir kentsel planlama anlayışı olarak öne çıkmaktadır. Bu çalışma, günümüz kentlerinde yaygınlaşan rant odaklı ve denetimsiz büyüme pratiklerine karşı bir alternatif olarak yatay mimari temelli konut politikasını ele almakta; söz konusu yaklaşımın kentsel mekân ve toplumsal yaşam üzerindeki etkilerini Karabük ili örneği üzerinden irdelemektedir. Çalışmada, Türkiye ve Karabük ilinin yatay mimari potansiyeli TÜİK verileri üzerinden incelenmiştir. Buna ek olarak, araştırma kapsamında erken Cumhuriyet dönemi mimari anlayışının nitelikli bir temsilcisi olan Yenişehir yerleşimi ile

[11] Bu çalışma, Karabük Üniversitesi Kamu Politikaları Araştırma ve Geliştirme Merkezi Koordinatörlüğü (KAPGEM) bünyesinde oluşturulan *"Kentleşme Politikaları Masası"* raporundan üretilmiştir. Karabük Üniversitesi rektörü ve KAPGEM koordinatörü Prof. Dr. Fatih KIRIŞIK'a katkılarından dolayı teşekkür ederiz.

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1970'li yıllarda oluşturulan 5000 Evler yerleşim alanı analiz edilmiştir. Bu iki bölge üzerinde gerçekleştirilen mekânsal analizler sonucunda, yatay mimari anlayışının kentsel doku bütünlüğünü güçlendirdiği, çevresel uyumu desteklediği ve sosyal yaşam üzerinde olumlu etkiler ürettiği tespit edilmiştir. Elde edilen bulgular doğrultusunda, yatay mimari temelli konut politikalarının güncel kentsel koşullar çerçevesinde yeniden ele alınması ve yerel yönetimler tarafından uygulanabilir planlama ve tasarım stratejilerinin geliştirilmesi gerektiği sonucuna ulaşılmıştır.

**Anahtar Kelimeler:** Kentsel planlama, kentsel tasarım, yatay mimari, Karabük

## 1. GİRİŞ

Literatürde 21. yüzyıl, kentleşme olgusunun tarihte benzeri görülmemiş bir hız ve kapsamda gerçekleşmesi nedeniyle sıklıkla "kentsel çağ" kavramı ile tanımlanmaktadır (Gürboğa, 2024). Bu tanımlamayı destekleyen nicel göstergeler, Dünya Bankası verilerine göre 2022 yılı itibarıyla dünya nüfusunun %56,8'inin kentsel alanlarda yaşadığını ve yaklaşık 4,54 milyar insanın kentlerde ikamet ettiğini ortaya koymaktadır (Dünya Bankası, 2024). Küresel ölçekte yapılan projeksiyonlar, 2050 yılına gelindiğinde dünya nüfusunun yaklaşık üçte ikisinin kentlerde yaşayacağını öngörmekte; bu durum, yaklaşık altı bin yıllık kentleşme tarihinin en yoğun dönemine girildiğini göstermektedir. Söz konusu eğilim, yüzyılın sonuna doğru insanlığın büyük ölçüde kentlerde yaşayan bir topluluk hâline dönüşeceğine işaret etmektedir (Wilson, 2024).

Türkiye özelinde değerlendirildiğinde, 2002–2022 yılları arasında kentsel nüfusun 44,2 milyondan 65,4 milyona yükseldiği görülmektedir. Aynı zaman diliminde kentsel nüfus oranı %66 seviyesinden 2023 yılı itibarıyla %77'ye ulaşmıştır. TÜİK verilerine göre 2023 yılında il ve ilçe merkezlerinde yaşayan nüfus 80 milyon 7 bin 258 kişi olarak kaydedilmiştir (TÜİK, 2025a). Adrese Dayalı Nüfus Kayıt Sistemi'nin 2024 yılı sonuçları ise nüfusun %93,4'ünün il ve ilçe merkezlerinde ikamet ettiğini göstermektedir. Bu veriler, Türkiye'nin demografik yapısının belirgin biçimde kentleşme ekseninde şekillendiğini ortaya koymaktadır. Bununla birlikte, bir milyonun üzerindeki kentsel alanlarda yaşayan nüfusun oranının %29,6'dan %38,1'e yükselmesi, kentleşme sürecinin yalnızca sayısal artışla sınırlı kalmadığını; mekânsal olarak da büyük ölçekli kent merkezlerinde yoğunlaştığını göstermektedir. Bu bağlamda, Türkiye'de kentleşmenin giderek metropoller etrafında biçimlendiği ve nüfusun büyük kentlerde daha yoğun bir şekilde toplandığı söylenebilir. 2050 yılına ilişkin öngörüler, Türkiye'de nüfusun yaklaşık %95'inin kentsel alanlarda yaşayacağını ortaya koymaktadır (ÇŞİDB, 2024). Bu doğrultuda, kentleşme dinamikleri ve kentsel yönetim yaklaşımları, kamu politikalarının geliştirilmesi ve uzun vadeli planlama süreçlerinde öncelikli araştırma ve uygulama alanları arasında değerlendirilmelidir.

Günümüzde büyük kentlerde yaşam alanları giderek küçülmekte ve belirli merkezlerde yoğunlaşma eğilimi göstermektedir. İstihdam olanakları ile sosyal ve kültürel etkinliklerin odaklandığı sınırlı kentsel bölgeler, artan talep nedeniyle daha yüksek bir nüfus yoğunluğuna

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maruz kalmaktadır. Kısıtlı alanlarda mümkün olan en fazla sayıda bireyin barındırılması, kentsel yoğunlaşmayı kaçınılmaz hale getirmekte; bu durum yapılı çevrenin baskınlığını artırarak kent silüetinin olumsuz yönde değişmesine neden olmaktadır. Artan yapılaşma karşısında kentsel yeşil alanların giderek azalması, ekolojik dengeyi tehdit eden önemli bir sorun olarak öne çıkmaktadır. Bununla birlikte, yapıların dikey yönde çoğalması güneşlenme, doğal havalandırma ve rüzgârdan yararlanma gibi çevresel faktörlerin etkin kullanımını sınırlamaktadır. Doğal çevreyle ilişkisi zayıflayan ve toprakla bağını koparan bireylerin yaşadığı kentsel ortamlar, toplumsal yalnızlaşmayı derinleştirmekte; komşuluk ilişkilerinin zayıflamasına yol açmaktadır. Bu bağlamda, nüfusun ve çalışma alanlarının kentsel mekân içinde daha dengeli bir biçimde dağıtılması büyük önem taşımaktadır. Böyle bir yaklaşım, aynı zamanda ulaşım kaynaklı sorunların azaltılmasına da katkı sağlayabilir. 2050 yılına ilişkin öngörüler, Türkiye'de nüfusun yaklaşık %95'inin kentsel alanlarda yaşayacağını ortaya koymaktadır. Bu nedenle, kentleşme dinamikleri ve kentsel yönetim süreçleri, politika üretimi ve uzun vadeli planlama çalışmalarında öncelikli başlıklar arasında değerlendirilmelidir.

Yatay mimari; az katlı yapılaşmayı esas alan ve her ailenin sağlıklı, nitelikli bir yaşam alanına sahip olmasını hedefleyen bir planlama yaklaşımıdır. Bu anlayış yalnızca bir konut üretim modeli değil, aynı zamanda sosyal, mekânsal ve çevresel açıdan sürdürülebilir bir yaşam biçimi sunmaktadır. Yatay mimari çerçevesinde, bireylerin ihtiyaçlarına duyarlı ve esnek mekânsal düzenlemeler yapmak, mahalle ölçeğinde sosyal ilişkileri yeniden canlandırmak ve komşuluk bağlarının güçlenmesi yoluyla toplumsal dayanışma kültürünü desteklemek daha olanaklı hale gelmektedir. Bu bağlamda çalışmanın izleyen bölümünde, bir yapılı çevre üretim politikası olarak yatay mimari anlayışı önce kavramsal açılımıyla ele alınacak, daha sonra yatay mimariye ilişkin planlama stratejileri Karabük ili özelinde analiz edilecektir.

## 2. KAVRAMSAL ÇERÇEVE

Türkiye'de kültürel miras niteliği taşıyan kentlerin yeterli düzeyde korunamadığı yönündeki değerlendirmeler, uzun süredir kamusal ve akademik tartışmalarda dile getirilmektedir. Özellikle İstanbul örneğinde görüldüğü üzere, birçok kent geçmişte sahip olduğu özgün mekânsal karakterini ve kolektif bellekte yer eden kentsel siluetini büyük ölçüde yitirmiştir. Kentlerde yaşanan bu dönüşümün olumsuz sonuçları, merkezi yönetim tarafından da kabul edilmiş; bu doğrultuda yeni bir şehirleşme anlayışının geliştirildiği ifade edilmiştir. Söz konusu yaklaşım, "yatay mimari" kavramı çerçevesinde tanımlanmaktadır. Ancak bu kavram, her ne kadar mimar Turgut Cansever'in savunduğu "yatay şehircilik" yaklaşımıyla benzer çağrışımlar taşısa da, kuramsal arka planı ve uygulama biçimi açısından ondan ayrışmaktadır. Cansever'in yaklaşımında yatay şehircilik; her ailenin toprağa yakın, 1–2 katlı müstakil konutlarda ve kendine ait bir yaşam alanı içerisinde hayatını sürdürmesini esas alan bir kentsel düzen önerisi olarak ele alınmaktadır.

Bu anlayış, yalnızca mekânsal bir yerleşim modeli değil, aynı zamanda belirli bir yaşam kültürünün ve toplumsal düzenin yansıması olarak kurgulanmıştır. Yatay mimari; genellikle bir parsel üzerinde tek bir hanenin ikamet ettiği, kentsel ölçekte daha geniş alanlara yayılan ve çoğunlukla bir ya da iki katlı, bahçeli konutlardan oluşan bir yerleşim düzeni olarak

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tanımlanabilir (Düzenli, 2016). Her ne kadar yatay mimari kavramı Türkiye'de son yıllarda daha görünür hâle gelmiş olsa da, kentlerin nasıl biçimlendirilmesi gerektiğine ilişkin tartışmalar tarihsel olarak oldukça köklüdür. Özellikle 19. ve 20. yüzyılın şehir plancıları, hızlı nüfus artışıyla ortaya çıkan sağlıksız ve düzensiz kentleşme koşullarına çözüm ararken, "ideal kentin nasıl inşa edilmesi gerektiği" sorusu etrafında farklı yaklaşımlar geliştirmiştir. Bu süreçte öne çıkan temel tartışma başlıklarından biri, kentlerin dikey yapılaşma mı yoksa yatay yerleşim modeli üzerinden mi şekillendirilmesi gerektiği olmuştur.

Modern mimarlığın öncü isimlerinden Le Corbusier, kentsel projelerinde ağırlıklı olarak yüksek yapıları tercih etmiş ve mevcut kent dokularının yeterli yoğunluğa sahip olmadığını ileri sürmüştür. Le Corbusier'e göre, eski yapı stokunun ortadan kaldırılarak, park alanları ve geniş ulaşım aksları arasında konumlanan, cam ve çelikten oluşan, geometrik düzende yerleştirilmiş yüksek yapıların inşa edilmesi gerekmektedir (Corbusier, 1999). Bu yaklaşımda dikey yapılaşma, hem arazi kullanımını daha verimli hâle getirmekte hem de birim alana düşen nüfusun sağlıklı biçimde artırılmasına olanak tanımaktadır. Ayrıca konut ve çalışma alanları arasındaki mesafelerin kısalmasıyla ulaşım sürelerinin azalacağı, buna karşılık kent içinde daha fazla yeşil alan üretilebileceği savunulmaktadır.

Le Corbusier'in bu yoğunluk odaklı yaklaşımına karşılık olarak, Howard, Wright ve Bauer gibi düşünürler kentlerin yatay düzlemde gelişmesini savunmuşlardır. 19. yüzyıl şehir plancılarından Ebenezer Howard, "Yarının Bahçe Şehirleri" başlıklı çalışmasında, iki katlı konutların geniş caddeler aracılığıyla birbirine bağlandığı bir yerleşim modeli önermiş ve bu çerçevede yatay yapılaşmayı idealize etmiştir (Howard, 2019). "Bahçe Şehir" yaklaşımıyla amaçlanan, kentsel yaşamın sunduğu olanakların kırsal çevrenin sağlıklı ve doğal koşullarıyla bütünleştirilmesidir. Howard'a göre, bireylerin geçmişte kendi istekleriyle kırsal alanlardan kentlere yönelmesi gibi, plansız, sağlıksız ve aşırı yoğun kent ortamlarından da yine gönüllü biçimde uzaklaşmaları mümkündür (Fishman, 2016). Organik mimarlık anlayışının kurucu figürlerinden Frank Lloyd Wright ise yüksek yapılaşmaya eleştirel yaklaşarak, farklı ihtiyaç ve beklentilere sahip bireylerin tek tip mekânlarda bir arada yaşamaya zorlanmasının sorunlu olduğunu savunmuştur. Wright'a göre, insanların yaşam biçimleri, tercihleri ve sorunları birbirinden farklı olduğundan, konut üretiminde bireysel gereksinimlerin esas alınması gerekmektedir. Bu nedenle onun ideal kent tasavvuru, geniş alanlara yayılan ve doğal çevreyle uyumlu biçimde inşa edilmiş müstakil konutlara dayanmaktadır. Wright, her bireyin en az dört dönümlük bir araziye sahip olduğu ve yarı zamanlı tarımsal faaliyetlerde bulunduğu bir yerleşim modeli geliştirmiştir (Fishman, 2016). Türkiye'de yatay mimarlık anlayışının önemli temsilcilerinden biri olarak kabul edilen Turgut Cansever de Wright'ın bu yaklaşımını desteklemiştir. Cansever'in şehircilik anlayışında, kentsel düzenlemelerin halkın iradesi ve kültürel birikimi yok sayılarak değil, bireylerin bilgi ve deneyimlerine dayalı olarak şekillenmesi temel bir ilke olarak benimsenmektedir.

Bu çalışma, Cansever'in "ufki mimari" olarak tanımladığı yatay yapılaşma anlayışının, yatay şehirleşme fikrinin ideal tiplerinden birini temsil ettiği varsayımından hareket etmektedir. Bununla birlikte, yalnızca kat sayısını sınırlayan; buna karşın yapıların arsa üzerindeki kaplama oranını artıran uygulamaların, yatay mimariye atfedilen sosyal, çevresel ve mekânsal

kazanımları bütünüyle sağlayamayacağı ileri sürülmektedir. Cansever (2014), bu yaklaşımı "ufkî yoğun yerleşme" olarak adlandırmış ve bu modelin sürdürülebilir, yaşanabilir, ekolojik, ekonomik ve toplumsal açıdan katılımcı bir yaşam çevresi sunduğunu ileri sürmüştür (Düzenli, 2016). Ona göre ufkî yerleşim, yalnızca bir kent planlama modeli değil; aynı zamanda bir yaşam biçimi ve dünya görüşüdür. Bu anlayışla insanların çevresine duyarlı hale gelebileceği, mimari değerlere sahip çıkabileceği ve edilgen seyirciler olmaktan kurtulabileceği savunulmaktadır (Cansever, 2016). Cansever (2014), otuz katlı bir binaya bir aileyi yerleştirmenin, ona nerede yaşayacağını dayatmak anlamına geldiğini ve bu durumun bireyin çevresini algılayıp değerlendirme hakkını elinden aldığını düşünmektedir. Yüksek katlı yapılarda yaşamak, insanların hem birbirleriyle hem de doğayla olan bağlarını zayıflatır. Komşuluk ilişkileri, bu tür yapılarda yüzeysel ve teknokratik müdahalelerle şekillenen sığ ilişkilere dönüşür. Cansever ayrıca, yüksek beton bloklar arasında büyüyen çocukların doğayla ilişkilerini kaybettiğini, yaşlıların ise hayatlarının son dönemlerini estetik güzelliklerden mahrum geçirdiklerini dile getirmiştir (Ayvazoğlu, 2019). Bu nedenle ufkî yerleşim modelinin, komşuluk bağlarını güçlendireceği, dayanışma ve yardımlaşmayı teşvik edeceği, insanı dev beton yapılar arasında silinip gitmekten kurtaracağı düşünülmektedir.

Cansever, zorunlu durumlarda dahi yüksek katlı bina fikrine karşı çıkmıştır. Örneğin, kentlerin sınırlı araziye sahip olması nedeniyle yapıların dikeyde yükselmesi gerektiğini savunan İtalyan mimar Paolo Soleri'nin geliştirdiği ve 100 katlı binaları içeren "tutumlu kent" projesini sert bir dille eleştirmiştir. Cansever'e göre, nüfus sorununa çözüm üretmek adına insanları üst üste yığmak, insanı teknolojiye kurban etmektir (Ayvazoğlu, 2019). Cansever'e göre bir şehrin yalnızca ekonomik olması yeterli değildir; aynı zamanda estetik açıdan güzel olması ve içinde yaşayan bireylerin düşüncelerini, ihtiyaçlarını yansıtması da gerekir. Ancak yüksek katlı apartmanlar bu anlamda büyük bir engel barındırır. Çünkü bu yapılarda yaşayanlar, evlerinin biçimini değiştirmek isteseler bile buna imkân yoktur; yalnızca mobilyalarını değiştirebilirler ve çoğu zaman bununla yetinmek zorunda kaldıklarının farkında bile değildirler (Cansever, 2014). Cansever'e göre, eğer yatay yoğunlukta şehirler kurulmuş olsaydı, dikey yapılarda kullanılan asansörlerin hem sağlıksız havası solunmaz hem bu sistemleri çalıştırmak için harcanan enerji tasarruf edilir, hem de insanlar işe yürüyerek gidip egzoz dumanına maruz kalmadıkları için sağlık giderleri azalırdı (Ayvazoğlu, 2019). Bu nedenle Cansever'e göre dikey yapılaşma, insanları sağlıklı kalabilmek için spor salonlarına ve hastanelere gitmeye mecbur bırakan, yaşanması gereken güzelliklere ayrılacak zamanı çalan ve yaşam maliyetini artıran bir sistemdir. Bu koşullar altındaki bir kente "tutumlu" demek anlamını yitirir. Ona göre tutumlu şehir; içerisinde sosyal hayatın gereksinimlerini karşılayan tüm olanakları barındıran, katılımcı, sürdürülebilir ve adil bir yerleşim alanıdır. Dolayısıyla Cansever'in şehir vizyonunda mesele, yapıların yüksekliği değil, tıpkı Osmanlı mahallelerinde olduğu gibi bireylerin ihtiyaçlarını kendi çevresinden karşılayabildiği, entegre bir yaşam alanı oluşturmaktır.

## 2.1 Yatay Mimariyi Destekleyen Argümanlar

***Toprakla Temasın Artması:***

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Yatay yapılaşmayı destekleyen temel gerekçelerden biri, bireylerin toprakla doğrudan ilişki kurabilme olanağının artmasıdır. Balkon gibi sınırlı açık alanlar yerine, bahçe ile bütünleşen bir yaşam biçimi, özellikle Amerika Birleşik Devletleri'nde banliyö yerleşimlerinin yaygınlaşmasında etkili olmuştur (Ayvazoğlu, 2019; Cansever, 2014). Bununla birlikte, bu avantaj her yatay yapılaşma örneğinde kendiliğinden ortaya çıkmamaktadır. Yetersiz planlama koşullarında, küçük parseller üzerinde inşa edilen tek katlı yapılar, kimi zaman açık alanların betonlaşmasına neden olmakta ve toprakla temas olanağını ortadan kaldırmaktadır. Dolayısıyla, yapıların yalnızca düşük katlı olması, tek başına bahçe kültürünün geliştiği ya da doğayla bütünleşik bir yaşam biçiminin sunulduğu anlamına gelmemektedir.

***Daha Sakin ve Huzurlu Bir Yaşam Ortamı:***

Dikey mimarinin bireylerde yalnızlık ve mekânsal yabancılaşma duygusunu artırdığı yönündeki değerlendirmeler literatürde yaygın biçimde dile getirilmektedir. Buna karşılık, yatay mimaride doğayla kurulan doğrudan ilişkinin, bireylerin daha dingin ve huzurlu bir yaşam sürmelerine katkı sağlayabileceği öne sürülmektedir (Ökten, 2019). Ancak bu görüş, yatay yapılaşmanın sosyal izolasyonu kendiliğinden ortadan kaldıracağı varsayımına dayanmaktadır. Oysa yalnızlaşma olgusu, yalnızca mekânsal düzenlemelerle açıklanamayacak kadar karmaşık bir yapıya sahiptir. Modern yaşamın teşvik ettiği bireycilik, pragmatik ilişkiler ve artan duygusal mesafe, bu sürecin belirleyici unsurları arasında yer almaktadır. Nitekim Simmel'in 20. yüzyıl başlarında Berlin üzerine yaptığı gözlemler, metropol yaşamının bireylerde akılcı ve mesafeli bir tutum geliştirdiğini ortaya koymaktadır (Simmel, 1970). Bu bağlamda, sorun yalnızca mimari ölçekle sınırlı olmayıp kültürel ve toplumsal boyutları da içermektedir.

***Komşuluk İlişkilerinin Güçlenmesi:***

Yatay yerleşim modellerinin savunulmasında öne çıkan en güçlü argümanlardan biri, komşuluk ilişkilerinin gelişmesine uygun bir zemin sunmasıdır. Az sayıda haneden oluşan yerleşim düzenleri, bireylerin birbirlerini tanımalarını kolaylaştırarak mahalle kültürünün yeniden canlanmasına katkı sağlayabilir (Düzenli, 2016). Bununla birlikte, kent yaşamının sunduğu bireysel özgürlük alanları ve artan mahremiyet talepleri, apartman yaşamını bazı kesimler için daha cazip kılmaktadır. Özellikle Batı toplumlarında müstakil konut tercihi, çoğu zaman komşuluk ilişkilerini güçlendirme arzusundan ziyade, aşırı sosyal etkileşimden kaçınma isteğiyle ilişkilendirilmektedir. Cansever ise bu yaklaşımdan farklı olarak, İslam kent geleneğinde önemli bir yer tutan yardımlaşma, dayanışma ve komşuluk değerlerinin yeniden canlandırılması gerektiğini savunmuş; yatay mimariyi bu değerlerin mekânsal taşıyıcısı olarak değerlendirmiştir. Nitekim geleneksel konut dokusunu koruyan tarihî kentlerde, mahalle kültürünün bu nitelikleri hâlen gözlemlenebilmektedir.

***Deprem Etkisini Azaltma Potansiyeli:***

Yatay mimarinin savunulduğu bir diğer önemli alan, doğal afetlere karşı sunduğu görece güvenlik avantajıdır. Yüksek yapıların deprem güvenliğinin sağlanması, ileri mühendislik çözümleri ve yüksek maliyetler gerektirmektedir. Buna karşılık, uygun malzeme ve tasarım ilkeleriyle inşa edilen az katlı yapılar, sismik hareketlere karşı daha düşük risk taşıyabilmektedir

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(Ayvazoğlu, 2019; Cansever, 2014). Düşük yükseklikleri ve daha dengeli ağırlık dağılımları sayesinde yatay yapılar, deprem anında görece daha dayanıklı bir performans sergileyebilmektedir. Bu yönüyle yatay yapılaşma, çökme ve ağır hasar riskini azaltan bir yaklaşım olarak öne çıkmaktadır.

***Birey ve İhtiyaç Odaklı Tasarım:***

Yatay mimarinin önemli avantajlarından biri, konutların kullanıcıların bireysel ihtiyaçlarına göre tasarlanabilmesine olanak tanımasıdır. Kişiye özel mekânsal çözümler sunabilen bu yaklaşım, kullanıcıların yaşam alışkanlıklarına daha uygun konut tiplerinin geliştirilmesini mümkün kılmaktadır (Ayvazoğlu, 2019; Cansever, 2010; Düzenli, 2016). Ancak bu avantajın gerçek anlamda ortaya çıkabilmesi, tek tip site anlayışından uzaklaşılarak, özgün ve karakter sahibi yapıların üretilmesine bağlıdır. Cansever'in de vurguladığı üzere, mevcut imar düzenlemeleri çoğu zaman benzer biçimde konumlandırılmış konutlar üretmekte; bu durum hem manzara hem de mahremiyet açısından sorunlar doğurmaktadır (Cansever, 2010). Ayrıca, müstakil konutların kent içinde erişilebilirliğinin sınırlı olması ve yüksek maliyet gerektirmesi, yatay mimarinin uygulanabilirliğini zorlaştıran etkenler arasında yer almaktadır. Cansever, Osmanlı dönemindeki vakıf sistemi üzerinden elde edilen rantların kente yeniden kazandırılmasını önererek, kentlerin rant odaklı değil insan merkezli bir anlayışla planlanması gerektiğini savunmuştur (Can ve Doğan, 2019).

***Mahremiyet:***

Bahçeli ve müstakil konutlar, çok katlı yapılara kıyasla genellikle daha yüksek düzeyde mahremiyet sunmaktadır (Ayvazoğlu, 2019; Can ve Doğan, 2019; Cansever, 2010; Düzenli, 2016). Ancak bu durum, yalnızca yeterli büyüklükte parseller üzerinde inşa edilen konutlar için geçerlidir. Türkiye'de yaygın olan site tipi yerleşimlerde, ikiz ya da bağımsız konutlar çoğu zaman birbirine oldukça yakın konumlandırılmakta ve kişisel alanlar sınırlı kalmaktadır. Dolayısıyla, mahremiyet avantajı daha çok geniş alanlarda yer alan müstakil konutlar için söz konusu olmakta; bu tür yapılara erişim ise genellikle üst gelir gruplarıyla sınırlı kalmaktadır.

***Doğal Işık ve Havalandırma Olanakları:***

Yüksek katlı yapıların oluşturduğu gölgelenme etkisi, doğal ışık alımını ve hava dolaşımını olumsuz yönde etkileyebilmektedir (Ayvazoğlu, 2019). Özellikle alt katlarda oluşan karanlık ve havasız mekânlar, yaşam kalitesini düşüren unsurlar arasında yer almaktadır. Buna karşılık yatay yapılaşma, yapıların konumlanışına bağlı olarak daha dengeli bir ışık dağılımı ve etkili havalandırma olanakları sunabilmektedir. Yapıların yatayda genişlemesi, mimarlara doğal aydınlatmadan daha etkin yararlanma, çatı bahçeleri, iç avlular ve ortak yeşil alanlar oluşturma gibi tasarım olanakları sağlamaktadır.

## 3.TÜRKİYE'DE VE KARABÜK'TE KONUT YAPILANMASINA İLİŞKİN MEVCUT DURUM

2021 yılı verilerine göre Türkiye'de toplam 25.329.833 hane halkı bulunmaktadır (TUİK, 2021a). Bu hanelerin 3.179.805'i (%12,5) 1980 ve öncesinde inşa edilen binalarda, 7.834.588'i (%30,9) 1981–2000 yılları arasında inşa edilen binalarda, 12.007.355'i (%47,4) ise 2001 ve

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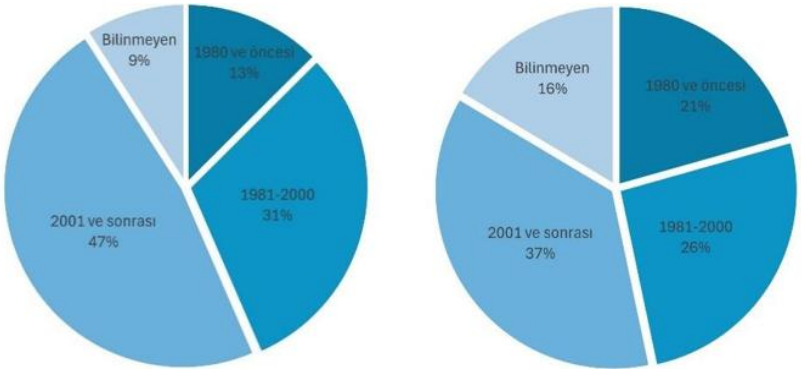
sonrasında inşa edilen binalarda ikamet etmektedir (TÜİK, 2021a). 2.308.085 hane (%9,1) için binanın inşa yılı bilinmemektedir (TUİK, 2021c). Ülke genelindeki toplam hane halkının %33,57'si (85.036 hane) Karabük ilinde bulunmaktadır. Bu hanelerin %20,6'sı (17.551 hane) 1980 ve öncesinde inşa edilen binalarda, %26,0'ı (22.150 hane) 1981 ile 2000 yılları arasında inşa edilen binalarda, %36,9'u (31.341 hane) ise 2001 ve sonrasında inşa edilen binalarda ikamet etmektedir (TÜİK, 2021b). Ayrıca %16,4'lük kesimi oluşturan 13.994 haneye ait binaların inşa yılı bilinmemektedir (Görsel 1). Veriler, Karabük'teki hane halklarının büyük bölümünün 2001 yılı ve sonrasında inşa edilmiş yapılarda yaşadığını ancak önemli bir kısmının daha eski binalarda ikamet etmeye devam ettiğini göstermektedir. Bu bulgu, kentte yapı stokunun kısmen yenilendiğini ancak eski binaların toplam stok içinde hâlen kayda değer bir paya sahip olduğunu ortaya koymaktadır.




(a) Türkiye geneline ilişkin oranlar (b) Karabük geneline ilişkin oranlar

**Görsel 1.** 2021 yılı verilerine göre Türkiye'de ve Karabük'te binanın inşa yılına göre hane halkı sayısı oranının karşılaştırılması (TUİK, 2021a; TUİK, 2021b.TÜİK, 2021c).

2021 yılı itibarıyla Türkiye genelinde hane halklarının %47,4'ü 2001 ve sonrasında inşa edilen binalarda yaşamaktadır. Bu oran Karabük'te %36,9'dur. Bu fark, Karabük'te yenilenmiş yapı stoku oranının Türkiye ortalamasının altında olduğunu göstermektedir. Benzer şekilde Türkiye genelinde 1980 ve öncesine ait yapılarda oturanların oranı %12,5 iken Karabük'te bu oran %20,6'dır. Başka bir ifadeyle Karabük'te her beş haneden biri, 1980 ve öncesinde inşa edilmiş yapılarda yaşamaktadır. Bu veriler, Karabük'te daha eski binalarda ikamet etme oranının Türkiye ortalamasına göre daha yüksek olduğunu ortaya koymaktadır. Bu eğilim, kentsel yapı stokunun yaşlanmakta olduğu ve özellikle eski yapıların fiziksel dayanıklılığı, enerji verimliliği ve afet riski açısından yeniden değerlendirilmesi gerektiğine işaret etmektedir. Ayrıca, Türkiye genelinde inşa yılı bilinmeyen konutların oranı %9,1 iken Karabük'te bu oran yaklaşık %16,4'tür. Bu veri, Karabük özelinde konut stoğuna ilişkin verilerin güncellenmesi veya kayıt sisteminin iyileştirilmesi gereksinimine işaret etmektedir. Sonuç olarak veriler Karabük'teki yapıların yaş ortalamasının Türkiye geneline kıyasla daha yüksek olduğunu, yeni yapı oranının görece düşük kaldığını ve yapı envanteri konusundaki bilgi eksikliğinin daha belirgin olduğunu göstermektedir.

**Çizelge 1.** İl ve ikamet edilen binanın kat sayısına göre hane halkı sayısı ve oranı (TÜİK, 2021d; TÜİK, 2021e).

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| | | KARABÜK | ANKARA | İSTANBUL | TOPLAM |
|---|---|---|---|---|---|
| **Hane halkı sayısı** | | 85.036 | 1.874.093 | 4.755.086 | 25.329.833 |
| **Ortalama kat sayısı** | | 4,3 | 7,1 | 6,9 | 5,0 |
| **Bina kat sayısı (%)** | 1 | 5,8 | 3,1 | 2,1 | 11,7 |
| | 2 | 24,8 | 4,0 | 3,7 | 17,3 |
| | 3 | 12,3 | 3,4 | 6,2 | 11,3 |
| | 4 | 11,5 | 6,4 | 10,2 | 10,7 |
| | 5 | 20,4 | 24,2 | 22,9 | 14,4 |
| | 6 | 25,3 | 59,0 | 54,9 | 34,4 |

2021 yılı TÜİK verilerine göre hane halklarının %11,7'si 1 katlı, %17,3'ü 2 katlı, %11,3'ü ise 3 katlı binalarda ikamet etmektedir (Çizelge 1). Dolayısıyla toplamda %40,3'lük bir kesim, yatay mimari kapsamında değerlendirilebilecek 3 kat ve daha az katlı yapılarda yaşamaktadır. Buna karşılık 4 kat ve üzeri binalarda yaşayan hanelerin oranı %59,7'ye ulaşmakta olup bu durum Türkiye'de dikey yapılaşmanın ağırlık kazandığını göstermektedir. Özellikle 5, 6 ve 10 kat ve üzeri binalarda yaşayan hane halklarının yüksek oranları, yapı stokunun giderek daha fazla çok katlı konutlar üzerine kurulduğunu ortaya koymaktadır. Bu dağılım, Türkiye'deki kentleşme modelinin, özellikle büyükşehirlerde yoğunluk artışı ve arsa maliyetlerinin etkisiyle dikey mimariye yöneldiğine işaret etmektedir.

Ancak yatay mimaride 3 kat ve daha az katlı yapıların hâlen %40'ın üzerinde bir oranla temsil edilmesi, bu yapı biçiminin tamamen kaybolmadığını ve yeniden planlamaya açık bir alan sunduğunu göstermektedir. Yatay mimari yalnızca estetik ve kültürel değerler açısından değil aynı zamanda afet riski, sosyal etkileşim, mahalle kültürü, yaşlı ve çocuk dostu çevreler gibi birçok açıdan yaşanabilir kentler için önemli bir model sunmaktadır. Türkiye gibi deprem riski yüksek bir ülkede dikey yapılaşmanın yarattığı fiziksel ve sosyal kırılganlıklar göz önünde bulundurulduğunda, yapılaşmaya dair kentsel politikaların yeniden düşünülmesi gerekmektedir. Özellikle küçük ve orta ölçekli şehirlerde, yeni gelişme alanlarında yatay yapılaşmanın teşvik edilmesi, sürdürülebilir kentleşme açısından stratejik bir öncelik olarak değerlendirilmelidir.

2021 yılı TÜİK verilerine göre Karabük ilinde toplam 85.036 hane ikamet etmektedir ve bu hanelerin yer aldığı binaların ortalama kat sayısı 4,3 olarak belirlenmiştir (TÜİK, 2021d). Bina kat sayısına göre dağılım incelendiğinde, 1 katlı binalarda yaşayan hane halklarının oranı %5,8 (4.890 hane), 2 katlı binalarda %24,8 (21.095 hane), 3 katlı binalarda ise %12,3 (10.420 hane) olarak hesaplanmaktadır (TÜİK, 2021d). Bu üç kategori birlikte değerlendirildiğinde, Karabük'teki hanelerin %42,9'u yatay mimariye uygun (3 kat ve altı) binalarda ikamet etmektedir. Orta ve çok katlı yapılara bakıldığında ise, 4 katlı binalarda yaşayanların oranı %11,5 (9.815 hane), 5 katlı binalarda %20,4 (17.326 hane), 6 kat ve üzeri binalarda ise %25,3 (21.490 hane) olduğu görülmektedir (TÜİK, 2021e). Bu veriler, Karabük'te hane halklarının yaklaşık %57,1'inin çok katlı veya yüksek katlı sayılabilecek binalarda yaşadığını ortaya koymaktadır. Buna karşılık yalnızca %42,9'luk kesimin üç kat ve altındaki yapılarda ikamet etmesi, Karabük'ün yatay mimarinin sunacağı faydalardan yararlanabilecek önemli fakat kullanılmamış bir potansiyele sahip olduğunu ortaya koymaktadır.

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## 4. YATAY MİMARİNİN KARABÜK İLİ ÖZELİNDE DEĞERLENDİRİLMESİ

Yatay mimari, yaşam kalitesini arttıran, doğal doku ile uyumlu, sosyal etkileşimi destekleyen bir kentsel planlama anlayışı sunar. Karabük özelinde, bu mimari yaklaşımın daha geniş alanlara yayılması, kent dokusunun insan merkezli olarak gelişmesini sağlayabilir. Karabük ili, yatay mimari benimsemesi konusunda Yenişehir yerleşimi ve 5000 Evler yerleşimi gibi toplu konut üretimlerinin gerçekleştirildiği önemli deneyimlere sahiptir. Raporun bu kısmında, Yenişehir yerleşiminin inşa süreci ve planlama kriterleri ile 5000 Evler toplu konut yerleşiminin analizi ele alınacaktır.

### 4.1 Yenişehir Yerleşimi: Erken Cumhuriyet Dönemi Yatay Mimari Örneği

Yenişehir, Karabük Demir ve Çelik Fabrikaları'nın kurulmasıyla birlikte, sanayi çalışanlarının barınma ihtiyacını karşılamak amacıyla planlanmış bir yerleşimdir (Görsel 2). Bu planlama süreci, sosyal donatı alanları, yeşil alan düzeni ve düşük yoğunluklu yapılaşma prensiplerini içermektedir. Yatay mimari, burada bireylerin yaşam alanlarında konforlu ve insan merkezli bir yerleşim sağlamıştır. Yenişehir yerleşimindeki lojmanlar, erken Cumhuriyet Dönemi'nin planlı ve sosyal odaklı kentleşme anlayışının bir parçası olarak tasarlanmıştır. Yenişehir yerleşiminin tasarımında dikkate alınan başlıca kriterler şunlardır:

**Düşük Yoğunluklu Yapılaşma:** Yatay mimari prensiplerine uygun olarak, nüfus yoğunluğunun dengeli dağıtılması sağlanmış, binalar arasındaki mesafeler korunarak yaşam kalitesi arttırılmıştır. Yenişehir'de genellikle tek veya iki katlı, müstakil ya da ikiz konut tipi lojmanlar inşa edilmiştir. Bazı alanlarda az katlı apartman blokları da bulunmakta olup, tüm yapılar geniş bahçeli ve ferah bir yerleşim düzeni sunmaktadır.

**Yeşil Alan ve Sosyal Donatılar:** Lojmanlar, doğal çevreyle uyumlu bir şekilde planlanmış olup, bolca yeşil alan ve park alanı içermektedir. Bunun yanı sıra, spor alanları, okullar ve sosyal tesisler gibi donatılar bölgeye entegre edilmiştir.

**Fonksiyonel Planlama:** Konutlar, çalışanların işlerine kolay erişimini sağlayacak şekilde konumlandırılmış, fabrika ve konut alanları arasında dengeli bir mesafe korunmuştur.

**Tip Projeler:** Lojmanlar belirli bir tipolojiye sahip olup, malzeme ve yapı kalitesi açısından standartlar belirlenmiş ve uygulanmıştır (Görsel 3).

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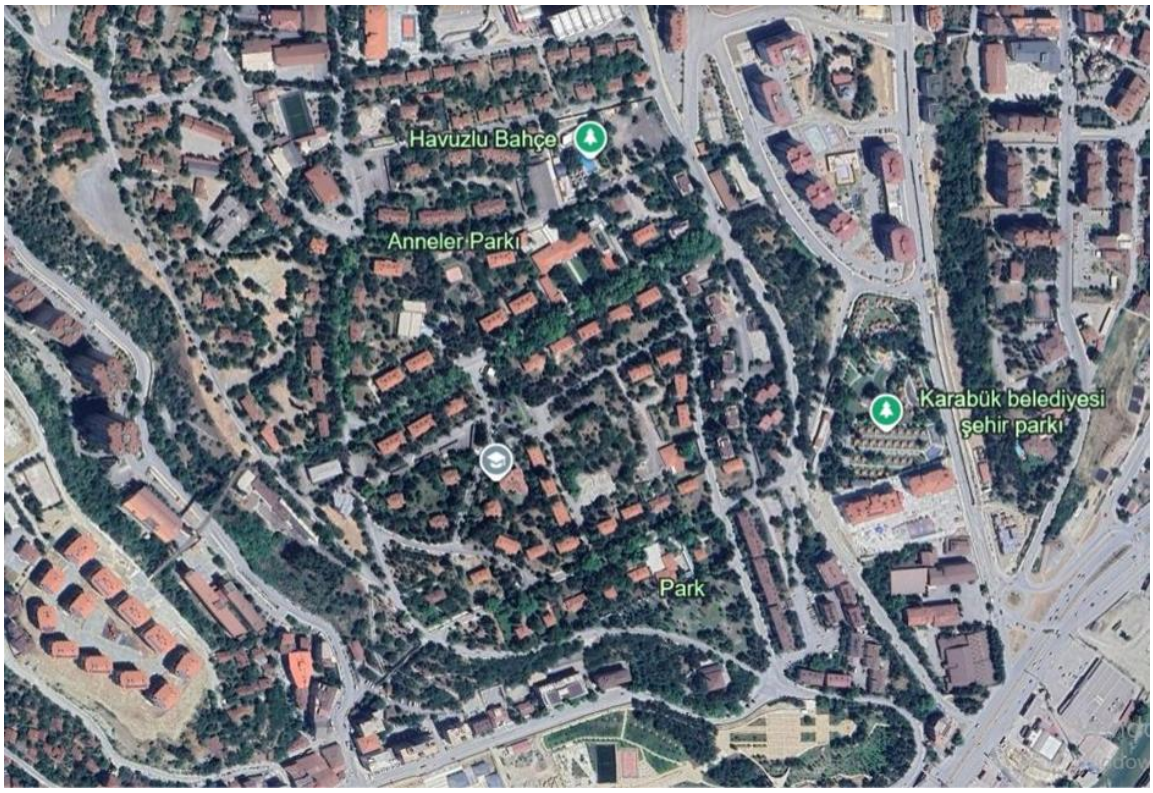
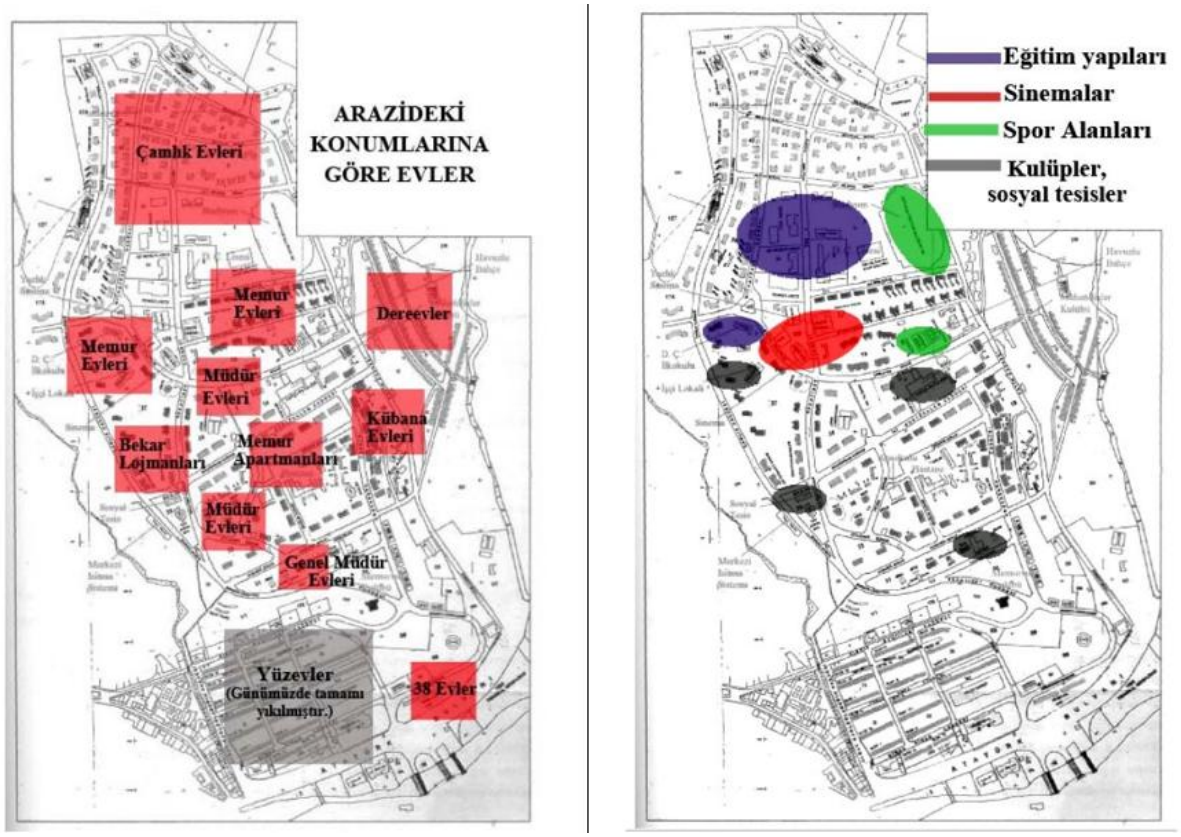



**Görsel 2.** Yenişehir yerleşimine ilişkin uydu görüntüsü (Google Earth, 2025)




**Görsel 3.** Yenişehir yerleşiminde konumlarına göre evler ve sosyal donatılar (Kaya, 2011)

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Sosyal Dayanışmayı Teşvike Yönelik Kurgular: Komşuluk ilişkilerini güçlendiren, ortak kullanım alanlarını öne çıkaran bir planlama anlayışı benimsenmiştir. Bu kapsamda, mahalle ölçeğinde ortak kullanım alanları oluşturulmuş, çamaşırhaneler, ortak bahçeler, çocuk oyun alanları, mahalle kahvehaneleri ve kültürel etkinliklerin düzenlendiği sosyal tesisler gibi mekânlar planlamaya dâhil edilmiştir (Görsel 3).

Yenişehir'deki konutlar yalnızca yapı ölçeğinde değil, mahalle bütününde işleyen bir sistemin parçası olarak düşünülmüştür. Evlerin cephe oranları, iç mekân organizasyonları, bahçeye yönelimleri ve doğal aydınlatma ilkelerine uygunlukları dönemin sağlıklı ve modern yaşam ideallerine hizmet edecek şekilde tasarlanmıştır. Mahallede bulunan konut harici tüm birimlerle, cumhuriyetin hedeflediği sosyalleşme ve kamusal kültürün inşası amacıyla da düzenlenmiştir (Onur, 2021: 675-677). Sümerbank İnşaat Fen Heyeti, konut alanlarının planlamasını detaylı olarak gerçekleştirirken, çalışanların sosyal ve kültürel ihtiyaçlarını gözetmiş ve modern yaşamın gereklerini yerine getirecek şekilde altyapıyı oluşturmuştur. Bu çerçevede Karabük'te Yenişehir Mahallesi'nde de işçi evleriyle birlikte eğitim yapıları, çocuk bahçeleri, spor alanları, sinema, lokaller, cami, misafirhane ve umumi banyolar gibi sosyal donatılar bulunmuştur (Görsel 4).



(a) Sinema (b) Sosyal bina (c) Stadyum

**Görsel 4.** Yenişehir'de bulunan çeşitli yapı örnekleri (Kalyoncu, 2016).

Yenişehir'deki konutlarda modern mimari üslubu benimsenmiş, sosyal sınıflara göre işçi pavyonlarından yönetici konutlarına kadar bir hiyerarşi oluşturulmuştur. Tek işçi yurtları, aile konutlarından ayrı inşa edilmiştir. Konutların tasarımı, işçilerin konforunu artırmaya ve sosyal yaşamlarını desteklemeye odaklanmıştır. Ayrıca bahçeli evler, ailelerin tarımsal faaliyetlere devam etmelerine ve kent yaşamına uyum sağlamalarına olanak tanımıştır. Karabük'teki inşaat faaliyetleri 1936'da 6 adet kübik tarzda apartman binası ve 150 yataklı işçi yurdu ile başlamış; 1939-1948 yılları arasında 920 konutluk bir yapılaşmaya ulaşılmıştır (Görsel 5).

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**Görsel 5.** Yenişehir yerleşiminden çeşitli yapı örnekleri (Saraçoğlu Gezer, 2018).

### 4.2 5000 Evler Toplu Konut Yerleşimi

Demir-Çelik Fabrikası'nın kurulmasıyla Karabük sanayi kentine dönüşmüş ve sanayileşmeye bağlı olarak hızla göç almıştır. Bu süreçle birlikte kentte konut sorunu ortaya çıkmış ve gecekondulaşma hızla artmıştır. Bu sorunların çözümüne yönelik olarak çeşitli tedbirler geliştirilmeye çalışılmış, bu kapsamda Bulak tarlaları, "Gecekondu Önleme Bölgesi" kapsamında devletin kamulaştırma programına dâhil edilerek 1969 yılında bu bölgede 5000 Evler toplu konut yerleşiminin inşasına başlanmıştır. 1985 yılına kadar etaplar halinde tamamlanan bu yerleşim, Karabük kent merkezine 5 km, Safranbolu ilçesine ise 3 km uzaklıkta olup yaklaşık 164 hektarlık alan üzerinde kurulmuştur (Görsel 6 ve 7).

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**Görsel 6.** 5000 Evler uydu görüntüsü (Google Earth, 2025)




**Görsel 7.** 5000 evler 1. ve 2. kısma ait vaziyet planı (Doğan, 2020).

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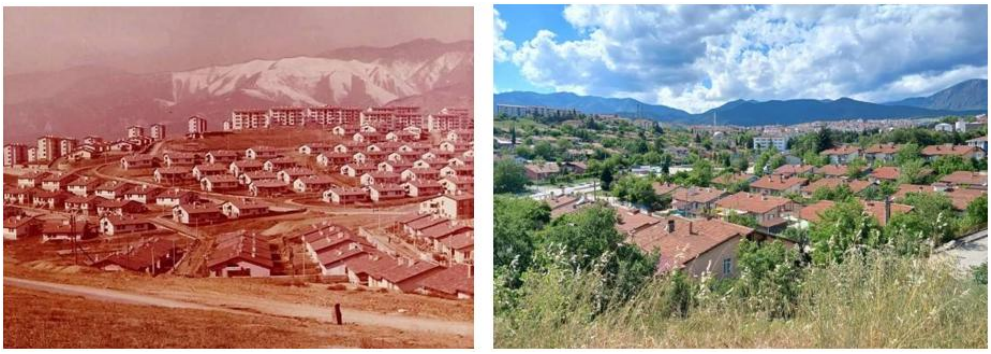

**Görsel 8.** 5000 Evler Toplu konut yerleşiminin 1976 (solda) ve 2025 (sağda) yıllarına ait görünümleri (Karabük Valiliği, 1985; Fidan, 2025).

Kooperatif yoluyla ve Karabük Belediyesi, Karabük Demir Çelik Fabrikası, Çelik- İş Sendikası, Bayındırlık ve İskân Bakanlığının ortak dayanışmasıyla oluşturulan yerleşimde 5782 konut inşa edilmiştir. Bu proje ile demir çelik fabrikası çalışanlarının birer mesken sahibi olabilmeleri ve kentte gecekondulaşmanın önlenmesi amaçlanmıştır. Ortak mülkiyet şeklinde oluşturulan yerleşimde kamuya ait olan konutlar, ailelerin nüfusu ve gelir durumu gibi etkenler dikkate alınarak puanlama ile tahsis edilmiştir. Şuandaki mülkiyetler ise kişilere aittir. 5000 Evler Toplu Konut Projesi'nin uygulanması, Safranbolu ve Karabük'te kooperatif yöntemiyle konut üretimine teşvik etmiş ve gecekondulaşmayı önemli ölçüde engellemiştir. Ayrıca apartmanlaşma olgusunun önünü açarak modern apartman kurgusunun yaygınlaşmasını sağlayan girişimlerden biri olmuştur.

5000 Evler toplu konut yerleşimi, yapıldığı dönem için bu öncül özelliklere sahip olmasının yanı sıra yatay mimari kurgusu ile günümüz için de referans alınabilecek nitelikli örneklerden biridir. Az katlı konutların üretildiği projede yeşil doku ön planda tutulmuş, sosyal donatılar da düşünülmüştür. Alandaki konutların inşası 3 kısımda tamamlanmıştır. İlk etapta tek ve iki katlı konutlar inşa edilmiştir (Görsel 8). Ancak barınma açığını karşılamada bunların yetersiz geleceği öngörülerek 2. etapta üç katlı, 3. etapta ise üç ve dört katlı konutlar üretilmiştir. Yerleşmedeki konutların yaklaşık %25'i bir ve iki katlıdır. Bu yapılar yerleşim içinde diğerlerinden ayrı alanlarda yer alırken, ikiz tipli ve bitişik düzendedir. Blok apartman şeklindeki konutlardan üç katlı olanlar ayrık düzendeyken, dört katlı olanları ise ayrık veya bitişik olarak tasarlanmıştır. Bu blok yapılar yerleşimde karışık şekilde konumlanmaktadır. İçinde bir aileyi barındıracak şekilde yapılan tek katlı konutlar 103 $m^2$ büyüklüğündedir. Diğer az katlı konutlar ise birden fazla aileyi barındıran ve çok konutlu yapı anlayışındadır. Bunlar da kullanıcıların mekânsal gereksinimlerini optimum seviyede karşılayacak şekilde farklı $m^2$'lerde oluşturulmuştur. Konut büyüklüklerindeki ve tiplerindeki bu farklılaşmalar kullanıcılara tercih imkânı sunması açısından projenin başarılı yanlarındandır.

5000 Evler toplu konut yerleşimi, sadece barınma yeri olarak değil aynı zamanda sosyal donatıları da içerecek şekilde planlanmıştır. Bu kapsamda sağlık yapıları, eğitim yapıları, spor alanları, ibadethaneler, idari tesisler, ticari birimler, sosyo-kültürel tesisler, park ve oyun alanları, açık hava sineması, rekreasyon ve ağaçlık alanlar oluşturulmuştur. Sahip olduğu bu mekânlar

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sayesinde kullanıcılara çağdaş yaşam olanakları sunan, bireylerin sosyal, kültürel ve rekreatif ihtiyaçlarının karşılandığı ve sağlıklı şekilde yaşam kalitelerinin arttığı bir ortam sağlanmıştır. Bu özelliklerin günümüzde de büyük ölçüde devam ettiği söylenebilir. Yerleşme bütününde yeşil dokunun hâkim olduğu görülmektedir. Tasarımda, geniş yaya kaldırımları, temiz su, kanalizasyon ve yangın tesisatı gibi altyapının düşünülmesinin yanı sıra geniş yeşil alanların oluşturulmasına önem gösterilmiş, her evin bahçeli olmasına dikkat edilmiştir (Görsel 9). Kamusal alanlardaki açık-yeşil alan düzenlemeleri belediye ve kooperatifin birlikte çalışması ile yapılmış, konut bahçesi gibi özel mekânlar ise kullanıcıları tarafından düzenlenmiştir. Tek ve iki katlı konutların kendilerine ait asgari 250 $m^2$ bahçeleri bulunmaktadır. Yola paralel olarak sıra şeklinde dizilmiş bu konutların bahçelerinde süs bitkileri ve meyve ağaçları yer almakta, günlük ihtiyaçların karşılanmasına yönelik sebze yetiştirilmektedir. Bazı bahçelerde ise kümes hayvancılığının yapıldığı da görülmektedir. Diğer konutlarda ise daire sayısının artışına bağlı olarak bahçe büyüklüğü daha fazladır. Bunlarda bitkisel düzenlemeler ön bahçelerde yoğunlaşırken, arka bahçeler daha çok otopark amaçlı kullanılmaktadır. Yerleşme tek ve çok konutlu yapıların özellikle ön bahçeleri ortak oturma mekânı olarak kullanılmaktadır. Bu sayede komşuluk ilişkileri de güçlenmektedir. Yerleşmede geniş yeşil alan düzenlemeleri yapılarak Karabük kentinin hava kirliliğine karşı tedbir de alınmaya çalışılmış ve sağlıklı yaşam ortamı yaratılmıştır. Ayrıca alandaki yapılaşmada, yoğunluğu rant amaçlı artırmak yerine dolu-boş dengesi iyi kurularak ve kat sayısı az tutularak yapıların birbirinin güneşini ve manzarasını engellemesinin de önüne geçilmiştir. Bu durum enerji tasarrufu da sağlamaktadır.



**Görsel 9.** 5000 evlerde sokak ve bahçe ilişkileri (Fidan, 2025)

5000 Evler toplu konut yerleşmesi, yatayda ve düşeyde insan ölçeğinde yapılaşma sunan, mekânsal ihtiyaçların karşılanmasında kendi kendine yetebilen, insanların toprakla temasını artıran ve komşuluk ilişkilerini güçlendirerek mahalle kültürünü yaşatan özellikleri ile yatay mimariye örnek verilebilecek niteliktedir. Günümüz kentlerinde hâkim olan dikey mimari anlayışının getirdiği sorunlara çözüm noktasında oluşturulacak yeni konut alanları için bu örneklerden daha çok yararlanılması gerekmektedir.

## 5. SONUÇ

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Günümüz kentlerinde hem Türkiye hem de küresel ölçekte hızla artan nüfus ve buna paralel olarak sürekli artan kentsel yoğunluk, sürdürülebilir mimari anlayışına uygun olmayan altyapı sistemleri, ulaşım ağları, kamusal alanlar ve çevresel taşıma kapasitesi gibi birçok unsur üzerinde giderek artan bir baskı oluşturmaktadır. Yoğun ve dikey yapılaşmanın hâkim olduğu mevcut kent formu hava kalitesi, ısı adası etkisi, sosyal ayrışma ve yaşam kalitesi gibi çeşitli sorunlara yol açmaktadır. Bu sorunların bir kısmı, doğal ışık ve hava akışının engellenmesi, yeşil alan sürekliliğinin bozulması ve erişilebilirliğinin azalmasıyla daha da derinleşmektedir. Bu durum, "nasıl bir şehirde yaşamalıyız?" veya "bir ülkede nasıl bir kentleşme ya da konut politikası uygulanmalıdır?" sorularını yalnızca teknik bir planlama meselesi olmaktan çıkararak insan türünün yeryüzündeki geleceğine ilişkin varoluşsal bir sorgulamaya dönüştürmektedir. Veriler hem Türkiye'de hem de dünyada kentsel nüfus artışının ötesinde kentlerin fiziksel olarak orantısız biçimde genişlediğini ve bunun gerçek anlamda bir "şehir" üretmek yerine doğayı betonla kuşatan mekânsal alanlar yarattığını göstermektedir. Bu genişleme insanların yaşam alanı inşa ederken aynı anda kendi ekolojik dayanaklarını tüketen çelişkili bir kentleşme biçimine işaret etmektedir.

Bu doğrultuda bir konut politikası olarak ele alınan yatay mimari modeli, yalnızca yapı yüksekliğine ilişkin bir tercih olmanın ötesinde, çevresel ve kentsel sürdürülebilirlik ve kentsel yaşamın niteliği açısından stratejik bir planlama yaklaşımı veya modeli olarak öne çıkmaktadır. Türkiye'de de artan nüfus baskısı, dikey yapılaşmanın getirdiği kentsel sorunlar ve değişen yaşam tercihlerinin etkisiyle daha düşük yoğunluklu ve ekolojik yaşam biçimlerine yönelik eğilim güçlenmekte olup bu durum konut politikalarının yeniden ele alınmasını gerekli kılmaktadır. Bu eğilim aynı zamanda yatay mimarinin doğal havalandırma, yeterli güneşlenme, daha düşük enerji tüketimi ve erişilebilirlik gibi sağladığı mimari imkânlarıyla da uyumluluk göstermektedir.

Yatay mimari, çoğu zaman yalnızca bir yapılaşma biçimi olarak değerlendirilse de literatürde insan ölçeği, mekânsal adalet ve sürdürülebilir kent formuna ilişkin çalışmalar çerçevesinde düşük katlı yerleşim modellerinin yalnızca fiziksel bir tercih değil aynı zamanda daha sürdürülebilir bir kentleşme yaklaşımının parçası olarak ele alındığı görülmektedir. Düşük yoğunluklu, iyi havalandırılan ve yeşil alanlarla bütünleşik yerleşimler kentsel ısı adası etkisini azaltabilir, doğal ışık ve hava sirkülasyonundan yararlanmayı artırarak enerji tüketimini düşürebilir ve yeşil altyapı ile uyumlu tasarımları kolaylaştırabilir. Aynı şekilde bahçeli yaşamın sunduğu kentsel tarım olanakları, organik atıkların kompostlanması, mahalle ölçekli sosyal etkileşim ve yerel biyoçeşitliliğin desteklenmesi gibi ek yararlar da yatay mimarinin sürdürülebilirlik etkisini güçlendirmektedir. Afet riski açısından bakıldığında ise yoğun ve yüksek katlı yapılaşmanın yarattığı "yığılma etkisi" yatay mimariyle sınırlanabilecektir. Büyük şehirlerin yanı sıra orta ve küçük ölçekli şehirlerde de gittikçe yükselerek yayılan yapılı çevrenin insanı ezici etkisini azaltmak için kent planlama ve tasarım stratejilerinin insan odaklı yaşanılır şehirler oluşturma amacıyla geliştirilmesi gerekmektedir. Yatay mimari tasarımın yaygın olduğu konut alanları insan ölçeğinde bir kentsel çevre oluşturmaktadır. Yatay mimarinin öncelikle merkezi idare ve yerel yönetimler ile şehir plancıları tarafından benimsenmesi önem taşımaktadır. Bu bağlamda, kent planlamasında yatay mimariyi öne çıkaran politikalar benimsenmeli, insanın yanı sıra diğer canlıların ihtiyaçlarını da gözeten,

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yaşanılır ve sürdürülebilir yaşam çevrelerinin oluşturulması hedeflenmelidir. Yatay mimarinin benimsenmesi, depreme dayanıklı güvenli ve dirençli kentlerin oluşturulması için kent politikasında yer alması gereken en stratejik hedeftir.

Bu çalışmada, yatay mimari anlayışı bağlamında Karabük ilinde Yenişehir ve 5000 Evler yerleşimlerinden elde edilen mekânsal ve toplumsal deneyimler, günümüzde konut gelişim alanlarının planlanmasına yönelik önemli bir referans çerçevesi sunmaktadır. Bu yerleşimlerde gözlemlenen yatay mimari temelli kentsel düzenlemeler, insan ölçeğini önceleyen mekânsal organizasyonları ve sosyal etkileşimi destekleyen mahalle yapılarıyla dikkat çekmektedir. Bu bağlamda, yatay mimari anlayışını esas alan yeni konut projeleri, Karabük'ün mevcut kent dokusunun niteliksel olarak iyileştirilmesine ve kentsel yaşam kalitesinin artırılmasına yönelik etkili çözümler geliştirilmesine olanak tanıyabilir. Karabük'te yatay mimari yaklaşımının planlama politikaları çerçevesinde teşvik edilmesi, kentsel çevrenin sürdürülebilirlik ve yaşanabilirlik düzeylerinin yükseltilmesine katkı sağlayacaktır. Bu modelden hareketle yerel yönetimler tarafından uygulanabilir, bütüncül ve uzun vadeli stratejilerin geliştirilmesi önem arz etmektedir.

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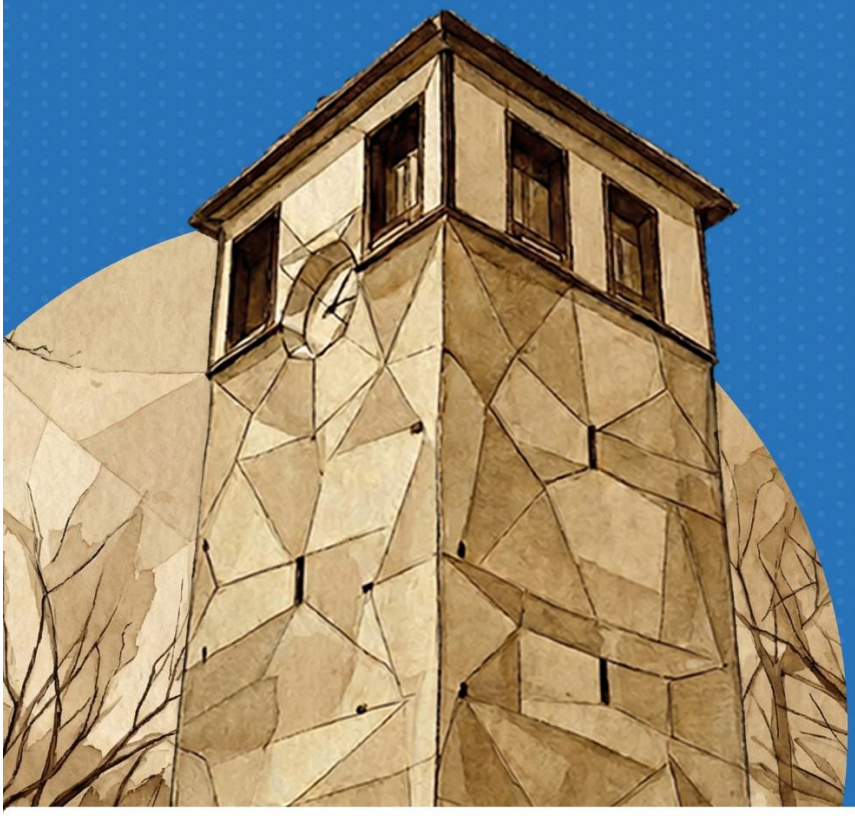

# TARİHTE SAFRANBOLU SEMPOZYUMU

SYMPOSIUM ON SAFRANBOLU THROUGHOUT HISTORY

ÖZET BİLDİRİLER KİTABI / BOOK OF ABSTRACTS

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# Safranbolu Tarihi Kentinde Yangın Güvenliği: Mevcut Durum ve Öneriler

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**Özet**

UNESCO Dünya Miras Listesi'nde yer alan Safranbolu tarihi kenti; geleneksel ahşap yapı sistemleri, bitişik nizamlı yapılaşmaları ve dar sokakları nedeniyle yüksek yangın riskine sahiptir. 2013-2024 döneminde tarihi çarşı bölgesinde meydana gelen 58 yangın olayı, geleneksel risk yönetimi yaklaşımlarının yetersiz kaldığına işaret etmektedir (Bakırhan ve Beyhan, 2025). Bu çalışma, Safranbolu'nun tarihi bölgesinde akıllı yangın algılama sistemlerinin uygulanabilirliğini değerlendirerek IoT (Nesnelerin İnterneti) ve yapay zekâ destekli erken uyarı teknolojilerinin entegrasyon potansiyelini araştırmayı ve pilot uygulama önerileri sunmayı amaçlamaktadır. Çalışmada literatür taraması, yangın istatistikleri analizi ve mevcut teknolojik altyapı değerlendirmesi kullanılmıştır. Akıllı şehir uygulamaları, IoT sensör sistemleri ve yapay zekâ destekli risk tahmin modelleri incelenmiş, diğer dünya mirası alanlarındaki akıllı yangın algılama uygulamaları karşılaştırmalı olarak değerlendirilmiştir. Bulgular, mevcut pasif ve aktif yangın önleme sistemlerinin yetersiz olduğunu, proaktif risk yönetimi için akıllı sensör ağları ve gerçek zamanlı izleme sistemlerine ihtiyaç duyulduğunu ortaya koymaktadır. Elektrik altyapısı problemleri ve baca tutuşmaları gibi tekrarlayan yangın nedenlerine çözüm olarak IoT tabanlı erken uyarı sistemleri önerilmektedir. Ayrıca, bölgede IoT sensör ağı kurulumu, yapay zekâ destekli risk tahmin modelleri ve mobil uyarı sistemi ile tam entegre akıllı yangın yönetim platformları önerilmektedir. Sonuç olarak, Safranbolu'nun sürdürülebilir korunması için geleneksel koruma yaklaşımlarının akıllı teknolojilerle desteklenmesi gereklidir.

**Anahtar Kelimeler:** Safranbolu, Akıllı Yangın Algılama, IoT, Yapay Zekâ

## Fire Safety in the Historic City of Safranbolu: Current Status and Recommendations

**Abstract**

Safranbolu, a historic town inscribed on the UNESCO World Heritage List, faces a high fire risk due to its traditional timber construction systems, contiguous building layout, and narrow streets. The 58 fire incidents that occurred in the historic bazaar district between 2013 and 2024 indicate that conventional risk management approaches have been insufficient (Bakırhan & Beyhan, 2025). This study aims to assess the feasibility of implementing smart fire detection systems in Safranbolu's historic area by examining the integration potential of IoT (Internet of Things) and AI-supported early warning technologies, and by proposing pilot applications. The study employs a literature review, analysis of fire statistics, and assessment of the existing technological infrastructure. Smart city applications, IoT sensor systems, and AI-based risk prediction models are examined, and smart fire detection implementations in other world heritage sites are evaluated through comparative analysis.

Findings reveal that current passive and active fire prevention systems are inadequate, highlighting the need for smart sensor networks and real-time monitoring systems to enable proactive risk management. IoT-based early warning systems are recommended as solutions to recurring fire causes such as electrical infrastructure issues and chimney ignitions. Additionally, the study proposes the establishment of an IoT sensor network in the area, the development of AI-supported risk prediction models, and fully integrated smart fire management platforms with mobile alert systems. In conclusion, reinforcing traditional conservation approaches with smart technologies is essential for the sustainable preservation of Safranbolu.

**Keywords:** Safranbolu, Smart Fire Detection, IoT, Artificial Intelligence

# DOĞAYLA BÜTÜNLEŞEN ŞEHİRLER: KENTSEL MEKANLARDA BİYOFİLİK TASARIMA YÖNELİK ARAŞTIRMA

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## ÖZET

Biyofilik tasarım, insanların doğal çevreyle bağını güçlendirmeyi amaçlayan bir yaklaşım olarak tanımlanabilir. Bu tasarım anlayışı, doğadan ilham alan unsurları yapılı çevrelere entegre ederek bireylerin doğayla temasını artırmayı hedefler. Tarihsel kökenleri antik dönemlere kadar uzanan biyofilik tasarım, modern kentleşme sürecinde artan betonlaşma ve doğadan kopuşa karşı bir çözüm olarak önem kazanmıştır. Biyofilik tasarım, bireylerin fiziksel ve ruhsal sağlığı üzerindeki olumlu etkileriyle dikkat çekmektedir. Özellikle pandemi gibi olağanüstü dönemlerde, doğayla temasın stres seviyelerini düşürdüğü, mutluluk ve yaşam kalitesini artırdığı birçok çalışma ile ortaya konulmuştur. Bu tasarım yaklaşımı, bireylerin doğal unsurların içinde bulunma ihtiyacını karşılamakla kalmaz, aynı zamanda toplumsal refahı artırıcı bir rol üstlenir. Kentlerde biyofilik tasarımın kullanımı, hem bireysel hem de çevresel faydalar sunmaktadır. Yeşil çatılar, dikey bahçeler ve açık yeşil alanlar gibi uygulamalar, şehirlerde ısı adası etkisini azaltır, hava kalitesini iyileştirir ve enerji verimliliği sağlar. Eğitim, sağlık, ofis ve konut yapılarında biyofilik tasarım; yaratıcılığı artırma, iş performansını yükseltme ve genel yaşam kalitesini iyileştirme gibi sonuçlara ulaşılmasına katkı sağlar. Sonuç olarak, biyofilik tasarım, yalnızca bireylerin yaşam kalitesini artıran bir yaklaşım değil, aynı zamanda sürdürülebilir kentleşme hedeflerine ulaşmada etkili bir araçtır. Bu çalışmada, biyofilik tasarımın yaygınlaştırılması ve bu konuda farkındalık yaratmanın, daha sağlıklı bireyler ve çevresel sürdürülebilirlik için kritik bir öneme sahip olduğu vurgulanmaktadır.

**Anahtar kelimeler:** Biyofilik Tasarım, Ekolojik Tasarım, Kentsel Mekan, Sürdürülebilirlik, Toplumsal Refah,

# CITIES INTEGRATED WITH NATURE: RESEARCH ON BIOPHILIC DESIGN IN URBAN SPACES

## ABSTRACT

Biophilic design can be defined as an approach that aims to strengthen people's connection with the natural environment. This design approach aims to increase individuals' contact with nature by integrating elements inspired by nature into built environments. Biophilic design, whose historical roots date back to ancient times, has gained importance as a solution to increasing concreting and separation from nature in the modern urbanization process. Biophilic design draws attention with its positive effects on individuals' physical and mental health. Many studies have shown that contact with nature reduces stress levels, increases happiness and quality of life, especially during extraordinary periods such as pandemics. This design approach not only meets individuals' need to be in natural elements, but also plays a role in increasing social well-being. The use of biophilic design in cities offers both individual and environmental benefits. Applications such as green roofs, vertical gardens and open green spaces reduce the heat island effect in cities, improve air quality and provide energy efficiency. Biophilic design in education, healthcare, office and residential buildings contributes to achieving results such as increasing creativity, improving work performance and improving overall quality of life. As a result, biophilic design is not only an approach that increases the quality of life of individuals, but also an effective tool for achieving sustainable urbanization goals. This study emphasizes that the dissemination of biophilic design and awareness-raising on this issue is of critical importance for healthier individuals and environmental sustainability.

**Keywords**: Biophilic Design, Ecological Design, Urban Space, Sustainability, Social Well-being

## GİRİŞ

"Biyofili" terimi, ilk kez psikolog Erich Fromm tarafından "insanın doğaya ve diğer canlılara duyduğu sevgi" anlamında kullanılmış, ardından Edward O. Wilson tarafından "doğayla bağlantı kurma içgüdüsü" olarak tanımlanmıştır (Wilson, 1984). Bu kavram, insanın doğaya olan bağlılığını temel bir içgüdü olarak ele alırken, modern şehirleşmenin ve hızlı kentleşmenin bu bağı giderek zayıflattığını ortaya koymaktadır. Kent yaşamının yoğun temposu ve betonlaşmış ortamlar, insanları doğal dünyadan uzaklaştırmakta, bu da ruhsal ve fiziksel sağlık üzerinde olumsuz etkiler yaratmaktadır. Biyofilik tasarım, doğanın bu eksikliğini giderme ve insanların çevresel ihtiyaçlarını karşılamayı hedefleyen bir tasarım yaklaşımı olarak karşımıza çıkar. Bu

yaklaşım, doğanın estetik bir öge olmasının ötesine geçerek, insan sağlığı ve refahını destekleyen bütünsel bir çözüm sunar (Kellert & Calabrese, 2015).

Araştırmalar, doğayla etkileşimin insan sağlığı üzerindeki olumlu etkilerini açıkça ortaya koymaktadır. Örneğin, yeşil alanların, stres hormonları olan kortizol seviyelerini düşürdüğü, tansiyonu dengelediği ve ruh halini iyileştirdiği kanıtlanmıştır (Gill et al., 2015). Ağaçlar ve yeşillik, sadece görsel bir estetik sunmakla kalmaz, aynı zamanda havayı temizler, gürültüyü azaltır ve mikroklimayı düzenler. Yapraklı bitkilerin saldığı fitonsitlerin (doğal uçucu bileşikler) insan bağışıklık sistemini güçlendirdiği ve pozitif ruh hali üzerinde etkili olduğu gösterilmiştir (Toyoda et al., 2023). Şehirlerde yaşayan bireylerin yeşil alanlara erişiminin daha yüksek yaşam kalitesiyle ilişkilendirilmesinin arkasında, bu tür çevresel ve fizyolojik etkilerin bütünsel bir rol oynadığı görülmektedir (Barbiero et al., 2021).

Biyofilik tasarımın en belirgin örneklerinden biri olan yeşil çatılar, hem bireysel hem de toplumsal düzeyde birçok fayda sağlar. Yeşil çatılar, binaların termal performansını artırarak enerji tüketimini azaltır, karbon emisyonlarını düşürür ve kent sıcaklıklarını dengelemede önemli bir rol oynar. Bu çatılar, yağmur suyu yönetimi için de etkili bir çözüm sunar, suyun toprağa süzülmesini sağlayarak kentsel taşkın risklerini azaltır (Ryan et al., 2014). Aynı zamanda yeşil çatılar, biyolojik çeşitliliği destekleyerek kuşlar, böcekler ve diğer canlılar için habitat oluşturur.Dikey bahçeler ise yoğun kent dokusunda yeşil alan eksikliğine yenilikçi bir çözüm sunmaktadır. Binaların cephelerinde bitkilerle kaplanmış bu bahçeler, sadece görsel zenginlik katmakla kalmaz, aynı zamanda hava kalitesini artırır ve kentsel ısı adası etkisini hafifletir. Bu tür uygulamalar, kent içinde sınırlı alanlardan maksimum verim alınmasını sağlarken, aynı zamanda insanların doğayla bağlantısını güçlendirmektedir.

Biyofilik tasarım, yalnızca dış mekanlarda değil, aynı zamanda iç mekanlarda da kendini göstermektedir. Eğitim binalarında biyofilik ögeler, öğrencilerin dikkat sürelerini artırırken, öğrenme süreçlerine olumlu katkıda bulunur. Örneğin, doğa temalı tasarımlar, öğrencilerin stres seviyelerini düşürerek akademik başarılarını yükseltmektedir (Barbiero et al., 2021). Sağlık tesislerinde kullanılan biyofilik unsurlar, hastaların iyileşme süreçlerini hızlandırır, hemşirelerin ve sağlık çalışanlarının tükenmişlik seviyelerini azaltır ve genel memnuniyeti artırır (Kellert & Calabrese, 2015). Ofis ortamlarında ise biyofilik tasarım, çalışanların yaratıcılığını ve üretkenliğini destekleyerek iş memnuniyetini yükseltir. Bu uygulamaların ortak paydası, insanın doğal çevreye olan ihtiyacını karşılamak ve yaşam kalitesini artırmaktır.

Sonuç olarak, biyofilik tasarım, sadece bireysel faydalar sağlamakla kalmayıp, toplumsal sürdürülebilirlik ve refahı da destekleyen, geleceğin kentsel mekanlarını şekillendiren yenilikçi bir yaklaşımdır (Söderlund & Newman, 2022). İnsanların doğayla olan bağını yeniden kurarak fiziksel, psikolojik ve sosyal anlamda iyileşme sağlarken, aynı zamanda çevresel sürdürülebilirlik hedeflerini destekler (Wilson, 1984; Ryan et al., 2014). Yeşil çatılar ve dikey bahçeler gibi biyofilik uygulamalar, yoğun kent dokusunda hem doğaya hem de insana yönelik somut çözümler sunar (Kellert & Calabrese, 2015; Barbiero et al., 2021). Ayrıca eğitim, sağlık ve iş ortamlarında biyofilik tasarım uygulamalarının kullanılması, bireylerin üretkenlik, motivasyon ve mutluluk düzeylerini artırırken, toplumsal düzeyde daha sağlıklı ve dirençli bir yapı oluşturur (Toyoda et al., 2023). Bu bağlamda, biyofilik tasarımın yaygınlaşması, yalnızca bireyler için değil, doğa ve kent arasındaki uyumu yeniden sağlamak için de kritik bir adım niteliğindedir. Geleceğin şehirleri, bu tasarım anlayışı ile hem insan hem de çevre odaklı çözümlerle şekillenecektir.

## BİYOFİLİK TASARIM NEDİR

Biyofilik tasarım, insanların doğal çevreyle bağını yeniden güçlendirmeyi amaçlayan yenilikçi bir tasarım yaklaşımıdır. Bu yaklaşım, mimarlık, iç mekan tasarımı, kentsel planlama ve peyzaj mimarlığı gibi disiplinlerde, doğal unsurların mekansal düzenlemelere entegre edilmesiyle uygulanmaktadır (Kellert, 2015; Batal, 2022). Biyofilik tasarım; doğal ışık, bitki örtüsü, su ögeleri gibi unsurları kullanarak, kullanıcıların doğayla fiziksel ve duygusal bağ kurmasını sağlamayı hedefler. Bu anlayış, bireylerin doğal çevreye olan özlemini gidermeye yönelik bir çözüm sunarken, modern kentleşme ve endüstrileşme süreçlerinin yarattığı doğadan kopukluğa bir yanıt niteliğindedir.

## BİYOFİLİK TASARIMIN ÖNEMİ

Biyofilik tasarım, yalnızca estetik bir yaklaşım değil, aynı zamanda insan sağlığı ve çevresel sürdürülebilirlik açısından kritik bir stratejidir. Doğal unsurların yaşam alanlarına entegre edilmesi, bireylerin psikolojik, fiziksel ve sosyal refahını artırır (Aktaş, 2022). Araştırmalar, biyofilik tasarımın stres seviyelerini azalttığını, yaratıcılığı artırdığını ve genel mutluluk düzeyini yükselttiğini göstermektedir. Özellikle hastaneler, okullar ve ofislerde uygulandığında, doğa ile temasın iş performansını artırdığı ve sağlık sonuçlarını iyileştirdiği belirlenmiştir. Ayrıca, COVID-19 gibi küresel kriz dönemlerinde doğayla bağın, bireylerin mental sağlığını korumada önemli bir etken olduğu vurgulanmaktadır (Üstündağ, 2023).

## BİYOFİLİK TASARIMIN GÜNÜMÜZ KENTLERİ İÇİN KULLANIM ALANLARI VE YARARLARI

Biyofilik tasarımın uygulama alanları oldukça geniştir. Kentlerde; yeşil çatılar, dikey bahçeler, kentsel parklar ve yeşil alanlar gibi açık mekan uygulamalarıyla dikkat çekmektedir. Bu tasarım, kentsel ısı adası etkisini azaltma, hava kalitesini iyileştirme ve enerji verimliliği sağlama gibi çevresel faydalar sunmaktadır (Duna, 2024). Eğitim, sağlık ve ofis binaları gibi iç mekanlarda ise biyofilik tasarım, doğal ışık, havalandırma ve bitki kullanımı yoluyla hem enerji tasarrufu sağlamakta hem de bireylerin refahını artırmaktadır. Örneğin, Erzurum'daki hastane bahçeleri, hastaların stresini azaltmada ve iyileşme süreçlerini hızlandırmada etkili bir rol oynamaktadır (Aktaş, 2022). Lagos'taki sürdürülebilir bina projeleri ise enerji tasarrufu sağlarken, kullanıcıların doğayla bağ kurmasını kolaylaştırmaktadır. Ayrıca, kamusal alanlarda biyofilik tasarım, sosyal etkileşimi artırarak toplumsal fayda sağlamaktadır. Doğal unsurlarla donatılmış mekanlar, bireylerin kent yaşamının olumsuz etkilerini hafifletmekte ve çevreye olan duyarlılıklarını artırmaktadır (Üstündağ, 2023).

## DÜNYADAN ÖRNEKLER

### Barbican Merkezi, Londra

Barbican Centre, Londra'nın merkezinde, kültür ve sanatın kalbinde yer alan bir sahne sanatları merkezidir. Avrupa'nın en büyük kültürel mekanlarından biri olarak bilinen Barbican, brutalist mimarinin karakteristik unsurlarını taşıyan bir yapıdır. 1982 yılında Kraliçe II. Elizabeth tarafından halka açılan merkez, brutalist mimarinin karmaşık ve çok katmanlı düzenini yansıtırken, kullanıcı deneyimini kolaylaştırmak amacıyla çeşitli tasarım müdahaleleriyle zaman içinde yenilenmiştir (Url 1).

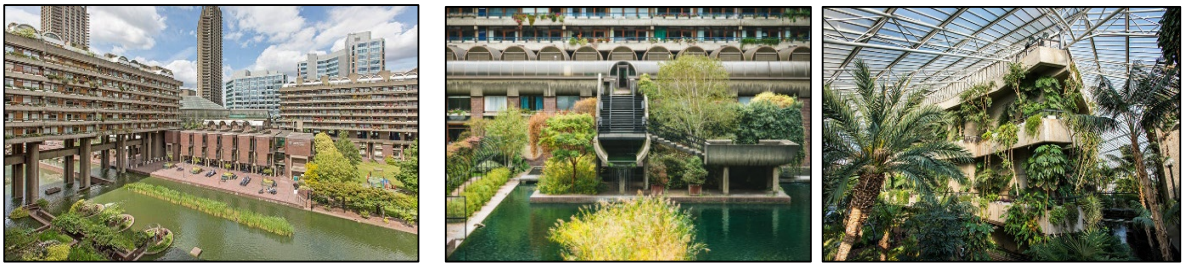
Biyofilik Tasarım ve Barbican Centre :

Barbican Centre, Londra'nın merkezinde yer alan, brutalist mimarisi ve kültürel zenginlikleriyle dikkat çeken bir sanat merkezidir. 1982 yılında açılan bu yapı, betonun sert estetiğiyle öne çıkarken, biyofilik tasarım unsurlarıyla kullanıcılarına doğayla bağlantı kurma fırsatı sunar.

Biyofilik tasarım, insan-doğa bağını güçlendirmeyi hedefleyen bir yaklaşımdır ve Barbican Centre'da bu anlayış, yapının farklı alanlarına entegre edilmiştir. Örneğin, kış bahçesi ve göl kenarı terasları, ziyaretçilere hem görsel hem de fiziksel bir doğa deneyimi sunar. Yeşil alanlar, beton yüzeylerle kontrast oluştururken, mekansal bütünlük sağlayarak ziyaretçilerin stresini azaltır ve zihinsel rahatlama imkanı tanır. Bu alanlar, kentsel bir ortamda doğayı yeniden

deneyimleme fırsatı sunarak biyofilik tasarımın sağlık ve refah üzerindeki olumlu etkilerini sergiler.

Barbican Centre, brutalizm ve biyofilik tasarımın bir arada nasıl uygulanabileceğine dair önemli bir örnek teşkil eder. Betonun sert yapısını yumuşatan doğal unsurlar, sadece estetik bir zenginlik katmakla kalmaz, aynı zamanda mekansal konforu ve kullanıcı deneyimini iyileştirir. Bu özellikleriyle Barbican Centre, modern şehirlerde doğayla uyumlu tasarım anlayışının ne kadar etkili olabileceğini gözler önüne sermektedir (Url 2).



Şekil 1. Barbican Center'a Ait Görünümler

Barbican Centre örneği, brutalist mimarinin sert estetik özellikleri ile biyofilik tasarımın insan odaklı doğa unsurlarını birleştirmenin mümkün olduğunu göstermektedir. Bu yapı, betonun güçlü ve ağır yapısını yeşil alanlar, kış bahçesi ve su unsurları gibi biyofilik tasarım öğeleriyle dengeleyerek, kullanıcı deneyimini iyileştirmekte ve zihinsel rahatlama sağlamaktadır. Ayrıca, Barbican Centre gibi iş ve kültür merkezleri, karma kullanım alanlarında biyofilik tasarımın uygulanabilirliğini ve etkisini kanıtlamaktadır. Bu tür tasarımlar, sadece estetik bir değer katmakla kalmaz, aynı zamanda şehir yaşamının yoğunluğunu dengeleyerek bireylerin sağlık ve refahını artırır. Bu da biyofilik tasarımın, modern kentleşmenin neden olduğu stres ve doğadan kopuş sorunlarına etkili bir çözüm sunduğunu ortaya koymaktadır.

**Apple Park, Kaliforniya**

Apple Park, biyofilik tasarımın çağdaş iş yerlerindeki etkisini gösteren önemli bir örnektir. Kampüs, geniş cam yüzeyleri ve iç mekanlara entegre edilmiş yeşil alanlarıyla çalışanların ve ziyaretçilerin doğayla sürekli bir bağ kurmasını sağlar. Halka şeklindeki ana bina, hem iç hem de dış mekanlarda kesintisiz bir görsel bağlantı sunarak, çalışanların doğal ışık ve temiz havadan maksimum düzeyde yararlanmasını hedefler. Bu tasarım, yalnızca estetik bir tercih değil, aynı zamanda çalışanların üretkenliğini artıran ve stres seviyelerini azaltan bir stratejidir.

Kampüste yer alan 30 dönümlük park, meyve bahçeleri, yürüyüş yolları ve açık sosyal alanlarla biyofilik tasarımın temel unsurlarını taşır. Çalışanlar, bu alanlarda hem bireysel hem de ekip

olarak vakit geçirirken doğanın iyileştirici gücünden faydalanabilir. Ziyaretçiler için de park, Apple'ın doğaya duyarlı tasarım anlayışını deneyimlemek için ilham verici bir ortam sunar.

Apple Park'ın tasarımı, modern mimarinin doğayla uyum içinde olabileceğini gösterirken, aynı zamanda iş yerinde refah ve yaratıcılığı destekleyen bir yaklaşımı temsil eder. Doğanın sakinleştirici etkisiyle birleşen bu yapısal çözümler, biyofilik tasarımın iş yerlerinde daha yaygın uygulanabilirliğine dair güçlü bir örnek oluşturur (Url 3).



Şekil 2. Apple Park'a ait görünümler

Apple Park, biyofilik tasarımın modern iş yerlerinde uygulanabilirliğini gösteren etkileyici bir örnektir. Doğal unsurların cam yüzeyler, yeşil alanlar ve sosyal mekanlarla entegre edilmesi, çalışanların stresini azaltırken üretkenliği ve yaratıcılığı artırır. Kampüs, doğayla bağ kurmayı teşvik eden tasarımıyla, iş yerlerinde refah ve sürdürülebilirliği destekleyen bir model sunmaktadır.

**Bosco Verticale, Milano**

Bosco Verticale, İtalya'nın Milano kentinde yer alan, biyofilik tasarımın kentsel mimarideki potansiyelini gözler önüne seren bir projedir. Stefano Boeri tarafından tasarlanan bu iki konut gökdeleni, şehir içinde doğal unsurları yeniden canlandırmayı amaçlayan yenilikçi bir yaklaşımı temsil etmektedir. Cephelerinde yer alan yaklaşık 800 ağaç, 5.000 çalı ve 11.000 bitki, yoğun bir kentsel ortamda doğayla bağ kurmayı mümkün kılan dikey bir orman yaratmaktadır.

Binaların bu eşsiz bitki örtüsü, sadece görsel bir estetik sunmakla kalmaz, aynı zamanda çevresel sürdürülebilirlik ve biyolojik çeşitlilik açısından önemli faydalar sağlamaktadır. Bitkiler, karbon emisyonlarını azaltır, ince parçacıkları filtreler, güneş ışığını gölgeleyerek sıcaklık kontrolü sağlar ve atmosferden oksijen üretir. Aynı zamanda, kent içindeki gürültü kirliliğini azaltarak, kuşlar ve böcekler gibi türler için yeni habitatlar oluşturur. Bu sayede Bosco Verticale, kent yaşamında doğal unsurlarla yeniden bağ kurmayı hedefleyen bir ekosistem yaratır (Url 4).

Bosco Verticale'nin mimari ve çevresel başarısı, dünya çapında takdir toplamıştır. 2014'te Uluslararası Yüksek Bina Ödülü'ne layık görülen proje, aynı zamanda 2015'te "dünyanın en

güzel gökdeleni" olarak seçilmiştir. Milano'daki bu proje, bitki örtüsüyle zenginleştirilmiş binaların hem çevresel sorunlara çözüm sunabileceğini hem de kentsel yaşamın kalitesini artırabileceğini göstermektedir.

Bosco Verticale, biyofilik tasarımın modern kentlerde hem estetik hem de çevresel sürdürülebilirliği nasıl bir araya getirdiğinin çarpıcı bir örneğidir. Doğayla bütünleşen bu tasarım, şehirlerin yoğunluğunu azaltmadan, çevresel ve sosyal faydaları bir araya getirerek geleceğin kentleri için ilham kaynağı olmaktadır. Bu yönleriyle, yalnızca Milano için değil, tüm dünya kentleri için yeni nesil şehirleşme anlayışının bir modelini temsil etmektedir (Url 5).



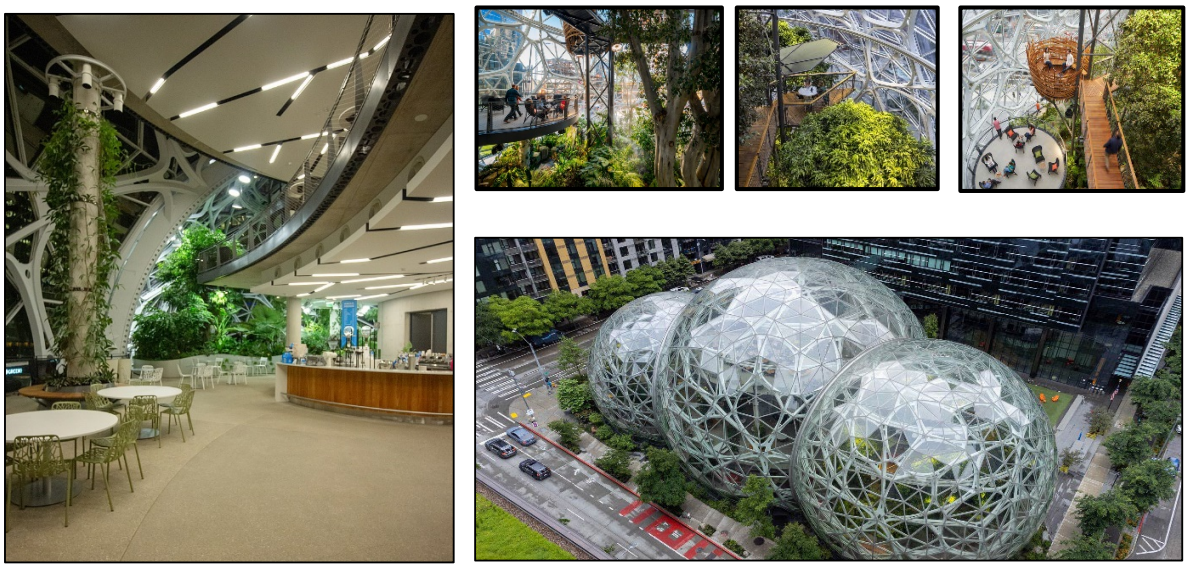
Şekil 3. Bosco Verticale'ye ait görünümler

Bosco Verticale, biyofilik tasarımın konut yapılarında nasıl uygulanabileceğini gösteren yenilikçi bir projedir. Milano'da bulunan bu dikey orman, doğal unsurları konut mimarisine entegre ederek çevresel sürdürülebilirliği artırırken, sakinlerine doğayla iç içe bir yaşam sunar. Yoğun bitki örtüsü, karbon emisyonlarını azaltır, hava kalitesini iyileştirir ve kent yaşamına yeni habitatlar kazandırır. Bosco Verticale, biyofilik tasarımın konut yapılarında hem estetik hem de çevresel faydalar sağlayabileceğini kanıtlayan çarpıcı bir örnektir.

**Amazon Küreleri, Seattle**

The Amazon Spheres, Seattle'daki Amazon merkez kampüsünde yer alan ve biyofilik tasarımın çağdaş bir örneğini sergileyen üç cam kubbeden oluşmaktadır. NBBJ ve Site Workshop tarafından tasarlanan bu yapılar, çalışanlara doğayla bütünleşik bir çalışma ortamı sunmayı hedefleyen bir iş yeri ve sosyal alan olarak hizmet vermektedir. Üç kubbede, 40.000 bitki ve 50'den fazla ülkeden getirilen çeşitli türler bulunmakta; bu sayede hem biyolojik çeşitliliği hem de çalışanların refahını artıran bir ortam yaratılmaktadır.

Biyofilik tasarımın temel ilkelerine uygun olarak, Amazon Spheres, doğal ışık, yeşil alanlar ve doğal malzemelerle insan doğa bağlantısını güçlendiren bir mekansal deneyim sunar. Yapının içindeki 25.000 bitkiden oluşan dört katlı "yaşayan duvar" ve 55 metre yüksekliğindeki Ficus rubiginosa ağacı gibi unsurlar, çalışanların stres seviyelerini azaltmayı ve üretkenliklerini artırmayı amaçlamaktadır. Kubbenin sıcaklık ve nem oranı, tropik bir ekosistem oluşturmak için özel olarak düzenlenmiş olup, ziyaretçilere ve çalışanlara doğal bir ortamda çalışma ve dinlenme imkanı sunar (Url 6).



Şekil 4. Amazon Küreleri'ne Ait Görünümler

Amazon Spheres, yalnızca çalışanlar için bir çalışma alanı değil, aynı zamanda biyofilik tasarımın iş yerlerine getirdiği potansiyel faydaları sergileyen bir eğitim ve keşif alanıdır. Sık sık düzenlenen turlar ve özel etkinlikler, ziyaretçilere bu inovatif yapının mimari ve ekolojik detaylarını keşfetme fırsatı sunar. Doğal çevrenin modern iş yerlerine entegre edilmesinin, hem bireylerin refahını artırmada hem de sürdürülebilir bir çalışma ortamı yaratmada nasıl etkili olabileceğini gözler önüne seren The Amazon Spheres, biyofilik tasarımın gelecekteki ofis ve yaşam alanları için bir model niteliğindedir (Url 7).

The Amazon Spheres, biyofilik tasarımın iş yerlerinde nasıl etkili bir şekilde uygulanabileceğini gösteren yenilikçi bir örnektir. Bu üç cam kubbe, çalışanlara doğal bir ortamda çalışma ve dinlenme imkanı sunarak refahı ve üretkenliği artırmayı amaçlamaktadır. Tropik bitkilerle dolu yaşam alanları, doğal ışık kullanımı ve biyofilik tasarımın diğer unsurları, çalışanların stres seviyelerini azaltırken modern ofislerde doğayla bağ kurmanın önemini vurgulamaktadır. The

Amazon Spheres, biyofilik tasarımın hem çalışma ortamlarında refah artırıcı etkilerini hem de sürdürülebilirlik potansiyelini sergileyen çarpıcı bir örnek teşkil etmektedir.

**Jewel Changi Havaalanı, Singapur**

Jewel Changi Airport, Singapur'daki Changi Havalimanı'nın bir parçası olarak, doğa temalı mimarisi ve kapsamlı sosyal alanlarıyla biyofilik tasarımın çağdaş bir örneğini sunmaktadır. Moshe Safdie ve PWP Landscape Architecture tarafından tasarlanan kompleks, dünyanın en yüksek kapalı şelalesi olan Yağmur Girdabı (Rain Vortex) ile merkezinde yer alır ve çevresini saran Shiseido Orman Vadisi (Shiseido Forest Valley) gibi dikkat çekici doğal unsurlarla donatılmıştır. Bu yapılar, doğanın sakinleştirici etkisini havalimanının karmaşık yapısına entegre ederek ziyaretçilere eşsiz bir deneyim sunmaktadır.

Toplam 135.700 metrekarelik bir alanı kapsayan Jewel, bahçeler, eğlence alanları, otel ve 300'den fazla perakende ve yemek seçeneği ile hem yerel halkın hem de turistlerin ilgisini çeken bir çekim merkezi haline gelmiştir. Kapalı bahçeleri ve beş kat yüksekliğindeki Shiseido Orman Vadisi, 3.000 ağaç ve 60.000 çalı ile dünyanın dört bir yanından gelen türleri barındırır. Doğayla bağ kurmayı teşvik eden bu alanlar, yalnızca görsel bir estetik sunmakla kalmaz, aynı zamanda ziyaretçilerin stresi azaltmasına ve huzur bulmasına olanak tanır.

Yağmur Girdabı, Jewel'ın ikonlarından biri olarak 40 metre yüksekliğindeki serbest düşüş yapan bir su akışını sergiler. Hem gün ışığında hem de geceleri ışık ve ses gösterileriyle ziyaretçilere dinamik bir görsel şölen sunar. Su, bina içindeki sıcaklık ve nem seviyesini dengeleyerek biyofilik tasarımın işlevsel bir parçası olarak da hizmet eder.

Kompleks, yalnızca doğayla etkileşim sağlamakla kalmaz, aynı zamanda modern eğlence ve keşif imkanları sunar. Tepelik Parkı (Canopy Park), Şekilli Ağaç Yolu (Topiary Walk) ve Çiçek Bahçesi (Petal Garden) gibi bahçeler, çocuklar ve yetişkinler için oyun alanları, Gökyüzü Ağları (Sky Nets) ve Ayna Labirenti (Mirror Maze) gibi yenilikçi aktivitelerle donatılmıştır. Bu alanlar, hem bireylerin hem de ailelerin keyifli vakit geçirmesini sağlarken, doğanın mekansal deneyime kattığı değerleri vurgular.

Jewel Changi Airport, biyofilik tasarımın modern mimarideki rolüne güçlü bir örnek teşkil eder. Doğa, kültür ve ticaretin bir araya getirildiği bu yapı, insanların doğayla bağlarını güçlendirirken sürdürülebilir ve estetik bir mekansal deneyim sunar. Aynı zamanda, havalimanını sadece bir transit noktası değil, ziyaretçilerin vakit geçirmek isteyeceği bir cazibe merkezi haline getirerek kentsel tasarımda yeni bir standart belirlemektedir (Url 8).



Şekil 5. Jewel Changi Havaalanı'na Ait Görünümler

Jewel Changi Airport, biyofilik tasarımın modern mimaride nasıl estetik, fonksiyonel ve sosyal faydalar sunabileceğini gösteren çarpıcı bir örnektir. Dünyanın en yüksek kapalı şelalesi olan Yağmur Girdabı ve Shiseido Orman Vadisi gibi doğal unsurlarla, ziyaretçilerin stresini azaltırken huzur bulmasına olanak tanır. Doğa, kültür ve ticareti bir araya getiren bu kompleks, sadece bir havalimanı değil, aynı zamanda bir sosyal ve eğlence merkezi olarak da hizmet vermektedir. Jewel, biyofilik tasarımın kentsel alanlarda insanların doğayla bağını nasıl güçlendirebileceğine dair güçlü bir model sunmaktadır.

**Khoo Teck Puat Hastanesi(KTPH), Singapur**

Singapur'daki Khoo Teck Puat Hastanesi (KTPH), biyofilik tasarımın sağlık tesislerine entegrasyonunda öncü bir model olarak öne çıkmaktadır. Doğayı mimari tasarıma dahil eden bu yaklaşım, hasta sağlığını ve refahını artırmak amacıyla yapılandırılmıştır. CPG Consultants ve RMJM tarafından tasarlanan hastane, "iyileştirme ortamı" olarak işlev görmeyi hedeflemiş ve tasarım süreci boyunca biyofilik tasarım ilkeleri temel alınmıştır.

KTPH'nin merkezi unsurlarından biri, doğal unsurların mimariyle uyum içinde bir araya geldiği yeşil avludur. Bu avlu, su öğeleri, kuşlar, kelebekler ve tropik bitki türleriyle zenginleştirilmiş bir "orman benzeri" atmosfer yaratır. Yeşil alanlar, yalnızca estetik değil, aynı zamanda hastane içindeki mikro iklimi dengeleme işlevi de görür; ölçümlere göre bu avlunun sıcaklığı, hastane dışındaki alanlardan 2°C daha düşüktür. Binanın teraslarında yer alan aromatik bitkiler, doğayı doğrudan hasta odalarına taşır ve hastalara iyileştirici bir atmosfer sunar (Url 9).

Hastane, çevresel sürdürülebilirlik açısından da dikkat çekicidir. Yapı, yatay ve dikey yeşil alanlarıyla toplamda 3.92'lik bir yeşil alan oranına sahiptir; bu, binanın oturduğu alanın neredeyse dört katına eşittir. Ayrıca, bitişiğindeki fırtına suyu göleti, bir park haline dönüştürülerek hasta ve ziyaretçiler için yürüyüş yolları ve dinlenme alanları eklenmiştir. Bu düzenleme, hastane çevresindeki mavi-yeşil alanları %400 artırmıştır.

Toplum katılımı, KTPH'nin temel değerlerinden biridir. Çatı bahçeleri, gönüllüler ve hastane personeli tarafından birlikte yönetilir ve buradan elde edilen ürünler hastane mutfağında kullanılır. Hastane ayrıca yoga, tai chi ve Zumba gibi etkinliklerle toplum sağlığını destekleyen programlar düzenler. Bu şekilde KTPH, yalnızca bir sağlık tesisi değil, aynı zamanda toplumsal sağlığı teşvik eden bir merkez haline gelmiştir.

2016 yılında yapılan bir ankette, kullanıcılar KTPH'nin biyofilik özelliklerinin stresi azalttığını, doğaya olan farkındalıklarını artırdığını ve genel refahlarını olumlu yönde etkilediğini belirtmiştir. KTPH, hem mimarisi hem de sosyal programlarıyla, biyofilik tasarımın sağlık sektörüne kattığı değeri güçlü bir şekilde kanıtlamaktadır. Bu yaklaşımla hastane, modern sağlık tesislerinin hem insanlar hem de çevre için daha iyi tasarlanabileceğini göstermektedir (Url 10).



Şekil 6 Khoo Teck Puat Hastanesi'ne Ait Görünümler

Khoo Teck Puat Hastanesi (KTPH), biyofilik tasarımın sağlık tesislerinde nasıl etkili bir şekilde uygulanabileceğini gösteren öncü bir modeldir. Yeşil avlular, tropik bitkiler ve su unsurları gibi doğa odaklı tasarım elemanları, hastalara ve ziyaretçilere sakinleştirici bir ortam sunarken, hastane içindeki mikro iklimi iyileştirir. Toplam yeşil alan oranı ve sürdürülebilir uygulamalarıyla KTPH, yalnızca estetik bir yapı değil, aynı zamanda toplumsal sağlığı destekleyen bir merkez olarak işlev görür. Bu örnek, biyofilik tasarımın hastaların stresini azaltmada, refahını artırmada ve çevresel sürdürülebilirliğe katkıda bulunmada sağlık sektöründe önemli bir rol oynadığını göstermektedir.

## SONUÇ VE DEĞERLENDİRME

Biyofilik tasarım, modern kentleşmenin getirdiği doğadan kopuş sorununa karşı sürdürülebilir ve insan odaklı çözümler sunan yenilikçi bir yaklaşım olarak öne çıkmaktadır. Doğal unsurların yapılı çevreye entegre edilmesi, bireylerin fiziksel, ruhsal ve sosyal refahını artırırken, aynı zamanda çevresel sürdürülebilirliği desteklemektedir. Çalışmada ele alınan örnekler, biyofilik tasarımın yalnızca estetik bir anlayıştan ibaret olmadığını, aynı zamanda sağlık, eğitim, çalışma hayatı ve kent planlaması gibi farklı alanlarda doğrudan olumlu etkiler yarattığını ortaya koymuştur.

Araştırmalar, biyofilik tasarımın stres seviyelerini azalttığını, konsantrasyonu ve yaratıcılığı artırdığını, iş performansına olumlu katkıda bulunduğunu göstermektedir. Sağlık yapılarında biyofilik unsurların hastaların iyileşme süreçlerini hızlandırdığı, eğitim ortamlarında öğrencilerin akademik başarısını desteklediği ve ofislerde çalışanların üretkenliğini artırdığı kanıtlanmıştır. Kent ölçeğinde ise yeşil çatılar, dikey bahçeler ve kamusal yeşil alanlar gibi biyofilik uygulamaların hava kalitesini iyileştirdiği, kentsel ısı adası etkisini azalttığı ve enerji verimliliğini artırdığı görülmektedir.

Çalışmada incelenen Barbican Centre, Apple Park, Bosco Verticale, Amazon Spheres, Jewel Changi Airport ve Khoo Teck Puat Hastanesi gibi başarılı projeler, biyofilik tasarımın farklı ölçeklerde nasıl uygulanabileceğini gözler önüne sermektedir. Bu projeler, yalnızca yeni yapılar için değil, mevcut yapıların dönüştürülmesi için de biyofilik tasarımın etkili bir strateji olduğunu göstermektedir.

Sonuç olarak, biyofilik tasarım yalnızca bireysel faydalar sağlamakla kalmayıp, toplumsal refah ve çevresel sürdürülebilirlik açısından da kritik bir rol oynamaktadır. Geleceğin kentleri, doğayla daha uyumlu, ekolojik dengenin korunduğu ve insan sağlığını ön planda tutan tasarımlarla şekillenmelidir. Bu doğrultuda, biyofilik tasarım ilkelerinin mimari ve şehircilik politikalarına entegre edilmesi, yerel yönetimler, mimarlar, şehir plancıları ve politika yapıcılar tarafından öncelikli bir konu olarak ele alınmalıdır.

Biyofilik tasarım, yalnızca geçici bir trend değil, doğayla uyumlu ve insan merkezli mekanlar oluşturmayı hedefleyen kalıcı bir çözüm yoludur. Bireylerin doğayla bağlarını güçlendiren, daha sağlıklı ve yaşanabilir çevreler yaratan bu yaklaşım, sürdürülebilir kentleşme hedeflerine ulaşmada önemli bir araçtır. Bu bağlamda, biyofilik tasarımın kent ölçeğinde yaygınlaştırılması, doğa ile insan arasındaki kopuşu onarmak ve daha sağlıklı, dirençli şehirler inşa etmek için kritik bir adım niteliğindedir.

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# Material assessment in tiny houses: comparing the embodied carbon and circular potential of steel and timber

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**Abstract.** Tiny houses have emerged as a potential, environmentally friendly housing solution to mitigate the unsustainable impacts of the residential sector. Their popularity has increased significantly, especially during the COVID-19 pandemic. With their growing appeal, the building performance, sustainability, and circularity of various materials in tiny houses are worth to be search. This study focuses on the performance characteristics of the most commonly used architectural materials in tiny house models, steel and timber, to assess the relations with $CO_2$ emission, energy use, and circularity. A prototype tiny house, located in a temperate climate zone (Mersin, Turkiye), is modelled in Autodesk Revit using steel and timber material configurations for walls, floors, and ceilings. The energy consumption and carbon emission of these two cases are analyzed using Autodesk Insight in conjunction with Revit software. For the circularity evaluation of the cases, the Material Circularity Indicator (MCI) tool is used. The findings reveal that using timber for wall, floor, and ceiling elements in tiny houses has better embodied carbon emissions than steel. The embodied carbon emissions of a steel-based tiny house exceed those of a timber-based counterpart by 30%. However, from the circularity perspective, steel has a higher circularity index with an 82% ratio than timber with 52%. Consequently, the environmentally friendly buildings are not only related to carbon emissions or energy consumption but also related to waste disposal reduction and, accordingly, circularity.

**Keywords:** Tiny houses; Circularity; Carbon emission; Energy use; MCI.

## 1. Introduction

In the late 1990s in the United States, due to housing affordability issues and a desire to live more sustainably, the tiny house movement emerged by building very small homes (Shearer et al., 2018). The idea behind this movement is mainly to cope with economic challenges and to reduce the consumption of natural resources to be sustainable and energy efficient (Saleem et al., 2021). The 'tiny house' or 'tiny home' is defined as a small dwelling unit less than 37 $m^2$ that is either permanent or relocatable by the 2018 International Residential Code (IRC) (Kuittinen et al., 2023). A typical tiny house layout features a compact kitchen, a bathroom, a combined living and working area, and a sleeping space, with very limited storage capacity. Vaulted ceilings are often used to maximize vertical space, and sleeping lofts are commonly incorporated into the design (Mukhopadhyay, 2020).

There are many benefits to living in a tiny house and reducing the size of the living space. One of the biggest benefits of living in a tiny house is the reduction of the carbon footprint (Wu and Hyatt, 2016). Although in Boeckermann et al.'s (2019) questionnaire study, the most distinct reason to live in a tiny house is seen as affordability, the environmental impact of tiny houses is another important key driver (Kuittinen et al., 2023).

Buildings consume over 40% of global energy, generate 36% of all carbon dioxide ($CO_2$) emissions, and 28% of greenhouse gas emissions (Rauf et al., 2022). Even though significant improvements in energy efficiency have been achieved in recent decades, population growth (supposed to grow by 29% until 2050) and the increasing need for residential areas cause a rise in energy demand (Crawford and Stephan, 2020). The energy demand and greenhouse gas emissions are influentially related and so, high energy use causes unfavorable environmental impacts (Jin and Kim, 2018; Sabobeh et al., 2024). In this regard, the studies (Carlin, 2014; Kilman, 2016; Crawford and Stephan, 2020; Sabobeh et al., 2024) claim that tiny houses reduce the material demands, create a lower environmental impact in terms of resources and production process. Unlike traditional residences, tiny houses consume less energy for heating, cooling, and lighting. Yet, the selection of the building materials plays a crucial role in evaluating a buildings' environmental impacts (Dipasquale et al., 2025). In other words, the materials

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used in the design of tiny houses affect the carbon emissions and energy use. Commonly used material for these houses is wood. However, owing to some advantages like being lighter, fire-resistant, etc., steel is also used for the tiny houses.

Among sustainability approaches, circular economy (CE) has attracted great attention in recent years and this interest has significantly influenced design processes, especially with circularity-focused approaches (Ruiz-Pastor et al.,2024). The primary goal of evaluating the circularity of products is to aid decision-making by offering insights regarding the products and their life stages (Bragança et al., 2010). Additionally, the assessment needs to be coherent, comprehensive, and objective (Mesa et al., 2018; Ruiz-Pastor et al.,2024). The primary additive of the circular economy is made "sustainability more likely" by separating economic development and resource consumption (van den Berg, 2019). On one hand, adopting circular economy (CE) practices is increasingly recognized as contributing to sustainable development goals (Schroeder et al., 2019). On the other hand, circular economy and sustainable development are not systematically synonymous because the recycling process can create new challenges for overall environmental impacts, while it is one of the main opportunities in circularity. However, to understand the relation of circularity and sustainability still needs further research (Schroeder et al., 2019).

In this regard, the aim of this study is to investigate the triple relation between carbon emissions, energy use, and circularity through a tiny house. The objectives of the research are (i) to compare the carbon emission and used energy intensity differences of timber and steel wall, floor, and ceiling elements in tiny houses, (ii) to calculate the circularity index of timber and steel materials wall, floor, and ceiling elements in tiny houses, and (iii) search the environmental impacts of CE work toward sustainability.

## 2. Materials and Method

In this research, a tiny house with two alternatives, timber-based and steel-based, is modelled in Autodesk Revit as a case study. The tiny house has a floor area of 18,85 $m^2$ and a loft area of 4,5 $m^2$, including open living space with a kitchenette, a bathroom, and a loft that serves as a sleeping space, and a closet. The height of the highest point of the house is 4.20 meters, and the height of the lowest point is 2.70 meters. The plan layout and 3D view of the tiny house are illustrated in Fig. 1. The first alternative model is built from wood and has a wooden joist for the floor and ceiling. The wall frames are created with C16 timber stud (75x125 mm) and covered with wood-based MDF material. The second alternative model is made from steel material. For ceiling and floor elements are designed with steel joists. The wall frames are formed with steel studs and covered with gypsum board. The material details in two alternatives are seen in Fig. 2.

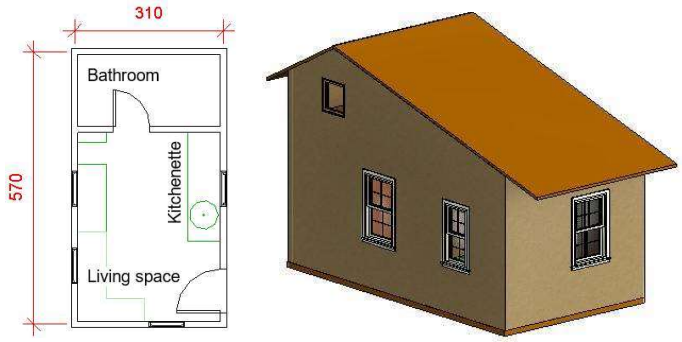


Fig. 1. Tiny house case study floor plan and 3D view

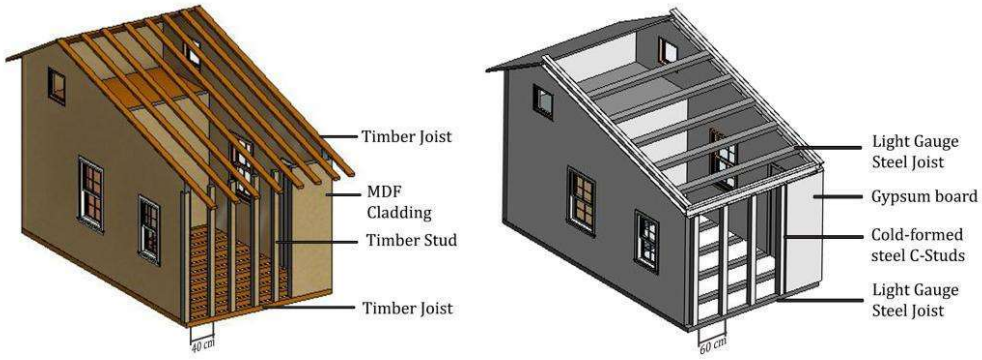


Fig. 2. Two alternatives with timber and steel material-based tiny houses

In the light of the scope of the study, the embodied carbon, operational carbon, energy used and circularity ratios for timber and steel tiny houses are calculated. In light of the scope of the study, the embodied carbon, operational carbon, energy used, and circularity ratios for timber and steel tiny houses are calculated. The tools used are explained in the following sections.

2.1. Carbon Emissions and Energy Use Intensity Calculations in Next Gen Insight

Assessing the carbon impacts of timber and steel tiny houses, two alternatives are simulated by utilizing Autodesk Insight. The scope of Insight covers the envelope and interiors subset of architectural elements based on the data included in the Energy Analytical Model. Therefore, the walls, ceiling, and floor elements are the focus of this research. Moreover, embodied carbon emission calculation in Insight comprises only the manufacturing stage (A1-A3) while the operational carbon emissions include operational energy (B6). Hence, the embodied carbon in this study refers only to the manufacturing stage, and operational carbon represents the operational energy phase.

Insight is a cloud-based tool that connects with Revit, providing users with flexible dashboards, an intuitive interface, and an easy analysis approach. The interface of Insight makes it more practical to explore, visualize, and compare carbon analysis results. It relies on Revit's Energy Analytical Model as its foundation for Operational (OC) and Embodied Carbon (EC) analysis. Insight uses the stored data in Revit, like building envelope performance, material specifications, etc., and more to illustrate the relation between carbon impacts and energy offsets (Insight Product Team, 2024).

The Revit Energy Analytical Model offers a reliable foundation for evaluating both Embodied and Operational carbon analyses. The Embodied Carbon analysis in Insight leverages data from Building Transparency's EC3 database regarding material Embodied Carbon and provides the option to modify these defaults or incorporate specific EC definitions. For Operational Carbon, Insight uses EnergyPlus, an extensively used open-source simulation engine for energy analyses. This engine is developed by the US Department of Energy (DOE), managed by the National Renewable Energy Laboratory (NREL), and applied worldwide for dynamic energy simulations (Insight Product Team, 2024).

2.2. Circularity Calculations in Material Circularity Indicator (MCI) Tool

For the evaluation of the circularity indexes of timber and steel tiny houses, Material Circularity Indicator (MCI) tool is used in this study. The Material Circularity Indicator (MCI) is a free Excel tool that measures the circularity of a product's material flow. The MCI is one of the circularity metrics that meets the guidelines of the new ISO 59020 standard for 'Circularity Metrics'. Circularity metrics provide a superior assessment compared to solely depending on recycling rates, as they encompass all methods of attaining circularity, including consumption avoidance, durability enhancement, reuse, remanufacturing, bio-based products, and composting.

The MCI tool can be used to evaluate and compare the 'circularity' scores of individual goods and product portfolios. The MCI quantifies the circularity of a product, namely the extent to which it has separated from the use of non-renewable resources and the generation of unrecoverable trash. The calculator assesses a product's circularity using the modified 2024 MCI methodology, delivering a score ranging from 0 to 100%. A score of 0 implies a standard linear model based on consumption and disposal. A 100% score, on the other hand, represents a fully circular strategy in which the product avoids the use of nonrenewable resources and eliminates waste entirely (URL-1, 2025).

**3. Results and Discussion**

In this section, the quantitative results are generated and interpreted to assess the sustainable performance of products from a circularity perspective. First, the carbon footprints of tiny houses are calculated in Insight. Second, the circularity ratio of them is computed. Finally, the results are compared and used to try to solve the relationship between carbon emissions and circularity.

As a first step of the study, carbon emission calculations are carried out. Before simulating the carbon emissions in Insight, some necessary parameters should be specified in the energy settings in the Revit interface because Insight uses data in the energy analytical model. Under the advanced energy setting tab in Revit, building function is selected as single house, building operating schedule is set 24/7, HVAC system is arranged Central VAV, HW Heat, Chiller 5.96 COP, Boilers 84.5 eff. The geographic location of the project should also be clarified before the analysis. In this study, Mersin is selected as the location of the tiny houses. Then, an analytical model is generated and uploaded to the Insight. The model is analysed in the cloud for key sustainability and performance aspects of the houses. The results are seen in the cloud web page. The outputs from the analysis are shown comparatively for timber and steel tiny houses in Fig. 3.

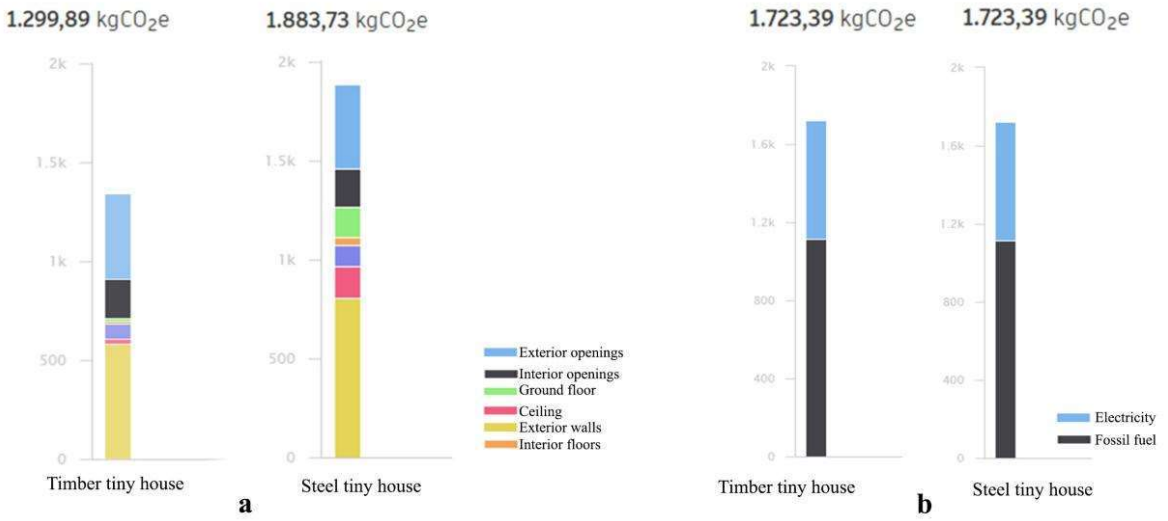


Fig. 3. (**a**) Embodied carbon emissions and (**b**) operational carbon emissions of timber and steel tiny houses

According to the calculation results, timber-based tiny house has lower embodied carbon emission with 1299,89 kgCO2e, while steel-based tiny house has 1883,72 kgCO2e embodied carbon emission. The operational energy of tiny represents their total energy demand to operate building systems, determined through analysis of fossil fuel types and electricity data. Therefore, operational energy is not related to the type of materials used for the building elements. Thus, the operational energy of the two alternatives, which are exactly the same each other except for building materials, is observed to have the same value. Accordingly, annual energy use intensity, an indicator of the energy efficiency of a building's design and/or operations, should be the same for the two alternatives. The energy consumption of these houses is 274,79 kWh/m², which represents the amount of total energy used in one year divided by the building area. When considering the amount of energy for individual heating is 311 kWh/m2 in Turkey's capital Ankara (Ucal and Günay, 2021), the energy use of tiny houses for heating, cooling, and electricity is considered reasonable.

The second step of the study is getting the circularity ratios of the two alternatives. For the calculation, selected material types and their used amounts are taken into consideration. The quantity and mass of each component are specified. The source of the materials for each component is added under the resource inflow. In this tool, the source of the materials can be chosen as virgin, recycled, remanufactured, or reused. In this study, the source of each material is designated as virgin. Besides, it is indicated how many functional units the components deliver over their life versus the industry average. Here, the industry average is '1' while the steel elements are defined as '6', and timber elements are '2'. Then, for the circularity calculation, the end-of-use conditions of each product should be clarified. For the steel alternative, resource outflow is defined as reuse, and for the timber alternative, it is defined as recycling. According to these inputs, the calculator tool gives the circularity results seen in Table 1. This table includes inputs provided by users and outputs, highlighted in the table, generated by the calculator tool. The tool gives the circularity index result between 0 and 1, circularity index percentage between 0% and 100%, also produces circular mass and linear mass results.

Table 1. Circularity results of timber and steel tiny houses generated in MCI tool

| | Component Name | Mass Each | Quantity | Resource Inflows | | | Utility Unit | | Utility Function | Resource Outflows | | (0-1) MCI | % MCI | Comprised of | | | | Circular Mass | Linear Mass |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Kilograms | | Material Type | Source | Utility Based on | U | U(av) | | Collection Rate | Destination | | | Raw material Decoupling | Waste Decoupling | Enhanced Utility | Circularity Gap | kg | kg |
| STEEL TINY HOUSE | Cold Formed Steel C-stud | 3,78 | 30 | Steel | Virgin | Utility | 6 | 1 | 6 | 100% | Reuse | 0,93 | 91,7% | 0% | 50% | 41,70% | 8,3% | 98,82 | 8,98 |
| | Light Gauge Steel Floor Joist | 16,85 | 15 | Steel | Virgin | Utility | 6 | 1 | 6 | 100% | Reuse | 0,93 | 91,7% | 0% | 50% | 41,70% | 8,3% | 231,66 | 21,06 |
| | Light Gauge Steel Ceiling Joist | 16,85 | 10 | Steel | Virgin | Utility | 6 | 1 | 6 | 100% | Reuse | 0,93 | 91,7% | 0% | 50% | 41,70% | 8,3% | 154,44 | 14,04 |
| | Internal Gypsum Board | 8,23 | 20,38 | Gypsum | Virgin | Utility | 3 | 1 | 3 | 50% | Reuse | 0,78 | 75% | 0% | 25% | 50% | 25% | 123,45 | 41,15 |
| | External Gypsum Board | 8,23 | 20,38 | Gypsum | Virgin | Utility | 3 | 1 | 3 | 50% | Reuse | 0,78 | 75% | 0% | 25% | 50% | 25% | 123,45 | 41,15 |
| | | | | | | | | | | | | | | | | | | | |
| TIMBER TINY HOUSE | Timber Stud Wall Frame | 1027,18 | 1 | Timber | Virgin | Utility | 2 | 1 | 2 | 100% | Recycle | 0,57 | 52,50% | 0% | 5% | 47,50% | 47,5% | 539,27 | 487,91 |
| | Timber Floor Joist | 397,82 | 1 | Timber | Virgin | Utility | 2 | 1 | 2 | 100% | Recycle | 0,57 | 52,50% | 0% | 5% | 47,50% | 47,5% | 208,86 | 188,96 |
| | Timber Ceiling Joist | 477,36 | 1 | Timber | Virgin | Utility | 2 | 1 | 2 | 100% | Recycle | 0,57 | 52,50% | 0% | 5% | 47,50% | 47,5% | 250,61 | 226,75 |
| | Internal MDF Cladding | 6,7 | 50 | MDF | Virgin | Utility | 2 | 1 | 2 | 100% | Recycle | 0,55 | 50% | 0% | 0% | 50% | 50% | 167,5 | 167,5 |
| | External MDF Cladding | 6,7 | 50 | MDF | Virgin | Utility | 2 | 1 | 2 | 100% | Recycle | 0,55 | 50% | 0% | 0% | 50% | 50% | 167,5 | 167,5 |

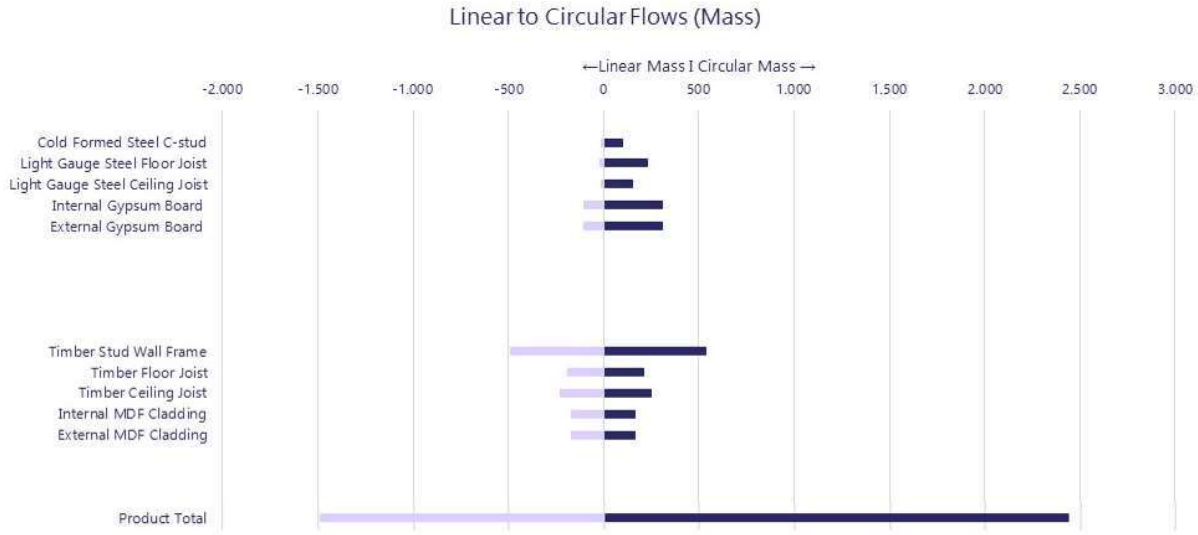


Fig. 4. Circular and linear mass distribution of the component, illustrating the proportion of mass considered circular based on total mass and circularity percentage

The circularity results demonstrated that the steel material tends to be more circular than timber. When compared to the linear and circular mass of the two alternatives, parallel to the circularity ratio, the circular mass of steel is higher than timber, as shown in Fig. 4. The circularity ratio strongly depends on the utility factors in the calculation. In the MCI tool, utility can also be chosen as lifetime, mass, lifetime &mass, utility &mass. In this study, it is defined as utility. Additionally, destination decisions, like reuse, recycle, compost, landfill, etc., and their rates affect the result of circularity. In this study, the destination decision for steel elements is defined as reuse with 100%, while for timber, it is recycling with 100%. In this regard, while steel is compared to timber, steel's strength-to-weight ratio is up to seven times greater, reducing the load on foundations. This efficiency leads to faster, more cost-effective construction. Steel can be reused repeatedly without losing integrity, and it is easy to disassemble steel frames. It is resistant to moisture-related problems and so does not require maintenance in a short period (Hradil et al., 2014).

As a result of the calculations, the circularity ratio of the steel tiny house is 81,5%, and the circularity ratio of the timber tiny house is 51,8%. From the perspective of the embodied carbon emissions releases, the timber tiny house has 30% less carbon emissions than the steel tiny house. At this point, only circularity or embodied carbon emission is not enough to say that one of the tiny steel or timber houses is the best option. The following Fig. (Fig. 5) provided by the MCI calculator helps to define components that you may want to prioritise for enhanced circularity due to their environmental footprint. Thus, the relation between circularity and carbon footprint can be interpreted.

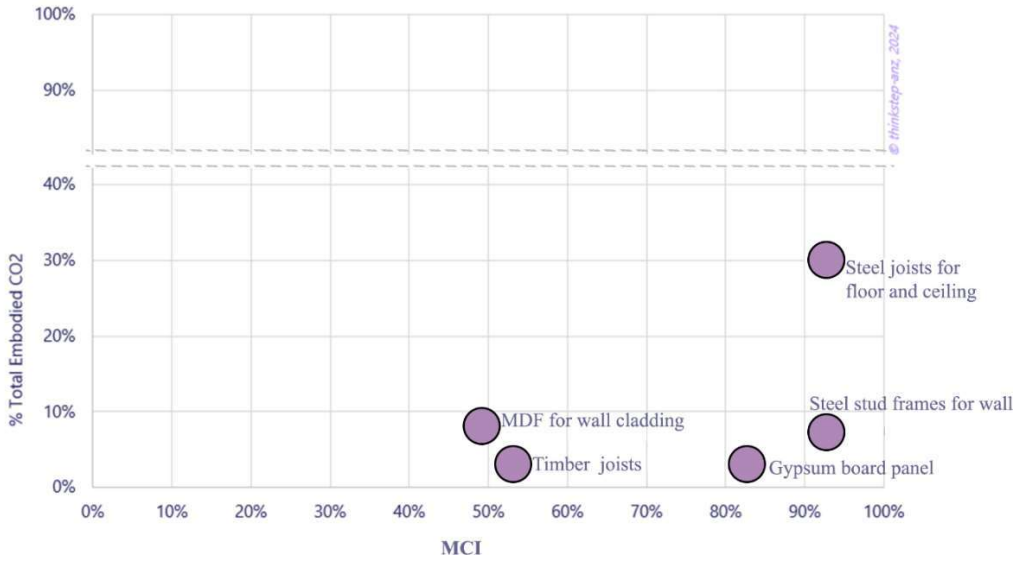


Fig. 5. % Circularity vs % Embodied $CO_2$ for timber and steel elements

## 4. Conclusions

Tiny houses are defined as affordable and environmentally friendly alternatives for the built environment, but the variety of materials used to produce these houses creates confusion and uncertainty. Although the dominant materials are seen as timber in the industry, steel also has a high usage ratio for the modular and tiny houses sector. In this regard, this study investigates the carbon footprint and circularity relations from the perspective of the environmental impact through a timber and steel tiny houses case project.

When the calculation results are evaluated directly, the embodied carbon of a tiny steel house is 30% more than tiny timber house. As a rapid evaluation, timber can be thought of as more logical to use for the sustainability goals. On the other hand, when examining the circularity results, the circularity ratio of the elements of the steel tiny house is 82%, while the circularity of the timber alternative is 52%. Moreover, considering the reuse potential of steel frames, steel can be evaluated as a more sustainable alternative than a timber house due to the reduction of waste generation and decrease in the use of raw materials. Consequently, sustainability has many inflows, and they show that there are additional factors for industry and owners to evaluate the environmental impacts of the housing design. As a result, this study does not provide a certain decision for the selection of material for tiny houses, as it can not be said that a timber tiny house or a steel tiny house is a preferable option for sustainable design. The embodied carbon of the steel tiny house is higher than timber, but maybe the environmental impact of the steel option can be balanced with the reuse of 5 or 6 times in its lifecycle. Ultimately, a truly comprehensive life cycle assessment should adopt a holistic perspective—one that not only considers the material production phase but also evaluates the potential for reuse, multiple life cycles, and recyclability beyond the initial end-of-life. Such an approach is essential for accurately assessing the long-term environmental performance of all types of buildings.

A limitation of this study can be specified that the operational carbon emission amounts and energy intensity used in the two alternatives are the same. For this reason, the operational energy cannot be an active input for the assessment of the environmental impacts of steel and timber tiny houses.


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# DÖNGÜSEL EKONOMİ POLİTİKALARININ YAPI SEKTÖRÜNE YANSIMALARI: EKOLOJİK ETİKETLERDEN DİJİTAL ÜRÜN PASAPORTUNA UZANAN DÖNÜŞÜM

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## ÖZET

Son elli yılda küresel kaynak tüketiminin yaklaşık dört kat artması, yapılı çevrenin bu tüketimdeki payını daha görünür hâle getirmiştir. Bu eğilim, yapı sektöründe ham madde kullanımının azaltılmasını, atık oluşumunun önlenmesini ve yeniden kullanım ile geri dönüşüm stratejilerinin bütüncül bir biçimde ele alınmasını zorunlu kılmaktadır. Avrupa Birliği'nin döngüsel ekonomi alanında aldığı kararlar ve geliştirdiği mevzuat, yapı sektörüne yönelik uygulamaları doğrudan etkilemekte; bu kararların yansımaları ulusal ölçekte de giderek daha fazla karşılık bulmaktadır.

Bu çalışmada, yapı sektörünü ilgilendiren döngüsel ekonomi politikaları kronolojik olarak incelenmiştir. Ekolojik etiket uygulamalarından başlayarak anlaşmalar, yönetmelikler, standartlar ve eylem planları değerlendirilmiş; son dönemde önem kazanan Dijital Ürün Pasaportu (DPP) uygulamalarına uzanan süreç bütüncül bir çerçevede ele alınmıştır. Ayrıca belirli yapı malzemeleri için geliştirilen düzenlemeler, bu düzenlemelerin doğal çevre üzerindeki etkileri, ekonomik katkıları ve sürdürülebilir mimarlık açısından ortaya çıkardığı sonuçlar tartışılmıştır.

Elde edilen bulgular, son beş yılda yapı sektörüne yönelik döngüsel ekonomi politikalarının sayısında belirgin bir artış olduğunu ve bu politikaların kademeli iyileştirmelerle desteklendiğini göstermektedir. Bu süreçte yapı ürünlerinin çevresel ve teknik özelliklerinin izlenebilirliğinin artırılması, geri dönüştürülmüş içerik kullanımının teşvik edilmesi ve eko-tasarım kriterleri doğrultusunda piyasa rekabetinin güçlendirilmesi hedeflenmektedir. Böylece yapı sektörünün doğal kaynaklara bağımlılığının azaltılması ve sürdürülebilirlik odaklı bir dönüşümün hızlandırılması amaçlanmaktadır.

**Anahtar kelimeler:** Yapı sektörü, döngüsel ekonomi, yasal çerçeve.

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# REFLECTIONS OF CIRCULAR ECONOMY POLICIES ON THE CONSTRUCTION SECTOR: A TRANSFORMATION FROM ECOLOGICAL LABELS TO DIGITAL PRODUCT PASSPORTS

## ABSTRACT

Over the past fifty years, global resource consumption has increased nearly fourfold, and the contribution of the built environment to this trend has become increasingly evident. This trajectory necessitates reducing raw material use in the construction sector and adopting integrated strategies for waste prevention, reuse, and recycling. The decisions and regulatory frameworks developed by the European Union in the field of circular economy directly affect construction-related practices, and their impact is becoming increasingly apparent at the national level.

This study chronologically examines circular economy policies related to the construction sector. The investigation, which begins with eco-labeling, covers agreements, regulations, standards, and action plans, providing a comprehensive overview of the process up to the recently implemented Digital Product Passport (DPP) system. In addition, sector-specific regulations for certain construction materials, their environmental impacts, economic contributions, and effects on sustainable architecture are addressed.

The findings show a significant increase in the number of circular economy policies targeting the construction sector over the past five years, supported by gradual improvements in regulatory approaches. During this period, key objectives have included enhancing the traceability of the environmental and technical characteristics of construction products, promoting the use of recycled content, and strengthening market competitiveness through eco-design criteria. Ultimately, these efforts aim to reduce the construction sector's dependence on natural resources and accelerate its sustainability-focused transformation.

**Keywords:** Construction sector, circular economy, regulatory framework.

## GİRİŞ

"Sadece bir tane dünyamız var, ancak 2050'de, dünya sanki üç gezegen varmış gibi tüketiyor olacak." - EC, 2020.

Avrupa Birliği (AB) Döngüsel Ekonomi Eylem Planı'nın açılış paragrafı bu şekilde başlar. Sadece yapılı çevrenin dahi doğadan çıkarılan tüm malzemelerin yaklaşık %50'sine ihtiyaç duyduğu düşünüldüğünde (EC, 2020) bu yargının doğruluğu anlaşılacaktır. Son 50 yılda küresel ölçekte tüketilen ham madde yaklaşık 4 kat artmış olup, Ekonomik İş birliği ve Kalkınma Örgütü (OECD)'ne göre, 2060 yılına kadar 167 Gt malzeme kullanımına ulaşılacağı öngörülmektedir (ÇŞİDB, 2025). Bu durum, kişi başına günlük malzeme kullanımının 45 kg civarına ulaşacağı ve malzeme kullanımındaki bu artışın çevresel zorlukları da beraberinde getireceğini ifade etmektedir.

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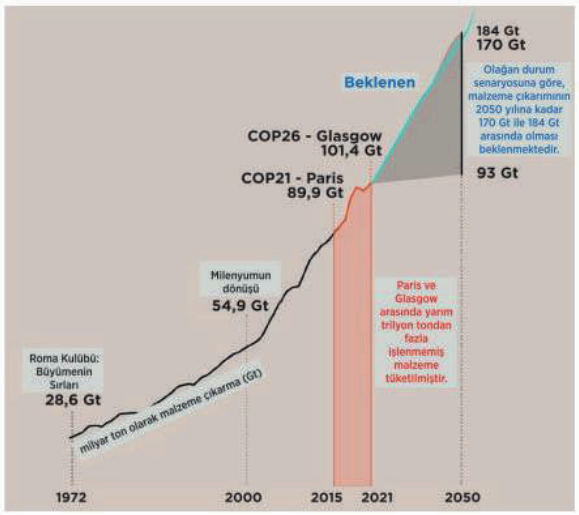
Çevresel emisyonlar açısından bakıldığında ise malzeme çıkarma, inşaat ürünlerinin imalatı, binaların inşaatı ve yenilenmesinden kaynaklanan sera gazı emisyonlarının, toplam ulusal sera gazı emisyonlarının %5-12'sini oluşturduğu tahmin edilmektedir. Ancak daha yüksek malzeme verimliliği sayesinde bu emisyonların %80 kadarı azaltılabilir (EC, 2020).

Bugüne kadar çıkarılan ve kullanılan tüm ham maddelerin sadece %8,6'sı ekonomiye kazandırılabilmiştir. Bir diğer deyişle kullanılan ham maddelerin %90'ından fazlası atığa dönüşmüştür (PACE, 2022). Biyokütle, fosil yakıtlar, metaller ve mineraller gibi malzemelerin küresel tüketiminin önümüzdeki 40 yılda iki katına çıkması öngörülmekte olup 2050 yılına kadar yıllık atık üretiminin %70 oranında artması beklenmektedir (OECD, 2021). Şekil 1'de 2050 yılına kadar öngörülen malzeme çıkarım miktarlarındaki artış gösterilmektedir.




**Şekil 1.** 1972-2050 Yılları Arasında Küresel Ölçekte Tüketilen Ham Madde Miktarları (ÇŞİDB, 2025).

Tüm bu ham madde tüketimi ve beraberinde gelen atık oluşumu düşünüldüğünde döngüsel ekonomi kavramının ön plana çıkmasının gerekliliği anlaşılmaktadır. Döngüsellik, kaynakların, malzemelerin ve ürünlerin verimli ve yeniden kullanımı ile döngüsel akışı anlamına gelmektedir. Bu ekonomik model, ürün ve malzemelerin ömrünü uzatarak ve atıkları en aza indirerek sürdürülebilir yeşil büyümeyi teşvik etmektedir.

Döngüsel ekonomi modelinde, Sürdürülebilir Tüketim ve Üretim ile doğal kaynakların ve toksik malzemelerin kullanımını en aza indiren ve bunun yerine daha iyi bir yaşam kalitesini destekleyen malzemelerin kullanımı arasındaki fark gözetilmektedir (Şekil 2). Bir başka deyişle döngüsel ekonomi, yaşam sonu kavramını, azaltma, yeniden kullanma, üretim ve tüketim süreçlerinin iyileştirilmesi ile değiştirir (Meis-Harris vd. 2021). Sürdürülebilir Kalkınma Amaçlarından birinin "Sorumlu Tüketim ve Üretim" (No.12) olması, konunun araştırılmaya değer yönünü ortaya koymaktadır (UNSD, 2025).

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**Şekil 2.** Kaynak kullanımını baz alan ekonomi modelleri (ÇŞİDB, 2025)

## MATERYAL VE METOT

Çalışmanın amacı uluslararası ve ulusal alanda yapı sektörü bağlamında döngüsel ekonomi politikalarındaki gelişimin incelenmesidir. Ana materyaller olarak son 50 yılda yayınlanan standartlar ve mevzuatlardan bilgi toplanmıştır (Şekil 3). Bu çalışmanın yürütülmesinde belli araştırma sorularından yararlanılmıştır. Bu sorular yardımıyla çalışmanın amacı doğrultusunda kapsam ve sınırları belirlenmiştir. Bahsi geçen araştırma soruları şu şekildedir:

- Uluslararası sahada yapı sektörü ile ilişkili olarak döngüsel ekonomi alanında ne gibi adımlar atılmaktadır?
- Zaman içerisinde bu alandaki gelişmeler nasıl seyretmiştir?
- Yakın zamanda ulusal sahada ne gibi yenilikler planlanmaktadır?
- Yapı malzemeleri ile ilişkili olarak ne gibi önlemler düşünülmekte, hangi yapı malzemeleri emisyon ve atık oluşumu açısından ön plana çıkmaktadır?

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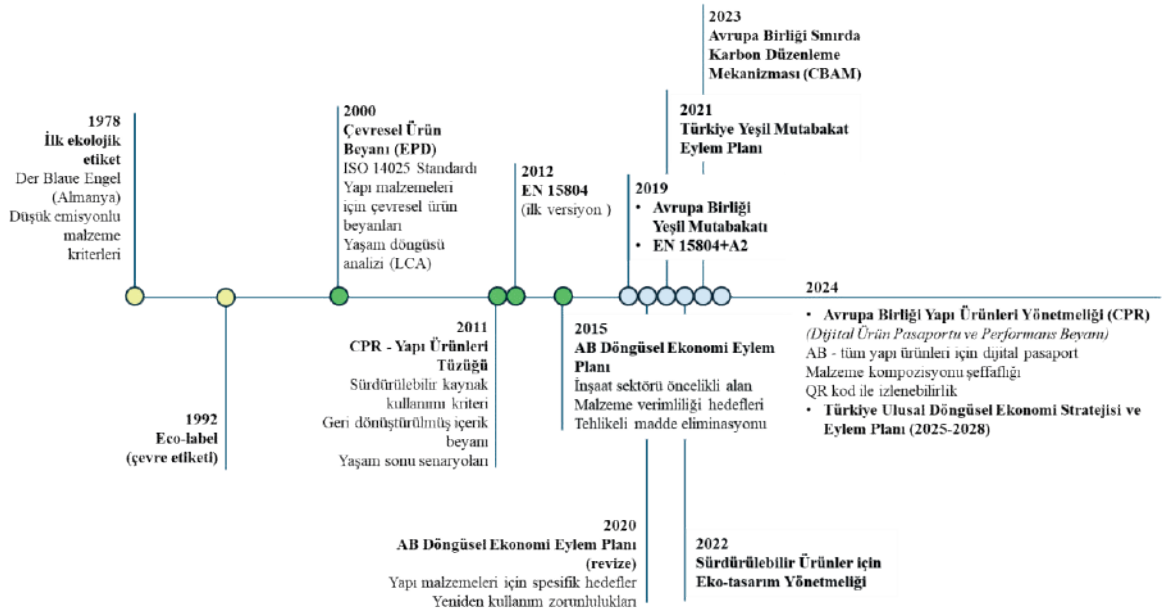


**Şekil 3.** Yapı Malzemeleri Üzerinden Döngüsel Ekonominin Gelişimi

## ULUSLARARASI ALANDAKİ GELİŞMELER

### Ekolojik Etiketler

İlk olarak 1978 yılında "Der Blaue Engel" adıyla ortaya çıkan eko-etiketin ardından 1992 yılında farklı alanlarda nice eko-etiket yaygınlaşmaya başlamıştır (Blauer Engel, t.y.). Enerji verimliliği (*Energy Star*), sürdürülebilir kaynak kullanımı (*FSC*), adil ticaret uygulamaları (*Fairtrade*), düşük karbon ayak izi (*Carbon Trust*), yağmur ormanlarının korunması (*Rainforest Alliance*) gibi bilinen örnekleri dahil 700'den fazla farklı eko etiket şu anda kullanımdadır.

Üstelik bu eko etiketler hizmetlerde, turizmde, inşaatta ve gıda zincirlerinde de kullanılmaktadır. AB Yeşil Mutabakatı, Sürdürülebilir Ürünler İnisiyatifi (SPI) ve Dijital Ürün Pasaportu (DPP) gibi yeni düzenlemeler, eko etiketlerin dijitalleşmesini teşvik etmektedir (Institute of Sustainability Studies, 2025).

### Avrupa Birliği Yeşil Mutabakatı (2019)

2019 yılında yayınlanan AB Yeşil Mutabakatının amacı AB'yi 2050'ye kadar "iklim-nötr" hale getirmek ve döngüsel ürünler için öncü pazarların gelişimini teşvik etmektir. Enerji, sanayi, ulaşım, tarım, finans, inşaat, atık yönetimi, tüketici ürünleri vb. tüm sektörlerde sürdürülebilir dönüşüm gerçekleştirmeyi hedeflemektedir. AB Yeşil Mutabakatı, eko etiketleri gönüllü bir pazarlama aracı olmaktan çıkarıp, yasal olarak tanımlı, dijital, izlenebilir ve doğrulanabilir bir sistem haline getirmektedir (EC, 2019).

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**EN 15804 Standardı ve Çevresel Ürün Beyannamesi**

EN 15804, LCA yöntemi kullanılarak Çevresel Ürün Beyanları (EPD) oluşturmak için rehberlik sağlayan bir Avrupa standardıdır. İlk olarak 2012 yılında yayınlanmış olup 2013 ve 2019 yıllarında revizyon geçirmiştir. EN 15804, EPD'lere ilişkin verilerin nasıl toplandığını, raporlandığını, doğrulandığını ve sunulduğunu tanımlar ve ayrıca Yaşam Döngüsü Etki Değerlendirmesi (LCIA) ve Envanterler (LCI) için kuralları da içerir. +A1 sürümünde 11 adet çevresel etki kategorisi ve sınırlı sayıda raporlama kategorisi tanımlanmıştır. +A2 ile, temel etki kategorisi sayısı 13'e çıkarılmış olup ilave 6 adet opsiyonel etki kategorisi tanımlanmıştır. 2022 yılı itibari ile EPD'lerde +A2 kullanımı zorunlu hale gelmiştir. +A2 ile C1–C4 modüllerinin ve modül D'nin (ömrü sonu yarar) beyanı zorunlu hale gelmiştir (One Click LCA, 2025). Türkiye, AB standartlarıyla uyumlu EN 15804 ve ISO 14025 çerçevesini benimsemiştir.

Çevresel Ürün Beyanı (EPD), ürünlerin ve hizmetlerin çevresel performansı hakkında karşılaştırılabilir, objektif ve üçüncü taraf tarafından doğrulanmış bilgiler sağlayan bir belgedir. Yeni Yapı Ürünleri Yönetmeliği (CPR-2024) ile EPD'nin DPP'ye ait çevresel bilgi modülünü oluşturması kararlaştırılmıştır. Bu sayede EPD artık bir "ek belge" değil, ürünün kimliğinin bir parçası haline gelmiş olacaktır (Blue Room Innovation, 2024).

**Avrupa Birliği Döngüsel Ekonomi Eylem Planı**

İlk versiyonu 2015 yılında yayınlanan AB Döngüsel Ekonomi Eylem Planı 2020 yılında revize edilerek tekrar yayınlanmıştır. Bu eylem planının amacı AB'nin kaynak tüketimini azaltan, döngüselliğini artıran ve böylece gezegene net faydalar sağlayan bir büyüme modeline geçmesinin önünü açmaktır (EC, 2020).

Bu eylem planında döngüsel ekonomiye geçişte öncelikli sektörler:1- Ambalaj 2. Batarya ve Araç 3. Elektronik ve Bilgi-İletişim Teknolojileri (BİT) 4. Gıda ve Biyokütle 5. İnşaat ve Bina 6. Plastik 7. Tekstil olarak belirtilmiştir (EC, 2020).

**Sürdürülebilir Ürünler için Eko-tasarım Yönetmeliği**

Sürdürülebilir Ürünler için Ekolojik Tasarım Yönetmeliği (ESPR), Avrupa Yeşil Anlaşması'nı içeren 2020 Döngüsel Ekonomi Eylem Planı'nın ardından gelen kurallar paketinin bir parçasıdır (EC,2024). 2022 yılında sunulan yönetmelik 2024 yılında yürürlüğe girmiştir. ESPR, AB'de kullanılan malzemelerin döngüsellik oranının iki katına çıkmasına katkıda bulunmayı hedeflemektedir. Önceki Eko-tasarım Direktifi'nden (Ecodesign Directive) farklı olarak üç ana değişiklik içermektedir. Bunlar DPP, yeşil kamu alımları ve satılmayan ürünlerin imhası ile ilgili kurallardır. 2025–2030 Çalışma Planı (Ecodesign working plan, COM (2025)) temel alınarak, öncelik verilen ürün grupları ile tahmini uygulama yılları şu şekildedir: 2026-demir-çelik, 2027-alüminyum, tekstil-giyim, lastik, 2028-mobilya, 2029-süngerli yatak döşeği (T.C. Ticaret Bakanlığı, 2023).

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**Avrupa Birliği Sınırda Karbon Düzenleme Mekanizması**

AB, sınırda karbon fiyatlandırması getiren CBAM ile "karbon yoğun" olarak değerlendirilen ithal ürünlerde yalnızca üretim maliyeti değil, o ürünün içindeki gömülü emisyonlar için de bir bedel ortaya koymaktadır. 2023 yılında yürürlüğe girmiştir. Sera gazı emisyonlarının %55 oranında azaltılması hedefiyle başlıca riskli ürün gruplarına uygulanması planlanmaktadır. Bu ürün grupları çimento, demir ve çelik, alüminyum, gübre, hidrojen ve elektrik olarak sıralanabilir. AB Resmi Gazetesi'nde yayınlanan bu mekanizma, iklim eylemleri ile ve Avrupa'nın 2050 yılına kadar sera gazı emisyonlarını dengelemesi (iklim-nötr bir kıta olma hedefi) ile uyumludur (T.C. Ticaret Bakanlığı, 2021).

**Avrupa Birliği Yapı Ürünleri Yönetmeliği**

2024/3110 sayılı AB Yapı Ürünleri Yönetmeliği (Construction Products Regulation, CPR), 2024'te kabul edilmiştir. 2025'te kısmi yürürlüğe giren yönetmeliğin 2026 yılının başına kadar tam uygulamaya geçilmesi hedeflenmiştir. Yapı Ürünleri Yönetmeliği (CPR), AB genelinde yapı ürünleri için standartlaştırılmış güvenlik, performans ve çevresel etki gerekliliklerini belirleyen kritik bir AB mevzuatıdır. Güncellenmiş mevzuat, kilit performans alanlarını tanımlamakta ve Üye Devletlerin güvenlik ve çevresel gereklilikleri uygulamasını zorunlu kılmaktadır. Ürünlerin doğal kaynakların daha etkin kullanımı, geri kazanılmış içerik, döngüsel ekonomi prensiplerine uygunluk gibi hususlara yönelik beklentiler artmıştır. Güncellenmiş CPR gereksinimleri, inşaat ürünleri ve malzemeleri için Çevresel Ürün Beyanları (EPD'ler) oluşturma kurallarını belirleyen bir Avrupa Standardı olan EN 15804 ile uyumludur. Bu yönetmelik ile DPP zorunluluğu getirilmiştir. CE işaretleme alanının genişletilmesi, geri dönüştürülmüş içerik ve eko-tasarım gibi sürdürülebilirlik gereklilikleri, zorunlu yeşil kamu alım kriterleri yönetmelikte yer alan diğer gelişmelerdir (European Parliament & Council of the European Union, 2024).

DPP, bir ürünün teknik özellikleri ve çevresel verilerini dijital olarak depolayan bir platformdur ve ürünlerin geri kazanım, yeniden kullanım, atık yönetimi açısından izlenebilirliğini artırmayı hedefler. DPP, ürünle ilgili bilgilerin QR kodu gibi dijital olarak etkinleştirilmiş bir veri taşıyıcı aracılığıyla erişilebilir olmasını sağlayacak bir araçtır. Özellikle kaynak tüketiminin ve sera gazı emisyonlarının azaltılması nedeniyle çevresel faydalar ortaya çıkacaktır (European Parliament & Council of the European Union, 2024).

Performans Beyanı (Declaration of Performance, DoP) ise CPR'ın bir başka parçasıdır. CPR ile zorunlu hale getirilmiştir. Ürünün karşıladığı performans ve çevresel standartları detaylandıran kapsamlı bir ürün dosyası görevi görmektedir. Bu beyan, tüm teknik ve çevresel iddiaların doğrulandığını ve şeffaf olduğunu garanti ettiğinden düzenleyici otoriteler için önemlidir (European Parliament & Council of the European Union, 2024).

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## ULUSAL ALANDAKİ GELİŞMELER

### Türkiye Yeşil Mutabakat Eylem Planı

2021 yılında yayınlanan eylem planında, yeşil-döngüsel ekonomi, iklim değişikliği ile mücadele, sınırda karbon düzenlemeleri ve yeşil finansman gibi içerikler de dahil olmak üzere 9 ana başlık altında 32 hedef ve 81 eylem tanımlanmaktadır. Bunlarla amaçlanan Türkiye^yi AB'nin Avrupa Yeşil Mutabakatı ile uyumlu olarak sürdürülebilir, kaynak-etkin ve yeşil ekonomiye yönlendirmektir (T.C. Ticaret Bakanlığı, 2021).

### Ulusal Döngüsel Ekonomi Stratejisi ve Eylem Planı

Resmî Gazete'de 2024 yılında yayınlanan 1.Ulusal Döngüsel Ekonomi Stratejisi ve Eylem Planı (UDESEP), Çevre, Şehircilik ve İklim Değişikliği Bakanlığı (ÇŞİDB) tarafından hazırlanmıştır. İnşaat sektörü de dahil olmak üzere 7 öncelikli sektör belirlenmiş olup 6 stratejik hedef ve 53 eylem ortaya konmuştur. Böylelikle 2053 net sıfır emisyon hedeflerine katkı sunulması amaçlanmıştır (ÇŞİDB, 2025).

Eylem planına dair amaçlardan bazıları şu şekilde sıralanabilir: (i) Daha döngüsel ürünler için çevreye duyarlı tasarımı teşvik etmek. (ii) AB Sürdürülebilir Ürün Politikası kapsamındaki yeni döngüsel girişimler için gerekli altyapıları hazırlamak (iii) Döngüsel ekonomi ilkelerini endüstriyel üretim süreçlerine entegre etmek, (iv) Atık yönetiminde dijitalleşmeyi artırmak ÇŞİDB, 2025).

## BULGULAR VE TARTIŞMA

Elde edilen bulgular, son beş yıl içerisinde yapı sektörüne yönelik döngüsel ekonomi politikalarının hem kapsam hem derinlik bakımından belirgin biçimde arttığını göstermektedir. EN 15804+A2 standardının çevresel etki değerlendirmesinde kapsam genişletmesi yapması, özellikle ürün yaşam döngüsünün çevresel etki ve ömür sonu yarar aşamalarını öne çıkarmıştır. Buna paralel ESPR kapsamında emisyon azaltımı, enerji ve su tüketiminin düşürülmesi, hizmet ömrünün uzatılması, malzeme verimliliğinin artırılması, onarıma uygun tasarım, geri dönüşüm senaryolarının güçlendirilmesi ve toprak–hava–biyoçeşitlilik üzerindeki etkilerin sınırlandırılması gibi kriterler sektörün teknik çerçevesini yeniden şekillendirmektedir.

Gelişen politika seti, gönüllü uygulamalardan (eko-etiketler, EPD) zorunlu uyumluluk gerektiren düzenlemelere (DPP, ESPR gereklilikleri, CBAM yükümlülükleri) doğru bir dönüşümün yaşandığını göstermektedir. Özellikle CPR kapsamında ürün güvenliği, çevresel etki ve kaynak tüketimindeki azaltım için geliştirilen düzenlemeler, döngüsel performansı artık ürün kalitesinin ayrılmaz bir bileşeni haline getirmiştir.

İnşaat sektöründe çimento, demir–çelik ve alüminyum gibi karbon yoğun malzemeler hem CBAM hem ESPR kapsamında döngüsellik ve emisyon azaltımı açısından odak sektörler olarak öne çıkmaktadır. Bu durum, karbon ayak izinin şeffaf biçimde hesaplanmasını ve düşük karbonlu ya da geri

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dönüştürülmüş hammaddelere geçişi hızlandırmaktadır. AB'nin döngüsel ekonomi alanındaki mevzuatı, yapı sektörüne yönelik gereklilikleri doğrudan etkilemekte; bu düzenlemelerin etkilerinin ulusal politikalara giderek daha güçlü biçimde yansıdığı gözlemlenmektedir. Bu çerçevede ortaya çıkan genel eğilim, yapı sektörünün hem doğal kaynak bağımlılığını azaltmayı hem de sürdürülebilirlik odaklı dönüşümü hızlandırmayı hedeflediğini açıkça ortaya koymaktadır.

## SONUÇ VE ÖNERİLER

Bu çalışmada son 50 yılda döngüsel ekonominin yapı sektöründeki yansımalarına dair ortaya çıkan standartlar, belgeler ve mevzuat incelenmiş olup bunların uluslararası ve ulusal alandaki uygulamalara yönelik yansımaları değerlendirilmiştir. AB tarafından kabul gören kararlar ve yürürlüğe konan uygulamalar dikkate alındığında Türkiye için şu maddeler öne çıkmakta olup bu alanda iyileştirmelere gidilmesi önerilmektedir:

- Üreticilerin malzemeye ilişkin karbon ayak izi, geri dönüştürülmüş içerik, kimyasal bileşen ve dayanım performansı gibi verileri dijital ve doğrulanabilir formatta sunabilmesi için ulusal ölçekte destek mekanizmaları kurulmalıdır.

- Özellikle çimento, çelik ve alüminyum sektörlerinde geri dönüştürülmüş hammadde kullanımını zorunlu kılacak asgari oranlar belirlenmelidir. Bu yaklaşım ile AB düzenlemeleri ile uyum sağlanmış ve döngüsel malzeme piyasası güçlendirilmiş olacaktır.

- Onarılabilirlik, modülerlik, sökülebilirlik ve eko-tasarım ilkeleri yapı malzemeleri standartlarına entegre edilmeli; tasarımcıların bu kriterleri uygulamasını sağlayacak rehber dokümanlar hazırlanmalıdır.

- Yapı ürünleri için yaşam döngüsü veri tabanları geliştirilmeli ve genişletilmelidir.

- CBAM kapsamındaki sektörlerde Ar-Ge ürünlerine ve düşük karbon teknolojilerine öncelik verilmelidir. Düşük klinkerli bağlayıcılar, hurda bazlı çelik üretimi ve düşük karbonlu alüminyum teknolojileri vb. yaygınlaştırılmalıdır.

- Mevcut durumdaki düşük kaliteli geri dönüşüm uygulamalarından (dolgu, alt temel vb.) ileri dönüşüm uygulamalarına geçiş için kalite kontrol laboratuvarları, ayrıştırma teknolojileri ve malzeme geri kazanım tesisleri desteklenmelidir.

- Mimarlar, mühendisler, malzeme üreticileri ve yatırımcılar için DPP, karbon ayak izi raporlaması ve döngüsel tasarım uygulamalarına yönelik eğitim ve danışmanlık programları yaygınlaştırılmalıdır.

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# SAFRANBOLU YAZIKÖY'DE GELENEKSEL KONUT MİMARİSİ: BİR RUM EVİ ÖRNEĞİ

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## ÖZET

Geleneksel mimari, sadece estetik bir değer taşımaktan öte, somut ve somut olmayan mirasla birlikte kolektif hafızayı ve toplumsal yaşam kültürünü oluşturmaktadır. Yöresel, yerel, halk, kırsal, anonim, spontane mimari gibi çeşitli kavramlarla ifade edilen bu yapı kültürü, yerel, bölgesel, ulusal ve küresel ölçekte kültürel çeşitliliği yansıtması açısından önemlidir. Bu bağlamda, Dünya Mirası Safranbolu şehrinin geleneksel yapım teknikleri kırsal yerleşimlerinde de varlığını sürdürmektedir. Bu yerleşimlerden biri olan Yazıköy, 1924 Nüfus Mübadelesi öncesinde Türk ve ağırlıklı olarak Rum nüfusun birlikte yaşadığı bir köydür. Geçmişte üç büyük yangın geçiren köyde, özellikle 1916 yılındaki yangında birçok Rum evi zarar görmüş, ancak aynı yapım teknikleriyle yeniden inşa edilerek günümüze ulaşmıştır. Bağcılığın geliştiği köyde, Rum nüfusun ağırlıklı olarak şarap üretimiyle geçimini sağlaması nedeniyle evlerinde şarap mahzenleri bulunmaktadır. Dönemin yaşam ihtiyaçlarına göre ve yöresel yapı malzemeleri kullanılarak inşa edilen bu konutlar, tarihi birer belge niteliğindedir. Bu çalışmada, Yazıköy'de bulunan ve 185 ada, 5 parselde kayıtlı terkedilmiş bir Rum evinin mimari özellikleri ele alınmaktadır. Yapı, yer, ara ve üst kattan oluşmakta olup; yer katı taş yığma, ara ve üst katları ise hımış (ahşap karkas-kerpiç dolgulu) teknikte inşa edilmiştir. Konut, Türk evi plan tipolojisine göre orta sofalı plan düzenine sahiptir. Alt katında, yapının şarap mahzeni olarak kullanıldığı döneme ait pitoslar bulunmaktadır. Ara ve üst katlar yaşam alanı olarak düzenlenmiş olup, üst katta yer alan duvar resimleri dikkat çekmektedir. Çalışmada, söz konusu yapının mimari özellikleri ve belgeleme süreci ele alınarak, gelecekte gerçekleştirilecek koruma çalışmalarına katkı sağlanması amaçlanmaktadır.

**Anahtar Kelimeler:** Safranbolu, Yazıköy, Geleneksel Konut, Kırsal mimari, Rum evi

# TRADITIONAL HOUSING ARCHITECTURE IN SAFRANBOLU YAZIKÖY: A GREEK HOUSE EXAMPLE

## ABSTRACT

Traditional architecture, beyond just having an aesthetic value, constitutes collective memory and social life culture together with tangible and intangible heritage. This building culture,

expressed with various concepts such as regional, local, folk, rural, anonymous, and spontaneous architecture, is important in reflecting cultural diversity on a local, regional, national, and global scale. In this context, the traditional construction techniques of the World Heritage city of Safranbolu continue to exist in its rural settlements. Yaziköy, one of these settlements, was a village where Turkish and predominantly Greek populations lived together before the 1924 Population Exchange. In the village, which experienced three major fires in the past, many Greek houses were damaged, especially in the fire in 1916, but they were rebuilt with the same construction techniques and survived to the present day. In the village where viticulture is developed, there are wine cellars in their houses since the Greek population mainly makes a living from wine production. These houses, built according to the living needs of the period and using local building materials, are historical documents. This study examines the architectural features of an abandoned Greek house registered in block 185, parcel 5 in Yazıköy. The structure consists of ground, middle, and upper floors; the ground floor was built with stone masonry, and the middle and upper floors were constructed with the hımış (wood frame-adobe filled) technique. According to the Turkish house plan typology, the house has a central sofa plan. On the lower floor, there are pithos from the period when the building was used as a wine cellar. The middle and upper floors are arranged as living spaces, and the wall paintings on the upper floor are striking. The study aims to contribute to the conservation efforts to be carried out in the future by examining the architectural features and documentation process of the building in question.

**Keywords:** Safranbolu, Yazıköy, Traditional Housing, Rural Architecture, Greek House

## 1. INTRODUCTION

Traditional architecture is a concept of structure that reflects cultural values and environmental conditions developed and produced by societies throughout history. This architectural phenomenon, referred to with different terms such as vernacular, anonymous, spontaneous, local, or rural, addresses structures that emerge in a specific geographical context and their responses to the physical and cultural environment (Rudofsky, 1968; Özköse, 2022). The concept of vernacular architecture creates certain typological models using local techniques and construction methods and shapes the characteristic plastic elements of the region. For this reason, it is accepted as a concept of structure that develops within certain boundaries. Today, it is not limited to a primitive construction process or individually constructed structures but can continue with a production process based on skilled labor. According to Rapoport, all local architecture is traditional by definition (Rapoport, 1972). Kuban explains that anonymous

architecture is a concept that generally defines local and simple structures for ordinary people. Although these non-monumental structures are often described as "anonymous" because the name of a specific architect is unknown, each structure had a master or owner during its construction period. This architectural approach refers to building types that belong to large communities whose individual differences are not apparent. In traditional societies, houses built with local materials and workmanship constituted a large part of the environment shaped by human hands. During the Ottoman period, since most of the population consisted of villagers, small-town dwellers, and nomads, the structures built were also predominantly anonymous. Such houses are based on simple design principles that respond to functionality and ecological needs rather than aesthetic concerns. While traditional houses bear the traces of the geography and historical context in which they are located, they also reflect individual identity with small differences (Kuban, 1995, pp. 12-13).

The traditional Turkish house, which developed on the Anatolian heritage, is enriched with the ideas that form its spatial identity and is closely related to the period's social, commercial, economic, and technological advances. For this reason, it was effective in the Ottoman geography for many years, and the housing construction culture that became classic from the 17th century onwards continued until the Republic period. Despite the diversity of climate, environment, materials, and technology, the spatial identity that was formed was preserved (Küçükerman & Güner, 1995, pp.12-17).

The realization of the 1975 European Architectural Heritage Year events in Safranbolu with the cooperation of Istanbul Technical University Faculty of Architecture and Safranbolu Municipality and the declaration of the city as an urban protected area in 1976 were important steps that initiated the process of protecting the cultural heritage in the region. The inclusion of Safranbolu in the UNESCO World Heritage List in 1994 expanded the scope of the protection works and contributed to protecting the settlements in the vicinity.

Safranbolu houses are important examples that reflect Turkish society's lifestyle, socio-economic structure, and construction technology in the 18th and 19th centuries. These structures were built with wood, stone, and adobe materials by the slope of the land in a way that would not block the view, sun, and wind. These houses, which draw attention with their sloping roofs covered with wooden tiles and their appearance resembling monumental mansions, have an introverted arrangement behind the high walls of the courtyards in harmony with the street texture. While the ground floors were generally built with the stone masonry system, the hımış (wood frame) construction system was used on the upper floors. While few

windows were on the lower floors, the upper floors were expanded with projections, and a spacious spatial order was provided with more window openings. The buildings where the Greek minority lived in the city during the Ottoman period were generally built with a stone masonry system. The lower floors were used for commercial purposes, and the upper floors were used as residences. The spatial use of these structures differs significantly from the houses of the Muslim population (Figure 1).



**Fig. 1.** House images from Safranbolu Historical Bazaar area, Kıranköy, Bağlar and Historical Bazaar (Çukur) area

Similar spatial and structural features are also seen in the Safranbolu countryside. Yazıköy, located on the Kastamonu road, approximately 5 km from Safranbolu, takes its name from its topographically flat location. Settled by Yörük Turkmens in the 1500s, this village draws attention as a region where the Greek population also lives densely. The lands of the Greek population in Safranbolu Kıranköy and Yazıköy were left to them. The Greeks in the village lived in the Hisar neighborhood, which was surrounded by walls whose traces cannot be seen today. Several fires have occurred in the village throughout history. In the fire that occurred in 1916, many houses were completely burned, and the village was rebuilt (Özdemir, 1984, pp. 56-57). The village contains religious structures such as mosques, chapels, and public structures such as baths and laundries. Today, there are 111 registered buildings in the village, 100 of which are mansions (Özköse, 2022, pp. 74-75) (Figure 2).



**Fig. 2.** General view of the architectural heritage of Karabük, Safranbolu, Yazıköy.

## 2. MATERIAL AND METHODS

In this study, the architectural features of an abandoned Greek house in Yazıköy will be examined, and the structure will be documented for its preservation. The study's main purpose is to evaluate traditional construction techniques and building materials and contribute to the preservation of the structure in the context of cultural heritage. In this context, the current status of the structure has been documented. All plans, facades, and structure sections were converted into survey drawings, and a detailed observation was made. In this process, the load-bearing systems of the structure, material use, details, and structural deteriorations will be determined, and visual data will be collected. In order to understand the historical and cultural context of the structure, literature reviews were conducted, and documents regarding the village's past were examined. The historical evolution of the structure was discussed in the light of data from written sources before the population exchange. This was investigated by investigating regional architectural features, construction techniques, and functional changes. The aim is to reveal the

architectural features and historical context of the traditional Greek house in Yazıköy through on-site observation and examination, architectural and photographic documentation, and source research. The aim of documenting the structure in question is to contribute to the research on the historical texture and architecture of Yazıköy in the literature.

## 3.RESEARCH AND FINDINGS

Reflecting the traditional residential architecture in Yazıköy and the common past of Greek and Turkish culture, the house is among the important structures that reflect both the local architecture and the historical and cultural transformation of the region (Figure 3).



**Fig. 3.** Architectural appearance of the house in Yazıköy, block 185, parcel 8.

**Plan features:** The house in the Yazıköy village of Safranbolu district of Karabük, on the 185th island, fifth parcel, is a characteristic example of traditional housing architecture in Safranbolu. The building is arranged in a trapezoidal shape in the northeast-southeast direction, in harmony with the form of the plot. The three-story house consists of a ground floor, a mid-floor, an upper floor, and a central sofa plan typology (Figures 4-5).

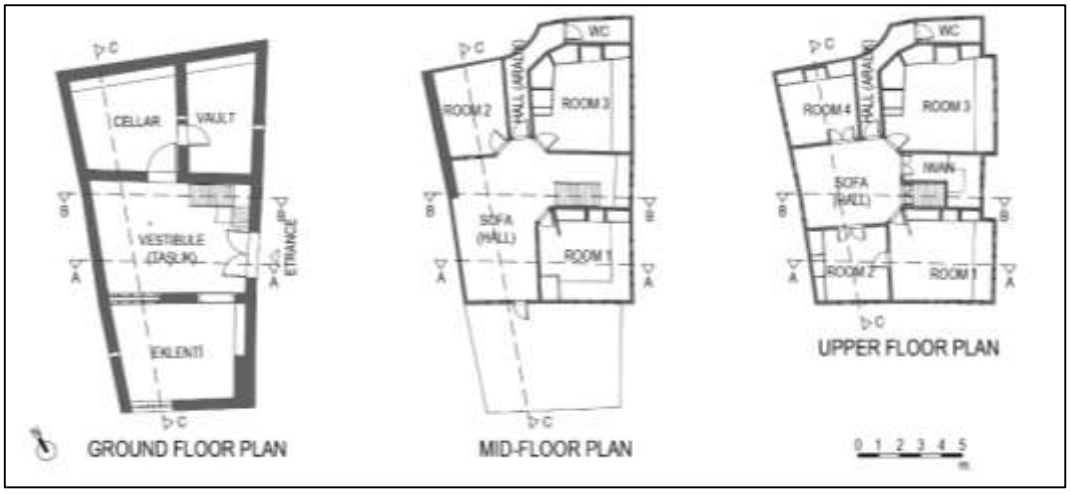


**Fig. 4.** Floor plans.




**Fig 5.** Sections and Facades

The main entrance is on the southeast facade, and the rocky area is accessed through this door. The stacked stone technique built the rocky area with a soil floor. On the left of the area, a loophole window to the northwest of the single-story section was added to the structure later, and a door opened to the backyard on the southwest. On the right of the loophole are two interconnected areas, with a loophole window facing the road. This area used to house pithos used for wine production and later for molasses and must production. This floor was also used as a hayloft, a barn, and a cellar for storing food and beverages, and after the Greeks left, the cellars were used as molasses storage areas (Figure 6).



**Fig. 6.** View of the ground floor stony area, warehouse (old cellar) and cellar.

An 18-step wooden staircase starting from the stony area provides access to the mezzanine floor. This staircase's starting point is a step called "stone shoe." The mezzanine floor later acquired an inner hall arrangement by removing a room. This floor contains three rooms, one in the southwest and two in the northeast, and a toilet accessed through a gap. The inner hall has two windows opening onto the street facade. The room's walls, previously present in the

southwest, were removed and converted into an iwan. The space, which was later added to the ground floor and arranged as a kitchen, was used as a terrace on the mezzanine floor. Due to this later intervention, one of the windows on the southwest facade was converted into a door, and a terrace connection was provided (Figure 7).



**Fig 7.** View from the inner hall of the mezzanine floor, the room converted into a kitchen and the door converted into a door.

In the northeast direction, a space extending between two rooms surrounds Room 3, and at the end of this space is a lavatory. Natural ventilation is provided in the space and the lavatory through two skylights facing northwest (Figure 8).



**Figure 8.** Mid- floor toilet space (Aralık) and toilet.

The most authentically preserved spatial arrangement is Room 1 on the mid-floor, with two windows facing southeast and southwest. On the wall of the room adjacent to the sofa are cupboards, a stove, and a wooden divan facing the window (Figure 8).



**Fig. 8.** Mid-Floor Room 1 Space

The outer façade of Room 2, located in the northwest of the Mid- Floor Room 1 Space, was closed and a window was opened from the inside to the opened iwan (Figure 9).



**Fig. 9.** Mid-Floor Room 2 Space

Room 3 has lost its side windows due to the arrangement of the toilet space; only two windows on the front facade have been preserved. On the closed wall of this room, a stove and cupboards have been arranged, as well as a wooden divan in the direction of the window. The floor is wooden, and the ceilings are wooden with slats. There are black shutters (Karakapak) on the windows of the mid-floor (Figure 10).



**Fig.10.** Mid-Floor Room 3 Space

The staircase following the inner hall provides access to the upper floor. A window to the northwest illuminates the hall on the upper floor. A bench is placed on the northwest (street) facade, and an L-shaped wooden bench is placed in the northwest. There are two rooms in the south part of the building and two rooms and a toilet in the middle, as on the intermediate floor, on the northeast side (Figure 11).



**Fig. 11.** View from the Upper Floor Sofa

A curved corridor accesses the toilet in the northeast direction. Natural ventilation is provided in these two spaces using two skylights in the northwest direction. The layout of these spaces is similar to the plan on the mid-floor (Figure 12)..



**Fig. 12.** View of the Staircase with Toilet and Aralık

On this floor, Room 1 extends straight to the street facade, containing three windows on the southeast and southwest sides and a stove and cupboards on the northeast wall. It has a floor and a geometric patterned ceiling with wooden slats. Just below the ceiling molding is a geometric waterway pattern consisting of light blue, navy blue, and white, and geometric patterned hand-drawn ornaments, mostly plant-colored, in the red lead between the windows. With these features, Room 1 must be the main room (Figure 13).



**Fig. 13.** Upper Floor Room 1 (Main Room)

Room 2 was designed with two windows in the southwest direction and cupboards on the northwest wall, preserving its original structure (Figure 14).



**Fig. 14.** View from Upper Floor Room 2

Room 3 extends straight towards the street facade and contains two windows in this direction and a stove and cupboards on the northeast wall (Figure 15).)



**Fig. 15**. View from Upper Floor Room 3

The north wall of Room 4 is blank and contains the stove and cupboards; it has two windows facing northwest. A wooden railing is placed before the upper-floor windows (Figure 16).



**Fig. 16.** View from Upper Floor Room 4

Facade features: The house's ground floor is built with partially plastered and partially rough-pointing rubble stone masonry. The upper floor is covered with plaster and whitewash on a wooden frame system. The building ends, and moldings on the mid and upper floors are made of timber. There is no soffit covering. As a result of the renovations it has undergone, the building has preserved its original layout on the entrance and southwest facades.

In contrast, it has changed to the northeast and northwest facades. On the entrance facade, the mid-floor is arranged as a miter bay along the entire facade, extending over the ground floor towards the street. On the upper floor, the rooms on both sides of the inner hall have straight bays, and wooden cornices support these projections. On the ground floor, there is no direct connection to the street except for the house's wooden entrance door and the room's loophole window in the northeast direction. On the southeast facade of the mid-floor, there are six windows, two in each room and hall, according to the interior layout of the room sections. There are wooden shutters in front of the windows. The upper floor has a similar window arrangement to the mid-floor, but there is a who's who window on the north side of the main room (Room 1) and a who's who window on each side of the bay in Room 4. There is a black shutter on the who's who window on the north side, while wooden railings are in front of all the other windows. The northwest and northeast facades are blind up to the upper floor, and there are only two windows for the middle sofa and the skylights of the toilets on the northwest side (Figure 17).



**Fig. 17.** View of the Facades of the House

On the southwest facade, the new structure added to the ground floor disrupted this floor layout, but the facade layout of the mid and upper floors was preserved. On this facade, one of the windows was converted into a door to provide access from the space on the intermediate floor, which was later converted into an iwan and used as a kitchen to the terrace on the ground floor. Of the two rooms in the southwest direction, Room 1 has preserved its original window layout and two windows. One of the two windows of the space converted into an iwan has been converted into a door, and all of its windows have black shutters. On the upper floor, the same opening layout as the mid-floor was preserved in the room space in the southwest direction, but since it was expanded with the main room, it was arranged to have a total of five windows. There are colored crescent and star motif hand-drawn decorations on the edges of the windows of the main room. Deer antlers are hung from its eaves.

In Safranbolu, hanging objects such as horseshoes, turtle shells, deer antlers, and animal skulls on the visible parts of houses are also included in the scope of folk beliefs. Writing phrases such as "Maşallah," "Maşallah Kâne," or "100 Ya Hafîz" on buildings also assumed a protective function in line with these beliefs (Durmuş and Soykan, 2013, pp. 99–100). Placing animal heads on the corners or roofs of houses is based on the belief that the evil eye effect will be warded off (Uygur, 2013, p. 161). The deer figure, together with the Geyik Baba shrines in Göveren, is one of the examples where these beliefs are spatially embodied (Kalafat, 2003, p. 33; Gür and Soykan, 2013, pp. 106–107; Yiğit, 2023, p. 388). As a reflection of this tradition, the crescent star and deer antlers are seen on the eaves of the house's main room.



**Fig. 18.** Deer antlers on the eaves of the house.

According to another story in Yazıköy, keşkek was left on the "Altar Stone" stone among the people living in the village for the deer, and the deer helped in return. However, after the miracle of this event was heard, the deer were never seen again, and Dede passed away shortly thereafter. Over time, the keşkek dish became the village's symbol; this dish, especially prepared on holidays, attracted visitors from the surrounding villages to Yazıköy. In line with this tradition, many stone ovens were built in the village, which were called "keşkek ovens." There is also a tomb in the village of a saint known as "Keşkek Dede"; the stone next to the tomb is still known as the "Altar Stone" among the people.

**Construction Materials and Techniques:** In Safranbolu, fir and Scots pine timber were used as building materials in wooden structural systems, and calcareous stone and a porous and light material called kufenk stone were used as filling materials. Mortar prepared with lime obtained from the hard blue limestones in the region or mud plaster made from adobe dough was applied (Güneş, 2014, pp. 82-83; Günay, 1981, p.169; Özdemir, 1984, p. 61). In Yazıköy, the stone of the region was used. While Yazıköy stone was supplied from the quarries in the past, there is no active quarry in the region today (Şener, 2023, 58-60).

While wooden materials of 30 cm width, 3 cm thickness, and less than 4 m were preferred for flooring, wooden elements of 17.5-20 cm width and 1.5 cm thickness were used for ceiling coverings. Clay soil, usually obtained from the region in May, is mixed with straw and crushed with feet to make it thick, then poured into four- or three-piece molds and shaped. After drying for 10 days, these adobe bricks can be used as wooden roof filling. The dimensions of stuffed adobe bricks generally vary from 27x27x10 cm, 27x22x10 cm, and 27x13x10 cm (Günay, 1981, p. 169; Kaya, 1996, p. 57).

Different types of wood, such as walnut and poplar, are used in the structural elements in Yazıköy. Walnut is preferred for elements such as floor, ceiling, interior and exterior doors, black doors, picket fence, cabinet doors, and musabak; poplar is preferred for stair railings and windows (Özdemir, 1984, p. 61).

Rough rubble stone was used on the ground floor, and the wall thickness in Safranbolu houses varies between 55-80 cm (Kaya, 1996, p. 53), while it was measured as 55 cm in this house. The wall structure was formed by placing two rows of stones on the inside and outside, and the middle part was strengthened by filling it with small stones and mortar. A wooden frame called "yeğdane" was established on the walls supported by wooden beams at intervals of 80-150 cm. Fir and black pine with a 10-12 cm diameter are generally preferred as wooden material (Özdemir, 1984, p. 60). Floor beams are placed at 35-40 cm (Günay, 1981, p. 171). The pillars

are generally made of beech, and their intervals vary according to the filling material. In adobe-filled systems, the pillars are placed at 45-70 cm intervals; in stone-adobe-filled systems at 40-45 cm intervals; in stone-adobe-filled systems at 30-35 cm intervals, and stone-only filled systems at 20-25 cm intervals (Günay, p. 171; Kaya, 1996, p. 99). While side pillars are placed at the corners of the building, "shoulders" are placed at the edges of the windows, and additional pillars are positioned between the windows. The dimensions of the bays are shaped on the upper floor depending on the location of the building on the land. Flat bays are generally 65 cm wide, while buttressed bays can be widened up to 95 cm (Kaya, p. 100). In the examined mansion, the bay size is 62 cm, and the lower part is supported by a wooden furuş (wooden buttress). In the ceiling flooring in the attic, a "bulgurlama" system is created by placing clay soil between the beams and the floor covering, and insulation is provided. The wooden construction roof has a hipped entrance facade and three shoulders with a gable at the rear facade. The roofs, which used to be covered with wooden tiles, were covered with Marseille tiles after the fires.

**Originality and Deteriorations:** The structure is in a village where different cultural communities lived together and hosted Greek and Turkish owners. Wine production in Safranbolu and the surrounding villages was an important economic activity until the population exchange in 1924. This tradition was weakened by the migration of the Greek population to Greece during the exchange, and it has almost disappeared today. However, today, with the support of the state, grape production continues as an economic activity in Safranbolu and the surrounding villages, especially Yazıköy, Çiftlik, Çerçen, Konarı, and Gayza (Türker and Gür, 2024, p. 740). In many civil structures in Yazıköy and Kıranköy, grape presses, reservoirs where grape juice was extracted and stored, and pithos (jars) were found. The large pithos and must cellars located under some houses in Yazıköy are concrete indicators that wine was produced in the village (Türker and Gür, 2024, p. 745).

In this context, the Greeks used the cellar on the ground floor of the house for wine cellar storage purposes; later, this section was used by the Turkish owners for molasses production as part of the viticulture tradition. An additional space serving functions such as a barn and hayloft was built on the southwest corner of the ground floor. However, these functional additions were only limited to the ground floor and were not reflected on the upper floors.

Over time, interventions made depending on the changes in user profile and lifestyle caused deterioration in the building's original plan and façade layout. The plan layout with an interior sofa accessed through doorways with beveled corners prevails on the mid-floor. In the southwest wing, the room's wall on the west side was removed and converted into an open

kitchen; a window on the south side was turned into a door, and the top of the additional space on the lower floor was used as a terrace. With the arrival of municipal services in the villages in the mid-20th century, the introduction of water installations into houses made it necessary to integrate wet spaces such as toilets into houses. In this context, access to the toilet in the structure in question was provided by converting the space previously used as a storage room or storage into an aisle. On the upper floor, the iwan in the northeast of the interior sofa plan was divided by a wall, and a new spatial arrangement was made. Despite all these interventions, the original plan scheme of the structure was largely preserved.

In the house, which exhibits moderate structural strength, joint gaps are observed in the rubble stone walls on the ground floor, and microbiological deterioration has begun in the wooden load-bearing elements. Although the damage is not visible because the plaster layer on the exterior façades of the house is primarily preserved, there are risks of wear and tear that may occur over time in the wooden frame system on the upper floors. In addition, structural wear due to lack of maintenance is noticeable in the wooden beams carrying the mid-floor flooring and the floor coverings.

Apart from the interventions on the mid-floor, architectural elements such as wooden flooring, ceiling, joinery, stairs, and fixed furniture are damaged due to lack of maintenance. In addition, plaster and paint peeling and cracks are observed on the wall surfaces. The upper floor is better preserved than the other floors; the main room's decorations, sofas, cupboards, and stoves preserve their original qualities (Figure 19).

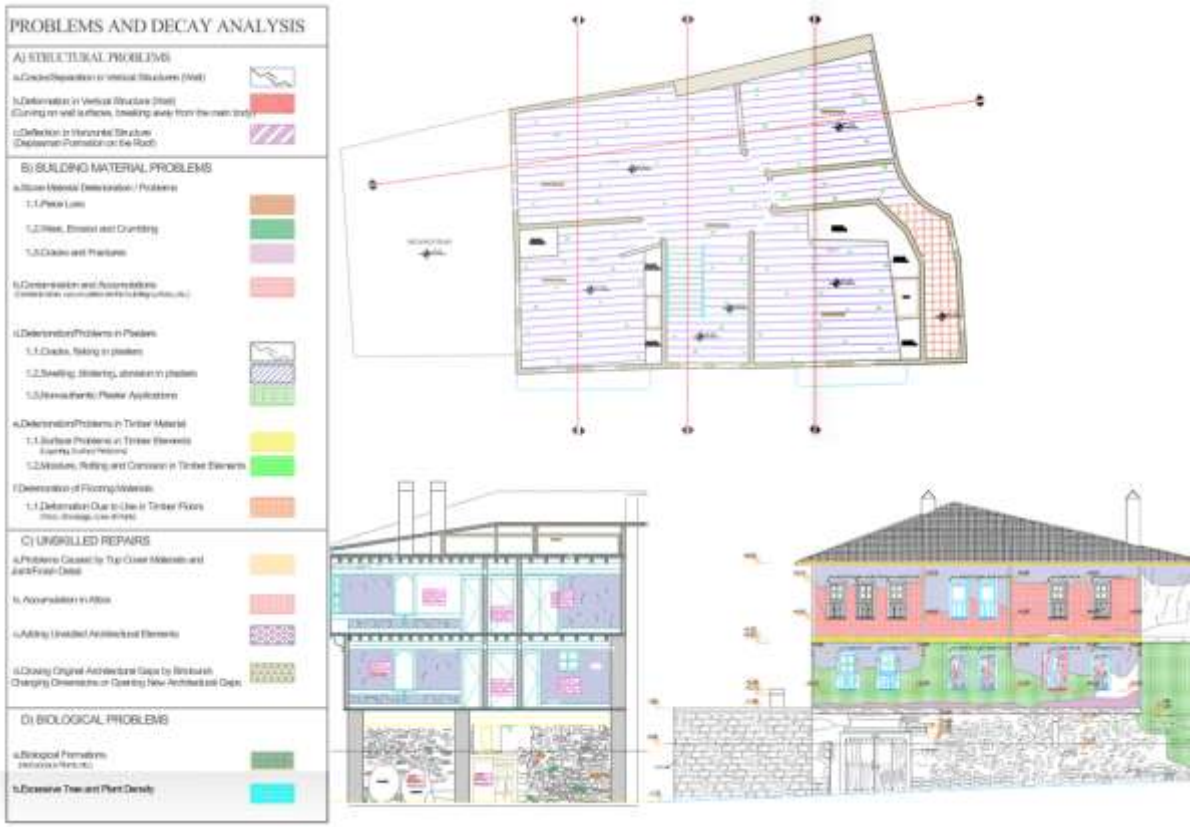


**Fig. 19.** Visuals from the Analysis Sheet of Problems and Deteriorations in the Analytical Survey Studies of the House

The structure, which has not been used for a long time, is rapidly deteriorating due to this situation. Physical wear and maintenance deficiencies that occur over time have negatively affected the structure's overall integrity. Environmental factors such as seasonal temperature differences, long-term exposure to sun ultraviolet rays, and water capillary movement cause significant deterioration in building materials. Microorganisms that settle in the building fabric, especially through rainwater leaking from the roof, cause the materials to lose their strength over time. Stone material is subject to surface erosion due to external environmental conditions; layering and surface separation occur in areas constantly exposed to water and moisture. Analyses conducted on samples obtained from old quarries show that Yazıköy stone is a type of limestone. The volumetric density of this stone is 2.69 Mg/m³, its water absorption rate is 0.78%, and its compressive strength is 40.63 MPa. These strength values reveal that the stone in question is suitable for coating material rather than a carrier. It can be said that due to its low compression and frost resistance values it is one of the main reasons for the deterioration of the material, especially in structures that have been abandoned for a long time (Şener, 2023, pp. 98–100). The fact that the structure is not used today is the biggest obstacle to its preservation. Despite the spatial transformations it has undergone, this house, which has largely preserved its

original identity, should be evaluated either with its original function or by providing a new function that will meet the current needs of the village.

**CONCLUSION**

The Greek minority subjected to forced migration was effective in crafts such as tailoring, goldsmithing, and stonemasonry in Safranbolu. With the departure of the Greeks from Safranbolu, deficiencies were seen in many areas, including construction craftsmanship. This migration negatively affected the city's socio-economic structure (Kalyoncu and Tunçözgür, 2012, pp.51-54). The baths, chapels, educational buildings, and many mansions belonging to the Greeks who were exchanged in Safranbolu and its surroundings were either abandoned or passed into the hands of people who could not fulfill the responsibility of maintaining these structures. This situation is also seen in some examples that have survived to the present day in the village of Yazıköy (Figure 20).



**Fig.20.** The current status of some buildings belonging to the Greek minority in Yazıköy.

In 1994, cadastral studies were carried out in Yazıköy, and a protection area was also determined in the village to protect cultural heritage. One of these cultural assets, the Greek House located in block 185, parcel 8, was one of the least damaged structures in the 1916 fire and has undergone some changes over time due to the addition of a toilet area and user changes. However, it largely preserves its originality regarding plan features, façade layout, and decorative elements. It has survived to the present day as an important representative of the traditional architecture that developed in Safranbolu and its surroundings. Work should be initiated to protect the structure, which is currently unused and idle. In this direction, the survey studies, the most important and first step of the protection process, were carried out between 2024-2025, and the building archive document was created and recorded. Technical information, visuals, and drawings obtained regarding the house were shared, and the aim was to contribute to the protection works to be carried out in the future.

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# TARİHİ ÇEVRE ÖZELLİKLERİNİN YENİ YAPILAŞMAYA YANSIMALARININ SAFRANBOLU ÖRNEĞİNDE İRDELENMESİ

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## ÖZET

Tarihi çevreler, geçmiş dönemlere ait toplumların mimari, sosyal, kültürel ve ekonomik özelliklerini yansıtan alanlardır. Bu çevreler somut olduğu kadar somut olmayan kültürel miras değerlerine de sahiptir. Değerler bir bütün olarak bulundukları kente kimlik kazandırmakta ve kentlileri ortak duyguda buluşturmaktadır. Eğitici ve öğretici yönlere de sahip tarihi çevreleri anlamak, bunlardan çıkarımlar yapmak günümüz ve geleceğin mimarlığı için yol gösterici olmaktadır/olacaktır. Tarihi yapı ve çevrelerin koruma-kullanma dengesi içerisinde yaşama entegre edilmeleri korunarak geleceğe aktarılmalarını sağlayacaktır. Yapılacak yeni ek/yapı tasarımlarının nasıl olması gerektiği konusu ise mimarlık alanında tartışılmaktadır. Bu konuda farklı yöntem ve yaklaşımlar olmakla birlikte, bağlamdan uzak uygulamalar tarihi değere zarar verebilmektedir. Yaşam koşullarının ve ihtiyaçların giderek değişmesi, nüfus artışı, hızlı kentleşme faaliyetleri, ekonomik çıkar sağlama isteği gibi nedenlerle kentlerde yeni yapılaşma yoğunluğu da hızla artmaktadır. Bu durumdan tarihi dokular olumsuz etkilenebilmektedir. Tarihi dokuların etrafında hızla türeyen yeni yapılaşmalar insan ölçeğinde ve doğayla bütünleşmiş silüeti bozabilmekte, tarihi çevrenin okunurluğunu zayıflatmaktadır.

Çalışmada, tarihi dokuya sahip Safranbolu kenti irdelenmiştir. Günümüze ulaşabilmiş tipik bir Osmanlı şehri örneği olan kent, sahip olduğu değerlerin korunmasına yönelik 1985 yılında kentsel sit alanı ilan edilmiş, 1991'de koruma amaçlı imar planı devreye sokulmuştur. Özgünlük ve bütünlük ana ölçütlerini sağlaması neticesinde ise 1994 yılında UNESCO Dünya Miras Listesi'ne dahil edilmiştir. Kentin eski dokuya komşu alanlarında hızla yeni yapılaşmalar meydana gelmiştir ve bu süreç günümüzde de devam etmektedir. Bu çalışmada, Safranbolu'daki tarihi doku özelliklerinin yeni yapılaşmaya yansımalarını örnekler üzerinden ortaya koymak hedeflenmiştir. Örnekler; sit alanı, etkileme geçiş alanı (geçiş bölgesi) ve bu ikisi dışında kalan kısım olmak üzere farklı noktalardan seçilmiştir. Bunların mimari okumaları yapılarak, tarihi çevre bağlamıyla uyum ve uyumsuzluklarının eleştirisi yapılmıştır. Yapılan

incelemeler sonucunda eski ile yeni arasında anlamsal ilişkinin yeterince kurulmadığı, genellikle uyumun geleneksel öğelerin taklidi şeklinde yakalanmaya çalışıldığı tespit edilmiştir.

**Anahtar Kelimeler:** Tarihi çevre, Safranbolu, tarihi çevrede ek/yeni yapı tasarımı

## 1. GİRİŞ

Mimari tasarımda geçmiş ile geleceği ilişkilendirme ve tarihi çevreyi koruma yaklaşımları, eski ve yeni yapıların bir arada var olabileceği ve bu birlikteliğin sürdürülebilir bir mekânsal kimlik üretebileceği varsayımına dayanmaktadır. Yeni yapıların tasarım sürecinde ortaya çıkan kaygılar, tarihsel çevrenin korunmasına yönelik duyarlılıklarla kesiştiğinde, mimari açıdan bütüncül bir sentezin oluşması mümkün hale gelmektedir. Bu bağlamda, mimaride geçmişe değer vermenin ve mevcut yapı dokusu ile çağdaş tasarımı dengeli biçimde bir araya getirmenin temel koşulu, tasarım sürecinde tarihsel bağlamın dikkate alınmasıdır. Bu yaklaşımın sağlıklı biçimde uygulanabilmesi yalnızca mimari kararlarla sınırlı kalmamakta, aynı zamanda toplumsal bilinçle de doğrudan ilişkilendirilmektedir. Toplumun kendi kültürel birikimini benimsemesi, mimari mirası koruma sorumluluğu üstlenmesi ve yaşam çevrelerinin tarihsel değerlerini kavraması, bu sürecin sürdürülebilirliği açısından önem taşımaktadır. Böylelikle mimarlar, tasarım yaklaşımlarını toplumsal ve kültürel değerlerle uyumlu hale getirerek güçlü kimliğe sahip ve kalıcı mekânların üretimine katkı sağlayabilmektedir.

Brandi (1956), modern olanı bütünüyle reddetmeden ve tarihsel olanı tahrip etmeden gelecekle ilişki kurmanın gerekliliğine vurgu yapmaktadır. Tarihi çevrede gerçekleştirilen tasarım süreçlerinde mimarın temel sorumluluğu, geleceğe yönelik nitelikli mekânlar üretmeyi hedeflerken aynı zamanda geçmişin en doğru biçimde korunmasını sağlamaktır. Yapılacak tasarımlarda mimardan beklenen yaklaşım; geçmişi ve bugünü doğru analiz edebilen, süreklilik ve değişim kavramlarını bir arada değerlendirebilen ve çağın gerekliliklerini tasarımına yansıtabilen bir anlayıştır. Bu niteliklere sahip mimarlar, kullanıcılar için daha nitelikli ve yaşanabilir çevreler oluşturabilecektir.

Farklı tarihsel dönemlerde çeşitli kültürlerin etkisiyle biçimlenen mimari anlayışların izlerini barındıran tarihi çevrelerde, yeni yapıların form, malzeme, yapım tekniği ve üslup açısından nasıl ele alınması gerektiği günümüzde tartışmalı bir alan oluşturmaktadır. Bu bağlamda, tarihsel doku içerisinde gerçekleştirilecek yeni yapıların ve çağdaş eklerin, bulundukları dönemin mimari özelliklerini birebir yeniden üretmesi mi, mevcut çevrenin karakteristik niteliklerini referans alarak uyumlu ya da benzeşimci bir yaklaşım sergilemesi mi, yoksa çağdaş mimarlığın güncel ifade biçimlerini yansıtan özgün tasarımlar mı olması gerektiği sorusu, tasarım sürecinde mimarların karşı karşıya kaldığı temel karar alanlarından biri olarak öne çıkmaktadır (Kılıç, 2015). Bu bağlamda bu çalışmada yukarıda açıklanan sorunsalların ele alındığı yaklaşımlar tarihi nitelikleriyle ön plana çıkan Safranbolu özelinde irdelenecektir.

## 2. TARİHİ ÇEVRE ve KORUMA

Tarihi çevre, geçmiş dönemlerden günümüze taşınan kimlik, hafıza ve yaşam biçimlerinin somutlaştığı bir kültürel miras alanı olarak tanımlanabilir. Miras kavramı 1964 yılında Venedik Tüzüğü ile birlikte anıt ölçeğinden alan, yer boyutuna genişletilmiştir. Soyupak ve Çardak'a

göre, kültürel miras olarak tarihi çevreler, geçmiş dönem yaşam biçimlerini sosyal, kültürel, teknolojik ve ekonomik açıdan yorumlamayı sağlayan alanlardır. Buralar, arka arkaya gelen tarihi dönemlere ve kültür katmanlarına ait taşıdıkları izlerle korunmaya değer görülmektedir (Soyupak ve Çardak, 2023). Tarihi çevreler; değişik zaman dilimi ve coğrafyalarda yaşamış insan topluluklarının yaratmış olduğu uygarlıkların ürünüdür ve bu uygarlıkların mimari, sosyal, kültürel ve ekonomik özelliklerini yansıtan yerleşim yerleri ve bunlara ait kalıntılardır (Özteke, 2004). Bir toplumun geçmişine, yaşanmışlıklarına ve uygarlıklara şahitlik etmiş değerler bütünü olan tarihi çevre, bileşenleriyle birlikte bulunduğu kente karakter vermekte ve kentlilerin ortak duyguda buluşmalarını sağlamaktadır (Karataş, 2021). Bu bağlamda korunarak gelecek nesillere aktarılmaları konusu önem kazanmaktadır.

Korumanın kültürel, ekonomik, toplumsal, gelişimsel, çevresel ve eğitimsel olmak üzere topluma farklı boyutlarda yararları vardır. Kültürel yönden zenginleşme, geçmiş ile bağlantı kurularak koruma konusunda isteğin artması, kültürel gelişimin yaşanması, turizme kazandırılarak ekonomik katkı sağlanması, değerlerin bakımlı hale gelmesi, tarihi çevrenin önemi anlaşılarak kültürel değerlere saygının artması gibi katkılar alınabilecektir (URL 1). Sahip olduğu zenginlikleri ve çeşitlilikleri ile bu çevreler, öğretmekte, eğitmekte ve insanların gelişimini yönlendirebilmektedir (Hatami, 2013).

Amos Rapoport'a göre insanlar mekânı biçimsel niteliklerinden ziyade anlamsal ve simgesel ilişkiler üzerinden algılar (Rapoport, 1982). Bir yerleşme, toplumun değerler sistemi, yaşam biçimi ve inançlarıyla şekillenir. Bu nedenle tarihi çevre, geçmişteki kültürel davranış biçimlerinin ve toplumsal düzenin somutlaşmış bir kültürel metnidir. Tarihi çevrelerin biçimsel özellikleri kadar, onları var eden sosyal normlar ve anlam sistemlerinin de korunması gereklidir. Bu yüzden kültürel miras, yalnızca fiziksel dokunun yaşatılması değil, anlamın sürekliliğinin de sağlanmasıdır (Rapoport, 1969; 1982). Bu süreklilik bozulduğunda fiziksel varlık korunsa bile kültürel mirasın özü kaybolur.

## 3. TARİHİ ÇEVREDE YENİ YAPI TASARIMI

Tarihi çevrede yeni yapı tasarımı konusundaki tartışmalar koruma kaygısının artmasıyla başlamıştır. Bu konuyla ilgili yaklaşımlar 20. yüzyılın başlarından itibaren uluslararası anlaşma, yönetmelik, tüzük ve bildirgelerde yer almıştır.

1931 tarihli Carta Del Restauro'da anıt çevresinin niteliği, üslubu, kütlesi ve rengi ile rahatsız edici yapılar tarafından sarılmasına engel olunması gerektiği vurgulanmıştır (URL 2). 1933 tarihli Atina Tüzüğü'nde geçmişteki bina tiplerinin estetik kaygılarla tarihi alanlardaki yeni yapılara uygulanmasının yıkıcı sonuçları olacağı ve buna izin verilmemesi gerektiği belirtilmiştir (URL 3). 1964 yılındaki Venedik Tüzüğü'ne göre anıtların korunması çevresini de içine almalı; kütle, renk ilişkilerini değiştirecek yeni eklentiye izin verilmemelidir (URL 4). 1975 tarihli Amsterdam Bildirgesi'nde bütünleşik koruma için yeni yapıların çevreleriyle uyum sağlayacak şekilde hacimsel ve boyutsal kısıtlamaları getirecek yasa hazırlamanın önemli olduğundan bahsedilmiştir (URL 5). Unesco'nun 1976 yılındaki Nairobi Bildirgesi'ne göre yeni bina mimarisinin tarihi bina gruplarının mekânsal organizasyonuna ve çevresine uyumlu şekilde entegre olmasını sağlamak için, yüksekliklerin uyumunu, kullanılan renk, malzeme ve

biçimleri, cephe ve çatı formlarını, bina kütlelerinin parsel içindeki konumlarını, parsellerdeki yapılaşma oranlarını içeren kentsel çevre analiz edilmelidir. Parsellerin yeniden düzenlenmesinin bütünün uyumuna zarar verebilecek kütle değişikliğine neden olabileceği belirtilmiştir (URL 6). 1985 tarihli Granada Sözleşmesi'nde tarihi binaların veya ören yerlerinin özelliklerini bozacak önemli tadilat çalışmaları, binaların yıkımı, yeni binaların yapımı ile ilgili projelerin yetkili makamın iznine sunulması gerekliliği vurgulanmıştır (URL 7). 1987 yılındaki Washington Tüzüğü'nde yeni binalar yapılırken veya eskileri uyarlanırken mevcut mekânsal oluşumlara saygı gösterilmesi, ölçek ve parsel boyutuna dikkat edilmesi, çevreyle uyumlu çağdaş öğelerin yöreyi zenginleştirebileceği için yeni tasarımların engellenmemesi gerektiği konularından bahsedilmiştir (URL 8). 1999 yılındaki Burra Tüzüğü'nde yeni tasarımların mevcut ile uyumlu ancak taklitten kaçınılması gerektiği belirtilmiştir (URL 9). Yine aynı yıla ait ICOMOS Geleneksel Mimari Miras Tüzüğü'nde geleneksel yapı, yapı grubu ve yerleşmelere çağdaş müdahalelerin bunların kültürel değerlerine ve geleneksel karakterlerine saygı göstermesi gerektiği ifade edilmiştir (URL 10). 2011 tarihli Valetta İlkeleri'ne göre yeni binaların yapılması veya eskilerin uyarlanması gerektiğinde, çağdaş mimari tarihi kentin mekânsal oluşumuyla ve kentsel çevrenin tümü ile ahenk içinde olmalıdır ve alanın ölçeğine saygı göstermelidir (URL 11). 2013 tarihli Burra Tüzüğü'nde, yapılacak yeni uygulamaların bulunduğu tarihi çevrenin önemini, parsel düzenini, biçimini, ölçeğini, karakterini, rengini, dokusunu ve malzemesini dikkate alarak yansıtması ve taklitten kaçınılması tavsiye edilmektedir (URL 12).

Rapoport, tarihi çevrede yapılacak müdahalelere kuramsal çerçeve sunmaktadır. Yeni yapı, tarihsel biçimleri taklit etmek yerine onların kültürel mantığını kavrayarak çağdaş bağlama aktarılmalıdır. Bağlam duyarlılığı sadece fiziksel uyumla değil, anlamın yeniden üretilebilmesiyle gerçekleşir (Rapoport, 2000). Yeni yapı, tarihi çevrenin yaşam döngüsüne entegre edilmelidir. Böylece bu yapı çevre tarafından benimsenir ve sürekliliğe katkı sunan unsur haline gelir (Akbıyık, 2013). Kılıç (2015), tarihi çevrede tasarım yapmanın tek bir reçetesinin olmadığına, her tasarımın yer aldığı çevrenin sahip olduğu koşullarına ve kültürel dinamiklerine göre biçimlendiğine vurgu yapmaktadır (Kılıç, 2015). Tarihi çevrede yeni yapı tasarımının nasıl olacağı konusu mimarlık alanında tartışılmaktadır. Bu konuda farklı yaklaşım ve uygulamalar vardır. Bunlar; taklit, uyum, nötr ve zıt yaklaşım olmak üzere dört ana başlıkta birleştirilebilir. Taklit/kopya yönteminde, tarihi yapının biçim, kompozisyon, malzeme, cephe özellikleri vb. tekrar edilmektedir. Ancak bu durumda dönemsel farklılıklar algılanamamaktadır. Uyumlu yaklaşımda, tarihi çevreden referanslar alınarak bunlar yeni tasarımda yorumlanarak kullanılır, dönem farklılıkları okunabilir. Uyumluluk ve farklılaşma arasında denge yakalanmaya çalışılır. Nötr yaklaşımda, yeni yapı tasarımı baskın davranmaz ve bu sayede tarihi yapının ön plana çıkması sağlanır. Bu yöntemde yalın yeni yapı, mevcut yapının yanında ayırt edilir. Zıt yaklaşımda, mevcut mimarinin malzeme, cephe düzeni, kat yüksekliği, hacim, form vb. özelliklerine tezat hareket edilerek yeni yapı/ek tasarımı bilinçli bir şekilde aykırı davranır.

## 4. SAFRANBOLU TARİHİ

Batı Karadeniz Bölgesi'nde yer alan Safranbolu, Karabük'e bağlı bir ilçedir. Tarihi M.Ö. 3000 yıllarına uzanan Safranbolu'da pek çok uygarlığın izi bulunmaktadır. Kent, Homeros'un İlyada'sında Paphlagonia bölgesinin sınırları içinde yer almaktadır. Safranbolu yöresinde sırasıyla Hititler, Frigler, Lidyalılar, Persler, Helenistik Krallıklar (Pondlar), Romalılar, Selçuklular, Çobanoğulları, Candaroğulları ve Osmanlılar egemenlik kurmuşlardır (URL 13). 1392 yılında Osmanlı ve Candaroğulları'nın savaşı sonucunda bölge Osmanlı Devleti'ne geçmiştir (Karacakaya vd., 2013). Kent, Osmanlı döneminde ekonomik ve kültürel anlamda üst seviyeye ulaşmıştır (Aksoy ve Kuş, 1997). İç Anadolu Bölgesi'ni Karadeniz limanlarına bağlayan tali kervan yollarının ulaşım ağında olduğu için uzun yıllar stratejik önemini korumuştur. 17. yüzyılda imar hareketlerinin hızlandığı kentte, Cinci Hanı, Cinci Hamamı, elli adet dükkân, Köprülü Mehmet Paşa Camisi, Tuzcu Hanı ve Cami bu dönemde inşa edilmiştir (Acar, 2006). 60 oda, depo ve ahır mekanlarına sahip Cinci Han, yapıldığı dönemde Anadolu'daki en büyük hanlardan biri olarak görülmektedir (Başak, 1966). 18. yüzyılda Safranbolu'da önemli iktisadi gelişmeler yaşanmıştır. Yeni meslekler ortaya çıkarken, iktisadi iş bölümü de artmıştır (Acar, 2006). 19. yüzyıl ise kentin ekonomik anlamda en parlak dönemidir. 6 han ve 500 dükkânın olduğu bir yerleşim yeri haline gelmiştir. İstanbul ve Kastamonu'yla kurulan ilişkiler, üretim ve ticaretten kazanılan tecrübe, ekonomik güç kentteki kültürel gelişimi de yönlendirmiştir. Bunun neticesinde konut kalitesi ve kentleşme alanlarında zirveye ulaşılmıştır (Yaşar, 2004). Bunun yanında meslekler ve sanat dalları da artmıştır (Şendil, 2017). Debbağlık, kunduracılık, dericilik, yemenicilik, saraçlık, semercilik, aşçılık, fırıncılık, kasaplık, pamukçuluk, hallaçlık, bez dokumacılığı, urgancılık, terzilik, kalaycılık, sobacılık, hattatlık, manifaturacılık, kereste ticareti, nalbantlık, cambazlık, dülgerlik kentin meslek gruplarındandır (Acar, 2006).

1870 yılında kaza olarak Kastamonu sancağına bağlanan Safranbolu, 1927 yılında Zonguldak'a dahil edilmiştir. Son olarak ise Karabük'ün il olması neticesinde 1995 yılında bu kente bağlanmıştır (URL 14). Safranbolu 1994 yılında Unesco Dünya Miras Listesi'ne alınmıştır. Bu gelişmeden sonra yerli ve yabancı turistlerin giderek ilgisini çeken kent zamanla turizm kentine dönüşmüştür.

## 5. SAFRANBOLU KENTİNDE TARİHİ DOKUNUN ÖZELLİKLERİ

Safranbolu'da farklı dönemlere ait birçok mimari ürün bulunmaktadır. Kette koruma altına alınmış çok sayıda yapının yanı sıra 21 adet arkeolojik sit, 6 adet kentsel sit, 2 adet doğal sit alanı vardır (Koçan, 2022). Özellikle Osmanlı döneminde ekonomik açıdan en canlı günler yaşanmış, mimari bakımdan birçok nitelikli mekân oluşmuştur. Geleneksel Safranbolu evleri 18. ve 19. yüzyıl Türk hayatının ekonomisini, kültürünü, yaşam biçimini ve mimarisini yansıtmaktadır. Bu sivil mimari yapılarının dışında, cami, türbe, hamam, han, çeşme, köprü gibi çok sayıda kültür varlığı da inşa edilmiştir (Yetiş, 2016). Tipik bir Osmanlı kenti özelliği gösteren Safranbolu'da Han-Hamam-Cami-Çarşı bir arada bulunmaktadır. Arazinin durumuna göre çarşı çukur yerdeyken, evler yamaçlara konumlandırılmıştır. Merkezdeki camilerin etrafında dükkanlar sıralanmaktadır (Bozkurt, 2022; Tuncel, 1980). Eski kent dokusunda hemen

tüm caddeler, han, cami, hamam, arasta dükkanları ve pazaryerinin olduğu bölgeye doğru açılmaktadır (Hacısalihoğlu, 1995). Safranbolu Çarşısı, Lonca düzeninin hüküm sürdüğü dönemlere ait örneklere sahiptir. Yemeniciler arastası bunun en tipik örneğidir (Ulukavak, 1976). Bakırcılık, semercilik, dikicilik, ayakkabıcılık gibi işlenmiş üretime yönelik kolların mekânsal yapıda, eski lonca düzenine uygun biçimde ayrı ayrı sokaklarda, ama hep bir arada yer tuttukları görülür. 17. yüzyılda Safranbolu'da temel üretim kolu dericilik olmuştur. 19. yüzyılın sonunda kentteki tabakhanelerin sayısı ise 84'tür (Aktüre ve Şenyapılı, 1976). Kentteki diğer bazı üretimleri de işlevsel olarak beslemiş olan bu imalathaneler kentin en alt kotunda, derenin kenarında konumlandırılmıştır. Ancak günümüzde deri imalatı yapılmamaktadır. Bazı imalathaneler zamanla yok olurken, bazıları günümüze erişebilmiştir, ancak bunlar atıl durumdadır. Kentte zanaat düzeyindeki diğer geleneksel üretimler ise eski canlılığını büyük ölçüde yitirmiştir.

Safranbolu kent merkezindeki geleneksel yerleşim dokusu Çukur, Kıranköy ve Bağlar olmak üzere üç bölgede yer almaktadır. Bu bölgelerde farklı imparatorlukların etkilerine rastlanmaktadır. Çukur (Eski Çarşı) ve Bağlar, Selçuklu ve Osmanlı sürekliliğini gösterirken, Kıranköy'de ise Roma-Bizans-Osmanlı etkisi görülebilmektedir. Kentin dokusu ve iyi korunmuş konakları Osmanlı'da Müslüman ve Rum-Ortodoks aile ve sosyal yaşamına ait önemli bilgiler vermektedir (Canbulat, 2016). Tarihi dokuda hem bina hem de yerleşim ölçeğinde iklim şartları ve topografik özellikler konumlanmada önemli etken olmuştur. Kentin üretim, ticari ve idari fonksiyonlarını barındırmış Çukur bölgesi, dik yamaçlara sahip, Gümüş ile Akçasu derelerinin geçtiği vadi içinde ve yamaçlarında yer almaktadır. Bu alanda, kanyon duvarlarının sert rüzgarlara set olması ve soğuğa karşı korunaklı konumlanma nedeniyle konutlar daha çok kış ayları için tercih edilmiştir. Bağlar bölgesi ise Çukur ve Kıranköy'e göre daha üst kotlardadır. Yüksek rakımdaki bu bölge rüzgarlara açık ve serin özellikte olup, yazlık yerleşim yeri olarak kullanılmıştır. Çukur'da sıkışık bir yapılaşma dokusu varken, Bağlar'da geniş bahçeler yer almakta ve yapılaşma seyrek düzendedir. Bağlar bölgesi, adından da anlaşılabileceği üzere özellikle üzüm yetiştiriciliğinde ön plana çıkmıştır. Bu üretim faaliyetleri Bağlar'a üretim kimliği kazandırmıştır, ancak günümüzde bu kimliğinden uzaklaşmış durumdadır. Çukur'un üst kotunda, çeperde yer alan Kıranköy'de ise mübadele dönemine kadar Rum azınlıklar yaşamıştır. Buradaki evlerde yer alan şaraphaneler yörede bağcılık faaliyetlerinin gelişmiş olduğunu göstermektedir.

Safranbolu geleneksel yerleşimdeki yapılaşma doğal çevre ile uyum içerisindedir. Az katlı, yalın ve basit geometrili binalar doğayla yarışmadan, ona saygılı şekilde bütünleşmektedir. Eğime uygun hareket edilerek araziye mümkün olduğunca az müdahale edilmiştir (Fidan, 2024). Yamaçlara yerleşmiş binalarda, arazi eğimine bağlı olarak değişik kotlardan girişlerinin sağlandığı veya ön ve arka cephelerinin farklı yükseklikte olduğu da görülebilmektedir. Kentin tarihi dokusundaki mimari ürünlerin büyük çoğunluğunu geleneksel evler oluşturmaktadır. Safranbolu evleri geçmiş dönemlere ait kent kültürünü ve değerleri yansıtan önemli simgelerdir. Topografik özelliklerin iyi değerlendirilmesi sonucunda evler birbirinin güneşini ve manzarasını engellememekte, bu sayede doğal ısı ve ışık kaynağından maksimum derecede faydalanabilmektedir.

Arnavut kaldırımlı sokaklar, kaba taş duvarla sokaktan ayrılmış bahçeler, avluya veya eve açılan çift kanatlı kapılar, kapı tokmağı, içeriye ışığın alınmasını sağlayan ve istifli odunların kurumasını kolaylaştıran gliste adı verilen ahşap kafes, "hayat" mekanı, büyük fırınlar, kiler, ahır, samanlık, ahşap işçiliğinin güzel örneği olan merdivenler, sofa ve buna bağlı odalar, ahşap dolaplar, ahşap raflar, pencere önündeki sedirler, gusülhane (yüklük dolaplarının içindeki küçük banyo), ahşap süslemeli tavanlar, oda büyüklüğüne göre değişen sayıda dar uzun pencereler, muşabak denilen ahşap kafesler, kara kapaklar, cumbalar, payandalar, alaturka kiremitli kırma çatılar geleneksel Safranbolu evlerindeki önemli mimari öğelerdir (Birlik vd., 2025). Evlerin ortak özelliklerinden biri de doğa-insan-ev, sokak-ev, sokak-çarşı ilişkilerinin son derece dengeli ve düzenli kurulmuş olmasıdır (Safranbolu Belediye Başkanlığı, 2007). Doğal peyzajın büyük ölçüde korunmuş olduğu kentte evler bahçeli düzendedir. Bağlar bölgesindeki konutların bahçeleri ise daha büyüktür. Meyve ve sebze yetiştirilen bu mekanlarda iklim koşullarıyla uyumlu ağaçlar gölgeleme elemanı olarak da değerlendirilmiştir. Yüksek tutulan bahçe duvarları ise mahremiyeti sağlamanın yanında soğuk havayı da kesmektedir. Bahçe duvarları, bina yüzeyleri, ağaçlar, çeşmeler, yeşil doku kamusal mekân olarak sokakların tanımlayıcı unsurlarıdır.

Safranbolu evleri kalabalık ailelerin bir arada yaşayabileceği mekânsal kurguya sahiptir. Bu durum dönemin yaşam tarzını ortaya koymaktadır. Az katlı (genellikle 2,3 kat) olmaları sayesinde yerleşim dokusunda insan ölçeği yakalanmıştır. Bahçeli ve az katlı özellikte olmaları sayesinde günümüz kentlerinde eksikliği hissedilen yatay mimariye örnek oluşturmaktadırlar.

Çukur bölgesinde konutlar çoğunlukla vadi ve güney yönüne bakan yamaç eteklerine yayılmış, bu sayede soğuk havadan korunurken güneş ışığından en iyi derecede yararlanılmıştır (Gürel, 2010). Bağlardaki yerleşim ise güneye bakan yamaç ve sırtlarında yer almaktadır ve burada hâkim rüzgâra açık konumlanma ve yönlenme ile yazları serinlenme sağlanabilmiştir. Kentin geleneksel konutlarında kare, kareye yakın kompakt formlar oluşturularak soğuk dönemlerde ısı kayıpları azaltılmıştır. Üst katlarda yapılan çıkmalarla bina yüzey alanı artırılmakta, ısıl denge ve gölgeleme elde edilebilmektedir. Ayrıca bu çıkmalar sokakla bütünleşmeyi, farklı yönlerden ışık almayı ve farklı manzaralara yönlenmeyi de sağlamaktadır.

Geleneksel evlerde kullanılan taş ve kerpiç malzeme ısıl kütle gibi çalışarak iç mekânda uygun sıcaklık konforu oluşturmaktadır. Taş malzemeli ve duvarlarında minimum boşluk açılmış alt katlar tampon görevi de üstlenerek, üst katlardaki yaşam alanlarını zeminin soğuğu ve neminden korumaktadır. Üst katlarda ise manzarayı görme, güneş ışığı ve doğal havalandırmadan faydalanma açısından fazla sayıda pencere kullanılmıştır. Ancak cephelerdeki dolu-boş dengesi duvar malzemesinin taşıyıcı özelliği ve fiziksel çevre denetimi sağlamak amacıyla dengeli kurulmuştur. Pencerelerde sıcak ve soğuğa önlem olarak kara kapak uygulamaları da görülmektedir.

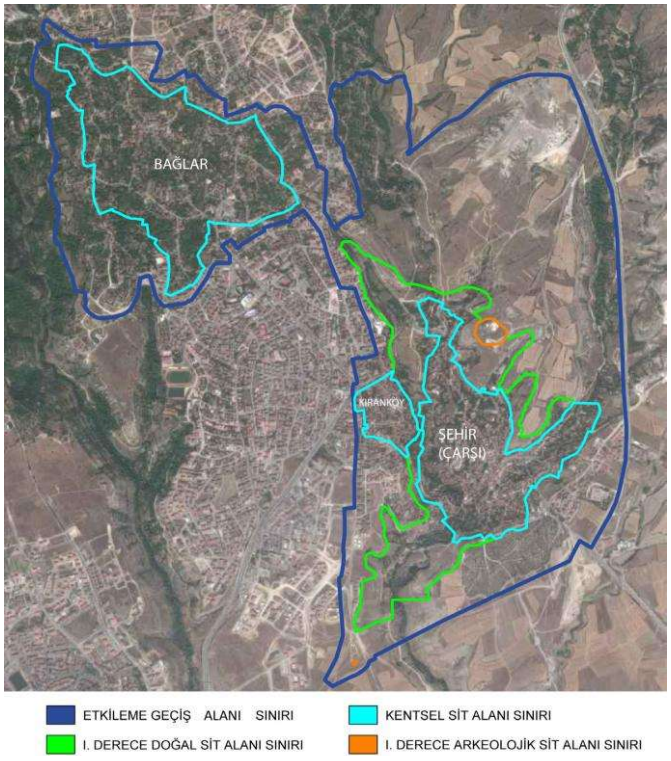
Geleneksel yaşamda günün büyük bölümü sofada geçirilmektedir. Bunun etrafında ise uyuma, oturma, yıkanma, yemek yeme-pişirme gibi çeşitli işlevlerin yapılabildiği esnek mekân özelliğindeki odalar vardır. Sofa, oda ve eyvanlarda çapraz veya karşılıklı konumlandırılan pencere ve kapı açıklıkları sayesinde doğal havalandırma imkânı da yaratılmıştır. Odalardaki ocaklar iç ortamın ısıtılmasında da kullanılmıştır. İklim koşulları referans alınarak binalarda eğimli çatılar uygulanmış, saçakları ise geniş yapılarak yağmur ve güneşin olumsuz etkilerine

karşı önlem alınmıştır. Safranbolu'nun geleneksel mimarisinde yöreden elde edilen taş, ahşap, toprak vb. malzemeler kullanılmıştır. İnsan ve çevre sağlığına zarar vermeyen bu malzemeler, geri dönüştürülebilir oldukları için atık sorunu da yaratmamakta ve enerji tasarrufu sağlamaktadırlar.

Safranbolu'daki bazı geleneksel konutlarda havuz odaları ve havuzlu sofalar bulunmaktadır. Evden bağımsız inşa edilen havuz odalarına da rastlanmaktadır (Bölükbaşı Ertürk, 2010). Bu sayede iç mekânda suyun serinletici özelliğinden faydalanılmıştır. Bağlar bölgesinin bazı sokaklarında üstü açık su arkları mevcuttur. Kaynaktan çıkan sular bahçelerin sulanmasında kullanılmak üzere bu arklarla yönlendirilmiştir.

## 6. SAFRANBOLU'DA TARİHİ ÇEVRE ÖZELLİKLERİNİN YENİ YAPILAŞMAYA YANSIMALARI

Çalışma kapsamında, önceki bölümde anlatımı yapılan Safranbolu tarihi dokusunun taşıdığı özelliklerin yeni yapılaşmaya yansımaları örnekler üzerinden irdelenmiştir. Bu örnekler kentsel sit alanı, etkileme geçiş alanı (buffer zone) ve kentin diğer noktalarından olmak üzere çeşitli yerlerden seçilmiştir. Kentteki tarihi alanların konumları Görsel 1'de görülmektedir.




Görsel 1. Safranbolu merkezindeki etkileme geçiş ve sit alanı sınırları (Yetiş, 2018)

### 6.1. Bağlar Bölgesinde Konut Yapısı-1

Safranbolu Değirmenbaşı Mahallesi'nde yer alan konut 1975 yılında inşa edilmiştir (Birlik vd., 2025). Yapı, kentsel sit alanı içerisindedir ve yanında tescilli geleneksel konut bulunmaktadır (Görsel 2). Sokağa bitişik tarihi yapının hizasından yaklaşık 5 m geriye çekilerek konumlandırılması tarihi değere saygılı bir yaklaşımdır. Tescilli konutta ahşap, kerpiç, taş gibi

yöresel malzemelerin kullanılmasına karşın yeni konutta ahşap çatı strüktürü dışında bu malzeme kullanımlarına rastlanmamaktadır. Duvarlar tuğla, pencereler PVC, giriş kapısı çelik, bahçe duvarı korkulukları ise alüminyum malzemelidir. Bahçe kapısı ve duvar üstü korkuluk-küpeşte uygulamalarının tasarım dili ve rengi birbirinden farklı olup bu durum uyumsuzluk yaratmaktadır. Tarihi konutun pencere düzenindeki ritim ve oran yeni yapıda yoktur. Geleneksel dokuda görülen arazi eğimiyle uyum, bu yapıda yoktur. Alt katın ışık alabilmesi için konut önünde yapay bir çukur alan oluşturulmuştur. Cephedeki yatay/dikey silmeler ve pencerelerin üç kenarında yapılan söveler gelenekselin biçimsel taklididir. Bağlar bölgesindeki hâkim yeşil dokunun aksine yeni konutun ön kısmı tamamen sert zemin bırakılmıştır. Yüksekliği (2 kat) ve yataydaki büyüklüğü ise tarihi çevrenin ölçeğine uyum sağlamaktadır. Çatısının üst kotu yanındaki ve sokak üzerindeki tarihi yapılarınkinden düşük tutulmuştur.



Görsel 2. Tescilli konut (solda) ve yeni konut (sağda)

### 6.2. Bağlar Bölgesinde Konut Yapısı-2

Değirmenbaşı Mahallesi'nde yer alan konut 1971 yılında yapılmıştır (Birlik vd., 2025). Sit alanı içerisinde olan konutun yakın çevresinde tescilli binalar bulunmaktadır. Sokak üzerindeki tarihi binaların hizasından saygılı biçimde 5 m geride konumlanan konut, gabari olarak tarihi çevreyle uyumludur. Ön cephesinde görülen kütlesel çıkma geleneksel yapılara atıf yapmaktadır (Görsel 3). Geleneksel evlerin pencere boyut ve düzeni bu yapıda görülememektedir. Duvarlarda beyaz, PVC pencerelerde ise ahşap rengi tercih edilerek tarihi çevrenin renk dokusuyla uyum yakalanmıştır. Ancak yapının giriş kotuna sonradan eklenen niteliksiz ve özensiz yarı açık mekân uygulaması çevre doku ile uyumsuz görünmektedir. Sokak üzerindeki taş malzeme sürekliliği ise incelemesi yapılan iki konutun (Konut 1,2) olduğu kısımlarda farklı malzeme ve tasarım dili nedeniyle kesintiye uğramaktadır.



Görsel 3. Konut yapısının ön cephesinden görünüm

### 6.3. Safranbolu Belediyesi Leyla Dizdar Kültür Merkezi

Bağlarbaşı Mahallesi'nde yer alan kültür merkezi binası kentsel sit alanı sınırları içerisindedir. İki katlı bina betonarme taşıyıcı sistemine sahiptir. Cephelerindeki çıkma hareketleri, yatay/dikey bantlar, yer yer ritmik düzende kullanılan pencerelerin formları ve bölüntü özellikleri, geniş saçaklar, ahşap pencereler geleneksel dokudan izler taşımaktadır (Görsel 4). Zemin kattaki büyük pencerelerde sık aralıklı dikey kayıtların kullanılması geleneksel yapılarda görülen glisteye atıf yapmaktadır. Cephelerin beyaz ve kahverengi tonlarında olması tarihi çevrenin renk dokusuyla uyumu sağlamıştır. Bağlar bölgesinde öne çıkan yeşil doku özelliği bu binanın peyzajında da devam etmektedir. Ancak binanın yataydaki büyüklüğü tarihi çevrenin insan ölçeğindeki minimal yapılaşma özelliği ile uyumsuzdur. İç mekanlarda ise geleneksele öykünme olmayıp, modern düzenlemeler yapılmıştır.



Görsel 4. Kültür merkezinin genel görünümü

### 6.4. Hilton Otel

Bağlar bölgesinin çeperinde konumlanan Hilton Garden Inn Otel etkileme geçiş alanı sınırları içindedir. 2016 yılında inşası tamamlanan otel yapısında, alt katlarda taş kaplama malzemesinin kullanılması, çıkmalar, üst katlarda ritmik düzende giden dikey dikdörtgen pencereler, söveler, geniş saçaklı kırma çatı, kahverengi ve beyaz renklerin kullanımı geleneksel dokuya atıf yapmaktadır (Görsel 5). Binanın bazı yüzeylerinde ahşap çatkı görünümlü uygulamalar, çıkmaların altında payandalar ve yatay/düşey silmeler de görülmektedir. Ancak işlevi olmayan bu unsurlar tarihi yapı bileşenlerini taklit etmektedir. Binanın iç mekân kullanımında geleneksele öykünme yoktur. Yatay ve düşeydeki büyüklüğü ise insan ölçeğindeki tarihi çevre dokusu ile uyumsuzdur.



Görsel 5. Otel binasından görünüm

### 6.5. Yavuzlar Otel

Atatürk Mahallesi'nde yer alan otel binası etkileme geçiş alanı sınırları içerisindedir. Otelin yakınında geleneksel evler ve 1890 yılında Frengi Hastanesi olarak yapılmış tescilli bina bulunmaktadır. Dört katlı otel binasında kullanılan yatay/dikey ahşap silmeler, ahşap söve ve muşabaklar tarihi dokuya atıf yapmaktadır (Görsel 6). Cephelerin beyaz, pencerelerin ise PVC malzemeli olmasına rağmen ahşap renginde tercih edilmesi tarihi çevrenin renk özelliğine uyumu sağlamıştır. Pencere düzeni ise gelenekselden farklılaşmaktadır. Yataydaki kütle ölçeği çevre ile uyumludur ancak kat sayısı nispeten fazladır. Binanın resepsiyon-lobi kısmındaki ahşap malzeme kullanımı ve sedir düzeni dışında iç mekânda geleneksele öykünme yoktur.



Görsel 6. Yavuzlar Otelin görünümü

### 6.6. Safranbolu Belediyesi İtfaiye Müdürlüğü Binası

Çukur bölgesinin çeperinde yer alan bina, etkileme geçiş ve doğal sit alanı sınırları içerisindedir. 2018 yılında inşa edilen yapı betonarme taşıyıcı sistemine sahiptir. Yatay ve düşeyde kütle hareketleri yapılarak masif etki kırılmak istenmiştir. Arazi eğiminden de yararlanılarak farklı kotlardan girişler sağlanmıştır. Yapı görünüm olarak geleneksel Safranbolu evlerine benzetilmeye çalışılmıştır. Üst katlarda oluşturulan çıkmalar, kırma çatı uygulaması, ahşap malzemeli söve, pencere, payanda ve yatay/dikey silmelerin yapılması, alt katlarda taş kaplama malzemesinin tercih edilmesi bu benzetme çabalarını göstermektedir (Görsel 7). Bina dış yüzeylerindeki renkler (beyaz, kahverengi) tarihi çevre ile uyumludur. Payandaların ise taşıyıcı özelliği yoktur ve tarihi evlerden taklit edilmiş öğelerdir. İç mekanlarda geleneksele herhangi bir öykünme bulunmamaktadır.



Görsel 7. İtfaiye müdürlüğü binasının görünümü

### 6.7. Ermersa Siteleri

Safranbolu Barış Mahallesi'nde yer alan Ermersa Sitesi 2006 yılında tamamlanmıştır (Oral, 2019). Etkileme geçiş alanındaki sitede 6 blok yer almaktadır. Betonarme taşıyıcı sisteme sahip binalar bodrum+zemin+3 katlıdır. Son üç katta tek parça halinde yapılan çıkmalar geleneksel Safranbolu evlerine referans vermektedir (Görsel 8). Çıkmaların üzeri üçgen alınlıkla bitirilmiş binalarda kırma çatı kullanılmıştır. Pencere malzemesi, ritmi, boyutu ve bölüntüleri geleneksel konutlardan izler taşımaktadır. Yine eski yapılardaki gibi cephelerde yatay ve düşey ahşap bantlar kullanılmıştır ancak bunlar taklit edilmiş uygulamalardır. İç mekân düzeninde ise geleneksel konutlara öykünme yoktur.



Görsel 8. Sitedeki konut binalarının görünümü

### 6.8. Akçasu Konakları

Babasultan Mahallesi'nde site olarak inşa edilen Akçasu konakları etkileme geçiş alanı sınırları içerisindedir. 2014 yılında yapımı tamamlanan iki katlı konutlar betonarme taşıyıcı sistemine sahiptir. Bina formunda görülen kütle hareketleri, ahşap malzemeli dikdörtgen pencere düzenleri, ahşap kaplamalı oda çıkmaları, üçgen alınlıkları ve geniş saçaklı kırma çatı uygulamaları geleneksel dokudan izler taşımaktadır (Görsel 9). Tarihi konutlarda sıklıkla görülen beyaz ve kahverengi renkler de bu yapılarda tercih edilmiştir. İç mekânda ise geleneksele öykünme yoktur.



Görsel 9. Villa yapısının görünümü

### 6.9. Safranbolu Orman İşletme Müdürlüğü

Bağlarbaşı Mahallesi'nde yer alan müdürlük binası etkileme geçiş alanı sınırları içindedir. 2012 yılında inşa edilen yapı, betonarme taşıyıcı sistemine sahiptir. Cephelerde; taş ve ahşap malzemeli kaplama ve sövelerin, ahşap silmelerin, çıkmaların, dikdörtgen ve kemerli pencere formlarının, beyaz ve ahşap renklerinin kullanılması geleneksele öykünme çabalarıdır (Görsel 10). Pencere düzen, boyut ve bölüntüleri de belli ölçüde yine geleneksel izler taşımaktadır. Yakın çevresinde yer alan tarihi Bağlar bölgesinde yeşil doku hakimdir. Bina geniş bahçesi ile bu özelliğe uymaktadır ancak çevredeki ağaç dokusu sürekliliğinin bu kısımda kesintiye uğradığı görülmektedir.



Görsel 10. Müdürlük binasının görünümü

### 6.10. Abdurrahman Yerlikaya Kız Anadolu İmam Hatip Lisesi

Kirkille Mahallesi'nde yer alan okul binası etkileme geçiş ve sit alanı sınırları dışındadır. 2010 öncesi dönemde inşa edilmiş bina 5 katlı olup, betonarme taşıyıcı sistemine sahiptir. Dik hatlı çıkmalar, üçgen alınlıklı yüzeyler, ritmik düzendeki ahşap pencereler, söveler, yatay/dikey silmeler tarihi çevreye referans vermektedir (Görsel 11). Bahçe duvarlarında geleneksel yerleşimdeki gibi taş kullanılmıştır. Pencere boyut ve bölüntüleri de gelenekselden izler taşımaktadır. Cam mozaik malzemedeki renk ile yapılan silme ve söveler biçimsel olarak taklit edilmiş öğelerdir. Günümüzde binanın deprem güçlendirme ve tadilat çalışmaları devam etmektedir.



Görsel 11. Okul binasının görünümü

### 6.11. Çimkent Sitesi

Safranbolu Cemalcaymaz Mahallesi'nde yer alan Çimkent Sitesi dört bloktan oluşmaktadır. 2006 yılında inşası tamamlanan site, etkileme geçiş alanı sınırının hemen dışındadır. Dört katlı konut binalarında, üç kat boyunca yapılan çıkmalar, üçgen alınlıklar, moloz taş görünümlü bodrum duvarları, ikili gruplandırılmış ahşap malzemeli pencerelerin boyutları, kırma çatı uygulaması, ahşap muşabak, söve ve yatay/dikey silmeler geleneksel evlere referans vermektedir (Görsel 12). İç mekânda ise geleneksele öykünme yoktur.




Görsel 12. Sitedeki konut bloğu

### 6.12. Safranbolu Türker İnanoğlu İletişim Fakültesi Binası

Yenimahalle Mahallesi'nde bulunan fakülte binası sit alanı ve etkileme geçiş alanı sınırları dışında konumlanmaktadır. 2020 yılında inşası tamamlanan yapının taşıyıcı sistemi betonarmedir. Simetrik forma sahip binada farklı yükseklikteki kütleler U biçiminde bir araya gelerek avluyu tanımlamaktadır (Görsel 13). Ana girişin yapıldığı orta kısım, yan kollardan bir kat daha yüksek tutularak kütle hareketliliği sağlanmıştır. Bunların kesişim noktalarında ise küçük planlı kütleler yükselmektedir. Binanın cephe tasarımında geleneksel evlere öykünülmüştür. Giriş kısmını tanımlı hale getiren çıkma, payanda, yatay/dikey silmeler, geniş saçaklı kırma çatı, genellikle iki veya üçerli gruplandırılmış pencere düzenleri, avlu ortasındaki su öğesi, pencere boyut ve bölüntüleri gibi özellikleri ile bina tarihi çevreden izler taşımaktadır. Ancak payandaların taşıyıcı özelliği yoktur. Binanın cephesinde geleneksel dokuda sıklıkla görülen beyaz ve kahverengi renkler kullanılmıştır. İç mekanlarda ise geleneksele öykünme yoktur.



Görsel 13. Fakülte binasının görünümü

### 6.13. Safranbolu Otobüs Terminali

Barış Mahallesi'nde yer alan terminal binası sit alanı veya etkileme geçiş alanı sınırları içerisinde olmamakla birlikte geleneksel dokuya atıfta bulunmaktadır. Betonarme taşıyıcılı bina az katlı ve insan ölçeğindedir. Ritmik pencereler, geniş saçaklar, cephedeki üçgen çatı yüzeyi hareketleri, zemin kat dış duvarında yer yer görülen taş kaplamalar, söveler, ahşap payanda ve muşabak öğeleri ile tarihi dokudan izler taşımaktadır (Görsel 14). Cephesinde kullanılan renkler (beyaz, kahverengi) ise geleneksel evlerle uyumludur.



Görsel 14. Otogar binasının görünümü

### 6.14. Bağlar Saray Otel

Yenimahalle Mahallesi'nde yer alan ve 2002 yılında inşa edilen Bağlar Saray Otel etkileme geçiş ve sit alanı sınırları dışında kalmaktadır. Beş katlı olan binada, ritmik düzende ikili, üçlü düzenlenmiş ahşap pencereler, pencere boyutları ve bölüntüleri, saçaklı kırma çatı uygulaması, çıkmalar, çıkmaların üzerindeki üçgen alınlıklı yüzeyler, ahşap malzemeli balkon korkulukları, söveler, yatay/dikey silmeler ve payandalar tarihi dokunun mimari unsurlarına benzetilmiştir (Görsel 15). Ancak ahşap payandalar taklit amaçlıdır ve taşıyıcılığı yoktur. Bahçe duvarında tarihi çevredeki gibi taş malzeme kullanılmıştır. İç mekanlardaki düzenlemeler ise belli ölçüde geleneksel evlere öykünmeler içermektedir. Bu düzenlemelerde modern yaşam koşullarına uyarlama söz konusudur. Tavan kaplaması, merdiven ve tefrişlerde yoğun olarak ahşap malzemenin kullanıldığı görülmektedir.



Görsel 15. Otel binasının görünümü

### 6.15. İsmail Necati Efendi KYK Öğrenci Yurdu

Safranbolu-Kastamonu ve Karabük-Kastamonu ana kara yolu akslarının kesişiminde konumlanan öğrenci yurdu, tarihi çarşı merkezine yaklaşık 3 km mesafededir. Sit alanı ve etkileme geçiş alanı sınırları dışında olan yurt, 2015-2016 yılları arasında inşa edilmiştir. Yüksekliği oldukça fazla tutulan binaların taşıyıcı sistemi betonarmedir. Cephelerde geleneksel yapılara öykünmeye çalışılmıştır. Ancak bileşenlerinde birbirinden farklı anlayışta tasarım dilinin kullanılması ve çok sayıda farklı malzemenin tercih edilmesi cephe bütünlüğünü bozmuş ve karmaşıklığa neden olmuştur (Görsel 16). Geleneksel evlerde görülen kütle çıkmaları yurt binalarında, işlevselliği olmayan küçük çıkıntıya dönüşmüştür. Giydirme cephe olan kısımlarda, gelenekseldeki yoğun ahşap kullanımına referans vermek amacıyla ahşap görünümlü kaplama kullanılmıştır. Yine bazı yüzeylerdeki taş kaplama uygulaması da benzer amaçlıdır. Cam yüzeyler üzerindeki ahşap renkli çapraz elemanlar ise payandaya atıfta bulunmaktadır ancak iki boyutlu taklidin ötesine geçilememiştir. Uzun cephe boyunca birbirini tekrar eden söveli pencerelerin boyut ve düzeni geleneksel evlerdekinden farklılaşmıştır. Eğimli çatının dar tutulan saçaklarına yer yer dekoratif, taşıyıcı özelliği olmayan küçük payandalar yerleştirilmiştir. Binaların gabarisi tarihi ve doğal çevre ile uyumsuzdur.



Görsel 16. Yurt binasının görünümü

## SONUÇ VE DEĞERLENDİRME

Bu çalışma, tarihi çevrede yeni yapılaşma sorunsalını Safranbolu örneği üzerinden ele alarak, çağdaş mimari müdahalelerin mevcut tarihsel doku ile kurduğu ilişkiyi değerlendirmeyi

amaçlamıştır. Safranbolu'nun çok katmanlı kültürel mirası ve özgün kentsel silüeti, yeni yapılaşmalar açısından hem önemli bir referans hem de hassas bir tasarım alanı oluşturmaktadır. Çalışma kapsamında elde edilen bulgular, tarihi çevrede yeni yapı üretiminde biçimsel yaklaşımların belirleyici rol oynadığını, ancak bu yaklaşımların çoğunlukla eleştirel bir tasarım sürecinden uzak kaldığını ortaya koymaktadır.

Araştırma bulgularına göre, Safranbolu'da tarihi çevreye yakın alanlarda gerçekleştirilen yeni yapılaşmalarda, geleneksel mimariye yönelik biçimsel öykünme ve taklit eğilimi yaygın biçimde gözlemlenmektedir. Bu taklitçi yaklaşım, çoğu zaman yalnızca cephe düzenlemeleri, çatı formları veya malzeme seçimleri üzerinden sınırlı kalmakta; mekânsal kurgu, işlevsel organizasyon ve çağdaş yaşam gereksinimleri ile bütüncül bir ilişki kuramamaktadır. Bu durum, geleneksel mimarinin özünü ve üretildiği sosyo-kültürel bağlamı yeniden yorumlamak yerine, yüzeysel bir biçim aktarımına indirgenmesine yol açmaktadır.

Bulgular ayrıca, geleneksel mimarinin çağdaş bir yorumla ele alındığı nitelikli örneklerin sayıca oldukça sınırlı olduğunu göstermektedir. Oysa tarihi çevrede yeni yapılaşmanın, geçmişi birebir kopyalamak yerine, tarihsel sürekliliği çağdaş tasarım diliyle yeniden üretmesi beklenmektedir. Safranbolu özelinde mevcut durum, bütüncül bir kültürel peyzaj ve silüet algısının halen izlenebilir olduğunu; ancak plansız ve kontrolsüz yeni yapılaşma baskısı nedeniyle bu bütünlüğün giderek zayıfladığını ortaya koymaktadır. Özellikle yeni yapılaşma alanlarının tarihi dokunun hemen yakınında konumlanması, bu yapıların yalnızca fiziksel değil, görsel ve algısal olarak da kentsel silüetin ayrılmaz bir parçası haline gelmesine neden olmaktadır.

Çalışmanın bir diğer önemli bulgusu, tarihi çevrede tasarım konusunun mimarlık eğitiminde yeterince derinlikli biçimde ele alınmadığına işaret etmektedir. Özellikle mimari proje derslerinde, tarihi çevrede yeni yapı tasarımına ilişkin kuramsal tartışmaların, eleştirel yaklaşımların ve özgün tasarım denemelerinin daha fazla yer bulması gerekmektedir. Bu bağlamda, öğrencilerin yalnızca biçimsel uyuma odaklanan çözümler yerine, bağlam, ölçek, işlev, kullanıcı ve kültürel süreklilik gibi çok boyutlu tasarım kriterleri üzerinden düşünmeleri teşvik edilmelidir.

Sonuç olarak, Safranbolu örneği, tarihi çevrede yeni yapılaşmanın yalnızca koruma refleksiyle değil, bilinçli ve eleştirel bir tasarım yaklaşımıyla ele alınması gerektiğini ortaya koymaktadır. Tarihi çevrede sürdürülebilir ve nitelikli bir mimari üretim için, taklitçi eğilimlerin ötesine geçen, çağdaş mimarlık ile kültürel miras arasında dengeli ve yaratıcı bir ilişki kuran yaklaşımların geliştirilmesi kaçınılmazdır.

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# ARCHITECT ATTRIBUTION AND DOCUMENT-BASED EVALUATION IN OTTOMAN ARCHITECTURE: KARAPINAR SULTAN SELIM MOSQUE

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## ABSTRACT

The Karapınar Sultan Selim Mosque, a representative example of Ottoman classical architecture in the provinces, has long been attributed to Mimar Sinan in the literature, often justified by the building's stylistic features and its dating to the reign of Selim II. However, there is no direct inscription on the architect or any record of Sinan. This situation highlights the problem of "hypothetical attribution", a common occurrence in Ottoman architectural historiography.

An archival document recently published by Prof. Dr. Yusuf Küçükdağ, dating to the reign of Selim II in Konya, reveals that the architect of the Karapınar Sultan Selim Mosque was Architect Cemaleddin of Aleppo. This document not only casts doubt on the attribution of this structure to Sinan but also brings to light the name of an architect previously unknown in the literature. However, no information about Architect Cemaleddin of Aleppo beyond this document has been found.

This paper explores the issue of architect attribution in Ottoman architecture through a document-based inquiry, using the example of the Karapınar Sultan Selim Mosque. It will discuss how Sinan's central position in architectural history was reinforced through hypothetical attributions in provincial buildings, and the implications of the diverse data presented by the documents. Furthermore, the nature of the relationship between central authority and local practitioners in provincial buildings will be evaluated within the context of issues of visibility and representation in architectural production. Within this framework, the study aims to highlight the need for a critical revision in Ottoman architectural historiography and highlight the decisive role of archival documents in this process.

**Keywords:** Ottoman architecture, Karapınar Sultan Selim Mosque, Mimar Sinan, Architect Cemaleddin of Aleppo, archival documents, citation tradition.

## 1. INTRODUCTION

The Karapınar Sultan Selim Complex is an Ottoman külliye located in the Karapınar district of Konya. In its original form, the complex consisted of a mosque, two caravanserais, a bathhouse, an imaret, a tabhane, an arasta, a school, a horologe room (muvakkithane), a ablutions fountain (şadırvan), storerooms, wheat and barley granaries, a wood depot, a wheat dingi, a windmill, a watermill, and a large water facility (Küçükdağ, 2009, p. 518) (Figure 1).

The complex is one of the most significant examples representing 16th-century classical Ottoman architecture in Central Anatolia. The district, enriched by such a variety of structures, was initially referred to as "Sultaniyye", while the complex itself is recorded in historical sources as the "Sultaniyye Imaret" or "Sultan Selim Imaret". Constructed during the reign of

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Sultan Selim II, the complex has survived to the present day despite severe damages over time, thanks to subsequent restorations. Although there are many opinions and anecdotes regarding the construction date of the külliye, the most reliable information indicates that the mosque and imaret were begun in the summer of 1550 and completed in the summer of 1563.



**Figure 1. Karapınar Sultan Selim Complex (URL. 1)**

The two-line inscription above the entrance door of the mosque provides a precise date, particularly regarding the inauguration of the building, through the use of the abjad (ebced) system. The phrase in the last line, *"When this lofty mosque was completed, it spoke a hidden date"*, refers to the *abjad* date, and it is followed by a quotation from verse 108 of Surah At-Tawbah: *"This mosque has been built upon the foundation of piety,"* which also indicates the date. According to the *abjad* calculation, the inscription corresponds to A.H. 971 (A.D. 1563-64) (Table 1).

**Table 1. Abjad Verification Table of the Inscription of Karapınar Sultan Selim Mosque**

| انه لمسجد ا سس علي التقو ى | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ى | و | ق | ت | ل | ا | ي | ل | ع | س | س | ا | د | ج | س | م | ل | ه | ن | ا |
| 10 | 6 | 100 | 400 | 30 | 1 | 10 | 30 | 70 | 60 | 60 | 1 | 4 | 3 | 60 | 40 | 30 | 5 | 50 | 1 |
| 971 | | | | | | | | | | | | | | | | | | | |

While the architect of the building is traditionally known as Mimar Sinan according to the attribution tradition, archival documents indicate that it was Architect Cemaleddin of Aleppo. This discrepancy forms the basis of this study.

## 2. THE ARCHITECT OF THE BUILDING ACCORDING TO THE ATTRIBUTION TRADITION

The *Tezkiretü'l-Ebniye* and *Tezkiretü'l-Bünyân*, written by Saî Mustafa Çelebi -who was a close friend of Mimar Sinan and is believed to have recorded Sinan's accounts- are considered sources that, although not authored directly by Sinan, convey his observations, narratives, and information about his works. These sources explicitly state that the mosque (Saî Mustafa Çelebi, 2003, p. 99), the imaret (Saî Mustafa Çelebi, 2003, p. 104), and the bathhouse (Saî Mustafa Çelebi, 2003, p. 108) of the Karapınar Sultan Selim Complex were constructed by

Mimar Sinan. As one of the earliest written sources, Evliya Çelebi also attributes the building to Sinan in his *Seyahatname*[3] (Evliya Çelebi, 1999, p. 22). Such information likely served as the primary reference for attributing the complex to Mimar Sinan in most studies conducted until the 1990s. Additionally, the stylistic features of the building, which resemble those of Sinan's known works, reinforced this attribution.

In publications during the Republican period, almost all sources continued to attribute the Karapınar Sultan Selim Complex to Mimar Sinan until Yusuf Küçükdağ's comprehensive study published in 1997. For example, in the *Konya Eski Eserler Kılavuzu* co-authored by Faik Soyman and İbrahim Tongur, the architect of the complex is listed as Mimar Sinan; Semavi Eyice also refers to Saî Mustafa Çelebi to state that the complex was built or designed by Sinan (Eyice, 1964, p. 128). Oktay Aslanapa, in his work *Osmanlı Devri Mimarisi*, emphasizes that Sinan completed the mosque in Karapınar within the year the Selimiye Mosque was begun, thereby affirming that the work in Karapınar belongs to Mimar Sinan (Aslanapa, 1985, p. 264; 1988, p. 109; 1989, pp. 268–269).

On the other hand, some scholars have presented alternative perspectives regarding the architect of the complex. Osman Şevki Uludağ first observed that the section between the door arch and the *muqarnas* of the mosque attributed to Sinan does not date from Sinan's period; moreover, the motif between the inscription and the door arch began to be used in Ottoman architecture after the 17th century. Based on his examination of aesthetics and symmetry, Uludağ argued that a master like Mimar Sinan would not have made such errors. Nevertheless, without considering the possibility of another architect, he suggested that these differences were likely due to later restorations (Küçükdağ, 1997, p. 32). These evaluations indicate that, in Ottoman architectural historiography, the "attribution tradition" and archival documents can yield divergent results. Therefore, the information provided by such sources must be critically assessed in light of archival evidence.

## 3. THE ARCHITECT OF THE BUILDING ACCORDING TO ARCHIVAL DOCUMENTS

The most consistent information regarding the architect of the Karapınar Sultan Selim Complex is provided in historian Yusuf Küçükdağ's 1996 book Karapınar Sultan Selim Külliyesi. Based entirely on archival records, the study indicates that during Sultan Selim II's governorship of Konya (1524-1544), a decision was made to construct a mosque and an imaret in Karapınar. For this purpose, a survey was conducted by the local judge (In the Ottoman Empire, it was referred to as a *"kadı"*). Subsequently, a letter was sent to the central authorities requesting permission for the project, explicitly naming the architect who would be assigned to the work. The request was reviewed and approved by the Divan[4], and orders were issued to the judges of

[3] In the relevant section, this information appears in Ottoman Turkish as: *"Çârsû içre Süleymân Hân câmi'i kurşunlu binâ-yı mu'azzam câmi'dir. Mi'mâr Sinân binâsıdır. Ma'mûr imâret-i dârü'z-ziyâfesi var."*

[4] Divan, refers to the sultan's government in the Ottoman Empire and denotes the highest decision-making body. It served as the main venue where general policies were decided, state matters were discussed, complaints were adjudicated, and official consultations were held.

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the respective regions regarding the craftsmen and carpenters to be employed in the construction. Within this framework, a decree sent to the Judge of Aleppo[5] on A.H. 18 Shaban 967 (A.D. 14 May 1560) explicitly requested the assignment of Architect Cemaleddin of Aleppo to the project (Figure 2)[6].

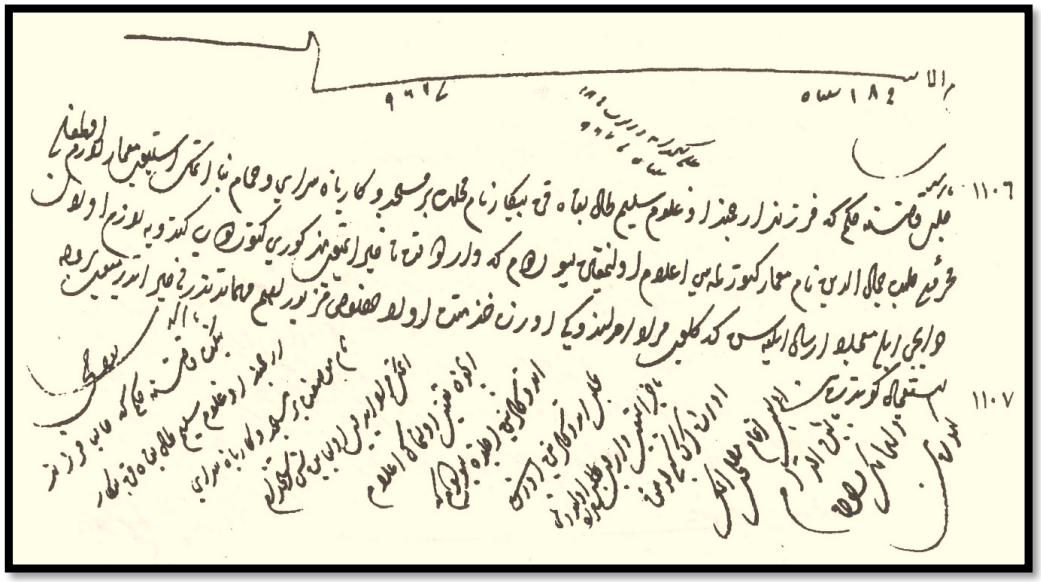

**Figure 2. Archival document indicating the assignment of Architect Cemaleddin of Aleppo as the architect for the construction of Karapınar Sultan Selim Complex (BOA, Mühimme, No: 3, Page: 374, Entries: 1106–1107)**

At the time the construction of the Karapınar Sultan Selim Complex commenced, it seems unlikely that Sinan could have been directly involved in a provincial building project in Anatolia, given that he was personally tasked by the Sultan with overseeing the construction of the Kırkçeşme waterworks and the transfer of the Kağıthane water supply to Istanbul. These projects were carried out between 1554 and 1564, spanning approximately ten years of construction (Çeçen, 1988, p. 34). Under these circumstances, archival documents indicating that the architect of the complex was Architect Cemaleddin of Aleppo provide the strongest evidence.

Subsequent publications addressing the complex, following the emergence of the archival document, have shown a more cautious approach regarding the identification of the architect. In his 2013 publication, H. Mustafa Eravcı notes that the design of the complex was prepared by Mimar Sinan, while the architectural execution was carried out by Architect Cemaleddin of Aleppo (Eravcı, 2013, p. 91); however, no archival document has yet been presented to

[5] The decree requesting the assignment of the architect named Architect Cemaleddin reads in Ottoman Turkish as follows: *"Halep kadısına hüküm ki, ferzend-i ercümend oğlum Selim tâle begâhu Karapınar nâm mahalde bir mescid ve kârbânsaray ve hamam bina itmek isteyüp mimar lâzım olmağla mahrüse-i Haleb'de Cemâleddin nâm mi'mâr getürülmesi ilâm olunmağın buyurdum ki vardukda tehîr etmeyüb mezküri getürüb kendüye lazım olan harayici ile mucceela irsâl eyleyesin ki gelüb murâd olunduğu üzere hizmetin ola husus-i mezbûr ehem-i mühimmatdandır, tehir itdürmeyüb ber-vech-i isti'câl gönderesin".*

[6] I would like to thank Dr. Sami Ağaoğlu for the transcription of the document.

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substantiate this claim. The author references both the traditional attribution and archival evidence in his dating.

A more recent publication, Karapınar Sultan Selim Mosque and Complex by Mustafa Aşkar, issued by the Karapınar Municipality in 2022 (Aşkar, 2022), represents a current account. In discussing the architects, the author states that *"with Sinan's knowledge and based on his designed project, Cemaleddin of Aleppo contributed to the construction of the mosque as the general supervisor".* In this evaluation, Aşkar integrates both the traditional attribution and archival evidence, and he further cites an archival document indicating that a certain "Mimar Mehmet" also participated in the mosque's construction (Aşkar, 2022, p. 39).

## 3. EVALUATION AND CONCLUSION

The 16th century, during which Mimar Sinan lived, represents one of the most productive and intense periods of construction activity in Ottoman architecture. During this time, numerous külliyes, mosques, madrasas, and infrastructure facilities were built not only in the capital, Istanbul, but also across various regions of Anatolia and Rumelia. Given the scale of this activity, it was naturally impossible for Sinan to personally oversee all construction sites simultaneously. It is well established that Sinan appointed trusted architects he trained, particularly for projects outside Istanbul, who played crucial roles in the execution of provincial constructions. This fact is essential for understanding the discrepancies that often arise between the attribution tradition and archival documents in Ottoman architectural studies.

In this context, the Karapınar Sultan Selim Complex constitutes a noteworthy example. The attribution of the külliye to Sinan in the works of Saî Mustafa Çelebi and Evliya Çelebi's Seyahatname led for many years to the acceptance of the complex as Sinan's work in architectural historiography. Furthermore, the architectural style of the complex aligns with the classical lines of Sinan's period, reinforcing this attribution. However, considering that the attribution tradition in Ottoman architecture frequently relies on personal accounts, biographical works (tezkire), or stylistic similarities, such claims require critical scrutiny.

On the other hand, archival documents provide strong evidence that directly challenge this attribution. In particular, the decree sent to the judge of Aleppo clearly indicates that Cemalettin of Aleppo was appointed as the architect for the construction of the complex, offering a concrete and reliable source regarding the architect's identity. This case demonstrates that traditional attributions alone are insufficient in Ottoman architectural studies, and that archival evidence must be meticulously evaluated. Accordingly, the Karapınar Sultan Selim Complex occupies a distinct position among works attributed to Sinan and exemplifies the typical discrepancy between the attribution tradition and archival reality.

At this point, it becomes evident that studies listing Sinan's works should be revisited with a critical perspective. The attribution tradition, a natural consequence of Sinan's prominence and influence, resulted in many buildings being recorded under his name. However, it appears that some of these works were constructed not under Sinan's direct supervision but through architects he appointed. The Karapınar example suggests that other works attributed to Sinan in Anatolia should likewise be re-evaluated in light of archival documentation.

To date, no biographical information is available regarding Architect Cemaleddin of Aleppo beyond this document. It remains unknown whether his architectural activity was limited solely to this külliye or if he contributed to other projects. This underscores the difficulty of identifying provincial Ottoman architects and the extent to which research depends on archival sources. Therefore, the Karapınar Sultan Selim Complex is significant not only for re-examining works attributed to Sinan but also for bringing to light secondary figures in Ottoman architecture.

In conclusion, the discrepancies between the attribution tradition and archival evidence have profound implications for the writing of architectural history. While the attribution tradition glorified Sinan's art and led to many buildings being recorded under his name, archival documents demonstrate that these attributions do not always reflect reality. The Karapınar Sultan Selim Complex thus serves both as a cautionary case and a starting point for new research.

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**“COMPLIANCE WITH PUBLICATION ETHICS IS THE SOLE RESPONSIBILITY OF THE AUTHORS; ACCORDINGLY, THEY BEAR BOTH ETHICAL AND LEGAL ACCOUNTABILITY”**

# LOGO TASARIMLARINDA MİMARİ ÖGELERİN KULLANIMI: SAFRANBOLU/KARABÜK ÖRNEĞİ

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## ÖZET
Logo tasarımı, kurum ve kuruluşların kimliklerini yansıtan en önemli görsel iletişim araçlarından biridir. Logolarda kullanılan renkler, formlar ve semboller, hem markanın hedef kitlesi tarafından algılanış biçimini hem de kurumun kendini konumlandırma stratejisini doğrudan etkilemektedir. Bu çalışma, logo tasarımlarında mimari öğelerin kullanımını ele almakta; özellikle Safranbolu'nun tarihi kent dokusu ve geleneksel konut mimarisinin Karabük'teki kurum ve kuruluşların logolarında nasıl temsil edildiğini incelemektedir. Safranbolu'nun UNESCO koruması altındaki özgün tarihi yapıları ve kentin marka değerine dönüşen geleneksel ev tipolojisi, incelenen logolarda sıkça kullanılan temel görsel unsurlar arasında yer almaktadır. Çalışmada öncelikle logo tasarımının temel ilkeleri, görsel algı kuramları ve kültürel sembollerin logolardaki işlevi tartışılmış; ardından Karabük ve Safranbolu'daki kurum, dernek, spor kulübü ve işletmelere ait logolar sistematik biçimde değerlendirilmiştir. Bu değerlendirme, logolarda Safranbolu evleri, Hükümet Konağı ve saat kulesi gibi mimari öğelerin güçlü bir simgesel dil oluşturduğunu göstermektedir. Geleneksel mimari çizgilerin, kent kimliğiyle bütünleşen birer marka öğesi olarak kullanılması hem yerel aidiyeti pekiştirmekte hem de bölgenin tanıtımında etkili bir araç işlevi görmektedir. Safranbolu mimarisinin logolardaki görsel temsili, kentin kültürel mirasını sembolleştiren ve marka kimliğine dönüştüren önemli bir tasarım yaklaşımı sunmaktadır. Çalışma, mimari öğelerin logo tasarımındaki rolünü anlamak açısından yerel ölçekte değerli bir örnek teşkil etmektedir.
**Anahtar Kelimeler:** Kültürel miras, Safranbolu, mimarlık, geleneksel ev, logo.

# USE OF ARCHITECTURAL ELEMENTS IN LOGO DESIGNS: THE SAFRANBOLU/KARABÜK EXAMPLE

## ABSTRACT
Logo design is one of the most important visual communication tools that reflects the identities of institutions and organizations. The colors, forms, and symbols used in logos directly influence both how a brand is perceived by its target audience and the institution's positioning strategy. This study examines the use of architectural elements in logo designs, specifically examining how Safranbolu's historical urban fabric and traditional residential architecture are represented in the logos of institutions and organizations in Karabük. Safranbolu's unique historical structures, under UNESCO protection, and the traditional house typology, which has become a brand value for the city, are among the key visual elements frequently used in the examined logos. The study first discussed the fundamental principles of logo design, theories of visual perception, and the role of cultural symbols in logos. Following this, logos belonging to institutions, associations, sports clubs, and businesses in Karabük and Safranbolu were systematically evaluated. This evaluation demonstrates that architectural elements such as Safranbolu houses, the Government Office, and the clock tower in these logos create a powerful symbolic language. The use of traditional architectural elements as brand elements integrated with the city's identity both reinforces local identity and serves as an effective tool for promoting the region. The visual representation of Safranbolu's architecture in logos presents a

significant design approach that symbolizes the city's cultural heritage and transforms it into a brand identity. The study provides a valuable example at the local level for understanding the role of architectural elements in logo design.
**Keywords:** Cultural heritage, Safranbolu, architecture, traditional house, logo.

## 1. GİRİŞ

Logo tasarımı, bir markanın kimliğini yansıtan en önemli görsel araçlardan biridir. Logo tasarımında kullanılan renkler ve ögeler hem sektörel kimliğin vurgulanmasını hem de marka değerlerinin görselleştirmesini mümkün kılmaktadır. Kurum veya kuruluşların hedef kitleleri tarafından görünen ilk yüz olması da görsel algıda seçicilik sağlamaktadır. Bu nedenle logolar, markanın mesajını ileten temel görsel olarak değerlendirilmektedir (Ceylan, 2015). Başarılı bir logo tasarımı, yalnızca estetik bir tercih olmanın ötesinde, markanın uzun vadeli hedeflerini, kimliğini ve imajını yansıtması açısından kritik bir unsurdur. Markaların görsel iletişiminde kullanılan logolar, hedef kitlenin algısının şekillenmesinde önemli bir rol oynamaktadır.

Etkili logo tasarımlarının ortak noktası, görsel algı prensiplerini kullanarak, hedef kitlelerinde iz bırakacak şekilde font, şekil ve renk seçmelerinde yatmaktadır. Doğru bir marka bilincinin oturtulabilmesi için, seçilen tasarımda kullanılan çizgilerin, karakterlerin ve renklerin tasarım ilkelerine uygunluğu ve bunların verdiği mesajlar büyük önem taşımaktadır (Erdoğan, 2024). Logoların dikkat çekici, anlamlı, tanınabilir ve uzun süre akılda kalmasını sağlama amacı taşıması, görsel unsurların algısal bir bütünlük içinde sunulması ve tasarım sürecinde logo tasarım ilkelerinin bilinçli bir şekilde uygulanmasıyla gerçekleşebilecektir.

Bir logonun insan zihninde nasıl bir etki bıraktığını anlamak için tasarımın psikolojik kökenleri, tasarımda kullanılan ögeler ve tasarım ilkelerinden bahsetmek gereklidir. Yılmaz ve Kaya (2003), araştırmalarında bireylerin karşılaştıkları görsel uyaranları nasıl algıladıklarını ve bu algının hangi kuramsal temellere dayandırılabileceğini incelemişlerdir. Bu çalışmada altı adet algı kuramı detaylandırılmıştır:

- Gestalt Algı Kuramı: Bütünün parçalarının toplamından daha fazla anlam içerdiğini savunur.
- Olasılıklı İşlevselcilik Kuramı: Algının bireyin deneyimleri, kültürü ve çevresel koşullarıyla şekillendiğini öne sürer.
- Bilişimsel Algı Kuramı: Algılama sürecinde hafıza ve zihinsel işlemlerin önemini vurgular.
- Yapılandırmacı Algı Kuramı: Algının aktif bir süreç olduğunu, bireyin göz hareketleri ve deneyimleriyle şekillendiğini savunur.
- Doğrudan Algı, Ekolojik Optik Kuramı: Algının çevreden doğrudan bilgi alımıyla gerçekleştiğini açıklar.
- Nörofizyolojik Algı Kuramı: Algı ve öğrenmenin nöronlar arası bağlarla ilişkili olduğunu açıklar.

Logo tasarımlarında renk ve formların seçimlerinde bilinçli ve stratejik kararlar alınması son derece önemlidir. Her tasarım ögelerden oluşmakta ve her öge görsel bir mesaj içermektedir. Görsel tasarımda tasarım ögeleri nokta, çizgi, form, yön, boyut, alan, doku ve renk olarak belirlenmiştir. Kültürel farklılıklar olmakla birlikte, renklerin insan üzerinde bıraktığı etkiler şu şekilde özetlenebilmektedir (Elliot ve Maier, 2014):

- Kırmızı: Heyecan, tehlike, tutku.
- Mavi: Güven, huzur, sakinlik.
- Sarı: Yüksek enerji, geçicilik.
- Yeşil: Sağlık, şans, sakinlik.

- Mor: Yaratıcılık, bilgelik, zenginlik.
- Turuncu: Neşeli, haraketli, canlandırıcı.
- Pembe: Nezaket, sevgi, neşe.
- Kahverengi: Tutarlılık, dayanıklılık, hüzün.
- Beyaz: Saflık, masumiyet, temizlik.
- Siyah: Prestij, güç, ciddiyet.

## 2. LOGONUN ORTAYA ÇIKIŞI

Türk Dil Kurumu tarafından çevrimiçi erişimdeki Güncel Türkçe Sözlükte 'logo' kelimesinin anlamına bakıldığında, İngilizceden dilimize geçmiş bu kelime yerine, sözlük bizi 'imlek' kelimesine yönlendirmektedir. 'İmlek' kelimesinin anlamı ise 'Bir kurum veya kuruluşun kendine seçtiği, bazı ticaret eşyası üzerine konulan, o eşyayı üreten veya satanı tanıtan resim, harf vb. özel işaret; logo' olarak belirtilmiştir (URL-1). Hasol'un Ansiklopedik Mimarlık Sözlüğünde (2017) logo kavramı yer almasa da sembol kavramı, simge kavramıyla eş anlamlı olarak, 'Herhangi bir varlığı, nesneyi, kavramı ya da olayı temsil eden ve çağrışım, benzerlik yoluyla ona gönderme yapan işaret' anlamıyla sunulmuştur.

Görüldüğü üzere sembol, simge ve logo kavramları; tanıtma, temsil etme ve işaret kavramlarıyla tanımlanmaktadır. Bu kavramların genel anlamı, 'temsil ettiği varlığı, nesneyi, kurum veya kuruluşu çağrıştıracak özel işaretlerin kullanılması durumu' olarak özetlenebilecektir.

### 2.1. Simgesel Kullanımın Tarihi

İnsanlık tarihi boyunca, mağaralardaki duvar resimlerinden de anlaşılacağı üzere, insanın gördüğü her şeyi simgeleştirmeye karşı bir yönelimi olduğu bilinmektedir. Simgeleştirmede kullanılan biçimin üç ögesi nokta, çizgi ve formdur. Simge olarak daire, kare, çapraz kare, üçgen gibi formlar kullanıldığı gibi, hayvanlar ve bitkiler gibi canlılar ya da ok, yay gibi aletler de nesneler olarak kullanılmıştır. Çeşitli dönemler ve kültürlerde bu simgeler aynı anlamları taşıyacak şekillerde de kullanılmıştır.

- Kare: Dört kenarının eşit olması nedeniyle dengeyi ve sağlamlığı ifade etmektedir. Aynı zamanda yeryüzünün sembolik ifadesi ve güven göstergesidir.
- Üçgen: Şekil itibariyle yönlendirme anlamı taşımaktadır. Ucu yukarı bakan üçgen; yüksekliğin, başarının, gücün, olumluluğun ifadesiyken, ucu aşağı dönük üçgen bunun tam tersini ifade etmektedir.
- Daire: Köşesiz bir şekil olarak sonsuzluğun ifadesidir. Şeklen benzerliği nedeniyle, güneş, ay ve gezegenleri temsil etmektedir.

### 2.2. Sanayi Devrimi ve Kurumsal İşaretler

Sanayi Devrimi ile birlikte üretim olanaklarının artması ve ürünlerin satışı için yeni pazarların açılmasıyla, üreticilerin tanınırlık kaygıları ortaya çıkmıştır. Sanayileşmenin yaygınlaşmasıyla sanayi kentleri gelişmiş ve bu yeni kentlerde insan yoğunluğu yaşanmaya başlanmıştır. Bu kentlerde, ticaret de farklı bir boyut kazanmış, yan yana sıralı dükkanlarda, farklı üreticilerin ürünleri sergilenmiştir.

Reklam kavramı da yine bu dönemde ilk kez gündeme gelmiş, ürünlerin tanıtılması için ilan, afiş ve tabelalar geliştirilmiştir. Tanıtımın kolay olması amacıyla, dükkanların yanı sıra satılan ürünler de işaret taşımaya başlamış ve böylece günümüze kadar gelen ilk kurumsal işaretler ortaya çıkmıştır (Pılıcı, 2008).

## 3. KARABÜK'TEKİ KURUM VE KURULUŞLARIN LOGOLARINDA SAFRANBOLU

Karabük ilinin ilçelerinden biri olan Safranbolu'nun Tarihi Çarşı bölgesi, 1994 yılından itibaren UNESCO tarafından korunan kentler listesinde yer almaktadır (URL-2). Karabük'ün 1995 yılında il statüsü kazanmasıyla, Safranbolu ilçesi de Zonguldak'tan ayrılıp, Karabük'e bağlanmıştır (Resmi Gazete, 1995). Bölgede yer alan geleneksel Türk Evi özelliğindeki yapıların kentsel bir bütünlük içinde korunuyor olması sayesinde, Safranbolu; yerli ve yabancı turist çeken, kentin ve bölgenin gözbebeği konumundadır.

Geleneksel konutların yanında camii, han, hamam, arasta, hükümet konağı, saat kulesi, muvakkithane gibi kamusal yapılara sahip olup, bu yapılar da koruma altındadır. Kentin tanınırlığının yanı sıra, bu kente hizmet eden kurum ve kuruluşlarda da aidiyet duygusu çerçevesinde Safranbolu'da olmak ve Safranbolulu olmak önemli görülmektedir. Bu tarihi yapılar, ildeki birçok kurum ve kuruluşun logolarında yer bulmuştur. Bu çalışmada, sektör farklılıkları göz önünde bulundurularak farklı alanlardan on altı adet logoya yer verilmiştir. Logoların birçoğunda mimari öge olarak Safranbolu'nun geleneksel konut dokusundan izlerin görülmekle birlikte, Hükümet Konağı ve saat kulesi de logolarda kendilerine yer bulmaktadır.

### 3.1. Mimarinin ve Kültürel Ögelerin Temsili

Çizelge 1'de (Logoların görsel tablosu) yer alan logolardan T.C. Karabük Valiliği, Safranbolu Belediyesi, Safranbolu Ticaret ve Sanayi Odası, Safranbolu Kent Konseyi, Safranbolu Turizm İşletmecileri Derneği, Korunan Kent Safranbolu Derneği, Mor Safran Kültür Sanat Derneği, Safranbolu Anneeli Eğitim, Kültür, Sosyal Yardımlaşma ve Dayanışma Derneği, Safranbolu Birlik Haber Gazetesi, Safranbolu Belediyespor, Safranbolu Bağlar Spor Kulübü, Safranbolu Dağ ve Doğa Sivil Arama Kurtarma Derneği, Safranbolu Zariftat Lokum ve Safran Germia Palas Otel logolarında Safranbolu'daki evlerin çizimleri görülmektedir.

T.C. Safranbolu Kaymakamlığı logosunda, kente hakim bir tepede yer alan, günümüzde müze olarak kullanılan tarihi bir yapı olan Hükümet Konağı yapısı görülmektedir. Safranbolu Gençlik Merkezi Spor Kulübü logosunda ise Hükümet Konağı'nın hemen yanında yer alan saat kulesi yer almaktadır.

**Çizelge 1.** Karabük'teki kurum ve kuruluşların logolarında Safranbolu.

| | | | |
|---|---|---|---|
| (a) T.C. Karabük Valiliği | (b) T.C. Safranbolu Kaymakamlığı | (c) Safranbolu Belediyesi | (d) Safranbolu Ticaret ve Sanayi Odası |
| (e) Safranbolu Kent Konseyi | (f) Safranbolu Turizm İşletmecileri Derneği | (g) Korunan Kent Safranbolu Derneği | (h) Mor Safran Kültür Sanat Derneği |

| | | | |
|---|---|---|---|
| (i) Safranbolu Anneeli Eğitim Kültür Sosyal Yardımlaşma ve Dayanışma Derneği | (j) Safranbolu Birlik Haber Gazetesi | (k) Safranbolu Belediyespor | (l) Safranbolu Gençlik Merkezi Spor Kulübü |
| (m) Safranbolu Bağlar Spor Kulübü | (n) Safranbolu Dağ ve Doğa Sivil Arama Kurtarma Derneği | (o) Safranbolu Zariftat Lokum | (p) Safran Germia Palas Otel |

Logolarda Safranbolu'nun endemik bitkisi olan safran çiçeğinin ve bu bitkinin taç yapraklarındaki mor rengin de logolarda kullanılması da yine bölgeye özgü bir tercihtir. Örneğin; Safranbolu Belediye'sinin logosu mor renkte ve taç yaprakları stilize edilmiş şekildedir. Safranbolu Turizm İşletmecileri Derneği, Safranbolu Anneeli Eğitim Kültür Sosyal Yardımlaşma ve Dayanışma Derneği, Safranbolu Dağ ve Doğa Sivil Arama Kurtarma Derneği logolarında safran çiçeği kullanılmıştır. Mor Safran Kültür Sanat Derneği'nin ise ismine de taşıdığı çiçeğin rengi logosunda görülmektedir. Safranbolu'nun bir diğer coğrafi işaretli ürünü olan çavuş üzümü de Safranbolu Bağlar Spor Kulübü logosunda tercih edilmiştir. Ayrıca, Türkiye'nin yaklaşık %70 oranıyla, orman yoğunluğu en yüksek ilinin Karabük olması nedeniyle de T.C. Karabük Valiliği ve Safranbolu Dağ ve Doğa Sivil Arama Kurtarma Derneği logolarında da orman vurgusu yapılmıştır.

## 4. SONUÇ

Her toplumun, kendisine özgü anlamlar içeren simgeleri bulunmaktadır. Bu simgeler aidiyet, tanınırlık, bütünlük ve özgünlük içermektedir. Toplumun, kurumun, kuruluşun ya da üreticinin yararını gözetmesi beklenen bu simgeler; geçmişten günümüze armalar, tuğralar, mühürler, piktogramlar ve logolar olarak karşımıza çıkmaktadır.

Reklam anlamı da taşıyan logolarda, ürününün ya da hizmetin özelliklerini öne çıkaran ve markalaşmada fayda sağlayan tasarımların olması beklenmektedir. Mesajın doğru algılanması, ortak görsel anlam üretimi için gereklidir. Bu bağlamda, görsel algı kuramları, reklam tasarımlarının etkinliğini anlamada önemli bir analiz aracıdır. Tasarımcılar, hedef kitlenin algısal özelliklerini ve psikolojik süreçlerini dikkate alarak iletişim başarılarını artırabilmektedirler.

Görsel olarak ilk dikkat çeken ögeler logonun rengi ve grafik çizimleridir. Bu çalışmada incelenen on altı logoda Safranbolu'nun kendine özgü tarihi değerlerinin ilçedeki ve ildeki logolara nasıl yansıdığı incelenmiştir.

### 4.1. Safranbolu Örneği ve Temsil Edilen Ögeler

Logolarda geleneksel konut mimarisine ait detaylı çizimlerin yanı sıra çizgisel olarak ya da yalnızca sınırlarının betimlendiği örneklerin de olduğu gözlemlenmektedir. Genel itibariyle konutlara vurgu yapılsa da hükümet konağı ve saat kulesi içeren logolar da bulunmaktadır. Aynı zamanda safran çiçeği, çavuş üzümü ve ormanlar da simgesel anlamda canlılar olarak logolarda tercih edilmişlerdir.

Bu durum, Safranbolu'nun tasarımcılar tarafından yalnızca geleneksel konut bağlamında değerlendirilmediği, kentin tüm değerleriyle bir bütün olarak görüldüğünü göstermektedir.

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# TARİHİ KENTLERİN İKLİM DEĞİŞİKLİĞİNE UYUMU: SAFRANBOLU ÖRNEĞİNDE UYUM TEDBİRLERİ

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## ÖZET

İklim değişikliği, artan sıcaklıklar, aşırı yağışlar ve su stresi gibi etkiler yoluyla kentlerin fiziksel ve ekolojik yapısını giderek daha fazla zorlamakta; bu durum tarihî kentler için daha karmaşık ve çok boyutlu riskler doğurmaktadır. Bu çalışma, Safranbolu özelinde, iklim değişikliğine uyum kapsamında alınması gereken öncelikli tedbirleri ortaya koymayı amaçlamaktadır. UNESCO Dünya Mirası Listesi'nde yer alan Safranbolu, korunması gereken tarihî dokusu ile iklim değişikliğine uyum gereklilikleri arasındaki hassas denge açısından önemli bir örnek teşkil etmektedir. Çalışmada Safranbolu'nun kentsel ve iklimsel özellikleri dikkate alınarak; sıcaklık artışı ve ısı dalgaları, aşırı yağış ve nem, kuraklık ve su stresi ile kentsel yeşil alan kaybı gibi başlıca iklim riskleri değerlendirilmiştir. Analiz süreci, UNESCO'nun kültürel miras ve iklim değişikliği politikaları ile "Historic Urban Landscape" yaklaşımı temel alınarak yürütülmüştür. Bu çerçevede, yapılı çevre, su yönetimi, kentsel peyzaj, afet ve risk yönetimi, ölçülebilirlik ve yönetişim başlıkları altında Safranbolu için uygulanabilir uyum tedbirleri tanımlanmıştır. Bulgular, Safranbolu'da iklim değişikliğine uyumun; sert ve geri döndürülemez fiziksel müdahaleler yerine, geleneksel mimarinin pasif iklim avantajlarını koruyan, su ve yeşil alan yönetimini güçlendiren ve veri temelli izleme mekanizmalarıyla desteklenen bütüncül bir yaklaşım gerektirdiğini göstermektedir.

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**Anahtar Kelimeler:** İklim değişikliği, tarihi kentler, Safranbolu

## 1. GİRİŞ

İklim değişikliği, küresel ölçekte artan ortalama sıcaklıklar, aşırı hava olaylarının sıklık ve şiddetindeki artış, yağış rejimlerindeki değişimler ve su kaynakları üzerindeki baskılar yoluyla kentlerin fiziksel, çevresel ve sosyo-ekonomik sistemlerini derinden etkilemektedir (IPCC, 2021). Kentler, yoğun nüfus, yüksek yapılaşma oranı ve karmaşık altyapı sistemleri nedeniyle iklim değişikliğinin etkilerine karşı daha hassas hâle gelmekte; aynı zamanda küresel sera gazı emisyonlarının önemli bir bölümünden sorumlu olmaları nedeniyle bu sürecin hem nedeni hem de sonucu olarak öne çıkmaktadır (Seto et al., 2014; UN-Habitat, 2020).

Tarihî kentler, çağdaş kentlere kıyasla iklim değişikliğine karşı daha kırılgan bir yapı sergilemektedir. Bu kırılganlık, tarihî yapıların özgün malzeme özellikleri, yaşlanmış yapı stokları ve koruma odaklı planlama kısıtlarıyla doğrudan ilişkilidir. Literatürde, artan sıcaklıklar, nem değişimleri, aşırı yağışlar ve don-çözülme döngülerinin tarihî yapılarda fiziksel bozulma süreçlerini hızlandırdığı açıkça ortaya konmuştur (Hughes et al. 2020; Avila-Diaz vd., 2020 , Ummenhofer ve Meehl, 2017; Brimblecombe & Grossi, 2010). Bu bağlamda iklim değişikliği, yalnızca fiziksel hasar riski değil, aynı zamanda kültürel mirasın uzun vadeli sürdürülebilirliği açısından da ciddi bir tehdit oluşturmaktadır (Fatorić & Seekamp, 2017).

Bu çerçevede, Safranbolu, tarihî kentlerin iklim değişikliğine uyumu bağlamında önemli bir örnek teşkil etmektedir. Osmanlı dönemi sivil mimarisinin özgün örneklerini barındıran Safranbolu, tarihî kentsel dokusu, topoğrafik yapısı ve yoğun turizm faaliyetleri nedeniyle iklim değişikliğinin etkilerine karşı çok boyutlu bir kırılganlık sergilemektedir. Aynı zamanda UNESCO Dünya Mirası Listesi'nde yer alması, Safranbolu'da uygulanabilecek uyum önlemlerinin koruma ilkeleriyle uyumlu, geri döndürülebilir ve bütüncül bir yaklaşımla ele alınmasını zorunlu kılmaktadır (UNESCO, 2011).

UNESCO tarafından geliştirilen Historic Urban Landscape (HUL) yaklaşımı, tarihî kentlerin iklim değişikliğine uyum sürecinde yalnızca yapı ölçeğine odaklanılmaması; doğal çevre, peyzaj, sosyal yapı ve ekonomik faaliyetlerin birlikte değerlendirilmesi gerektiğini vurgulamaktadır (UNESCO, 2011; Hosagrahar et al., 2016). Bu yaklaşım, iklim değişikliğine uyumun sert mühendislik çözümleri yerine, yerel bağlama duyarlı, aşamalı ve veri temelli stratejilerle ele alınmasını önermektedir.

Bu çalışma, Safranbolu örneğinde tarihî kentlerin iklim değişikliğine uyum sürecinde alması gereken öncelikli tedbirleri belirlemeyi amaçlamaktadır. Çalışmanın kapsamı; yapılı çevre, su yönetimi, kentsel yeşil alanlar, afet ve risk yönetimi ile yönetişim başlıkları altında değerlendirilen uyum tedbirlerini içermektedir. Bu çerçevede, tarihî kentlerde iklim değişikliğine uyumun, koruma ilkeleriyle çelişmeyen; geleneksel kentsel bilginin bilimsel veriler ve çağdaş planlama araçlarıyla bütünleştirildiği bir yaklaşım gerektirdiği savunulmaktadır.

## 2. SAFRANBOLU'NUN KENTSEL VE İKLİMSEL ÖZELLİKLERİ

Safranbolu, Batı Karadeniz Bölgesi'nde, Karabük iline bağlı, engebeli topoğrafyaya sahip bir yerleşim olup tarihî kent dokusu büyük ölçüde vadi tabanları ve yamaçlar boyunca gelişmiştir. Kentin bu topoğrafik yapısı, mikroiklim koşullarının oluşmasında belirleyici olmakta; özellikle dar sokaklar, eğimli araziler ve yapı yoğunluğu, hava sirkülasyonu, yüzey akışı ve nem dağılımı üzerinde doğrudan etkili olmaktadır. Topoğrafyanın bu belirleyici rolü, Safranbolu'da aşırı yağışlar sırasında yüzey akışının hızlanmasına ve lokal taşkın risklerinin artmasına neden olabilmektedir.

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Safranbolu'nun iklimi, Karadeniz iklimi ile İç Anadolu karasal iklimi arasında bir geçiş özelliği göstermektedir. Yaz ayları nispeten sıcak ve kurak, kış ayları ise soğuk ve zaman zaman kar yağışlı geçmektedir. Türkiye genelinde gözlenen iklim değişikliği eğilimlerine paralel olarak, bölgede ortalama sıcaklıkların arttığı, aşırı sıcak gün sayısının yükseldiği ve yağışların mevsimsel dağılımında düzensizlikler ortaya çıktığı rapor edilmektedir (MGM, 2021; IPCC, 2021). Bu durum, Safranbolu gibi tarihî kentlerde hem yapı ölçeğinde termal stresin artmasına hem de su yönetimi ve altyapı sistemleri üzerinde ek baskılar oluşmasına yol açmaktadır.
Nüfus yapısı ve turizm faaliyetleri, Safranbolu'nun kentsel dinamiklerini şekillendiren temel unsurlar arasında yer almaktadır. Safranbolu'nun daimi nüfusu sınırlı olmakla birlikte, kültürel miras turizmi nedeniyle yılın belirli dönemlerinde kentte yoğun bir ziyaretçi artışı yaşanmaktadır. Bu mevsimsel nüfus artışı; su tüketimi, atık üretimi ve enerji talebinde ani yükselmelere neden olarak kentsel altyapı üzerinde ilave baskı oluşturmaktadır. Literatürde, turizm yoğunluğu yüksek tarihî kentlerde iklim değişikliğinin etkilerinin, bu geçici nüfus artışları nedeniyle daha da şiddetlendiği vurgulanmaktadır (Scott et al., 2016).
Safranbolu'nun tarihî yapı stoku, büyük ölçüde ahşap karkas sistemli, taş temelli ve geleneksel Osmanlı sivil mimarisinin özgün örneklerinden oluşmaktadır. Bu yapıların kalın duvarlar, saçaklar, avlular ve doğal havalandırma gibi pasif iklimlendirme özellikleri, geçmişte iklim koşullarına uyum sağlayan önemli avantajlar sunmuştur. Ancak günümüzde artan sıcaklıklar, nem oranındaki değişimler ve aşırı yağışlar, ahşap ve taş gibi geleneksel yapı malzemelerinde bozulma süreçlerini hızlandırmakta ve yapıların iklim değişikliğine karşı kırılganlığını artırmaktadır.
Safranbolu'nun UNESCO Dünya Mirası Listesi'nde yer alması, kentsel planlama ve müdahale süreçlerine önemli kısıtlar getirmektedir. Dünya Mirası statüsü, tarihî dokunun özgünlüğünü ve bütünlüğünü korumayı temel ilke olarak benimsemekte; bu durum, iklim değişikliğine uyum kapsamında gerçekleştirilecek fiziksel müdahalelerin sınırlı, geri döndürülebilir ve koruma odaklı olmasını zorunlu kılmaktadır (UNESCO, 2011). Dolayısıyla Safranbolu'da iklim değişikliğine uyum, yalnızca teknik bir çevre sorunu değil; aynı zamanda kültürel mirasın korunması, kentsel planlama ve yönetişim süreçlerini birlikte ele almayı gerektiren çok boyutlu bir planlama problemi olarak ortaya çıkmaktadır (Bandarin & van Oers, 2012).

## 3. SAFRANBOLU İÇİN ÖNE ÇIKAN İKLİM RİSKLERİ

### 3.1 Sıcaklık Artışı ve Isı Dalgaları

Safranbolu'nun dar ve yoğun yapılaşmış tarihî merkezi, doğal yüzeylerin azalması ve yapı malzemelerinin ısı tutma kapasitesi nedeniyle Kentsel Isı Adası (KİA) etkisine meyillidir. Küresel sıcaklık artışları ile birleşen KİA etkisi, termal stresi artırarak enerji talebini yükseltir ve kent konforunu olumsuz etkiler (Akbari, 2020). Bu durum, özellikle yaşlı nüfus için ciddi sağlık riskleri oluşturmaktadır. Tahminler, yüzyılın sonuna kadar 7,5°C'ye kadar varan potansiyel ısınmayla birlikte, aşırı sıcaklıklarda önemli bir artışa işaret etmektedir (Gümüş vd., 2024). Safranbolu evlerinin ana yapı malzemeleri olan ahşap karkas ve sıvalı kerpiç/dolgu, yüksek sıcaklık ve termal değişimlere karşı hassastır. Ani ve aşırı sıcaklık dalgaları, ahşapta kuruma, çatlama ve yoğun genleşme/büzülme döngülerine neden olarak yapısal bozulmayı hızlandırır. Bu durum, malzemelerin fiziksel bütünlüğünü tehdit ederek restorasyon maliyetlerini artırmaktadır.

### 3.2 Aşırı Yağış, Nem ve Taşkın Riski

Karabük bölgesinin genel topoğrafik yapısı ve iklim değişikliğinin tetiklediği şiddetli yağış rejimleri, Safranbolu için taşkın ve heyelan riskini önemli ölçüde artırmaktadır. Safranbolu'nun

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tarihî merkezi, derin vadilerin tabanına yerleşmiştir. Bu topoğrafik özellik, şiddetli yağışlarda yüzeysel akışı hızlandırır. Eski ve yetersiz kalmış drenaj sistemlerinin bu yüksek akışa cevap verememesi durumunda, sel ve taşkın olayları kaçınılmaz hale gelmektedir. Dere yatakları yakınındaki tarihî yapılar ve altyapı bu riskten doğrudan etkilenmektedir. Artan nem ve yoğun yağış, tarihî yapı malzemelerinde biyolojik ve kimyasal bozulmaları tetikler. Ahşap elemanlar, yüksek nemin etkisiyle mantar ve böcek zararlarına karşı daha savunmasız hale gelirken, sıva ve taş gibi gözenekli malzemelerde nemlenme ve tuzlanma kaynaklı yüzey dökülmeleri ve erozyon hızlanmaktadır.

### 3.3 Kuraklık ve Su Stresi

Karadeniz Bölgesi genelinde yağış rejimi dengesizlikleri ve artan buharlaşma, Safranbolu'nun yeraltı ve yüzey su kaynakları üzerinde baskı yaratmaktadır. Uzun süreli kuraklık periyotları, su rezervlerinin azalmasına ve kentsel/tarımsal su ihtiyacının karşılanmasında ciddi kısıtlamalara yol açma potansiyeli taşımaktadır. Safranbolu'nun yoğun turistik faaliyetleri, özellikle yüksek sezonda su talebini doğal kaynaklar üzerindeki baskıyı artıracak şekilde yükseltmektedir. Kuraklık dönemlerinde, artan turizm talebiyle birlikte kısıtlı su kaynaklarının yönetimi, yerel yönetimler için önemli bir sorun haline gelmektedir.

### 3.4 Ekosistem ve Peyzaj Riskleri

Yüksek sıcaklıklar ve kuraklık, Safranbolu çevresindeki ormanlık alanlar ve doğal peyzaj üzerinde yangın riskini ve ekosistem stresini artırmaktadır. Yeşil alanların kaybı, KİA etkisinin şiddetlenmesine ve kentin ekolojik dengeleme kapasitesinin düşmesine neden olur. Hızlı iklim değişikliği, bölgedeki bitki ve hayvan türlerinin habitatlarını değiştirmekte ve hassas türlerin hayatta kalma şansını azaltmaktadır. Özellikle yerel ekosistemlere özgü olan türler, artan sıcaklıklar ve değişen nem koşullarına adapte olamayarak biyoçeşitlilik kaybına yol açabilir.

### 3.5. Hava Kirliliği

Safranbolu yakınlarındaki Karabük'te bulunan demir ve çelik sanayisi, Türkiye'nin toplam sera gazı emisyonlarının yaklaşık %7'sine katkıda bulunmaktadır. Hava kalitesi değerlendirmeleri, yüksek düzeyde partikül madde (PM) olduğunu göstermekte olup, halk sağlığını ve turizmi korumak için acil kirlilik azaltma önlemlerinin alınmasını gerektirmektedir (Güllü et al., 2025).

## 4. SAFRANBOLU İÇİN UYUM TEDBİRLERİ

### 4.1. Yapılı Çevreye Yönelik Uyum Tedbirleri

Tarihî kentlerde iklim değişikliğine uyum sürecinde yapılı çevreye yönelik tedbirler, yeni ve sert müdahalelerden ziyade mevcut mimari mirasın iklimle kurduğu geleneksel ilişkinin korunması ve güçlendirilmesi esasına dayanmalıdır. Safranbolu'daki geleneksel konut dokusu, kalın duvarlar, ahşap karkas sistemler, geniş saçaklar, avlular ve doğal havalandırmayı destekleyen mekânsal kurgular aracılığıyla geçmişte yerel iklim koşullarına uyum sağlayan pasif iklimlendirme çözümleri sunmuştur. Literatürde, bu tür geleneksel mimari unsurların, günümüz iklim değişikliği koşulları altında dahi enerji talebini azaltma ve iç mekân termal konforunu iyileştirme potansiyeline sahip olduğu vurgulanmaktadır (Ratti et al., 2003). Bu nedenle Safranbolu'da uyum tedbirlerinin ilk adımı, söz konusu pasif iklim avantajlarının korunması ve işlevsel hâle getirilmesi olmalıdır.

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Artan sıcaklıklar, nem oranındaki dalgalanmalar ve aşırı yağışlar, Safranbolu'daki tarihî yapıların yapı malzemeleri üzerinde doğrudan olumsuz etkilere yol açmaktadır. Özellikle ahşap elemanlarda biyolojik bozulma, taş yüzeylerde tuzlanma ve çatlama, nemin yoğun olduğu alanlarda ise malzeme yorgunluğu ve yüzey kayıpları gözlenmektedir. İklim değişikliğinin bu tür bozulma süreçlerini hızlandırdığı, çok sayıda deneysel ve saha çalışmasıyla ortaya konmuştur (Brimblecombe & Grossi, 2009). Bu bağlamda yapı ölçeğinde alınacak önlemler; nem kontrolünün iyileştirilmesi, doğal havalandırmanın sürekliliğinin sağlanması, çatılarda ve cephelerde suyun yapıdan uzaklaştırılmasına yönelik detay çözümleri ve yapı temellerinde drenaj koşullarının izlenmesi gibi düşük müdahaleli fakat etkili uygulamaları içermelidir. Bu tür önlemler, yapıların iklim değişikliğine karşı dayanıklılığını artırırken, özgün malzeme ve mimari karakterin korunmasına da olanak tanımaktadır (ASHRAE, 2011; Camuffo, 2019).
Safranbolu'nun UNESCO Dünya Mirası statüsü, yapılı çevreye yönelik her türlü uyum müdahalesinin koruma ilkeleriyle uyumlu, sınırlı ve geri döndürülebilir olmasını zorunlu kılmaktadır. UNESCO'nun Historic Urban Landscape yaklaşımı, tarihî kentlerde iklim değişikliğine uyumun, özgün kentsel dokuyu bozan kalıcı müdahaleler yerine; izlenebilir, aşamalı ve gerektiğinde geri alınabilir uygulamalarla gerçekleştirilmesini önermektedir (UNESCO, 2011). Bu çerçevede, Safranbolu'da modern yalıtım malzemeleri, mekanik iklimlendirme sistemleri veya cephe müdahaleleri gibi uygulamalar, ancak görsel bütünlüğü bozmadığı, yapıya zarar vermediği ve geri döndürülebilir olduğu ölçüde değerlendirilebilir. Literatürde, geri döndürülebilirlik ilkesinin, tarihî yapıların iklim değişikliğine uyumunda temel bir planlama aracı olduğu ve uzun vadede koruma–uyum dengesini güçlendirdiği belirtilmektedir (Bandarin & van Oers, 2012; Fatorić & Seekamp, 2017).
Sonuç olarak Safranbolu'da yapılı çevreye yönelik iklim uyum tedbirleri; geleneksel mimarinin pasif iklim potansiyelini koruyan, yapı ölçeğinde ısı ve nem kaynaklı riskleri azaltan ve koruma ilkeleriyle uyumlu geri döndürülebilir müdahalelere dayanan bütüncül bir yaklaşım gerektirmektedir. Bu yaklaşım, tarihî kentlerde iklim değişikliğine uyumun, teknik bir yenileme sürecinden ziyade, kültürel mirasın sürekliliğini esas alan bir dönüşüm süreci olarak ele alınması gerektiğini ortaya koymaktadır.

### 4.2. Su Yönetimi ve Kuraklıkla Mücadele Tedbirleri

İklim değişikliğiyle birlikte yağış rejimlerinde gözlenen düzensizlikler ve artan sıcaklıklar, tarihî kentlerde su kaynakları üzerindeki baskıyı önemli ölçüde artırmaktadır. Özellikle Safranbolu gibi topoğrafik olarak eğimli ve tarihî dokusu yoğun kentlerde, yağmur suyunun hızla yüzey akışına geçmesi hem taşkın riskini artırmakta hem de suyun etkin biçimde değerlendirilmesini engellemektedir. Literatürde, iklim değişikliğine uyum kapsamında yağmur suyunun yerinde yönetimi ve hasadının, tarihî kentler için düşük maliyetli ve etkili bir çözüm sunduğu vurgulanmaktadır (Fletcher et al., 2015). Bu bağlamda Safranbolu'da, avlu sistemleri, bahçeler ve geçirgen yüzeyler aracılığıyla yağmur suyunun toplanması ve depolanmasına yönelik geleneksel uygulamaların yeniden değerlendirilmesi, iklim uyum stratejilerinin temel bileşenlerinden biri olarak ele alınmalıdır.
Su verimliliği uygulamaları, Safranbolu'da kuraklık riskinin azaltılması açısından kritik öneme sahiptir. Artan sıcaklıklar ve yaz aylarında yükselen su talebi, özellikle içme suyu kaynakları üzerinde ciddi baskı oluşturmaktadır. Dünya genelinde yapılan çalışmalar, yapı ölçeğinde su tasarruflu armatürlerin kullanımı, gri suyun yeniden değerlendirilmesi ve kentsel ölçekte su kayıplarının azaltılmasına yönelik altyapı iyileştirmelerinin, su tüketimini önemli ölçüde düşürdüğünü göstermektedir (Gleick, 2014). Ancak tarihî kentlerde bu tür uygulamaların, yapıların özgünlüğünü bozmadan ve geri döndürülebilir biçimde hayata geçirilmesi gerekmektedir. Bu nedenle Safranbolu'da su verimliliği politikaları, teknik çözümler kadar koruma ilkeleriyle uyumlu planlama yaklaşımlarını da içermelidir.

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Turizm faaliyetleri, Safranbolu'nun ekonomik sürdürülebilirliği açısından önemli bir rol oynarken, iklim değişikliği bağlamında su tüketimi üzerinde ek baskı oluşturmaktadır. Literatürde, turizm yoğunluğu yüksek tarihî kentlerde kişi başına düşen su tüketiminin yerleşik nüfusa kıyasla belirgin şekilde daha yüksek olduğu ortaya konmuştur (Gössling et al., 2012; Scott et al., 2016). Bu durum, özellikle yaz aylarında su stresi riskini artırmaktadır. Safranbolu'da turizm kaynaklı su tüketiminin izlenmesi, konaklama tesisleri için su verimliliği standartlarının geliştirilmesi ve farkındalık odaklı uygulamaların teşvik edilmesi, iklim değişikliğine uyum kapsamında öncelikli tedbirler arasında yer almalıdır.

### 4.3. Kentsel Yeşil Alan ve Peyzaj Tedbirleri

Kentsel yeşil alanlar, iklim değişikliğine uyum sürecinde yalnızca estetik unsurlar değil, aynı zamanda kentlerin iklim altyapısının ayrılmaz bir parçası olarak değerlendirilmektedir. Yeşil alanlar; sıcaklıkların düşürülmesi, yağmur suyunun tutulması, hava kalitesinin iyileştirilmesi ve biyolojik çeşitliliğin korunması gibi çok yönlü ekosistem hizmetleri sunmaktadır (Gill et al., 2007; Kabisch et al., 2017). Safranbolu gibi tarihî kentlerde yeşil alanların korunması ve geliştirilmesi, kentsel ısı adası etkisinin azaltılması ve iklim kaynaklı risklerin hafifletilmesi açısından kritik öneme sahiptir.

Yerel ve iklim koşullarına dayanıklı bitki türlerinin kullanımı, kentsel peyzajın iklim değişikliğine uyum kapasitesini artıran temel unsurlardan biridir. Literatürde, yerel bitki türlerinin daha düşük su ihtiyacı, daha yüksek sıcaklık toleransı ve bakım gereksiniminin azlığı nedeniyle iklim uyum stratejilerinde öncelikli olarak tercih edilmesi gerektiği vurgulanmaktadır. Safranbolu'da peyzaj düzenlemelerinde yerel flora ile uyumlu, kuraklığa dayanıklı bitki türlerinin kullanılması, hem su verimliliğini artıracak hem de tarihî peyzaj karakterinin korunmasına katkı sağlayacaktır.

Kentsel ısı adası etkisi, yapı yoğunluğu yüksek ve yeşil alan oranı sınırlı tarihî kentlerde iklim değişikliğinin etkilerini daha da şiddetlendirmektedir. Yeşil çatılar, gölgeleme sağlayan ağaçlandırma uygulamaları ve geçirgen yüzeylerin artırılması gibi doğa temelli çözümler, ısı adası etkisinin azaltılmasında etkili araçlar olarak öne çıkmaktadır (Bowler et al., 2010). Ancak Safranbolu gibi Dünya Mirası alanlarında bu uygulamaların, görsel bütünlüğü bozmayacak ve geri döndürülebilir nitelikte tasarlanması gerekmektedir. Bu bağlamda kentsel yeşil alan ve peyzaj tedbirleri, iklim değişikliğine uyum ile kültürel mirasın korunmasını birlikte ele alan bütüncül bir planlama yaklaşımını zorunlu kılmaktadır.

### 4.4. Afet ve Risk Yönetimine Yönelik Tedbirler

Safranbolu gibi tarihî kentlerde iklim değişikliğine uyum, yalnızca uzun vadeli çevresel iyileştirmelerle sınırlı değildir; aynı zamanda taşkın, sıcak dalgası ve kuraklık gibi iklim kaynaklı afetlerin olasılık ve etkilerini azaltmaya dönük sistematik bir risk yönetimi yaklaşımını gerektirir. Bu çerçevede ilk adım, kentin topoğrafyası, drenaj ağı, yapı yoğunluğu, hassas miras varlıkları ve kritik altyapı bileşenlerini birlikte değerlendiren iklim risk haritalarının oluşturulmasıdır; çünkü risk haritalama, tehlike–maruziyet–kırılganlık bileşenlerini bütünleştirerek öncelikli müdahale alanlarının belirlenmesini sağlar (IPCC, 2022; UNDRR, 2015). İkinci adım, Safranbolu'nun yerel koşullarına uygun taşkın, sıcak dalgası ve kuraklık senaryolarının geliştirilmesidir; senaryoların yalnızca meteorolojik değişkenleri değil, aynı zamanda turizm mevsimselliğiyle artan nüfus baskısı ve su talebi gibi sosyo-ekonomik etkenleri de içermesi, risk yönetiminin gerçekçi ve uygulanabilir olmasını güçlendirir (IPCC, 2022; Scott et al., 2016). Üçüncü adım ise erken uyarı ve kriz yönetimi kapasitesinin kurumsallaştırılmasıdır: meteorolojik uyarıların yerel yönetim operasyonlarına bağlanması, sıcak dalgası eylem planları, geçici serinleme alanları, taşkın anında kritik noktalarda hızlı

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müdahale protokolleri ve tarihî yapı stoğu için olay sonrası hızlı hasar değerlendirme prosedürleri bu bütünün temel parçalarıdır (WMO, 2015; WHO, 2008). Dünya Mirası alanları bağlamında ayrıca, afet risk yönetiminin koruma yaklaşımıyla entegre edilmesi ve müdahalelerin "özgünlük–bütünlük–geri döndürülebilirlik" ilkeleriyle uyumlu kurgulanması önerilmektedir (UNESCO/ICCROM/ICOMOS/IUCN, 2010; UNESCO, 2011).

### 4.5. Ölçülebilirlik ve Veri Temelli Yönetim

İklim uyumunun etkili biçimde yönetilebilmesi için Safranbolu'da ölçülebilirlik ilkesi temel alınmalı; karar alma süreçleri yalnızca genel hedeflere değil, düzenli izlenen göstergelere dayandırılmalıdır. Bu kapsamda kent ölçeğinde karbon, su ve enerji ayak izi envanterlerinin oluşturulması, hem iklim değişikliğiyle mücadele (azaltım) hem de uyum önceliklerinin doğru belirlenmesi açısından kritik bir başlangıçtır; özellikle kent emisyon envanteri için uluslararası kabul gören GHG Protocol for Cities yaklaşımı, yerel yönetimlerin karşılaştırılabilir ve denetlenebilir veri üretmesine imkân verir (WRI et al., 2014). Su ayak izi ve su verimliliği tarafında ISO çerçeveleri, kuraklık riskinin arttığı dönemlerde önceliklendirme ve performans takibine yardımcı olur. Enerji performansı için ise ISO 50001 gibi sistematik yaklaşımlar, kamu binaları ve turizm tesislerinde sürekli iyileştirme döngüsü kurulmasını kolaylaştırır. Ölçülebilirlik yaklaşımının sahadaki karşılığı, tarihî kent merkezinde mikroiklim izleme sistemlerinin kurulmasıdır; sıcaklık-nem sensörleri, yüzey sıcaklığı izleme (uygun noktalarda), yağış şiddeti ve kısa süreli taşkın gözlemi gibi veri akışları, risk haritalarının güncellenmesini ve bakım/onarım önceliklerinin kanıta dayalı biçimde belirlenmesini sağlar (Camuffo, 2019; WMO, 2015). Bu altyapı kurulduğunda, karar alma süreçleri "iyi niyetli ama ölçümsüz" yaklaşımdan çıkar; hangi mahallede ısı adası baskısının arttığı, hangi yapı tipinde nem kaynaklı bozulmanın hızlandığı veya turizm sezonunda su talebinin hangi eşikleri aştığı gibi sorular, düzenli raporlama ve hedef güncellemesiyle yönetilebilir hâle gelir (Kitchin, 2014).

### 4.6.Yönetişim, Politika ve Kurumsal Tedbirler

Safranbolu'da iklim uyum tedbirlerinin kalıcı ve uygulanabilir olması, teknik çözümler kadar yönetişim ve kurumsal kapasiteye bağlıdır. Yerel yönetimler, risk azaltım ve uyum eylemlerinin koordinasyonunda "ana taşıyıcı" aktör olarak; planlama, altyapı yatırımları, bakım-onarım programları, veri toplama-raporlama ve acil durum yönetimini tek bir iklim dayanıklılığı çerçevesinde birleştirmelidir (UNDRR, 2015; IPCC, 2022). Bununla birlikte, tarihî kentlerde başarı, yalnız belediye içi süreçlerle sınırlı kalmaz; paydaş katılımı belirleyicidir. Yerel halkın günlük pratikleri, esnafın işletme kararları ve turizm sektörünün su-enerji tüketim davranışları, iklim uyumunun sahadaki etkisini doğrudan şekillendirir; bu nedenle bilgilendirme-teşvik mekanizmaları, gönüllü taahhüt programları ve sezonluk yoğunluk yönetimi gibi araçlar, uyumun sosyal kabulünü ve sürdürülebilirliğini artırır (Ostrom, 2010; Scott et al., 2016). Son olarak Safranbolu'nun Dünya Mirası statüsü nedeniyle, koruma politikaları ile iklim politikalarının entegrasyonu ayrı bir kurumsal gerekliliktir: koruma amaçlı imar planları, bakım protokolleri ve turizm yönetimi uygulamaları; iklim risk haritaları, envanter verileri ve afet senaryolarıyla birlikte ele alınmalı; müdahaleler "minimum müdahale, geri döndürülebilirlik ve peyzaj bütünlüğü" ilkelerini korurken aynı anda dayanıklılığı artırmalıdır (UNESCO, 2011; Bandarin & van Oers, 2012). Bu entegrasyonun somut çıktısı, Safranbolu için ölçülebilir göstergelere dayanan, paydaşlı bir izleme mekanizması bulunan ve düzenli güncellenen bir İklim Uyum ve Dayanıklılık Eylem Planının kurumsallaştırılmasıdır.

## 5. TARTIŞMA

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Bu çalışmada Safranbolu için önerilen iklim değişikliğine uyum tedbirleri, tarihî kentlerde koruma–uyum dengesini gözeten, düşük müdahaleli ve aşamalı bir yaklaşım üzerine kurulmuştur. Önerilen tedbirlerin uygulanabilirliği değerlendirildiğinde, özellikle pasif mimari özelliklerin korunması, yağmur suyu yönetimi, kentsel yeşil alanların iklim altyapısı olarak güçlendirilmesi ve veri temelli izleme sistemlerinin kurulması gibi uygulamaların, yüksek maliyetli ve geri döndürülemez yatırımlara kıyasla daha gerçekçi ve kısa vadede hayata geçirilebilir olduğu görülmektedir. Literatürde, tarihî kentlerde iklim uyumunun başarısının, büyük ölçekli mühendislik çözümlerinden ziyade yerel bağlama duyarlı, küçük ölçekli ve birbiriyle uyumlu müdahalelere dayandığı vurgulanmaktadır (Bandarin & van Oers, 2012; IPCC, 2022). Bu bağlamda Safranbolu için önerilen tedbirler, yerel yönetim kapasitesi ve mevcut koruma rejimi dikkate alındığında uygulanabilir bir çerçeve sunmaktadır.

Önerilen yaklaşımın tarihî kentler için genellenebilirliği, çalışmanın önemli tartışma noktalarından biridir. Safranbolu, özgün topoğrafyası, geleneksel yapı stoku ve yoğun turizm baskısı ile kendine has özellikler taşımakla birlikte; iklim değişikliğine karşı karşılaşılan temel riskler (ısı dalgaları, su stresi, aşırı yağışlar) ve uyumda karşılaşılan kısıtlar, birçok tarihî kent için ortak niteliktedir. Bu nedenle çalışmada geliştirilen risk temelli, ölçülebilirlik odaklı ve yönetişimle entegre uyum çerçevesi, benzer nitelikteki tarihî kentlere uyarlanabilir bir model sunmaktadır. Nitekim UNESCO'nun Historic Urban Landscape yaklaşımı da, tarihî kentlerde iklim değişikliğine uyumun yerel bağlama göre uyarlanabilir ancak kavramsal olarak ortak ilkeler üzerine inşa edilmesi gerektiğini ortaya koymaktadır (UNESCO, 2011).

Bununla birlikte, uygulama sürecinde çeşitli sınırlılıklar ve zorluklarla karşılaşılması kaçınılmazdır. İlk olarak, veri eksikliği ve süreklilik sorunu, ölçülebilirlik temelli yönetim yaklaşımlarının önünde önemli bir engel oluşturmaktadır. Mikroiklim izleme, ayak izi envanterleri ve risk haritalarının oluşturulması, teknik kapasite ve kurumsal süreklilik gerektirmektedir (Kitchin, 2014). İkinci olarak, koruma mevzuatı ile iklim uyum gereksinimleri arasındaki potansiyel çatışmalar, özellikle yapı ölçeğinde alınacak önlemlerde karar süreçlerini yavaşlatabilmektedir. Üçüncü olarak, turizm sektörü ve yerel kullanıcı davranışlarının değişimi zaman almakta; bu durum, uyum tedbirlerinin kısa vadeli etkisini sınırlayabilmektedir (Scott et al., 2016). Bu sınırlılıklar, Safranbolu örneğinde iklim uyumunun yalnızca teknik değil, aynı zamanda kurumsal ve toplumsal bir dönüşüm süreci olduğunu göstermektedir.

## 6. SONUÇ VE ÖNERİLER

Bu çalışma, Safranbolu örneğinde tarihî kentlerin iklim değişikliğine uyum sürecinde alması gereken tedbirleri, yapılı çevre, su yönetimi, kentsel yeşil alanlar, afet ve risk yönetimi, ölçülebilirlik ve yönetişim başlıkları altında bütüncül bir çerçevede ele almıştır. Bulgular, Safranbolu'nun geleneksel mimari ve kentsel peyzaj özellikleri sayesinde belirli bir uyum potansiyeline sahip olduğunu; ancak bu potansiyelin, iklim değişikliğinin artan etkileri karşısında kendiliğinden yeterli olmayacağını ortaya koymaktadır. Özellikle veri temelli izleme mekanizmalarının eksikliği, su ve turizm kaynaklı baskıların artışı ve iklim risklerinin sistematik olarak yönetilmemesi, kentin kırılganlığını artıran temel unsurlar olarak öne çıkmaktadır.

Safranbolu için öncelikli eylem alanları üç başlıkta özetlenebilir;

1. Geleneksel yapıların pasif iklim avantajlarını koruyan ve güçlendiren yapı ölçeği tedbirlerinin yaygınlaştırılmasıdır.
2. Yağmur suyu yönetimi, su verimliliği ve kentsel yeşil alanların iklim altyapısı olarak ele alındığı doğa temelli çözümlerin, koruma ilkeleriyle uyumlu biçimde hayata geçirilmesidir.
3. Karbon, su ve enerji ayak izi envanterlerine dayanan, mikroiklim izleme ile desteklenen ve paydaş katılımını içeren veri temelli bir yönetişim yapısının kurumsallaştırılmasıdır.

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Bu alanlarda atılacak adımlar, Safranbolu'nun iklim değişikliğine karşı dayanıklılığını artırırken, kültürel mirasın korunmasına da katkı sağlayacaktır.
Gelecek çalışmalar açısından, Safranbolu'da mahalle ölçeğinde mikroiklim analizleri, yapı tiplerine göre kırılganlık değerlendirmeleri ve turizm sezonlarına özgü su–enerji tüketim profillerinin detaylandırılması önemli araştırma alanları olarak öne çıkmaktadır. Ayrıca önerilen uyum tedbirlerinin pilot uygulamalar üzerinden izlenmesi ve uzun dönemli performans değerlendirmelerinin yapılması, tarihî kentler için geliştirilecek iklim uyum politikalarının etkinliğini artıracaktır. Bu yönüyle çalışma, Safranbolu özelinde somut öneriler sunmakla birlikte, tarihî kentlerin iklim değişikliğine uyumuna yönelik daha geniş ölçekli karşılaştırmalı araştırmalar için de bir başlangıç noktası niteliği taşımaktadır.

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8. ULUSLARARASI

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**“COMPLIANCE WITH PUBLICATION ETHICS IS THE SOLE RESPONSIBILITY OF THE AUTHORS; ACCORDINGLY, THEY BEAR BOTH ETHICAL AND LEGAL ACCOUNTABILITY”**

# YEMEN'DEKİ GELENEKSEL SAN'A EVLERİNDE CEPHE ESTETİĞİ VE BİÇİMSEL ÖZELLİKLER[103]

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## ÖZET
Yemen'in başkenti San'a'da UNESCO kültür mirası listesinde yer alan geleneksel konutlar, özgün mimari karakteri ve estetik değerleriyle dünya mirasları içinde özel bir yere sahiptir. İşlevsellik ve estetiğin kusursuz bir bütünlük içinde sunulduğu cephe tasarımları, malzeme kullanımı ve mimari bileşenler bu çalışmanın temel odağını oluşturmaktadır. San'a evlerinin cephe kurgusunda alt katlarda kullanılan taş malzemenin sağlamlığı ile üst katlardaki tuğla işçiliğinin hafifliği arasındaki geçiş dikkat çekicidir. Bu geçiş, yapının görsel dengesini sağlayan temel unsurlardan biridir. Malzeme çeşitliliği, cephelerde hem dokusal bir zıtlık hem de bütünde görsel bir uyum yaratmaktadır. Cephedeki doluluk-boşluk oranları ve insan ölçeği ile kurulan ilişki, ışık ve gölgenin bir tasarım aracı olarak kullanımına dair başarılı bir örnektir. İklime dayalı ve kültürel ihtiyaçlara yanıt veren işlevsel çözümler üretilmiş olması, San'a geleneksel evlerini çalışmaya değer kılmaktadır. İç mekana renkli ışık hüzmeleri taşıyan kamariyeler, mahremiyet ve hava sirkülasyonu sağlayan müşebbekler gibi detaylar, sadece dekoratif amaçlı kullanılmayan, yöreye özgü karakteristik yapı elemanlarıdır. Konut mimarisi olarak, binanın kullanım amacının dışarıdan da okunabildiği bu evlerde; cephe estetiği, malzeme dili ve yapısal uyumu bir arada bulundurmaktadır. San'a konutlarının sadelik ilkesiyle biçimlenen ancak detaylarda zenginleşen mimari dilinin, bir bölgenin geleneksel evlerinin inşa hikayesini anlatması, cephe kurgusuyla görsel algısını yansıtması açısından bu çalışmada yer bulması amaçlanmıştır.
**Anahtar Kelimeler:** Yemen, San'a, geleneksel konut, cephe tasarımı, iklime dayalı tasarım.

# FACADE AESTHETICS AND FORMAL CHARACTERISTICS OF TRADITIONAL SAN'A HOUSES IN YEMEN

## ABSTRACT
In Sana'a, the capital of Yemen, traditional houses, listed as UNESCO World Heritage sites, hold a special place among world heritage sites due to their unique architectural character and aesthetic value. The facade designs, material usage, and architectural components, where functionality and aesthetics are presented in perfect harmony, form the main focus of this study. The transition between the solidity of the stone material used on the lower floors and the lightness of the brickwork on the upper floors is striking in the facade design of Sana'a houses. This transition is one of the fundamental elements that ensures the visual balance of the

[103] Bu çalışma Karabük Üniversitesi, Safranbolu Başak Cengiz Mimarlık Fakültesi, Mimarlık Bölümü'nde gerçekleştirilmiş uluslararası öğrenciler için ülkelerindeki geleneksel konutların tanıtıldığı bir çalışmadan üretilmiştir. Katkıları için öğrencimiz Ali Hasan Ali Taheri'ye teşekkür ederiz.

structure. The variety of materials creates both textural contrast and overall visual harmony on the facades. The ratio of solids and voids on the facades and the relationship established with the human scale are successful examples of the use of light and shadow as a design tool. The fact that functional solutions have been produced that respond to climate-based and cultural needs makes Sana'a's traditional houses worthy of study. Details such as gazebos that bring colorful light beams into the interior and porches that provide privacy and air circulation are not merely decorative but are characteristic architectural elements unique to the region. In these houses, where the intended use of the building is discernible from the outside, as residential architecture, facade aesthetics, material language, and structural harmony are combined. This study aims to highlight the architectural language of San'a houses, shaped by the principle of simplicity but enriched in detail, in order to tell the story of the construction of traditional houses in a region and to reflect its visual perception through its facade design.
**Keywords:** Yemen, San'a, traditional housing, facade design, climate-based design.

## 1. GİRİŞ

Kule evler, işlevsel olarak barınmanın yanında savunma amacıyla inşa edilmiş, dikey mimarisiyle öne çıkan konut tipolojisidir. Bu yapılar, dış tehditlerin yoğun olduğu dönemlerde ailelerin güvenliğini sağlamak amacıyla dünyanın pek çok coğrafyasında birbirinden bağımsız ancak benzer prensiplerle gelişmiştir. Kule evlerin kökeni Antik Çağ'a kadar uzanmaktadır. Feodal düzende güçlü ailelerin kendi topraklarını ve soylarını koruma ihtiyacı bu yapıların yaygınlaşmasına neden olmuştur. Zamanla savunma ihtiyacı azalsa bile, kulenin yüksekliği ailenin gücü, zenginliği ve toplumsal hiyerarşideki yeriyle doğru orantılı kabul edilmiştir.

Kule evlerin tasarımı, içeridekileri koruma ve dışarıdakileri uzak tutma felsefesi üzerine kuruludur. Alan darlığı veya stratejik avantaj sağlamak için evler yukarıya doğru büyümektedir. Zemin katlar genellikle penceresiz olup; depo, kiler veya hayvan barınağı olarak kullanılmaktadır. Mutfak ve günlük yaşam alanları orta katlarda yer alırken, üst katlar yatak odaları ve misafir kabul odalarına (başodalar) ayrılmıştır.

Kule evlerde duvarlar oldukça kalındır. Üst katlara çıkıldıkça duvar kalınlıkları azalmaktadır. Buna karşılık pencere düzeni alt katlarda dar mazgal delikleri şeklindeyken, üst katlarda genişlemektedir. Giriş kapıları genellikle yüksekte bulunmakta ve geri çekilebilir merdivenlerle erişim sağlanmaktadır.

Kule ev tipolojisi örneklerinden biri olan geleneksel San’a evleri, Yemen’in kültürel ve tarihi kimliğini yansıtan, estetik ve işlevselliği bütünsel bir şekilde bir araya getiren benzersiz sivil mimarlık örneği yapılar arasındadır. Bu evlerin mimari özellikleri, kullanılan malzemelerden cephe düzenlemelerine kadar belirli bir uyum ve mantık çerçevesinde şekillenmiştir. UNESCO Dünya Miras Listesi’nde de yer alan bu evler, tehlike altındaki kültürel miras kategorisinde yer almaktadır.

Geleneksel mimari, halkların kültürel ve tarihi kimliğinin ayrılmaz bir parçasıdır; zanaat ve sanattaki detaylarında geçmişin özgünlüğünü ve günümüzün ihtişamını yansıtmaktadır. San’a’daki konutların cepheleri de bir hikaye anlatımı gibi şekillendirilmiştir. Cephe tasarımında kullanılan bileşenler, binanın inşa hikayesini yansıtmakta ve yapısını açıklamaktadır. Mimari ve dekoratif cephe elemanları aracılığıyla, binanın her bölümünün işlevi anlaşılabilmektedir (Tahir, 2002). Bu bağlamda San’a geleneksel konut mimarisi, şehrin ana mimari ögesi ve silüeti olarak kabul edilmektedir.

## 2. MİMARİ TASARIM İLKELERİ VE GÖRSEL ANALİZ

Mimari tasarım ilkeleri de tasarımın beş temel ilkesi olan oran, denge, ritim, bütünlük ve denge kavramlarıyla açıklanabilmektedir. İnsanın ve çevrenin ihtiyaçlarına cevap verme misyonu olan mimar, mekan ve estetik ilişkisinde yapılar tasarlamaktadır. Bu çalışmada sadece bir kabuk olmanın dışında, şehrin imajı haline gelen mimari cepheler üzerine bir değerlendirme yapılmıştır. Bu kapsamda ele alınan Yemen'deki San'a geleneksel evlerinin cephelerindeki biçimsel özellikler irdelenecektir.

Mekânsal düzenin dışarıdan okunabildiği yapılar başarılı ve dengeli bulunmaktadır. Cephe tasarımında simetri tercih edildiğinde; düzen algısının ağır bastığı ve görsel yoğunluğun az olduğu tasarımla karşılaşılmaktadır (Malewczyk vd., 2024). Cephede çeşitlilik tercih edildiğinde; görsel zenginlik oluşmakta, ilgi çekici ve özgün tasarımlar gerçekleştirilmektedir (Mortazavi vd., 2024). Tarihi ve modern örnekler, cephenin yalnızca bir çeper olmadığını; malzemesiyle ve doluluk-boşluk oranlarıyla, estetik bir tasarım ürünü olarak, yapıya yaklaşımdaki ilk algı etkeni olduğunu göstermektedir (Wu, 2024).

## 3. GELENEKSEL SAN'A EVLERİ

Yemen, kule ev mimarisinin dünyadaki en özgün ve görkemli örneklerine ev sahipliği yapmaktadır. "Dünyanın ilk gökdelenleri" olarak anılan bu yapılar, Yemen'in coğrafyasına ve sosyal yapısına mükemmel bir uyum sağlamıştır. San'a kule evlerinde katlar, toplumsal yaşamın ve mahremiyetin bir yansımasıdır.

Girişin sağlandığı zemin katta depolar ve ahırlar bulunmaktadır. 1. ve 2. katlarda mutfak ve servis birimleri yer alırken, orta katlar mahremiyetin en yüksek olduğu ve günlük yaşam alanları olan mekanları içermektedir. Bu kat aileye ve kadınlara ayrılmıştır. Üst katlarda misafirlerin ve erkeklerin bir araya geldiği, 'diwan' isimli salon; en üst katta ise şehrin en güzel manzarasına hakim, dinlenme ve sosyal etkileşim işlevini gerçekleştiren 'mafraj' isimli mekanlar yer almaktadır (Barlak, 2017). Birimler arasındaki bu ilişkiler, San'a'daki mimari kültürün derinliğini yansıtmaktadır. Çünkü bunlar sadece yapılar değil, aynı zamanda Yemen kültürel kimliğini ifade eden unsurlardır. Tarihsel ve estetik değer katmanın yanı sıra, güzellik ile işlevselliği bütünsel bir şekilde bir araya getirmektedirler (Şekil 1).



**Şekil 1.** Yemen geleneksel San'a evlerinin kesitleri.

San'a evlerindeki cephelerde oranlara büyük önem verilmiştir. Kullanılan ögeler dengeli ilişkiler sağlamakta ve çoğu ögede altın orana yakın oranlar gerçekleştirilmiştir. Ögelerin birbirleriyle etkileşimi de görsel açıdan uyumlu ve dikkat çekicidir. Yapıların inşasında mekanların ve cephe tasarımında süslemelerin planlanmasında, insan ölçeğinin esas alındığı

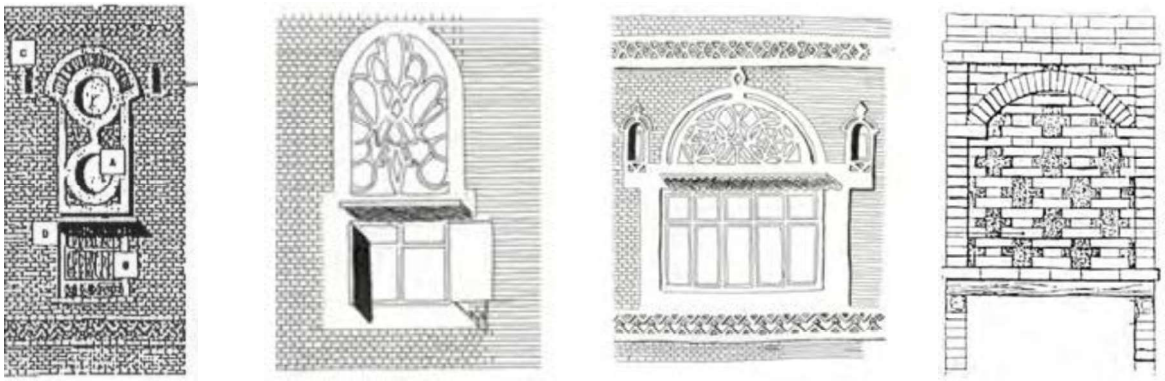
söylenebilmektedir. Cephelerdeki unsurlar aşağıdaki şekilde alt başlıklar halinde incelenmiştir (Muin Abdu, 2002):

Giriş Kapısı: Genişliği 1.00-1.40 ve yüksekliği 1.60-1.80 arasında değişen açıklıktır. Kapının üst kısmında ışık ve hava girmesi için düzenlenmiş bir pencere açıklığı bulunmaktadır. Bu pencere ve kapı bir bütün olarak yarım daire şeklinde kemerle çerçeve içine alınmıştır. Giriş kapısı, tanb ağacından yapılmaktadır. Zeminden yükseltilerek, basamakla yapıya giriş sağlanmaktadır (Şekil 2).



**Şekil 2.** Giriş kapısı örneği.

Pencereler: Kule evlerde pencere tipolojisi her katta farklı olacak şekilde kurgulanmıştır (Şekil 3). Zemin katlarda dar, üst katlarda geniş açıklıklara rastlanmaktadır. Pencerelerin genişliği kademeli olarak 80 cm'den 160 cm'e kadar genişlemektedir. Pencerelerin üzerinde, 'kamariye' adı verilen beyaz mermerden yapılmış kemerler bulunmaktadır (Şekil 3b ve 3c). Katlar değiştikçe kamariye özellikleri de değişmektedir. Pencerelerin üzerleri kemerlerle geçilmektedir. Kemerler geometrik, bitkisel ya da hayvansal benzeri şekillerle ve bazen de Arapça yazılarla süslenmiş olarak karşımıza çıkmaktadır. Kimi örneklerde boşaltmalar yapılıp renkli camlarla kaplandığı da görülmektedir. Ayrıca önceleri düşmanları izlemek ve gözlemlemek için ortaya çıkan, ancak sonradan konutlarda havalandırma ve kapıdaki ziyaretçileri görmek için kullanılmaya başlanan gözetleme pencereleri de bulunmaktadır (Şekil 3d). Bu pencereler, duvardan 30 cm çıkıntı yapmaktadır.



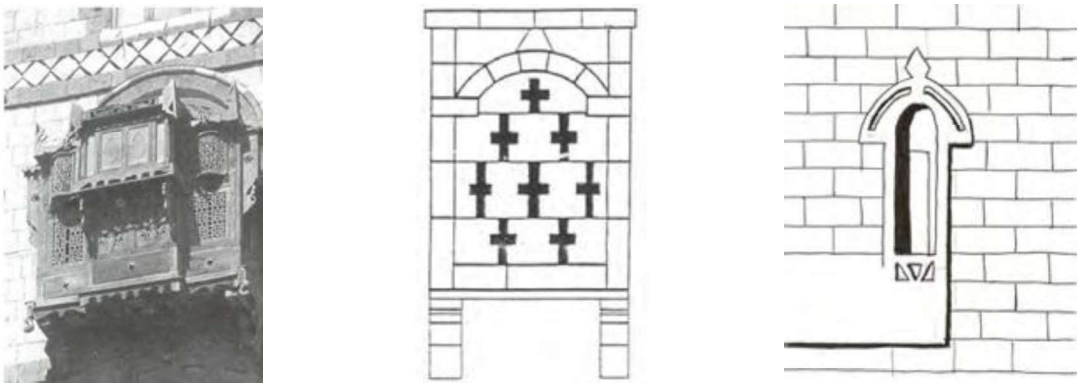
(a) (b) (c) (d)

**Şekil 3.** Pencere örnekleri.

Müşebbek (Meşrabiye): Duvarın dışına çıkan bir açıklıktır ve genellikle ahşaptan yapılmaktadır. Ahşap konsollar veya kademeli uzun taş plakalar ya da kademeli tuğlalar üzerine oturmaktadır. Çıkıntı yaptığı üç yüzeyinde de küçük delikler bulunmakta ve bu delikler havalandırma ve kadınlara mahremiyet sağlamak amacıyla kullanılmaktadır (Şekil 4a).

Su Soğutucusu: Yaklaşık 30-40 cm duvarın dışına çıkan, genişliği 50-70 cm ve yüksekliği 80-100 cm arasında değişen bir açıklıktır. Duvarın yapı malzemesiyle aynı malzemeden yapılmakta ve ahşap destekler veya aynı malzemeden yapılan kademeler üzerine oturtulmaktadır. Bu elemanın ön yüzünde ve yanlarında hava akışını sağlamak için küçük delikler bulunmakta; işlevi yiyecekleri, etleri ve suyu muhafaza etmek ve soğutmaktır. Bu nedenle, hakim rüzgar hareketine maruz kalan cepheye yerleştirilmektedir (Şekil 4b).

Şakos: Pencerelerin üst seviyesinde, ahşap rafların üzerinde ve pencere kemerinin iki yanında çift olarak yer alan küçük bir açıklıktır. Yüksek seviyede yerleştirilerek, boşluktaki havayı yenilemek amacıyla uygulanmaktadır (Şekil 4c).



(a) (b) (c)

**Şekil 4.** Müşebbek, su soğutucusu ve şakos.

## 4. SONUÇ

Yemen'in başkenti San'a'da yer alan geleneksel kule evler hem savunma hem de barınma ihtiyacını dikey mimariyle çözen, estetik ve işlevselliğin bütünleştiği benzersiz bir yapı tipolojisidir. Bu çalışmada incelenen San'a evleri, UNESCO Dünya Miras Listesi'nde yer almalarını sağlayan malzeme ve cephe dengesi, iklimsel ve kültürel çözümler, sosyal hiyerarşi ve mekan kullanımı, tarihsel sürdürülebilirlik gibi dört özellikle öne çıkmaktadır.

Cephelerde yer alan kamariye, müşebbek, şakos ve su soğutucusu gibi bileşenlerin yalnızca dekoratif unsur olmadığı anlaşılmaktadır. Bu elemanlar, iç mekâna renkli ışık hüzmeleri taşımaktan doğal hava sirkülasyonuna, mahremiyetin korunmasından gıdaların soğutulmasına kadar geniş bir işlevsel yelpazeye hizmet etmektedir. Doluluk-boşluk oranlarıyla da cepheye ahenk katmaktadırlar. San'a evleri, kalın duvarların sağladığı ısıl kütle, doğal havalandırmaya imkan tanıyan "baca etkisi" ve yerel malzeme kullanımıyla modern "pasif ev" prensiplerinin tarihsel bir öncüsü sayılabilmektedir.

Sonuç olarak, San'a'nın geleneksel konut mimarisi, insan ölçeğini esas alan oranları ve zengin detaylarıyla dünya mimarlık mirasının en değerli parçalarından biridir. Ancak bu eşsiz miras, günümüzde devam eden iç savaş ve bakımsızlık nedeniyle ciddi bir yok olma tehdidi altındadır. Bu yapıların korunması, sadece bir mimari üslubun değil, bir bölgenin kültürel kimliğinin ve inşa hikâyesinin geleceğe aktarılması açısından hayati önem taşımaktadır.

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Dr. Nilgün ÖZPOZAN, Erciyes Üniversitesi
Dr. Çolpon TOKTOSUNOVA, Kırgız Ekonomi Üniversitesi
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Dr. Bhakta Bandhu Dash, ASBM Üniversitesi
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Dr. Hakan EYGÜ, Atatürk Üniversitesi
Dr . Faruk DÜNDAR, GLASGOW Üniversitesi
Dr. Rui Alberto da Silva Martins Isidoro, Beja Politeknik Üniversitesi, Portekiz

# 04.07.2025 / 21:00-22:00

***10 minutes for each presentation***

| MODERATOR: Assoc. Prof. Dr. Ceren ORAK | | |
|---|---|---|
| **AUTHORS** | **UNIVERSITY** | **PAPER TITLE** |
| Assoc. Prof. Dr. Ceren ORAK | *Sivas University of Science and Technology, Türkiye* | LaTiO 3 PHOTOCATALYST FOR EFFICIENT WASTEWATER TREATMENT |
| Asst. Prof. Dr. Semra Zeren<br>Asst. Prof. Dr. Fatma Almaz | *Sivas Bilim ve Teknoloji University, Türkiye*<br>*Batman University, Türkiye* | INVARIANT AND ANTI-INVARIANT TOTALLY UMBILICAL SUBMANIFOLDS IN ALMOST POTENT MANIFOLDS |
| Mücahit ÇALIŞAN<br>Nevzat OLGUN<br>Gürkan GÜRGÖZE<br>Ferdi DOĞAN<br>Mehmet NERGİZ<br>İbrahim TÜRKOĞLU | *Bingöl University, Türkiye*<br>*Afyon Kocatepe University, Türkiye*<br>*Elazığ MEB, Türkiye*<br>*Adıyaman University, Türkiye*<br>*Dicle University, Türkiye*<br>*Fırat University, Türkiye* | OBJECT CLASSIFICATION IN NON-LINE-OF-SIGHT ENVIRONMENTS USING SYNCHRONOUS ACOUSTIC SIGNALS |
| *Nevzat OLGUN*<br>*Mücahit ÇALIŞAN*<br>*Gürkan GÜRGÖZE*<br>*Ferdi DOĞAN*<br>*Mehmet NERGİZ*<br>*İbrahim TÜRKOĞLU* | *Afyon Kocatepe University, Türkiye*<br>*Bingöl University, Türkiye*<br>*Elazığ MEB, Türkiye*<br>*Adıyaman University, Türkiye*<br>*Dicle University, Türkiye*<br>*Fırat University, Türkiye* | DETECTION OF THE HUMAN PRESENCE IN NON-LINE-OF-SIGHT ENVIRONMENTS WITH SIMULTANEOUS SOUND SIGNALS |
| *Asst. Prof. Dr. Fatma Almaz*<br>*Asst. Prof. Dr. Semra Zeren* | *Batman University, Türkiye*<br>*Sivas Bilim ve Teknoloji University, Türkiye* | THE ELECTROMAGNETIC VECTOR FIELDS ON SPECIAL SURFACES IN 4D SEMI-EUCLIDEAN SPACE |
| ***The question-and-answer session of the panel***<br>***30 minutes*** | | |

# 04.07.2025 / 22:00-23:45

***10 minutes for each presentation***

| MODERATOR: Prof. Dr. Yusuf SERT | | |
|---|---|---|
| **AUTHORS** | **UNIVERSITY** | **PAPER TITLE** |
| Lect. Semahat Merve TOP | *Karabük University, Türkiye* | EVALUATING BIOPHILIC DESIGN IN THE URBAN CONTEXT: A BIBLIOMETRIC ANALYSIS |
| Abdullah GÖKTAŞ<br>Sultan GÖKTAŞ | *Harran University, Türkiye* | IMPACT OF LA SUBSTITUTION ON THE STRUCTURAL AND PHOTOCATALYTIC PROPERTIES OF ZNS THIN FILMS |
| Prof. Dr. Yusuf SERT | *Yozgat Bozok University, Türkiye* | IN-SILICO ANALYSIS OF 5-CHLOROTHIOPHENE-2-SULFONAMIDE |
| Assoc. Prof. Tansu USKUTOĞLU<br>Prof. Dr. Belgin COŞGE ŞENKAL | *Pamukkale University, Türkiye*<br>*Yozgat Bozok University, Türkiye* | ROLE AND IMPORTANCE OF ENVIRONMENTAL FACTORS IN CULTIVATION OF MEDICINAL PLANTS |
| *Prof. Dr. Belgin COŞGE ŞENKAL* | *Yozgat Bozok University, Türkiye* | EVALUATION OF GERMINATION AND SEEDLING DEVELOPMENT PERFORMANCE OF SALVIA SCLAREA L. DEVELOPED BY USING EMS IN M3 GENERATION |
| *Prof. Dr. Yusuf SERT* | *Yozgat Bozok University, Türkiye* | DFT ANALYSIS OF 5-(THIOPHENE-2-SULFONYL) THIOPHENE-2-SULFONAMIDE |
| *Sultan GÖKTAŞ*<br>*Abdullah GÖKTAŞ* | *Harran University, Türkiye* | PHOTODEGRATION OF METHYLENE ORANGE VIA CUO BASED NANOSTRUCTURES: A MINI REVIEW |
| *Lect. Semahat Merve TOP* | *Karabük University, Türkiye* | SECTORAL APPLICATIONS OF ADDITIVE MANUFACTURING TECHNOLOGY AND ITS POTENTIAL IN THE CONSTRUCTION INDUSTRY |
| ***The question-and-answer session of the panel***<br>***30 minutes*** | | |

# KATMANLI ÜRETİM TEKNOLOJİSİNİN SEKTÖREL UYGULAMALARI VE İNŞAAT ALANINDAKİ POTANSİYELİ

**Semahat Merve TOP**

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## ÖZET

Katmanlı üretim, dijitalleşme süreci ve Endüstri 4.0'ın etkisiyle geleneksel üretim yöntemlerine alternatif olarak gelişen yenilikçi bir imalat teknolojisidir. 1980'li yıllarda ortaya çıkan bu yöntem, üç boyutlu (3B) model verilerine dayalı olarak malzemenin katman katman biriktirilmesi esasına dayanmakta ve tasarımdan üretime kadar dijital bir üretim süreci sunmaktadır. Başta tıp, havacılık, otomotiv ve uzay sanayii olmak üzere birçok sektörde yaygın biçimde kullanılan katmanlı üretim, son yıllarda inşaat sektöründe de önemli bir dönüşüm aracı haline gelmiştir. Bu çalışmada katmanlı üretim teknolojisinin tarihsel gelişimi, tanımı, sınıflandırması, avantaj ve dezavantajları ile sektörel kullanım alanları kapsamlı biçimde ele alınmaktadır. Özellikle inşaat sektörüne odaklanılarak, 3B yazıcıların yapı üretim süreçlerine sağladığı katkılar ve bu teknolojinin sunduğu yenilikçi potansiyel değerlendirilmektedir. Beton, seramik ve kompozit gibi malzemelerle çalışan sistemlerin hız, maliyet ve iş gücü açısından sağladığı avantajlar analiz edilmiştir. Katmanlı üretimin sürdürülebilir yapı üretimine katkısı, hızlı prototipleme, atık azaltımı ve kaynak verimliliği gibi yönleriyle birlikte değerlendirilmekte; ayrıca kerpiç ve beton temelli malzemelerle düşük gelirli konutlar, afet sonrası acil barınaklar ve geleneksel yöntemlerle üretimi zor olan karmaşık formlu yapılar için sunduğu olanaklar tartışılmaktadır. Bunun yanı sıra, Ay ve Mars gibi başka gezegenlerde yapı üretimi amacıyla kullanım potansiyeline de dikkat çekilmektedir. Bu kapsamda çalışma, katmanlı üretim teknolojisinin inşaat sektörü özelindeki mevcut ve gelecekteki uygulamalarını bütüncül bir bakış açısıyla ele almayı amaçlamaktadır.

**Anahtar Kelimeler:** Katmanlı Üretim, 3B Yazıcılar, İnşaat Teknolojileri, Endüstri 4.0

# SECTORAL APPLICATIONS OF ADDITIVE MANUFACTURING TECHNOLOGY AND ITS POTENTIAL IN THE CONSTRUCTION INDUSTRY

## ABSTRACT

Additive manufacturing is an innovative manufacturing technology that has developed as an alternative to traditional manufacturing methods, with the impact of the digitalisation process and Industry 4.0. This method, which emerged in the 1980s, is based on layer-by-layer material deposition based on three-dimensional (3D) model data and offers a digital production process from design to production. Widely used in many sectors, especially in the medical, aviation, automotive and aerospace industries, additive manufacturing has become a vital transformation tool in the construction industry in recent years. This study discusses the historical development, definition, classification, advantages, disadvantages, and sectoral usage areas of additive manufacturing technology. With a particular focus on the construction industry, the contributions of 3d printers to building production processes and the innovative potential offered by this technology are evaluated. The advantages of systems working with materials such as concrete, ceramics and composites in terms of speed, cost and workforce are analysed. The contribution of additive manufacturing to sustainable building production is evaluated in terms of rapid prototyping, waste reduction and resource efficiency, as well as the possibilities it offers for low-income housing with adobe and concrete-based materials, emergency shelters after disasters, and structures with complex forms that are difficult to produce with traditional methods. It also draws attention to the potential for use in the production of buildings on other planets, such as the Moon and Mars. In this context, the study addresses the current and future applications of additive manufacturing technology in the construction sector from a holistic perspective.

**Keywords:** Additive Manufacturing, 3D Printers, Construction Technologies, Industry 4.0

## 1. Giriş

Modern sanayinin gelişimi günümüze kadar duraksamadan devam etmiş ve bu gelişme süreci içerisinde üç büyük devrim gerçekleşmiştir. Halihazırda içinde yer aldığımız çağ ise dördüncü sanayi devrimi olarak adlandırılan 'Endüstri 4.0' çağıdır. Sanayinin dijital dönüşümü olarak nitelendirilen Endüstri 4.0'ın temel hedefi geleneksel endüstriyel süreçlerin bilişim teknolojileriyle bütünleşerek dijitalleşmesi (Kılıç ve Alkan, 2018) yoluyla dijital ortamda robotların, makine ve ekipmanların birbirleriyle bağlantılı olarak çalışabilmesini ve üretimde önemli bir yer tutan enerji ve hammadde kaynaklarının en etkin şekilde kullanılmasını (Doğru, 2018) sağlamak şeklinde özetlenebilir. Günümüz üretim sektörü mühendislik, malzeme, lazer işleme ve yazılım teknolojilerindeki ilerlemeler sayesinde üç boyutlu katı modele dayalı dijital dizaynların seramik, metal ve polimer gibi malzemelerden katmanlı bir şekilde modellerin üretilebildiği bir imalat yöntemiyle tanışmıştır. Bu yöntem; Endüstri 4.0'ın getirdiği yeni teknolojilerden biri de sanal/dijital ortamlarda tasarlanan ürünün, üç boyutlu (3B) olarak çıktısının alınmasını sağlayan katmanlı üretim (KÜ) yöntemidir. KÜ günümüzde çeşitli alanlara özgü ürünlerin hızlı prototiplerinin oluşturulmasına ve/veya sonuç ürünün üretilmesine olanak sağlamıştır (Yalçın ve Ergene 2017). KÜ, 3B model verileri kullanılarak katman üzerine katman eklenmesi ile obje oluşturma yöntemi olarak tanımlanmaktadır (ISO/ASTM 52900, 2015). Bu üretim yöntemi, 1983 tarihinde KÜ teknolojilerinden biri olan ilk 3B yazıcının icat edilmesinden itibaren gelişmeye başlamış ve günümüzde hızlı büyüyen, gelişen ve kompleks ürünler ortaya çıkaran teknolojilerden biri haline gelmiştir. Otomotiv, havacılık ve aero-uzay gibi önemli sanayi sektörleri, kalite ve verimliliği artırmak için bu dijital teknolojiyi benimseyerek radikal süreç değişiklikleri yaşamıştır. İcat edildiği ilk yıllarda hem daha pahalı hem de daha karmaşık bir teknik donanıma sahipken, zamanla günlük yaşamda dahi kullanılabilir bir duruma gelerek ulaşılabilir bir teknoloji konumuna gelmiştir. KÜ aşamalarında çeşitli yazma teknikleri kullanılmaktadır. Endüstrinin neredeyse tüm alanlarında KÜ teknolojisine rastlamak mümkündür. KÜ sektöründe, 2022 yılına kadar yaklaşık olarak 7,3 milyar dolar olan satış büyüklüğünü dört katından daha fazlasına çıkması beklenen hızla gelişen bir sektördür (Çelebi, 2021).

## 2. Katmanlı Üretim (KÜ) Kavramının Tarihçesi

1980'lerin başlarında başlamış olan KÜ teknolojileri; prototiplerin (hızlı prototipleme ile) yaratılması için geliştirilmesiyle hayatımıza girmiştir. KÜ donanımı ve malzemeleri 1980'li yıllarda geliştirilmeye başlanmıştır. 1981'de Nagoya Endüstriyel Araştırma Enstitüsü'nde Hideo Kodama iki farklı KÜ metodu geliştirmiştir. 1984'te Alain Le Mehaute, Olivier de Witte ve Jean Claude Andre stereolithografi metoduna patent almışlardır. 1984'te 3D Systems'dan Chuck Hull ultraviyole lazer ışınları aracılığıyla fotopolimerleri biçimlendiren bir stereolitografi metodu geliştirdi. İlk ticari plastik KÜ sistemi 1987 yılına dayanıyor. Metal ile KÜ teknolojileri; seçmeli lazer sinterleme, doğrudan lazer sinterleme, seçmeli lazer eritme gibi isimlendirmelerle 1980 ve 1990'lı yıllarda gündeme geldi. İlk ticari metal KÜ sistemi ise 1995 yılında piyasaya sürülmüş; sistem kullanıcıları, parçaların doğrudan imalatı için KÜ kullanmaya başlamıştır. 2000'li yıllarla birlikte birçok farklı malzeme ve yöntemden yararlanan KÜ teknolojileri gelişmeye ve büyümeye devam etmiştir. 21. yüzyılın ilk on yılında bu teknolojinin endüstriyel kullanım alanı genişledi. Bu dönemde KÜ teknolojileri hızlı prototiplerine, kalıp imalatı, özellikli ve sayıca az miktardaki (butik) ürünlerin imalatında yaygın olarak kullanılmaya başladı. Bugünün KÜ sistemleri henüz seri üretim amacıyla tasarlanmamıştır. Diğer yandan proses hızı, malzeme maliyetleri ve proses kontrolü, prototiplendirme için bir sorun oluşturmadı. KÜ'nün, ilerleyen zamanla birlikte çeşitli uygulamalar için parçaların ekonomik, hacimli ve sabit kalitede imal edilebildiğini göstermesi beklenmektedir. KÜ; Endüstri 4.0 çatısını taşıyan teknolojilerden birisi kabul edilmektedir. Bunun nedeni; bir yandan KÜ'in çıkarmalı (eksiltmeli) imalatın yerini almasına ek olarak Internet teknolojileri ile herhangi bir 3B tasarımın dünyadaki herhangi bir KÜ hizmet noktasına iletilerek uzaktan erişim ile orada üretiminin gerçekleşebilmesidir (Banger, 2017). KÜ teknolojilerinin kronolojik gelişimi Tablo 1'de gösterilmektedir (Arcam, 2014; Gebhardt 2011; Sames vd. 2016).

Tablo 1: KÜ Teknolojisinin Kronolojik Gelişimi (Akbaba & Akbulut, 2021)

| Yıl | Gelişme |
|---|---|
| 1981 | Japonya Nagoya Endüstriyel Araştırma Enstitüsü<br>Hideo Kodlama<br>UV ışığı ile polimerize edilmiş reçineyi kürleyen **ilk hızlı prototipleme** patent başvurusu |
| *1984* | Charles Hull SLA teknolojisi kullanılarak **ilk 3 boyutlu yazıcı** geliştirildi. |
| 1986 | Charles Hull Stereolithografi yönteminin kullanım hakkını aldı.<br>Charles Hull, 3D Sytems firmasını kurdu ve **ilk ticari 3B yazıcıyı** geliştirdi. |
| 1988 | 3D Systems tarafından, SLA 250 isimli kullanıma yönelik ilk model tanıtıldı.<br>**SLS ve FDM** teknolojileri bulundu. |
| 1989 | Scott ve Lisa Crump Stratasys isimli **3 boyutlu yazıcı firmasını** kurdu. |
| 1991 | Helisys firması **ilk 3 boyutlu imalat sistemini sattı**. |
| 1992 | Stratasys ilk **FDM** cihazını **sattı.**<br>DTM firması ilk **SLS** sistemini **sattı.** |
| 1993 | Solidscape firması mürekkep püskürtmeli bir cihaz üretme amacı ile kuruldu.<br>Massachusetts Institute of Technology (MIT) **2 boyutlu yazıcılardaki mürekkep püskürtme** yöntemini kullanarak 3 boyutlu obje üretimi ile ilgili bir kullanım hakkı aldı.<br>**İlk renkli baskı** alındı. |
| *1995* | Z Corparation şirketi MIT'in patentini lisansladı ve **3 boyutlu yazıcı satışına** başladı. |
| 1996 | Stratasys "Genisys" modelini piyasaya sürdü.<br>Z Corporation "Z402" modelini piyasaya sürdü<br>3D Systems "Actua 2100" modelini piyasaya sürdü. **3 boyutlu yazıcı kelimesi ilk defa** kullanılmaya başlandı. |
| 1997 | EOS firması stereolithografi firmasını 3D Systems'e sattı. |
| *2007* | Açık kaynak kodlu 3 boyutlu yazıcılar (katmanlı imalat tekniklerinin) **Reprap** ismi ile çıktı. Böylece 3 boyutlu yazıcılara ulaşma ve onları geliştirme imkânı arttı.<br>İlk defa **10.000$**'ın altına inen 3 boyutlu bir yazıcı, 3D Systems firması tarafından pazara sunuldu. |
| 2008 | Reprap'in ilk versiyonu tamamlandı. Bu yazıcı kendi parçalarının %50 sini üretebiliyordu.<br>Object Geometries firması Connex500 modelini geliştirdi. Bu cihaz aynı anda **farklı malzemeleri** kullanabiliyordu. |
| 2009 | FDM teknolojisi patentinin 25 yıllık tek kullanım dönemi bitti. Böylece firmalar yasal sorunla karşılaşmadan **FDM teknolojisini kullanarak 3 boyutlu yazıcı üretimine** başladı.<br>Makerbot ve 3D Systems'in geliştirdiği modeller ile ev tipi 3 boyutlu yazıcıların sayısında artış oldu. |
| 2011 | Southampton Üniversitesi'ndeki mühendisler dünyanın **ilk 3B baskılı uçağını** tasarladı. |
| 2012 | 3 boyutlu yazıcı teknolojisi kullanılarak daha az komplikasyonlu **kişiselleştirilmiş eklem protezi** geliştirildi.<br>Sektör açısından iyi bir büyüme ve sağlamlaşma yılı oldu. |
| 2013 | Stratasys, Makerbot şirketini devraldı.<br>**4D üretim tekniği** geliştirildi. |
| 2014 | **Uzayda ilk 3 boyutlu yazıcı** kullanıldı. Deneme amaçlı küçük parçalar ve el eşyaları üretildi. |
| *2015* | ASA, **uzayda 3B yazıcı ile üretim** yapmaya başladı. |
| 2016 | Adidas, 3B yazıcı ile ayakkabı tabanı üreteceğini açıkladı.<br>New Balance, tabanını **3B yazıcı ile ürettiği ayakkabısını** piyasaya sürdü. |

## 3. Katmanlı Üretim (KÜ) Nedir?

KÜ geleneksel eksitmeli (çıkartmalı) imalat yöntemleri yerine, genellikle katmanlar şeklinde düzenlenen 3B modellerin verilerini ürün oluşturmak için malzemeleri birleştiren bir süreçtir. Bu üretim yöntemine; katmanlı (eklemeli) süreçler veya teknikler, katmanlı fabrikasyon, serbest formlu fabrikasyon veya eklemeli katman imalatı da denilmektedir. KÜ'de öne çıkan kavramlardan biri de hızlı prototiplemedir. 3B baskı ve hızlı prototipleme yönteminin etkili kullanımıyla sanayi ve teknolojinin bütünleşmesine 'KÜ' denilmektedir. Kısaca söylendiğinde; katmanlı üreten, bilgisayardaki sanallığı (gözle görünen ve elle dokunulan) fiziksel gerçekle dönüştüren teknolojidir (Banger, 2017).

KÜ, herhangi bir şekle sahip dijital bir modelin üç boyutlu bir katı nesne oluşturma işlemidir. KÜ, hammaddenin birbirini takip ederek üst üste katmanlara dönüştürülmesi ile gerçekleşir (Banger, 2018). KÜ, materyallerin birbirini izleyen katmanlara uygulandığı türden bir süreci kullanır. KÜ, kesme veya frezeleme gibi yöntemlerle malzemenin çıkarılmasına (eksiltilmesine) dayanan geleneksel işleme tekniklerinden ayrılır (Banger, 2017).

KÜ sürecinde dijital üç boyutlu model üçgenlerden oluşan kafes yüzeylere sahip STL (stereolitografi) modeline dönüştürülür. STL; 3B model verilerini düzenlemeye yarayan ve makinelerin fiziksel parçalar üretmesini sağlayan dosya formatıdır. Stereolitografi sözcüğünden üretilen STL kavramı, KÜ sistemlerinde

yaygın kullanılan arayüzdür (ISO/ASTM 52900-15, 2015). STL haricinde VRML SLC / CLI, PLU, AMF, OBJ gibi dosya formatlarında da kullanılabilmektedir (Gebhardt & Hötter, 2016). 3B Model, dijital programlarla katmanlar şeklinde dilimlenmesinin ardından 3B yazıcıya iletilerek zeminden başlayarak katmanlar üst üste gelerek nihai ürüne dönüştürülmektedir (Banger, 2017).




Şekil 1. KÜ Aşamaları

KÜ'de ürün, bilgisayar destekli tasarım (BDT) programı ile çizim, bilgisayarlı tomografi (BT), tersine mühendislik (TM) gibi farklı metotlardan oluşturulan 3B modelden üretilmektedir (Şekil 1). Dijital model ince katmanlara ayrılır ve üretim sistemleri, ürün tamamlanıncaya kadar her katmanın basılması için bu dijital veriyi kullanır ve nihai ürün oluşturulur (Çelik, Karakoç, Çakır, & Duysak, 2013; Giannatsis & Dedoussis, 2009; Özsoy & Duman, 2017).

### 3.1. Katmanlı Üretim (KÜ) Türleri

KÜ aşamalarında çeşitli yazma teknikleri kullanılmaktadır. Uluslararası Amerikan Test ve Materyalleri Topluluğu (ASTM) ile Uluslararası Standardizasyon Örgütü (ISO)'nün yayınladığı standartta KÜ teknolojileri 7 alt gruba ayrılmaktadır (ISO/ASTM 52900-15, 2015). Bu 7 alt grup; havuz fotopolimerizasyonu (vat photopolymerisation), malzeme püskürtme (material jetting), malzeme ekstrüzyonu (material extrusion), yapıştırıcı püskürtme (binder jetting), toz yataklı birleştirme (powder bed fusion), direkt enerji biriktirme (direct energy deposition), plaka tabakalaştırma (sheet lamination) şeklindedir. Tablo 2'de KÜ çeşitlerinin çalışma prensibi, örnek teknolojileri, dezavantajları, avantajları ve kullanılan malzemeleri verilmektedir.

Tablo 2. KÜ çeşitlerinin özellikleri (Özer, 2020)

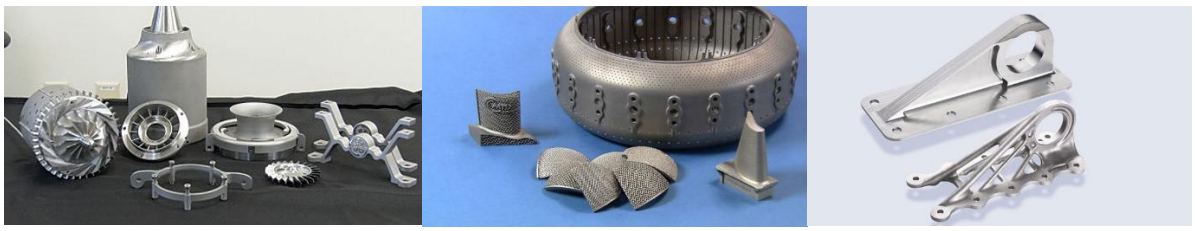
| ASTM Kategorisi | Çalışma prensibi | Örnek teknoloji | Dezavantajları | Avantajları | Kullanılan Malzemeler |
|---|---|---|---|---|---|
| Yapıştırıcı Püskürtme (Binder Jetting), | Parçacıklar birbirine yapıştırılarak katman katman inşa edilir. | 3B mürekkep püskürtme (inkjet) teknolojisi | Sınırlı mekanik özelliklere sahip kırılgan parçalar üretilir, Son işlem gerektirebilir. | Destek/altlık içermez, Tasarım özgürlüğü sağlar, Yüksek baskı hızı vardır, Nispeten düşük maliyetlidir. | Polimerler, Seramikler, Kompozitler, Metaller, Hibrit malzemeler |
| Direkt Enerji Biriktirme (Direct Energy Deposition) | Odaklanmış ısı enerjisi biriktirme esnasında malzemeleri eritir. | Lazer Biriktirme, Lazer Şekillendirme, Elektron Işını, Plazma Ark Ergitme. | Yüzey kalitesi düşüktür, Metaller/metal tabanlı hibrit malzemelerle sınırlıdır. | Tane yapısının yüksek derecede kontrolü mümkündür, Yüksek kaliteli parçalar üretilebilir. | Metaller, Hibrit malzemeler |
| Malzeme Ekstrüzyonu (Material Extrusion) | Malzeme, seçici olarak bir nozül veya orifisten (ağız) dışarı itilir. | Ergiyik Yığma Modelleme, Ergiyik Filament Fabrikasyonu, Ergiyik Katman Modelleme. | Basamaklı yüzey oluşturur, Ayrıntılar için uygun değildir. | Yaygın kullanımlıdır, Ucuzdur, Tamamen işlevsel parçalar oluşturabilir. | Polimerler, Kompozitler |
| Malzeme Püskürtme (Material Jetting) | İnşa malzemesinin damlacıkları biriktirilir. | 3B inkjet teknolojisi, Direkt Mürekkep Yazdırma. | Destek malzemesi gereklidir, Fotopolimerler ve termoset reçineler gereklidir. | Yüksek damlacık biriktirme doğruluğu vardır, Düşük atık oluşturur, Çoklu malzeme parçaları üretilebilir, Çok renkli parçalar üretilebilir. | Polimerler, Seramikler, Kompozitler, Hibrit malzemeler, Biyolojik malzemeler |
| Toz Yataklı Birleştirme (Powder Bed Fusion) | Isı enerjisi, toz yatağındaki inşa malzemesinin küçük bir bölgesini birleştirir. | Elektron Işın Ergitme, Direkt Metal Lazer Sinterleme, Seçici Lazer Sinterleme/Ergitme. | Nispeten yavaştır, Yapısal bütünlük eksikliği vardır, Boyut sınırlamaları mevcuttur, Yüksek güç gereklidir. | Nispeten ucuz bir teknolojidir, Geniş malzeme seçenekleri mevcuttur. | Polimerler, Seramikler, Kompozitler , Metaller, Hibrit malzemeler |
| Plaka Tabakalaştırma (Sheet Lamination | Malzemelerin sac/folyoları yapıştırılmıştır. | Tabakalı Malzeme Üretimi, Ultrason Birleştirme/Ultrason Eklemeli Üretim. | İşlem sonrası son işlemler gerekebilir, Sınırlı malzeme kullanılabilir. | Hızı yüksektir, Düşük maliyetlidir, Malzeme taşıma kolaylığı vardır. | Polimerler, Seramikler, Metaller, Hibrit malzemeler |
| Havuz Fotopolimerizasyonu (Vat Photopolymerisation) | Bir havuzdaki sıvı polimer ışıkla sertleştirilir. | SLA, Dijital Işık İşleme. | Sadece fotopolimerlerle sınırlıdır, İnşa işlemi yavaştır, Pahalı bir yöntemdir. Fotopolimerlerin düşük mekanik özellikleri vardır. | Büyük boyutlu parçalar üretilebilir, Mükemmel boyutsal hassasiyet sağlar, Mükemmel yüzey ve detaylar sağlar. | Polimerler, Seramikler |

## 4. Katmanlı Üretimin Kullanım Alanları

KÜ endüstrisi incelendiğinde Uzay ve havacılık, Tıp, Otomotiv, Dişçilik, Askeri donanım, İnşaat, Kişisel araç-gereç, Heykelcilik, Kuyumculuk ve Eğitim disiplinlerinde bu teknolojiyle üretilen ürünlerin kullanıldığı saptanmaktadır. KÜ teknolojilerinin kullanım alanları gün geçtikçe yaygınlaşmakta ve genişlemektedir (Özsoy & Duman, 2017).

### 4.1. Havacılık Sanayi

Uzay ve havacılık endüstrisinde, iyi mekanik özelliklere sahip küçük miktarlarda, karmaşık geometrili ve hafif parçaların devamlı olarak üretebilmesi en önemli gereksinimlerdendir. Bunlar, katmanlı imalatı havacılık sanayisinde çok önemli bir üretim yöntemi haline getirmektedir. Düşük hacimlere sahip karmaşık havacılık parçaları, yedek parçalar ile özel parçalar, uçak kanatları, hafif yapılar, talep üzerine üretilen (on-demand) parçala, minimal atığa sahip parçalar ve uzay araştırmalarında kullanılacak gerekli yedek parçaların üretilmesinde kullanılır. Kompozit malzemelerle KÜ havacılık sanayisi için önemli bir adım olmuştur. Titanyum, alüminyum, özel çelikler ve nikel süper alaşımlar gibi ileri malzemeler KÜ teknolojileri kullanılarak havacılık sanayisine özel imal edilmiştir. KÜ sektörü son 7 yılda yaklaşık 5,7 kat büyümüştür. Havacılık sanayisinde KÜ teknolojilerin kullanımındaki artışın yaklaşık 1 milyar dolar civarında olması beklenmektedir (Özer, 2020). Şekil 2'de havacılık sanayinde KÜ uygulamaları gösterilmektedir.

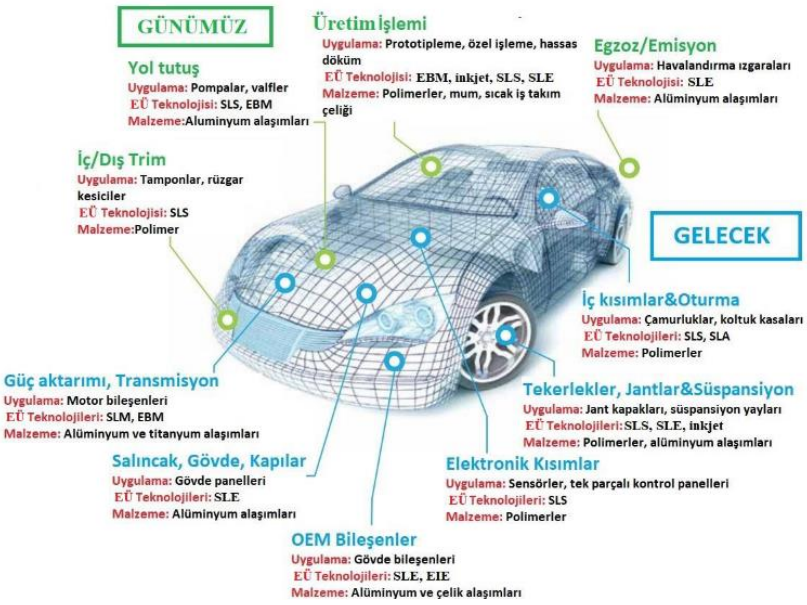


Şekil 2. Havacılık sanayinde KÜ uygulamaları[1]

### 4.2. Otomotiv Sektörü

KÜ teknolojilerinin özellikle otomotiv sanayide, envanter sistemleri ve geçerli olan tedarik zincirlerine ek olarak parça tasarımında da önemli tesirleri bulunmaktadır. Otomotiv endüstrisinde metal KÜ işlemlerinin kullanılmasıyla, karmaşık şekillere sahip hafif parçalar üretilebilmektir. Otomotiv yapılarının ağırlığı, KÜ ile önemli ölçüde azaltılabilmektedir. Otomotiv sektöründe yapısal kompozit bileşenler, turboşarj türbinlerinin ve motor vanalarının üretiminde katmanlı imalat kullanılmaktadır.

Prototipleme, KÜ'in otomotiv sektöründe kullanılan alanlarından biridir. 2011'de Kor, Ecologic Urbeemodelini tanıtmıştır. Bu otomobilde; gövdeyi oluşturan tüm parçalar KÜ yöntemiyle imal edilmiştir. Şekil 3, KÜ teknolojilerinin otomotiv saniyedeki şimdiki ve gelecekteki kullanım alanlarını özetlemektedir (Özer, 2020).



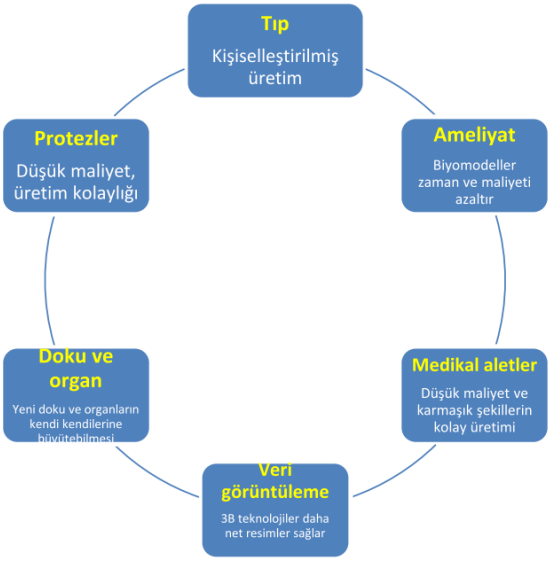

Şekil 3. Otomobilde KÜ uygulamaları (Özer, 2020)

### 4.3. Sağlık Endüstrisi

KÜ sağlık sektöründe tıbbi cihazların üretiminde önemli yer tutmaktadır. KÜ, tıbbi alet ve cihazlar ile implant üretimi için yenilikçi bir teknolojidir. Bu teknolojiyle, implantların üretim süresi geleneksel yöntemlerle kıyaslandığında oldukça azaltılabilmektedir. Ayrıca, implantlar, protezler hastaya ve tedaviye özel kişiselleştirillerek üretilebileceği için hastayla daha iyi uyum sağlayarak seri üretilen implantlara göre başarısızlık riskini azaltmaktadır. Diş hekimliği alanında KÜ süreçleri hassas dental kuronlar, implantlar ve köprüler oluşturmak için kullanılmaktadır. Medikal sektörde metal KÜ süreçleri çok hızlı özel bileşenler üretebilmesi sebebiyle kullanılmaktadır. KÜ teknolojisi, ameliyatlarda kullanılan cerrahi aletler üretmek için uygundur. Sağlık hizmetlerinde diğer KÜ teknolojileri ürünlerinden olan implant, protez, cilt, burunlar, yapay uzuvlar için özel kaplamalar, kozmetik kulaklar ve biyonik kulaklardır. Bu teknolojinin farklı üretim şekilleri farklı sıcaklık direncine, gerilme mukavemetine, kopmaya ve kimyasal dirence sahip farklı malzeme sınıfıyla

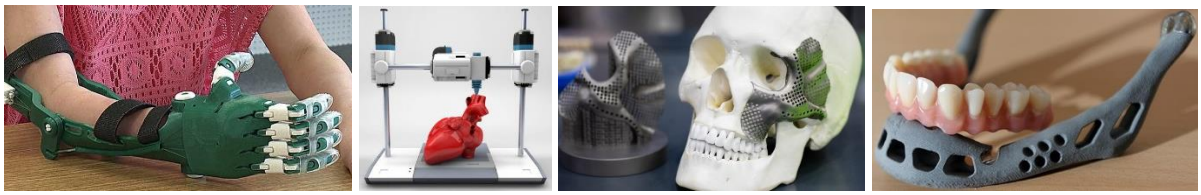
[1] https://d3.harvard.edu/platform-rctom/submission/additive-manufacturing-revolutionizes-aerospace/

uyumludur. Tıbbi cihaz mühendislerinin uygulamalarını malzeme, çözünürlük ve diğer gereksinimlerle eşleştirmesi ve buna göre bir teknoloji seçmesi gerekir. Şekil 4'te KÜ teknolojilerinin sağlık sektörüne sağladığı avantajlar görülmektedir (Özer, 2020).




Şekil 4. KÜ teknolojilerinin sağlık sektörüne sağladığı avantajlar (Özer, 2020).

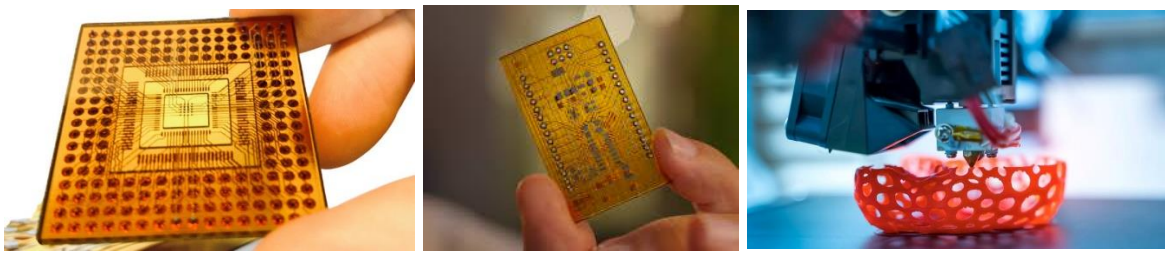
Şekil 5'te KÜ teknolojilerinin sağlık sektöründeki uygulamaları gösterilmektedir.



Şekil 5. KÜ teknolojilerinin sağlık sektöründeki uygulamaları (Akbaba & Akbulut, 2021).

### 4.4. Nano-üretim Sektörü

Mikro ölçekli eklemeli imalat yeni nano kompozitlerden ürünler üretimi için nano teknoloji ile bütünleşik hale gelmiştir. KÜ işlemlerinde nano malzemelerin kullanılmasının faydası, üretilen ürünlerin malzeme özelliklerini geliştirmektedir. Böylece, daha iyi termal, optik, mekanik ve elektrokimyasal özelliklere sahip ürünler üretilmektedir. Nano ölçekteki KÜ, nano gözeneklerle metal ürünlerin üretiminde çok önemli olup, böylece boşlukların ve gözeneklerin oluşumunu azaltmakta ve yok etmektedir (Özer, 2020). Şekil 6'da KÜ teknolojilerinin nano-üretim sektöründeki uygulamaları gösterilmektedir.



Şekil 6. KÜ teknolojilerinin nano-üretim sektöründeki uygulamaları[2]

[2] https://www.3dnatives.com/nano-dimension-impression-3d-electronique-28042021/

### 4.5. Enerji Sektörü ve Tedarik Zinciri

"Yeşil" enerji cihazlarından biri olan yakıt hücreleri; düşük emisyon, yüksek güç yoğunluğu, yüksek verimlilik gibi faydalar sağlamaktadır. Otomotiv sistemleri, taşınabilir güç kaynakları ve dağıtılmış güç sistemleri potansiyel uygulamaları arasında bulunmaktadır (Özer, 2020). Rüzgar ve güneş enerjisi gibi yenilenebilir enerji, KÜ tedarik zincirine dahil etme açısından tesisin kapanarak elektrik üretmemesi ekonomik zarara sebep olmaktadır. Yedek parça için uzun süre beklemek veya rüzgar türbinlerinin veya güneş panellerinin tamamen devre dışı kalması, yenilenebilir enerji için ek maliyete sebep olur. Bu nedenle, yerinde parça basmak kritik öneme sahiptir. Şekil 7'de KÜ teknolojilerinin enerji sektöründeki uygulamaları gösterilmektedir.




Şekil 7. KÜ teknolojilerinin enerji sektöründeki uygulamaları (Sanandiya, Vijay, Dimopoulou, Dritsas, & Fernandez, 2018)

### 4.6. Sanat ve Hobi Uygulamaları

KÜ teknolojileri, mobilya, aydınlatma, dekoratif obje, tekstil ve kuyumculuk sektöründe en karmaşık şekli üretme olanağı sağlayan çok kuvvetli bir araçtır (Özer, 2020). Sanatta KÜ, bir sanatçının zihnindekini üretmesine olanak sağlar. Çoğu zaman, bir sanatçı sanat eserini tam olarak hayal ettiği gibi üretmeye çalıştığında, geleneksel ve manuel üretim süreçleriyle sınırlı olacaktır. KÜ kullanırken, sanatçı artık üretim yönteminin türü ile sınırlı değildir. Şekil 8'de KÜ teknolojilerinin sanat ve hobi uygulamaları gösterilmektedir.



Şekil 8. KÜ teknolojilerinin sanat ve hobi uygulamaları[3]

### 4.7. Gıda Sektörü

KÜ teknolojileri gıda sektöründe, istenen ürün oluşturulana kadar bir malzemenin art arda katmanlar halinde bir yüzeye bırakılması şeklinde çalışır. Kişiye özel gıda tasarımları, kişiselleştirilmiş gıda tasarımları gibi çeşitli avantajları nedeniyle gıda üretim sektöründe büyük bir popülerlik kazanmıştır. Beslenme, tedarik zincirinin basitleştirilmesi ve çeşitli renk, şekil ve boyutlarda mevcut gıda malzemesinin genişlemiştir. Şekil 9'da KÜ teknolojilerinin gıda sektöründeki uygulamaları gösterilmektedir.

[3] https://www.dotcomwomen.com/beauty/halloween-makeup-inspirations-from-fashion-week-runways/15943/



Şekil 9. KÜ teknolojilerinin gıda sektöründeki uygulamaları[4]

### 4.8. Eğitim

KÜ teknolojileri daha iyi öğrenmeyi, beceri geliştirmeyi ve konuyla ilgili öğrenci ve öğretmen katılımını artırmayı kolaylaştırmaktadır. Ayrıca, 3B baskı, sorunları çözmede daha fazla yaratıcılığı ve işbirliğini teşvik eder. Eğitime KÜ; öğrencilere KÜ teknolojisinin nasıl çalıştığı ve gerçek dünya senaryolarındaki uygulamaları hakkında bilgi vererek (örn. endüstriyel süreçleri kolaylaştırmak), eğitim müfredatlarına uygun şekilde dahil edilebilmesi için eğitimcileri 3B baskı hakkında bilgilendirerek, öğrencilerin önemli kavramları anlamalarına yardımcı olacak KÜ ürünlerinin gösterilmesiyle dahil edilebilir.

Ayrıca KÜ teknolojilerinin potansiyellerinin doğru kullanılabilmesi ve uzman kişilerin yetiştirilebilmesi için üniversitelerde eğitime dahil edilmesi gerekmektedir. KÜ eğitimi için üniversitelerde; KÜ süreçleri ve malzeme ilişkileri, malzeme bilimleri ve üretim süreçleri hakkında temel bilgiler, eleştirel düşünme ve problem çözme için profesyonel zeka, KÜ uygulamaları için tasarım yapabilme ve tasarım odaklı düşünebilme, yaratıcılık için ekip oluşturma ve fikir oluşturma tekniklerinin eğitime dahil edilmesi gerekmektedir.[5]

## 5. İNŞAAT SEKTÖRÜNDE KATMANLI ÜRETİM

KÜ alanında **inşaat sektörü,** etkin kullanım olanakları olan, fakat diğer sektörlere göre büyük ölçekli ürünler ortaya koyduğu için bu teknolojinin nispeten daha az kullanıldığı bir sektör olup en önemli bileşenini ***üç boyutlu baskı (3BB)*** uygulamaları oluşturmaktadır (Yalçın ve Ergene, 2017). Her ne kadar nispeten zor ve kapsamlı bir süreç gerektirse de günümüzde kullanılan yazıcı sistemlerinin ve baskı malzemelerinin geliştirilmesiyle inşaat sektöründe de önemli ilerlemeler kaydedilmiştir (Felek, 2019). İnşaat sektöründe ***otomatikleşme ve dijitalleşme sağlayan bu ilerleme***; inşaat şirketlerinin yaptıkları faaliyetler özelinde verimliliği artırmasına, proje gecikmelerini ve maliyet aşımlarını azaltmasına, karmaşıklığı yönetmesine, güvenliği, kaynak verimliliğini ve kaliteyi artırmasına olanak tanımaktadır (De Soto vd., 2018; Ghaffar vd., 2018). Ayrıca nakliye maliyetlerinde, malzeme için gereken depolama alanlarında, işçilik maliyetlerinde, işçi yaralanmalarında ve ölümlerinde ve malzeme israfında azalma ile birlikte üretkenlikte ve tasarım yaratıcılığında artma, yeni pazarların ve endüstrilerin oluşturulması, daha fazla sürdürülebilirlik ve dayanıklılık, inşaat süresinin kısalması, yeni iş yaratma, hızlı prototip oluşturma gibi geniş perspektifte avantajlarda sağlamaktadır (Aghimien vd., 2020). Bu bahsedilenlere ek olarak, 3B uygulamaları yapı üretimine de farklı bir bakış açısı sunmuş, kullanıcılara özgün ve yaratıcı eserlerin prototiplerini oluşturabilmeleri ve soyut olan düşüncelerini somuta dönüştürebilmeleri için bir araç niteliği teşkil etmiştir (Seelow, 2017).

3BB, hammaddeyi bir toz yatağı üzerine katman katman basarak nesne üretme Endüstri 4.0 teknolojisidir (Akbaba & Akbulut, 2021). 3BB, farklı malzemeleri katmanlayarak üç boyutlu nesneler üretmeyi içerir (ASTM International, 2013). 3BB son yıllarda çarpıcı bir şekilde gelişerek baskıya uygun malzeme karışımları oluşturulmuştur (Agustí-juan ve diğerleri, 2017). Prensip olarak malzeme bazında 3BB işlemi gereksinimi şu şekilde özetlenebilir; 1) kontrol edilebilir ve esnek sertleşme süresi, 2) malzemenin noozledan dökülebilecek şekilde işlenebilirlik ve akışkanlığa sahipken, basıldıktan sonra da üzerine gelen katmanın ağırlığını taşıma kabiliyetine sahip, 3) Malzemenin kendi ağırlığını ve üst üste binen katmanları destekleyebilmesini sağlamak için yüksek erken dayanıma sahip olmalıdır, çünkü baskının ilerlemesiyle alt katmanların yukardaki katmanların yükünü 2-3 saat içinde taşıması gerekecektir. Bu kriterler, amaca uygun özel karışımın oluşturmak için malzeme geliştirme araştırma hedefi olarak belirlenmiştir (Jianchao, Zhang, Faried, & Wengang, 2017).

3BB üretim yönteminin günden güne gelişen teknolojiyle birlikte fark edilebilir ilerleme kaydettiği görülmektedir. İlk ortaya çıktığı zamanlardan günümüze doğru artan kullanım alanı ile mimaride de özgün

[4] https://www.yenicaggazetesi.com.tr/bilim-kurgu-gercek-oldu-yemek-devrimi-880857h.htm
[5] https://www.amchronicle.com/insights/an-introduction-to-additive-manufacturing-education-part-1/

arayışlar içine girilmiştir. İnşaat sektöründe de yaygın olaark kullanılmaktadır (Tablo 3). Ayrıca bu yöntem daha yüksek hız ve doğrulukla (minimum insan kaynaklı hata) kalıpsız inşaata olanak tanımaktadır (Lloret vd., 2015). İnşaatta kalıptan kaçınmak, inşaatın en maliyetli yönlerinden biri olduğu için toplam maliyeti %30-60 oranında azaltabilmektedir (Perrot vd., 2015). Dünya kaynaklarının 1/3'ünü yapı endüstrisinin tükettiği göz önünde bulundurulduğunda, verimlilik ve etkin inşaat stratejileri ile 3BB ile üretim sistemlerinin yapı üretiminde fayda sağlayacağı öngörülmektedir (Özer, 2020). Günümüzde bu üretim sistemi ile bir haftada, hatta bir günde üretilen konutlar üzerinde projeler yapılmaktadır (Archdaily, 2022). Bu kapsamda özellikle modern ürün geliştirmenin anahtarı haline gelen 3BB kullanımı arttıkça, büyük ölçekli üretimlere yönelik araştırmalar, yapı üretimindeki potansiyel uygulamaları ortaya çıkarmaya başlamaktadır (Deeezen, 2022).

Tablo 3. 3BB inşaat sektöründeki kullanımı

| | | |
|---|---|---|
|  |  |  |
| Apis Cor evi, Rusya, 2016 | Ofis yapısı, Dubai, 2016 | The BOD, Kopenhag, 2017 |
|  |  |  |
| Bir sergi prototipi, İtalya, 2018 | Minimalist bir ev, ABD, 2018 | Geo House, İtalya, 2018 |
|  |  |  |
| Yhnova projesi, Fransa, 2018 | Lotus House, Çin, 2018 | Belediye binası, Dubai, 2019 |
|  |  |  |
| Konut projesi, Meksika, 2020 | KampC ev projesi, Belçika, 2020 | Prvok, Çek Cumhuriyeti, 2020 |
|  |  |  |
| Yerel malzemeden imal edilen ev projesi, İtalya, 2021 | Kitap okuma kabini, Çin, 2021 | Beton malzemeli ev (Milestone Project), Hollanda, 2021 |

| | | |
|---|---|---|
|  Konut yapısı, Almanya, 2021 |  Yaşanabilir heykel yapısı (The House of Dust), Almanya, 2021 |  Konut yapısı, Hindistan, 2021 |
|  3dpod Pavilyon, Japonya, 2023 |  3BB Otel, Almanya, 2024 |  3BB bina, Osaka Expo, 2025 |

## 6. Sonuç ve Tartışma

KÜ teknolojisi, tasarım ve üretim süreçlerinde önemli avantajlar sunmaktadır. Bu teknoloji sayesinde tasarımda büyük bir esneklik sağlanmakta ve imalatı zor veya mümkün olmayan karmaşık parçalar hızlı bir şekilde üretilebilmektedir. Tasarımdaki herhangi bir değişiklik, bilgisayar üzerinde sanal 3B modelleme ile kolayca yapılabilir ve ek maliyet gerektirmez. KÜ, üretim sınırlarını aşarak karmaşık geometrilerin ve imalatı zor parçaların üretimini mümkün kılar. Banger (2017) ve Özer (2020) bu teknolojinin sağladığı avantajları şu şekilde sıralamaktadır: hızlı modelleme ve prototipleme imkânı sunar, karmaşık parçaların üretimini kolaylaştırır, tasarım ve üretim süreçlerinde zaman tasarrufu sağlar, ürün iyileştirmesini hızlandırır, tasarım ve üretim süreçlerinin entegrasyonunu sağlar (ki bu da Endüstri 4.0 felsefesine uygundur), üretim için gereken makinelerin sayısını ve ilk yatırımı azaltarak maliyetleri düşürür, modüler yapıları destekler, fonksiyonel ürünlerin geliştirilmesine olanak tanır, KÜ teknolojisi bulut bilişim sistemleriyle entegre olabilir ve her tür ürünün üretilebilmesine olanak sağlar, özel ürünlerin üretimini mümkün kılar, ürünlerin işlevsel optimizasyonunu sağlar, kısa sürede teslimat yapılmasını sağlar, tasarımda geniş serbestlik tanır, kalıp ihtiyacı ortadan kalkar, lojistiği kolaylaştırır ve malzeme sarfiyatını ve atık miktarını azaltır. Ancak, KÜ teknolojisinin bazı dezavantajları da bulunmaktadır. Bu dezavantajlar, üretim maliyetlerinin yüksekliği ve kullanılan malzemelerin sınırlı olması gibi zorlukları içermektedir. Ayrıca, KÜ teknolojisi, özel uzmanlık gerektirdiğinden, bu alanda eğitimli iş gücü bulmak zor olabilir. Üretim sonrası iç gerilmeler, iç boşluklar ve yüzey pürüzlülüğü gibi problemler oluşabilir, bu da ek işlemler gerektirebilir ve bu işlemler sonucunda ürünlerin mekanik özellikleri istenilen seviyede olmayabilir. Ayrıca, kullanılan malzemeler genellikle pahalıdır ve bazı polimerler ile radyasyon maddeleri insan sağlığına zarar verebilir. Son olarak, KÜ sistemlerinin yüksek maliyetleri, geniş çapta benimsenmesini engelleyebilir (Popović ve Milijić, 2020). Sonuç olarak, KÜ teknolojisi, inşaat sektöründe önemli bir dönüşüm aracı olarak öne çıkmakta ve sürdürülebilir yapı üretimi, hızlı prototipleme ve atık azaltımı gibi avantajlar sunmaktadır. Ancak, yüksek maliyetler, uzmanlık gereksinimleri ve üretim sonrası oluşabilecek sorunlar gibi dezavantajların çözülmesi, bu teknolojinin daha geniş bir şekilde benimsenmesi için kritik olacaktır.

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# Tarihi Yapıların Analiz Süreçlerine VR Sistemlerinin Entegre Edilmesi: İnayetullah Camii Örneği

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## Özet

*Bu çalışma, Çorum ili sınırlarında yer alan ve günümüzde İnayetullah Camii olarak bilinen yapının tarihsel süreç içerisinde geçirdiği mekânsal ve işlevsel değişimleri, dijital belgeleme teknikleri ve sanal gerçeklik (VR) teknolojileri aracılığıyla analiz etmeyi ve deneyimlenebilir hale getirmeyi amaçlamaktadır. Yapıya ilişkin en erken tarihli arşiv kaydı 1926 yılına ait olsa da, mimari izler, malzeme kullanımı ve bölgedeki benzer yapılarla yapılan karşılaştırmalı analizler, yapının 20. yüzyıl başlarında mescit olarak inşa edildiğini, zamanla camiye dönüştürüldüğünü ortaya koymaktadır. Bu dönüşümde minberin ve ahşap minarenin yapıya eklenmesi, işlevsel farklılaşmayı belirleyen temel unsurlar arasında yer almaktadır.*

*Çalışma kapsamında, yapının tarihsel gelişimi üç ana döneme ayrılarak ele alınmıştır: ilk inşa dönemi (mescit olarak kullanıldığı dönem), onarım sonrası dönem (minber ve minarenin eklendiği, işlevsel olarak camiye dönüştüğü dönem) ve mevcut durum (bugünkü mimari kimliğini kazandığı dönem). Her bir dönem için detaylı restitüsyon projeleri hazırlanmış, bu projeler temel alınarak üç boyutlu dijital modeller oluşturulmuştur. Veri toplama sürecinde arşiv taramaları ve literatür incelemelerine ek olarak, yapının mevcut durumunun yüksek doğrulukla belgelenmesi amacıyla fotogrametrik ölçüm teknikleri ile yersel lazer tarama yöntemleri bir arada kullanılmıştır. Bu hibrit belgeleme yaklaşımı, hem geometrik hem de dokusal özelliklerin hassasiyetle kaydedilmesini mümkün kılmıştır.*

*Elde edilen veriler sistematik biçimde sınıflandırılarak dijital ortama aktarılmış ve SketchUp yazılımı kullanılarak detaylı 3B modeller üretilmiştir. Bu modellerde yapıların iç mekân unsurları olan minber, mihrap, ahşap tavan detayları gibi ögeler ayrıntılı şekilde modellenmiştir. Üç dönem için ayrı ayrı hazırlanan bu modeller, yapının farklı zamanlardaki fiziksel ve işlevsel durumlarını kullanıcıların görsel ve mekânsal olarak deneyimleyebileceği bir formatta sunmayı amaçlamaktadır.*

*Dijital modeller, sanal gerçeklik ortamına aktarılmak üzere Unity oyun motoruna entegre edilmiştir. Unity'nin kapsamlı VR geliştirme araçları, görsel programlama destekleri ve Meta Quest Oculus 3 gözlüğü ile olan uyumluluğu sayesinde kullanıcı etkileşimine açık, sürükleyici bir deneyim ortamı oluşturulmuştur. Uygulama içerisinde, kullanıcıların farklı dönemlere ait modellere geçiş yapmalarına olanak sağlayan arayüzler ve kontrol mekanizmaları geliştirilmiştir. Böylece kullanıcılar, caminin üç ayrı tarihsel dönemine ait versiyonları arasında gezinebilmekte, mimari unsurları karşılaştırmalı olarak gözlemleyebilmektedir.*

*Bu çalışmanın en önemli çıktılarından biri, kültürel miras yapılarının sanal ortamlarda yeniden inşa edilerek deneyimlenebilir hale getirilmesidir. Bu yaklaşım, özellikle mimarlık ve sanat tarihi gibi disiplinlerde eğitim aracı olarak kullanılabileceği gibi, koruma ve restorasyon süreçlerinde karar vericilere önemli bir öngörü ve analiz imkânı sunmaktadır. Ayrıca, yapıların fiziksel erişiminin mümkün olmadığı durumlarda, sanal deneyim yoluyla toplumun geniş kesimlerine kültürel mirasın tanıtılması sağlanabilmektedir.*

*Sonuç olarak bu çalışma, geleneksel mimari belgeleme yöntemlerinin ötesine geçerek, dijital teknolojilerin kültürel miras alanındaki potansiyelini ortaya koymakta; görselleştirme, belgeleme ve eğitsel amaçlarla kullanılabilecek çok yönlü bir uygulama geliştirmektedir. Yapının tarihsel değişimini mimari ve mekânsal boyutlarıyla sanal ortamda deneyimlenebilir hale getiren bu yöntem, benzer projeler için örnek teşkil edecek nitelikte bütüncül bir metodoloji sunmaktadır.*

***Anahtar Kelimeler:*** *VR, Restorasyon, Geleneksel Cami, Dijital Rekonstrüksiyon.*

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# Integrating VR Systems into the Analysis Process of Historical Buildings: The Case of Inayetullah Mosque

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## Abstract

*This study aims to analyze the spatial and functional changes of the building known as Inayetullah Mosque in Çorum province through digital documentation techniques and virtual reality (VR) technologies. While the earliest archival record of the building dates back to 1926, architectural traces, material use, and comparative analysis with similar buildings in the region reveal that the building was constructed as a mosque in the early 20th century and converted into a mosque over time. The integration of the minbar and the wooden minaret stands as a pivotal element in the functional differentiation of the building.*

*The historical development of the building is divided into three main periods: the initial construction period (when it was used as a mosque), the post-repair period (when the minbar and minaret were added and functionally transformed into a mosque), and the current situation (when it gained its present architectural identity). Detailed restitution projects were prepared for each period, and three-dimensional digital models were created based on these projects. The data collection process involved a multifaceted approach, encompassing archival research and literary reviews, complemented by applying photogrammetric measurement techniques and terrestrial laser scanning methodologies. These methods were employed in conjunction to ensure the capture of precise and comprehensive data, facilitating a detailed documentation of the building's current state. This hybrid documentation approach enabled the precise recording of both geometric and textural features.*

*The data were systematically classified and digitized, and detailed 3D models using SketchUp software. These models are notable for their intricate depiction of interior elements, including the minbar, mihrab, and wooden ceiling details. These models, prepared separately for three periods, aim to present the physical and functional conditions of the building at different times in a format that users can experience visually and spatially.*

*The digital models were integrated into the Unity game engine to be transferred to the virtual reality environment. The Unity game engine's comprehensive VR development tools, coupled with its visual programming support and compatibility with Meta Quest Oculus 3 glasses, have been instrumental in creating an immersive experience environment that is open to user interaction. Interfaces and control mechanisms have been developed within the application to allow users to switch between models from different periods. Consequently, users can navigate between mosque models from three distinct historical periods and observe the architectural elements comparatively.*

*A significant finding of this study is the reconstruction of cultural heritage buildings in virtual environments, thereby making them experiential. This approach can function as an educational instrument, particularly in disciplines such as architecture and art history. Moreover, it offers decision-makers a valuable opportunity to gain insight and conduct analysis on conservation and restoration processes. Furthermore, in cases where physical access to the buildings is not possible, the cultural heritage can be introduced to large segments of the society through virtual experience.*

*Consequently, this study transcends conventional architectural documentation methods, underscoring the transformative capacity of digital technologies within the domain of cultural heritage. It has yielded a multifaceted application, proficient in visualizing, documenting, and facilitating education, thus paving the way for innovative research in the field. This methodology, which encompasses the historical transformation of the building with its architectural and spatial dimensions, can be experienced in a virtual environment. It offers a holistic methodology that can serve as an example for similar projects.*

***Keywords:*** *VR, Restoration, Traditional Mosque, Digital Recontruction.*

## 1. Giriş

Günümüzde sanal gerçeklik (Virtual Reality, VR) teknolojisi, kültürel mirasın korunması, deneyimlenmesi ve bu mirasa ilişkin bilgi üretiminin yeniden tanımlanması açısından kritik bir rol üstlenmektedir. VR teknolojisi; mimarlık, mühendislik, dijital beşeri bilimler, eğitim ve müzecilik gibi farklı disiplinlerde yalnızca bir temsil aracı değil, aynı zamanda düşünme ve deneyimleme biçimlerini dönüştüren yenilikçi bir platform olarak öne çıkmaktadır. Özellikle kültürel miras bağlamında VR, geçmişin izlerini taşıyan yapıların dijital olarak belgelenmesi, zaman içinde kaybolmuş ya da tahrip olmuş unsurların yeniden kurgulanması ve bu yapıların geniş kitlelerce erişilebilir hâle getirilmesi yönünde önemli fırsatlar sunmaktadır. Sanal ortamlar, kullanıcıların mekânsal bilgiye sezgisel, etkileşimli ve deneyimsel yollarla ulaşmasına olanak tanıyarak geleneksel iki boyutlu temsil yöntemlerinin sınırlarını aşmakta ve mimarlığın zamansal boyutunu da içerecek şekilde yeniden düşünülmesine imkân tanımaktadır (Yıldırım, 2024).

Son yıllarda, kültürel mirasın dijital ortama aktarılması ve sanal deneyimler aracılığıyla sunulmasına yönelik artan sayıda akademik çalışma dikkat çekmektedir. Khorloo vd. (2022), Karakurum Antik Kenti'nin sanal rekonstrüksiyonunu gerçekleştirdikleri çalışmada, VR teknolojisinin tarihî mirasın hem korunması hem de farklı toplumsal kesimlere aktarılması açısından sunduğu potansiyeli ortaya koymuşlardır. Pietroni ve Ferdani (2021), ise, sanal rekonstrüksiyon süreçlerinde kullanılan metodolojik ve görsel temsil tekniklerine yönelik eleştirel bir değerlendirme sunarak, dijital şeffaflık ve temsilin epistemolojik boyutlarını tartışmışlardır. Öte yandan, Rodriguez-Garcia vd. (2024) tarafından gerçekleştirilen sistematik derleme çalışması, sürükleyici VR (iVR) teknolojilerinin kültürel miras rekonstrüksiyonlarındaki kullanım biçimlerini, etkileşim düzeylerini ve teknik standartlarını analiz ederek, bu alanda karşılaşılan metodolojik sorunlara ve çözüm önerilerine dikkat çekmiştir.

Tüm bu çalışmalar, VR'ın kültürel mirasın deneyimlenmesinde kullanıcı merkezli bir yaklaşımı mümkün kıldığını ve tarihî yapıların farklı açılardan analizine olanak tanıdığını göstermektedir. Bununla birlikte, literatür incelendiğinde Osmanlı dönemine ait geleneksel cami yapılarının sanal ortama aktarılması, tarihsel evrimlerinin modellenmesi ve bu modellerin interaktif VR ortamlarında sunulması yönünde görece daha az sayıda çalışma bulunduğu gözlemlenmektedir.

Bu çalışma, Çorum ili Merkez ilçesi Karakeçili Mahallesi'nde yer alan ve İnayetullah Vakfı'na ait olan İnayetullah Camii'ni örnek vaka olarak ele almaktadır. İnayetullah Camii'nin farklı tarihsel evrelerine ilişkin üç boyutlu (3B) modeller oluşturulmuş ve bu modeller VR teknolojisiyle bütünleştirilerek etkileşimli bir dijital platforma aktarılmıştır. Böylece yapı hem mimari hem de tarihsel açıdan çok katmanlı bir biçimde analiz edilebilmekte; kullanıcılar ise caminin değişen mekânsal kurgusunu zamansal bir süreklilik içerisinde deneyimleme olanağı elde etmektedir. Çalışmanın nihai hedefi, dijital miras kavramını teknik bir araçtan öte, katılımcı ve erişilebilir bir anlatı ortamına dönüştürmek; aynı zamanda kültürel mirasın daha geniş kitleler tarafından anlaşılmasına ve değerinin fark edilmesine katkı sunmaktır.

## 2. 3B Model Oluşturulmasında Yazılımların Rolü

Sanal gerçeklik (Virtual Reality – VR) teknolojisinin kültürel mirasın dijital olarak belgelenmesi, yeniden inşası ve deneyimlenmesine yönelik uygulamaları, üç boyutlu (3B) modellerin oluşturulmasını ve bu modellerin etkileşimli ortamlarla bütünleştirilmesini zorunlu kılmaktadır. Bu süreçte kullanılan yazılımlar, görsel gerçeklik düzeyi, kullanıcı etkileşimi, platform uyumluluğu ve erişilebilirlik gibi parametreler doğrultusunda önemli rol oynamaktadır. Unity, Unreal Engine, Enscape ve Twinmotion gibi yazılımlar, kültürel miras alanında yürütülen dijital rekonstrüksiyon çalışmalarında farklı avantaj ve sınırlılıklarla öne çıkmaktadır.

Unity, açık kaynak kodlu yapısı, çok yönlü entegrasyon yetenekleri ve maliyet etkinliği gibi özellikleri sayesinde kültürel miras projelerinde yaygın olarak tercih edilen bir platformdur. Geniş bir model formatı yelpazesini desteklemesi ve ücretsiz lisanslama seçeneği, özellikle akademik projelerde kullanımını artırmaktadır. Ancak, sistemin işlevselliğinin artırılması için C# programlama dili üzerinden özel kodlamaların gerçekleştirilmesi gerekliliği, mimarlık ya da arkeoloji gibi teknik olmayan disiplinlerden gelen araştırmacılar için belirli zorluklar teşkil etmektedir (Al shawabkeh & Arar, 2024). Bununla birlikte, Unity'nin sahip olduğu geniş kullanıcı topluluğu, zengin çevrimiçi kaynakları ve geliştirici desteği, performans optimizasyonu ve teknik sorunların çözümünde önemli katkılar sağlamaktadır. Ciekanowska vd. (2021) tarafından gerçekleştirilen karşılaştırmalı bir çalışmada, Unity'nin sanal müze oluşturma sürecinde Unreal Engine'e kıyasla daha verimli olduğu saptanmıştır.

Unreal Engine, özellikle yüksek düzeyde görselleştirme gerektiren uygulamalarda öne çıkan bir diğer yazılımdır. Gelişmiş dinamik ışıklandırma sistemi, detaylı materyal yönetimi ve gerçek zamanlı render kapasitesi sayesinde kullanıcıya daha etkileyici ve gerçekçi deneyimler sunmaktadır (Rodriguez-Garcia vd., 2024). Kodlama bilgisi gerektirmeksizin görsel programlama yapmayı mümkün kılan Blueprint Visual Scripting özelliği, Unreal Engine'i teknik bilgi düzeyi düşük kullanıcılar için erişilebilir hale getirmektedir. Ayrıca, platformlar arası uyumluluk (PC, mobil, VR gözlükleri vb.) açısından sunduğu geniş seçenekler, bu yazılımın kültürel miras uygulamalarında tercih edilme oranını artırmaktadır (Al shawabkeh ve Arar, 2024). Rodriguez-Garcia vd. (2024), gerçekleştirdikleri sistematik derlemede, Unreal Engine'in özellikle Level of Detail (LoD) ve Level of Scale (LoS) bakımından Unity'ye kıyasla daha üstün sonuçlar verdiğini ortaya koymuşlardır. Nanite teknolojisi sayesinde yüksek poligon sayısına sahip modellerde dahi performans kaybı yaşanmamakta, bu da yazılımın büyük ölçekli ve detaylı tarihi yapılarla çalışma potansiyelini artırmaktadır. Ek olarak, Virtual Scouting ve Multi-User Editing gibi modüller, çoklu kullanıcı ortamlarında iş birliği odaklı geliştirme süreçlerini mümkün kılmaktadır.

Enscape ve Twinmotion, özellikle mimari tasarım ve görselleştirme süreçlerinde kullanılan, hızlı render alma ve kullanıcı dostu arayüz özellikleriyle öne çıkan yazılımlardır. VR destekli işlevler içermekle birlikte, interaktif senaryo üretme ve kullanıcı etkileşimini özelleştirme noktasında Unity ve Unreal Engine kadar güçlü değildirler. Twinmotion, sahne animasyonları ve etkileşimli öğeler ekleme konusunda kolaylık sağlamakta; ancak yapısal olarak daha çok görsel sunumlara odaklanmaktadır (Banfi & Oreni, 2025).

Bu çalışmada, yukarıda belirtilen karşılaştırmalar doğrultusunda Unity yazılımı tercih edilmiştir. Seçim sürecinde yazılımın açık kaynaklı olması, yaygın kullanıcı desteği, dökümantasyon zenginliği ve maliyet etkinliği belirleyici faktörler olmuştur. C# programlama dili gereksinimi sebebiyle süreç içerisinde çeşitli zorluklarla karşılaşılmış olsa da, bu zorlukların üstesinden gelmek adına ChatGPT, Claude gibi yapay zekâ destekli araçlardan yararlanılmıştır. Böylelikle, hem yazılım öğrenme süreci desteklenmiş hem de dijital üretim süreçlerinin yapay zekâ ile entegrasyonu deneyimlenmiştir.

Çalışma kapsamında, İnayetullah Camii'nin farklı tarihsel evrelerini temsil eden üç boyutlu modeller oluşturulmuş ve bu modeller, Unity yazılımı aracılığıyla sanal gerçeklik platformuna entegre edilmiştir. Unity'nin sunduğu esneklik sayesinde kullanıcılar, yapıların dönemsel değişimlerini karşılaştırmalı olarak inceleyebilmekte, mimari detaylara yakın plan erişim sağlayabilmekte ve yapı ile etkileşimli bir deneyim kurabilmektedir. Ayrıca, proje ekibinin Unity platformuna olan aşinalığı, geliştirme sürecinin hızlanmasına ve karşılaşılan teknik sorunların hızlıca çözümlenmesine katkı sunmuştur. Sonuç olarak, interaktif özelliklerin özelleştirilebilirliği ve maliyet etkinliği gibi avantajlar göz önünde bulundurulduğunda, Unity, bu tür kültürel miras projeleri için işlevsel ve uygun bir platform sunmaktadır.

## 3. Metot

Bu çalışmada, İnayetullah Camii'nin tarihsel süreç içerisinde geçirdiği fiziksel ve işlevsel dönüşümlerin belgelenmesi ve sanal ortamda deneyimlenmesine olanak sağlayacak dijital bir modelleme ve etkileşimli sunum yöntemi benimsenmiştir. Bu yaklaşım üç temel aşamada yürütülmüştür: veri toplama, üç boyutlu modelleme ve sanal gerçeklik uygulamasının geliştirilmesi.

İlk aşamada, yapıya ilişkin tarihsel bilgi ve belgeler toplanmıştır. Bu kapsamda arşiv taramaları gerçekleştirilmiş, alanda yapılan gözlemler ve ölçümler aracılığıyla yapının mevcut durumu detaylı biçimde belgelenmiştir. Elde edilen veriler, yapının tarihsel gelişiminin analizine temel teşkil etmiş ve bu doğrultuda yapının üç farklı dönem altında incelenebileceği sonucuna varılmıştır. Her bir dönem için ayrı ayrı restitüsyon projeleri hazırlanarak, yapının tarihsel sürekliliği mekânsal olarak ortaya konulmuştur.

İkinci aşamada analiz sonucunda belirlenen üç döneme ilişkin restitüsyon verileri temel alınarak, SketchUp yazılımı aracılığıyla yapının üç boyutlu dijital modelleri oluşturulmuştur. Modelleme sürecinde yalnızca yapının dış mimarisi değil, aynı zamanda iç mekân öğeleri (örneğin, mihrap, minber, tavan detayları) de dahil edilerek ayrıntılı bir temsiliyet sağlanmıştır. Bu yaklaşım, kullanıcıların yapıyı her açıdan deneyimleyebileceği yüksek çözünürlüklü ve gerçekçi modellerin geliştirilmesine imkân tanımıştır.

Üçüncü aşamada 3 boyutlu modeller, sanal gerçeklik ortamına aktarılmak üzere Unity oyun motoruna entegre edilmiştir. Uygulamanın Meta Quest Oculus 3 VR gözlüğü ile uyumlu çalışabilmesi amacıyla, Unity içerisinde gerekli sahne yapıları oluşturulmuş ve APK formatında derlemeler gerçekleştirilmiştir. Kullanıcının her üç dönemi ayrı ayrı deneyimleyebilmesi amacıyla modeller arası geçişleri mümkün kılan kullanıcı arayüzleri ve hareket kontrolleri programlanmıştır.

Bu aşamada, kullanıcıların yapının farklı dönemlerine ait temsiller arasında geçiş yapabileceği bir navigasyon sistemi tasarlanmış; yönlendirme, konum değiştirme ve sahne geçişi gibi etkileşimsel fonksiyonlar uygulamaya entegre edilmiştir. Böylelikle, kullanıcılar VR gözlük aracılığıyla yapının geçmişten günümüze uzanan mekânsal dönüşümünü doğrudan deneyimleme fırsatı bulmuştur.

Süreç sonunda geliştirilen VR uygulaması test edilmiş ve yapının farklı dönemlerine dair sanal deneyim başarıyla gerçekleştirilmiştir. Bu kapsamda elde edilen çıktıların, hem koruma amaçlı belgeleme çalışmalarında hem de kültürel mirasın dijital ortamda aktarılmasında kullanılabilirliğine ilişkin değerlendirmeler yapılmıştır. Uygulamanın eğitim, tanıtım ve mimari analiz gibi farklı disiplinlerdeki potansiyel katkıları, proje çıktıları doğrultusunda ortaya konulmuştur.

## 4. Vaka Çalışması

### 4.1. İnayetullah Camii

Çorum İli, Merkez İlçesi, Karakeçili Mahallesi, 523 ada 1 parselde yer alan ve Karakeçili ile Kültür sokaklarının kesişim noktasında konumlanan İnayetullah Camii, mülkiyeti İnayetullah Vakfı'na ait bir dini yapıdır. Caminin inşa tarihine ilişkin Osmanlıca bir kitabe mevcut olmamakla birlikte, güney cephesinin güneybatı köşesinde yer alan Türkçe bir kitabede "İnayetullah Camii, Y. Tarihi 1902" ifadesi bulunmaktadır. Buna ek olarak, 1973 yılına ait Çorum İl Yıllığı'nda yapının 1318/1900 yılında halk tarafından inşa ettirildiği belirtilmektedir (Çorum İl Yıllığı, 1973). Caminin mihrap duvarındaki vitraylı pencerede yer alan 1318/1900 tarihi de bu bilgileri doğrular niteliktedir (Dündar, 2004).

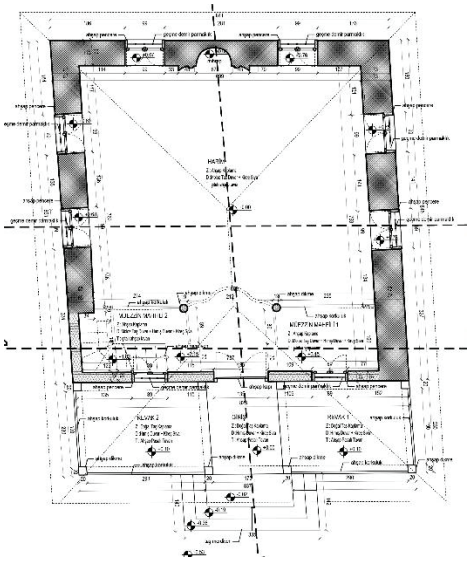
**İlk İnşa Dönemi (1900 – 1926 öncesi)**

İnayetullah Camii, Çorum İli, Merkez İlçesi, Karakeçili Mahallesi'nde konumlanmaktadır. Yapının günümüze ulaşan kitabesi bulunmamakla birlikte, güneybatı köşesindeki taş levhada "İnayetullah Camii, Y. Tarihi 1902" ibaresi yer almakta, mihrabın üst kısmındaki vitraylı pencerede ise 1318/1900 tarihi görülmektedir. 1973 tarihli Çorum İl Yıllığı da yapının halk tarafından 1900 yılında inşa ettirildiğini belirtmektedir.

Yapıya ilişkin en erken tarihli arşiv kaydı ise 1926 yılına aittir ve Vakıflar Genel Müdürlüğü arşivlerinde yer almaktadır. Her ne kadar daha erken bir belge bulunmasa da, mevcut mimari izler ve karşılaştırmalı analizler doğrultusunda yapının 20. yüzyıl başlarında mescit olarak inşa edildiği anlaşılmaktadır.

Bu dönemde yapı, derinlemesine dikdörtgen planlı, sade, tek katlı bir mescit görünümündedir. Doğu, batı ve kuzey cepheleri kerpiç yığma duvarlarla örülmüştür. İç mekânda özgün mihrap nişi, sağındaki duvar dolabı ve vitraylı pencere bu döneme aittir. Yapının kuzeyindeki mahfil, sınırlı büyüklükte tutulmuştur. Son cemaat yeri ise ahşap sütunlarla taşınan, yarı açık bir mekân olarak düzenlenmiştir.

Minber bu dönemde mevcut değildir. Bu durum, yapının ilk aşamada sadece mescit olarak kullanıldığını göstermektedir. Dolayısıyla bu dönemdeki dini kullanım biçimi, cuma namazı gibi toplu ibadetleri kapsamayacak şekilde, daha çok mahalle ölçekli günlük ibadetlere yöneliktir (**Şekil 1**).



**Şekil 1:** Birinci dönemde yapının durumu (Çorum İl Yıllığı, 1973)

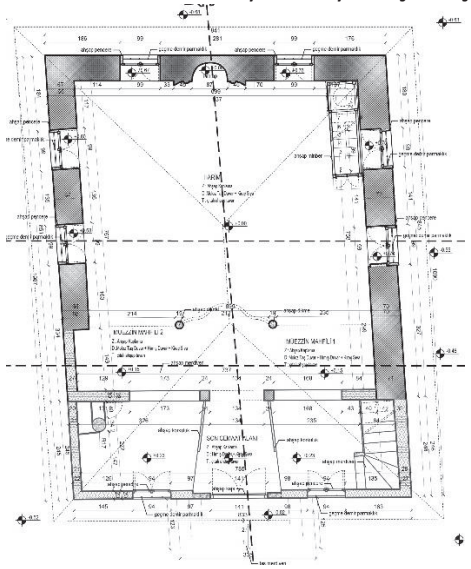
**İkinci Dönem: Fonksiyonel Dönüşüm ve Camiye Evrilme (1926 – 1963)**

1926 tarihli arşiv kaydının ardından, yapıda işlevsel ve yapısal değişikliklerin başladığı bir dönem gözlenir. Bu değişimlerin en önemlisi, yapının mescit kimliğinden cami kimliğine evrilmesidir. Bu dönüşümdeki en belirleyici unsurun, minberin yapıya eklenmesi olduğu düşünülmektedir. Minberin varlığı, cuma namazı ve hutbe gibi ibadetlerin bu yapıda gerçekleştirilmesine imkân tanımış, böylece yapı resmen bir cami işlevi kazanmıştır.

Minber ile eş zamanlı olarak, ahşap minarenin de bu dönemde eklendiği değerlendirilmektedir. Minarenin çekirdeğini oluşturan ahşap seren, müezzin odasına kadar uzanmakta ve her iki kattan da erişilebilmektedir. Minare, caminin mahalle ölçeğindeki dinsel ve sosyal statüsünü güçlendiren bir unsur olarak dikkat çeker.

Bu dönem aynı zamanda mahfilin kuzey yönünde genişletildiği, bu bölümde ahşap karkas (hımış) sistemin tercih edildiği, aralarının ise kerpiçle doldurulduğu bir müdahale dönemidir. Bu inşa tekniği, duvar kalınlıklarında da fark edilmektedir.

Son cemaat yerinin açık formu zamanla değişmiş, mahfilin genişletilmesi ve yapının kuzey cephesinde kapatmalar yapılmasıyla, özgün cephe karakteri bu dönemde kısmen kaybolmaya başlamıştır (**Şekil 2**).

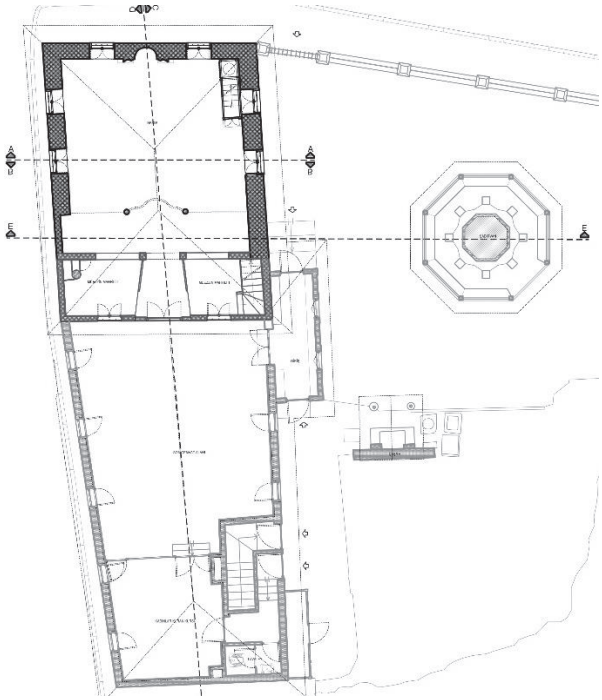


**Şekil 2:** İkinci dönemde yapının durumu

**Üçüncü Dönem: Ekler (1963 – 2003)**
Yapının en kapsamlı müdahalelere uğradığı bu dönem, 1963 yılında başlatılan onarımla başlamaktadır. Bu süreçte caminin kuzey cephesine ayakkabılık, batı avlusuna ise şadırvan ve tuvalet eklenmiştir. Bu düzenlemeler, cemaatin artan sosyal ihtiyaçlarına ve temizlik koşullarına yanıt olarak gerçekleştirilmiştir.

En öne çıkan değişiklikler ise 2003 yılı onarımında meydana gelmiştir. Bu onarımla birlikte, kuzey yönünde mevcut cami yapısından bağımsız fakat ona eklemlenmiş büyük bir yapı inşa edilmiştir. Bu yapı, giriş işlevini üstlenmekle kalmamış; aynı zamanda mahfil genişletilerek kadınlar için zemin kat, erkekler için bodrum kat tuvalet olarak işlevselleştirilmiştir. Şadırvan da batı yönüne kaydırılarak yeniden inşa edilmiştir.

Bu ek yapı, özgün yapının cephe düzeniyle oransal uyumsuzluklar taşımakta; özellikle mahfil katındaki yeni pencere açıklıkları ve boyutları, yapının ilk dönemine ait mimari ölçekle uyuşmamaktadır. Böylece cami, özgün mimari karakterinden uzaklaşarak günümüzdeki görünümüne kavuşmuştur (**Şekil 3**).



**Şekil 3:** Üçüncü dönemde yapının durumu

### 4.2. Unity Entegrasyonu ve VR Deneyimi

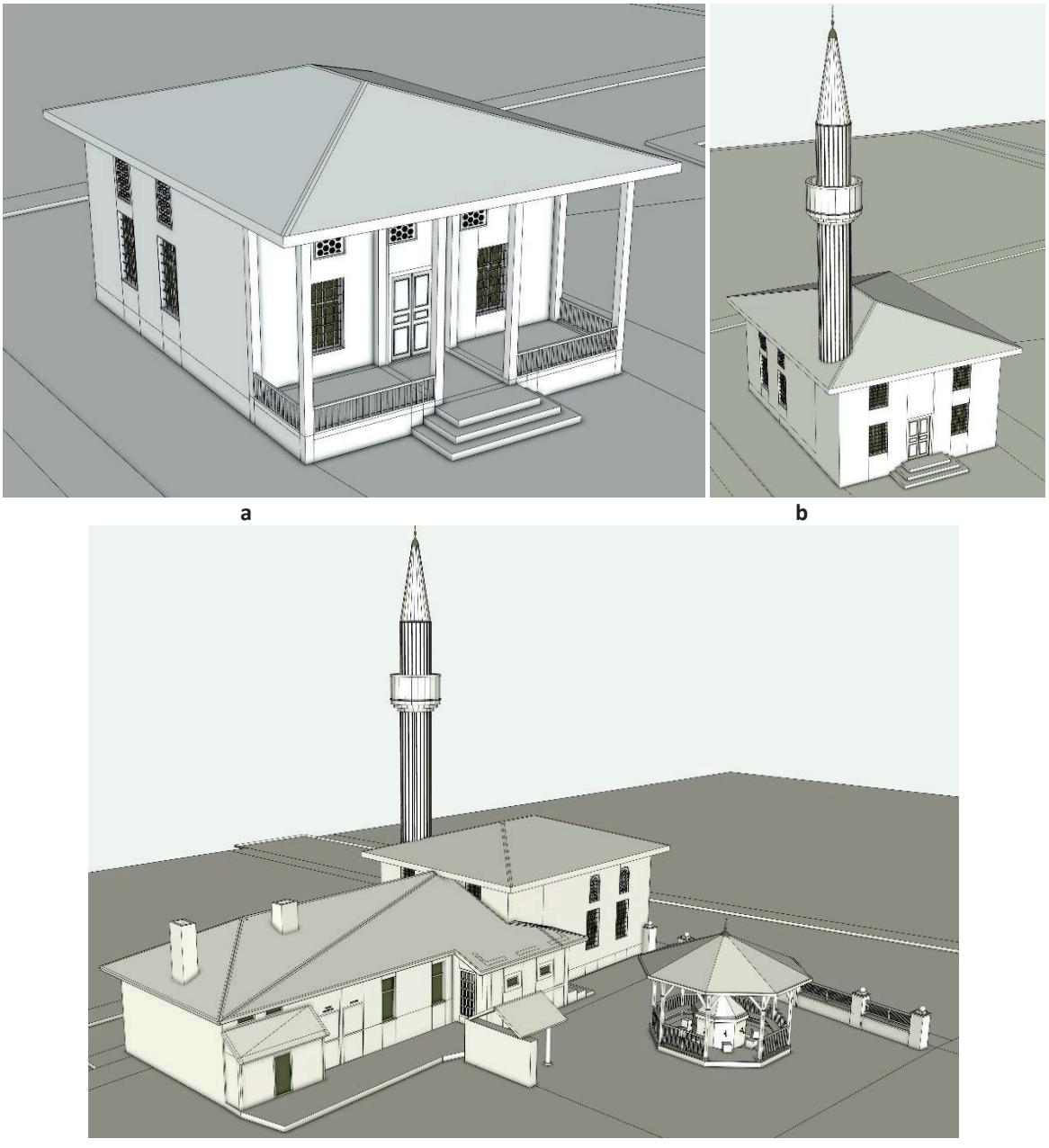
Bu çalışmada, yapının tarihsel gelişiminin sağlıklı bir şekilde izlenebilmesi amacıyla hem arşiv taraması hem de modern dijital dokümantasyon tekniklerinden faydalanılmıştır. Yapıya ilişkin tarihsel veriler, özellikle Vakıflar Genel Müdürlüğü ve diğer resmi kurum arşivlerinden elde edilen belgeler aracılığıyla toplanmıştır. Bu belgeler, yapının fonksiyonel ve mekânsal dönüşüm sürecine dair önemli ipuçları sunmaktadır.

Mevcut durumun yüksek doğrulukla belgelenmesi amacıyla fotogrametri ve yersel lazer tarama (Terrestrial Laser Scanning - TLS) teknikleri birlikte kullanılmıştır. Bu hibrit dokümantasyon yaklaşımı, yapının hem geometrik yapısını hem de yüzey dokularını milimetrik hassasiyetle kayıt altına alma imkânı sunmuştur. Elde edilen veri seti, dijital ortamda sistematik biçimde sınıflandırılarak hem arşivlenmiş hem de üç boyutlu modelleme süreçleri için altlık olarak kullanılmıştır.

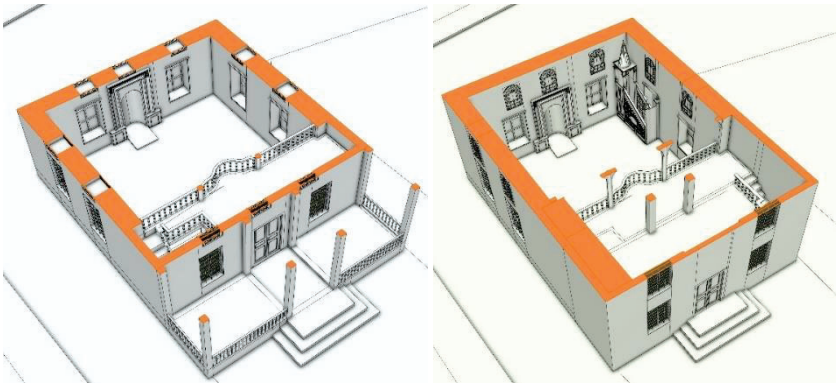
Yapının mimari evrimini daha iyi anlayabilmek ve farklı dönemler arasındaki değişimleri karşılaştırmalı olarak inceleyebilmek adına, SketchUp yazılımı kullanılarak yapının üç farklı döneme ait modelleri oluşturulmuştur. Söz konusu dönemler; yapının ilk inşa edildiği dönem, minber ve minarenin eklendiği ikinci dönem ve 2003 sonrası

müdahalelerin yapıldığı üçüncü dönemi kapsamaktadır. Her bir dönem için hem iç hem de dış mekân modellemeleri gerçekleştirilmiştir.

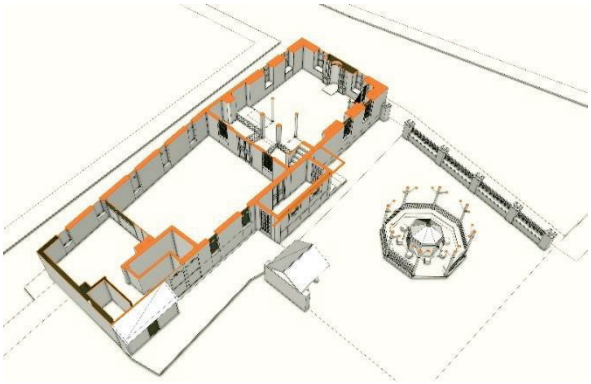
Modelleme sürecinde, yapı içindeki minber, mihrap, tavan kaplamaları ve pencere açıklıkları gibi mimari detayların yüksek çözünürlükte temsil edilebilmesine olanak tanınmıştır (**Şekil 4-5**). Böylece yapının dönemsel mimari dönüşümleri sadece görsel olarak değil, mekânsal deneyim açısından da karşılaştırmalı olarak analiz edilebilmiştir.



**Şekil 4:** Yapının 3 ayrı dönemine ait modeller (a: 1. Dönem, b: 2. Dönem, c: 3. Dönem)



a b



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**Şekil 5:** Yapının 3 ayrı dönemine ait iç mekân modelleri (a: 1. Dönem, b: 2. Dönem, c: 3. Dönem)

Oluşturulan üç boyutlu modeller, kullanıcıların yapının tarihsel gelişimini etkileşimli bir ortamda deneyimleyebilmesi amacıyla Unity oyun motoruna aktarılmıştır. Unity'nin tercih edilmesinin başlıca nedenleri arasında; kapsamlı VR geliştirme araçları sunması, farklı platformlarla geniş uyumluluğa sahip olması ve yaygın kullanıcı topluluğu desteği ile güçlü dökümantasyon altyapısı yer almaktadır. Unity'nin sunduğu görsel programlama arayüzü, teknik programlama bilgisine sahip olmayan kullanıcıların dahi temel düzeyde etkileşimli içerikler geliştirebilmesine olanak tanımaktadır.

Geliştirilen uygulama, Meta Quest Oculus 3 sanal gerçeklik başlığı ile uyumlu olacak şekilde, APK formatında derlenmiş ve sahne içi hareket kontrolleri, kullanıcı navigasyonu gibi özelliklerle desteklenerek kullanıcı deneyimi optimize edilmiştir. Böylelikle kullanıcılar, yapının üç farklı dönemini sanal ortamda gezerek, mekânsal ve tarihsel bağlamı doğrudan deneyimleyebilmektedir (**Şekil 6-7**).



**Şekil 6:** Modellerin VR ortamına aktarılması



a b



c

**Şekil 7:** VR ortamında yapının deneyimlenmesi (a: 1. Dönem, b: 2. Dönem, c: 3. Dönem)

## 5. Sonuçlar

Bu çalışma, İnayetullah Camii'nin tarihsel gelişimini ve dönüşümünü sanal gerçeklik (VR) teknolojileri ve dijital belgeleme yöntemleri kullanarak derinlemesine incelemeyi amaçlamıştır. Çalışma sürecinde, caminin tarihsel gelişimi üç ana döneme ayrılarak her bir dönemin özgün mimari özellikleri ve mekânsal dönüşümleri 3D modeller aracılığıyla görselleştirilmiştir. Fotogrametrik belgeleme ve yersel lazer tarama tekniklerinin birleşimi, yapının geometrik ve dokusal özelliklerinin yüksek hassasiyetle kaydedilmesini sağlamış, ardından SketchUp yazılımı ile elde edilen modeller Unity oyun motoruna aktarılmıştır. Bu sayede kullanıcılar, İnayetullah Camii'nin farklı dönemlerine ait mimari ve iç mekân detaylarını sanal ortamda deneyimleyebilmiştir.

Çalışmanın önemli çıktılarından biri, kültürel miras yapılarının dijital ortamda yeniden inşa edilerek hem korunmasının sağlanması hem de sanal ortamda deneyimlenebilir hale getirilmesidir. Bu yöntem, özellikle mimarlık, sanat tarihi ve restorasyon gibi disiplinlerde eğitim aracı olarak kullanılabilir. Yapının geçmişine dair bilgiye sahip olmayan kullanıcılar için interaktif bir deneyim sunulmuş, böylece tarihsel mirasa duyulan ilgi artırılmıştır. Ayrıca, yapıların fiziksel olarak erişilemez olduğu durumlarda sanal ortamlar, bu yapıları deneyimlemek için güçlü bir alternatif sunmaktadır.

Çalışmada elde edilen sonuçlar, kültürel mirasın dijital ortamda belgelenmesi ve sanal gerçeklik teknolojileriyle halkla buluşturulmasının önemini bir kez daha ortaya koymuştur. Bu yöntem, kültürel mirasın korunmasında yeni bir boyut açmakta ve gelecekte yapılacak benzer projeler için model teşkil etmektedir.

*Öneriler:*

Dijital Restorasyon Çalışmalarının Yaygınlaştırılması: İnayetullah Camii örneğinde olduğu gibi, tarihi yapıların dijital ortamda belgelenmesi ve sanal gerçeklik teknolojileriyle sunulması, kültürel mirasın korunmasına önemli katkı

sağlamaktadır. Bu tür çalışmaların yaygınlaştırılması, tarihî yapıların korunması ve gelecek nesillere aktarılması açısından kritik bir adım olacaktır. Benzer projelerin diğer tarihi yapılarda da gerçekleştirilmesi önerilmektedir.

Eğitim ve Araştırma Amaçlı Kullanım: Sanal gerçeklik ve 3D modelleme teknolojileri, mimarlık, restorasyon ve sanat tarihi gibi disiplinlerde eğitim aracı olarak kullanılabilir. Bu tür projeler, öğrencilere ve araştırmacılara tarihi yapıları detaylı bir şekilde inceleme fırsatı sunarak eğitim süreçlerini zenginleştirecektir. Ayrıca, bu teknolojilerin müze ve sergi alanlarında da kullanılmasına yönelik çalışmalar yapılabilir.

Sanal Miras Projeleri: Tarihi yapıların sanal ortamlarda halkın erişimine sunulması, kültürel mirasa olan ilgiyi artıracak ve bu mirasın korunmasına yönelik farkındalığı destekleyecektir. Bu tür sanal deneyimlerin kamuya açık hale getirilmesi, toplumun kültürel mirasa duyduğu saygıyı pekiştirecek ve mirasın korunmasına yönelik sosyal sorumluluk bilincini güçlendirecektir.

Çoklu Dönem ve Bölgelerin İncelenmesi: Çalışmada, yapının üç farklı döneminin dijital ortamda sunulması, yapıların geçirdiği değişimleri gözlemleme imkânı sunmuştur. Benzer projeler, birden fazla tarihi dönemi ve coğrafi bölgeyi kapsayacak şekilde genişletilebilir. Bu tür çalışmalar, yerel mimari çeşitliliği ve kültürel zenginliği daha geniş bir kitleye tanıtma fırsatı verebilir.

Sonuç olarak, bu çalışma İnayetullah Camii gibi kültürel miras yapılarının dijital ortamda belgelenmesinin ve sanal gerçeklik teknolojileriyle halkla buluşturulmasının önemini vurgulamaktadır. Bu tür projeler, sadece kültürel mirası koruma adına değil, aynı zamanda toplumun bilinçlendirilmesi ve eğitilmesi açısından da önemli bir araçtır. Gelecekte, bu çalışmaların daha geniş kapsamlı ve erişilebilir hale getirilmesi, kültürel mirasa duyulan ilgiyi ve saygıyı artıracaktır.

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# 20. YÜZYIL KENT TASARIM PARADİGMALARI ÜZERİNE İNCELEME

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**Özet**

1960'lı yıllardan itibaren kentsel tasarım, çok disiplinli ve normatif bir yaklaşım çerçevesinde gelişmiştir. Bu süreçte mekân kavramı, mimarlık, şehir planlama, sosyoloji, psikoloji ve çevre bilimleri gibi farklı alanların etkileşimiyle ele alınmış ve kentsel tasarım kuramları çeşitlenmiştir. Normatif kuramlar, iyi kent veya ideal kentsel parçanın nasıl olması gerektiğine dair ilkeler sunarken, estetik, işlevsel ve toplumsal boyutlara farklı ağırlıklar vermektedir. Kevin Lynch, normatif teorileri planlama, fonksiyonel ve normatif olarak sınıflandırmış; Roger Trancik, şekil-zemin, bağlantı ve yer teorileri ile mekânı yorumlamıştır. Ellin, Avrupa ve Amerika merkezli yaklaşımları ayrıştırarak postmodern kuramsal çerçeveyi açıklamıştır. Güncel teoriler, günlük kentsellik, Yeni Şehircilik ve post-yapısalcı yaklaşımlar üzerinden kent deneyimini yeniden tanımlar. Günlük kentsellik, sıradan mekânlar ve sosyal pratiklere odaklanırken; Yeni Şehircilik, yürünebilir, kompakt ve topluluk odaklı mekânları savunur. Post-strüktürel ve art-yapısalcı yaklaşımlar ise modernist bütüncüllüğün yerine çoğulcu, dinamik ve deneyim odaklı kent anlayışını koyar. Sonuç olarak, kentsel tasarım kuramları interdisipliner, normatif ve sürekli evrilen bir yapı sergiler; uygulamada ise mekânsal, toplumsal ve kültürel boyutları bütünleştirerek estetik ve işlevselliği dengelemeye çalışır.

**Anahtar Kelimeler:** Kent, kentsel tasarım, kent kuramları, kentsel tasarım paradigmaları

## A STUDY ON 20TH CENTURY URBAN DESIGN PARADIGMS

**Abstract**

Since the 1960s, urban design has developed within a multidisciplinary and normative approach. During this process, the concept of space has been addressed through the interaction of diverse fields such as architecture, urban planning, sociology, psychology, and environmental sciences, and urban design theories have diversified. While normative theories offer principles for what constitutes a good city or ideal urban segment, they place varying emphasis on aesthetic, functional, and social dimensions. Kevin Lynch categorized normative theories as planning, functional, and normative; Roger Trancik interpreted space through figure-ground, connection, and place theories. Ellin explained the postmodern theoretical framework by distinguishing between European and American-centric approaches. Contemporary theories redefine the urban experience through everyday urbanism, New Urbanism, and poststructuralist

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approaches. While everyday urbanism focuses on ordinary spaces and social practices, New Urbanism advocates for walkable, compact, and community-oriented spaces. Poststructural and poststructural approaches, on the other hand, replace modernist holism with a pluralistic, dynamic, and experience-oriented understanding of the city. Consequently, urban design theories exhibit an interdisciplinary, normative, and constantly evolving structure; in practice, they attempt to balance aesthetics and functionality by integrating spatial, social, and cultural dimensions.

**Keywords:** Urban, urban design, urban theories, urban design paradigms

## 1.GİRİŞ

1960'lı yıllardan itibaren kentsel tasarım alanında geliştirilen düşünceler ve teoriler, oldukça geniş bir çeşitlilik göstermektedir. Mekân kavramı ise tarih boyunca farklı disiplinlerin odağında yer almış, üzerine çok sayıda kuramsal yaklaşım üretilmiş ve günümüzde de üretilmeye devam eden çok boyutlu bir kavram olmuştur. Özellikle mekân üretimiyle doğrudan ilişkili meslek alanlarının temsilcileri, tarihsel süreç içerisinde süreklilik gösteren bir arayışın uzantısı olarak, hem kendi disiplinlerinden hem de ilişkili alanlardan kavramsal çıkarsamalar yaparak yeni mekânsal kuramlar ortaya koymuşlardır. Bu çoğulcu yapı, farklı yaklaşımları tanımak açısından zengin bir düşünsel ortam sunarken, aynı zamanda kavramsal karmaşaların da ortaya çıkmasına neden olmuştur.

Kentsel tasarım gibi uygulamaya dayalı bir disiplin açısından kuram; tasarım sürecinde karşılaşılan problemlere çözüm üretmeye yönelik ilkeler bütünü olarak tanımlanabilir. Kuramın yapısı, fiziksel ve sosyal bilimlerde farklı biçimlerde karşımıza çıkar. Fiziksel bilimlerde kuramlar çoğunlukla nicel olarak ölçülebilen, yani pozitif niteliktedir. Sosyal bilimlerde ise kuramlar normatif karakter taşır; mevcut durumdan ziyade nasıl olması gerektiği üzerine yoğunlaşır ve olması gereken duruma ilişkin öneriler sunar. Kentsel tasarım kuramı da bu ikinci kategoriye dâhildir. İnsan, yapılı çevre ve bu ikisi arasındaki ilişkilerin nasıl olması gerektiğine dair fikirsel bir çerçeve oluşturur; iyi kent ya da ideal kent parçasının ne şekilde kurgulanması gerektiğine dair normatif ilkeleri tanımlar (Karaman, 2001:49).

Kentsel tasarımın normatif yaklaşımları, nitelikli bir kentsel çevrenin nasıl oluşturulabileceği sorusuna odaklanır. Ancak en iyinin tanımı, değer yargılarına bağlı olarak değişkenlik gösterir ve bu durum, kentlerin hangi bakış açılarıyla kavramsallaştırıldığıyla doğrudan ilişkilidir. Bazı yaklaşımlar için estetik ölçütler belirleyici olurken, bazıları için kentin işlevsel kapasitesi, yani toplumsal yaşama ve üretim süreçlerine nasıl hizmet ettiği önem taşır. Diğer bazı görüşlerde ise kentin iyi olarak tanımlanması, gündelik yaşamın sosyal, kültürel ve ekonomik gereksinimlerini karşılama düzeyine bağlıdır (Stein, 2003). Değer yargılarındaki bu çeşitlilik, normatif kuramların kendi içinde de farklılaşmasına neden olmuştur. Bazı kuramlar, kenti toplumsal yapının bir yansıması olarak ele alır ve genellikle büyük ölçekli analizlere odaklanarak çevresel veya estetik değerlere sınırlı ölçüde yer verir. Diğer yandan, bazı yaklaşımlar kentsel formun estetik veya duyusal niteliklerine öncelik tanırken, işlevsel ya da toplumsal

gereksinimleri ikincil planda bırakır. Bunun dışında, mekânsal karakter, ulaşım, hareketlilik ya da enerji verimliliği gibi belirli temalar etrafında şekillenen kuramlar da mevcuttur.

Kentlerin karmaşık yapısı, barındırdıkları çeşitlilik ve çok katmanlı özellikleri, araştırmacıları konuyu belirli perspektiflerden ele almaya yöneltmiştir. Bununla birlikte, kentsel tasarım teorilerinin yalnızca bazı yönlerden başarılı olması ve önemli eksiklikler taşıması, büyük ölçüde bu dar ve tekil teorik yaklaşımlardan kaynaklanmaktadır.

## 2. NORMATİF KENTSEL TASARIM TEORİLERİ VE SINIFLANDIRMALAR

1960'lı yıllardan itibaren kentsel tasarım alanında geliştirilen kuramsal yaklaşımlar, çeşitlilik ve disiplinler arası etkileşim bakımından zengin bir birikim ortaya koymuştur. Bu kapsamda, normatif kentsel tasarım teorilerinin farklı araştırmacılar tarafından değişik ölçütler doğrultusunda sınıflandırıldığı görülmektedir. Her bir sınıflandırma, kent ve mekân kavramlarına dair farklı kavramsal, felsefi ya da ölçeksel perspektifleri yansıtmaktadır.

Bu çerçevede, Gosling ve Maitland (1984) normatif teorileri kavramsal kökenlerine göre sınıflandırırken, Broadbent (1990) bu teorileri felsefi yaklaşımları temelinde incelemiştir. Lynch (1981), teorileri yol gösterici metaforlar üzerinden değerlendirirken, Madanipour (1996), teorik yaklaşımları küçük veya büyük ölçekli kentlere dayanıp dayanmadıkları ölçütüne göre ayırmıştır (Stein, 2003).

Bu bağlamda Kevin Lynch, tarihsel süreçte kentlere ilişkin geliştirilen kuramları üç ana grupta toplamaktadır:

1. Planlama teorileri,

2. Fonksiyonel teoriler,

3. Normatif teoriler.

Planlama teorileri, kentsel gelişim süreçlerinde rol oynayan karmaşık toplumsal kararların nasıl alındığını ya da nasıl alınması gerektiğini sorgulayan yaklaşımlardır. Genellikle politik ve ekonomik karar mekanizmaları düzeyinde şekillenirler. Fonksiyonel teoriler, kentsel formun ortaya çıkışı, biçimlenme süreci ve işleyişine odaklanırken; normatif teoriler, insanın değerler sistemi ile mekânsal biçimlenme arasındaki ilişkiyi açıklamaya çalışır. Bu teoriler, kentsel formun neden ve nasıl belirli şekillerde oluştuğunu, ideal bir kent formunun hangi nitelikleri taşıması gerektiğini irdeleyen modeller sunar. Lynch, bu normatif teorileri de kendi içinde kozmik kent, mekanik kent ve organik kent olarak üç alt kategoriye ayırmaktadır (Lynch, 1981).

Roger Trancik (1986) ise modern dönemdeki mekân anlayışının üç temel kuramsal yaklaşıma dayandığını belirtmektedir.

Bunlardan ilki olan şekil-zemin teorisi, kentsel formun anlaşılmasında yapı kütleleri ile açık mekânlar arasındaki ilişkinin analizine odaklanır. Şekil-zemin analizleri, kentsel dokunun tanımlanmasında güçlü

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araçlar sunmakla birlikte, genellikle iki boyutlu ve statik bir mekân algısıyla sınırlı kalmaktadır. İkinci yaklaşım olan bağlantı teorisi, kentsel formun belirlenmesinde dolaşım ve hareket dinamiklerini temel alır; ancak mekânsal tanımlama açısından bütüncül bir çerçeve sunmakta yetersizdir. Üçüncü yaklaşım olan yer teorisi ise, açık kentsel alanlarda tarihsel, sosyal ve kültürel değerlerin ön plana çıktığı bir anlayışı temsil eder. Bu teori, sosyo-kültürel referansları tasarımın merkezine yerleştirir.

Kentsel tasarım teorilerine ilişkin farklı bir yaklaşım, Nan Ellin tarafından geliştirilmiştir. Ellin, Postmodern Urbanism (1999) adlı eserinde geç modern ve postmodern dönem kentsel tasarım teorilerini temelde iki ana kategoriye ayırır: Avrupa merkezli ve Amerika merkezli yaklaşımlar. Avrupa merkezli teoriler arasında neorasyonalizm, neoklasisizm, açık mimarlık, Fransız yaklaşımı ve mimarlık sergileri yer alırken; Amerika merkezli teoriler arasında townscape hareketi, katılımcı planlama, bölgeselcilik ve yerel tasarım, bağlamsalcılık, tarihsel eklektisizm, tarihsel koruma ve yenileme, eleştirel bölgeselcilik, planlı topluluklar, yeni geleneksel şehircilik ve postmodern kentsel tasarım bulunmaktadır.

Aslında, söz konusu tüm sınıflandırmalar, içerik bakımından benzer kuramsal temelleri paylaşmaktadır. Farklı araştırmacıların kendi kavramsal yaklaşımlarına göre oluşturdukları bu sınıflandırmalar, benzer fikirleri farklı üst başlıklar altında toplamaktadır. Bu durum, alan yazında kimi zaman kavram karmaşasına yol açabilmektedir. Dolayısıyla, kentsel tasarım teorilerinin sınıflandırılmasında, teorilerin toplumsal, biçimsel ve çevresel beklentileri karşılama düzeyleri esas alınarak yapılacak bir değerlendirme, daha bütüncül ve açıklayıcı bir perspektif sunacaktır.

***Sosyoloji / İnsan Merkezli Kuramlar***

Tasarımda insan algısı üzerine yapılan araştırmalarda, mekânın boyutsal, geometrik ve fiziksel özelliklerinin, bireylerin psikolojisi üzerindeki etkileri incelenmiştir. Bu bağlamda, insan–çevre etkileşimini psikolojik, sosyolojik, ekonomik ve kültürel davranış kalıpları üzerinden ele alan yaklaşımlar geliştirilmiştir. Kentsel çevrenin biçimlenmesini insan davranışlarıyla ilişkilendiren bu kuramlar, mekânın yalnızca fiziksel bir varlık değil, aynı zamanda toplumsal deneyimlerin yansıtıcısı olduğunu vurgular.

Bu kategori içerisinde Rapoport, Jacobs, Lynch, Venturi ve Lang gibi araştırmacıların çalışmaları öne çıkar (Karaman, 2002; Stein, 2003). Bunun yanı sıra, Gestalt kuramı çerçevesinde yapılan algı çalışmaları, Cullen'in ardışık mekân algısı üzerine geliştirdiği kuramlar ve Bacon'ın mekân-zaman ile mekân-hareket ilişkilerini vurgulayan çalışmaları da insan merkezli yaklaşımlara örnek oluşturmaktadır. Bu teoriler, bireyin mekânı deneyimleme biçimini çözümleyerek, tasarımın insani boyutunu ön plana çıkarır.

***Formal / Fiziksel Yapıya İlişkin Kuramlar***

Bu kuramsal grup, çevrenin mekânsal ve morfolojik özelliklerini analiz ederek biçimsel estetik bileşenleri çözümlemeye odaklanır. Kentsel formun oluşum sürecini sosyal ve kültürel bağlam içinde değerlendirmekle birlikte, ağırlıklı olarak fiziksel biçim ve yapısal düzen ön plandadır (Karaman, 2002;

Stein, 2003). Bu yaklaşımlar, yapılaşmış çevreyi görünür formu üzerinden yorumlar; dolayısıyla estetik, kompozisyon ve biçimsel bütünlük gibi kavramlar merkezî bir konumdadır. Bu kategorideki önemli teorisyenler arasında Aldo Rossi, Colin Rowe & Fred Koetter ve Christian Norberg-Schulz yer alır. Ayrıca, biçimsel yapıyı yorumlarken eleştirel ve kuramsal bir derinlik kazandıran Bernard Tschumi ve Rem Koolhaas gibi art-yapısalcı (post-structuralist) düşünürler de bu grupta değerlendirilebilir. Bu yaklaşımlar, kentin biçimsel yapısının yalnızca estetik bir nesne değil, aynı zamanda anlam üreten bir sistem olduğunu ileri sürer.

***Çevresel Kuramlar***

Çevresel kuramlar, insan merkezli ve biçimsel yaklaşımlar arasında konumlanan bir ara kategori olarak değerlendirilebilir. Bu kuramlar, yapılaşmış çevreyi yalnızca fiziksel bir düzen olarak değil, yaşamın sürdüğü bir mekân olarak ele alır. Dolayısıyla, çevresel değerler, yaşanabilirlik, toplumsal organizasyon ve sürdürülebilirlik kavramları bu kuramların temelini oluşturur.

Bu yaklaşımlar, yaşantının kalitesini mekânın fiziksel özelliklerinden çok, toplumsal örgütlenme biçimleriyle ilişkilendirir. Biçimsel kaygılardan büyük ölçüde uzak durarak, çevrenin birey ve toplum üzerindeki etkisine odaklanırlar. Bu kapsamda, Allan Jacobs, Donald Appleyard, Leon Krier ve Yeni Şehircilik (New Urbanism) hareketi çevresel kuramlara örnek olarak gösterilebilir (Stein, 2003). Bu teoriler, kentlerin insana ve topluma hizmet eden, ekolojik ve sosyal olarak sürdürülebilir mekânlar olarak tasarlanması gerektiğini savunur.

***Kentsel Tasarımda Yeni Yaklaşımlar***

Günümüzde kentsel tasarım kuramı, oldukça geniş ve çok yönlü bir düşünsel alan haline gelmiştir. Bu çeşitlilik içerisinde, son yıllarda öne çıkan üç temel eğilim dikkat çekmektedir: günlük kentsellik (everyday urbanism), yeni şehircilik (new urbanism) ve post-yapısalcı yaklaşımlar (post-structural approaches).

Bu üç ideolojik yönelim, çağdaş mimarlık paradigmasıyla paralel olarak gelişmiş ve tasarımın toplumsal, çevresel ve kültürel boyutlarını yeniden tanımlamıştır. Tarihselcilik, çevreselcilik ve yerellik gibi kavramlar da bu üç yaklaşımın içinde farklı biçimlerde temsil edilmektedir (Kelbaugh, 2001). Günlük yaşamın pratikleri, çevresel duyarlılık ve yerel kimlik arayışı; günümüz kentsel tasarım kuramlarının yönünü belirleyen başlıca parametreler olarak öne çıkmaktadır.

***Günlük Kentsellik (Everyday Urbanism)***

Günlük kentsellik yaklaşımı, kent yaşamının gündelik pratiklerine ve kamusal etkinliklerin gerçekleştiği sıradan mekânlara odaklanır. Bu bakış açısı, kenti öncelikle bir sosyal ürün olarak ele alır ve tasarımın temel hedefini, işleyen ve yaşanabilir bir gündelik yaşam biçimi oluşturmak olarak tanımlar. Mekân kadar zamanın da tasarım sürecinde belirleyici bir rol oynadığı bu yaklaşımda, günün gereksinimleri öncelikli kabul edilir.

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Yaklaşımın kuramsal temelleri, Henry Lefebvre ve Guy Debord gibi sosyal teorisyenlerin yaşam deneyimine dair geliştirdikleri düşüncelere dayanır. Günlük kentsellik, bu düşünceleri tasarımın diline ve pratiğine aktararak, mekânı yalnızca fiziksel bir varlık değil, aynı zamanda yaşanan bir süreç olarak ele alır. Bu çerçevede tasarımcının rolü, uzman otoritesinden çok, kullanıcı deneyimini güçlendiren bir katılımcı aracı haline gelir. Dolayısıyla, projeler genellikle katılımcı yaklaşımlar üzerine kuruludur; kullanıcıların sürece aktif olarak dâhil edilmesi öncelikli bir tasarım ilkesi olarak benimsenir.

Günlük kentsellik stratejik değil, taktiksel bir yaklaşıma sahiptir; kentte var olan durumları yeniden yorumlayarak, mevcut toplumsal dokunun içinden çözümler üretir. Özellikle Amerika ve Avrupa kentlerinde, bu düşünce doğrultusunda örgütlenen çeşitli kurumlar ve sivil inisiyatifler, kullanıcı odaklı yeni fikirler ve uygulamalar geliştirmektedir. Türkiye'de ise bu yaklaşımın dayandığı ölçekte bir toplumsal bilinç ve örgütlenme kültürü henüz tam anlamıyla oluşmamıştır.

Günlük kentsellik, ütopik ya da yapısalcı bir yaklaşım değildir. Ütopik olmamasının nedeni, gündelik yaşamın sıradanlığına ve kentteki gerçek deneyimlere odaklanmasıdır. John Kaliski ve Margaret Crawford'un vurguladığı üzere, kent tasarımı çoğulculuğa, eşzamanlılığa, geçiciliğe, uyumsuzluk ve karmaşaya açıklık göstermelidir. Bu yaklaşımı özgün kılan da, kentin biçimsel düzeninden ziyade, onun çoğulcu ve informel karakterine karşı geliştirilen bu açıklıktır. Yapısalcı olmaktan uzak durur çünkü fiziksel çevre ile sosyal davranış arasındaki karşılıklı ilişkiyi doğrudan bir etkileşim olarak kabul eder (Kelbaugh, 2001).

***Yeni Şehircilik (New Urbanism)***

Yeni Şehircilik hareketi, günümüz kentsel tasarım tartışmalarında en çok üzerinde durulan yaklaşımlardan biridir. Bu akımın temel amacı, herkes için daha yaşanabilir bir gelecek oluşturmak ve yapılaşmış çevrenin tasarımına insan ölçeğinde yeni bir perspektif kazandırmaktır. Yeni Şehircilik, yaşam kalitesini artırmak için geleneksel yerleşim biçimlerinden ilham alır; yürünebilir, kompakt, çeşitlilik içeren ve yaşantı açısından canlı mekânlar üretmeyi ya da mevcut yerleşimleri yeniden canlandırmayı hedefler.

Kelbaugh'a (2001) göre Yeni Şehircilik, hem biçimsel hem de toplumsal açıdan ütopyacı ve yapısalcı nitelikler taşır. Ütopyacıdır çünkü farklı sosyoekonomik ve kültürel grupların bir arada yaşayabildiği, eşitlikçi bir toplumsal düzen oluşturmayı amaçlar. Bu yaklaşım, çeşitlilik ilkesini yalnızca kullanıcı profiliyle sınırlamaz; farklı işlevlerin, kullanım biçimlerinin ve mimari tipolojilerin kamusal bir bütünlük içinde harmanlanmasını da öngörür. İlham verici yönü ise, bireysel dünyaların ötesine geçerek insanları bir toplumun ortak değerleriyle buluşturan kamusal mekânlar ve mimariler önermesidir. Yeni Şehircilik, ayrıca doğal çevreyle uyumlu kentsel yaşam biçimlerini savunur.

Bu yaklaşım, modern yaşamın yarattığı mekânsal parçalanmaya ve işlevsel ayrışmalara bir tepki olarak doğmuştur. Amaç, bireyin bilgi, duygu ve inanç dünyasıyla fiziksel çevresi arasında yeniden bir bağ kurmak; özel yaşam ile kamusal yaşam arasındaki kopukluğu gidermektir. Yeni Şehircilik, sosyal

davranış ile fiziksel form arasında doğrudan bir ilişki bulunduğunu savunduğu için strüktüralist bir çerçeveye sahiptir. Aynı zamanda normatif bir yön taşır; çünkü iyi tasarımın, mekânsal aidiyet ve topluluk duygusu üzerinde ölçülebilir biçimde olumlu etkiler yarattığını ve bu etkilerin sürdürülebilir bir toplum için hayati önemde olduğunu kabul eder.

Yeni Şehircilik'in fiziksel modeli; kamusal ve özel alanlar arasında net bir hiyerarşi, sosyal etkileşimi destekleyen açık mekânlar, yürünebilir mesafelerde kurgulanmış kompakt kentsel dokulara dayanır. Bu yaklaşımda meydanlar, parklar ve kamusal binalar, konut alanlarının odak noktalarını oluşturur ve topluluk yaşamının merkezinde yer alır.

Yeni Şehircilik'in temel ilkeleri şu şekilde özetlenebilir (CNU, 2004):

- Yürünebilirlik,
- Kentsel bağlantı ve süreklilik,
- Karma kullanım ve işlevsel çeşitlilik,
- Mimari ve kentsel tasarımda kalite,
- Geleneksel komşuluk yapısının korunması,
- Artırılmış yoğunluk,
- Akıllı ulaşım sistemleri,
- Sürdürülebilirlik,
- Yaşam kalitesinin artırılması.

Bu akımın önemli temsilcilerinden Peter Calthorpe, The Next American Metropolis adlı eserinde, nitelikli kentsel çevrelerin nasıl oluşturulabileceğine ilişkin kapsamlı bir kuramsal ve pratik çerçeve sunar. Kitabın ilk bölümünde Yeni Şehircilik'in temel felsefesini, ikinci bölümde tasarım ilkelerini, son bölümde ise bu ilkelerin uygulamaya yansıdığı örnek projeleri ele alır (Velibeyoğlu, 1999). Calthorpe'a göre, II. Dünya Savaşı sonrası gelişme politikaları Amerikan kentlerinin toplumsal ruhunu zayıflatmıştır. Değişen yaşam biçimlerine rağmen, tasarımcıların eski üretim kalıplarını sürdürmeleri, kentlerin insani ölçekteki yaşantısını olumsuz etkilemiştir.

Calthorpe, bu durumu aşmak için yalnızca estetik ya da biçimsel bir yenilenme değil, aynı zamanda sosyal, ekonomik, politik ve ekolojik sınırları gözeten bütüncül bir dönüşüm gerektiğini savunur. Bu doğrultuda, orta yoğunlukta, sürdürülebilir kentsel yaşama dayalı bir manifesto geliştirmiştir. Transit Oriented Development (TOD) kavramı, onun bu vizyonunun somut bir yansımasıdır. TOD yaklaşımı, ulaşım ağlarını hiyerarşik biçimde düzenleyerek, yaya ölçeğindeki yerleşimlerle toplu taşıma sistemleri arasında denge ve bütünlük kurmayı hedefler. Böylece, hem hareketliliği destekleyen hem de topluluk kimliğini güçlendiren insan merkezli kent modelleri önerir.

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***Post-Strüktürel Yaklaşımlar (Post-Urbanism)***

Post-strüktürel yaklaşımlar, 20. yüzyılın sonlarından itibaren özellikle Rem Koolhaas ve Bernard Tschumi gibi mimarlar tarafından öncülüğü yapılan ve kent kuramında köklü bir paradigma değişimini temsil eden düşünsel bir yönelimi ifade eder. Bu yaklaşımlar, modernist kent planlamasının düzenli, rasyonel ve bütünlüklü yapısına karşı çıkarak, günümüz kentlerinin dijitalleşme, iletişim teknolojileri ve küreselleşme ile dönüşen yeni dinamiklerini kavramsallaştırmaya çalışır.

Post-strüktürel kentsel düşünce, bir anlamda içinde yaşadığımız çağın bilgi ve iletişim teknolojilerinin mekânsal ve toplumsal etkilerine odaklanır. Bu bağlamda, mimarlık ve şehircilik artık yalnızca fiziksel biçim üretimi değil, aynı zamanda akışkanlık, belirsizlik, hız ve sürekli dönüşümün mekânsal ifadesi haline gelir. Bu yaklaşım, kentsel alanı durağan bir bütünlük olarak değil, sürekli değişen bir ağlar sistemi olarak görür; bu nedenle de geleneksel kent morfolojisinin sınırlarını aşar.

Rem Koolhaas, post-strüktürel düşüncenin en belirgin temsilcilerinden biri olarak, kenti sabit bir formdan ziyade dinamik bir olgu şeklinde tanımlar. Ona göre, çağdaş kentler ne tamamlanmış bir görsel kompozisyon ne de tutarlı bir mimari kimlik taşır; aksine, rastlantısallığın ve çeşitliliğin yarattığı bir çekiciliğe sahiptirler. Kent, sürekli olarak seçimlerin, değişimlerin ve etkileşimlerin üretildiği bir sahneye dönüşmüştür. Bu bağlamda, kentteki dönüşümleri nostaljik veya korumacı tepkilerle reddetmek yerine, yeni teknolojik ve kültürel dinamikleri tasarım sürecine entegre etmek gerektiğini savunur

Koolhaas'ın Generic City kavramı, bu yaklaşımın özünü açıklar niteliktedir. Generic City, bilgi çağının etkisiyle kimliğini, sınırlarını ve özgünlüğünü yitirmiş, ancak aynı zamanda sonsuz bir etkileşim ve paylaşım potansiyeli barındıran yeni bir kent formunu temsil eder. Bu tür kentlerde, kamusal yaşamın önemli bir kısmı sanal ortamlara taşınmış, fiziksel mekân ise yalnızca bu dijital yaşantının bir uzantısı haline gelmiştir.

Koolhaas'a göre günümüz kentinde tartışılması gereken temel mesele, artık biçimsel bütünlük ya da planlama ilkeleri değil, beğeni, deneyim ve estetik olmalıdır. Kentsel mekânın kaybolduğuna, mimarlığın işlevsizleştiğine ya da şehircilik disiplininin anlamını yitirdiğine dair melankolik yaklaşımları reddeder. Bunun yerine, mevcut durumun kabul edilmesi ve çağın dinamiklerini yansıtan yeni bir mimari ve kentsel temsil dili geliştirilmesi gerektiğini öne sürer (Sigler, 1998).

Bu bağlamda post-strüktürel yaklaşımlar, modernist bütüncüllüğün yerine parçalanmış, çoğulcu ve esnek bir kentsel anlayışı koyar. Kent, bu bakış açısında planlanması gereken bir nesne değil, sürekli evrilen bir süreç olarak görülür.

***Tschumi ve Art-Yapısalcı Yaklaşımlar***

Bernard Tschumi, art-yapısalcı mimarlık ve şehircilik düşüncesinin önde gelen temsilcilerinden biridir. Kuramsal yaklaşımını olay (event) kavramı üzerine temellendirir. Event-Cities adlı eserinde, mimarlığın yalnızca fiziksel biçimlerden ibaret olmadığını; zaman, olay ve deneyim aracılığıyla anlam kazanan,

toplumsal yaşamla birlikte şekillenen dinamik bir bütün olduğunu ileri sürer. Tschumi'ye göre, çağdaş dönemde mimari yapılar yalnızca biçimsel bileşenleriyle tanımlanamaz; kentin süreklilik arz eden hareket ve eylem döngüsü, kentsel oluşumun temel belirleyicilerinden biridir. Bu nedenle kentsel devinim, bir tür katalizör görevi üstlenerek mekânın üretiminde kurucu bir unsur haline gelir (Tschumi, 1996). Bu yaklaşımın en somut örneği, Tschumi'nin Parc de la Villette projesidir. Bu proje, geleneksel kentsel park anlayışını dönüştürerek, mekânı yalnızca dinlenme ve rekreasyon alanı olmaktan çıkarıp, çok katmanlı deneyimlerin yaşandığı olay mekânları dizisine dönüştürmüştür.

Art-yapısalcı düşünceye göre, günümüz dünyası parçalanmış, ayrıştırılmış ve hiper-tüketim odaklı bir yapıya sahiptir. Bu nedenle, geleneksel değerlere, kalıplaşmış paylaşımlara ve sabit kimliklere bağlı kalmak, çağdaş yaşamın dinamik doğasına uygun değildir. Art-yapısalcı mimarlar, içinde yaşadığımız çağın bilgi, teknoloji, iletişim ve tüketim kültürü tarafından şekillendiğini kabul ederler. Bu nedenle, mevcut mekânsal düzenlere ve klasik kentsel planlama ilkelerine duyulan güvenin sarsılması, onları geleneksel mimari anlayışa karşı eleştirel bir konuma taşımıştır (Kelbaugh, 2001). Bu düşünce akımı, tıpkı modernizm gibi, sıklıkla soyut ve deneysel bir mimari dil benimser. Ancak modernistlerin aksine, tarihsel ya da fiziksel bağlama güçlü göndermelerde bulunmaz; hatta kimi zaman tamamen kopar. Art-yapısalcı tasarımlar, alışılmadık biçimler üretmeyi ve kullanıcıda şaşkınlık ya da sorgulama uyandırmayı hedefler.

Rem Koolhaas, Peter Eisenman, Zaha Hadid, Daniel Libeskind, Bernard Tschumi ve Frank Gehry gibi isimler, farklı eğilimlere sahip olmalarına karşın, art-yapısalcı mimarlık ve şehircilik başlığı altında bir araya gelirler. Bu mimarlar, düzen, istikrar ve otorite gibi modernist kavramları reddederek, tasarımı belirsizlik, çokluk ve dinamizm üzerine kurarlar. Felsefi olarak, Jacques Derrida ve Michel Foucault gibi post-yapısalcı düşünürlerin fikirlerinden etkilenmişlerdir. Onların amacı, kentsel kaosu ortadan kaldırmak değil, aksine bu kaosa estetik bir değer kazandırmaktır. Frank Gehry'nin yapıları bu anlayışın tipik örneklerindendir. Gehry, biçimsel olarak yerel dokudan kopuk, hatta kimi zaman baskın karakterdeki tasarımlarını, açık, demokratik ve özgürleştirici bir kent vizyonu olarak yorumlar. Art-yapısalcı projeler, çoğu zaman bağımsız ve özerk birer tasarım nesnesidir; kentsel dokunun bütüncül yapısına eklemlenmektense, kendi iç mantığıyla var olur.

Bu yaklaşımın temel özelliği, statik ve öngörülebilir mimarlığın yerine, sürekli değişen, esnek ve deneyim odaklı bir tasarım anlayışını koymasıdır. Art-yapısalcı mimarlık ve şehircilik, dolayısıyla, bağlamdan çok bireyselliği; süreklilikten çok anlık olay ve hareketi önemser. Bu yönüyle, mimari ürünler çoğu zaman tasarımcının kişisel imzasını taşıyan, benzersiz mekânsal deneyimler olarak ortaya çıkar (Kelbaugh, 2001).

## 3.DEĞERLENDİRME VE SONUÇ

Kentsel tasarım kavramı, farklı disiplinlerin kesişim noktasında yer alan, çok boyutlu ve tartışmalı bir alandır. Bu durumun temel nedeni, kentsel tasarımın yalnızca mimarlık ya da şehir planlama disipliniyle

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sınırlı kalmaması; sosyoloji, psikoloji, ekonomi, çevre bilimleri, peyzaj mimarlığı ve sanat gibi alanlarla doğrudan ilişkili olmasıdır. Dolayısıyla her disiplin, kendi yöntemsel ve düşünsel perspektifinden hareketle kentsel tasarım kavramına farklı anlamlar yüklemektedir. Bu bağlamda literatürdeki temel kavramsal ayrışmalar; kentsel tasarımın yöneldiği kentsel dokunun ölçeği, kentsel çevrenin görsel ve mekânsal değerlerinin önceliği, sosyal-toplumsal değerlerin tasarımdaki rolü, kentsel tasarımın bir süreç mi yoksa bir ürün mü olduğu tartışması, disiplinler arası ilişkilerin niteliği, kamu ve özel sektör arasındaki etkileşim ve tasarımın nesnelliği ya da öznelliği gibi konularda yoğunlaşmaktadır. Bu farklı yaklaşımlara karşın genel bir tanımlama yapmak gerekirse, kentsel tasarım; yapılı çevreyi bilinçli biçimde şekillendirmeyi ve yönetmeyi amaçlayan bir süreçtir. Disiplinlerarası bir etkinlik olarak, kentlerin estetik, biçimsel ve işlevsel organizasyonunu sağlarken, aynı zamanda toplumsal değerleri ve kullanıcı katılımını göz önünde bulundurur. Bu yönüyle kentsel tasarım, yalnızca fiziksel biçimlendirme eylemi değil, aynı zamanda sosyal etkileşimi ve kamusal yaşam kalitesini düzenlemeye yönelik bir süreçtir.

Bu dönemin önemli düşünürleri arasında yer alan Jane Jacobs, Kevin Lynch, Christopher Alexander ve Gordon Cullen, modernizmin evrenselci ve tek tipçi anlayışını eleştirerek, insan merkezli, algısal ve deneyim odaklı kentsel çevrelerin nasıl oluşturulabileceğine dair çeşitli fikirler geliştirmişlerdir. Onların katkılarıyla, kentsel tasarım, yalnızca fiziksel bir düzenleme etkinliği olmaktan çıkarak, insan davranışlarını, mekânsal algıyı ve toplumsal dinamikleri dikkate alan daha bütüncül bir yaklaşıma evrilmiştir. Kentsel tasarımın bu çok boyutlu yapısı, kuramsal düzlemde farklı sınıflandırmaların doğmasına neden olmuştur. Bu sınıflandırmaların yanı sıra, günümüz kent teorisinde üç yeni eğilim ön plana çıkmaktadır: gündelik kentsellik (everyday urbanism), yeni şehircilik (new urbanism) ve post-yapısalcı yaklaşımlar (post-structural approaches). Bu yaklaşımlar, modern kentlerin dinamik yapısına ve toplumsal çeşitliliğine farklı perspektiflerden yanıt arayan güncel teorik yönelimler olarak değerlendirilmektedir.

Sonuç olarak, kentsel tasarım kavramı hem tanımsal hem de kuramsal düzeyde çok sesli bir yapı sergilemektedir. Bu durumun en önemli nedenlerinden biri, kentsel tasarımın doğası gereği interdisipliner bir alan olması ve bu alandaki fikirlerin çoğunlukla belirli bakış açılarından türetilmesidir. Bununla birlikte, kentsel tasarım kuramlarının genellikle normatif nitelikte olması uygulama düzeyinde çeşitli belirsizlikler yaratmaktadır. Dolayısıyla kentsel tasarım, hem kuramsal hem de pratik düzlemde sürekli tartışılan ve gelişmeye açık bir alan olarak varlığını sürdürmektedir.

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# ÜNİVERSİTE KAMPÜSLERİNDE TASARIM SÜRECİNE ETKİ EDEN FAKTÖRLER

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## Özet

Üniversite kampüslerinin tasarım süreci, mekânsal düzenlemelerden kullanıcı gereksinimlerine kadar çok sayıda faktör tarafından etkilenmektedir. Bu çalışmada, üniversite kampüslerinde tasarım sürecini belirleyen başlıca etkenler; fiziki, sosyo-ekonomik ve işlevsel faktörler çerçevesinde incelenmiştir. Fiziki faktörler, arazi topografyası, iklim koşulları, doğal ve yapılı çevre unsurları gibi mekânın somut özelliklerini kapsamakta ve tasarımın mekânsal düzenini doğrudan şekillendirmektedir. Sosyo-ekonomik faktörler ise üniversite kullanıcılarının demografik özellikleri, mali kaynaklar, toplumsal ihtiyaçlar ve kentsel bağlam ile ilişkili olarak tasarım kararlarını etkilemektedir. İşlevsel faktörler ise akademik programlar, sosyal kullanım alanları, ulaşım ve altyapı gereksinimleri gibi kampüsün etkin ve verimli çalışmasını sağlayacak mekân ihtiyaçlarını belirlemektedir. Bu üç faktör arasındaki etkileşim, kampüs tasarımında bütüncül bir yaklaşımın önemini ortaya koymaktadır. Araştırma, planlama sürecinde her bir faktörün dikkate alınmasının, kampüsün mekânsal niteliğini, kullanıcı deneyimini ve sürdürülebilirliğini artırdığını vurgulamaktadır. Sonuç olarak, üniversite kampüslerinin tasarımında fiziki, sosyo-ekonomik ve işlevsel faktörlerin dengeli ve eşgüdümlü biçimde değerlendirilmesi, çağdaş ve kullanıcı odaklı kampüslerin ortaya çıkmasına olanak sağlayacaktır.

**Anahtar Kelimeler:** Üniversite kampüsleri, planlama, tasarım, tasarım süreci.

## FACTORS AFFECTING THE DESIGN PROCESS IN UNIVERSITY CAMPUSES

## Abstract

The design process of university campuses is influenced by numerous factors, from spatial arrangements to user needs. This study examines the primary factors determining the design process on university campuses within the framework of physical, socio-economic, and functional factors. Physical factors

encompass the tangible characteristics of the space, such as land topography, climatic conditions, and natural and built environmental elements, and directly shape the spatial layout of the design. Socio-economic factors, on the other hand, influence design decisions in relation to the demographic characteristics of university users, financial resources, social needs, and urban context. Functional factors, on the other hand, determine the spatial requirements that will ensure the effective and efficient operation of the campus, such as academic programs, social areas, transportation, and infrastructure requirements. The interaction between these three factors highlights the importance of a holistic approach in campus design. The research emphasizes that considering each factor in the planning process enhances the spatial quality, user experience, and sustainability of the campus. Consequently, a balanced and coordinated evaluation of physical, socio-economic, and functional factors in the design of university campuses will enable the emergence of contemporary and user-focused campuses.

**Keywords:** University campuses, planning, design, design process.

## 1.GİRİŞ

Modern dönemde, bilim ve felsefenin doğuşu insan topluluklarının ilerlemesi ve toplumsal iş bölümünün gelişimiyle yakından ilişkilidir. Bu süreçte üniversiteler, uzun süre boyunca kilise, cami ve benzeri dini kurumların etkisi altında kalmış, yaratıcı bir konumdan ziyade bu kurumların uzantısı olarak biçimlenmiştir. Üniversiteler, toplumsal iş bölümünün gelişimine paralel olarak okul kavramının bir devamı şeklinde ortaya çıkmıştır (Timur, 2000). Dolayısıyla, üniversite kavramı tarihsel açıdan oldukça eski bir geçmişe sahiptir ve farklı dönemlerde değişen anlamlar kazanmıştır. Üniversite terimi, Latince kökenli *universitas* sözcüğünden türemiştir ve bu kelime, ortak çıkarları bulunan bağımsız bir tüzel kişilik olarak tanımlanır (Turcan, 1996; Öztürk, 2009).

Kampüs kavramı ise, ortaçağda *castrum* (askeri kamp) anlayışından etkilenerek, tekrarlanan ünitelerden oluşan düzenli bir bütün fikrine dayanır. Bu fikir, ilk kez Amerika Birleşik Devletleri'nde, belirli bir düzeni koruyarak gelişen bir yapılar topluluğu biçiminde ortaya çıkmıştır (Aydemir, 1975). Kortan'a (1981) göre, ilk üniversiteler *universitas magistrorum et scholarium* ifadesiyle tanımlanmış; yani öğretmenler ve öğrencilerin oluşturduğu bilim toplulukları olarak görülmüştür. Günümüzde ise üniversite kavramı bilimlerin birliği anlamına gelen *universitas literarum* şeklinde kullanılmaktadır (Çınar, 1998). Kampüs sözcüğü kelime anlamı olarak açık alan veya düzlük anlamına gelir ve genellikle şehir içinde ya da dışında konumlanan, akademik ideallerin mekânsal biçime dönüştüğü yeşil alanlı akademik yerleşkeleri ifade eder (Turner, 1995). Üniversiteler, tarih boyunca bulundukları coğrafyanın ekonomik, siyasal, sosyal ve teknolojik koşullarına bağlı olarak farklı biçimlerde gelişmiştir. İlk üniversiteler, orta çağ Avrupa'sındaki feodal düzenin etkisiyle şekillenen kurumlardı. Bu dönemde, özgür düşünceye ve modern bilim anlayışına dayalı bir eğitim sistemi henüz gelişmemişti. Dolayısıyla, ilk üniversitelerin temel amacı bilimi ilerletmekten çok, var olan dini bilgi düzenini sürdürmekti. Bu

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nedenle üniversiteler, tarihsel süreçte ortaya çıktıkları toplumsal yapıların ekonomik ve kültürel koşulları çerçevesinde değerlendirilmelidir (Aytaç, 1992; Öztürk, 2009).

Benzer biçimde Kısakürek (1986) de ilk üniversitelerin dini kurumlara bağlı olarak ortaya çıktığını, bu kurumların Papa ya da hükümdarların otoritesi altında din temelli eğitim verdiklerini belirtir. Kortan'ın (1981) aktardığına göre, orta çağ üniversitelerinde iki temel öğretim yöntemi uygulanmıştır: takrir (lectio) ve tartışma (disputationes). Tartışma yöntemi, günümüzün seminer sistemine benzer bir yaklaşımdı ve olağan tartışmalar (disputation ordinaire) ile olağanüstü tartışmalar (disputation quodliberales) olmak üzere ikiye ayrılıyordu. Olağanüstü tartışmalar halka açık biçimde yürütülür, katılımcılar yalnızca belirli bir konuyla değil, çeşitli bilim alanlarıyla ilgili sorular sorarak fikir alışverişinde bulunabilirlerdi. Bu yönüyle bu tartışmalar, ilerici bir anlayışı ve halka açık üniversite düşüncesini yansıtmaktaydı (Kortan, 1981; Öztürk, 2009).

Günümüzde üniversiteler; fakülte, enstitü ve yüksekokullardan oluşan, bilimsel araştırma, eğitim ve yayın faaliyetlerini bir arada yürüten kurumlardır. Bu kurumlar, elde ettikleri bilimsel bulguları toplumun sosyal, ekonomik ve siyasal gelişimine katkı sağlayacak biçimde kullanabilecek bireyler yetiştirir (Kaya, 1981). Bir başka ifadeyle, üniversiteler hem meslek insanlarını yetiştirir hem de araştırma yoluyla bilgi üretip topluma sunan en üst eğitim basamağını oluşturur (Keleş, 1972). Çağdaş yükseköğretim kurumları, toplumsal değişimi yönlendirme gücüne sahip yapılar olarak sosyal, ekonomik, politik ve teknolojik dönüşümlerde önemli bir rol üstlenirler. Üniversiteler yalnızca bilgi aktaran kurumlar değil, aynı zamanda eleştirel düşünceyi besleyen, yeni bilgi üreten ve toplumsal değerleri yeniden şekillendiren yapılardır. Bu yönüyle, üniversite sistemi yalnızca mesleki eğitim sağlayan bir mekanizma değil, aynı zamanda bilim, kültür ve ideoloji üreterek toplumun gelişiminde etkin rol oynayan bir kurumdur (Öner, 1999; Öztürk, 2009). Bu bağlamda kent içinde önemli konumda olan üniversite kampüslerinin tasarım ve planlama stratejileri de mimarlık alanı için önemli bir alanı teşkil eder. Bu çalışma, üniversite kampüslerinde tasarım sürecine etki eden faktörleri irdelemeyi amaçlamaktadır. Bu amaç doğrultusunda öncelikle, kampüs-kent ilişkileri daha sonra fiziki, sosyo-ekonomik ve işlevsel faktörler ele alınacaktır.

## 2. ÜNİVERSİTE KAMPÜSLERİNDE PLANLAMA KARARLARI

Tarihsel gelişim süreci incelendiğinde, ilk üniversitelerin genellikle kent merkezlerinde konumlandığı görülmektedir. Ancak II. Dünya Savaşı sonrasında ortaya çıkan yeni gereksinimler, üniversitelerin kent dışına taşınmasını ve bu bölgelerde kampüs biçiminde örgütlenmesini beraberinde getirmiştir. Bu doğrultuda çalışmada üniversite kampüsleri, konum stratejileri açısından iki temel başlık altında değerlendirilmiştir: kent içi üniversiteler ve kent dışı üniversiteler.

Amerika Birleşik Devletleri'nde başlangıçta kentten tamamen bağımsız bir yerleşim modeli olarak tasarlanan kampüs kavramı, zamanla gelişerek kentin bir mikrokozmosu şeklinde algılanmış ve çeşitli kentsel işlevleri üstlenen bir yapıya dönüşmüştür (Turner, 1995; Öztürk, 2009). Amerikan

üniversitelerinin kent dışındaki biçimlenme süreci, iki ana evrede incelenebilir: İlk Amerikan üniversiteleriyle birlikte ortaya çıkan, Amerikan Devrimi'nin ardından biçimlenen ve Endüstri Devrimi sonrasında yaygınlaşan kent dışı kampüsler ve 19. yüzyılın sonlarında Alman üniversite modelinin etkisiyle gelişen, kent merkezine dönüş eğilimini temsil eden kent içi kampüsler (Sönmezler, 2003; Öztürk, 2009). Türkiye'deki duruma bakıldığında, 1950'li yıllara kadar üniversitelerin çoğunlukla şehir merkezlerinde yer aldığı görülmektedir. Ancak daha sonraki yıllarda özellikle ABD öncülüğünde kent dışı kampüs anlayışı benimsenmeye başlanmıştır (Türeyen, 1999). Günümüzde ise hem kent içi hem de kent dışı üniversite yerleşim modellerinin eşzamanlı olarak gelişimini sürdürdüğü gözlenmektedir.

***Kent İçi Kampüsler***

Kent içi üniversitelerin gelişim süreci, aynı zamanda üniversite kurumunun tarihsel evrimiyle paralellik göstermektedir. İlk üniversiteler, başlangıçta şehir merkezlerinde yer alan çeşitli yapılarda eğitim faaliyetlerine başlamış; zamanla kiliselerin denetimi altındaki kolejlerden, şehir dokusu içerisinde kendi bölgelerini oluşturan eğitim alanlarına dönüşmüştür. İngiltere'de Oxford ve Cambridge örnekleri, bu dönüşümün en belirgin biçimde gözlendiği yerleşimlerdir; her iki kent de zamanla üniversite kenti kimliği kazanmıştır (Sönmezler, 1995; Öztürk, 2009). Üniversiteler tarihsel süreç içerisinde, kent içinde dağınık biçimde yer alan küçük kolej yapılarından, birbirine bağlı binalardan oluşan daha bütünleşik kurumlara evrilmiştir. Ancak bu dönüşüme rağmen, aynı üniversiteye ait yapıların kentin farklı bölgelerinde yer aldığı durumlar da görülmektedir.

Türkiye'de bu duruma örnek olarak, Ayazağa Kampüsü kurulmadan önceki İstanbul Teknik Üniversitesi yerleşimi ile Ankara Üniversitesi gösterilebilir (Erkman, 1990). Kentlerin henüz birkaç yerleşimden oluşan küçük ölçekli yapılar olduğu ve ulaşımın genellikle yaya olarak sağlandığı dönemlerde, farklı bölgelerde konumlanan üniversite binaları iletişim açısından büyük zorluklar yaratmamaktaydı. Aksine, bu durum kentsel yaşamla bütünleşen olumlu bir etki sağlamaktaydı. Kent içi üniversitelerin temel sorunlarından biri olan büyüme ve genişleme ihtiyacı ise, o dönemlerde kentsel alanların henüz yoğun olarak kullanılmaması nedeniyle kısmen karşılanabiliyordu; böylece yeni yapıların inşasına ve mekânsal genişlemelere uygun koşullar bulunabiliyordu (Erkman, 1990; Öztürk, 2009).

Kent merkezinde konumlanan Illinois Institute of Technology (IIT) ve Massachusetts Institute of Technology (MIT) gibi üniversiteler, sahip oldukları avantajlı konumları sayesinde, kent içi kampüslerin tek işlevli yapılarından kaynaklanabilecek olası olumsuzlukları azaltan örnekler olarak değerlendirilebilir (Öztürk, 2009) (Şekil 1).

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**Şekil 1**. a) MIT, Cambridge, Amerika, b) IIT, Illinois, Chicago, Amerika (Öztürk, 2009)

Türkiye'de ise kent içi yerleşim örnekleri arasında İstanbul Teknik Üniversitesi, Ege Üniversitesi, Ankara Üniversitesi, Akdeniz Üniversitesi, Mimar Sinan Güzel Sanatlar Üniversitesi, Yıldız Teknik Üniversitesi, İstanbul Üniversitesi ve Hacettepe Üniversitesi sayılabilir. Bu üniversiteler, köklü geçmişleriyle erken dönem kent içi kampüs modelini temsil etmektedir (Öztürk, 2009).

***Kent Dışı Kampüsler***

1960'lı yıllardan itibaren, özellikle Avrupa'da üniversitelerin kent merkezlerinden uzaklaşarak kent dışı alanlarda konumlanmaya başladığı görülmektedir. Erkman (1990), kent dışı kampüslerin hem avantajlar hem de dezavantajlar barındırdığını vurgulamaktadır. Bu kampüslerin olumsuz yönleri incelendiğinde, kent merkezindeki üniversitelerin kütüphane, müze, sergi salonu, seminer ve kongre etkinlikleri aracılığıyla topluma sunduğu kültürel katkıların, kent dışına taşınmayla birlikte azaldığı görülmektedir. Şehir merkezinde yer alan üniversiteler, bu etkinlikler aracılığıyla halk ile entelektüel çevre arasında bir etkileşim kurabiliyorken, kampüslerin şehir dışına taşınması bu ilişkinin zayıflamasına yol açmıştır (Erkman, 1990; (Öztürk, 2009).

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Buna karşın, kent dışı kampüslerin çeşitli olumlu yönleri de bulunmaktadır. Geniş alanlara sahip olmaları sayesinde çağdaş ve teknolojik olarak donanımlı eğitim ve araştırma ortamları oluşturulabilmekte; fiziksel olarak büyüme ve gelişme olanağı sağlanmaktadır. Ayrıca farklı bilim dalları arasındaki etkileşimi kolaylaştıran mekânsal bütünlük, kampüs içi ulaşımın daha etkin düzenlenebilmesi ve ortak sosyal alanların yoğun biçimde kullanılabilmesi gibi avantajlar da sunmaktadır (Erkman, 1990). Kent dışı kampüsler, bulundukları bölgelerde yalnızca eğitim alanları oluşturmakla kalmayıp, çevrelerindeki kentsel gelişimi de yönlendirme potansiyeline sahiptir. Bu tür kampüsler, kentin dışında yer alan alanların dönüşümünü tetikleyerek yeni yerleşimlerin ve ekonomik odakların oluşmasına katkıda bulunur. Bu duruma Stanford Üniversitesi örnek olarak verilebilir (Öztürk, 2009) (Şekil 2).



**Şekil 2**. Stanford Üniversitesi California, Amerika (Öztürk, 2009)

## 3. ÜNİVERSİTE KAMPÜSLERİNDE PLANLAMA SÜRECİNİ ETKİLEYEN FAKTÖRLER

Schmitt (2007), başarılı bir kampüs tasarımı oluşturabilmek için üç temel koşulun sağlanması gerektiğini belirtmektedir. İlk olarak, ortak bir vizyonun oluşturulması gereklidir. Master plan hazırlanmasına geçmeden önce, kampüste yaşam sürecek bireylerle ve çevredeki topluluklarla etkileşim kurularak geleceğe yönelik ortak bir vizyonun tanımlanması önem taşır. İkinci koşul, tamamlayıcı bir programın geliştirilmesidir. Bu kapsamda kampüs tasarımında, disiplinlerarası etkileşimi destekleyen alanlar ve iş birliğine açık programlar kurgulanmalıdır. Bu yaklaşım, kampüsün yalnızca akademik bir alan olmaktan çıkıp, endüstri ortakları gibi farklı aktörlerle etkileşime girerek topluma ve öğrencilere açık bir yapıya dönüşmesini sağlar. Böylece, kullanıcıların kurumsal kimliği güçlenmiş bir kampüsün parçası hâline gelmesi mümkün olur.

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Üçüncü koşul ise bütünleşik ve sürdürülebilir bir tasarım anlayışıdır. Bu anlayış, mimari yaklaşımlarla birlikte finansal stratejilerin de dikkate alındığı kapsamlı bir planlama sürecini gerektirir (Hoeger ve Christiaanse, 2007). Schmitt'e (2007) göre bu üç koşulun bir araya geldiği bir kampüs tasarımı, yalnızca günümüzün ihtiyaçlarına değil, aynı zamanda gelecek kuşaklara da hitap edebilecek nitelikte olacaktır. Bu tür projeler, toplum ve endüstrinin desteğini alarak araştırma ve eğitim alanında yenilikçi bir modelin oluşmasına zemin hazırlar (Öztürk, 2009).

Bu yaklaşım doğrultusunda, Christiaanse'nin geleceğe yönelik kampüs tipolojileri üzerine ortaya koyduğu görüşler, Schmitt'in planlama anlayışıyla paralellik göstermektedir. Gin'in (2007) aktardığına göre, günümüzde yalnızca tek işlevli üniversite alanları yerine, kamusal ve özel yaşamı bütünleştiren, dinamik ve sürdürülebilir kentsel kampüs alanları yaratmak ön plana çıkmaktadır. Bu nedenle, farklı coğrafyalardaki örneklerin analiz edilmesi ve kampüs tasarımındaki çağdaş eğilimlerin değerlendirilmesi büyük önem taşır. Günümüz koşullarında kampüs tasarımı yalnızca akademik işlevlerle sınırlı olmayıp; kültürel, sosyal, politik ve ekonomik bileşenleri de kapsayacak biçimde ele alınmalıdır. Bu bağlamda, mimarın rolü yalnızca iyi mekânlar üretmek değil, aynı zamanda ileriye dönük stratejik yaklaşımlar geliştirerek farklı bileşenler arasında etkili iletişim kurabilmektir. Kampüslerin hem kendi iç işleyişinde hem de kentle kurduğu ilişkide sürdürülebilir ve meşru bir varlık gösterebilmesi, bu bütüncül yaklaşımın benimsenmesine bağlıdır (Öztürk, 2009).

Üniversite kampüs yapıları planlama sürecine birçok faktörün etki ettiği bilinmektedir. Bu çalışmada, fiziki, sosyo-ekonomik ve işlevsel faktörler irdelenecektir.

### 3.1. Fiziki Faktörler

Kampüs planlamasında alan kullanımı (land use), kentsel planlama ilkelerinin kampüs ölçeğine yansıtılmasında temel bir unsurdur. Bu aşamayı takip eden bölge planı (district/precinct plan) ise, kampüs içindeki farklı akademik birimlerin (örneğin mühendislik, fen, beşerî bilimler vb.) birbirleriyle olan konumsal ilişkilerini ve yakınlık derecelerini belirleyen bir planlama düzeyidir. Alan kullanım kararlarının oluşturulması ve bölge planının hazırlanması, yerleşim planı (individual site planning) aşaması için ön hazırlık niteliği taşır. Yerleşim planı, fakülte ve diğer birimlerin kampüs genelindeki dağılımını gösterir; hem yeni yapılaşmalar hem de yenileme projeleri için yol gösterici bir çerçeve oluşturur. Bu aşamalar, kampüs tasarım sürecinin temel yapı taşlarını oluşturmakta ve sonrasında geliştirilen fiziksel planlama çalışmalarına zemin hazırlamaktadır (Öztürk, 2009).

Fiziksel planlama süreci, bu temeller üzerine inşa edilir ve kampüsün altyapı sistemleri ile birlikte barınma, ulaşım ve diğer mekânsal işlevlere dair düzenlemeleri içeren özel bir planlama aşamasıdır. Bu plan, kampüsün hem akademik hem de destekleyici programlarının mekânsal organizasyonunu bütüncül biçimde ele alır (Neuman, 2003).

Kampüs alanının değerlendirilmesinde dikkate alınması gereken başlıca fiziksel faktörler şunlardır:

- Arsanın sınırları, biçimi ve toplam alanı,
- Gelişme potansiyeli: rezerv alanların varlığı, doğal sınır koşulları ve ekonomik gelişim projeksiyonları,
- Mevcut yapı ve doğal unsurlar: korunacak, yıkılacak veya taşınacak yapılar ile enerji hatları,
- Çevresel etkiler: gürültü, koku, duman, titreşim ve çevre kirliliği gibi dışsal faktörler,
- Bölgenin sahip olduğu yerel mimari değerler.
- Bunlara ek olarak doğal faktörler de planlamada belirleyici rol oynar. Bu kapsamda;
- İklim koşulları,
- Alanın topografik, jeolojik, jeomorfolojik ve teknik nitelikleri (zemin yapısı, eğim durumu, hidrojeolojik özellikler vb.),
- Toprak yapısı,
- Doğal bitki örtüsü gibi çevresel bileşenler değerlendirilmelidir (Öztürk, 2009)

Kampüsün bulunduğu alanın yakın ve uzak çevresindeki yerleşim özellikleri, kampüsün kent dokusu içindeki konumu ya da şehir merkezine olan mesafesi, kampüs planlamasında dikkate alınması gereken temel etmenlerdendir. Bu doğrultuda, kampüs içi yaya ve araç trafiğinin düzenlenmesi ile kentle bağlantıyı sağlayan ulaşım sisteminin planlanması, kampüs yaşamının sürekliliğini ve işleyişini doğrudan etkileyen önemli bir unsurdur (Erkman, 1990; Öztürk, 2009).

Gelişmiş bir kampüs yapısında, mekânsal doku ve mimari bütünlük büyük önem taşır. Üniversitelerin zamanla büyüyerek çok sayıda farklı yapıdan oluşan büyük yerleşkeler haline gelmesi, özellikle birbirine benzeyen veya yinelenen birimlerin planlı bir biçimde tasarlanmasını zorunlu kılmıştır. Bu süreçte, belirli yapı kümelerinin belirli bölgelerde toplanması sonucunda, kampüs içerisinde doğal olarak çeşitli mimari dokular oluşmuştur. Bu dokular; yoğunluk açısından yüksek veya düşük yoğunluklu, yönlenme açısından ise iki ya da dört yönlü biçimlerde sınıflandırılabilir. Bazı üniversitelerde belirgin bir doku düzeni bulunmamakla birlikte, kampüsün bütününde dokusal bir karakterin oluşturulması, yapım süreci, mekânsal gelişim ve mimari bütünlük açısından olumlu bir yaklaşım olarak değerlendirilmektedir (Erkman, 1990; Öztürk, 2009).

Kampüsü oluşturan birimlerin, arazi üzerindeki işlevsel ilişkiler ve dolaşım sistemiyle uyumlu biçimde konumlandırılması planlama sürecinde kritik bir aşamadır. Bununla birlikte, söz konusu birimlerin iki ve üç boyutlu biçimlerinin yaklaşık olarak belirlenmesi de planın başarısı açısından önem taşır. Aksi halde, ortaya çıkan plan yalnızca sembolik bir şemadan ibaret kalır ve uygulamaya dönük bir yerleşim planı niteliği taşımaz. Bu nedenle, kampüs planlamasında görev alan tasarımcının; kampüs içinde yer alacak birimlerin mekânsal gereksinimlerini, örgütlenme biçimlerini ve üç boyutlu formlarını iyi analiz edebilmesi gerekmektedir (Türeyen, 1999; Öztürk, 2009).

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### 3.2 Sosyo-Ekonomik Faktörler

Günümüzde yalnızca çevresel ve enerji kaynaklarının korunması değil, aynı zamanda kültürel sürdürülebilirliğin sağlanması da önemli bir tartışma alanı haline gelmiştir. Hatta birçok durumda, kültürel sürdürülebilirlik çevresel sürdürülebilirlik kadar, hatta ondan daha fazla risk altındadır. Anadolu coğrafyasının sahip olduğu tarihsel birikim ve uygarlık geçmişi, bu açıdan evrensel ölçekte dikkate değer bir kültürel miras oluşturmaktadır. Kültürel süreklilik ile kentsel planlama arasındaki ilişki yalnızca teknik veya fiziksel bir düzenleme olarak değil, aynı zamanda bir yaklaşım biçimi ve değerler bütünü olarak ele alınmalıdır. Ancak günümüzde planlama pratikleri, uzun vadeli hedeflerden çok, günlük siyasi yönelimler ve kısa vadeli beklentiler doğrultusunda şekillenmektedir. Bu durum, plancıların mesleki ilkelerini uygulamaya aktarmasını güçleştirmekte; hazırlanan planların yaşama geçirilmesini sınırlamaktadır. Dolayısıyla planlama, tarihsel deneyimlerin birikiminden beslenen, geleceğe dönük ve bütüncül bir süreç olarak kurgulanmalıdır (Cebeci ve Çakılcıoğlu, 2002; Öztürk, 2009).

Kampüs planlaması bu perspektiften değerlendirildiğinde, kültürel faktörlerin önemli bir belirleyici olduğu görülür. Kampüsün içinde yer aldığı kentin yerleşim deseni, kentsel kimliği ve estetik görünümüyle uyumlu bir mekânsal kurgunun oluşturulması, hem kentle bütünleşik hem de sürdürülebilir bir tasarım anlayışını mümkün kılar. Özellikle tarihsel kimliği güçlü kentlerde, bu bütünleşme kültürel mirasın korunmasına ve kampüsün çevresiyle etkileşimini güçlendirmeye katkı sağlar.

Kampüs planlamasında ekonomik koşullar da sürecin yönünü belirleyen bir diğer kritik unsurdur. Arsa temini ve kampüsün fiziksel gelişimi, belirli bir bütçe gerektirir; dolayısıyla üniversitenin mali kaynakları ve sağlanan ekonomik destekler planlamanın ölçeğini doğrudan etkiler. Bu aşamada mülkiyet yapısı, imar planı, hukuki statü ve arsa değerleri dikkatle değerlendirilmelidir. Sınırlı bütçeye sahip üniversitelerde yeni kampüs alanlarının elde edilmesi çoğunlukla hazine veya kamu arazilerinin tahsisi yoluyla gerçekleşmektedir (Çınar, 1998; Öztürk, 2009). Arsa edinimi sonrasında yürütülen yapılaşma süreçlerinde de mevcut ekonomik kapasite, kampüsün gelişimini ve planlama kararlarını biçimlendiren başlıca faktörlerden biridir.

### 3.3 İşlevsel Faktörler

Kampüs planlamasında dikkate alınması gereken temel faktörlerden biri, kampüsün barındırdığı işlevlerin çeşitliliği ve bu işlevlerin mekânsal organizasyonudur. Erkman (1990) tarafından ifade edildiği üzere, gelişmiş bir üniversite kampüsünün temel amacı, eğitim-öğretim, araştırma ve uygulama faaliyetlerini etkin bir biçimde gerçekleştirebilmek için gerekli tüm fiziksel ve sosyal altyapıyı sağlamaktır. Bu kapsamda, kampüs yalnızca akademik faaliyetler için değil; aynı zamanda kullanıcılarının (öğrenciler, öğretim üyeleri ve idari personel) gündelik yaşam ihtiyaçlarını karşılayabilecek bir ortam sunmalıdır. Bu ihtiyaçlar arasında; çalışma alanları, barınma ve konaklama

imkânları, beslenme tesisleri, alışveriş olanakları, spor ve rekreasyon alanları, sağlık hizmetleri ile sosyal ve kültürel etkinlik alanları yer almaktadır. Bu çok yönlü yapı, üniversite kampüslerini, kendi içinde işleyen ve fonksiyonel olarak bağımsız birer üniversite kenti haline getirmektedir (Öztürk, 2009).

Kampüsün bu gereksinimleri karşılayamaması durumunda, akademik işlevlerin istenilen düzeyde yürütülmesi güçleşmektedir. Özellikle şehir merkezine yakın konumlarda dahi, öğrencilerin, öğretim üyelerinin ve diğer kampüs çalışanlarının kent içi ulaşım gereksinimleri; zaman, maliyet ve konfor açısından önemli sıkıntılar yaratabilmektedir. Bu durum, akademik faaliyetlerin verimliliğini ve kullanıcıların yaşam kalitesini doğrudan etkilemektedir (Türeyen, 1999; Öztürk, 2009).

Bu nedenle, özellikle kent dışı alanlarda konumlanan üniversite kampüslerinin, kendi kendine yeterli, bütüncül ve bağımsız bir mekânsal yapıya sahip olacak şekilde planlanması büyük önem taşımaktadır. Söz konusu planlama, kampüsün hem akademik hem de sosyal işlevlerini sürdürülebilir biçimde yerine getirmesine olanak sağlayacak şekilde; yapı yoğunluğu, mekân ilişkileri, dolaşım sistemleri, açık ve kapalı alan kullanımı, altyapı tesisleri ve destekleyici hizmetler açısından titizlikle tasarlanmalıdır. Böyle bir yaklaşım, yalnızca kampüs içi işlevlerin etkinliğini artırmakla kalmaz; aynı zamanda kullanıcıların yaşam kalitesini iyileştirir, kampüs ile çevresindeki kentsel doku arasında dengeli bir ilişki kurulmasına katkı sağlar ve üniversitenin kurumsal kimliğinin mekânsal bir yansımasını oluşturur.

Özetle, kampüs tasarımı, akademik, sosyal ve kültürel işlevleri bir arada ve uyumlu bir biçimde örgütleyebilen, kendi içinde işleyen bir sistem olarak ele alınmalıdır. Bu bağlamda, kent içi veya kent dışı konumlanmalarına bakılmaksızın, tüm üniversite kampüslerinin planlama süreçlerinde işlevsel yeterlilik, mekânsal bütünlük ve kullanıcı odaklı tasarım ilkeleri öncelikli kriterler olarak değerlendirilmelidir.

## 4. SONUÇ

Bu çalışmada, üniversite kampüslerinin tasarım sürecini etkileyen faktörler; fiziki, sosyo-ekonomik ve işlevsel boyutlar üzerinden ele alınmıştır. Analizler, kampüs tasarımının yalnızca mekânsal bir düzenleme değil, aynı zamanda akademik, sosyal ve kültürel gereksinimlerle bütünleşen çok boyutlu bir süreç olduğunu ortaya koymaktadır.

Fiziki faktörler, kampüsün topografyası, ulaşım bağlantıları, mevcut doğal ve yapılı çevre ile entegrasyonu, yapı yoğunluğu ve açık alan kullanımı gibi unsurları kapsamaktadır. Fiziki planlama, kampüsün estetik, kültürel ve çevresel değerlerle uyumlu olmasını sağlayarak uzun vadeli sürdürülebilirliği destekler. Ayrıca, mekânsal bütünlük ve dokusal kimlik, kampüsün akademik ve sosyal işlevlerinin etkinliği açısından önemli bir belirleyici olarak öne çıkmaktadır.

Sosyo-ekonomik faktörler, kampüsün ölçeğini, konumunu, donatı kapasitesini ve kullanıcı profiline uygunluğunu doğrudan belirlemektedir. Üniversitenin mali kaynakları, arazi edinimi ve bütçe olanakları, kampüsün gelişim potansiyeli ve işlevselliği üzerinde belirleyici rol oynar. Bu durum,

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özellikle ekonomik sınırlılıkları olan üniversitelerde, tasarımın sürdürülebilirliği ve kampüsün kendi kendine yeterliliği açısından kritik öneme sahiptir.

İşlevsel faktörler, kampüsün akademik ve sosyal işlevlerinin uyumlu biçimde yürütülmesini sağlayacak mekânsal ve organizasyonel düzenlemeleri ifade eder. Eğitim, öğretim, araştırma, uygulama ve destek hizmetlerinin etkin biçimde planlanması; kullanıcıların çalışma, barınma, beslenme, sağlık, spor ve sosyalleşme ihtiyaçlarını karşılayacak ortamların oluşturulmasıyla doğrudan ilişkilidir. İşlevsel açıdan bütüncül bir kampüs tasarımı, hem kent içi hem de kent dışı kampüslerde kullanıcı memnuniyetini ve akademik başarıyı artıracak bir temel oluşturur.

Bu bağlamda, üniversite kampüslerinin tasarımında sosyo-ekonomik, işlevsel ve fiziki faktörlerin birbirini tamamlayıcı biçimde değerlendirilmesi, planlamanın etkinliğini ve kampüsün uzun ömürlülüğünü artırmaktadır. Geleceğe dönük kampüs tasarımlarında, aşağıdaki yaklaşımların dikkate alınması önerilmektedir:

- Ekonomik ve arazi kaynaklarının verimli kullanımı: Kampüs alanlarının maliyet ve mülkiyet durumları, planlama sürecinin başından itibaren bütüncül biçimde değerlendirilmelidir.
- Kullanıcı odaklı işlevsel tasarım: Kampüs, akademik ve sosyal işlevleri dengeli biçimde sunacak şekilde planlanmalı; öğrenciler, akademisyenler ve idari personelin yaşam kalitesi öncelikli olarak ele alınmalıdır.
- Fiziki ve çevresel sürdürülebilirlik: Kampüsün doğal, kültürel ve kentsel çevresiyle uyumlu bir tasarım yaklaşımı benimsenmeli; mekânsal bütünlük, erişilebilirlik ve dokusal kimlik korunmalıdır.
- Bütüncül planlama stratejileri: Sosyo-ekonomik, işlevsel ve fiziki faktörler arasındaki etkileşimler dikkate alınarak, kampüs tasarımında uzun vadeli, esnek ve adaptif planlama modelleri geliştirilmelidir.

Sonuç olarak, üniversite kampüsleri yalnızca eğitim ve araştırma mekânları değil; aynı zamanda kültürel, sosyal ve ekonomik boyutlarıyla toplumla etkileşim içinde olan karmaşık sistemlerdir. Bu nedenle, kampüs tasarımında faktörlerin çok boyutlu değerlendirilmesi, hem kullanıcıların hem de kentin ihtiyaçlarını karşılayan sürdürülebilir ve işlevsel kampüsler yaratılmasını mümkün kılmaktadır.

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# MİMARLIKTA BAĞLAM KAVRAMININ ÇOK BOYUTLU YAPISININ İRDELENMESİ

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## Özet

Bu çalışma, mimarlıkta bağlam kavramını çok boyutlu yapısı içinde ele alarak, tasarım sürecindeki belirleyici rolünü tartışmaktadır. Bağlam, yalnızca fiziksel çevreyle sınırlı olmayan; tarihsel, kültürel, toplumsal, ekonomik ve çevresel bileşenleri kapsayan bütüncül bir kavram olarak değerlendirilmiştir. Mimarlıkta bağlam, yapının ait olduğu yer, zaman ve kültürle kurduğu ilişki aracılığıyla anlam kazanan dinamik bir sistemdir. Bu çerçevede, bağlamın yalnızca bir arka plan değil, aynı zamanda tasarımı biçimlendiren aktif bir öğe olduğu vurgulanmaktadır. Tasarımcı açısından bağlam, projenin yönünü belirleyen temel referans noktasıdır. Topoğrafya, iklim, malzeme, yönlenme ve sosyokültürel değerler gibi unsurlar, mimari bağlamın ölçütleri olarak ele alınmıştır. Bu ölçütler, yapının çevresiyle kurduğu ilişkileri tanımlamakla kalmaz, aynı zamanda mimari ürünün kimliğini ve özgünlüğünü de belirler. Bağlamsal verilerin doğru analiz edilmesi, tasarımın fiziksel, estetik ve işlevsel bütünlüğünü güçlendirirken, yapının bulunduğu çevreyle uyumlu ve sürdürülebilir bir varlık göstermesini sağlar. Sonuç olarak, mimarlıkta bağlam kavramı, tasarımın yalnızca biçimsel değil, aynı zamanda düşünsel ve kültürel temellerini de biçimlendiren çok katmanlı bir yapıdır. Her mimari ürün, kendi bağlamı içinde özgün bir anlam kazanır ve bu anlam, yerin, kültürün ve zamanın etkileşimiyle sürekli olarak yeniden üretilir.

**Anahtar Kelimeler:** Mimarlık, mimari tasarım, bağlam, mimarlıkta bağlam

## EXAMINING THE MULTI-DIMENSIONAL STRUCTURE OF THE CONCEPT OF CONTEXT IN ARCHITECTURE

## Abstract

This study examines the concept of context in architecture within its multidimensional framework and discusses its decisive role in the design process. Context is considered a holistic concept that encompasses historical, cultural, social, economic, and environmental components, not limited to the physical environment. In architecture, context is a dynamic system that gains meaning through the relationship a building establishes with its place, time, and culture. Within this framework, it is emphasized that context is not merely a background but also an active element shaping the design. For the designer, context is the fundamental reference point that determines the direction of the project.

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Elements such as topography, climate, materials, orientation, and sociocultural values are considered as criteria for the architectural context. These criteria not only define the relationship between the building and its surroundings but also determine the identity and originality of the architectural product. Accurate analysis of contextual data strengthens the physical, aesthetic, and functional integrity of the design, ensuring the building's harmonious and sustainable existence within its environment. Ultimately, the concept of context in architecture is a multilayered structure that shapes not only the formal but also the intellectual and cultural foundations of design. Every architectural product acquires a unique meaning within its context, and this meaning is constantly reproduced through the interaction of place, culture, and time.

**Keywords:** Architecture, architectural design, context, context in architecture

## 1. GİRİŞ

Türk Dil Kurumu (TDK), bağlam kavramını herhangi bir olguda olaylar, durumlar, ilişkiler örgüsü veya bağlantısı şeklinde tanımlamaktadır. Bu tanım doğrultusunda bağlam, bir olgunun yakın çevresinde yer alan diğer unsurlarla kurduğu ilişki ve etkileşim ağı olarak değerlendirilebilir.

Demirkaynak (2010), bağlamı geniş bir perspektiften ele alınması gereken, anlam kavramını bütüncül bir şekilde irdeleyen bir yapı olarak tanımlar. Bu yaklaşıma göre bağlam, düşüncenin dış dünyadaki somut ya da soyut karşılığını temsil eder. Düşüncelerin anlam ve niteliklerinin korunabilmesi için, bu düşünceler içinde bulundukları bağlamlar çerçevesinde değerlendirilmelidir. Her düşünce belirli bir bağlam içerisinde var olur ve anlam kazanır; dolayısıyla farklı bağlamlarda yer alan düşünceler farklı doğruluk ve geçerlilik ölçütleri taşır. Bir düşünce ya da düşünce sistemi, en iyi kendi bağlamı içinde anlaşılabilir.

Hekman'a (1999) göre bağlama bağımlılık, doğru veya yanlış değerlerinin tamamen ortadan kalktığı bir durumu değil, bu değerlerin bulundukları bağlama göre yeniden belirlendiği bir yapıyı ifade eder. Bağlam, bir olay veya durumu başka olaylarla ilişkilendirerek bir bütünlük oluşturur. Bu anlamda bağlam kavramı, belirli koşulların, durumların ve olayların bir araya gelmesiyle oluşan yapıyı tanımlar. Ayrıca, bir eylemi veya olayı çevreleyen ortam, arka plan, çerçeve ya da koşullar bütünü olarak da değerlendirilebilir (Çizgen, 2012).

Nesbitt (1996), her bilginin bağlamla ilişkili olduğunu ve bağlamın, bilginin anlamlandırılmasında temel bir unsur olarak işlev gördüğünü vurgular. Gestalt psikolojisine göre ise bağlam, bir bütünün parçalarına yeni anlamlar kazandırır; bağlamda meydana gelen herhangi bir değişim, bütünün anlamında da dönüşüme neden olur (İnceoğlu, 2004).

## 2.MİMARİDE BAĞLAM KAVRAMI

Mimarlığı diğer tasarım disiplinlerinden ayıran temel özellik, onun sabit bir fiziksel çevrede varlık kazanması ve anlamını bu çevre içerisinde oluşturmasıdır. Bu nedenle, mimarlığın en belirleyici unsuru

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ve varoluş zemini yer kavramıdır. Mimari ürün, içinde bulunduğu yerle kurduğu bağ aracılığıyla yeni anlamlar üretir. Bu durum, mimari bir yapının birebir tekrarını imkânsız hale getirir; çünkü aynı yapı, farklı bağlamlarda farklı anlamlara bürünür ve önceki örneklerinden ayrışır. Bağlam, mimarlık ürününü özgünlüğe yönelten bir zorunluluk olarak ortaya çıkar. Dolayısıyla, mimari tasarımlarda yapılan alıntılar ve göndermeler, yer aldıkları bağlama göre yeniden şekillenerek farklı anlamlar kazanır. Bir yapıyı sıradan bir kopyadan ayıran unsur, bulunduğu bağlamla kurduğu aidiyet ilişkisi ve bu bağlamın etkisiyle geçirdiği dönüşümün derinliğidir. Bağlam, yalnızca fiziksel çevreyle sınırlı bir kavram değildir; aynı zamanda yapının içinde var olduğu zamanı, kültürel ortamı ve toplumsal koşulları da kapsar (Güzer, 2007).

Mimarlık alanında bağlam kavramı, tarih boyunca farklı biçimlerde yorumlanmış ve anlamını çevresindeki diğer kavramlarla kurduğu ilişkiler aracılığıyla geliştirmiştir. Mimari üretim sürecinde soyut düşünce yapısını somut ürünlere dönüştüren ölçütler, bağlamın fiziksel düzlemde ele alınmasıyla belirginleşir. Bir yapının tasarlanabilmesi için, bağlam ve onun alt bileşenleri —örneğin yakın çevre, topoğrafya veya sosyal doku— tasarım sürecinin başlangıç noktası olarak değerlendirilir. Bu nedenle, bağlam, tasarım öncesi araştırmaların merkezinde yer alır ve projenin yönünü belirler (Soygeniş, 2015). Bağlamsalcı yaklaşımlar ise, bağlamı kültür, iklim, topoğrafya, teknoloji ve strüktür gibi unsurlarla ilişkilendirerek, bu öğelerin mimari dilde özgün biçimde temsil edilmesi gerektiğini savunur (Güzer, 2006).

Genel anlamda bağlam, herhangi bir varlığın çevresiyle kurduğu ilişkiyi, bu ilişki aracılığıyla ortaya çıkan sürekliliği ve geçişi tanımlar. Mimarlık özelinde ise, bir yapının ya da mimari ürünün çevresiyle olan etkileşimini ifade eder. Bu çevre, yalnızca yapıların oluşturduğu fiziksel çevreyle sınırlı değildir. Bağlam, çoğu zaman görsel olarak algılanabilen çevresel faktörlerle açıklansa da bu yaklaşım tek başına yeterli değildir. Fiziksel çevreye ek olarak sosyal, kültürel ve tarihsel unsurlar da bağlamın ayrılmaz bir parçasıdır (İnceoğlu, 2004).

Isenstadt (2005), bağlamı; arsa, parsel, mahalle, bölge, peyzaj, iklim ve yer kavramlarına ilişkin algılarımızın kesişiminde ortaya çıkan, eş merkezli halkalar biçiminde örgütlenen bir yapı olarak tanımlamaktadır. Tümertekin (1999) ise, bağlamı mimarın ötekiyle —yani dış dünya, çevre ya da kullanıcıyla— kurduğu ilişkiyi tarif eden ve bu ilişkiyi güçlendiren bir kavram olarak yorumlar. Paul-Alan Johnson (1994) bağlamı; bir metnin, olayın ya da kompozisyonun yer aldığı düzeni, aynı zamanda bir yapının yerleştirildiği fiziksel, kültürel ve tarihsel çevreyi betimleyen bir kavram olarak açıklar.

### 2.1 Mimari Tasarımcı ve Tasarım için Bağlamın Önemi

Mimarlıkta bağlam kavramı, yapının içinde yer aldığı fiziksel ve kültürel çevreyi ifade eder; bu kavram, mimari tasarım sürecinin hem düşünsel altyapısında hem de üretim aşamasında belirleyici bir rol oynar. Tasarımcı, projesinin çevresiyle bütünleşmesini sağlamak amacıyla bağlamsal ölçütleri dikkate alarak çalışabilir; kimi zaman da çevresine karşıt bir duruş benimseyerek bağlamla zıtlık kuran bir yaklaşımı

tercih edebilir. Ancak her iki durumda da bağlamın analizi tasarım sürecinin başlangıç noktasıdır ve tasarımın yönünü belirleyen temel unsurlardan biridir (Farrelly, 2013).

Mimari yapılar, bulundukları alanların birer parçası olarak, çevreleriyle etkileşim içinde yaşayan ve yaşatan unsurlardır. Bu nedenle bir yapının çevresinden, onu saran fiziksel ve kültürel değerlerden bağımsız biçimde tasarlanması mümkün değildir. Her yer kendi içinde özgün veriler barındırır; bu veriler tasarımın gerçekleşeceği alanın kimliğini tanımlar ve onu diğer yerlerden ayırır (Anderson, 2014). Dış çevre koşulları, mimari tasarım açısından önemli bir parametredir. Yapının biçimi, mekânsal organizasyonu ve işlevsel düzeni; bulunduğu alanın kendine özgü fiziksel, iklimsel ve çevresel niteliklerinden doğrudan etkilenir (Brooker & Stone, 2012).

Bir yapının tasarımı, bulunduğu bölgenin iklimsel koşulları, doğal çevresi ve diğer çevresel faktörler göz önüne alınarak şekillenir. Bu verilerin analiz edilmesi, tasarımın yönünü belirlerken tasarımcıya rehberlik eder. Mimari tasarımcı, yapının niteliklerini zenginleştirmek amacıyla yerel unsurlardan, malzeme çeşitliliğinden ya da mevcut kaynaklardan yararlanabilir (Brooker & Stone, 2012). Dolayısıyla arazinin konumu, kültürel bağlamı ve sahip olduğu potansiyeller, tasarım sürecinde belirleyici faktörler haline gelir. Proje sürecinin, yapının bulunduğu çevrenin fiziksel ve sosyal verileri dikkate alınarak yürütülmesi, tasarımın hem işlevsel hem de bağlamsal bütünlüğünü güçlendirir (Anderson, 2014).

Mimari bağlam, sosyo-kültürel değerlerden topoğrafyaya, malzeme özelliklerinden iklimsel koşullara, ekonomik ve estetik ölçütlere kadar uzanan çok katmanlı bir yapıya sahiptir. Bu unsurların tasarım sürecine hem soyut hem somut biçimde dâhil edilmesi, özgün, işlevsel, ekonomik ve çevresiyle uyumlu mimari ürünlerin ortaya çıkmasını sağlar (Anderson, 2014). Bu çerçevede, bir yapı fiziksel çevresinin sunduğu bağlamsal verilere göre tasarlandığında, o yapının özgünlüğü bulunduğu yerle özdeş hale gelir; dolayısıyla aynı yapının başka bir konumda aynı anlam ve etkiyle varlık göstermesi mümkün değildir (Brooker & Stone, 2012).

### 2.2 Mimarlıkta Bağlam Kavramının Ölçütleri

Malzeme ile tasarım arasındaki ilişki, her zaman belirli bir bağlam çerçevesinde ele alınır ve bu bağlam, tasarım sürecinin başlangıç aşamasında tanımlanır. Tasarımı çevreleyen koşullar, bağlamı şekillendiren başlıca unsurlar arasında yer alır. Bir yapının konumlandığı çevredeki mevcut yapılar, bu yapıların ölçek ve oranları, biçimsel özellikleri ve kullanılan malzemelerin nitelikleri tasarım süreci üzerinde doğrudan etkilidir. Bunun yanı sıra, iklimsel özellikler, hava koşulları ve çevrede bulunan doğal malzeme kaynakları da bağlamın oluşumunda önemli rol oynar (Hegger, Drexler & Zeumer, 2012).

Bir yapı, içinde bulunduğu çevreyle birlikte anlam kazanır ve o çevreden aldığı fiziksel, kültürel ve çevresel veriler aracılığıyla biçimlenir. Bu veriler, mimari tasarımda bağlam kriterleri olarak nitelendirilir. Topoğrafya, fiziki çevre, iklim, yönlenme, malzeme seçimi ve sosyokültürel yaşam biçimleri, mimari bağlamı belirleyen temel ölçütler arasında sayılabilir (Anderson, 2014). Anderson (2014), mimari tasarım sürecinde bağlamı değerlendirmek amacıyla altı temel kriter tanımlamıştır. Bu

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kriterler, yapının bulunduğu çevreyle kurduğu fiziksel, iklimsel, malzeme temelli ve kültürel ilişkilerin bütüncül biçimde analiz edilmesine olanak tanır.

***Topoğrafya***

Mimari üretim, belirli bir koordinat sistemi içerisinde tanımlanmış, fiziksel ve sınırları belirli bir arazi üzerinde gerçekleşir. Yapının konumlandığı alanın jeolojik yapısı, toprak özellikleri, eğim oranı ve genel topoğrafik karakteri, tasarım sürecinin temel belirleyicilerinden biri olarak karşımıza çıkar. Eğimli bir arazinin sunduğu çok katmanlı mekânsal deneyim ve değişken bakı perspektifleri, düz bir zeminle kıyaslandığında farklı tasarım stratejilerinin geliştirilmesini zorunlu kılar. Bu nedenle tasarımcı, projenin erken aşamalarında arazinin topoğrafik analizini ayrıntılı biçimde değerlendirir; potansiyel avantaj ve kısıtları saptayarak bu verileri tasarımın morfolojik kurgusuna entegre eder. Bu bütünleştirme sürecinin başarıyla gerçekleştirilmesi, hem bağlamsal hem de biçimsel anlamda özgün mimari sonuçların ortaya çıkmasını sağlar (Soygeniş, 2015).

Topoğrafya ile kurulan bu ilişki, yalnızca fiziksel bir uyumun ötesinde, iç ve dış mekânlar arasında sürekliliğin sağlanmasına aracılık eder; böylece mekânsal bütünlük ve işlevsel verimlilik güçlenir. Pek çok durumda, yapının biçimlenişi topoğrafyanın sunduğu kısıtlar ve olanaklar doğrultusunda şekillenir. Ancak bazı mimari yaklaşımlarda, yapı çevresiyle bilinçli bir biçimde ayrışarak, topoğrafyadan bağımsız bir kimlikte var olmayı tercih eder. Bu durumda yapı, kendi işlevsel gereksinimleri ve kavramsal öncelikleri doğrultusunda biçimlenir. Dolayısıyla topoğrafya, yalnızca fiziksel bir zemin değil, aynı zamanda farklı tasarım paradigmalarının ortaya çıkmasını teşvik eden dinamik bir değişken olarak değerlendirilebilir (Bielefeld & El Khouli, 2011).

***Fiziki Çevre***

Çevresel veriler, mimari tasarım sürecinin hem kavramsal çerçevesini hem de biçimsel yönünü belirleyen temel etmenler arasındadır. Yapılar, kırsal ya da kentsel bir bağlam içerisinde konumlandıklarında, bu bağlamın sahip olduğu özgün fiziksel, kültürel ve toplumsal dinamikler tasarımın biçimlenişini doğrudan etkiler (Soygeniş, 2015). Her bağlam, bulunduğu çevreye özgü değerler ve koşullar sunar; bu nedenle aynı işlevdeki bir yapı farklı çevresel koşullar altında farklı biçimlerde vücut bulur (Brooker & Stone, 2012). Çevre, yalnızca fiziksel bir alan değil, aynı zamanda toplumun teknolojik, ekonomik, sosyal ve kültürel yapısını da yansıtan çok katmanlı bir göstergedir (Kuban, 2007).

Kentsel dokuda konumlanan bir yapı, yalnızca iç mekân üretimiyle sınırlı değildir; aynı zamanda kente ait yeni bir dış mekânın oluşumuna da katkı sağlar. Bu nedenle, çevresindeki yapıların konumu, ölçeği, oranları ve kentsel boşluklarla kurduğu ilişkiler, tasarım sürecinde dikkate alınması gereken başlıca parametrelerdir. Günlük yaşamda bireylerin kamusal açık alanlarda geçirdikleri zamanın fazlalığı göz önünde bulundurulduğunda, kentsel mekânın yaşanabilirliği ve güvenliği, tasarımın başarısında belirleyici bir ölçüt haline gelir. Dolayısıyla, kentsel bağlamda yer alan her mimari ürün, hem iç hem de

dış mekân kurgusunu çevresiyle birlikte düşünerek bütüncül bir mekânsal deneyim oluşturmalıdır (Soygeniş, 2015).

Mimarlık, doğası gereği bulunduğu yere ait bir disiplindir. Her yapı, üzerinde yükseldiği toprağın tarihsel, topoğrafik ve çevresel nitelikleriyle birlikte anlam kazanır (Farrelly, 2013). Yapının bulunduğu doğal ortam, o mekânın atmosferini ve kimliğini belirleyen en güçlü etkendir. Bu ortamın sunduğu çevresel veriler —ışık, rüzgâr, nem, gürültü, yönlenme gibi— tasarım sürecinin vazgeçilmez bileşenleridir. Tasarımcı, bu fiziksel verileri değerlendirerek yapının çevresiyle kuracağı ilişkiyi biçimlendirir; kimi zaman çevreyle uyumlu bir tutum geliştirirken, kimi zaman da bağlamdan bilinçli bir kopuş stratejisi benimseyebilir. Bir yapının biçimi ile işlevi arasındaki ilişki, çevresel etkenlerden bağımsız olarak düşünülemez. İç mekân, yalnızca yapının kabuğuyla sınırlı bir varlık değil; çevresindeki fiziksel, kültürel ve görsel unsurlarla sürekli bir diyalog hâlindedir. Bu diyalog kimi zaman doğrudan, kimi zaman ise tasarımcının tercihine bağlı olarak dolaylı biçimde kurulabilir. Tasarımcı, örneğin dış çevrenin aydınlık ve açıklığını kontrastlayacak biçimde karanlık ve mahrem bir iç mekân kurgulayabilir; ya da tam tersine, dış mekândaki sürekliliği iç mekâna taşıyarak geçirgen ve akışkan bir mekânsal bütünlük oluşturabilir (Brooker & Stone, 2012).

Fiziksel çevre bağlamında, yolların konumu, trafik akışı, yoğunluk düzeyi ve kamusal alanların nitelikleri de tasarımın yönünü belirleyen etkenlerdendir. Mevcut kentsel dokuda bulunan bir yol veya ortak kullanım alanı, yapının çevresiyle kurduğu etkileşimi güçlendirebilir. Ayrıca, arsanın geometrik biçimi ve topografyası, yapının hem plan düzleminde hem de hacimsel kurgusunda belirleyici olabilir. Konuma bağlı olarak manzara yönü, yapının konumlandırılmasında ve mekânsal organizasyonunda bir odak unsuru haline gelebilir; böylece yapı, çevresiyle görsel ve fiziksel bir ilişki kurarak bağlamsal bütünlüğünü güçlendirir (Soygeniş, 2015).

### *İklim*

İklim, belirli bir coğrafi bölgede uzun yıllar boyunca gözlemlenen sıcaklık, yağış, rüzgâr yönü ve hızı, nem oranı ile hava basıncı gibi meteorolojik değişkenlerin ortalama koşullarını tanımlayan bir kavramdır. Bu meteorolojik unsurlar, mimari tasarım sürecinin yönünü ve biçimsel karakterini belirleyen temel girdilerden biridir. Yapının konumlandığı bölgenin ısı dengesi, rüzgâr yönleri, yağış miktarı ve güneş ışınlarının düşme açısı, tasarım kararlarını doğrudan etkileyen çevresel parametreler arasında yer alır (Brooker & Stone, 2012). Özellikle güneş enerjisinden yararlanarak iç mekânın ısıtılması veya soğutulması, mimarlık tarihinde yüzyıllardır kullanılan bir tasarım stratejisidir.

İklimsel koşullar, yalnızca yapının enerji performansını değil, aynı zamanda bulunduğu arazinin kimliğini ve mimari karakterini de biçimlendirir. Bu nedenle mimarlık, iklimsel verilerle sürekli bir etkileşim içerisindedir. Tasarımcı, iklimin etkilerini analiz ederek yapı kabuğu, açıklık oranları, yönlenme, gölgelendirme ve malzeme seçimi gibi unsurları bu analiz doğrultusunda biçimlendirir.

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Böylelikle yapı, bulunduğu iklim koşullarını denetim altına alan, çevresel verileri pasif ya da aktif biçimde kullanan bir sistem hâline gelir (Farrelly, 2013).

Yerel mimarlık örnekleri incelendiğinde, yapıların bulundukları coğrafyanın iklim özelliklerine doğrudan yanıt verdiği görülür. Geleneksel mimari, yerel malzemeyi, güneşin yönünü, hâkim rüzgârı ve topografik özellikleri dikkate alarak doğayla uyumlu çözümler üretmiştir (Soygeniş, 2015). Bu yaklaşımlar, enerji verimliliğini artırmanın yanı sıra, konfor koşullarını doğal yollarla sağlamayı da hedefler. İklimsel faktörlerin dikkate alınmadığı tasarımlar ise, enerji tüketimini artırmakla kalmaz, aynı zamanda iç mekân konforunu da olumsuz etkileyebilir. Kontrollü biçimde tasarlanmış yapılar, ışık, ısı ve hava akışı gibi çevresel verileri optimize ederek kullanıcı konforunu artırır. Yağmur, kar, rüzgâr ve güneş gibi dış etkenlerin yönlendirilmesiyle, yapı içinde sürdürülebilir ve dengeli bir mikroiklim yaratmak mümkündür (Brooker & Stone, 2012).

Bu bağlamda, iklim yalnızca tasarımı etkileyen dışsal bir faktör değil, aynı zamanda mimari biçimlenmenin ve mekânsal deneyimin doğrudan belirleyicisidir. İklimle kurulan bu etkileşim, yapının bulunduğu yerle kurduğu ilişkiyi derinleştirir ve mimarlığın bağlamsal niteliğini güçlendirir.

***Yönelim ve Mimari Tasarımda Konumlanma İlişkisi***

Yönelim, bir kavramın ya da varlığın başka bir kavram veya unsurla ilişki kurarak belirli bir fiziksel ve kavramsal konum kazanması sürecidir (Brooker & Stone, 2012). Mimarlık bağlamında yönlendirme, yapının arazideki konumunun, tasarımın biçimsel, işlevsel ve çevresel değişkenleri üzerindeki etkilerini anlamayı ve bu etkilere bilinçli biçimde yanıt üretmeyi ifade eder. Arazinin kendine özgü karakteri — örneğin eğimi, topoğrafyası, konumu ve yönlenme potansiyeli— mimari kararların alınmasında belirleyici bir rol oynar (Farrelly, 2013). Bu özgün nitelikler, yapıların çevreyle kurduğu dinamik ilişkinin hem sınırlarını hem de olanaklarını tanımlar.

Tasarımcı, mekânın görsel olanaklarını, manzara potansiyelini ve çevresel verilerini değerlendirerek belirli bakış açılarına göre yönelim stratejileri geliştirir. Bir yapı ya da iç mekân, bulunduğu konumun fiziksel özelliklerinden —güneş ışığı, rüzgâr yönü, manzara, ses gibi— yararlanacak biçimde konumlandırılabileceği gibi, bu etkenlerden korunacak veya uzaklaşacak şekilde de yerleştirilebilir. İç mekânın çevreyle olan yönsel ilişkisi, kullanıcıda farkındalık yaratır ve mekânsal deneyimin niteliğini artırır (Soygeniş, 2015).

Yapının yönlendirilmesinde, yalnızca güneşin hareketi ya da iklimsel özellikler değil, aynı zamanda arazinin coğrafi konumu da belirleyicidir. Bulunduğu yerin enlem ve boylam değerleri, güneş ışınlarının düşme açısını belirleyerek yapı kabuğunun, pencere oranlarının ve gölgelendirme elemanlarının biçimlenmesini etkiler. Bu nedenle, yönlendirme kararları yalnızca estetik veya fonksiyonel bir tercih değil, aynı zamanda çevresel verimlilik açısından da temel bir gerekliliktir (Soygeniş, 2015).

Yapı için yalnızca uygun yönün seçilmesi yeterli değildir; yakın çevrede bulunan yapıların yükseklikleri ve konumları da güneş ışığının alınış biçimini, gölge alanların oluşumunu ve görsel açıklıkları doğrudan

etkiler. Bu nedenle yeni bir yapı, çevresindeki mevcut dokuyla birlikte değerlendirilerek tasarlanmalıdır. Aksi halde, fonksiyonel olarak doğru konumlandırılmış bir mekân bile çevre yapıların gölgesinde kalabilir ve tasarımın hedeflenen mekânsal kalitesi zedelenebilir (Soygeniş, 2015). Tasarımcı, yapıyı yer aldığı bağlamın sunduğu avantaj ve kısıtlamalar doğrultusunda biçimlendirir. Bu süreçte güneşin hareketi, iklimsel koşullar, topoğrafya ve sosyal çevre gibi etmenler dikkate alınır. Tasarımcı, bu çevresel girdiler aracılığıyla mekânın hem somut hem soyut niteliklerini dönüştürme olanağına sahiptir (Brooker & Stone, 2012).

Bir yapı, bulunduğu yerin fiziksel karakterine doğrudan yanıt verecek biçimde ya da bu koşullara karşıt bir yaklaşımla tasarlanabilir. Tasarımcı kimi zaman manzarayı yapının temel bileşenlerinden biri hâline getirerek ön plana çıkarır; kimi zaman ise onu arka planda tutarak iç mekânın mahremiyetini vurgular (Brooker & Stone, 2012).

***Malzeme ve Mimari Anlamın Oluşumu***

Malzeme, mimarlıkta yalnızca bir yapım unsuru değil, aynı zamanda yapının maddi varlığını ve atmosferini belirleyen temel öğedir. Mimari deneyimin duyusal boyutu, kullanılan malzemelerin dokusal, termal ve görsel özellikleriyle biçimlenir. Bu bağlamda malzeme, yapının yalnızca fiziksel değil, aynı zamanda duygusal ve algısal kimliğini de kurar (Brooker & Stone, 2012). Tasarım, malzeme aracılığıyla anlam kazanır; soyut bir düşünceden somut bir yapıya dönüşür ve mimari bir varlık haline gelir (Hegger, Drexler & Zeumer, 2012).

Bir yapının kavramsal temeli, çoğu zaman malzemenin doğası, dokusu ve uygulama teknikleriyle şekillenir. Malzemeye duyulan sadakat, yani onun özelliklerine ve sınırlarına uygun biçimde kullanılma anlayışı, mimarlık düşüncesinin özünü oluşturur. Malzemenin işlenme biçimi, hem mekânsal hem biçimsel potansiyelleri belirler; dolayısıyla tasarım sürecinde malzeme seçimi yalnızca teknik bir karar değil, aynı zamanda mimari anlam üretiminin başlangıç noktasıdır (Brooker & Stone, 2012).

Her malzeme, kendi fiziksel karakterine ve kullanım olanaklarına bağlı olarak mekânın duyusal ve işlevsel niteliklerine farklı biçimlerde katkıda bulunur. Farklı malzeme türleri ve bu malzemelerin çeşitli kullanım teknikleri, yapıya özgün bir kimlik kazandırır; bu kimlik, kullanıcı tarafından yalnızca görsel olarak değil, dokunsal, işitsel ve termal duyular aracılığıyla da algılanır (Hegger, Drexler & Zeumer, 2012).

Malzeme ile yapı arasındaki ilişki birbirinden ayrı düşünülemez. Bir yapının biçimsel dili, taşıyıcı sistemi ve atmosferi, seçilen malzeme tarafından belirlenir. Malzeme seçimi genellikle tasarımın erken aşamalarında öngörülür; ancak bu süreç, kimi zaman sezgisel bir biçimde, kimi zaman da teknik olarak kesin bir kararla belirlenir. Her mimari ürün, form, işlev ve malzeme arasındaki özgün dengenin sonucudur (Hegger, Drexler & Zeumer, 2012).

Malzeme seçimi, yalnızca estetik kaygılarla değil, aynı zamanda bağlamsal koşullar doğrultusunda yapılmalıdır. Arazinin topoğrafyası, iklimi ve kültürel geçmişi, uygun malzemenin belirlenmesinde

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temel rol oynar (Farrelly, 2013). Kentsel ya da kırsal bağlamlar, her biri kendi yerel materyal repertuarına sahiptir; bu yerel malzemeler, tarihsel süreçte oluşmuş yapım gelenekleriyle birlikte bölgesel mimari kimliği şekillendirir. Geleneksel inşa yöntemleri, hem sürdürülebilirlik açısından hem de mimari sürekliliğin korunması bakımından günümüzde de değerini korumaktadır (Hegger, Drexler & Zeumer, 2012). Doğal peyzajdan elde edilen, yerel kaynaklara ait veya toprağın işlenmesiyle oluşturulan malzemeler, mimarlığın en temel yapı taşlarıdır. Bu tür malzemeler, yapının çevresiyle kurduğu ilişkiyi güçlendirir; hem görsel hem de duyusal anlamda yapıyı bağlamına dâhil eder. Malzemenin zamana bağlı değişimini kavrayabilmek, tasarım kararlarının yönünü belirleyen önemli bir unsurdur. Yerel malzemelerin kullanımı, yapının bulunduğu çevreyle bütünleşmesini sağlar ve yapı ile çevresi arasında organik bir bağ kurar. Bu bağ, yalnızca biçimsel bir uyum değil, aynı zamanda kültürel sürekliliğin korunması anlamına gelir.

Yerel kaynakların sunduğu malzeme çeşitliliği ve geleneksel yapım tekniklerinin çağdaş tasarıma entegre edilmesi, hem çevresel hem de kültürel açıdan sürdürülebilir bir yaklaşım sunar. Tarihsel örnekler incelendiğinde, tasarımcının malzeme bilgisinin yalnızca teknik değil, aynı zamanda kültürel bir birikim olduğu görülür (Brooker & Stone, 2012).

***Sosyokültürel Yaşantı***

Kültür kavramı, kökenini Latince cultum sözcüğünden alarak cultura biçiminde Batı dillerine geçmiş, oradan da Fransızca aracılığıyla Türkçeye dâhil olmuştur (Özer, 2004). Sir Edward Burnett Tylor (1871), dönemin düşünsel bağlamı içerisinde kültürü ve toplumu birbirinden bağımsız görmeyip bir bütün olarak değerlendirmiştir. Tylor'a göre kültür, bireyin toplumun bir üyesi olarak edindiği inanç, bilgi, sanat, gelenek, görenek, alışkanlık ve becerilerden oluşan bütünsel bir yapıdır (McGee & Warms, 1966).

Viyanalı mimar Adolf Loos (1910) Mimari başlıklı yazısında, kültür kavramını kültürsüzlük kavramıyla karşıtlık içinde ele almış; kültürü, insanın iç dünyası ile dış dünyası arasında kurduğu denge hali olarak tanımlamıştır. Benzer biçimde, Gökalp (2018) de kültürü, bir toplumun örf, adet, estetik anlayışı, yönetsel biçimleri ve sözlü-yazılı edebiyatı gibi unsurlardan oluşan bir olgu olarak açıklamaktadır.

Bülent Özer'in (2004) aktardığına göre, kültürü en kapsamlı biçimde tanımlayanlardan biri olan MacIver, onu düşünce ve yaşam biçimimizin, günlük alışkanlıklarımızın, sanatın, edebiyatın ve eğlencenin içinde ifadesini bulan insani doğa olarak açıklar. Thurnwald ise kültürü, davranış biçimleri, düşünceler, değer yargıları, gelenek ve kurumların zaman içinde bütünleşmesiyle oluşan uyumlu bir sistem olarak değerlendirmiştir.

Burak Kaptan'ın (2013) aktardığı tanımlara göre; Akarsu (1988) kültürü, insanlığın tarih boyunca geçirdiği manevi gelişim süreci ve bu sürecin ürünleri olarak yorumlamıştır. Erkman (1987) kültürü, düşünsel üretim, bilgi birikimi, toplumsal örgütlenme ve biçimlenişin bütünü olarak görürken; Erinç (2004) kültürü, insanın çevresinde var ettiği ya da var olmasını arzuladığı kavramsal ve görsel düzen

olarak tanımlamıştır. Turhan (1969) ise kültürü, toplumun bilgi birikimini, değer sistemini, tavırlarını, tutumlarını ve davranışlarını içeren maddi ve manevi bütünlük olarak ifade etmiştir.

Kültürün biçimlenmesinde coğrafya belirleyici bir rol oynar; zira bir kültürün özgünlüğünü, başka kültürlerden ayrılmasını sağlayan temel etken bulunduğu coğrafi ve tarihsel bağlamdır. Yerel kültürü oluşturan dinamikler; tarihsel geçmiş, konum, topoğrafya ve yakın çevredir. Tarihsel süreç boyunca bilgi, deneyim ve olaylar bir araya gelerek kültürel birikimi oluşturur. Coğrafi koşullar, üretim biçimlerini ve teknolojik gelişmeleri şekillendirirken; bu koşullara bağlı olarak yaşam alışkanlıkları, davranış kalıpları ve estetik tercihler ortaya çıkar. Dolayısıyla bir toplumun fikirleri, beğenileri, deneyimleri, alışkanlıkları ve davranış biçimleri kültürel koşullardan derin biçimde etkilenir (Kaptan, 2013). Yerel özellikler, toplumsal yapının birçok unsurunu dönüştürür. Dil, ırk, coğrafya, gelenek, görenek, tarihsel geçmiş ve yaşam biçimi yerel kültürün oluşumunda belirleyici unsurlardır. Bu etkenler bir toplumu diğerlerinden ayırarak ona özgün bir kimlik kazandırır. Yerel kültür, bireylere aidiyet duygusu ve özgür bir var olma alanı sunan değerler bütününü temsil eder (Kaptan, 2013).

Mekân kavramı da kültürle yakından ilişkilidir. İnsan eliyle üretilen değerler, mekânla bütünleştiğinde anlam kazanır. Kültürün hem somut hem soyut nitelikleri mekânın karakterine yansır; bu nedenle mekân, kültürel bir temsil aracıdır. Mekânın anlamı, onu deneyimleyen bireylerin kültürel birikimleri ve algısal çerçeveleri doğrultusunda farklılık gösterebilir (Kaptan, 2013). Her tasarım, onu üreten kültürün etik değerlerini, estetik anlayışını ve ruhsal dünyasını yansıtır. Mimari ürünler ve tasarım nesneleri, yalnızca fiziksel varlıklar değil; aynı zamanda belirli bir yaşam biçimini, düşünme ve hissetme biçimini temsil eden sembollerdir (de Botton, 2007).

Yapı, kendi fiziksel varlığının ötesinde içinde bulunduğu kültürel çevreyle anlam kazanan bir bütündür. Mimari nesne, çevresinden soyutlanamaz; çünkü taşıdığı anlam, onu çevreleyen kültürel atmosferde biçimlenir. Her kültürel bağlam, geçmişin izlerini taşır ve bu izler, mimari yapılara anlamsal derinlik kazandırır. Zamanla bu anlamlar, mimarlıkta semboller, işaretler ve biçimsel göndermeler aracılığıyla somutlaşır (Kuban, 2007). Burak Kaptan'ın (2013) aktardığı üzere kültür, yalnızca bir toplumun gelenekleri, alışkanlıkları ve yaşam biçimleriyle sınırlı değildir; aynı zamanda bu toplumun çevresini algılama, biçimlendirme ve dönüştürme biçimlerinin bütününü kapsar. Mimarlık, bu dönüşüm sürecinin en somut ve kalıcı yansımalarından biridir. Dolayısıyla mimari üretim, toplumsal değerlerin, yaşam biçimlerinin ve kültürel kodların mekânsal dile tercüme edilmesi olarak okunabilir.

Mimarlıkta bağlam kavramının sosyokültürel boyutu, yapının içinde yer aldığı toplumsal dokunun ve kültürel geleneklerin tasarıma etkisini açıklamak açısından belirleyicidir. Bir yapının biçimi, ölçeği, mekânsal organizasyonu ve malzeme seçimi yalnızca fiziksel çevreyle değil, aynı zamanda kullanıcı alışkanlıkları, toplumsal normlar ve kültürel sembollerle de etkileşim içindedir (Kuban, 2007). Bu nedenle, bağlam kavramını yalnızca topoğrafya veya iklim gibi fiziksel parametrelerle sınırlamak, mimarlığın toplumsal yönünü ihmal etmek anlamına gelir. Mimari tasarım, yerel yaşam biçimlerini

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anlamadan ve kültürel temsilleri çözümlemeden bağlamsal bir derinlik kazanamaz. Örneğin, kamusal alanların kullanımı, mahremiyet algısı, toplumsal cinsiyet rolleri veya topluluk dinamikleri gibi olgular, yapıların biçimlenişini doğrudan etkileyen sosyokültürel etmenlerdir. Tasarımcı, bu verileri yorumlayarak hem yerel kimliğe saygılı hem de çağdaş bir dil geliştirebilir.

Sosyokültürel bağlam, yapının zamansal sürekliliğini de belirler. Her kültür kendi mekânsal düzenini üretirken, aynı zamanda bir hafıza alanı inşa eder. Bu hafıza, mimari biçimlerin dönüşümüne rağmen varlığını sürdüren bir aidiyet duygusudur (Rossi, 1982). Dolayısıyla mimarlık, geçmişle gelecek arasında bir arayüz işlevi görür; kültürel kimliğin hem taşıyıcısı hem de yeniden üreticisidir. Mimari bağlamın sosyokültürel boyutunu dikkate alan yaklaşımlar, yapının yalnızca bulunduğu yere değil, aynı zamanda orada yaşayan insanlara ve onların tarihsel belleğine de ait olmasını sağlar. Bu yaklaşım, modernist evrensellik anlayışının ötesine geçerek, yerel ve küresel arasında diyalektik bir ilişki kurar.

## 3.DEĞERLENDİRME VE SONUÇ

Bağlam kavramı, mimarlık disiplininde yalnızca fiziksel çevreyle kurulan ilişkilerin tanımlayıcısı değildir; aynı zamanda zamansal, kültürel, toplumsal ve duyusal katmanları da içeren çok boyutlu bir yapıdır. Bir mimari ürünün kimliği, bu katmanların her biriyle kurduğu etkileşimin bir sonucudur. Topoğrafya, iklim, yönlenme, malzeme ve sosyokültürel yaşam biçimleri, tasarım sürecinde birbirini tamamlayan ve sürekli dönüşen girdiler olarak işlev görür. Bağlamsal yaklaşım, mimarlığı yerle, tarihsel bellekle ve kullanıcı deneyimiyle yeniden ilişkilendirir. Bu sayede yapı, yalnızca biçimsel bir nesne olmaktan çıkarak, bulunduğu çevrenin kimliğini dönüştüren, onunla diyalog kuran bir varlık haline gelir. Mimarlığın bağlamla kurduğu ilişki, hem yerel özellikleri koruma hem de çağdaş tasarım anlayışını sürdürülebilir biçimde geliştirmenin en etkili aracıdır.

Sonuç olarak, mimarlıkta bağlam kavramı çok boyutlu bir epistemolojik alan olarak ele alınmalıdır. Bu alan, fiziksel çevre ile kültürel ve toplumsal sistemler arasında kurulan dinamik bir etkileşim ağıdır. Tasarımcı, bu çok katmanlı veriler arasında denge kurarak, hem yerin ruhuna saygı gösteren hem de çağın gerekliliklerine yanıt veren mekânsal çözümler üretmelidir. Böylece mimarlık, yalnızca yapı üretimi değil, anlam üretimi haline gelir.

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# MİMARLIKTA DOĞAL IŞIK VE MEKÂN KİMLİĞİ ETKİLEŞİMİ

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## Özet

Bu çalışma, doğal ışığın mimarlıkta yalnızca bir aydınlatma unsuru olmanın ötesinde, mekân kimliğini biçimlendiren ve kullanıcıların mekân algısını belirleyen-dönüştüren temel bir öğe olduğunu ortaya koymaktadır. Doğal ışığın mekân kimliğine kattığı anlam, mimari formun algılanışını, yapının atmosferini ve kullanıcıyla kurduğu duygusal bağı doğrudan etkilemektedir. Çalışmada, ışığın mekân kimliği üzerindeki etkisi kuramsal bir çerçevede ele alınmış, farklı dönem ve coğrafyalardan seçilmiş mimarların yapıları üzerinden örneklendirilmiştir. Louis Kahn, Tadao Ando, Richard Meier, Behruz Çinici ve Turgut Cansever gibi mimarların eserlerinde ışığın poetik, sembolik ve deneyimsel gücü incelenmiş; her birinin ışığı mekânın ruhunu, zamansallığını ve anlamını kuran bir araç olarak yorumladığı ortaya konmuştur. Bulgular, doğal ışığın mekân kimliğini güçlendiren, mekânın fiziksel sınırlarını aşarak onu duyusal ve kültürel bir deneyim alanına dönüştüren bir unsur olduğunu göstermektedir. Sonuç olarak, doğal ışık, mimarlığın maddi ögeleri kadar soyut ve duyusal boyutlarını da inşa eden, mekân kimliğinin vazgeçilmez bileşenlerinden biri olarak değerlendirilmiştir.

**Anahtar Kelimeler:** Mimarlık, tasarım, mekân kimliği, doğal ışık

## INTERACTION BETWEEN NATURAL LIGHT AND SPACE IDENTITY IN ARCHITECTURE

## Abstract

This study demonstrates that natural light is more than just a lighting element in architecture; it is a fundamental element that shapes spatial identity and determines and transforms users' perception of space. The meaning natural light adds to spatial identity directly influences the perception of architectural form, the atmosphere of the building, and the emotional bond it establishes with the user. This study examines the impact of light on spatial identity within a theoretical framework, exemplified by works by selected architects from different periods and geographies. The poetic, symbolic, and experiential power of light is examined in the works of architects such as Louis Kahn, Tadao Ando, Richard Meier, Behruz Çinici, and Turgut Cansever, revealing that each interprets light as a tool that establishes the spirit, temporality, and meaning of space. The findings demonstrate that natural light is an element that strengthens spatial identity, transcending the physical boundaries of a space and transforming it into a sensory and cultural field of experience. Consequently, natural light is considered

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an indispensable component of spatial identity, shaping the abstract and sensual dimensions of architecture as well as its material elements.

**Keywords:** Architecture, design, spatial identity, natural light

## 1. GİRİŞ

Mimarlık, en geniş tanımıyla, insanın barınma ve yaşam gereksinimlerini karşılamak amacıyla fiziksel çevrenin biçimlendirilmesi olarak ifade edilmektedir. Mimari mekânın düzenlenmesi süreci, öncelikle onun tanımlanmasıyla ilişkilidir. Mekânı tanımlayan temel unsurlardan biri, onun algılanmasını, deneyimlenmesini ve görünür hale gelmesini sağlayan doğal ışıktır. Bu durum, ışığın mimari mekân üzerindeki belirleyici etkisini açık biçimde ortaya koyar. Özellikle iç mekânlarda gün ışığının kullanımı, mimari tasarım kararlarını doğrudan yönlendiren önemli bir etkendir.

Doğal ışık, mimari tasarım sürecinde hem işlevsel hem de anlamsal açıdan çok yönlü bir araç olarak değerlendirilmektedir. Mekân içinde renklerin, dokuların, biçimlerin ve boyutların doğru biçimde algılanmasını sağlayarak görsel konforu artırır; kullanıcıların fiziksel ve psikolojik gereksinimlerine yanıt verir. Bununla birlikte, doğal ışık yalnızca işlevsel bir unsur değil, aynı zamanda mekâna nitelik kazandıran, ölçülemeyen bir anlam katmanıdır. Gün ışığı, sıradan bir hacmi mimari bir mekâna dönüştürerek estetik, duygusal ve sembolik etkiler yaratabilir. Okuma, çalışma gibi görsel odaklı işlevlerin yürütüldüğü alanlarda doğal ışık öncelikle işlevsel bir gereklilik olarak öne çıkarken; dini yapılarda ise çoğunlukla ruhani veya mistik bir atmosfer oluşturmak amacıyla kullanılmaktadır. Işığın mekâna giriş biçimi, mevsimsel ve gün içi değişkenliklerle birlikte mekânın aydınlık düzeyini, hareketliliğini ve görsel dinamizmini belirler. Açıklıkların cephedeki konumu, boyutu, oranı, biçimi ve yönelimi, mekâna giren ışığın niceliğini ve niteliğini etkileyerek hem işlevsel hem de anlamsal düzeyde farklı sonuçlar doğurur.

Modern mimarlık üzerine yapılan çalışmalar, sanayi devriminin getirdiği teknolojik yenilikleri mimarlık tarihindeki önemli bir dönüm noktası olarak ele almaktadır. Bu dönüşüm süreci, yalnızca yapı teknolojilerini değil, doğal ışığın mekânda kullanılış biçimini de kökten değiştirmiştir. Modern mimarlıkta yaşanan bu kırılma, ışığın işlevsel bir gereç olmaktan çıkıp tasarımın temel belirleyicilerinden biri haline gelmesine zemin hazırlamıştır. Dolayısıyla, bu dönüşümü anlamak, hem modern dönem mimarlığını hem de günümüz mekân anlayışını kavramada önemli bir katkı sağlamaktadır.

## 2. DOĞAL IŞIK VE MEKÂN

Doğanın canlı, değişken ve somut bir biçimde algılanmasını mümkün kılan unsur doğal ışıktır. İnsan, varoluşundan bu yana dünyayı doğal ışık aracılığıyla tanımış, çevresini anlamlandırmış ve mevsimlerin döngüsünü deneyimlemiştir. Çevremizde algıladığımız tüm nesneler, doğal ışığın farklı biçimlerdeki yansımaları ve değişimlerinin bir sonucudur (Meiss, 1991:121; Özmen, 2010). Mimarlık tarihine bakıldığında, doğal ışığın tasarım sürecinde her dönemde temel belirleyicilerden biri olduğu

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görülmektedir. Hem estetik hem de işlevsel yönüyle doğal ışık, mimarlık ile kurduğu ilişkiyi tarihsel olarak derinleştiren önemli bir unsurdur.

Le Corbusier, ışık ve mimarlık arasındaki ilişkiyi Mimarlık, ışıkta bir araya getirilmiş kütlelerin doğru, ustaca ve muhteşem oyunudur. Gözlerimiz formları ışıkta görmek için yaratılmıştır; ışık ve gölge bu formları tanımlar. sözleriyle açıklamıştır (Le Corbusier, 1999). Modern mimarlığın öncülerinden biri olan Corbusier'in bu ifadesi, ışığın mimari biçim üzerindeki belirleyici etkisini vurgulamaktadır. Onun ışıkta bir araya getirilmiş kütleler tanımı, doğal ışığın mimari biçimle kurduğu doğrudan ilişkiye işaret eder. Karanlığı ışıkla yontmak benzetmesi ise, ışığın mimar için yalnızca bir fiziksel olgu değil, aynı zamanda biçim yaratımında araçsal bir değer taşıyan soyut bir malzeme olduğunu gösterir. Bu bakımdan mimar, yalnızca maddi unsurları bir araya getiren bir teknik uygulayıcı değil, aynı zamanda ışık gibi görünmez nitelikteki öğeleri de biçimsel ve anlamsal düzeyde kullanan bir yaratıcıdır (Özmen, 2010).

Mimari mekân, mimarın elinde biçim kazanırken, birbirine bağlı iki temel unsur da aynı anda inşa edilir: mekân ve kabuk. Bu iki kavram, birbirinden bağımsız düşünülemeyeceği gibi, birbirini tanımlayan bir bütünün parçalarıdır. Mimari mekân, en yalın biçimiyle sınırlandırılmış boşluk olarak tanımlanabilir. Bu bağlamda, mekânın üç boyutlu bir varlık olarak algılanabilmesi için onu çevreleyen, tanımlayan ve dış dünyadan ayıran bir ara yüz olan mimari kabuğa ihtiyaç duyulur. Arıtan'ın (2001) da belirttiği gibi, mimari kabuk, yapının uzay içindeki boşluğunu çevreden ayıran dış yüzeydir. Bunun yanı sıra kabuk, iç mekânda gerçekleşecek eylemler için uygun çevresel koşulların sağlanmasına aracılık eden; ışık, ses, koku ve ısı gibi dışsal unsurları kimi zaman filtreleyen, kimi zaman yönlendiren ya da dönüştüren bir ara katmandır. Dolayısıyla, ışığın mimari mekândaki varlığı da bu kabuk aracılığıyla tanımlanır. Işık, hem kabuğu görünür kılar hem de mekânın yaşanabilirliğini sağlar (Özmen, 2010).

Mimari kabuk, kullanıcı tarafından tüm duyularla algılanabilen yüzeyler bütünüdür. Diğer görsel sanatlarda olduğu gibi, mimari mekânın da varlığı görme eylemine bağlıdır. Bu durumda mekânın algılanması, ışığın varlığına ve onun niteliğine bağlı olarak değişir. Mekânın insan üzerindeki etkisi, ışığın yönü, şiddeti ve türüyle doğrudan ilişkilidir. Doğal ışığın değişken ve dinamik yapısı, mekânın algısında süreklilik içinde farklı duygusal ve görsel deneyimler yaratır. Doğal ışık ile mimari kabuk arasındaki ilişki, çoğunlukla ışığın mekâna giriş biçimi üzerinden şekillenir. Işığın işlevsel veya estetik amaçlarla doğrudan ya da dolaylı biçimde iç mekâna alınması, mimar açısından temel bir tasarım değişkenidir. Yapının konumu, yönelimi, yüksekliği gibi çevresel etkenlerin yanı sıra, kabuğun biçimsel ve yapısal özellikleri de bu ilişkinin niteliğini belirler. Mimari mekânın kimliği, onu çevreleyen yüzeylerin biçimi ve düzenlenişiyle somutlaşır. Mekân, insan algısı aracılığıyla anlam kazanır. Duyusal veriler—ses, koku, dokunma hissi—mekân deneyimine katkıda bulunsa da, mekânın görsel olarak algılanabilmesi ışık sayesinde mümkündür (Özmen, 2010).

Mekânın algısal niteliği, ölçüler, oranlar, yüzey dokuları, kabuğu oluşturan açıklıkların biçim, büyüklük ve yerleşim özellikleri gibi birçok bileşene bağlıdır. Cephelerdeki doluluk-boşluk oranı, geçirgenlik

derecesi ve ışıkla kurulan kontrastlar yalnızca iç mekânı değil, dış kabuğun estetik ifadesini de belirler. Bu açıklıklar, iç mekândaki yaşamın dışa yansıtılmasında da aracı bir rol üstlenir. Gün ışığının oluşturduğu gölge-aydınlık oyunları, cephe yüzeylerinde mimari anlatımın bir parçasına dönüşür. Tarihsel süreçte, yapı kabuğundaki bu açıklıklar öncelikle işlevsel bir gereksinimin sonucu olarak ortaya çıkmış; zamanla biçimsel ve estetik bir nitelik kazanarak mimari kimliğin ayrılmaz bir ögesi haline gelmiştir (İskender, 1995). Bu nedenle, doğal aydınlatma tasarımında yalnızca ışığın işlevsel gereksinimleri değil, aynı zamanda doluluk ve boşlukların dış kabuk üzerindeki estetik etkileri de dikkate alınmalıdır (Doğrusoy, 2001; Özmen, 2010).

Günümüzde farklı deneysel uygulamalar geliştirilse de, mimari kabuk genellikle taşıyıcı veya kaplama işlevi gören geleneksel malzemelerden oluşmaktadır. Doğal ışığın iç mekâna nasıl alındığı ve hangi oranda kontrol edildiği, yapının strüktürel sistemiyle doğrudan ilişkilidir. Yapı kabuğunun biçimlenişi, hem iç mekândaki ışık kalitesini hem de bina kütlesinin genel formunu belirleyen bir unsurdur (Yıldız, 1995). Mimari tasarımda aydınlatmanın temel amacı, mekân içindeki nesnelerin, renklerin ve dokuların doğru biçimde algılanmasını sağlamaktır. Tarihsel açıdan değerlendirildiğinde, doğal ışık ile yapı kabuğu arasındaki ilişkinin öncelikle işlevsel temelde kurulduğu görülür. Mekânda gerçekleştirilen eylemin gerektirdiği aydınlatma koşulları, kabuğun biçimlenmesi üzerinde doğrudan etkili olmuştur. Örneğin, okuma etkinliği için tasarlanan bir kütüphane mekânı ile ibadet eylemi için tasarlanan bir dini yapı, ışığın nitelik ve yönlenişi açısından farklı çözümler gerektirir. Işığın yalnızca işlevsel değil, aynı zamanda estetik ve anlamsal bir unsur olarak tasarım sürecine dâhil edilmesi, mekânın duyusal niteliklerinin ve mimari ifadenin güçlendirilmesini sağlar. Işık, mimari kabuğun biçimsel karakterini belirleyerek mekânın duygusal atmosferini biçimlendirir. Bu nedenle Louis Kahn, Frank Lloyd Wright, Le Corbusier ve Alvar Aalto gibi modern mimarlığın önde gelen isimleri, doğal ışığı yalnızca bir aydınlatma unsuru olarak değil, aynı zamanda mimari anlamın taşıyıcısı ve biçimsel ifadenin aracı olarak görmüşlerdir (Doğrusoy, 2001; Özmen, 2010).

### 2.1. Doğal Işık ve Mimarlık Etkileşimi

Doğal ışığın mimarlıkla kurduğu ilişki, öncelikli olarak işlevsel bir temele dayanmaktadır. Doğal aydınlatmanın temel amacı, mekân içindeki nesnelerin, renklerin, dokuların ve biçimlerin doğru ve doğal biçimde algılanmasını sağlamaktır. Kullanıcının görsel konfor düzeyinin artması, gerçekleştirdiği eylemlerdeki verimin yükselmesi ve fiziksel ile psikolojik gereksinimlerinin karşılanması bu doğrultuda mümkündür. Mekânı algılayan birey, görsel anlamda yalnızca fiziksel değil, aynı zamanda psikolojik tepkiler de geliştirir. Bu nedenle, ışığın niteliksel ve niceliksel özelliklerinin uygun düzeyde olması, insanın hem fizyolojik hem de zihinsel ihtiyaçlarının karşılanmasında belirleyici bir etkendir

Bir mekâna giren ışığın miktarı ve dağılım biçimi, görsel konforu doğrudan etkileyen önemli bir göstergedir. Işığın niceliği ve niteliği, tasarıma etki eden birçok fiziksel faktöre bağlı olarak değişir. Binanın konumu, yönlenişi, açıklıkların biçimi, boyutu ve malzeme özellikleri bu faktörlerin başında

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gelir. Bunun yanı sıra, yapının çevresindeki diğer yapılar, bitki dokusu, arazi eğimi gibi dış çevre koşulları ile iç mekânda kullanılan yüzeylerin yansıtıcılık özellikleri de doğal aydınlatma performansını etkiler (Sze-Hui Au, 1999; Özmen, 2010).

Mimari tasarımda doğal ışık, hem mekânda gerçekleştirilen eylemlerin gerektirdiği görsel koşulları sağlamak hem de mekânsal estetiği desteklemek amacıyla kullanılmaktadır. Işığın işlevsel kullanımı kadar, mekâna kattığı duygusal ve estetik etkiler de tasarımın önemli bir parçasıdır. Bu nedenle, doğal ışığın mimarlıkla kurduğu etkileşimin değerlendirilmesinde, öncelikle mekânın işlevi ve bu işlevle bütünleşen aydınlatma anlayışı dikkate alınmalıdır. Farklı eylemlerin gerçekleştiği alanlarda ışığın niteliği ve yönü değişkenlik gösterir; böylece aydınlatma, işlevsel gereksinimlerle estetik beklentiler arasında bir denge unsuru haline gelir.

Doğal ışık, aynı zamanda mimari mekânın bölümlenmesinde de etkin bir araçtır. Farklı ışık düzeylerine sahip alanlar, herhangi bir fiziksel sınır öğesine gerek kalmadan, yalnızca aydınlık-karanlık kontrastı aracılığıyla birbirinden ayrılabilir. Bu durum, tasarımcının mekân organizasyonuna yaklaşım biçimiyle ve işlevsel kurgunun ihtiyaçlarıyla doğrudan ilişkilidir. Böylelikle ışık, yalnızca bir fiziksel gereklilik olmaktan çıkarak, mimari tasarımın biçimsel ve kavramsal bir bileşeni haline gelir.

Tasarım sürecinde ışık, mekânı deneyimleyen kullanıcıyı yönlendiren bir araç olarak da değerlendirilebilir. Işığın yönü, şiddeti ve sürekliliği, mekân içinde kullanıcının hareketini ve algısal deneyimini belirler. Bir mekânda aydınlık ile karanlık arasında kurulan geçişler, bireyin mekânı algılama biçimini etkileyerek yönlendirici bir rol üstlenebilir. Doğal ışığın kontrolü, yapının duvarlarında ya da üst örtüsünde yer alan açıklıklar aracılığıyla sağlanır. Genel bir ifadeyle, bu açıklıklar yapı kabuğunda oluşturulan geçirgen alanlardır ve iç mekân ile dış çevre arasında bir bağ kurarlar. Açıklıkların boyutu, biçimi ve konumları kadar, bu yüzeylerin cam, güneş kırıcı, panjur gibi ışığı filtreleyen elemanlarla donatılması da mekânın ışıkla kurduğu ilişkiyi belirler. Tasarımcının bu ilişkiyi nasıl kuracağı, yapının işlevine göre değişir. Örneğin bir endüstri yapısı, bir ibadet mekânı veya bir konut, doğal ışıkla farklı düzeylerde ilişki kuracak biçimde tasarlanmalıdır. Aynı yapı içinde bile, farklı mekânların dış çevreyle kurduğu ışık bağlantısı farklılık gösterebilir.

İç mekân ile dış çevre arasındaki bu etkileşim, yapı kabuğunda oluşturulan boşluklarla sağlanır. Bu boşluklar, doğal ışığın iç mekâna girişini sağlayan tasarım elemanları olarak yalnızca aydınlatma işlevi görmekle kalmaz, aynı zamanda yapı kabuğunun hem dışa hem içe yönelik estetik karakterini belirler. Açıklıkların oranı, biçimi ve yerleşimi, mekânın ışık alma biçimini ve dolayısıyla kullanıcı üzerindeki psikolojik etkiyi doğrudan biçimlendirir. Bu öğeler, dış dünyayla bağlantı kurarak iç mekân yaşantısına dair ipuçları verir. Boşlukların bu çift yönlü iletişim rolü, hem dıştan içe hem de içten dışa bilgi aktarımını mümkün kılar. Bu durum, mekânın şeffaflık ve mahremiyet arasında kurduğu denge açısından önemli bir mimari problematiğe işaret eder. Böylelikle, doğal ışığın yönlendirilmesi ve yapı

kabuğundaki açıklıkların düzenlenmesi, hem estetik hem de psikolojik açıdan kullanıcı deneyimini belirleyen bir tasarım stratejisine dönüşür

Doğal ışığın mimariye sunduğu en önemli katkılardan biri, yapının estetik niteliğini güçlendirmesi ve ona yeni anlam katmanları kazandırmasıdır. Mimari kabuğun, günün farklı saatlerinde değişen ışık-gölge ve ışık-renk dengeleriyle dinamik bir karaktere bürünmesi, tasarım açısından zenginleştirici bir unsurdur. İç mekânlarda ise doğal ışığın sürekli değişen yapısı, kullanıcının mekânı algılayış biçimini dönüştürür ve bu algıya çeşitlilik kazandırır. Bu nedenle doğal ışık, durağan olmayan, aksine sürekli dönüşen bir tasarım bileşeni olarak kabul edilir. Mimari kabuğun biçimlenme sürecinde doğal ışığın yönü, şiddeti ve süresi dikkate alınarak tasarlanan yapılar, görsel anlamda yüksek bir estetik değer kazanır. Doğal ışığın kullanıcı üzerindeki psikolojik etkileri ve mekâna kattığı sembolik anlamlar, mimari tasarımın sadece fiziksel değil, duygusal ve bilişsel bir deneyim olarak da ele alınması gerektiğini göstermektedir. Araştırmalar, hem konut hem de kamusal yapılarda gün ışığının insan bedeninde biyolojik ritimleri düzenlediğini, ruhsal dengeyi desteklediğini ve genel yaşam kalitesini artırdığını ortaya koymaktadır.

Işığın anlam üretici bir unsur olarak kullanımı, mimari kabuğun biçimini doğrudan etkiler. Mekânın sınırlarını oluşturan yüzeyler, ışık ve gölgenin etkileşimiyle sembolik bir anlatım gücü kazanır. Bu etkileşim, yapının estetik karakterini belirleyen bir kompozisyon oluşturur. Abercrombie'ye göre anlam, insan davranışını şekillendiren en temel unsurlardan biridir ve doğrudan duygularla ilişkilidir. Benzer biçimde Loos da mimarın görevinin, kullanıcıda belirli duygular uyandıracak mekânsal düzenleri oluşturmak olduğunu ifade eder (Aydınlı, 1993). Bu bağlamda ışığın oluşturduğu anlam yalnızca estetik değil, aynı zamanda felsefi ve duygusal bir boyut da taşır. Aydınlı (1993), mimarlığın özünde barındırdığı anlamın kullanıcının estetik değer yargılarına bağlı olduğunu belirtir. Ona göre bir mekânın estetik değeri, kullanıcının bilinç düzeyinde yarattığı tepkiyle ölçülür; bu tepkiyi uyandıran unsurlar arasında ışığın yoğunluğu, yönü ve rengi gibi faktörler yer alır. Dolayısıyla ışık, hem mimari biçimlenişin belirleyici bir unsuru hem de estetik bütünlüğün tamamlayıcısıdır.

Doğal ışığın mekânda yarattığı anlam, ışığın kabukla etkileşimi ve mekâna giriş biçimiyle şekillenir. Bu etkileşim, mekânın algılanışını doğrudan etkiler; doğru biçim ve konumda kullanılan ışık ve gölge geçişleri, bireyin mekânı deneyimleme biçimini zenginleştirir (Altan, 1983). Işık, temas ettiği yüzeyler ve yarattığı gölgeler aracılığıyla görsel bir bütünlük oluşturur. Bu süreçte ışığın malzemeyle olan ilişkisi, mekânın duyusal karakterini ve biçimsel kimliğini belirler. Mimar, kullanıcıda belirli duygusal veya algısal yönelimler yaratmak amacıyla aydınlık ve karanlık arasındaki kontrasttan yararlanır. Mekânda anlam, genellikle bu iki zıt durumun yarattığı gerilimden doğar. Ancak bu anlamın tam olarak oluşabilmesi için ışığın, karanlığın ve gölgenin mimari elemanlarla birlikte bir kompozisyon içinde kurgulanması gerekir (Yıldız, 1995).

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Sonuç olarak, mimari mekânda doğal ışığın anlam üretici yönü, kabuk biçimlenmesi, yüzey malzemeleri ve açıklık düzenleriyle birlikte ele alındığında ortaya çıkar. Tasarımcının ışığı hangi yönde, ne yoğunlukta ve hangi biçimsel stratejilerle mekâna dâhil ettiği, kullanıcıda oluşacak duygu ve algı dünyasını belirler. Bu nedenle ışığın mimari anlam yaratma potansiyeli, hem mekânsal deneyimin hem de estetik bütünlüğün temel unsurlarından biri olarak değerlendirilmektedir.

## 3. DOĞAL IŞIK VE MEKÂN KİMLİĞİ

Mimarlık, somut yapısal öğeler aracılığıyla duygusal deneyimleri görünür kılan, böylece ruh kazanan bir sanat alanı olarak tanımlanabilir. Görsel etkisi güçlü ve mekânsal anlamda derinlik taşıyan bir mimari yapı, kullanıcıda estetik ve duygusal bir yönelim yaratacak öğelerin bilinçli biçimde bir araya getirilmesiyle ortaya çıkar (Aydınlı, 1993).

Işığın gün, ay ve mevsim döngüleri içinde sürekli değişkenlik göstermesi, bulunduğu mekânı da biçimsel ve algısal olarak dönüştürür. Bu nedenle zamanın akışıyla birlikte mekânın algısında kaçınılmaz farklılaşmalar yaşanır. Kahn bu durumu, modern mimaride binanın ne kadar güneş aldığı sorusunun yetersiz olduğunu vurgulayarak açıklar; asıl sorunun ışığın mekâna günün ve yılın farklı zamanlarında kazandırdığı ruh hallerinin neler olduğu olduğunu belirtir (Kahn, 1968). Frampton ise, mimarların yarı aydınlık ve sessizlik hissi uyandıran bir ışığa olan insani gereksinimi unuttuklarını söyleyerek ışığın duygusal yönüne dikkat çeker (Frampton, 1985). Gerçekte fiziksel biçim değişmeden, yalnızca ışığın niteliğiyle mekânın psikolojik algısının dönüşmesi mümkündür. Bu nedenle ışığın gün içinde süreklilik gösteren değişimi, mekânın ruhunu belirleyen temel unsurlardan biridir.

Doğal ışık, yalnızca işlevsel değil, aynı zamanda mekânsal anlamı güçlendiren bir ifade aracıdır. Özellikle dini yapılarda, ilahi bir atmosfer yaratmak amacıyla çoğunlukla yukarıdan alınan ışığın, ibadet duygusunu derinleştiren bir unsur olarak kullanıldığı görülür. Aydınlı'nın aktardığı biçimiyle, Gropius renkli vitraylardan süzülen güneş ışığının katedralin karanlık bölümünde yavaşça dolaşırken ani bir şekilde mihrabın arkasındaki mozaik ya da heykel üzerinde yarattığı etkiden söz eder; bu deneyimi yaşayan kişinin duyduğu şaşkınlık ve coşkunun benzersiz olduğunu ifade eder (Aydınlı, 1993).

Bir mekânın hem aydınlık hem de gölgeli bölümler içermesi, farklı tonlarda algısal etkiler yaratır. Işık ve gölge arasındaki bu ilişki, mekânın monotonluğunu kırarak plastik bir çeşitlilik kazandırır. Mimari bir mekânın etkileyiciliğinde ışığın rolü oldukça belirgindir; yalnızca biçimsel sınırları vurgulamakla kalmaz, aynı zamanda mekâna insani bir karakter ve duygusal bir derinlik kazandırır. Işığın mekâna giriş biçimi, aydınlık veya loşluk düzeyi, mekânın dingin ya da dinamik bir atmosfer kazanmasında belirleyici olur. Kullanıcı, mekânı algılarken öncelikle onun sınırlarıyla doğal ışığın birleşiminden doğan sinyalleri alır; bu sinyaller bilişsel ve duyusal düzeyde estetik bir yargıya dönüşür. Dolayısıyla mimari mekân, estetik algı yoluyla kavranan bir deneyim alanı hâline gelir. Mekânın anlamı ile doğal ışığın yarattığı etki zihinde bütünleşir ve kullanıcıda estetik bir bilinç oluşur (Yıldız, 1995).

Doğal ışığın estetik açıdan en önemli niteliği, durağan olmayışı ve sürekli değişkenlik göstermesidir. Günün saatlerine, hava koşullarına ve mevsimlere bağlı olarak değişen ışık yoğunluğu ve renk tonları, mekânsal deneyimi çeşitlendirir. Bu değişkenlik, mimari mekâna canlılık ve özgünlük kazandırır. Mekânın aydınlatma biçimi, kullanıcıların o mekânla kurduğu duygusal bağ üzerinde doğrudan etkilidir. Örneğin, doğrudan ve güçlü ışık, keskin gölgeler oluşturarak mekâna dinamik bir ifade kazandırırken; yansıtılmış, dolaylı ışık daha dingin ve huzurlu bir atmosfer yaratır. Bu nedenle doğal ışığın kullanımı, mekânda gerçekleşen eylemin niteliğiyle bütünleşmelidir. Bir müzede sergilenen objelere odaklanmayı kolaylaştıran, göz yormayan bir ışık tercih edilirken, dini yapılarda içe dönük, sakin ve maneviyatı güçlendiren bir atmosferin yaratılması amaçlanır. Dolayısıyla, aydınlatma tasarımının estetik değerleri yapının işleviyle uyum içinde değerlendirilmelidir (Doğrusoy, 2001).

Işığın sembolik anlamda bir ifade aracı olarak en yoğun biçimde kullanıldığı dönem Barok'tur. Bu dönemin mimarlığında ışık, duygu, hareket ve maneviyatı temsil eden bir unsur hâline gelmiştir. Barok yapılarında ışık ve gölgenin yarattığı dramatik etki, dini duyguları pekiştiren bir anlatım aracına dönüşmüştür. Bernini ve Borromini gibi mimarlar ışığı ustalıkla kullanarak biçimsel hareketi ruhsal bir deneyime dönüştürmüşlerdir. Brogan'a (1997) göre, 18. yüzyılda Neoklasik dönemde Boullee ve Ledoux gibi mimarlar, ışık ve gölgeyi geometrik formların dinamizmini ortaya koymak için kullanmışlardır.

19. yüzyılın Sanayi Devrimi ile birlikte ışığın sembolik değeri giderek azalmış, işlevsel bir nitelik kazanmıştır. Yeni yapı malzemelerinin (cam, çelik vb.) gelişmesi, modern mimaride ışığın kullanımını kökten değiştirmiştir. Çelik konstrüksiyonların sağladığı geniş açıklıklar ve büyüyen cam yüzeyler, iç mekânlara daha fazla ışığın girmesine olanak tanımış, böylece modern yaşamın aydınlık dünya idealini mimari biçimde görünür kılmıştır. 1851'de Londra'da inşa edilen Crystal Palace, dönemin teknoloji ve ışık ilişkisinin öncüsü olmuştur. Bunu izleyen Glass House (1914) ve Bauhaus Binası (1926) modern mimarlığın ışıkla kurduğu ilişkinin önemli örnekleri arasında yer alır. Teknolojinin gelişmesiyle cephelerin incelmesi ve hafiflemesi, ışığın mekânın en derin noktalarına kadar ulaşmasını sağlamıştır. Ancak Kutlu'ya (2001) göre, ışığın bu denli teknikleşmiş ve işlevsel kullanımı, mimarinin ruhsal ve sembolik boyutlarını yitirmesine yol açabilecek tehlikeleri de beraberinde getirmiştir.

### 3.1. Doğal Işık ve Mekân Kimliği Etkileşimi İçin Örnekler

Günümüzde de, Gotik ve Barok dönemlerde olduğu gibi, ışığın yeniden sembolik ve şiirsel bir değer kazanmasına yönelik eğilimlerin mimarlıkta giderek öne çıktığı görülmektedir. Bu bağlamda, bazı çağdaş mimarlar mekânsal kurgularını doğrudan ışığın anlam dünyası üzerine temellendirmekte ve onu tasarımın merkezine yerleştirmektedir. Louis Kahn, Tadao Ando, Ricardo Legorreta ve Steven Holl gibi isimlerin yapıtlarında bu yaklaşım belirgin bir biçimde izlenebilmektedir. Bu mimarların ışığı ustalıkla kullanabilmelerinin temelinde, ışığın doğasına ve davranış biçimlerine ilişkin derin bir kavrayış yatmaktadır.

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Kutlu'ya (2001) göre, yapılaşmış çevreyi kontrol altına almak ve mekân içerisinde istenilen dinamizmi kurmak, ancak ışığın niteliklerinin bilinmesi ve bu doğrultuda mekânsal organizasyonun kurgulanmasıyla mümkündür. Işığın önemi, yalnızca form, strüktür ve hacim gibi mekânsal öğelerle olan ilişkilerinde değil, aynı zamanda zaman, sınır ve hareket gibi kavramsal boyutlarla kurduğu karşılıklı etkileşimde ortaya çıkar. Bu ilişkilerin çözümlemesi, tasarımcıya ışığı mekânsal kompozisyonun etkin bir bileşeni olarak değerlendirme olanağı tanır ve böylelikle yapıya estetik ve deneyimsel bir zenginlik kazandırır. Işık aracılığıyla mekânlar arasında görsel ve duygusal bağlantılar kurulabilir; mekânsal bölgeler birbirinden ayrılabilir veya bütünleştirilebilir. Işık yardımıyla bir çekim merkezi yaratılabileceği gibi, kullanıcı hareketine yön veren bir mekânsal dinamizm de oluşturulabilir. Aynı zamanda, ışık farklı yoğunluk ve yönleriyle mekânın algısal karakterini dönüştürme gücüne sahiptir. Bu özellikleriyle ışık, yalnızca tamamlayıcı bir unsur değil, tasarım sürecinde aktif biçimde değerlendirilmesi gereken bir mimari araç olarak öne çıkar (Kutlu, 2001; Özorhon, 2002). Bu anlayışın somut örnekleri arasında, Ando'nun Işık Kilisesi'nde oluşturduğu haç biçimindeki ışık kurgusu, Kahn'ın Kimbell Sanat Müzesi'nde gün ışığını yönlendirme biçimi ve Steven Holl'un St. Ignatius Şapeli'nde yarattığı atmosfer sayılabilir. Bu yapılar, ışığın mimari tasarımda yalnızca işlevsel bir öğe olmaktan çıkıp, mekânın anlamını, duygusunu ve ruhunu tanımlayan temel bir ifade aracına dönüşebileceğini göstermektedir.

20. yüzyılın en etkili mimarlarından biri olan Louis Kahn, mekânın ne olmak istediğini anlamaya çalışan bir mimari düşünce sistemine sahiptir. Onun tasarım anlayışında mekân, yapı ve ışık birbirinden ayrılmaz bir bütün oluşturur. Kahn'a göre bir mekânın gerçekten mekân olarak tanımlanabilmesi, onun hangi yöntemle inşa edildiğinin, yapım sürecinin nasıl kurgulandığının ve bu mekânın ne tür bir ışıkla birlikte düşünüldüğünün ortaya konmasıyla mümkündür. Her mekân, kendine özgü ışık karakterine sahip olmalı ve bu durum, yapının strüktürel biçimlenişine de doğrudan yansımaktadır (Gülgönen, 1992; Özorhon, 2002)).

Kahn'ın tasarım yaklaşımı, soyut bir düşünsel düzlemde başlayan ve somut bir yapısal gerçekliğe ulaşan bir süreç olarak tanımlanabilir. Onun mimari üretiminde ölçülemeyen değerleri görünür kılan en önemli araç, doğal ışıktır. Kahn'a göre doğal ışık, varoluşun kaynağıdır; mimarlık ise sessizlik ile ışığın buluştuğu noktada anlam kazanır. Sessizlik, potansiyel olanı; ışık ise bu potansiyelin varoluşa dönüşümünü temsil eder. Böylece bir mekân, özsel anlamını ancak ışığın aracılığıyla bulur. Kahn'ın yapılarında ışık, hem mekânsal organizasyonu hem de tektonik düzeni biçimlendiren saf ve duru bir öğe olarak karşımıza çıkar. Kahn, mekâna anlam kazandırma sürecinde doğal ışığı farklı yapısal stratejilerle bütünleştirir. Bu stratejilerden en dikkat çekeni, mimarın ışık dolu oda (room full of light) olarak tanımladığı kurgulardır. Farklı geometrik biçimlerde tasarlanabilen bu ışık kutuları, kimi zaman ana hacmin dış sınırlarına eklemlenerek, kimi zaman da planın merkezine yerleştirilerek çevresinde ikincil işlevli mekânların örgütlenmesini sağlar. Böylece ışık, mekânın biçimlenme sürecine yön veren bir bileşene dönüşür. Kahn'ın bir diğer yaklaşımı ise, mimarlığın sanatsal niteliğini güçlendiren yapı

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kabuklarını yaratıcı biçimde kullanmasıdır. Ana mekânı çevreleyen bu kabuklar, iç ve dış arasındaki geçişi tanımlayan ara bölgeler oluşturur. Kahn, ışığı bu kabuklara dâhil ederek hem mekânın atmosferini hem de yapının biçimsel etkisini belirlemiştir. Böylelikle ışık, yalnızca bir aydınlatma unsuru değil, yapının poetik ve ruhsal karakterini inşa eden temel bir öğe hâline gelmiştir (Özorhon, 2002) (Şekil 1).



**Şekil 1**. Uniterian Kilisesi iç mekânı, Ronchester (Özorhon, 2002)

Kahn, bu mekânı tasarlarken yukarıdan süzülen yoğun bir ışığı, Tanrı'nın varlığını simgesel biçimde temsil eden bir unsur olarak kullanmıştır. Mekânı çevreleyen boşluksuz, masif duvarlar, ışığın yalnızca tavandan içeri girmesine olanak tanımış; böylece kullanıcının algısı göğe, yani ilahi bir yüceliğe doğru yönlendirilmiştir. Yapının üst örtüsü haç biçiminde tasarlanmış, bu haç formu tam bir kare planın içerisine yerleştirilmiştir. Haçın dört kolunun kesişim noktalarındaki alanlar yukarı doğru yükseltilmiş ve bu açıklıklardan gün ışığının içeri süzülmesi sağlanmıştır. Duvar yüzeylerinde pencere bulunmaması, iç mekânda karanlık ve aydınlık arasındaki karşıtlığı belirginleştirmiştir. Böylelikle doğal ışık, yalnızca fiziksel bir aydınlatma aracı değil, aynı zamanda Tanrı'nın göksel varlığını sembolik olarak ifade eden bir anlam katmanı hâline gelmiştir. Kahn, bu mekânsal etkiyi güçlendirmek amacıyla ana ibadet hacmini çevreleyen bölgelere ofis ve eğitim birimlerini yerleştirmiş; ana mekânı ise tamamen penceresiz tasarlamıştır. Yapının üst örtüsünü oluşturan strüktürel sistem, istenen ışık etkisini en doğru biçimde elde edebilmek için biçimlendirilmiş; böylece ışığın geliş yönü, mekânın biçimsel ve plastik karakterini doğrudan belirlemiştir (Özorhon, 2002).

Kahn, Bangladeş'teki Ulusal Meclis Binası tasarımında da ışığı biçimlendiren temel bir tasarım aracı olarak kullanmıştır. Yapının kabuğu ve taşıyıcı sistemi, ışığın mekânla kurduğu ilişkiye göre

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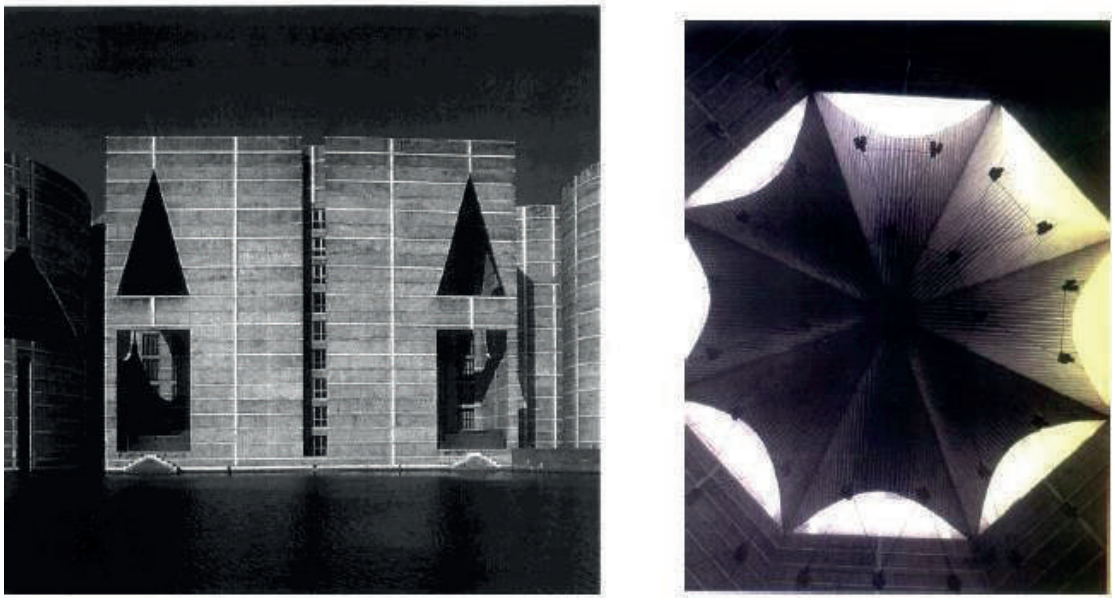
biçimlenmiştir. Kahn, hedeflediği mekânsal etkiyi elde edebilmek için duvar yüzeylerini uzatmış, yönlendirmiş ve bu sayede ara boşluklar meydana getirmiştir. İç mekânda ise, toplanma eyleminin yüceliğine duyduğu inanç doğrultusunda, aydınlatmayı yukarıdan sağlamış; böylece yapıya mistik ve manevi bir atmosfer kazandırmıştır. Kahn'ın yapılarında ışık genellikle kutsal ya da şiirsel bir nitelik taşır. Bu nedenle, ışığın onun mimarisine kattığı en önemli unsurun, mekânın ruhunu güçlendiren derin bir etki yaratmak olduğu söylenebilir (Özorhon, 2002) (Şekil 2).



**Şekil 2.** Meclis Binası, Dakka (Özorhon, 2002)

Işık, Tadao Ando'nun mimari anlayışında en temel bileşenlerden biridir. Brüt beton yüzeylerden yansıyan ışık oyunları ve bu yüzeylerin oluşturduğu gölgeler, Ando'nun mimarisindeki sadelik ve kusursuzluk dengesini ortaya koyar. Ando için ışık, yapıya yalnızca bir aydınlatma unsuru olarak değil, aynı zamanda incelik, duyarlılık ve huzur kazandıran bir öğe olarak dâhil edilir. Dışarıdan sade bir biçimde algılanan yapılarında, ışığın yönlendirilmesiyle oluşturulan karmaşık mekânsal kurgu, onun derin düşünsel yaklaşımının bir yansımasıdır.

Ando'nun amacı biçimsel bir sonuç elde etmekten ziyade, mekâna felsefi düşüncelerini yansıtmak ve bu yolla hacimsel bir deneyim yaratmaktır. Mimar, tasarımlarında doğa ile düşüncenin birlikteliğini kurmayı hedeflemiştir. Onun mimari dilini oluşturan dört temel unsur; malzeme, yalın geometrik biçimler, doğa ve ışıktır.

Ando'nun Zen-Budist inancı, mekân kurgusuna derin bir anlam kazandırır. Bu bağlamda, ışık ve geometriyi bir araya getirerek manevi bir mekânsal deneyim oluşturur. Zen felsefesinin merkezinde yer alan an kavramı, bütünü çağrıştırırken parçaların farkına varmayı; sonsuzluk duygusunu mekân içinde deneyimlemeyi sağlar. Aynı düşünce sistemi içinde önemli bir yere sahip olan Mu (boşluk) kavramı, varlığın özünün yoklukta bulunduğu anlayışını taşır ve Ando'nun mekân anlayışında bu düşünce

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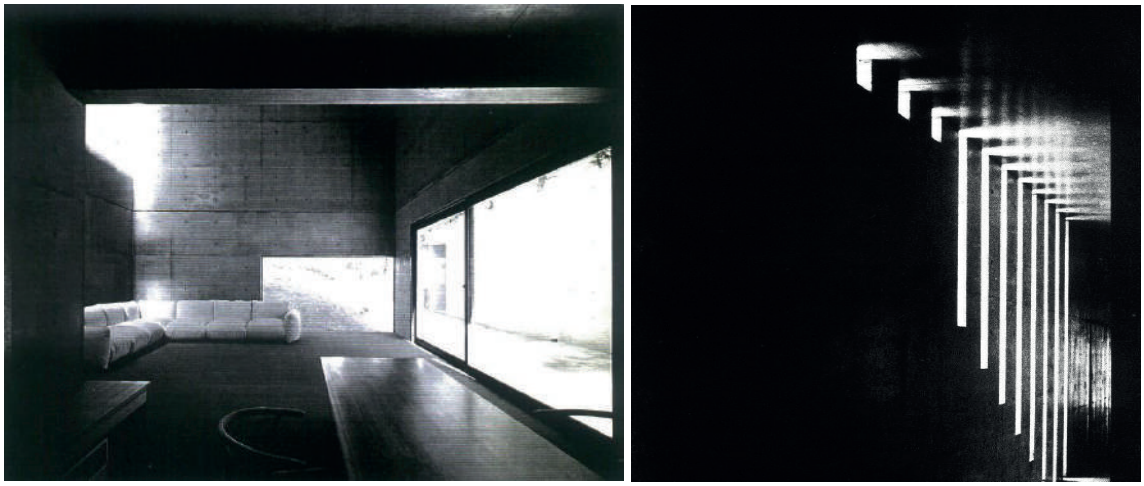
doğrudan karşılığını bulur. Tadao Ando, bu kavramların her birini aynı an içerisinde ışık ve geometri aracılığıyla mekâna aktarabilen, düşünsel derinliği yüksek, özgün bir mimar olarak öne çıkar (Özorhon, 2002) (Şekil 3).



**Şekil 3.** Koshino evi ve iç mekânı (Özorhon, 2002)

Tadao Ando tarafından tasarlanan Işık Kilisesi, dikdörtgen formda bir beton kutu ile bu kutuya dar bir açıyla yerleştirilmiş bir perde duvardan oluşmaktadır. Japonya'da yakın dönemde inşa edilen bu yapı, hem ışığın hem de gölgenin yarattığı etkileşimle, sadelik ve estetik bir incelik sergileyen bir mimari örnektir. Basit beton hacim, gündüz ışığını kadifemsi bir karanlık içerisine süzmek amacıyla, dar açıklıklar aracılığıyla biçimlendirilmiştir. Derin gölgeler mekânı doldurarak katı nesneleri gizlerken, mekâna giren ışık yavaş yavaş sert biçimleri yumuşatır, duvar bağlantı noktalarını belirsizleştirir ve boşlukları vurgular (Plummer, 1997; Özorhon, 2002).

Giriş tarafında, duvar ile tavan arasındaki ışık çubuğu ve giriş açıklığından sızan değişken ışık, mekâna farklı bir atmosfer kazandırır. Öte yandan, duvarda oluşturulan ince haç biçimindeki açıklık, karanlık yüzey üzerinde aydınlık bir kesit ortaya çıkarır. Haçın ışıkla etkileşimi, günün saatlerine bağlı olarak bazen döşemede, bazen tavanda ortaya çıkarak mekâna zengin bir görsel çeşitlilik katar. Ando, modern yaşamın doğadan kopmuş bireylerine, doğayı hem bedensel hem de ruhsal olarak deneyimleyebilecekleri mekânlar sunmayı amaçlamaktadır. Ancak bu yaklaşım, geçmişe duyulan bir nostalji ya da kaybolanı simgelemeye değil, doğayı insan yaşamının içine güçlü ve doğrudan bir biçimde yeniden katmaya yöneliktir. Bu bağlamda, Tadao Ando'nun mimarlığı, insan ile doğa arasındaki ilişkinin bir sahne olarak deneyimlendiği bir ortam yaratmaktadır (Özorhon, 2002). Ando bunu şöyle dile getirmektedir:

*"Benim tasarımlarımın amacı, mimarlık kuramımı barındırırken günlük yaşamın çeşitli yönleri ve doğal öğeler gibi şeylerle mekânlara zengin bir anlam getirmektir. Rüzgâr ve ışık gibi şeyler sadece dış dünyadan koparılarak sokulduğunda bir anlam taşırlar. Işığın ve havanın ayrılmış bir parçası tüm*

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*doğal çevreyi hatırlatır. Yarattığım biçimler, zamanın geçişini, mevsimlerin değişimini gösteren doğa öğeleri (ışık ve hava) aracılığıyla anlam kazanırlar...*" (Ando,1982).

Bir diğer önemli tasarımcılardan olan Meier'in mimarlığında yapısal kurgu ışık tarafından okutulur. Bunun yanında beyaz renk gerçekten de Meier"in tasarımlarında vazgeçilmeyen bir unsurdur. Meier gökkuşağının farklı renklerini kullanmak yerine, tüm renklerin birleşimi olan beyaz rengi kullanmayı tercih etmiştir. Böylece vurguyu tasarıma yöneltmiş olur. Meier, taşıyıcı sistemi gizlemek yerine onu ön plana çıkararak geometrisini dekoratif amaçlı kullanır Binaları topoğrafyayı yarıp yükselen kontrastlar oluşturur. Binanın taşıyıcı sistemini dış mekâna taşırmakla estetik açıdan hoş bir görüntü sergilemenin yanında iklim kontrolüne fayda sağlar. Yapılarını adeta saran bu elemanlar gün ışığından maksimum yararlanmanın yanı sıra aydınlık-gölge dengesini sağlar. Bina içinde gerekli yerde oluşturulan gölge alanı, tasarımı kullanıcı ihtiyaçlarıyla bütünleştirir (Özorhon, 2002) (Şekil 4).



**Şekil 4**. High Museum of Art, Georgia ve Douglas Evi, Michigan (Özorhon, 2002)

Behruz Çinici, çağdaş Türk mimarlığının öncü isimlerinden biri olarak kabul edilmektedir ve 50 yılı aşkın süredir sürdürdüğü üretimleri, onun özgün tasarım anlayışını açık biçimde ortaya koymaktadır. Çinici'nin mimari çalışmaları, biçim ve malzeme kullanımı açısından büyük çeşitlilik sergilerken, zaman zaman ışık da tasarımın belirleyici öğelerinden biri olarak ön plana çıkmaktadır. Bu bağlamda, Çinici'nin en dikkat çekici yapılarından olan T.B.M.M. Camii ve O.D.T.Ü. Mimarlık Fakültesi binaları, onun ışığı mekâna dâhil etme yaklaşımına dair önemli ipuçları sunmaktadır. 1995 yılında cami mimarisine getirdiği yenilikçi yaklaşımı ile Aga Khan Mimarlık Ödülü'ne layık görülen T.B.M.M. Camii, esasen bir meydan, ibadet ve kütüphane kompleksi olarak tasarlanmıştır (Şekil 5). Kütlesel

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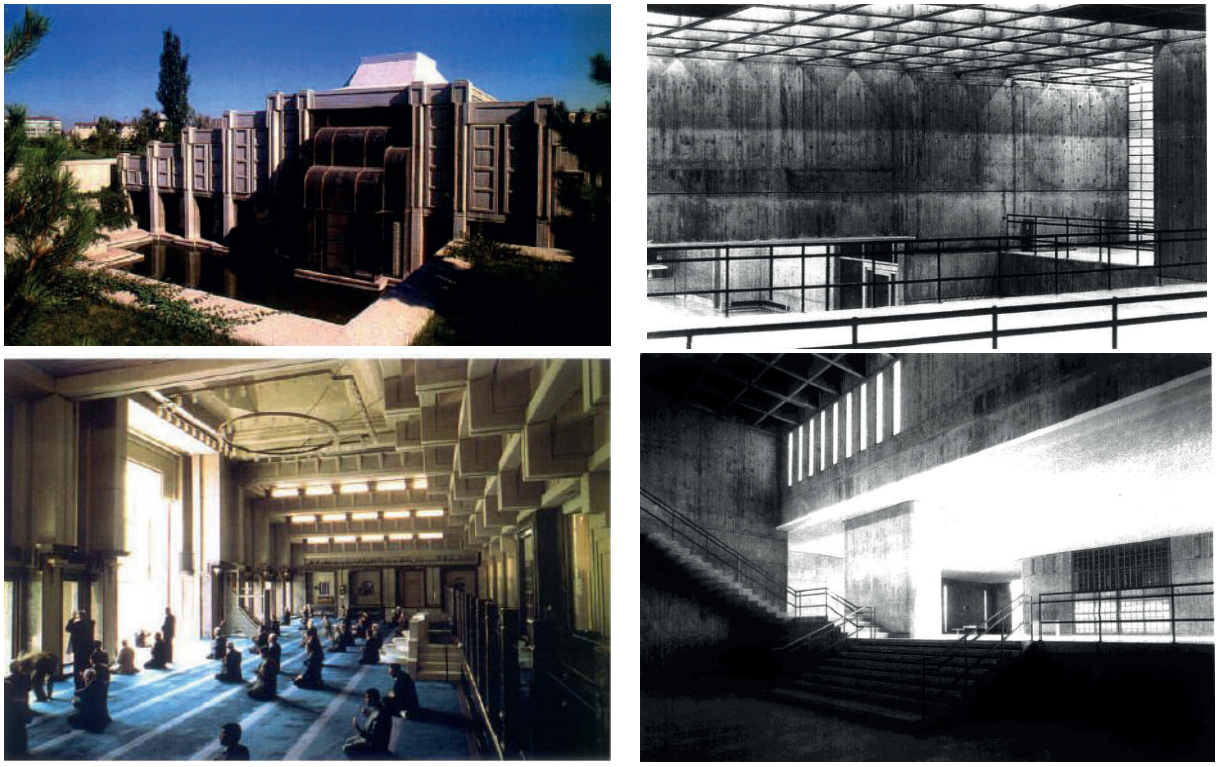
organizasyonu, güçlü ve yalın bir kurguya sahip olup, alçakgönüllü bir yaklaşım sergileyerek çevresel bağlamı ve özellikle Meclis binasının karakterini zedelemeden, geleneksel tipolojik cami anlayışından öncelikle ölçek açısından ayrışmaktadır.

Klasik kubbenin yerine, doğal ışığı iç mekâna taşıyan kademeli bir piramit konumlandırılmıştır. Minare yerine çift balkonlar tasarlanmış ve bir selvi ağacı, görsel olarak minare yükseltisini temsil etmiştir. Kıble duvarı şeffaflaştırılmış, mihrap ise camlı bir niş olarak yorumlanmış ve arkasındaki su öğesiyle donatılmış bahçeye açılmıştır. Geleneksel haremlik-selamlık ayrımı, yalnızca kot farkı ile vurgulanmıştır. Cami ve kütüphane cepheleri ile çevrili ön avlu, revaklarla tanımlanmış ve bir su öğesi ile mekânsal niteliği güçlendirilmiştir. Binanın ışıkla kurduğu ilişki, Ando'nun Göl Üzerindeki Kilise tasarımındaki yaklaşımı anımsatmaktadır. Mihrabın önünden giren güçlü ışık, piramidi oluşturan kirişler arasından süzülen yukarıdan gelen ışık ile birleşerek, dini mimarinin vazgeçilmez öğesini modern bir yorumla mekâna taşımaktadır (Özorhon, 2002)



**Şekil 5.** TBMM Cami ve ODTÜ Mimarlık Fakültesi Binası, Tasarımcı Mimar Behruz Çinici (Özorhon, 2002)

Turgut Cansever, mimarlıkta insanın bedensel, ruhsal ve kültürel gereksinimlerini karşılayan, insan merkezli bir yaklaşımı savunmaktadır. Bu yaklaşım, doğal olarak ışığın mekâna katkısını tasarım aracı olarak değerlendirmeyi de beraberinde getirir. Cansever'in ışığı mekân kimliğini ve niteliğini belirleyen

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bir öğe olarak kullandığı en dikkat çekici yapılarından biri, Ankara'daki Türk Tarih Kurumu (TTK) binasıdır (Şekil 6). 1930'lu yıllardan itibaren Ankara'da yaygınlaşan Uluslararası stile bir tepki niteliğinde geliştirilen TTK Binası, modern malzeme ve yapı elemanlarını geleneksel biçimlerle uyum içinde kullanarak özgün bir mimari dil oluşturur. Betonarme iskelet, Ankara taşı, cilalı Marmara mermeri, alüminyum doğramalar ve ahşap kafesler, birbirleriyle hem uyum hem de karşıtlık oluşturarak yapının karakterini belirler. Özellikle koyu kırmızı taş duvarlar, binanın dış masif kütlesi, tektonik yapısı ve Osmanlı medreselerinin biçimsel düzenini hatırlatan organizasyonu, yapıyı çevresinin görsel odak noktası hâline getirir.

1980 yılında Aga Khan Mimarlık Ödülü ile ödüllendirilen bu yapı, çağdaş yapı teknolojisini tarihselci bir biçim dili ile başarılı biçimde birleştiren önemli bir örnektir. Yapının zemin katında konferans salonu ve kitap depoları, üst katlarda ise kütüphane, okuma salonları, kısmi kitaplıklar ve ofis birimleri yer alır. Mekânlar, merkezi bir avlu etrafında toplanmış olup, Osmanlı yapılarının içe dönük karakterini çağrıştırmaktadır. Bu avlu aynı zamanda, şehir mekânına karşı korunmuş bir devamlılık sağlayan bir alan olarak da değerlendirilebilir (Cansever, 2001). Binada ışığın en etkili şekilde kullanıldığı mekân, söz konusu merkezi avludur. Üç kat yüksekliğindeki bu avluda çatıdan süzülen doğal ışık, mekânın şiirsel niteliğini öne çıkarır. Avluyu dolduran ışığın etkisine ek olarak, çevresindeki kat koridorlarının loşluğu ve koridor sonunda yer alan merdiven evine arkadan giren güçlü ışık, mekânın en dinamik öğesi olan merdiveni vurgular ve kullanıcıyı mekân içinde yönlendirir.



**Şekil 6.** Türk Tarih Kurumu Binası (Özorhon, 2002)

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## 4. DEĞERLENDİRME ve SONUÇ

Bu çalışma, mimarlıkta doğal ışığın yalnızca işlevsel bir aydınlatma unsuru değil, mekânın kimliğini kuran ve derinleştiren bir bileşen olduğunu ortaya koymaktadır. Işık, mimari formun görünür olmasını sağlayan bir araç olmanın ötesinde, mekânın duyusal, algısal ve anlam katmanlarını biçimlendiren dinamik bir unsurdur. Bu bağlamda doğal ışık, mimari mekânın fiziksel sınırlarını aşarak, kullanıcı ile mekân arasında duygusal ve zihinsel bir bağ kurar; böylelikle kimlik inşasının temel bileşenlerinden biri haline gelir. Mekânın kimliği, yalnızca malzeme, biçim ya da strüktür gibi somut öğeler üzerinden değil, bu öğelerin ışıkla kurduğu etkileşim yoluyla da tanımlanır. Bu durum, her bir yapının bulunduğu çevre, yönlenme, iklimsel koşullar ve kullanıcı deneyimi ile farklılaşan özgün bir kimliğe sahip olmasını mümkün kılar.

Doğal ışığın mekân kimliği üzerindeki belirleyici etkisi, modern mimarlık kuramlarında da geniş biçimde tartışılmıştır. Mimari tarih boyunca birçok düşünür ve mimar, doğal ışığın mekân üzerindeki belirleyici etkisini farklı kavramsal çerçevelerle ele almıştır. Louis Kahn, ışığı mekânın varlık sebebi olarak tanımlarken, ışığın bir duvarın formunu değil, o formun anlamını ortaya çıkardığını vurgulamıştır. Tadao Ando yapılarında, doğal ışığı bir metafor olarak kullanarak mekânın ruhsal derinliğini açığa çıkarır; ışığın yoğunluğu, yönü ve zamansallığı aracılığıyla kullanıcıda içsel bir farkındalık yaratır. Türkiye bağlamında ise Turgut Cansever'in tasarımlarında ışık, insan merkezli bir mimarlık anlayışının parçası olarak ele alınır; Cansever, ışığın mekâna kattığı manevi boyutu, kültürel ve ruhsal değerlerle ilişkilendirir. Bu yaklaşımlar, ışığın bir biçim verme aracı olmanın ötesinde, mimarlığın anlam katmanlarını dönüştüren poetik bir öğe olduğunu göstermektedir. Dolayısıyla doğal ışık, mimari üretimde soyut bir estetik değer olmanın yanında, mekânın ontolojik varlığını belirleyen bir faktör olarak ele alınmalıdır.

Işık, mekânın zamansal boyutunu da tanımlar. Günün farklı saatlerinde değişen ışık etkileri, mekânın sürekli yeniden algılanmasını sağlar; böylece mimari deneyim statik değil, dinamik bir süreç haline gelir. Bu değişkenlik, kullanıcıların mekânla kurduğu ilişkiyi derinleştirir ve onların mekânı yalnızca fiziksel bir barınak olarak değil, anlam yüklü bir deneyim alanı olarak algılamasına imkân tanır. Bu bağlamda, ışık aracılığıyla kurulan deneyimsel süreklilik, mekânın kimliğini sabitlemek yerine, onu sürekli yeniden tanımlayan bir süreç haline getirir. Doğal ışık, mimarlıkta kimlik, atmosfer ve algı arasındaki ilişkiyi kuran temel bir bileşen olarak değerlendirilmektedir. Işık, mekânın anlamını görünür kılarken, aynı zamanda o mekânın belleğini ve kullanıcıyla kurduğu duygusal bağı da güçlendirir. Dolayısıyla mimarlıkta doğal ışığın tasarım sürecine bilinçli bir biçimde dâhil edilmesi, mekânın kimliğini derinleştiren, özgün ve bütüncül bir mimari dilin oluşturulmasına katkı sağlar. Bu çalışmanın ortaya koyduğu üzere, ışık yalnızca bir aydınlatma aracı değil; mekânın kimliğini tanımlayan, deneyimsel zenginliğini artıran ve mimarlığın özünü görünür kılan bir anlam taşıyıcısıdır. Bu örnekler, doğal ışığın mimari kimliği kuran temel bir araç olduğunu ve her bir yapının bulunduğu coğrafya, iklim ve kültürel çevre doğrultusunda kendine özgü bir ışık diline sahip olduğunu göstermektedir. Işık,

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mekânın zamansallığını da biçimlendirir; günün farklı saatlerinde değişen ışık koşulları, mekânın sürekli dönüşen bir deneyim alanına dönüşmesini sağlar. Bu değişkenlik, mekânın durağan bir fiziksel nesne olmaktan çıkıp, kullanıcıyla etkileşim içinde yaşayan bir organizma haline gelmesine olanak tanır.

Sonuç olarak doğal ışık, mimari kimliğin oluşumunda yalnızca biçimsel ya da teknik bir parametre değil; aynı zamanda mekânın varoluşsal anlamını kuran bir araçtır. Işık aracılığıyla kurulan deneyimsel, duyusal ve ruhsal etkileşim, mimarlığın özünü görünür kılar. Mekânın kimliği, ışığın mekânsal örgütlenmesiyle birlikte şekillenir; bu da mimari tasarımın yalnızca maddi unsurlar üzerinden değil, soyut ve duygusal katmanlar üzerinden de değerlendirilmesi gerektiğini gösterir. Bu çalışma, doğal ışığın mekân kimliği üzerindeki etkisini çok boyutlu biçimde ortaya koyarak, mimarlıkta ışığın poetik, simgesel ve deneyimsel gücünün yeniden düşünülmesi gerektiğini vurgulamaktadır.

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# GLOBAL SUSTAINABILITY AND DEVELOPMENT CONGRESS

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GLOBAL SUSTAINABILITY AND DEVELOPMENT CONGRESS

# COMMUNITY-CENTRED FIRE RISK MANAGEMENT APPROACH FROM A SOCIAL SUSTAINABILITY PERSPECTIVE

**Bilgehan BAKIRHAN**

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## ABSTRACT

Preserving the cultural heritage is part of the sustainable development and in this context, fires affecting historic buildings are very important. UNESCO has reported increased number and scale of fire events that affects heritage places which are threatening the tangible expressions of social memory and identity. Generally, fire safety procedures focus on technical standards and engineering solutions, rather than the social fabric of these places and the contemporary relationship between local users and them.

This research addresses the problem that fire risk evaluation for historic buildings is currently fire engineer-dominated and ignores the social aspects of historic buildings. Focusing on how the experiences of local inhabitants and user groups shape perceptions of fire risk, the study seeks to outline a community-based fire risk management model that is based upon the principle of "living heritage." A structured questionnaire was applied to 53 users of historical buildings in the old bazaar area of Safranbolu regarding user-building relations, awareness of fire safety, risk perception and preventive behaviours. The survey results showed that 96.2% of respondents were highly interested in cultural heritage, and 83% thought that current fire protection was insufficient. Furthermore, 94.3% indicated a willingness for active community involvement in fire safety and 96.2% to be engaged in the relevant training modules, but 69.8% are poorly informed about firefighting techniques.

In conclusion, the community-based approach proposed herein enables sustainable cultural heritage preservation by fostering social engagement in fire risk management, which in turn improves resilience and makes it possible for policy makers to implement actions that are suggested in this paper.

**Keywords:** Social sustainability, Living heritage, Community-centred fire risk management.

## Introduction

The cultural concept of monument is defined as "monuments, groups of buildings and sites having cultural significance" (Article 1) according to the "Convention for the Protection of the World Cultural and Natural Heritage" issued by UNESCO in 1972, which also serves as the definition for cultural heritage in the view of Convention Concerning the Protection of the World Cultural and Natural Heritage (UNESCO, 1972). This definition was expanded by the 2003 Convention for the Safeguarding of the Intangible Cultural Heritage to also apply to practices, oral traditions, rituals, craftsmanship, and modes of knowledge transmission that affirm the identity and continuity of communities (UNESCO, 2003). In this sense, Tangible Cultural Heritage is not limited to material products and places but may also include Intangible Cultural Heritage whose characteristics or cultural content reflect the features of a specific historical period, culture, or civilization. Briefly cultural heritage can be defined as all the tangible and intangible values which expressed the identity, history and collective memory of the societies that passed and transcended across the generations (Bandarin and Van Oers, 2012). Historical buildings are the most visible manifestation of this heritage. However, these buildings are highly susceptible to natural and anthropogenic hazards. Among such threats, fire is one of the most devastating because of its rapid development and the irreparable damage it causes (Bakırhan & Beyhan, 2023).

UNESCO also stressed that the periodicity and destructiveness of fires damaging properties of cultural heritage have risen in the last years and that historic buildings all over the world are subject to greater fire risks (UNESCO, 2023). The 2018 blaze that destroyed the National Museum of Brazil and the 2019 fires at Notre Dame Cathedral and Shurijô, are heartbreaking testimonies to that danger. These are losses not just of material

existence but also of collective memory, cultural identity, and knowledge passed on through generations (Figure 1) (Bakırhan & Beyhan, 2025).

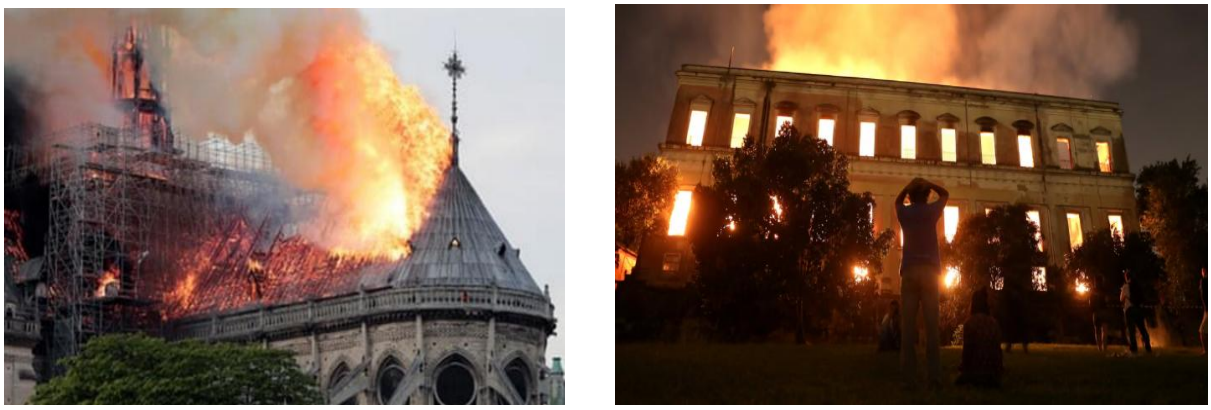

**Figure 1.** Notre Dame Cathedral fire (left), National Museum of Brazil fire (right)

Today's fire safety culture and practices are largely defined by a combination of technical standards, engineering solutions, and regulations. Nevertheless, in recent years, a number of technical tools such as performance-based design approaches, passive and active protection schemes and fire risk assessment have been developed (Watts & Kaplan, 2001; Meacham et al., 2005). However, contemporary approaches to fire safety are inadequate to completely address the tensions between the requirement to maintain the original fabric of historic buildings and the dictates of modern life safety code (Kincaid, 2018).

Conversely, these technocratic approaches ignore the social framework surrounding historic buildings, and the ties between local communities and their buildings. The 2003 Convention for the Safeguarding of the Intangible Cultural Heritage of the World Heritage Organization conceptualizes cultural heritage not as a frozen object but as a 'living heritage' in an ever flux with society (UNESCO, 2003). From this standpoint, community participation is seen as an essential component of conservation.

In addition, popular narratives within (CBDRM) paradigm promote raising consciousness and mobilize strategies which shift local communities from helpless recipients of aid to dynamic agents in managing risks (Shaw, 2012; Maskrey, 2011). This participatory method has demonstrated that indigenous knowledge, social networks, and processes for collective decision making strongly contribute to building disaster resistance.

This study intends to contribute to that void in the literature to answer the question: what is the connection between fire safety and social sustainability within the context of historic buildings? This study will seek to produce a community-based fire risk management model through fieldwork-based study in the Safranbolu Historic Bazaar district which was inscribed on the UNESCO World Heritage List.

**Main Problem**

Fire safety in old buildings is a multi-faceted and challenging matter. It is the absence of normal way of doing things, the constraints of technical means, the overlooking of social aspect, the knowledge-action paradox, and bureaucratic barrier. Traditional fire safety measures include such technical methodologies as the computation of the fire load, fire and evacuation modelling, and the evaluation of the structural resistance. As a result of these considerations, the structure can be designed to include active and/or passive protection measures. However, protecting the fabric of historic buildings means that such systems can only be installed The extent to which this is possible varies widely from building to building. This restriction complicates the choices for the conservator and fire engineer (D'Ayala & Benzoni, 2012).

In addition to these challenges, even technical solutions nowadays may completely disregard the social context of historic buildings and their communities of users. People who use historic structures know a lot about the building, the context, risk perception, and motivation for protection. However, the present modes do not take advantage of this potential.

However, users of historic buildings, almost without exception, acknowledge the significance of their cultural heritage and the fire risk, but do not convert it into personal protection actions. Reasons related to this shortcoming include ignorance, inadequate resources, and lack of responsibility, among others.

## Materials and Methods

Within the scope of this study, a survey was made in Safranbolu Historical Bazaar District and the numerical data obtained were analysed using descriptive analysis.

The selection of the research area was also influenced by Safranbolu's being inscribed in the UNESCO World Heritage List since 1994 as the most significant example that protects the 18th and 19th century Ottoman city form and by the traditional crafts, commercial uses and daily life being carried on in Safranbolu Historical Bazaar District. Moreover, the prevalence of wooden buildings raise the fire risk even further.

The research population consists of all users who work or reside in the Safranbolu Historical Bazaar District. 53 participants, including local merchants, artisans, and property owners and area residents took part in the workshops. As the instrument for gathering data a questionnaire was designed. The demographic information (age, education, length of residence, frequency of building use) and four core themes: building relationship, fire safety knowledge, risk perception, protective behaviours and responsibility were used to organize the questionnaire. The survey contained 5-point Likert scale questions (1=Strongly Disagree and 5=Strongly Agree), yes/no questions, multiple choice questions, and open-ended questions.

Data were collected by means of face-to-face interviews. The investigator accessed participants by traveling to their homes and places of employment in the Historic Bazaar District. The participants were given information regarding the aim of the study, they were reminded about the voluntary nature of participation and that the data would be used only for scientific purposes. The data obtained were processed and analyzed using SPSS software. Descriptive statistics (frequency, percentage, mean, standard deviation) were computed for every item. The analysis yielded significant results.

## Findings and Discussion

In this regard, the Safranbolu Case was applied and within the scope of the research, the community's perception, awareness and behavioural patterns in terms of fire safety hazards in historical buildings were obtained. The results are presented under four major headings: demographic characteristics that influence community capacity; levels of fire safety awareness and preparedness; trends in risk perceptions and specific concerns; and community participation and preservation motivation. These findings reveal both the potential and the key difficulties that such fire-risk reduction measures for living heritage sites entail.

### *Demographic characteristics*

The respondents are well distributed in terms of age, with the age group 18-30 being the most represented (34%), followed by 30.2% in the age group 31-45, 20.8% in the age group 46-60, and 15.1% in the age group 61 and above. This intergenerational representation creates the possibility of sharing fire safety information across generations. The educational background is diverse from the previous studies with the highest percentage of secondary school leavers (32.1%) and primary school leavers (30.2%), and among the other categories are university graduates 13.2%, people with post graduate education 11.3%, individuals who just can read 7.5% and illiterate individuals 5.7% (Figure 2).

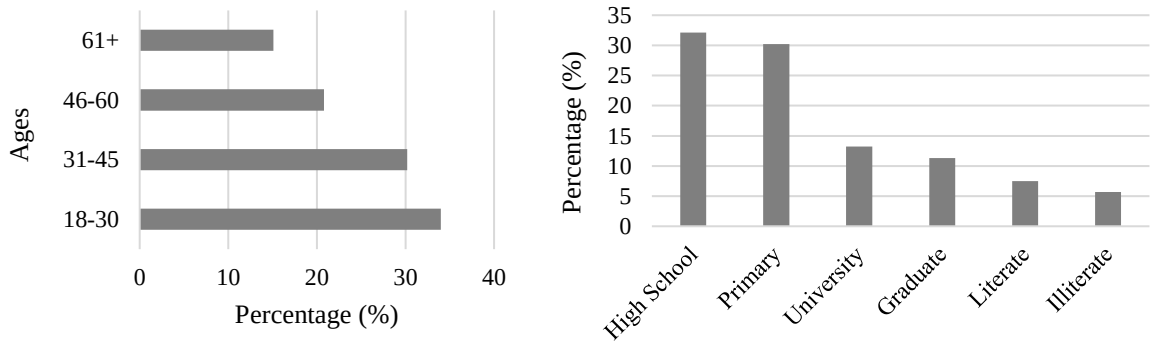


**Figure 2.** Age distribution (left), educational background of community members (right)

The majority of the respondents are long-term residents, 58.5% living there for 15 years or longer, 22.6% for 6 to 15 years, 17% for 1 to 5 years, and 1.9% for less than a year. High long-term residency also indicates

strong place attachment and local knowledge. Historic houses are used at an exceptionally high rate, 81.1% daily; 11.3% said they use it weekly, 5.7% monthly and 1.9% non-regular. Such frequent interaction indicates that participants have grown experience-based knowledge about fires in the area (Figure 3).

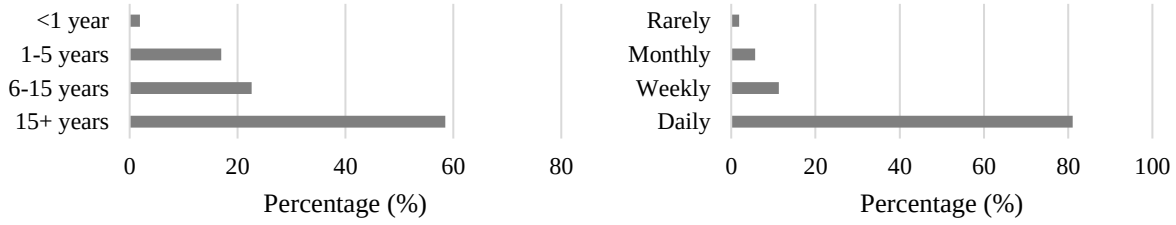


**Figure 3.** Residential tenure in historic district (left), frequency of historic building usage (right)

Among participants, the roles based on building use purpose were distributed as follows: users for the purposes of business (43.1%), building owners (33.3%), and residents/tenants (27.5%). This situation supports the implication that responsibility for fire safety lies with all these groups (Figure 4).

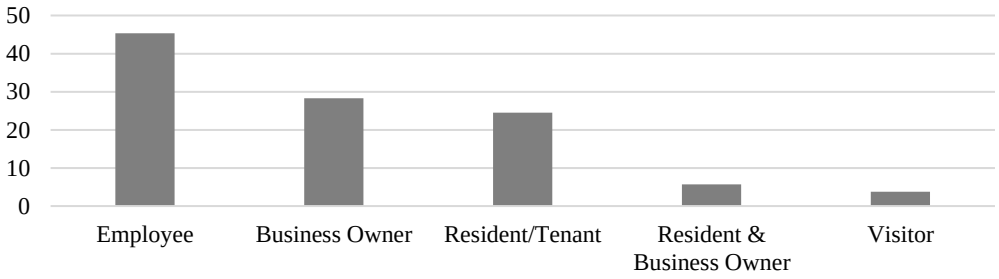


**Figure 4.** Occupancy types and building use patterns

***Fire safety awareness and preparedness level***

A full 77.4% of the participants state that they have the knowledge of what to do in case of a fire, while 18.9% are non-committal with Only a 3.8% dissenting opinion. While such high confidence seems to be positive, it does indicate a major discrepancy as to the actual knowledge level in the subsequent questions. Likewise, 94.3% of the respondents are informed that fire extinguishers exist and where to locate them, while 5.7% lack this information. While this indicates a strong fundamental awareness of equipment, the difference between simply knowing the equipment exists and actually being able to use it effectively becomes clearer in subsequent questions (Figure 5).

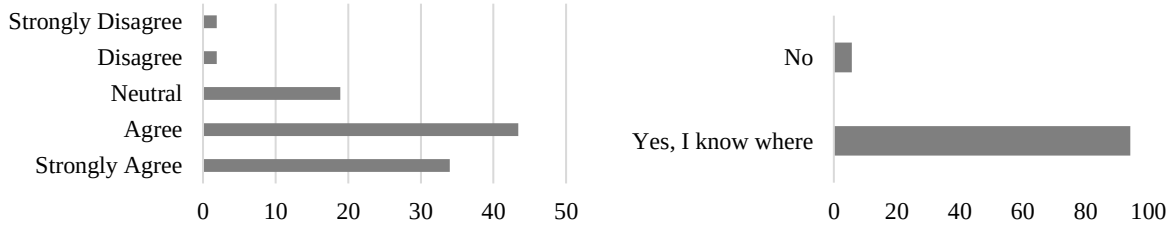


**Figure 5.** Self-assessed fire response knowledge (left), awareness of extinguisher locations (right)

Then there is a real difference in readiness for an actual fire, with only 30.2% stating they have a definite evacuation plan (the rest, 67.9%, have only partial information and 1.9% no information at all). This suggests a significant gap between high self-reported confidence levels in Q6 (77.4%) and actual preparedness, indicating passive knowledge does not translate into actionable preparedness'. On fire safety inspections in the last five years, the results show a scattered pattern: 45.3% say yes, 35.8% say no and 18.9% don't know. This ambiguity reflects some non-formal community participation (inspection) processes (see Figure 6).

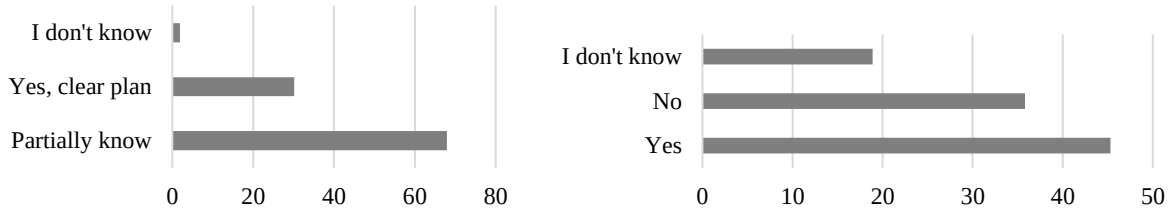


**Figure 6.** Preparedness for evacuation and response (left), fire safety inspection history (right)

***Risk perception and areas of concern***

In the analysis of perceived fire risk issues, a substantial 35.8% of respondents did not consider any particular fire risk, which indicates a very critical gap and shows that there is a wide disconnect between knowing a hazard in the abstract and actually perceiving a hazard. Among those who specified risks, largest proportions mentioned wooden structures (32.1%), electrical contact (17.0%), and chimney ignition (15.1%), all consistent with technical susceptibilities reported in the literature. Ironically, 90.5% agree that fire would severely damage historic structures (Strongly Agree 54.7%, Agree 35.8%), with 5.7% not sure and 3.8% disagreeing. The large discrepancy between such a high perception of abstract risk (Question 11) and a third of respondents being unable to mention a concrete risk (Question 10) highlights the need to convert general awareness into specific and practical understanding through focused fire risk education (Figure 7).

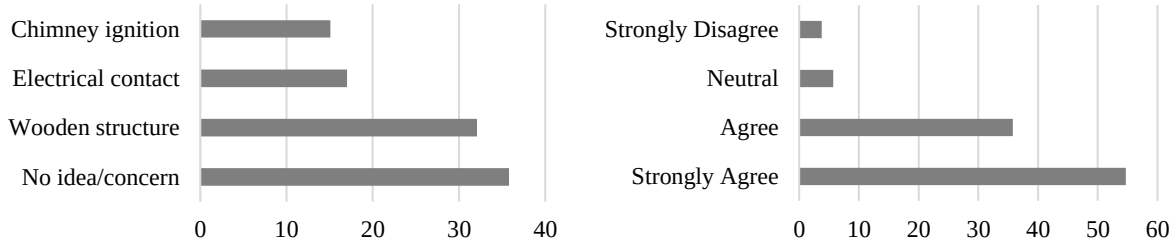


**Figure 7.** Identified risk concerns by category (left), perceived severity of fire damage (right)

There is a nearly universal agreement (96.2%) that traditional building materials have a fire risk (Strongly Agree: 60.4%, Agree: 35.8%), with only 3.8% not agreeing, demonstrating a common knowledge of fragility of materials in line with the high perception of damage asked in Q11. Regarding fire safety responsibility (multiple responses allowed), most respondents held municipalities accountable (75.5%), while 60.4% cited property owners, 45.3% mentioned fire departments, and only 37.7% acknowledged their own responsibility. This echoes strong expectations from local officials, is indicative of the low level of individual responsibility, and reflects the existence of the 'responsibility diffusion' phenomenon, suggesting that more attention is needed in enhancing self-responsibility awareness in community mobilization strategy (Figure 8).

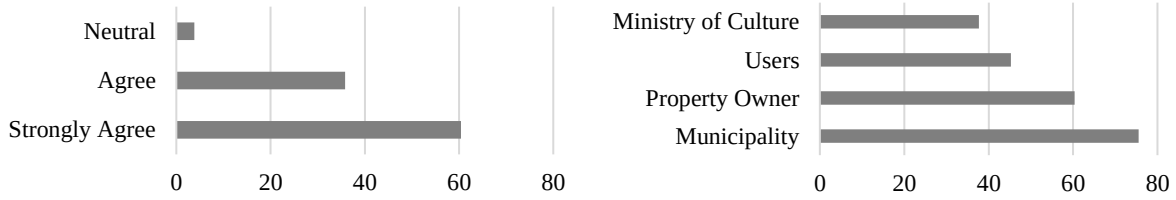


**Figure 8.** Risk perception of traditional materials (left), distribution of protection responsibility (right)

***Community participation and conservation motivation***

Quite a proportion of people (94.3%) have a positive attitude toward community participation in fire safety, and there is also a perception that local community members have a responsibility to protect historic buildings (Strongly Agree: 67.9%, Agree: 26.4%), with only 3.8% being neutral and 1.9% disagreeing. While this might

seem to be at odds with that relatively low sense of individual responsibility expressed in Question 13 (37.7%), it nevertheless suggests a major opening: the community is ready to take collective action, but needs structurally organized opportunities for mobilization. Such preparedness is substantiated by the overwhelming interest in fire safety education (39.6% as very willing and 56.6% as perhaps willing to participate, adding to a fantastically high participation expectation rate of 96.2% of respondents, only 3.8% expected not to participate). When considered together with the knowledge deficit reported in Question 8 (69.8% with little to no knowledge on evacuation), these results imply that there already exists an attentive and enthusiastic crowd longing to be taught but just waiting for an opening (Figure 9).

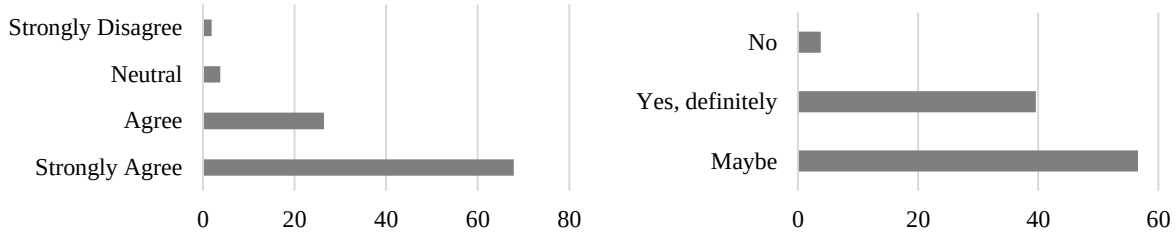


**Figure 9.** Support for community-based safety role (left), willingness to safety training (right)

Nearly all the respondents (96.3%) perceived the Value of historical and cultural building that they are in at a high level, on the contrary, 1.9% thought it was at medium, and also 1.9% gave a low opinion; this illustrates that emotional, identity attaching and place belonging are highly influenced by the status as a UNESCO World Heritage site and the site's living heritage. Despite strong motivation for protection, there is overwhelming dissatisfaction with current fire safety measures: 52.8% regarded them as inadequate, 30.2% as partly adequate, and only 17.0% as completely adequate. Since the over-arching inadequacy perception of 83% suggests poor operational conditions based on fragile technical (performance) as well as fragile institutional (guidance) support, it would seem that high interest for training (96.2%) in Q15 and high willingness for participation in Q14 (94.3%) is of essence: the community wants to protect their heritage, is clearly unhappy with present protection, and are apparently willing to participate in improving the situation (Figure 10).

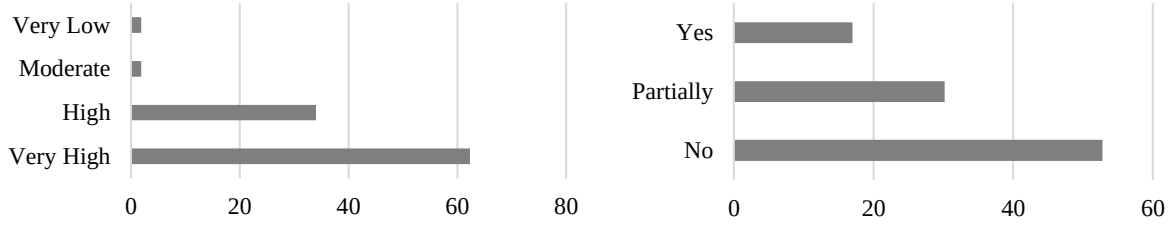


**Figure 10.** Valuation of historical significance (left), satisfaction with current safety measures (right)

The results highlight the presence of a systematic risk awareness-behaviour gap. Although respondents held high cultural value, perceived fire risk, and were supportive of fire management involvement in the community, they simultaneously displayed concrete knowledge gaps, low capacity to accurately identify personal risk, and limited self-responsibility. This paradox points out that general awareness does not result in operational preparedness. Yet, these same data reveal considerable opportunities for intervention: public demand for information, frustration with the current system, and willingness to engage in training all point towards a well-designed community-based intervention program that holds substantial promise for success.

## Conclusion and Recommendations

This study is an advance in community-based risk management philosophy by considering fire safety in historic structures through the social sustainability lens. An empirical study, with 53 participants in the Safranbolu Historical Bazaar, was conducted to obtain meaningful results and suggestions regarding actions toward cultural heritage.

The study reveals a deep paradox that defines the community's relation to cultural heritage preservation. Despite an extremely strong cultural identity among the participants, this cultural closeness does not effectively inform fire preparedness. The majority of respondents demonstrated insufficient knowledge of methods to extinguish fires, thus revealing a crucial gap between awareness and action that belies long-held beliefs in heritage management. This result implies that emotional ties to cultural heritage are required but are not sufficient for promoting protective behaviour in the absence of institutionalised intervention tools.

Stakeholders in the region are dissatisfied with the state of fire safety measures. Although 83% of respondents to the poll thought the current fire safety arrangements did not go far enough, this suggests deficiencies not just in technical solutions, but also in management of fire safety. The most pressing concerns are that wooden buildings are susceptible to fire and the earthquake damage they have suffered tends to compromise the electrical systems. Nonetheless, that pervasive discontent exists alongside a community hungry for participation; 94.3% hold a positive view of community participation and 96.2% indicated interest in taking part in firefighting training. Motivation and capacity exist within the community; the issue is appropriate avenues and structures of organisation through which to harness this collective enthusiasm.

This research contributes three key theoretical implications to the field at the nexus of heritage conservation and disaster risk management literatures. To begin, it presents a new interdisciplinary model drawing together fire safety engineering, cultural heritage conservation, community-based disaster risk management (CBDRM), and the social sustainability discourses. Second, it puts into practice UNESCO's notion of 'living heritage' in relation to fire risk management. Third, it provides empirical evidence of an “awareness-action gap” within the cultural material heritage context, and it reveals the main variables that influence the association between risk perception and protective actions.

Several strategic policy and practice responses can be prioritised on the basis of these results. The development of full community-based fire education programming (partnering with fire departments and heritage experts) is a high priority need for attention based on evidenced need. Forming volunteer neighbourhood fire watch teams, with the right legal foundation and basic equipment, can also add durable local response capacity. Strategic infrastructure enhancements should include a focus on electrical upgrades and context-sensitive warning systems that meet contemporary safety needs while preserving the integrity of heritage sites. And finally, the mainstreaming of policies must require that communities are actively involved in plans to conserve heritage, as well as legally protect volunteers and provide incentives to businesses that undergo safety training.

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# İKLİM DEĞİŞİKLİĞİNİN İNSAN SAĞLIĞI ÜZERİNDEKİ FİZİKSEL VE PSİKOLOJİK ETKİLERİNİN ARAŞIRTILMASI

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## ÖZET

Son yıllarda artan sanayileşme ve çarpık kentleşme, fosil yakıt kullanımının ve buna bağlı olarak sera gazı salımının artmasına neden olmuştur. Bu durum yalnızca çevresel bir sorun olmanın ötesinde, söz konusu çevrede yaşayan bireylerin ve toplumun sağlığını tehdit eden çok boyutlu bir kriz niteliği taşımaktadır. Yapılan araştırmalar, iklim değişikliğinin neden olduğu sıcak hava dalgaları, sel ve kuraklık gibi aşırı hava olaylarının; solunum yolu hastalıkları, bulaşıcı hastalıklar, su ve gıda krizleri gibi çeşitli fiziksel sağlık sorunlarına yol açtığını ortaya koymuştur. Bununla birlikte, iklim değişikliğinin çevresel etkilerinin yanı sıra bireylerde psikolojik rahatsızlıklara da neden olduğu görülmüştür. Çalışma kapsamında ele alınan veriler, iklim değişikliğine bağlı olarak yaşanan afet ve risklerin; bireylerde depresyon, anksiyete, uyku bozukluğu, travma sonrası stres bozukluğu (TSSB) ve intihar girişimleri gibi ruhsal sağlık sorunlarına yol açtığını göstermiştir. Özellikle kentsel alanlarda yeşil alanların azalması, artan betonlaşma ve kentsel ısı adası etkisinin yoğunlaşması gibi faktörlerin hem fiziksel hem de zihinsel sağlığı tehdit ettiği bilimsel olarak kanıtlanmıştır.

Bu bağlamda, şehirlerde uygulanan sürdürülebilir ve dirençli kent yaklaşımları Rotterdam ve Kopenhag örnekleri üzerinden incelenmiştir. Bu şehirlerde; yeşil altyapının yaygınlaştırılması, iklim dostu mimari uygulamaların hayata geçirilmesi, toplum sağlığını önceleyen planlamaların yapılması ve doğal afetlere karşı dirençli toplumsal yapılar oluşturulması gibi stratejilerin benimsendiği görülmüştür.

Bu çalışma, iklim değişikliğinin insan sağlığı üzerindeki fiziksel ve psikolojik etkilerini çok boyutlu bir perspektifle ele almayı amaçlamıştır. Sonuç olarak, iklim değişikliğinin yarattığı etkiler yalnızca çevresel değil; halk sağlığını doğrudan etkileyen, karmaşık bir kriz olarak karşımıza çıkmıştır. Bu nedenle çözüm süreçlerinde; çevre ve şehircilik kurumları, sağlık sistemleri ve sosyal

bilimlerin iş birliği içinde çalışması, geliştirilecek politikalarda insan odaklı yaklaşımların benimsenmesi bir gereklilik haline gelmiştir.

**Anahtar Kelimeler:** İklim, iklim değişikliği, kentsel ısı adası, insan sağlığı

## RESEARCH OF PHYSICAL AND PSYCHOLOGICAL EFFECTS OF CLIMATE CHANGE ON HUMAN HEALTH

**ABSTRACT**

In recent years, increasing industrialization and irregular urbanization have led to a rise in the use of fossil fuels and, consequently, an increase in greenhouse gas emissions. This situation has constituted a multidimensional crisis that goes beyond being merely an environmental issue, posing a significant threat to the health of individuals and communities living in affected areas. Research has revealed that extreme weather events caused by climate change—such as heatwaves, floods, and droughts—have resulted in various physical health problems, including respiratory diseases, infectious illnesses, and water and food crises. Furthermore, it has been observed that climate change has also triggered psychological disorders in individuals, in addition to its environmental impacts. The data examined in this study showed that disasters and risks associated with climate change have led to mental health problems such as depression, anxiety, sleep disorders, post-traumatic stress disorder (PTSD), and suicide attempts. In particular, the reduction of green spaces in urban areas, increased concretization, and the intensification of the urban heat island effect have been scientifically proven to threaten both physical and mental health.

In this context, sustainable and resilient urban strategies implemented in cities such as Rotterdam and Copenhagen were examined. These cities were found to have adopted strategies such as the expansion of green infrastructure, the implementation of climate-friendly architectural practices, health-oriented urban planning, and the creation of disaster-resilient communities.

This study aimed to address the physical and psychological effects of climate change on human health from a multidimensional perspective. In conclusion, the impacts of climate change have emerged not only as environmental issues but as a complex crisis that directly affects public health. Therefore, it has become essential for environmental and urban planning institutions, healthcare systems, and social sciences to work collaboratively, and for human-centered approaches to be adopted in the development of relevant policies.

**Keywords:** Climate, climate change, urban heat island, human health

## *GİRİŞ*

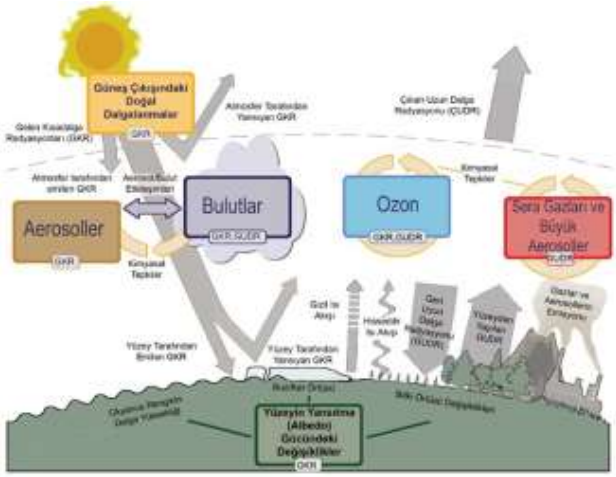
### *İklim*

Yaşamın doğal bir parçası olan iklim; ‘’değişen hava hareketlerinin, atmosferik süreçlerin ve iklim elemanlarının değişkenliklerini, sınır oluşumlarını ve ortalama değerleri gibi uzun zamanlı istatistiklerle elde edilen sentez’’ olarak tanımlanmaktadır. Yerkürenin yaklaşık 4.5 milyar yılık tarihinden günümüze kadar tüm zaman dilimlerinde iklimler doğal ve insan etkisinin sebep olduğu bir değişme eğilimi göstermektedir.

### *İklim Değişikliği ve Etkileri*

İklim değişikliği, iklimin ortalama durumunda ve/veya değişiklik gösterdiği uzun zaman dilimleri boyunca gerçekleşen değişiklikler olarak tanımlanabilir [URL1]. Çevre ve Şehircilik ve iklim Bakanlığı’nın elde ettiği veriler kapsamında iklim değişikliğine neden olan etmenler doğal ve insan kaynaklı olarak ikiye ayrılmıştır (Çevre ve Şehircilik Bakanlığı, 2017: 18-27). Bu etmenler şu şekilde açıklanabilir:

Doğal etmenler; geçmiş iklim koşulları da göz önüne alındığında, güneş enerjisi miktarında meydana gelen değişimler, dünya ekseninin eğim ve yörüngesinin geometrisine meydana gelen değişimler olarak tanımlanabilir(Koçak 2005). İnsan kaynaklı etmenler; insanlar tarafından atmosfere yayılan sera gazları, tarım kaynaklı ormansızlaşma ve çevreye atılan atık maddeler olarak tanımlanabilir (Çevre ve Şehircilik Bakanlığı, 2017: 18). İçinde günlük ihtiyaçlarımızı karşıladığımız binaları ısıtmak ve soğutmak için kullandığımız fosil yakıtlar atmosfere önemli ölçüde sera gazı salınımı yapmaktadır. Bu gazların sera gaza olarak ifade edilmelerinin sebebi, atmosferin alt kısmında bir sera gibi ısıyı tutabilmeleridir (Şekil 1.).




*Şekil 8: İklim değişikliğinin ana unsurları*(Change 2007)

Son İklim Değişikliği Uluslararası Paneli (IPCC)'nin elde ettiği raporda, iklim değişikliğine yol açan sebepler arasında baş aktörün insan olduğu belirtilmiştir. İklim değişikliklerinin meydana gelmesinde insan payının %95 düzeyinde olduğu ileri sürülmektedir(Erk 2017). Son 30 yılda Dünya Sağlık Örgütü verilerine göre ise insanların neden olduğu iklimsel olayların binlerce insanın ölümüne sebep olduğu açıklanmıştır(Patz et al. 2005) Günümüzde iklim değişikliğinin nedenleri ve sonuçları çok sayıda ülkenin ana gündeminde önemli bir sorun olarak yer almak almakta ve tartışılmaktadır. İklim değişikliğinin etkileri günümüzde de dünyanın dört bir yanında hissedilmekte ve hem doğa hem de insanlık için tehditler oluşturmaktadır. Bu etkilerin en önemlileri uzun süreli kuraklıklar, yoğunlaşan orman yangınları ve şiddetli fırtınalara sebep olan ortalama sıcaklıktaki artışlardır(Lindwall 2022). Hava olaylarında yaşanan bu büyük değişimler yalnızca ekosistemdeki dengeleri bozmakla kalmayıp gıda güvenliğini, su kaynaklarının bulunabilirliğini ve insan sağlığını da tehdit etmektedir. Sıcaklık artışıyla eriyen kutup buzulları ve buna bağlı olarak artan deniz seviyesinin yükselmesi iklim değişikliğinin etkileri arasındadır. Oluşan bu etkiler özellikle kıyı kesimlerinde yer alan topluluklar için endişe arz etmektedir(Mimura 2013). İklim değişikliklerindeki olumsuzlukların kendini fazlasıyla belli etmeye başladığı ve önlemlerin geçmişe göre arttırıldığı 20.yy'ın sonlarında yeşil altyapı kavramına eğilimde artış görülmektedir(Naumann et al. 2011). İklim değişikliğinin sosyal, fiziksel, ekonomik ve çevresel olmak üzere atmosfere ve yeryüzüne birçok etkisi bulunmaktadır. Kentsel mekanlar bu olası etkilerin hepsini içinde barındırması sebebiyle iklim değişikliğine bağlı yaşanacak

olumsuz koşullardan en fazla etkilenecek mekanlardır.

***Kent***

Tarihsel süreç incelendiğinde kent olgusunun her dönem farklı anlamlar barındıran canlı ve dinamik bir kavram olduğunu görebiliriz. Bu sebeple de kent olgusunda yapılan tanımlamalarda farklılıklar bulunmaktadır. İlk dönemlerde kent uygarlık kavramıyla eş değer bir anlam oluştururken, Orta Çağ döneminde ‘’duvarlarla çevrili insan yerleşimleri’’ olarak karşımıza çıkmaktadır. Sanayi devrimi sonrasında oluşan mekanların işlevlerinin de farklılık kazanmasıyla kent kavramı tanımlanırken nüfus yoğunluğu, ekonomik ve sosyal faaliyetler de göz önünde bulundurulmuştur(Topal 2004). Genel bir tanımla kent, sanayi devriminin bir ürünü olan, tarım dışındaki üretimleri ele alan, teknolojik gelişmelerle şekillenen belirli bir büyüklüğe ve heterojenlik düzeyine ulaşmış ve içinde belli bir nüfusu barındıran yerleşim yeri olarak tanımlanabilir(Es and Ateş 2004).

***Kentlerdeki İklim Değişikliğinin Sebepleri***

Kentler, iklim değişikliğinden de en çok etkilenen alanlardır (Özlem ALPASLAN et al. 2019). Bu nedenle iklim değişikliği ve kent planlaması birbirinden ayrı düşünülemez iki olgu haline gelmiştir(Koçan and Alp 2021).(Çobanyılmaz and Yüksel 2013)’da kent ve iklim değişikliğinin birbiriyle yakın ilişkili olduğunu savunmuştur. Kentlerde yaşayan insanların eylemleri sonucu doğal çevre bozulurken aynı zamanda iklim değişikliği nedeniyle oluşan problemler de kent varlığını tehdit etmektedir. Aşağıda (Tablo 1.) de bu problemlerin bir kısmına yer verilmiştir.

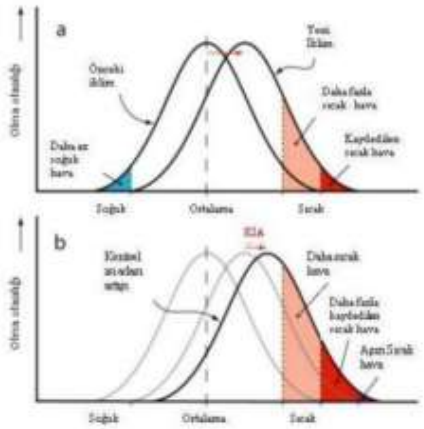
*Tablo 2: İklim değişikliği ve kentleşmenin etkileri*(Edition 2011)

| ***İklim Değişikliğinin Kentlerdeki Olumsuz Etkileri*** | ***Kentleşmenin İklim Değişikliğine Olumsuz Etkileri*** |
|---|---|
| Deniz seviyesindeki artış | Sera ve karbon gazı salınımı |
| Ani değişen hava koşulları, aşırı yağışlar ve artan sıcaklık dereceleri | Kentsel ısı adası etkisi |
| Su kaynaklarında azalma, su bulunabilirliğinin azalması ve yaşanan stres | Su kirliliği, oluşturulan geçirimsiz yüzeylerin neden olduğu yüzeysel akışlar |
| İklim değişikliğinin sebep olduğu sağlık sorunları, çift taraflı göçler, sosyo-ekonomik sıkıntılar | Aşırı yağış ve kuraklık |
| Kuraklık, yangınlar, seller | Ani değişen sıcaklık değerleri |
| Kentsel altyapı problemleri | Mevsimlerdeki iklim özelliklerinin bozulması |
| Ekosistemlerdeki farklılaşma | Canlıların doğal ortamlarının bozulması |

***Kentsel Isı Adası***

Basit bir tanımla kentsel ısı adası; kent içindeki sıcaklığın çevresinde bulunan kırsal alanlara oranla daha yüksek olması olarak tanımlanabilir. Bu sıcaklık farkını oluşturan en temel etken

kentteki arazi ötüşünün değişime uğramasıdır. Kent alanlarında artan yoğun betonlaşma ve çarpık yapılaşma, yeşil alanların yetersiz kalması, kentlerdeki enerji tüketimi ve yanlış kentsel planlama (Şekil 2.) kentsel ısı adalarının oluşumunda etkili olmaktadır.




*Şekil 9: İklim değişikliğinin ve değişen yüzey sıcaklıklarının kentsel ısı adasına etkileri*(H. Brown et al. 2018)

### *Kentsel Isı Adası Etkileri*

Kentsel ısı adası, yapılaşmış alanlar başta olmak üzere (Şekil 3.) kentin bütününe etki etkilemektedir. Enerji tüketimi, ekosistem, su kaynakları gibi birçok konuda etkili olmaktadır.

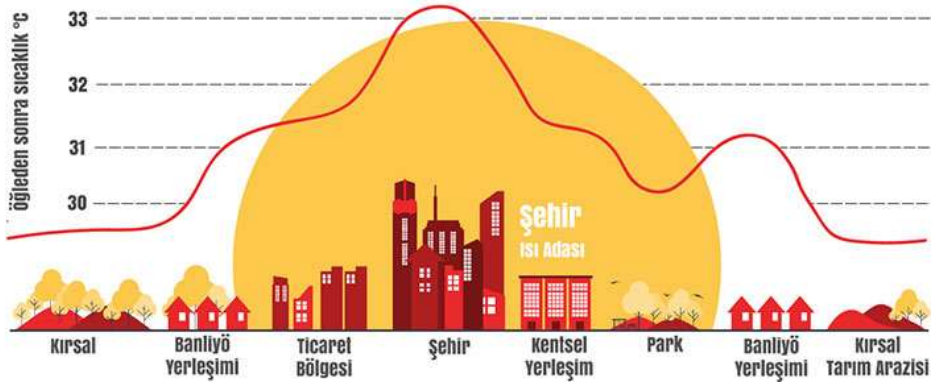


*Şekil 10: Kentsel ısı adasının kent üzerine etkileri*(Duygu Kavuncuoğlu 2022 tarafından türkçeye çevrilmiş; Phelan et al. 2015)

Kentsel ısı adası var olduğu günden bu yana bir çok ülke tarafında yoğun araştırmalara konu olan ve iklim değişikliğinde üzerinde en fazla durulan konu olmuştur(Glaeser and Kahn 2010; Peng et al. 2012; Rosenzweig et al. 2011). Dünyada bütün kent alanlarında var olan bu problem nüfus yoğunluğu ve kentleşme düzeyiyle doğru orantılıdır(Filho et al. 2018; Meehl et al. 2018). Kentlerdeki nüfus yoğunluğunun artması barınma talebini de arttıracağından yeşil alanların azalması arazi örtüsünün değişmesine büyük ölçüde sebep olmaktadır(Mirzaei and

Haghighat 2010; Norton et al. 2015).

Kentsel ısı adasının yoğunluğu kentlerin yapay yüzeylerinin ve bina çevrelerinin (Şekil 4.) etrafında bulunan yeşil alanlara oranla daha geç soğumasından etkilenir. Bunun sonucunda da bu alanlarda yüksek basınçlı hava koşulları oluşur. Her kentte farklılık gösteren bu etkenler sıcaklık farklarının değişmesine neden olur(Yuan et al. 2017). Kentsel ısı adasının olumsuz etkileri daha çok havaların sıcak olduğu yaz aylarında ortaya çıkmaktadır. Hava sıcaklıklarının yüksek olması nedeniyle kentsel faaliyetler azalır ve enerji tüketimi artar(Buchin et al. 2016).




*Şekil 11: Kentsel ısı adasına sebep olan etmenler*

Soğuk iklim bölgelerinde yer alan kentlerde ise bu durumun olumsuz etkilerindense olumlu etkilerine rastlanmıştır. Soğuk iklim bölgesinde yer alan kentlerin özellikle kış dönemlerinde donma ve buzlanma sürelerinin kısalması daha uzun sürede mahsul yetiştirmelerin sağlamıştır. Bu da bu kentlerdeki ekonomik canlanmaya fayda sağlamıştır (Lelovics et al. 2014).

(Kahraman and Şenol 2018)'a göre kentsel ısı adası ve iklim değişikliğinin çevresel ve insan sağlığına etkileri aşağıdaki tabloda yer almaktadır.

*Tablo 3: Kentsel Isı Adası ve İklim Değişikliğinin Çevre ve İnsan Sağlığına Etkileri*(Kahraman and Şenol 2018)

| **Kentsel Isı Adası ve İklim Değişikliğinin Çevre ve İnsan Sağlığına Etkileri** | |
|---|---|
| **EKOSİSTEM** | Kent yoğunluğunun artmasıyla yeşil kent örtülerinin yerini beton gibi geçirimiz yüzeylerin kaplaması ekolojik dengenin bozulmasına sebep olmaktadır. Bu yüzeylerin ısıyı yüzeyde tutmaları kent sıcaklığının artmasına neden olmaktadır. |
| **KENTSEL YERLEŞME** | Yaşanan kentsel tahribatlar ve iklim problemleri yerleşme alanlarının değişimine sebep olur. Örneğin; sel taşkınlarının artması, sıcaklık değerlerinin ve yoğunluğunun artması |
| **SU KAYNAKLARI** | Kentlerdeki geçirimsiz yüzeylerin yağışların toprak alanlara erişimini engellediğinden toprağın suya doyması güçleşmekte ve kentte kuraklıklar oluşmaktadır. |
| **HAVA KALİTESİ** | Kent alanlarında ihtiyaçların artmasına yönelik artan fosil yakıt kullanımı, sera gazları ve hava kirleticilerin kullanımı kentsel ısı adası oluşumunu ve buna bağlık olarak iklim değişikliklerini arttırmaktadır. |
| **EKONOMİ** | Ekosistem ve doğal yaşam dengesinin bozulmasından kaynaklı yaşanan doğal afetler büyük ekonomik krizlere yok açmaktadır. |
| **İNSAN SAĞLIĞI** | Artan sıcaklıklara bağlı olarak yaşanan deri hastalıkları, hava kirliliğine bağlı olarak yaşanan solunum yolu hastalıkları, psikolojik dengenin bozulmasıyla oluşan düzensiz yağışlar ve yeşil alanların azlığı hem fiziksel hem psikolojik yönde olumsuzluklara neden olmaktadır. |

***İnsan Sağlığı ve İklim Değişikliği***

İklim değişikliği yeryüzünün aşırı şekilde ısınması olarak tanımlanmaktadır. Bu ısınma insan hayatını çeşitli yönlerden olumsuz etkilemektedir. Kasırga, fırtına, sel basması gibi insan hayatına mal olan doğal afetlerin yanı sıra iklim değişikliğine adaptasyon sağlayamayan kentlerin besin kıtlığına, temiz su kaynaklarının azalmasına, canlıların zarar görmesine ve insan sağlığında olumsuz etkilerin çıkmasına sebep olacağı öngörülmektedir(SIRAKAYA and ASLANLAR n.d.).

***Kentlerdeki İklim Değişikliğinin ve Kentsel Isı Adasının Bireylerin Psikolojik Sağlığına Etkileri***

İklim değişikliği kavramı, antropojenik bir anlatımla olumsuz bir kavramı çağrıştırmaktadır. İklim değişikliğinin bireylerin hayatına zarar verdiğini savunan düşünürler bu fikri ilk ortaya koyduklarına halk tarafından kabul görmemişlerdir. İklim değişikliğinin bireyler üzerindeki olumsuz etkilerini ilk kez 1824 yılında ortaya koyan Fransız Doktor Jean Fourier bu etkileri *'Annales de la Chimie et de Physique'* adlı makalesinde vurgulamıştır(Anne Vlassopoulos 2012). İklim değişikliğinin psikolojik etkileri fizyolojik etkileri kadar belirgin olmasa da depresyon, antisosyal davranışlar hatta intihar gibi rahatsızlıklara yol açabilirler. İklim değişikliğinin fizyolojik etkileri dikkate alındığı kadar psikolojik etkileri de dikkate

alınmalıdır(Clayton et al. 2017). Dolaylı ya da doğrudan da olsa, iklim değişiklikleri stres, depresyon ve endişe ile sonuçlanan zihinsel sağlık sorunlarına dönüşebilmektedir(Karaman and Gökalp 2010). İklim değişikliği kaynaklı yaşanan doğal afetler de bireylerin psikolojik sağlık durumlarına etki eden ve bireylerde yaşanan olaylara bağlı stres, yeme bozuklu, ve bağışıklık sisteminin bozulması gibi etkilere yol açabilir(Clayton et al. 2017). Akut etkiler doğal afet ve hava olayları kaynaklıyken, kronik etkiler ise iklimlerdeki uzun süreli değişikliklerden kaynaklanmaktadır.

*Tablo 4: İklim değişikliğinin sebep olduğu akut etkiler*

| ***AKUT ETKİLER*** | |
|---|---|
| **Travma ve Şok** | İklim değişikliğine bağlı olarak yaşanan afetler yaralanma, mülkün zarar görmesi gibi ağır psikolojik travmalara ortam yaratmaktadır(Neria and Shultz 2012). |
| **TSSB (Travma Sonrası Stres Bozukluğu)** | TSSB(Travma Sonrası Stres Bozukluğu) madde kullanımının, anksiyete, şiddet, kişlik bozuklukları da dahil olmak üzere bir çok sorunla bağlantılı olduğu kanıtlanmıştır(Weissbecker 2011). |
| **Kayıp Duygusu** | İklim değişikliğini bireyler üzerinde en belirgin olarak hissettirdiği problemlerden biri kayıp duygusudur. İklim değişikliklerin insanların yaşadığı yerleri geri dönüleme hale getirmesi, çok sayıda bireye onlar için önemli olan bir yeri kaybettiği hissini yaşatır. İklim değişikliği aynı zamanda göçleri de etkilemesi sebebiyle 2050 yılına kadar 200 milyon insanın yaşadığı yeri bırakıp göç etmek zorunda kalacağı yönündedir(Fritze et al. 2008). |
| **Kimlik Kaybı** | Bir başka kayıp ise bireylerin günlük yaşamdaki standartlarını kaybetmesidir. İklim değişikliği sonucunda kaybedilen nesneler bireyin öz benliğini ve kimliğini bozabileceği bir ortam oluşturmaktadır. Çünkü nesneler kim olduğumuzu ve yaşamımızdaki önemli anları simgelemektedir(Clayton et al. 2017). |

*Tablo 5: İklim değişikliğinin sebep olduğu kronik etkiler*

| ***KRONİK ETKİLER*** | |
|---|---|
| **Saldırganlık** | Yapılan deney ve test temelli araştırmalar sıcaklık ve saldırganlık arasında bir ilişki olduğunu kanıtlar niteliktedir(Anderson 2001; Simister and Cooper 2005). Bunun yanı sıra ısının kişinin bilişsel işlevi üzerinde olumsuz bir etkisi olduğunu bunun da şiddet içermeyen bir tartışmayı çözme yeteneğini azalttığı ve kişiyi şiddete yönlendirdiği düşünülmektedir(Pilcher, Nadler, and Busch 2002). |
| **Azalan Yeşil Alanların Oluşturduğu Şiddet ve Saldırganlık** | Yüksek sıcaklıkların saldırganlığı arttırmasının yanında yeşil alanlara ve sosyal alanlara erişimin azalmasının da saldırganlığı arttırdığı düşünülmektedir. Artan hayal kırıklıkları kişilerarası sorunlara neden olmakta ve aile içi şiddet, taciz ve saldırı gibi olayları beraberinde getirmektedir. Yapılan bir araştırma 2099 yılına kadar sıcaklıkların artmasına bağlı olarak tahmini otuz bin cinayet, iki yüz bin tecavüz ve yaklaşık üç milyon hırsızlık vakasının olacağını öngörmektedir(Ranson,2012' den aktaran (Clayton et al. 2017). |
| **Toplumsal Yaşamın Zarar Görmesi** | İklim değişikliği etkilerinin sosyoekonomik açıdan daha dezavantajlı olan kesimlerde daha büyük zararlar vermesidir(Salick and Byg 2007). Sağlık sisteminin verimsiz olduğu bu bölgelerde yaşanan iklim değişikliği; akıl sağlığı sorunları, ruh halinde meydana gelen ani değişimler ve buna bağlı ortaya çıkan sıkıntıları beraberinde getirmektedir(Helen Louise Berry, Bowen, and Kjellstrom 2010). |

İklim değişikliği ve kentsel ısı adasına bağlı psikolojik sorunlar, coğrafi yer değiştirme, barınılan ya da var olan mülklerin zarar görmesi ve/veya kaybolması, yakınlarının ölümü veya yaralanması süreçlerinde ortaya çıkmaktadır(Ebi et al. 2008). İklim değişikliğine bağlı olarak yaşanan psikolojik rahatsızlıklar kişilerin ruh haline göre stres bozuklu, uyku güçlüğü, sosyal kaçınma vb. değişkenlik göstermektedir(Silove, Steel, and Psychol 2006). İklim değişikliği psikolojik sağlığın ekonomik ve çevresel belirleyicilerini etkilemekte ve en büyük hasarlarını sosyoekomik açıdan dezavantajlı olan toplumlarda doğurmaktadır(Fritze et al. 2008).

İklim değişikliğinden ruhsal açıdan en çok etkilenen gruplar, olaylarla sürekli iç içe olan acil durum çalışanları, etkilerinin daha çok hissedildiği kırsal kentte yaşayan halk, çocuklar, yaşlılar, kadınlar ve sosyoekonomik durumu kötü; evsizler, açık hava işçileri, göçmenler ve sağlık sorunu bulunan bireylerdir(Helen L Berry et al. 2008; P. Berry et al. 2014; Clayton et al. 2017; Costello et al. 2009; Trombley, Chalupka, and Anderko 2017).

***Kentlerdeki İklim Değişikliğinin ve Kentsel Isı Adasının Bireylerin Fizyolojik Sağlığına Etkileri***

Değişen iklim şartları ılıman iklimlerdeki soğuk kaynaklı ölümlerin azalmasında ve bazı yerlerde gıda üretimini arttırsa da genel sağlık etkileri büyük oranda olumsuzdur(Campbell-Lendrum, Corvalan, and Prüss Ustün 2003).İklim değişikliği insan sağlığını ve sağlıktaki birçok belirleyiciyi etkiler. Hava sıcaklığında yaşanan ani ve yüksek değişimler, bu değişiklikler sonucu yaşanan afetler, kuraklık, vektörlerle yayılan ve bulaşan hastalıklar, gıda ve su güvenliği, hava kirliliği ve değişen yağış koşulları iklim değişikliğinin sağlığa olan etkilerinden bazılarıdır(Evci Kiraz 2022). Bu durumlara bağlı yaşanan kitlesel nüfus göçleri gibi toplumsal etkiler toplum sağlığını da etkilemektedir. Yaşanan bu nüfus göçleri büyük kitlelerin yaşamını etkileyecek, artan kentleşmeyle sorunlar artacak ve kalkınmada kazanılan başarılar tersine dönecektir. Kaynaklardaki kısıtlılık ve oluşan rekabetin sosyal çatışmalara neden olacağı öngörülmektedir(Barnett and Adger 2007; Goldstone 2018).

İklim değişikliğinin 2050 yılına kadar yaklaşık iki yüz elli bin ek ölüme neden olması beklenmektedir. Bunların otuz sekiz bininin yaşlılarda yüksek sıcaklıklara bağlı olarak, kırk sekiz bininin ishal, altmış bininin sıtma vb. hastalıklar, doksan beş binin ise gıda yetersizliğine bağlı yetersiz beslenmeyle olacağı tahmin edilmektedir. Ekonomik olarak da zarar uğrayan ülkenin 2030 yılına kadar yaklaşık 2-4 milyar dolar zarar edeceği tahmin edilmektedir(Evci Kiraz 2022)[URL-2]

İklim değişikliğinin insan sağlığı üzerine doğrudan ve dolaylı olarak etkileri bulunmaktadır.

Doğrudan etkileri:

Ani sıcaklık değişimleri,

Sıcak/soğuk hava dalgaları,

İklim değişikliğine bağlı olarak yaşanan doğal afetler olarak sıralanabilir.

Dolaylı yoldan etkileri ise:

Vektörle Bulaşan Hastalıklar,

Enfeksiyon ve salgın hastalıklar,

Su Krizi ve Güvenliği,

Gıda Krizi ve Güvenliği

Nüfus ve Göç olarak ele alınabilir.

***DOĞRUDAN ETKİLERİ***

**Aşırı Hava Olayları**

Artan yüksek sıcaklıklar havada bulunan ozon ve diğer kirletici maddelerin seviyelerini yükselterek solunum yolu hastalıklarının oluşmasına ve şiddetlenmesine yol açar. Artan sıcaklıklar özellikle yaşlı bireylerde solunum yolundan kaynaklanan ölümlere yol açmaktadır. Bunun yanı sıra artan sıcaklık değerleri polen ve havada bulunan alerjen maddeleri tetikleyerek seviyelerini yükseltir. Bu durum da astım ve alerjik hastalıkları tetikleyebilir(Anthony J McMichael et al. 2008). Nüfusun ve buna bağlı olarak nüfus yoğunluğunun artması kentlerin daha fazla ısınmasına sebep olmaktadır. Avrupa'da 2003 yılında solunum yolu hastalıkları sebebiyle yetmiş bin kişi hayatını kaybetmiştir(Robine et al. 2008).

**İklim Değişikliğine Bağlı Yaşanan Doğal Afetler**

İklim değişikliklerinin sebep olduğu doğal afetler gün geçtikçe artış göstermektedir. 1950 ve 2007 yılları arasında yaşanan büyük doğal felaketlerin üçte ikisinin iklimle ilgili olaylardan kaynaklandığı verilerle açıklanmıştır(Evci Kiraz 2022).

***DOLAYLI ETKİLERİ***

**Vektörle Bulaşan Hastalıklar**

İklimde meydana gelen beklenmeyen değişimlerin, vektörle bulaşan hastalıkları zamanla arttıracağı ve bu hastalıkların bulaşma mevsimlerin zaman dilimlerinde oynamalar meydana getireceği tahmin edilmektedir(Gray et al. 2009; Mas-Coma, Valero, and Bargues 2008). Vektör kaynaklı hastalıklar, sivrisinek, kum sineği, kene, kara sinekler gibi eklembacaklılar adını verdiğimiz türün bireyleri sokması ve hastalık etkenlerini bireye bulaştırması sonucu ortaya çıkan hastalıklar olarak tanımlanmaktadır. İklim değişikliği ve hastalıklar üzerine yapılan çalışmalar incelendiğinde vektör kaynaklı oluşan hastalıklar günümüzde en çok çalışılan hastalık grubudur. Bunun en büyük sebebi bu hastalıkların yayılımının hızlı ve geniş bir alana sahip olabilmesidir(Sağlık Bakanlığı 2015).

İklim değişikliği, kene yayılımını arttıran ve buna bağlı bağlı olarak da bu yolla bulaşan hastalıkların görülmesini arttıran etmenlerden biridir. Dang humması da benzer şekilde iklim değişikliğinden etkilenen bir hastalıktır. Hastalık, vücutta yetersiz su depolanması sebebiyle daha çok kentsel alanlarda belirginleşir(Menne, Kunzli, and Bertollini 2002). 2080 yılına kadar, iklim değişikliği etkileri artmazsa 3-5 milyar insana, iklim değişikliğinin etkilerinin

artmasıyla da yaklaşık 6 milyar insana dang humması bulaşması beklenmektedir(Hales et al. 2002).

**Salgın Hastalıklar**

İklim değişikliği, Dünya Sağlık Örgütü küresel hastalık yükü (KHY) çalışmasında ‘’çevresel riskler’’ kapsamında bir risk faktörü olarak tanımlanmıştır(Mathers et al. 2003). İklim değişiklinin sebep olduğu hastalık derecesinin ölçülmesinde birtakım zorluklar bulunmaktadır. İklim değişikliğinin herhangi bir referans olması adına net bir maruziyet sınırı bulunmamaktadır. KHY çalışmasında, 1941-1990 yılları arasındaki ortalama seviyeler hesaplanarak senaryolar oluşturulmuştur(Kay, Prüss, and Corvalán 2000). Hastalık sırasında araya birçok adım dahil olabileceğinden iklim değişikliği ve hastalık arasında doğrudan bir sebep – sonuç kurmak zordur. Bunun yanı sıra kronik hastalıklar insanları uzun süreli etkilemesi sebebiyle süreç boyunca iklim değişikliğinin ne kadar etki edeceğini tespit etmek mümkün olmayabilmektedir. İklim değişikliğinin sağlık yükü hastalık yükünün ötesine geçmektedir. Bu sebeple iklim değişikliğinin etkilerinin neden olduğu bütün tabloyu görebilmek adına, Hastalık yükü (bireysel7toplumsal maliyeti), sağlık personellerinin yükü, sağlık hizmetlerinin yükü, diğer sektörlerin sağlık sektörünün üzerindeki baskı maliyeti, azaltım ve uyum maliyetlerinin de eklendiği ‘’sağlık yükü’’ hesabı yapılmalıdır(Evci Kiraz 2022).

**Su Krizi ve Güvenliği**

Temiz su kıtlığının bilinen en temel sağlık etkileri ishal ve kimyasal kirletici maddelerin sebep olduğu hastalık türleridir. Yerleşim yerlerinde bulunan yetersiz drenaj kirli suya maruz kalmaya ve sivrisinek oluşumuna sebep olur. Bu da vektör kaynaklı hastalıkların oluşumunu tetikler. İleride yaşanacak ani iklim değişikliklerin temiz su ve drenaj sorunlarını daha kompleks hale getireceği düşünülmektedir. Ortalama yıllık yağış miktarının bazı bölgelerde azalacağı bazılarında ise artış göstereceği öngörülmektedir. Kuraklık ve sel taşkınlarının artması beklenmektedir(Arnell 2004).

Fazla artan ve azalan sıcaklık değerleri su kirliliğine ve bununla birlikte gelen hastalıklara sebep olabilmektedirler. Örnek olarak 1998’de yaşanan Nikaragua, Honduras ve Guatemala’daki Mitch kasırgasının ardından artan kontrolsüz yağmur ve yaşanan se olayları, salgın hastalıklara, sıtma, dang humması ve kolera gibi vektörel hastalıklara neden olmuştur(Chivian and Bernstein 2008).

**Gıda Krizi ve Güvenliği**

İklim değişikliği, beslenmenin yetersiz kalması ve gıda güvenliği gibi etmenlerle insan sağlığına tehdit oluşturan bir unsurdur(M. E. Brown and Funk 2008). Yetersiz beslenen bireylerde oluşan mikro besin eksiklikleri bulaşıcı hastalıkların sayısını arttırabilir(Bhutta et al. 2008).

İklim değişikliğine uyum kapsamında gerekli önemler alınmadığı sürece mısır, buğday ve pirinç gibi önemli mahsullerin bu değişiklikten olumsuz etkileneceği düşünülmekledir. Tropikal ve subtropikal bölgelerde yetişen pirinç ve mısırın artan sıcaklıkların etkisiyle hasadının %20-40 arasında düşeceği tahmin edilmektedir. Deniz seviyesinde yaşanan yükselme ve taşkınlar, tarım alanlarının hasar görmesine ve balık yetiştirme alanlarının kaybolmasına sebep olacaktır(Morton 2007).

**Nüfus Hareketleri**

Artan nüfus barınma, gıda ve su yetersizliği olmak üzere birçok açıdan iklim değişikliğiyle etkileşim içindedir. Aynı zamanda sağlık sistemlerini olumsuz etkileyerek savunmasızlığı arttırır. Özellikle büyük iklim olaylarıyla ortaya çıkan nüfus hareketleri hem doğrudan hem de dolaylı olarak insan sağlığının etkilenmesine sebep olur(Nations 2019).

2008'den bu yana her yıl ortalama 21,5 milyon kişi yaşanan doğal afetler sebebiyle göç etmek zorunda kalmaktadır(Evci Kiraz 2022).İklim değişikliği, çevresel ve psikososyal stres kaynaklı güvenlik sorunlarını beraberinde getirirken, geçim kaynaklarının etkilenmesine ve sosyal bozulmalara sebep olmaktadır(Barnett 2003; Sondorp and Patel 2003).

***Kentlerde Oluşan İklim Değişikliğini Önlemek Amacıyla Yapılan Çalışmalar***

***Rotterdam, Hollanda***

Rotterdam, Kuzey Denizi'nin kıyısında tamamıyla deniz seviyesinin altında ve deniz seviyesinin yükselmesi riskiyle karşı karşıya kalan bir şehirdir. Kentin lokasyon kaynaklı yerleşimi sebebiyle, değişen iklim koşulları sebebiyle deniz seviyesindeki yükselmelere, kontrolsüz yağışlarla ve artan sıcaklığın sebep olduğu kuraklık sorunuyla karşı karşıya kalmaktadır(Spaans and Waterhout 2017). Bu sebeple kentte iklim değişikliğine karşı uyum kapasitesini arttırmak adına çeşitli uygulamalar yapılmış ve bu uygulamalar hayata geçirilerek kentsel direnç kazanılması sağlanmıştır. Bu yönüyle Rotterdam diğer kentlere ışık tutacak bir şehir olarak literatürde yer almıştır.

Belediye liderliğinde karar verilen bu çalışmalarda, özel sektör, üniversiteler ve gönüllü

topluluklar yer almıştır. İklim değişikliğinin kentteki olumsuz etkileri önlenmeye çalışılmış, krizlerin fırsata dönüştürülmesi sağlanmıştır (Duman and Bilgili 2022). Son 10 yılda yapılan iklim adaptasyonu çalışmaları hız kazanmış ve dünya kentlerinden beğeni toplamıştır. Yapılan uygulamalarla pek çok resmi heyete ev sahipliği yapmış, biriktirdiği bilgi birikimini diğer ülkelerle paylaşmıştır. Kentlerde bu kapsamında geliştirilen su meydanları (Şekil 5.), yağmur suyunu barındırma niteliğine sahip yeraltı otoparkları, su havzaları ve yüzen yapılar Rotterdam' a milyonlarca dolar gelir sağlamıştır.



*Şekil 5:a- Rotterdam su meydanları, b-yağmur tutma özelliğine sahip yeraltı otoparkları [URL-5, URL-6]*

Kentin en önemli direnç projesi Rotterdam'ın iki mahallesi olan Bospolder ve Tussendijken'i direnç bölgesi haline getirmeyi hedefleyen Resilient BoTu girişimidir. Bu proje bölgedeki toplumu doğal gazdan yenilebilir enerji kaynaklarına geçirmeyi ve bu sürece halkı direkt dahil etmeyi hedefler. Projede çok fazla kuruluş yer almaktadır. BoTu projesi, uygun olan konumlarda güneş panelleri kurulmasını ve bu paneller ile ilgili bilgi vermeyi, bunun yanı sıra panel kurulumu için uygun olmayan çatı alanlarının nasıl kullanılabileceğini topluma göstermektedir. Bu sayede toplumun yenilenebilir enerjiye olan dönüşümünü kolaylaştırmaktadır. Bu girişim yalnızca enerji dönüşümünü öğretmek ve desteklemekle kalmayıp, aynı zamanda topluma da ekonomik fırsatlar sunmaktadır (Duman and Bilgili 2022).

***Kopenhag, Danimarka***

Dünyada ilk karbon nötr başkenti olma fikriyle öne çıkan Kopenhag, başta iklim değişikliği ve doğal afetlerin sebep olduğu problemlere çözüm üretme konusunda farklı kuruluşlarla geliştirdiği söylemler ve uygulamalarla örnek bir şehir olmayı hak etmektedir. 2009 yılında

doğal afet ve iklim değişikliğine direnç bağlamında oluşturulan 2023 Kopenhag İklim Planı'nda şehirde var olan ulaşım, eğitim, imar ve konut, sağlık ve sosyal faaliyet problemlerinin risk analizleri ve bu problemlere geliştirilen çözüm alternatifleri yer almaktadır. Kopenhag bu çözüm önerileri sayesinde bugün en iyi sürdürülebilir yeşil kent örneklerinden biri haline gelmiştir. İklim planı oluşturulmasının en büyük sebebi 2011 yılında kentte meydana gelen sel felaketinin etkilerinin önlenememiş olmasıdır. Plan bağlamında doğal afetlerin beklenmeyen etkilerinin ortadan kaldırılmasını sağlama fikri bulunmaktadır. Bu bağlamda deniz seviyesini aşan binalar inşa edilmesi, alt ve üst yapı sistemlerinin geliştirilmesi hedeflenmektedir (Çolakoğlu 2018).

2017 yılında, kentte yaşanan sel kaynaklı taşkınlar sebebiyle önlemler alınmıştır. Bunlar; yeşil bölgelerin arttırılması, asfalt yolların ve park alanlarınki yüzey akışının kanalizasyona gitmeden su toplama alanlarına yönlendirilmesidir. Bu önlemler taşkınların kentte bıraktığı hasarları azaltmada etkili olmuştur. Kentte yeni bir ısıtma sistemi kurulması planlanmıştır. Bu sayede ısıtma maliyetlerinde %30 tasarruf sağlanması hedeflenmiştir. Bu sistemle mevcuttaki yeşil alanların korunması ve arttırılması amaçlanmaktadır(Duman and Bilgili 2022).

Kentteki ulaşım sistemleri geliştirilerek karayolu trafiğinin %20 oranında azaltılması, bisikletler için yol tesis edilmesi, toplu taşıma araçlarına getirilen çözümlerle sera gazının azaltılması da yapılması planlanan uygulamalardır (Xu, Liu, and Ding 2021).

***SONUÇ VE DEĞERLENDİRME***

İklim değişikliğinin çevresel etkilerinin yanı sıra insan sağlığını hem fiziksel hem de psikolojik olarak doğrudan tehdit ettiği birçok kaynakta karşımıza çıkmaktadır. Bu çalışmada, iklim değişikliğinin insan sağlığı üzerindeki fiziksel ve psikolojik etkileri kapsamlı bir literatür taramasıyla ele alınmış, bunun yanında bu değişikliğin kentleşme üzerindeki etkileri ve yapılan uygulamalara da çalışmada yer verilmiştir.

İnsan sağlığı üzerindeki fiziksel etkilere bakıldığında, iklim değişikliğinin; sıcak hava dalgaları, sıcaklık artışına bağlı olarak oluşan kuraklık, artan yağışların sebep olduğu sel ve diğer doğal afetlerin şiddetini ve verdiği hasarı arttırdığı gözlenmiştir. Bu olayların da özelikle solunum yolu, enfeksiyon ve vektör kaynaklı hastalıkların yayılımını hızlandırdığı kanıtlanmıştır. Artan nüfus su ve gıdaya olan talebi arttırmaktadır. Bu da güvenliğin azalmasına, yeterli hijyen koşullarının oluşmamasına, temiz su kaynaklarına olan erişimin yetersiz kalmasına sebep olmaktadır. Sağlık sistemleri üzerinde bir yük oluşturan bu etmenler

toplumu etkilemektedir. Özellikle de savunmasız grup olarak nitelendirilen çocuk, yaşlı, kronik solunum yolu hastaları ve düşük gelirli bireyler bu koşullar karşısında zorluk çekmektedir.

Psikolojik sağlık etkileri ise fiziksel özelliklere göre daha doğrudan etkiler göstermektedir ancak etkileri fiziksel etkiler kadar yıkıcı olmaktadır. İklim değişikliğinin bir sonucu olarak yaşanan travmalar, yerinden edilme, maddi zarar ve kayıplar ve sosyal ilişkilerin zarar görmesi bireylerde kötü ruh hali, depresyon, stres bozukluğu, anksiyete hatta intiharla bile sonuçlanabilmektedir. Ayrıca artan sıcaklık değerleri saldırganlık ve şiddet eğilimine sebep olmaktadır. Azalan yeşil alanlar bireyler toplumsal huzurunu tehdit etmektedir. Sosyal destek hizmetlerinin zayıf olması sorunların etkilerini arttırmakta ve kalıcı hale gelmesine sebep olmaktadır.

Kentleşme ve iklim değişikliği çift yönlü etkileşim haline olan iki olgudur. Artan betonlaşma eğilimi, yeşil alanların azalması, fosil yakıtların kullanıldığı enerji tüketimi ve nüfusla artan çarpık kentleşme iklim değişikliğinin etkilerini hızlandırmakta ve kentleri adaptasyon konusunda savunmasız hale getirmektedir. Bu etkiler kentsel ısı adası etkisini etkilemektedir. Kentsel ısı adası, toplumları doğrudan etkilemektedir. Termal konfor değerinin azalması, artan enerji tüketimi ve hava kalitesinin bozulması gibi sonuçlar toplumları risk altına sokmaktadır. Bu sebeple iklim değişikliği etkilerini ortadan kaldırmak çözüm süreçlerinde yerel yönetimlerin ve kent planlamacıların da aktif rol alması gerekmektedir. Rotterdam ve Kopenhag'da yapılan somut uygulamalar iklim değişikliğine adaptasyon ve dirençli kent oluşumunda diğer şehirlere örnek teşkil etmektedir. Sürdürülebilir alt yapı uygulamaları, yeşil alanların arttırılması, yenilenebilir enerji kaynaklarına yönelim ve toplumların süreçte aktif rol olması bu süreçte etkili olacaktır.

Sonuç olarak iklim değişikliği hem insan sağlığını hem de kent yaşamını tehdit eden büyük bir krizdir. Bu krizle mücadele edebilmek için işbirlikçi ve uzun vadeli politikalar izlenmesi gerekmektedir. İklim değişikliğinin sebep olduğu doğrudan ve dolaylı etkilerin gün geçtikçe arttığı etkileri, günümüzde bireylerin hem fiziksel hem de psikolojik sağlıklarının korunması yalnızca sağlık politikalarında değil şehircilik politikalarında da öncelik haline gelmelidir.

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***URL***

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# Conceptual evaluation for the Integration of historical railway stations into high speed railway systems in the perspective of sustainable development goals

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**Abstract.** The railway history of Türkiye can be analyzed under three headings: Pre-Republican period, Republican period: 1923-1950 period and the post-1950 period. The post-1950 period has different stages of development. Between 1950-1980, the construction of railways remained in the background as highway transportation gained momentum. In the 2000s, the integration of high-speed rail technology into national policy gained pace. The growing importance of high-speed railway transportation since the 2000s can be linked to the concept of sustainability. Sustainable development is one of the prominent concepts in the report "Our Common Future" (Brundtland), published by the World Commission on Economic Development (WCED) in 1987. In 1992, the Rio Earth Summit was held in Rio de Janeiro, the main outcomes of which were Agenda 21 and the establishment of the Commission on Sustainable Development. All these developments can be characterized as factors that accelerated the introduction of the concept of sustainable development into the agenda of international and national policies. Historic railway station structures have great importance in terms of providing economic and environmental benefits, as well as deep cultural and social ties to national history and urban identity. The continuous use of station buildings, with necessary maintenance and renovation interventions, offers many advantages in terms of reducing the consumption of energy and raw materials required for the construction of new buildings, reducing carbon emissions, preserving culture and history layers belonging to urban identity. It is clear historic station buildings have an critical role in achieving sustainable development goals. With the development of railway technology, historic railway lines and station structures have entered a process of transformation in line with modern technology and requirements. This global transformation is also having an impact at the national level. In this context, the issue of adapting historic station buildings to high-speed train technology has gained importance. Within the scope of this research, examples of international and national approaches to the integration of historic station buildings with high-speed train buildings will be examined. Then the selected examples will be evaluated conceptually in the context of sustainable development goals.

**Keywords:**Histotric train stations; Adaptive re-use; Sustainable development; Conservation of cultural heritage

## 1. Introduction

Railway transport has been one of the most important carriers of the technological and social transformations that accelerated with the industrial revolution on a global scale. Since the mid-19th century, railway lines and related station structures have not only shaped transport networks, but also deeply affected the physical structure, economic development and social dynamics of cities. Considering the railway history in Türkiye after the proclamation of the Republic, three main development phases can be defined: between 1923-1950, between 1950-2003 and after 2003. These periods are closely related to the economic, political and social changes and technological developments in the country. In the early Republican period (1923-1950), two significant policies were implemented, which had a considerable impact on the development of railway transport. The first of the aforementioned measures was the nationalisation of railway lines that were previously controlled by foreign capital. The second objective was to establish the essential transport infrastructure in regions lacking railway lines and integrating the existing network with the new infrastructure. The objective of this initiative is to establish an

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independent transport network that would facilitate efficient connectivity between the eastern and western regions of the country (Yalçın, 2024 as cited in Ekizoğlu, 2012).

Especially after 1950, with the prioritisation of road transport, railway construction activities remained in the background and railway investments followed a stagnant course. However, since the 2000s, the integration of high-speed train technologies into national transport policies has accelerated and a renewed interest in railway transport has emerged (Pektaş, 2017). This process is also overlapping with the gaining importance of the concept of sustainability on a global scale. The process, which started with international studies such as the Our Common Future (Brundtland) Report published by the World Commission on Economic Development (WCED) in 1987 and the 1992 Rio Earth Summit, has placed sustainable development at the centre of contemporary development goals. In parallel with the developments in the international agenda, the concept of sustainability has started to be discussed at the national level in terms of environmental impact.

In the 7th Development Plan prepared in 1995, attention was drawn for the first time to the negative environmental impacts caused by the transport sector. The need to increase the importance given to railway transport in public investments in the transport sector in Türkiye was emphasised for the first time in the 7th Development Plan, and the concept of sustainability was officially included in the 8th Development Plan prepared in 2011 (Zeren, 2021). Railway transport, which is a sustainable and efficient method in terms of environmental protection policies as an alternative to road transport, which is dependent on fuel consumption with high carbon emissions in both global and national transport policies, comes to the forefront with the development of high-speed train technologies (Candan Demirkol & Gülpınar, 2023).

Railways are socio-technical systems morphologically composed of 'social' and 'technical' elements. These elements cannot be separated from each other. A holistic approach is needed to properly analyse the historical significance of railway systems (Coulls et al., 1999). As an industrial heritage, railway structures have a strategic importance as social spaces that stand out in the city identity with the technical infrastructure they offer in the field of transport. Evaluating the changing technical infrastructure and social conditions together with technology is of great importance for the conservation of these heritage sites. In the period from the 1950s to the 2000s, the problem of the existing railway structures becoming idle and losing their importance by losing their function due to the prominence of road-based transportation and the effect of modernisation has started to be discussed. Railway structures, which are considered under the title of industrial heritage, came to the forefront in the 1970s as an element of cultural heritage (Kösebay Erkan & Ahunbay, 2008 as cited in Ede & Çelen Öztürk, 2024).

Since 2003, conventional railway lines and station structures, where national passenger transport services are provided, have been transformed in line with modern needs. Construction of new lines and station structures serving high speed train technology has gained momentum. In the 2024-2028 TCDD Strategic Plan, the vision of using renewable energy resources to contribute to a cleaner world and implementing sustainable practices to minimise the negative environmental impacts of railways has been adopted. Within the definition of this vision, the concepts of economic and environmental sustainability come to the fore. The development of different design models in order to carry out applications without damaging the buildings with historical value is among the targets included in the plan (T.C. General Directorate of State Railways, n.d.). This approach can be associated with the cultural dimension of sustainable development. The construction of new technological transport infrastructure brings along a number of debates. In the period from the 1950s to the 2000s, the prominence of road-oriented transport and the inactivity of existing railway structures due to the effect of modernisation and the loss of importance by losing their function have started to be discussed. This situation brings the problems regarding the preservation of the national railway heritage to the forefront of the agenda of contemporary conservation debates. TCDD does not have an effective inventory of its cultural heritage building stock. Documents, photographs, maps or drawings related to the history of these buildings are not collected in a single archive. The absence of an effective archive system for the protection of railway heritage creates a disadvantage for the protection of this heritage. Problems such as the demolition of existing buildings if deemed necessary and the loss of importance of existing historical buildings by becoming dysfunctional with the commissioning of new buildings come to the agenda (Kösebay Erkan & Ahunbay, 2008). In addition, although the strategies developed include the development of innovative designs for the protection of historic buildings and the expression of sustainability, an effective conceptual framework for the planning and implementation of these designs has not been defined.

The 17 universal goals and 169 objectives determined as a result of the United Nations' efforts to include sustainable development in country policies and to create global goals are a guide for multilateral and collaborative development strategies at the international level (Gedik, 2020). The Sustainable Development Goals (SDGs) published by the United Nations in 2015 are planned to be achieved by 2030 (United Nations, 2015). The strategic plans and programmes developed to achieve these goals prove the power of these goals to take action. These goals can be defined as a dynamic action tool that covers multidimensional goals such as environmental protection, economic development, social justice and cultural heritage protection. The integration of historic stations with new transport systems requires the development of effective approaches that are environmentally, economically and socially sensitive to the preservation of cultural heritage, modern living conditions and human needs. Objective, versatile and binding SDGs can be used as a tool for the development of these effective approaches.

Within the scope of this research, examples of international and national approaches to the integration and re-functionalisation of historical station buildings with buildings built for high-speed railway lines are examined. This examination aims to develop a conceptual perspective based on the evaluation of the selected examples through the concept of sustainability.

## 2.Methodolgy

Qualitative research methods were adopted in this study. Within the scope of the study, national and international examples of the integration and re-functionalisation of historical railway stations with high speed train lines were examined through literature and archive review. In the literature review, primary and secondary sources such as academic articles, reports, project documentation and relevant policy documents were utilised. During the literature review, the history of railway development in the Republic of Türkiye was firstly researched. In order to facilitate the research and evaluation stages, the history of railway development was handled in periods. Accordingly, three main development phases were defined as between 1923-1950, 1950-2003 and after 2003. Then, focusing on the concept of railway heritage, literature and archive researches were conducted on the studies on the conservation of historical station buildings. In the next step, literature researches were conducted on the historical development of the concept of sustainability and sustainable development. Literature researches were carried out to analyse the place of railway transportation and cultural heritage conservation approaches in sustainable development. International and national examples for the integration of historical station buildings and high-speed rail transport have been analysed using literature and archival documents. In the next methodological stage of the study, the examples analysed were conceptually evaluated on the axis of sustainable development. In the last stage, all the findings obtained are evaluated and included in the conclusion section.

## 3. Evaluation of the integration of historical railway stations into high speed railway systems in the perspective of sustainable development goals

In this chapter, the integration of historical railway stations, which have been shaped within the framework of the development process from the early periods of its history to the present day, with high-speed railway (HSR) systems is evaluated in the context of sustainable development goals. In this context, the historical development of the Republic of Turkey's railways is discussed. Subsequently, an evaluation is conducted of international approaches to the importance of railway structures as cultural heritage. Furthermore, with reference to the architectural, technical and socio-cultural characteristics of railway structures, the protection of these structures, ensuring their functional continuity and integrating them with modern transport systems, is discussed within the scope of the United Nations Sustainable Development Goals.

Finally, in this framework, national and international examples are analysed to evaluate the technical, functional and conservation-oriented challenges encountered in the process of integrating historical stations with high-speed train technologies.

### 3.1 Historical development of Turkish Republic railways

Railway policies of the Republican period are generally considered in three main phases. The first period is the period between 1923-1950 when the railway had a priority position in transport systems. The second period covers the years 1950-2003, when Türkiye started to intensify its relations with the United States of America within the framework of the Truman Doctrine in 1947, which led to a change in the direction of transport policies and highway investments came to the forefront. The third period is the period in which the restructuring process in railway transport started as of 2003, high speed train projects were prioritised at the state policy level and railways were repositioned as a strategic transport model (Ekizoğlu, 2012).

The railway policy effective in the period between 1923-1950 was carried out in line with two main objectives. The first one was to build railway lines covering neglected regions as well as developed centres and to organise the entire transport infrastructure through an interconnected network system. In this way, it was aimed to support national unity and economic development. Secondly, the nationalisation of railway lines inherited from the Ottoman Empire and controlled by foreign companies was adopted as a strategic step towards the nationalisation of transport infrastructure (Öztürk, 2009). In the Early Republican period, political and strategic priorities were decisive in the approaches towards railway enterprises. In this period, the size of the station buildings was planned by taking into account the population and importance of the settlement through which the line passed. The buildings constructed in the 1920s have elements such as wide eaves, arched windows and tile decorations reflecting the architectural understanding of the period. The 1926 Ankara Gazi Station and the 1912 Adana Station are examples of this architectural approach. In the 1930s, the simple and massed forms of modern architecture were blended with an understanding symbolising the authority of the state. Ankara Station, designed by Şekip Akalın in 1937, and Afyon Station in 1939 are among the buildings of this period, where prismatic masses add mobility to the façade (Sezginalp & Sezginalp, 2021). According to the Truman Doctrine, which developed during the Cold War period after World War II, Türkiye was included in the Marshall Plan in 1948. In order to benefit from the Marshall Plan, Türkiye was required to accept a number of conditions. As a result of these conditions

aimed at increasing the economic volume of private enterprises by reducing public entrepreneurship in the economy, it was put forward not to establish heavy industries such as iron and steel and heavy chemistry (Öztürk, 2009). This situation started the process that led to the railway lines being put into the background due to the emphasis on highway investments.

From 1950 to 2003, the importance given to railways gradually decreased. Road transport was encouraged through Marshall Aid and highway construction gained momentum. As a result of the road-oriented transport policies implemented in this period, highways took the first place among transport systems. Accordingly, the number of motorised vehicles increased rapidly in the following years. A completely foreign-dependent automotive industry was established for the necessary fuel and spare parts needs (Pektaş, 2017). In the 1996-2000 7th Development Plan prepared in 1995, attention was drawn for the first time to the negative environmental impacts of the road-based transport sector (Zeren, 2021). The increase in the use of motor vehicles has brought along the problems of excess fuel consumption, environmental pollution, accidents and traffic congestion in urban transport in Türkiye (Prime Ministry State Planning Organisation, 2010).

The EU harmonisation process has directly affected Türkiye's national policies, particularly in the field of transport. The development of the physical and economic infrastructure of the transport sector, which is directly related to the revitalisation of sectors such as trade and tourism, has become a priority issue. This priority status has directly affected the development plans prepared by the state, which also include transport policies (Zeren, 2021). In the Long Term Strategy 2001-2005 and the Eighth Five-Year Development Plan, the main objective is to strengthen the role of railway operations in the country's transport system by making them compatible with market conditions, commercially oriented and efficient.

With the effect of all these developments, 2003 was a turning point in railway transport and high speed train technology was included in national transport policies. In this way, railways were adopted as a priority transport model again as a state policy. In addition to Ankara-Istanbul and Ankara-Konya High Speed Train Projects, cooperation was established between the central government and local administrations for the development of urban rail public transport systems. In this context, large-scale urban rail transport projects such as Marmaray in İstanbul, Ege-ray in İzmir and Başken-tray in Ankara have been implemented (Karaman, 2010 as cited in Ekizoğlu, 2012). In the Ninth Five-Year Development Plan for 2007-2013, it is stated that the existing railway infrastructure is not suitable for high speed and high quality service between large populated cities. Within the scope of improvement works, restructuring of railway line and station structures to make them suitable for high speed train operation has been brought to the agenda (Ekizoğlu, 2012).

In the 19th century, train terminals built in many important cities of Europe attracted attention with their wide-span railway halls reflecting the developing engineering possibilities of the period. Today, these buildings are facing a ‘station renaissance’ process; some of them have been modernised and adapted to high-speed train (HSR) systems. In the last two decades, in line with the goals of revitalising city centres and expanding HSR networks, large-scale new generation station structures with multifunctional programmes have been built. These stations stand out not only as transport infrastructure but also as monumental structures within the urban space. Ankara HSR Station and Konya Selçuklu HSR Station, which have been commissioned in Türkiye in recent years, are among the local examples of this new generation of multifunctional and large-scale station buildings (Zeren, 2021).

### 3.2. Importance of railway structures as cultural heritage

The UK, which is at the forefront of the development of railway technology, has many examples in terms of the construction and preservation of railway structures. Therefore, analysing how railway heritage is handled in England is advantageous for studies in this field. Until today, railway heritage has not received the attention it deserves, including in the UK. The closure of many railway lines in the 1960s when coal mines became dysfunctional, and the structures lost as a result, have led to an awareness of railway heritage in the UK (Kösebay Erkan & Ahunbay, 2008).

The process of including railway infrastructure within the scope of cultural heritage initially encountered two main obstacles. Firstly, railway remains were considered as ordinary and functional infrastructural elements for a long time; this situation caused both their cultural and technological values to be insufficiently recognised. Secondly, due to this perception, the lack of an effective legal framework or regulation for the protection of railway structures has made the protection of these structures difficult. The acceptance of the concept of industrial heritage as a historical and cultural value came relatively late, resulting in a large number of industrial abandonments, including transport infrastructure that became dysfunctional with changing industry and technology. Abandoned railway lines, in particular, are often located in areas where coal mining or heavy industrial activities have ceased, leading to the dysfunctionalisation of the sites. Moreover, the gradual modernisation of railway systems resulted in the decommissioning of many historic lines of high engineering and architectural value (Merciu et al., 2022).

In the 1970s, in response to concerns about the potential environmental threats posed by the demolition of industrial buildings, meetings began to be organised under the leadership of various universities and conservation organisations. These reactions, which were initially shaped by environmental concerns, gained a different dimension in time with the effect of the sense of belonging of the workers who had worked in these buildings for

many years. These developments paved the way for an increase in interdisciplinary studies on industrial areas and the emergence of concepts such as 'industrial archaeology', 'industrial culture' and 'industrial area'. Thus, since the late 1970s, awareness for the conservation of industrial buildings has developed and these buildings started to be defined as a cultural value under the title of 'industrial heritage' in the second half of the 20th century. Since the mid-1980s, this conservation approach has expanded beyond the structural scale to include large-scale industrial areas (Gür, 2019).

In 1977, the exhibition 'Off the Rails', organised as part of the 'SAVE Britain's Heritage' initiative, contributed significantly to raising awareness of railway heritage in the UK. After this exhibition, the preservation of railway buildings with historical and architectural value came to the agenda; Manchester Central Station was re-functionalised instead of being demolished in 1980 and became one of the first applications that set an example for this process. By 1997, a total of 60 railway lines were under protection in the country, and by 2003, more than 2,000 railway structures were officially protected. Today, although railway heritage is generally evaluated within the framework of industrial heritage and industrial archaeology disciplines, historical railway lines and structures are specifically addressed under the title of 'railway heritage' within this inclusive framework (Kösebay Erkan & Ahunbay, 2008).

Railway heritage is not only an element reflecting the function of transport infrastructure in the past, but also a multi-layered cultural value bearing the traces of social, technological and spatial transformations. Railway structures, which played a central role in shaping the processes of urbanisation, mobility and economic development after the industrial revolution, constitute important reference points in terms of historical memory with their engineering achievements, architectural styles and urban locations. The preservation of this heritage is critical both for the reuse of environmental and economic resources in line with sustainable development goals and for ensuring cultural continuity. In addition, the re-evaluation of abandoned or defunct railway buildings is of great importance in terms of integration with modern transport systems, preservation of urban identity and urban aesthetics.

### 3.3. Evaluation of railway heritage from sustainable development perspective

The term sustainable development was first defined in the 'Our Common Future' report prepared by the United Nations' World Commission on Environment and Development (WCED) chaired by Gro Harlem Brundtland. In this report, sustainable development was defined as a development that meets the needs of the present without jeopardising the ability of future generations to meet their own needs (Basiago, 1999; Redcliff, 2005 as cited in Gedik, 2020). The Venice Charter, adapted and published by ICOMOS in 1965, emphasises that the protection of cultural heritage sites is a responsibility towards future generations (ICOMOS, 2023).In the early 1960s, the interaction between sustainability and conservation was emphasised by conservation experts and this relationship has been widely covered in the international conservation literature over time.In the following years, the Paris Declaration published by ICOMOS in 2011 stated that development-oriented investments and practices can lead to negative consequences that threaten heritage sites and their values. Therefore, it was stated that heritage sites, as fragile and non-renewable resources, should be protected for the benefit of future generations (ICOMOS, 2011). In this context, the expressions 'future generations' and 'non-renewable resource' clearly reveal the strong relationship of cultural heritage with the concept of sustainability.

With the development of conservation theory and sustainable development studies over time, the importance given to sustainability in heritage conservation policies has gradually increased. Following the 2030 Agenda adopted by the United Nations in 2015, the International Council on Monuments and Sites (ICOMOS) established the Sustainable Development Goals Working Group (SDGWG) to develop strategies related to sustainable development goals (ICOMOS, 2016). In the report published by this group, the role of tangible and intangible, natural and cultural heritage elements in achieving the Sustainable Development Goals is clearly emphasised. According to the report, integrating cultural heritage into various dimensions of sustainable development offers multifaceted contributions such as increasing social resilience, strengthening a sense of identity and belonging, and supporting environmental sensitivity (ICOMOS SDGWG, 2021).

This study aims to evaluate the process of integration of historical railway stations with high speed train systems from the perspective of the 17 Sustainable Development Goals (SDGs) announced by the United Nations in 2015. The SDGs that directly overlap with the scope of the study and the relationships established with them are explained below:

#### 3.3.1. SDG 9 - Industry, innovation and infrastructure

This goal aims to develop sustainable infrastructure systems, promote inclusive and sustainable industrialisation and disseminate innovative practices. Within the scope of the study, the process of integrating historical stations into the existing railway infrastructure, transforming these structures in accordance with technological requirements and integrating them into high-speed train systems overlaps with the principles of 'resilient infrastructure' and 'innovation-based transformation' of the target. In this way, while cultural continuity is ensured

by integrating historical buildings into modern transport networks without demolishing them, the functional efficiency of infrastructures is increased.

3.3.2. SDG 11 - Sustainable cities and communities
This goal aims to make cities inclusive, safe, resilient and sustainable. The preservation and re-functioning of historic railway stations contributes to strengthening cultural identity by ensuring the continuity of urban memory and architectural heritage. In addition, making transport systems sustainable with railway-based solutions helps to reduce urban traffic load and emission rates. Thus, both the quality of social life is improved and spatial sustainability is supported.

3.3.3. SDG 12 - Responsible production and consumption
This target envisages efficient use of natural resources, reduction of waste production and promotion of sustainable consumption and production patterns. Repurposing and adaptive reuse of existing historic stations, rather than new construction, helps to reduce the environmental burden of development. This approach not only reduces carbon emissions from construction activities but also minimises material and energy consumption.

3.3.4. SDG 13 - Climate action
This target aims to take urgent measures to combat climate change. Railway systems, especially high speed train lines, have a lower environmental impact in terms of carbon emissions compared to road and air transport. Therefore, prioritising railways in transport and integrating historical infrastructures into this system is important for reducing the carbon footprint. Moreover, such practices encouraging public transport are in line with long-term climate strategies.

3.3.5. SDG 8 - Decent work and economic growth
This goal includes elements such as increasing employment, supporting economic growth and ensuring inclusion in the labour market. The renovation of railway stations and their integration into modern transport projects creates new employment opportunities for various occupational groups in the planning, restoration, construction and operation processes. In addition, revitalised activities in these areas strengthen local economic dynamics and create new opportunities for the service sector and small businesses.

3.3.6. SDG 15 - Life on land
This goal aims to protect terrestrial ecosystems, sustain biodiversity and prevent the destruction of natural areas. The re-functioning of historic railway infrastructures means using existing areas without creating construction pressure on new areas. Indirectly, the reduced need to intervene in nature due to new development contributes to the protection of natural habitats.

3.4. Approaches to the integration and adaptive reuse of historical station buildings with high speed railway systems
This section explores how historic railway station buildings are integrated and adapted for use within high-speed railway systems. The goal is to balance heritage preservation with the demands of modern transportation. Using examples from different countries and cities, the section looks at architectural design, new uses, and planning strategies. It also assesses how these approaches support sustainable urban development, protect cultural heritage, and improve transport system integration.

3.4.1.Oslo central station & Nordic light (Norway)
Oslo Central Station, opened in 1854, originally served Norway's first railway line, the Christiania–Eidsvoll route. Over time, the station expanded and became one of the most important transportation hubs in Norway throughout the 20th century. Under the "Nordic Light" project, the station underwent a transformation that combines Scandinavian minimalism with environmental sustainability principles. The use of natural and recyclable materials such as wood, glass, and stone is notable, alongside open public spaces and interior arrangements designed to maximize natural light. Energy-efficient systems and green design strategies have endowed the station with new functionality. As a historical structure, Oslo Central Station has been reimagined with modern architecture, integrating sustainable materials, energy-saving systems, and public spaces under the Nordic Light project. Both functionality and environmental sustainability were given high priority in this redevelopment.



Fig. 1. Oslo Central Station & Nordic Light (Reiulf Ramstad Arkitekter, 2025)

3.4.2. Atocha station (Madrid, Spain)
Cultural continuity has been ensured through both the preservation of the historic terminal and the construction of a new terminal building serving high-speed rail lines. The botanical garden and interior spaces within the station reinforce the theme of sustainability. Atocha Station was built in 1851 and has since become Madrid's largest and busiest railway station. The monumental iron-and-glass entrance hall, designed in 1892 by Alberto de Palacio, is particularly notable. In 1992, with the integration of the high-speed rail system, the station was expanded, and the interior of the original building was transformed into a botanical garden. This intervention preserved the historic structure while creating a public space that enhances spatial sustainability. The new terminal building, designed by Rafael Moneo, establishes a balance between contemporary architectural lines and historical architecture.



Fig. 2. Atocha station (Freepik, 2023; The Wandering Passport, 2024)

3.4.3.Vilnius Railway Station (Lithuania,Vilnius)
Built in the late 19th century, Vilnius Station is one of the key hubs in Lithuania's railway history. Redesigned within the framework of the European Union's Green Deal principles, the station has been supported by open spaces oriented toward the city center and transportation routes prioritizing pedestrians and cyclists. The new design embraces a nature-integrated transport architecture that emphasizes green infrastructure. In this way, the station has been reimagined to establish a stronger connection with the urban fabric while also being integrated with sustainable infrastructure.



Fig. 3. Vilnius Railway Station(Godfrey, 2025)

3.4.4. California high-speed rail (USA, California)
This system, currently under construction, constitutes the first full-scale high-speed rail line in the United States. As part of the project, several historic train stations have been preserved and integrated with modern high-speed rail terminals. This approach establishes a hybrid station model that maintains local identity while addressing contemporary transportation demands.



Fig. 4. California High Speed Railway Station(The High Speed Rail Alliance, 2024)

3.4.5. Ankara railway station / Ankara high-speed railway station (Türkiye, Ankara)
Completed in 1937, Ankara Railway Station is a significant transportation structure reflecting the modernist architectural approach of its time and is considered a spatial representation of the Republican ideology. With its simple geometric masses, symmetrical layout, and monumental entrance axis—characteristic of Early Republican architecture—it has reinforced its symbolic position in the history of rail transport in Türkiye.

The Ankara High-Speed Rail (HSR) Station, which became operational in 2016, was positioned adjacent to the historic station complex to meet the increasing passenger demand and to accommodate the integration of high-speed rail lines. However, the new structure has been heavily criticized for its architectural language, façade character, and impact on the urban silhouette, particularly in terms of the relationship it establishes with the existing historical context. In line with conventional conservation principles, newly built structures in historic settings are expected to be sensitive to their surroundings, and to align in scale and materials; yet, Ankara HSR Station is argued to exhibit only limited compliance with these standards.




Fig. 5. Ankara high speed railway station (Altın, 2025)

3.4.6. Konya railway station / Selçuklu high-speed railway station (Türkiye,Konya)

Konya's historic railway station has served as a transportation hub since the Ottoman era. The new Seljuk High-Speed Train (HSR) Station was constructed at a separate location from the historic station. While this separation has been criticized in terms of physical and cultural continuity, it has enabled the efficient operation of high-speed rail services.



Fig. 6. Selçuk high speed railway station (Konya Büyükşehir Belediyesi, 2023)

3.4.7. Eskişehir railway station/ Eskişehir high-speed railway station project (Türkiye, Eskişehir)
Eskişehir holds a significant place in Turkey's railway history, spanning from the Ottoman Empire to the Republic. The city has made a significant contribution to the railway industry through its production and maintenance activities, a legacy that has been preserved to the present day. In accordance with this historical background, the Eskişehir High Speed Train Station (HSR) was designed by the renowned architects Orhan Uludağ and Prof. Dr. Zeynep Uludağ and completed in 2014. The newly constructed station building, which has been integrated into the city centre, aims to ensure the integrity of transport and urban structure. The edifice has garnered acclaim for its architectural conception, having been the recipient of the National Steel Structure Award in 2018 and the World Architecture Award from the World Architecture Community in 2020 (UMM, 2021). Nevertheless, concerns have been raised regarding the necessity to enhance the connection between the edifice and the historical station building, as well as the social memory of the city. This situation demonstrates that cultural heritage should be protected not only in physical but also in social aspects

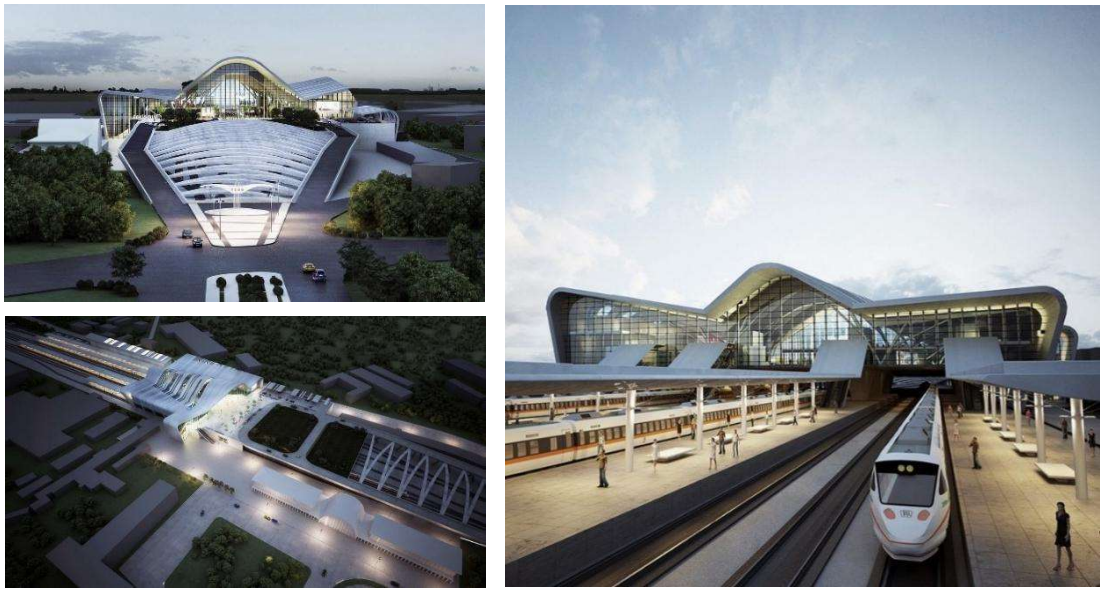

Fig. 7. Eskişehir high speed railway station (Arkitera Mimarlık Merkezi, 2025)

3.4.8. Adana railway station / Adana high-speed railway station project (Türkiye,Adana)
Opened in 1912, Adana Station has been one of the region's key transportation hubs during both the Ottoman and Republican periods. As part of the HSR project, efforts are being made to preserve the historic station and integrate it with the new infrastructure systems. Within the scope of the Adana HSR Station Project, adaptive re-use of the 1916-built historic warehouse building was proposed by the contractor. The original floor plan and façade design of the building have been preserved to ensure its integration with the new structure. The old warehouse building is intended to be refunctining as a restaurant. At the same time, the new HSR Station building has been designed with an architectural approach that respects the historical identity of Adana Station and its visibility within the city. The project's main principles include creating a balanced architectural transformation, taking into account the station's strategic location and historical significance.



Fig. 8. Adana High Speed Railway Station (Çizgi Hisar Mimarlık,2020)

## 4. Conclusions

This study examines the role of railway transport in the context of the Sustainable Development Goals (SDGs), with a particular focus on the integration and adaptive reuse of historic station buildings in high-speed rail systems. It highlights that historic buildings should not only be considered as aesthetic or nostalgic elements, but also as strategic assets that can contribute to sustainable urban development, environmental responsibility and economic resilience.

The SDGs approach heritage conservation not only as a matter of conservation, but also as a multidimensional development tool linked to social inclusion, economic vitality and environmental balance. In this context, the adaptive reuse of historic railway stations plays a crucial role in preserving urban identity and providing public spaces, in line with efforts to make cities more inclusive and sustainable. Furthermore, the reuse of existing structures reduces material consumption and construction waste, supporting resource efficiency and circular economy principles.

As a low-emission mode of transport, rail systems make a significant contribution to climate change objectives. By revitalising historic stations rather than demolishing and rebuilding them, the environmental impact is minimised. Integrating historic infrastructure with modern technology not only preserves architectural heritage, but also modernises transport networks in line with innovation and resilient infrastructure goals. In addition, such projects support local employment and stimulate economic activity through newly created functions and services, especially in sectors such as tourism and cultural industries.

Moreover, the reuse of existing buildings serves to reduce pressure on land development, thereby contributing to the protection of natural areas and terrestrial ecosystems. In essence, the adaptive reuse of historic station buildings signifies a comprehensive strategy that transcends mere physical transformation, embodying a holistic approach that seamlessly integrates the imperatives of cultural heritage conservation, urban sustainability, and integrated development.

By repositioning cultural heritage as both a driver and accelerator of sustainable development, the SDGs serve to dissolve the long-standing dichotomy between conservation and progress. Consequently, the integration of historic railway architecture into contemporary high-speed transport systems represents a strategic step towards the creation of more liveable cities and the safeguarding of cultural identity for future generations.

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11th MEDITERRANEAN CONGRESS OF CLIMATIZATION
Towards Decarbonized Buildings and Cities

# IMPACTS OF ACTIVE AND PASSIVE ENERGY RETROFITS ON HISTORIC BUILDINGS

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**Keywords:** Energy retrofits, Historic buildings, Sustainable environment

**Abstract** *Improving the energy efficiency of existing buildings is a more sustainable approach than constructing new buildings with high energy performance. This is because the number of existing building stock is substantial, and it is possible to increase their energy performance with the necessary interventions. However, historic buildings, which are considered within the scope of cultural heritage, do not allow all kinds of interventions. It is required to take some measures for energy efficiency without harming the historical texture and value of such buildings. Within the scope of this study, it is aimed to evaluate passive and active energy retrofits targeting historical buildings in the light of measures taken for the protection of cultural heritage. In addition, the economic, environmental and user comfort parameters of energy retrofitting decisions taken in accordance with the original structure of historic buildings are analyzed within the scope of 12 case studies examined in the last 10 years. Determining which energy-related interventions are more appropriate and effective in historic buildings is important in terms of raising awareness of sustainable historic environment and revealing the significance of multifaceted applications in the architectural field. This study contributes to the issues of addressing the concepts of energy efficiency and conservation together in historical buildings, reducing the environmental impacts of existing buildings by making them energy efficient and building a sustainable environment.*

## 1. INTRODUCTION

The increasing importance and escalating crisis of climatic changes since the 1990s pose significant threats to biodiversity, ecosystems, and resources, as well as to livelihoods. International agreements such as the Kyoto Protocol (1997), the Paris Agreement (2015), and the European Green Deal (2019) underscore the urgency of the situation, all aiming at reducing anthropogenic greenhouse gas emissions [1]. Given that the construction sector accounts for approximately 36% of total energy consumption and about 40% of carbon dioxide emissions from energy consumption, actions in this sector become crucial [2].

Buildings contribute to global warming and climate change throughout their life cycles by emitting greenhouse gases [3]. With new technologies, it is possible to reduce energy consumption and mitigate harmful gas emissions. However, the adaptation of these technologies to existing building stock presents a new area of debate. Particularly, interventions planned for historical buildings must be carefully assessed for their impact on the buildings' characteristic features and fabric. The United States, the European Union, and the United Kingdom have all enacted policies exempting historical buildings from energy improvements, demonstrating a deep sensitivity to this issue [4].

To qualify as a historical building, a structure must be over 50 years old, maintain the integrity of its original physical features, and possess societal, aesthetic, or historical significance [4]. The principle of preserving the physical integrity of historical buildings guides subsequent interventions these structures will undergo. Therefore, efforts aimed at improving historical buildings adhere to the principle of "as much as necessary, as little as possible" [5].

Studies on the energy improvement of historical buildings have been conducted under various categories such as indoor environment, economy, and building fabric [4]; addressing the advantages and disadvantages of each intervention at the local scale [6] and considering the energy gains of appropriate improvement measures [7]. Furthermore, research has been conducted focusing on design-based energy improvements [8]; the impacts of climate change on historical buildings [9]; and the examination of interventions focused on energy efficiency and thermal comfort [10], all of which have contributed to the literature. What sets this study apart from others is its consideration of active and passive systems aimed at increasing energy efficiency in historical buildings, based on case studies, and addressing the fundamental criteria of a sustainable built environment from social, environmental, and economic perspectives. This is because improvements made in building energy performance are closely related to the natural environment, user satisfaction, and economic gains.

The social sustainability dimension of the study entails improvement measures based on user comfort. Ensuring comfort conditions in indoor spaces, particularly in residential and office buildings where a significant amount of time is spent, enables effective use of the building. In the environmental sustainability domain, measures to reduce carbon emissions and energy demand in buildings are addressed. The gains from these improvements, their payback periods, and costs constitute the economic sustainability

dimension of the study. In addition to these criteria, measures taken for the historical and architectural values of the buildings are also included. The examined passive and active energy improvements are presented in Figure 1, focusing on 12 case studies selected from articles and conference papers worked on over the past 10 years.

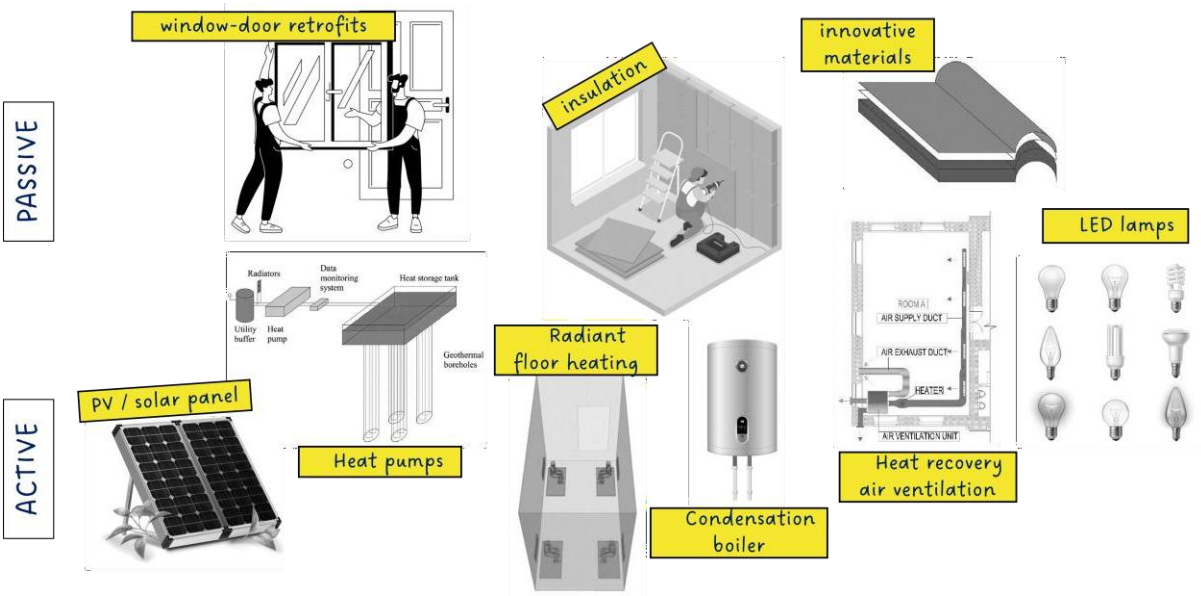


Figure 1. Inspected passive and active energy retrofits.

## 2. PASSIVE ENERGY RETROFITS

This section discusses passive improvements such as door and window enhancements, insulation applications, and innovative material designs.

### 2.1. Window and door improvements

Replacing existing windows of historical buildings with low-emissivity double or triple glazing technologies significantly impacts energy gains. In an example of a historic educational structure in Italy, replacing single-glazed systems consisting of wooden frames with argon-filled low-e double glazing, supported by high-reflectance external shading elements, resulted in a 40.2% reduction in annual energy consumption and a 39.2% decrease in operational carbon emissions, yielding a 40% economic gain during the building's use [11]. Similarly, a study conducted in southern Italy demonstrated a 14% gain in total energy consumption by replacing wooden-framed double glazing with low-emissivity, argon-filled PVC-framed double glazing [12]. In a scenario concerning the replacement of single-glazed windows of a historical building in the United Kingdom with low-e vacuum-sealed double glazing, coupled with insulation and reduction of air leaks, a 52% reduction in primary energy consumption was achieved [13].

### 2.2. Insulation

Insulation is one of the most crucial elements in ensuring the thermal inertia of building envelopes. However, insulation applications in historical buildings can lead to factors that adversely affect user comfort, such as overheating and mold formation, by altering the building's moisture and temperature balance. Hao et al. [9] noted in their study examining the effects of current and future climate conditions on historical buildings that insulation could cause mold formation in wooden walls and frost damage in stone walls. Therefore, improvements should consider climate and local materials [9].

Various insulation applications can be found in the insulation of historical buildings. Among those selected for their suitability in terms of energy efficiency are aerogels [5], wood fiber panels [5, 9], polyisocyanurate (PIR) [13], polyurethane (PU) [9, 11], extruded polystyrene (XPS) [14], vacuum panels [11], and expanded polystyrene (EPS) [15]. However, considering user comfort, cost-payback periods, carbon emissions, compatibility with locally used materials in historical buildings, and effects on human health are necessary precautions.

In a case study of an educational structure in Naples, southern Italy, utilizing vacuum insulation panels with a thickness of 3 cm on exterior walls resulted in approximately 14% primary energy gain and a 13.6% decrease in carbon dioxide equivalent emissions [11]. In a study conducted on a residential structure in northern Austria, walls and roofs were insulated with wood fiber insulation, while the floor was insulated with polyurethane. Additionally, an 85% improvement in air tightness rates was achieved. These improvements resulted in an 85.6% reduction in annual energy demand for heating [9]. In a historical building converted into a hotel complex in Saudi Arabia, insulation applied to exterior walls resulted in a 15% energy consumption reduction, while insulation applied to the roof led to a 5% gain. Insulation was applied to the interior of the walls to preserve the original stone texture of the building [16].

The insulation layer in historical buildings is generally applied to the interior space, which raises concerns about the factor of space reduction. In a study in this area, it was stated that energy and cost balance can be achieved through advanced technologies, and reductions in interior space volumes due to insulation can be minimized. Moreover, advanced improvements such as aerogels, vacuum materials, and high air tightness rates can result in up to 60% energy savings compared to the reference condition. However, traditional improvement methods such as PIR, mineral wool, air tightness, seals used in floor-wall joints, and single and double glazing result in lower energy savings and larger space reduction factors with payback periods of approximately 10 years [13].

### 2.3. Innovative building materials

In cases where traditional improvement methods are insufficient, have negative effects on the historical environment, or where greater energy gains are possible, innovative material and system suggestions can be pursued. In the examined case studies, it was found that cool tiles could improve comfort hours thanks to improved solar reflectance and provide a 4% gain in cooling energy. Care was taken to ensure that these newly designed tiles have

the same appearance as traditional tiles [17]. Another study compared the energy-saving benefits of panels containing phase change material (PCM) with thermal plaster. While the results showed a 27% reduction in energy consumption with PCM panels (3 cm), the use of thermal plaster was recommended due to rising costs. To preserve the architectural features of the building, which was a historic university structure, thermal plaster was applied to the interior walls of the building using vapor barriers. By replacing windows with low-emissivity ones, applying 5 cm thick thermal plaster to the walls (λ: 0.058 W/mK), and insulating the roof decking, a 38% reduction in greenhouse gas emissions was achieved [15].

## 3. ACTIVE ENERGY RETROFITS

### 3.1. Thermal and solar systems

*PV and solar panel installations*

Solar energy is considered as an energy source for historical buildings as much as it is for new constructions. Photovoltaic (PV) and solar panels, which can be installed on the inner parts of roof parapets, some parts of the roof, or on the ground in a manner that minimally affects architectural features, can meet the electricity and hot water needs of historical buildings. Systems integrated into the building envelope that can store solar energy can reduce carbon dioxide emissions by an annual rate of 15.6% [18]. However, it is possible for these panels to cause damage to the structure after installation. Therefore, the panels can be placed on their own supports using ground supports. In a study focusing on composite solar panels with a lifespan of approximately 10 years, the cost recovery period was estimated to be 3-5 years thanks to the gains provided by the panels [18]. Furthermore, it is known that PV applications result in a 7% decrease in total energy consumption of historical buildings [14]. However, the impact of climate on such panels should not be overlooked. For example, in desert climates where high temperatures and dust storms prevail, panel efficiency may decrease. Therefore, panel efficiencies should be calculated considering climate, shading, system age, and usability [16].

*Heat pumps*

Ground-source heat pumps are among the energy improvement interventions applied in historical buildings. According to a study conducted in Italy, a geothermal heat pump system with thermal energy storage is 37% less costly compared to the traditional method. Additionally, it provides a 64.3% reduction in heating energy and a 67% reduction in cooling energy [17]. In another study, replacing a standard boiler with a compression heat pump and thermostatic valves resulted in a 43.2% energy savings [12].

*Radiant floor heating*

In addition to energy efficiency, thermal comfort in historical buildings can be achieved through the use of radiant floor heating systems, thereby reducing annual heating requirements by 10% to 75%. These systems, which do not compromise architectural features, can greatly improve thermal comfort conditions depending on the location of the spaces within the building. However, it is important to avoid condensation in such systems, and dehumidifying devices may be necessary depending on the climate conditions [19].

*Condensation hot water boiler*

In traditional boilers, the flue gas temperature is often significantly higher than temperatures conducive to condensation, meaning that latent heat cannot be utilized. In condensing boilers, however, heat released during the phase change of hot water is recovered, thus significantly improving thermal efficiency [20]. Transitioning from gas boilers to condensing boilers in a historic educational building resulted in a 32% reduction in operating expenses, a 32.8% decrease in annual energy consumption, and a 31% reduction in carbon emissions [11].

### 3.2. Ventilation

*Heat recovery air ventilation*

In historical buildings, ventilation plays an undeniable role in ensuring indoor air quality and user comfort. Proper ventilation in indoor spaces prevents the accumulation of undesirable levels of moisture. The contributions of mechanical ventilation to indoor air quality and energy savings in historical buildings have been the subject of various studies [21]. In a study focusing on the effects of natural and heat recovery mechanical ventilation on indoor air quality, relative humidity, temperature, and particulate matter concentrations were measured in the interior of a restored historical building. It was found that when mechanical devices were in use, indoor pollutant levels remained below threshold values, and when mechanical ventilation was turned off, $CO_2$ concentrations exceeded the threshold value [22].

### 3.3. Lightening

*LED lamps*

The use of LED technology in lighting fixtures contributes significantly to increasing energy efficiency in building lighting, as LED lamps serve both as light sources and fixtures, producing more light with less energy. Compared to incandescent lamps, LED lights consume less energy and produce more light, thus reducing energy consumption in building lighting. Studies have shown that replacing incandescent lamps with LED lighting in historical buildings can reduce total energy consumption by 14-30% [12, 16].

## 4. RESULTS AND CONCLUSIONS

In this study, passive and active improvement strategies used in 12 different studies targeting historical buildings have been examined. The strategies investigated were evaluated in the context of energy consumption, carbon emissions, user comfort, economic efficiency, and measures taken in the historical environment. Passive improvements were categorized into three main headings: window-door improvements, insulation, and innovative material usage. Among these strategies, window improvements and the use of innovative materials in the building envelope are the most commonly applied methods. Window improvements and new material designs have been considered to ensure visual compatibility with historical buildings. Additionally, the selection of insulation products suitable for local materials is important for preventing condensation and mold risks. Insulation is generally applied to the inner side of exterior walls to preserve the texture of historical buildings. Furthermore, attention should be paid to the thickness of insulation for effective use of interior space and achieving a balance between cost and energy. The energy savings achieved by passive interventions generally range from 13% to 52%.

Active systems applied to historical buildings have been selected with a focus on energy efficiency, comfort conditions, and economic gains. These include underfloor heating systems, photovoltaic and solar panels, heat pumps, heat recovery ventilation systems, and LED lighting. Energy savings achieved through panels that generate electricity and heat from solar energy have reduced the payback period of panel costs to between 3 and 5 years. Annual heating energy savings obtained from underfloor heating systems can reach up to 70%. Heat pumps can contribute up to 40% to the total energy savings. The selected historical building case studies and the findings obtained are shown in Table 1.

Table 1. Selected case studies, energy retrofits and results.

| Building type | Retrofits | Cautions | Results | Ref. |
|---|---|---|---|---|
| **Complex (Genoa, Italy)** | **Passive:**<br>Design alternatives<br>Insulation (aerogel and wood fiber panels)<br>Replacement of the windows (triple glazed) and doors<br><br>**Active:**<br>Centralized thermal system and radiant floor panels, Heat recovery air ventilation unit, PV | Visual character of the façade.<br>Cement plaster coatings were preserved by covering with insulation materials instead of replacing them.<br>The insulation type was selected according to hygrothermal conditions of the opaque envelope. | Window and door replacements are responsible for 50% of total retrofit costs, while insulation accounts for 12-15% and PV for 2-4%. | [5] |
| **Residential building (China)** | **Active:**<br>Solar panels | Visual character of the façade. | Solar panels have achieved a 15% reduction in CO2 emissions. Payback period is 3-5 years. | [18] |
| **Net zero energy hotel complex (Saudi Arabia)** | **Passive:**<br>Insulation (both roof and walls)<br>**Active:**<br>PV, LED lamps | Visual character of the façade. | External wall insulation saves up to 15% energy per year, while roof insulation saves 5%.<br>LED lamps saved 14% energy compared to the base case. | [16] |
| **Residential building (UK)** | **Passive:**<br>Insulation (PIR, internal)<br>Window improvement (vacuum insulation windows)<br>Airtightness | Space reduction rate is considered while applying the wall insulation in order to balance energy and cost efficiency. | Vacuum insulated windows, reduced air infiltration and insulation result in primary energy savings of around 52%. These improvements can recoup costs in 18 years.<br>The best energy-cost combination results in an increase in indoor temperatures of about 4°C in winter and a decrease of 3°C in summer. | [13] |
| **Historical building (Matera, Italy)** | **Passive:**<br>Window improvement (double low-e glazing), Insulation (Kenaf insulation board)<br>**Active:**<br>Heat pump, LED lamps | The compatibility between old and new materials. | LED lamps save around 30%; heat pump 43.2%; window retrofit 14.8%; insulation 13%. | [12] |
| **Residential building (Tyrol, Northern Italy, and Northern Austria)** | **Passive:**<br>Insulation (wood fiber insulation board and polyurethane board) | Frost damage of sandstone walls, mould growth in wooden walls.<br>Overheating problem. | Annual heating energy is reduced by 85%.<br>Natural ventilation is sufficient to overcome the overheating problem. | [9] |
| **Educational building (Seoul, Korea)** | **Passive:**<br>Window improvement (double low-e), Internal shading, Insulation (XPS), Airtightness, Infiltration<br><br>**Active:**<br>PV, highly efficient HVAC, LED lights | Consideration of historical value and usability. | With the optimal scenario, total energy consumption is reduced 61% while annual energy cost is reduced 48%.<br>In addition, PV panels contributed to 7% reduction in total energy consumption. | [14] |

| | | | | |
|---|---|---|---|---|
| **Educational building (Naples, Italy)** | **Passive:** Insulation (Vacuum insulation panel and polyurethane), Window improvement (Argon filled double low-e), External shading, Relocation of the air terminals<br><br>**Active:** Condensation boiler, PV | Consideration of historical value and usability. | The best changes are window and boiler improvements. Low-emission windows and a condensing boiler reduced annual primary energy consumption by 59% and greenhouse gas emissions by 57%. | [11] |
| **Educational building (Central Italy)** | **Passive:** Cool roof tiles<br><br>**Active:** Ground source heat pump system | Cool tiles were designed to have the same appearance as traditional roof tiles. | The heat pump reduces heating energy consumption by 64% and cooling energy consumption by 67%. CO2 emissions are 82% lower thanks to the two scenarios implemented and the payback period for these improvements is 5 years. | [17] |
| **Educational building (Benevento, Italy)** | **Passive:** Insulation (EPS), Window improvement (Double low-e), Reduction of infiltration, Phase change wallboards<br><br>**Active:** HVAC systems | With regards to architectural properties, thermal plaster was applied to the interior walls with vapor barriers.<br>Historical integrity. | Low-e glass, thermal plaster and roof insulation applications have achieved a reduction of around 38% in greenhouse gases.<br>PCM plasterboards provides a 27% reduction in energy needs, but leads to an increase in total costs. | [15] |
| **Educational building (Kosice, Slovakia)** | **Active:** Heat recovery ventilation | | Indoor environment meets the standard in terms of IAQ while HVAC system is in operation. | [22] |
| **Offices (Northern Italy)** | **Active:** Radiant floor heating panels | Condensation risk. | Up to 70% of annual heating energy saving can be achieved. | [19] |

Historical buildings are unique architectural marvels that bear witness to the past and reflect the characteristics of their time in a holistic manner. Preserving these buildings and passing them on to future generations is crucial for maintaining societal memory. However, factors such as energy efficiency, zero carbon emissions, and cost-effectiveness, which are among the priorities of contemporary architecture, can potentially pave the way for improvements that may compromise the original architectural features of historical buildings. At this stage, it is essential to prioritize the preservation of historical fabric and take necessary steps while considering the importance of conserving the historical character.

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# CONFERENCE BOOK




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# THE CULTURE BROUGHT BY WATER: SELJUK SEBILS IN KONYA[1]

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## ABSTRACT

Sebils are among the significant structures in Islamic architecture that provide water for social life and are often associated with the Ottoman period. However, there are notable examples from the Seljuk era in Anatolia, which hold great importance for understanding the historical development of sebils. Three unique sebils, referred to as "emzikli sebils" (spouted sebils), from the Seljuk period have survived to the present day, all located in Konya. Two of these are situated in the Meram district of central Konya, while the third is in the Beyşehir district. These examples include the Meram Sahip Ata Sebil, Meram Hoca Ahmet Fakih Sebil, and the Beyşehir Eşrefoğlu Complex Sebil, all of which were constructed as elements of larger complexes.

These three Seljuk sebils, which have reached us today, were built in the specific type referred to as "emzikli sebil". The term "emzikli sebil" refers to a structural feature in which water flows out through a slender spout instead of a faucet or pipe. This characteristic enhances both the functionality and aesthetic appeal of the sebils. Outside Konya, no other examples of this sebil type are found in Anatolia, though it is known to have been used in Egypt. As integral parts of their respective kulliyes, these three sebils stand out for their architectural and social functions. Notably, the design, aimed at ensuring hygiene and continuity in water distribution, provides significant insights into the engineering knowledge and artistic sensibilities of the era.

This study aims to analyze the architectural and functional characteristics of these three sebils in detail. By examining the materials used in their construction, decorative elements, and spatial organization, the study seeks to reveal their place within Seljuk water architecture. Additionally, their unique presence in Konya underscores their regional significance. The presentation will explore the historical and architectural dimensions of these structures and evaluate their contributions to Seljuk architecture.

**Keywords:** Seljuk Architecture, Konya, Sebils.

[1] This study is derived from the doctoral dissertation titled *"Water Architecture in Konya"* prepared by Mehmet Mutlu under the supervision of Prof. Dr. Abdülhamit Tüfekçioğlu.

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## 1. INTRODUCTION

The term “sebil”, which literally means “path” in the dictionary, derives its terminological meaning from the expression “fi-sebil Allah” (in the path of God, for the sake of God) (Urfalıoğlu, 2009, 249). Sebils are water structures primarily constructed near mosques (Hasol, 1990, 456) to meet the water needs of passersby (Ödekan, 1997, 1626). Although not widely used earlier, it is known that the term “sebbale” was also employed (Urfalıoğlu, 2009, 249). Historically, in addition to water, honey sherbet, fruit juices, or sherbet were distributed to the public at these sebils during their initial periods of use (Urfalıoğlu, 1999, 464). In Turkish architecture, the term “miyon”, which signifies “reward-charity,” was used in the 11th century in Central Asia to describe charitable acts. This term referred to a water donation provided for passersby to drink and demonstrates that the Turks engaged in water-related charitable activities even before the development of sebil architecture under the same name (Ögel, 1995, 145).

As the names and definitions suggest, this term, which could initially refer to any type of charitable establishment, particularly those involving water donations, later came to denote specific structures with defined functions in Anatolian water architecture (Önge, 1997, 18). Although the Ottomans initially referred to the distributed water as sebil and the place where it was distributed as “sebil-hane”, over time, the term “hane” was abandoned, leaving the word in its present form (Pakalın, 1993, 135).

The simplest form of sebil, which has been in use in Anatolia since the Seljuk period, consists of a basin or jar with a faucet, placed on a slightly elevated base or platform. Some of these basins or jars were meticulously crafted and adorned with various motifs and inscriptions. These sebil reservoirs, filled with water by benefactors or foundation officials, allowed people to drink using ladles attached to the basin or the wall of the structure by a chain. Such sebils were installed as specially designed niches at the entrances of large buildings like mosques, madrasas, or caravanserais, or later placed at the gates of these structures or their courtyards, as well as along busy roadsides (Önge, 1996, 113).

In Anatolian Seljuk and Ottoman architecture, sebil structures served as significant buildings for delivering water to the public. Among the most renowned and distinguished examples of Seljuk-era sebils is the sebil at the Sahip Ata Complex located in the city center of Konya. Similarly, the sebil at the entrance of the Eşrefoğlu Süleyman Bey Mosque in the Beyşehir district is another important representative of this period. Three examples in Konya, considered the oldest (Önge, 1997, 18) and most intriguing sebils of Anatolian Turkish water architecture, are categorized as a unique type known as “emzikli sebil” (spouted sebils) (Önge, 1981, 1-15).

The finest examples of sebils in Ottoman architecture are found in Cairo and İstanbul (Urfalıoğlu, 1999, 564). Among the sebil structures in Cairo, a distinctive category known as “sebilküttâb” where the ground floor functions as a sebil and the upper floor serves as a Qur'an school-holds particular significance (Urfalıoğlu, 2009, 250). From the second half of the 14th century, especially during the Mamluk period, it became a tradition to construct two-story sebils at corners of mosques, madrasas, and khankahs facing the street, using the upper floor as a primary school. This tradition continued in the following centuries. These structures, called “sebilküttâb”, with numerous examples in Cairo, were also built during the Ottoman era

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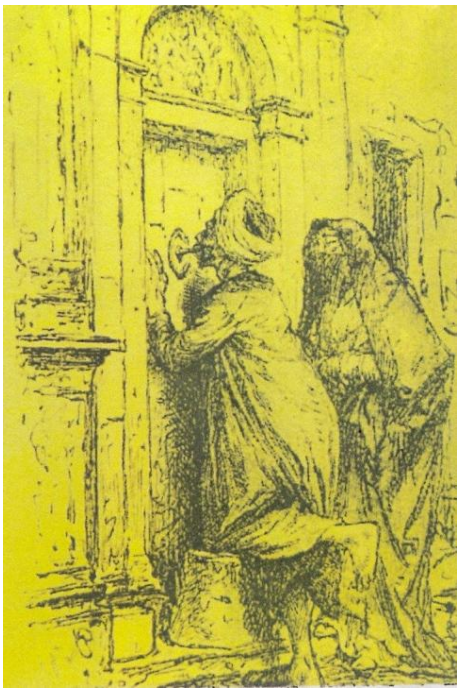
(Behrens-Abouseif, 1992, 4). Notable surviving examples of "sebilküttâb" buildings include those of Hüsnü Pasha (1535), Beşir Ağa (1719), Abdurrahman Kethüda (1744), Rukiyye Dudu (1761), and Silahtar Süleyman Ağa (1839) (Urfalıoğlu, 2009, 250). Ottoman architecture began incorporating such endowed structures only in the second half of the 16th century, producing its most remarkable works towards the late 16th and 17th centuries, and later, with the dominance of the Baroque style, in the 18th century (Eyice, 1994, 455).

In the 18th century, as in many other areas, Western influences in architecture also impacted on the design of sebils in the Ottoman Empire. As part of adapting Western lifestyles to Ottoman urban spaces, public square fountains were often designed in conjunction with sebils during this period (Urfalıoğlu, 1999, 467). The most exquisite example of this design is the monumental structure commissioned by Sultan Ahmed III in 1728, located behind Hagia Sophia and in front of Topkapı Palace. Featuring four fountains at its corners and integrated sebils, this masterpiece stands as one of the greatest achievements of Ottoman fountain and sebil architecture (Aslanapa, 1989, 304).



The Representative Illustration of the Usage of the Sahip Ata Complex Sebil



The Representative Illustration of the Usage of a Spouted Sebil in Cairo

**Figure 1. Illustrations depicting the usage of spouted sebils in Konya and Cairo (Y. Önge)**

All sebils from the Seljuk period in Konya are integrated into the façades of buildings to which they are attached. In all examples, a small window with a tangent-arched pediment is located in the central upper section above the reservoir and is directly connected to it. Since all these examples were constructed as "emzikli sebils" (spouted sebils) (Önge, 1981, 18), this niche connected to the reservoir was likely used for filling and cleaning the reservoir. The spouted sections of the sebils in the Eşrefoğlu Süleyman Bey Complex in Beyşehir and the Hoca Ahmet Fakih Complex in Meram were eliminated during later repairs, whereas the spouted nodes of

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the Sahip Ata Complex sebils have remained intact to the present day. In these sebils, metallic spouts attached to thin pipes extending into the reservoir allowed users to suck and drink beverages directly from the reservoir (Önge, 1981, 16-17). Önge published representative illustrations in his study on “emzikli sebils” that demonstrate how these types of sebils were used (Figure 1).

## 2. SELJUK SEBILS IN KONYA

### 2.1. Sebils of the Meram Sahip Ata Complex

The sebils of the Meram Sahip Ata Complex are located on either side of the main gate of the complex on Larende Street in the Meram district (Figure 2). The sebils are situated to the right and left of the monumental entrance gate of the complex, aligned with the projections of the minarets. While the arrangement of the sebils’ façades is perfectly symmetrical, there are some minor differences in their decorative details. As one of the earliest examples of spouted sebils, these sebils were not left as a solitary design; they served as models for later sebils built in the Meram Hoca Ahmet Fakih Complex and the Beyşehir Eşrefoğlu Complex (Önge, 1982, 18). However, the Sahip Ata Complex sebils are considered the most original examples that have survived to the present day, making them the most significant representation of spouted sebil architecture and its usage.



**Figure 2. The main gate of the Sahip Ata Complex and the sebils located on both sides (URL 1)**

Almost all of the inscriptions on the two sebils located at the main gate of the complex are verses from the Quran. The construction inscription of the building is located above the main gate. According to this inscription, the building was commissioned by Hacı Ebubekir Oğlu Hüseyin Oğlu Sahip Ata Fahreddin Ali during the reign of Sultan II. Keykâvus in 656/1258

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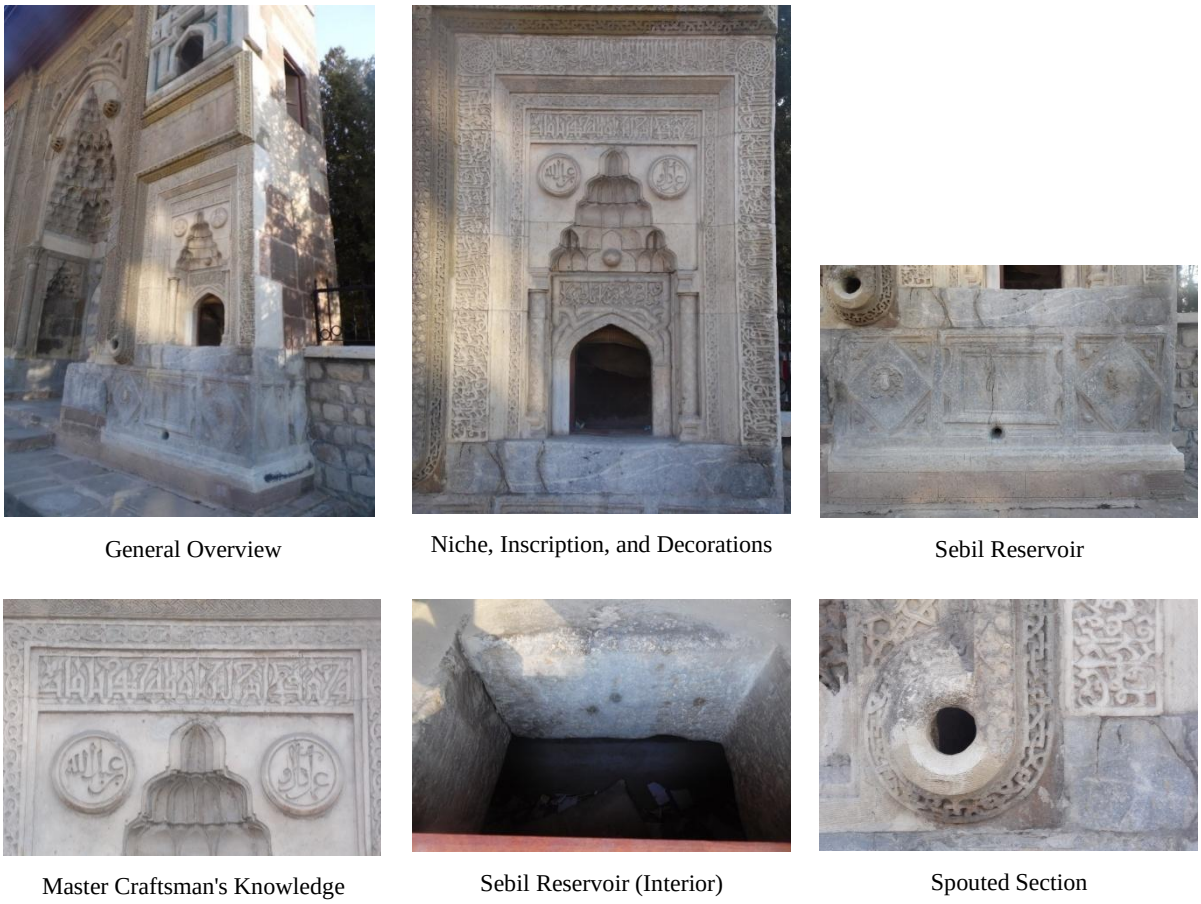
(Önder, 1971, 113; Baykara, 1985, 82; Duran, 2001, 58; Konyalı, 2007, 187, et al.). This complex is also the oldest known structure in Konya associated with Sahip Ata Fahreddin Ali (Yavaş, 2007, 90).

Sahip Ata Fahreddin Ali (d. 687/1288) was the son of Hüseyin el-Konevî, a member of a prominent family that had settled in Konya. During his nearly forty years of state service, he recognized the futility of opposing the Mongols and thus sought to maintain good relations with them. He was known for his wise decisions in administration and divan matters. Having spent his wealth on charitable works and for the benefit of the public, he earned the title "Ata". Due to his philanthropy, he was also known by the epithet "ebü'l-hayrât" (father of charity). Sahip Ata was a close associate of Mevlânâ Celâleddîn-i Rûmî. Both Mevlânâ and Sultan Veled praised him with favorable words. Sahip Ata returned ill from Tabriz, where he had gone on state business, and shortly thereafter passed away in the village of Nâdir (Atakent), near Akşehir, on the 25th of Shawwal, 687 AH / November 22, 1288 CE. He was buried in his tomb in Konya (Sönmez, 2002, 248-250; Merçil, 2008, 515-516; Uz, 2013, 115, et al.).



General Overview | Niche, Inscription, and Decorations | Sebil Reservoir

Master Craftsman's Knowledge | Sebil Reservoir (Interior) | Spouted Section

**Figure 3. Views of the western sebil of the Sahip Ata Complex (M. Mutlu)**

The only inscription on the sebils that does not contain a Quranic verse is the one located on the mirrored panels of the western sebil, which features two symmetrical circular medallions with the name of the architect (Figure 3). According to this inscription, the architect of the work is Kölük bin Abdullah. Very little information is available about Kölük bin Abdullah, and there are various opinions regarding his name, religion, and nationality. Apart from this structure,

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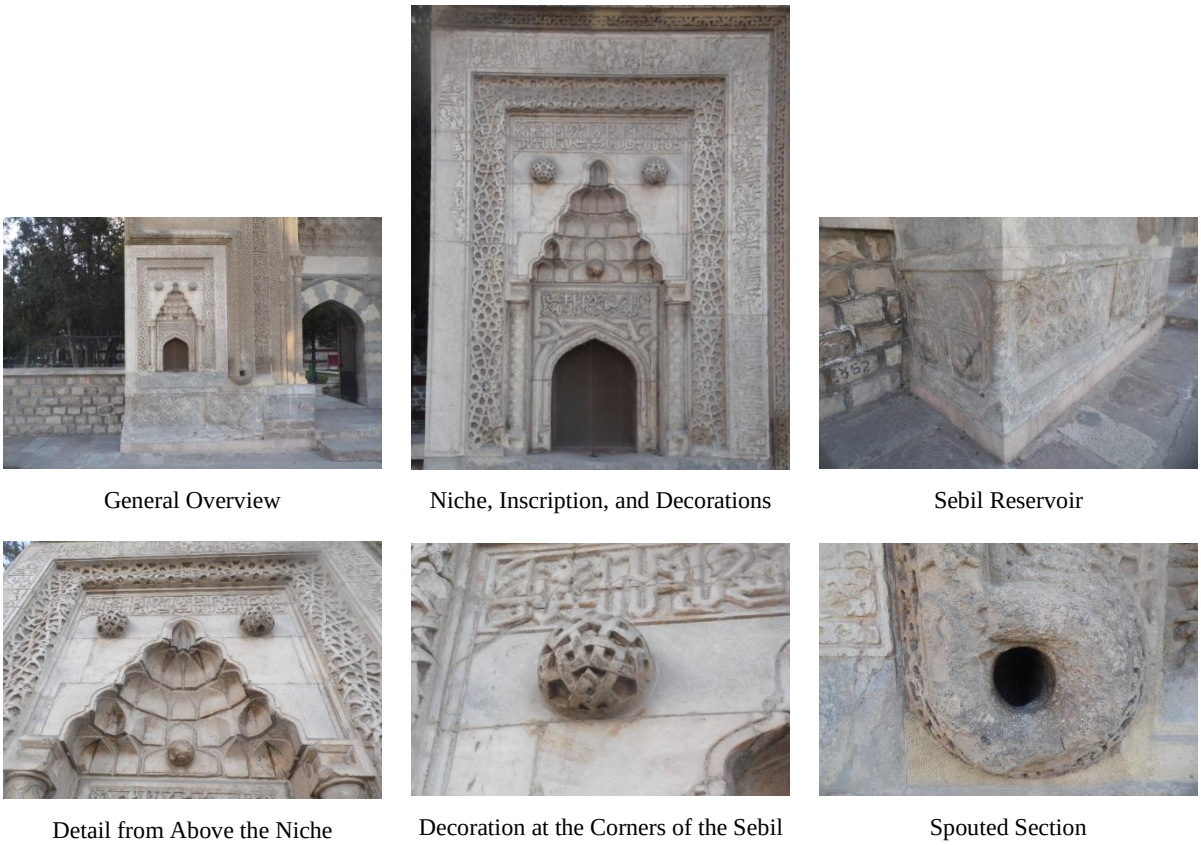
Kölük bin Abdullah is also credited with the construction of two other works in Konya: one is the İnce Minareli Medrese (Yavaş and Çobanoğlu, 2000, 269), and the other is the Nalıncı Baba (Emir Nizameddin) Tomb, which was demolished in 1927 (Sönmez, 2002, 250).

Both sebils are quite rich in terms of inscriptions (Figures 3, 4). On the section of the western sebil, shaped like a mihrab arch, the 30th verse of Surah Al-Anbiya from the Quran is engraved in raised relief in Arabic with rounded corners, using the Seljuk calligraphy style. On the horizontal panel between the arch and the tangent-arched niche of the same sebil, the 21st verse of Surah Al-Insan is also engraved in raised relief in Arabic, using the Seljuk calligraphy style.

One of the most important features of the western sebil of the Sahip Ata sebils is that it bears the signature of the architect who constructed the complex. In the spaces at the corners of the mihrab arch-shaped section, circular medallions are engraved with the master's signature in Arabic using the carving technique. The inscription in the western medallion reads *"Amelü Kelûk"* and in the eastern one, *"Bin Abdullah"* (Figure 3). Surrounding the western sebil, there is a frame on the right, top, and left sides, where verses from various chapters of the Quran are inscribed in Arabic using the Seljuk calligraphy style and carving technique.



General Overview | Niche, Inscription, and Decorations | Sebil Reservoir

Detail from Above the Niche | Decoration at the Corners of the Sebil | Spouted Section

**Figure 4. Views of the eastern sebil of the Sahip Ata Complex (M. Mutlu)**

On the mihrab arch-shaped section of the eastern sebil, as in the western sebil, there is a raised inscription in Arabic, written with rounded corners in the Seljuk calligraphy style. The verse text is engraved in relief. Similar to the western sebil, on the horizontal panel between the arch and the tangent-arched niche of the eastern sebil, another verse text is also engraved in raised relief in Arabic, using the Seljuk calligraphy style.

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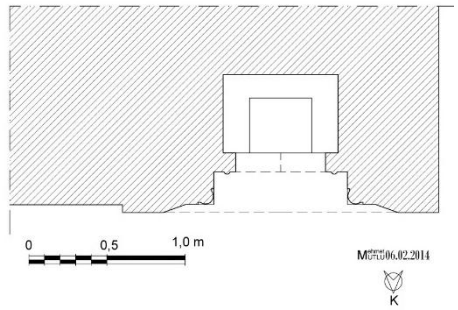
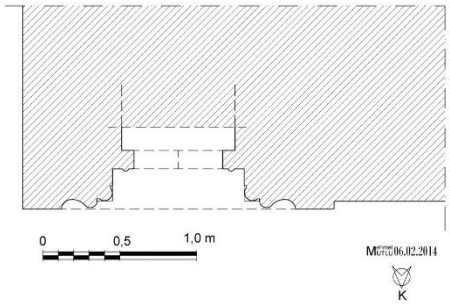
The eastern sebil is surrounded by a frame on the right, top, and left sides, inscribed in Arabic using the Seljuk calligraphy style and carving technique. The frame contains verses from different chapters of the Quran. These include the 30th verse of Surah Al-Anbiya, the 48th, 49th, and 50th verses of Surah Al-Furqan, the 14th, 15th, and 16th verses of Surah An-Naba, the 21st verse of Surah Az-Zumar, and the 5th and 6th verses, along with the 15th, 16th, and 17th verses of Surah Al-Insan.

On the arch of the eastern sebil, the 30th verse of Surah Al-Anbiya is inscribed, and below the arch, the 21st verse of Surah Al-Insan is found. The inscription surrounding the eastern sebil is composed of the 255th and 256th verses of Surah Al-Baqarah.

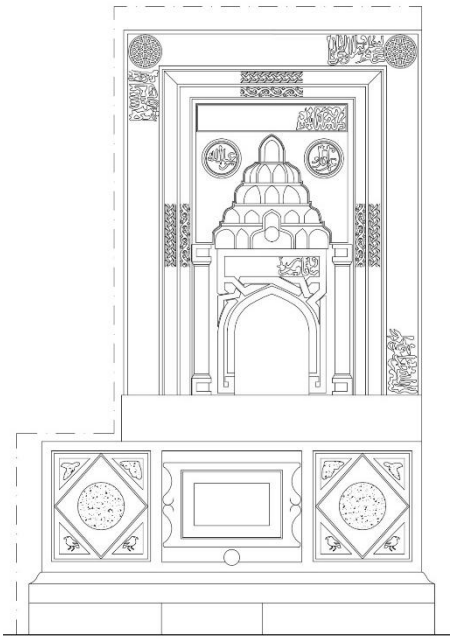
In both sebils, the reservoirs are made from high-quality (Boleken, 2010, 87) repurposed antique Roman sarcophagi (Figures 3, 4, 5).



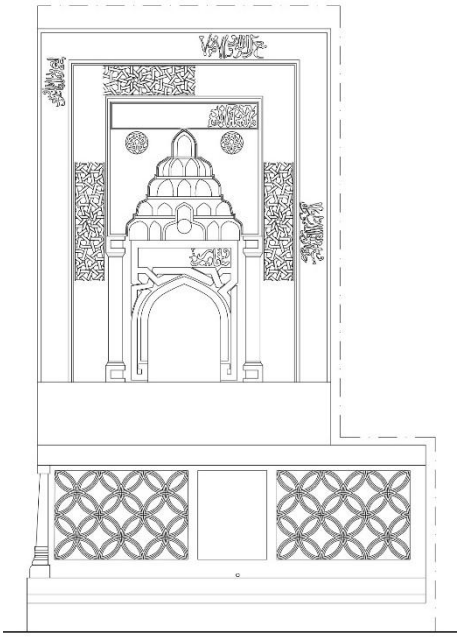

Plan of the Western Sebil




Plan of the Eastern Sebil



West Facade of the Sebil



East Facade of the Sebil

**Figure 5. Plans and Facade Views of the Sahip Ata Complex Sebils (M. Mutlu)**

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On the western side of the triumphal arch, the face of the repurposed marble sarcophagus used as the reservoir for the “emzikli sebil” measures 2.20 m by 0.90 m, while the side facing west measures 1.05 m by 0.90 m. The front surface of the sarcophagus is divided into three panels. The central panel features a blank tabula ansata, while the other two panels depict an equilateral rectangle with medusa heads at the center. Besides the medusa figures, bird figures are depicted on the lower and upper sides of the rectangles. A similar composition is seen on the side panel, but the surfaces of the equilateral rectangles are left empty, and the lower and upper sides of the rectangles are decorated with plant motifs (Figure 5). A hole in the lower part of the sarcophagus was likely used to drain the water during cleaning of the reservoir. In terms of composition and style, the sarcophagus can be dated to the Late Roman Period (Boleken, 2010, 88).

Both sebils have a niche connected to the reservoir, which is approximately centered above the reservoir and allows it to be filled (Figure 5). The upper part of the sebil, made from entirely original materials, is adorned with intricate decorations. The pointed arched sebil window, set approximately 0.30 meters inward from the facade, features corner details filled with the classic Seljuk knot motif, and the rectangular plaque formed with this motif is inscribed with verse 21 of Surah Al-Insan, known as the “water verse” from the Qur'an. Above the niche, a muqarnas series with five rows is used to create the crown, with a simple and circular bulge placed in the center of the first row of muqarnas. The crown is supported by circular columns, geometrically decorated, on either side. Just above the crown, a horizontal rectangular plaque is inscribed with another Qur'anic verse. The corners of the crown’s tympanum, which is left plain, feature symmetrically arranged circular medallions inscribed with the name of the master. The inclusion of the master's name on the sebil above the grand portal makes the sebil unique.

The niche, crown, and the rectangular plaque above the crown are bordered by a delicate line formed by a continuous ornamental floral design. Between the outer border of the facade, which is adorned with a geometric braided pattern, and this floral decoration, a slim transition band is used, enhancing the surface's aesthetics (Figures 5-6). At the top corners of this band, which features Qur'anic verses, there are two circular medallions intricately decorated with geometric Seljuk motifs.

The geometric decorative line surrounding the portal facade of the complex defines the boundaries of the portal and the sebil as it traces the upper and eastern sides of the sebil. It ends by surrounding the circular nipple hole located on the eastern side of the basin. Through this hole, thin tubes were extended to the reservoir, and a hollow rod attached to the tube would be sucked, allowing the drink stored in the reservoir to be consumed (Figure 1).

On the eastern side of the portal, the dimensions of the marble sarcophagus used as the nipple sebil’s reservoir are 2.45 m x 0.95 m on the front face and 1.05 m x 0.94 m on the side facing east. Two rows of arches with entablatures have been created on the side of the reused sarcophagus (Figure 5). Between the columns, there are double-stripe medallions surrounded by laurel wreaths, with carved cross motifs inside. The front face of the sarcophagus is divided into three sections, with the central section left empty or smoothed. The two side surfaces feature a symmetrical composition made of double stripes, with circles at the bottom and top that intersect one of the stripes. As with the sarcophagus on the western side, the hole at the

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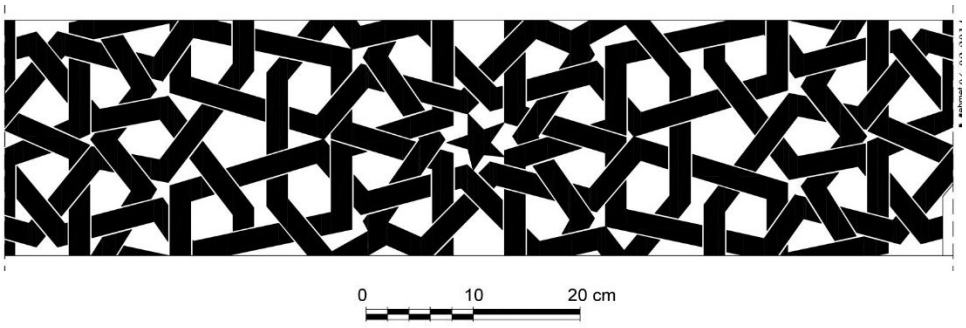
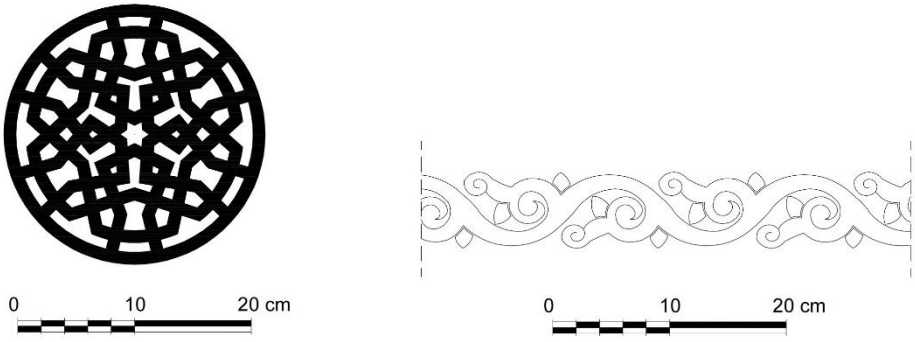
bottom of this one was likely used for draining water during the cleaning of the reservoir. The composition on the front face of the sarcophagus is dated to the period from the 5th century to the end of the 7th century, as similar examples from that era can be traced (Boleken, 2010, 87).

On the eastern side, similar to the sebil on the western side, a step of approximately 0.30 m has been created between the sebil window and the portal facade. These steps have allowed for the use of muqarnas in the arcades. The difference in the mirrors between this sebil and the western sebil, which was designed similarly, is the presence of hemispheres adorned with geometric knots in three dimensions in the sections where the master's name is found on the western sebil. One of the differences in the design of both sebils is that, while the western sebil features a slender plant ornamentation surrounding the mirror and a beveled transition between the outer decorative border and the outer kitabe, this element is absent in the eastern sebil. The area gained by omitting the beveling in the western sebil has been decorated with intricate geometric patterns that circle the sebil from three directions.




Detail from the front facade of the Eastern Sebil.




Details from the front facade of the Western Sebil.

**Figure 6. Decorative details from the facades of the Sahip Ata Külliyesi sebils (M. Mutlu)**

The eastern sebil is also bordered by a frieze with inscriptions from the Qur'an. In the western sebil, the inscription, which is embossed, is carved in the eastern sebil. The upper corners of this inscription band are also decorated with carved geometric medallions, although these decorations are heavily damaged. A large portion of the vertical section of this outer inscription frieze in the eastern sebil has also been damaged.

On the western side of the sebil, directly above the storage element, is the nipple section, which is symmetrically decorated and has the same characteristics as the one in the western sebil (Figure 3-4).

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These nipple sebils, which are among the finest examples of Anatolian Seljuk architecture, are still standing in good condition.

### 2.2. The Sebil of Beyşehir Eşrefoğlu Mosque Complex

The structure is located in the Beyşehir district, to the right of the monumental portal that provides access to the Eşrefoğlu Mosque, in the shadow of the minaret (Figure 7). There is no inscription on the sebil. However, since it was constructed as part of the mosque, the construction date of the sebil is the same as that of the mosque. According to the inscription above the pointed arch section leading into the mosque after the monumental portal, the structure was commissioned by Eşrefoğlu Süleyman Bey in 699/1299-1300 (Kızıltan, 1958, 36; Akok, 1976, 5; Eyüboğlu, 1979; Çaycı, 2008, 17; Yavaş, 1995, 479; Erdemir, 1999, 17; Erdemir, 2012, 272; Efe, 2013, 33; etc.). Eşrefoğlu Seyfeddin Süleyman Bey served as a military commander (uçbeyi) under Sultan III. Gıyaseddin Keyhüsrev of the Seljuk Empire (1264-1283). Süleyman Bey passed away in August 1302 and was buried in the tomb next to the Eşrefoğlu Mosque in Beyşehir, which he had commissioned (Eyüboğlu, 1979, 30; Aktaş Yasa, 2007, 343; Muşmal, 2012, 271-272; etc.).



Cami Genel Görünümü (URL 2)



General View of the Sebil



Upper Part of the Chamber



Detail from the Chamber Facade

**Figure 7. Views of the Sebil from Beyşehir Eşrefoğlu Mosque Complex (M. Mutlu)**

The master of the structure is unknown. However, the inscription *"amele İsa"* (meaning "workman Isa") can be found on the entrance door and the pulpit of the mosque, which is the largest mosque with wooden columns in Anatolia. The presence of this inscription on both the door and the pulpit, which are finely crafted elements, suggests that this master was responsible solely for creating these supplementary components, rather than for the entire structure.

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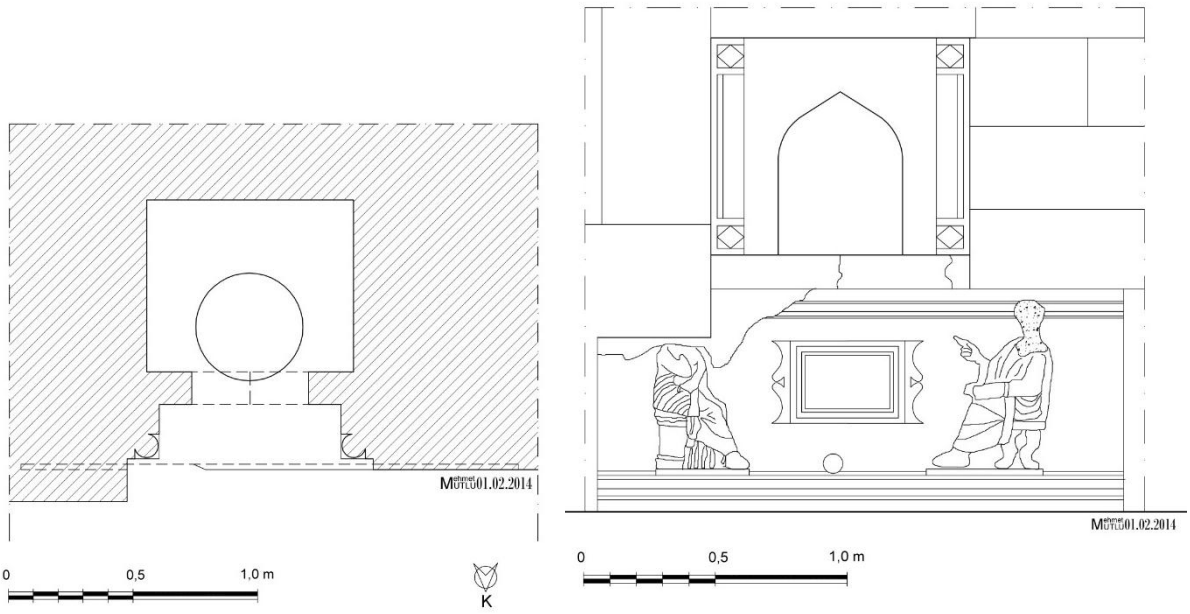
The sebil, located to the right of the entrance door of the Eşrefoğlu Mosque, which is the most important work of the Eşrefoğlu Principality, is constructed with dressed stone, the same material used for the mosque's body walls. As in other sebils of the same period in Konya, a reused Late Roman sarcophagus has been used as the reservoir (Öney, 1970, 25) (Figures 7, 8). The sebil is a "suckling sebil" (Önge, 1982, 18).

The sarcophagus that forms the chest of the sebil is an artistically high-quality piece, with a length of approximately 2 meters and a height of 0.80 meters. The sarcophagus has a broad base, and the front face, which is the only visible surface, depicts two human figures sitting on a stool, one on each side of a blank tabula ansata in the central panel. The figure on the right represents a teacher, with his right hand raised and pointing with his index finger as he teaches his student. The figure on the left represents a student with his arms crossed, resting his knees, and leaning forward to listen to his teacher. On the lower middle part of the front, a hole has been made, which is understood to have been used for drainage during cleaning the chest. The upper left side of the sarcophagus is damaged. Cracks can be seen in this section due to the weight placed on it. This section was likely damaged during the repair of the portal. A marble slab was placed on top of the sarcophagus, leaving an opening with a diameter of approximately 0.45 meters, which is connected to the chest (Figure 8).




Plan of the Sebil

Facade View of the Sebil

**Figure 8. Plan and facade view of the sebil of Beyşehir Eşrefoğlu Mosque Complex (M. Mutlu)**

In the facade, the sebil window, which has a width of 0.45 m and a height of 0.60 m, with a tangent-arched top, is located approximately 0.20 m behind the window niche, which measures about 0.95 x 0.80 m. The window is made of a single piece of marble, placed further inward compared to the facade, and marble fluted columns with base and top sections adorned with ornamental pedestals are placed on its outer sides (Figures 7, 8).

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The structure, which is no longer in use due to its function, is still standing despite being partially damaged in places.

### 2.3. The Sebil of the Meram Hoca Ahmet Fakih Complex

The work is located at 57 Hoca Fakih Street, Armağan District, Meram. The sebil, which is one of the components of the Ahmet Fakih Complex, does not have an inscription. However, the complex is from the 18th century, and the sebil is also dated to the same century (Önge, 1982, 18). The inscription on the door of the tomb, one of the elements of the complex, states that Hoca Ahmet Fakih, who gave the complex its name, died in 618/1221-22 and is buried in this tomb (Duran, 2001, 46). Today, the inscription on the sebil's pointed arch niche, found among blue tiles from the Seljuk period, is a gravestone from the 14th century (Figure 9). One of the gravestones from the Karaman and Ottoman periods, located in the cemetery within the courtyard, must have been moved here during one of the repairs the work underwent over time. The inscription reads, *"The Prophet, peace be upon him, said: Death is a cup, everyone will drink from it; the grave is a door, everyone will enter it"* (Konyalı, 2007, 140). The tiles found in this section and on the door of the mosque were removed from the Şeker Furuş Tomb in 1909-10 and placed here (Konyalı, 2007, 140).



The Facade of the Complex Facing the Road




General View of the Sebil



The Cover of the Sebil's Reservoir



The Tombstone Inscription on the Sebil

**Figure 9. Views of the Sebil from Meram Hoca Ahmet Fakih Complex (M. Mutlu)**

One of the 13th-century Seljuk complexes, the Hoca Ahmet Fakih Complex consists of buildings such as a hospice, bathhouse, stable, mausoleum, mosque, fountain, sebil, and cistern (URL 3); today, structures such as the mosque, mausoleum, cistern, fountain, and sebil are still

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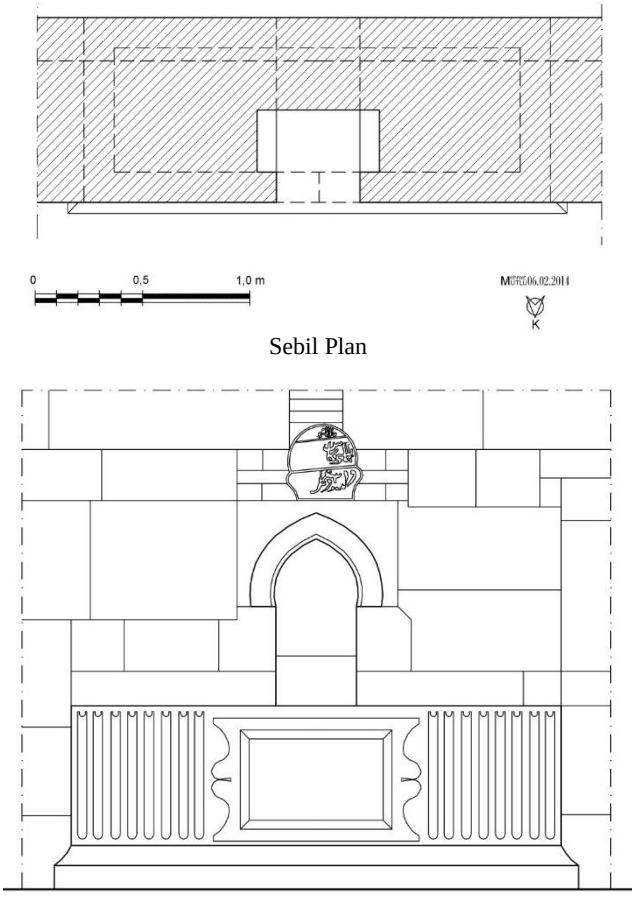
standing. On the northern wall, to the west, there is a cistern, while to the east, there is a water sebil and a fountain showing Ottoman period features.

The sebil located between the cistern and the fountain is a “emzikli sebil” (Önge, 1982, 18). The sebil, which has been relocated and reshaped many times during restorations, no longer has the sections where the “emzik” (sipping tube) were located (Figures 9, 10).

The building material used in the structure includes reclaimed materials, along with marble and various types of stone.

The sebil is placed within a garden wall that is approximately 0.85 meters thick. A marble sarcophagus from the Roman period is used as the basin in the sebil. The sarcophagus is approximately 2.15 meters in length and 0.85 meters in height. The lower part of the sarcophagus has a wide base, and the rear face, which is located within the courtyard, is decorated with vertical grooves. The front face features a central panel with a blank tabula ansata, and on either side, vertical grooves similar to those on the rear part form the facade decoration of the sarcophagus (Figure 10).




Sebil Plan

Front Facade of the Sebil

**Figure 10. Plan and facade view of the Sebil at Meram Hoca Ahmet Fakih Complex (M. Mutlu)**

At the front, in the center of the niche, there is a sebil window with a tangent-arched lintel that measures 0.35 meters in width and 0.75 meters in height. The tangent-arched lintel, made of a

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single piece of marble, has slightly beveled corners, and its perimeter is emphasized with a lightly embossed line 0.12 meters thick. The upper sections of the niche, outside the window's alignment, are covered with wide sal stones, allowing the continuation of the wall above. Additionally, a small gap was left behind the direction of the window for the purpose of filling the niche. In typical examples of the period, large sal stones, 0.20–0.30 meters thick, were placed on top of the niches as cover stones, and the sebil's windowed section was built on these stones (Önge, 1982, 18). However, during later repairs, the original cover stone was removed, and additional parts made of Sille stone were placed in its place.

Although the structure, considered one of the earliest examples of emzikli sebils from the Seljuk period, has lost many of its original details due to repairs over time, it still stands firmly.

## 3. EVALUATION and CONCLUSION

One of the distinctive elements of Seljuk period architecture, the "emzikli" sebils, are functional structures where Islamic architecture and daily life practices converge. The examples in Konya and its surroundings showcase the level of both aesthetic and technical achievement of this building type. The sebils in the examined complex of Meram Sahip Ata, Beyşehir Eşrefoğlu, and Meram Hoca Ahmet Fakih reflect the cultural and technological accumulation of the period through the materials used and their architectural details.

The reuse of Roman sarcophagi in the construction of these sebils is notable both for reflecting the pragmatic approach of the period and for the refunctionalization of the heritage from the Roman and Byzantine eras. Particularly, the sarcophagus used in the Beyşehir Eşrefoğlu Complex serves as an important example due to its artistic craftsmanship and symbolic meaning. The details found in the sebils of Meram Sahip Ata Complex emphasize the aesthetic richness of Seljuk stone craftsmanship. On the other hand, the visible signs of extensive restoration in Meram Hoca Ahmet Fakih Complex suggest that such structures have been subjected to various interventions over time, risking the loss of their original authenticity.

In addition to their functional features, the relationship of these sebils with the külliye complexes in which they are located is also of significant importance. These structures not only provided water but also served as charitable institutions and elements of social solidarity, playing an integral role in communal life. Particularly in the Seljuk period, it is evident that the foundation system was effectively managed through such structures. When examining the technical details of the emzikli sebils, it becomes clear that issues like the controlled flow of water from the reservoir and its drainage were carefully considered. This reflects the engineering knowledge and expertise of the period.

In conclusion, Seljuk sebils are structures where architectural aesthetics, functionality, and societal benefit are successfully integrated. The examples found in Konya and its surroundings are crucial for understanding the regional characteristics of this architectural type and the general nature of Seljuk architecture. However, more meticulous restoration processes are needed to preserve and pass these structures on to future generations. Preserving the original details, in particular, will allow for a deeper understanding of the cultural heritage of the Seljuk period. The examined examples shed light on the architectural and cultural legacy of the Seljuk era, further emphasizing the importance of preserving these structures for the future.

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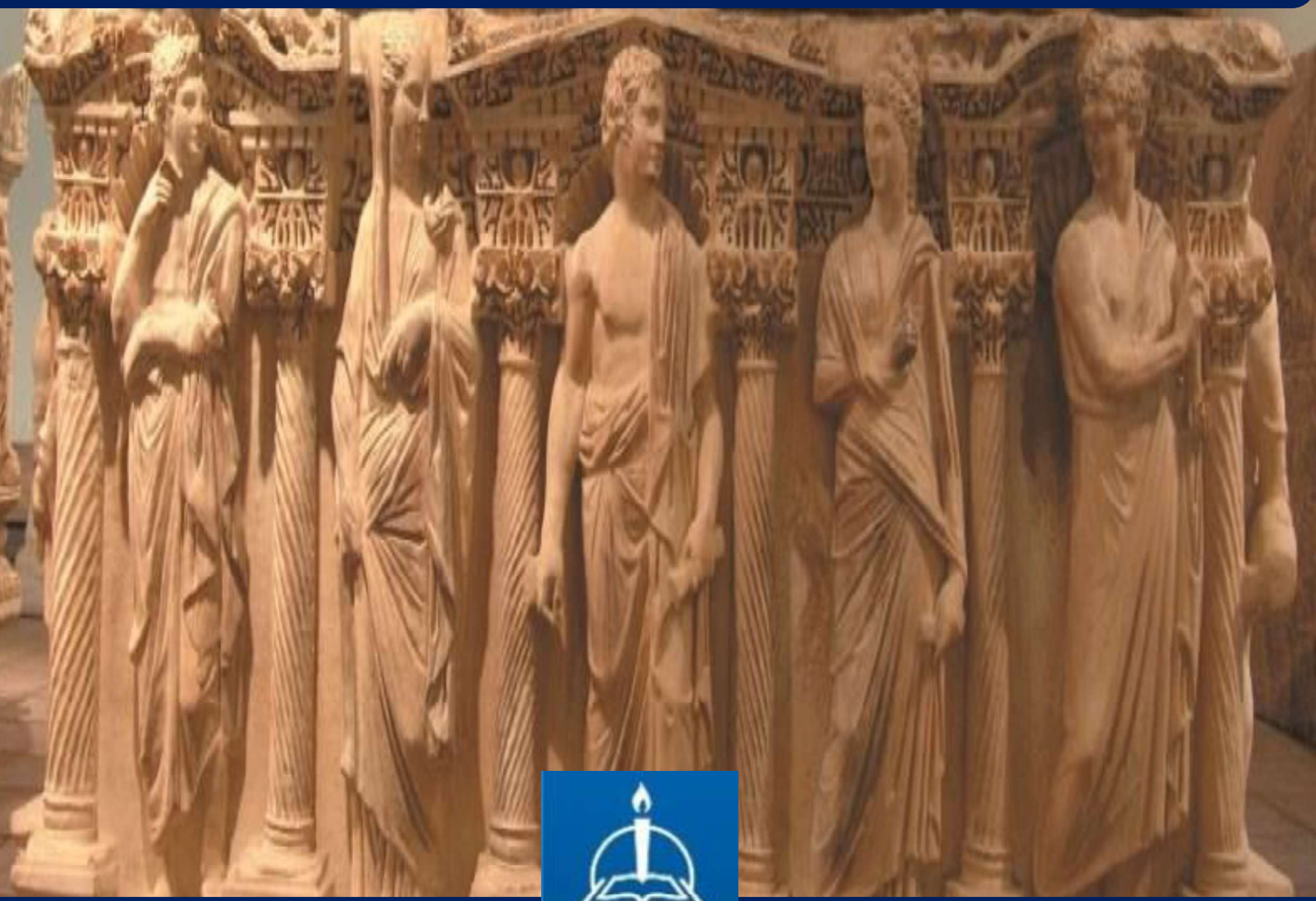

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# BİR BELGE OLARAK POSTA PULLARI: SAFRANBOLU SARAÇLAR EVİ

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## ÖZET
Posta pulları, ortaya çıktıkları 19. yüzyıldan itibaren sadece posta ücretinin karşılığını gösteren bir araç olmaktan çıkarak ülkelerin kültürel miraslarını, önemli olaylarını, ideolojik duruşlarını ve kolektif kimliklerini yansıtan simgesel ürünlere dönüşmüştür. Türkiye'de Cumhuriyet'in ilanından sonra pul tasarımları, ulusal kimliğin inşasında ve kültürel değerlerin tanıtımında etkin biçimde kullanılmış; mimarlık bu görsel dilin temel bileşenlerinden biri hâline gelmiştir. Bu çalışma, 1978 yılında yayımlanan "Geleneksel Türk Evleri" temalı posta pulu serisini ve bu seride yer alan yapılar arasındaki Safranbolu Saraçlar Evi'nin (Hatice Hanım Konağı) temsiliyetini incelemektedir. Araştırmada, filatelik materyal olarak pul tasarımlarının mimari temsile katkısı, kültürel mirasın görünür kılınmasındaki rolü ve bu seçimin dönemin kültürel politikaları bağlamındaki anlamı değerlendirilmiştir. Çalışma, mimari unsurların postada görsel bir dil olarak kullanılması üzerinden kültürel kimlik oluşturma sürecine dair bulgular sunmaktadır. Seride İstanbul, İzmit, Kula, Milas ve Safranbolu'dan seçilen beş konut yapısının farklı bölgesel mimari karakterleri yansıtacak biçimde tasvir edildiği; buna karşın Safranbolu'daki yapının adının belirtilmeyerek yalnızca "bir ev" olarak sunulmasının, Saraçlar Evi'nin filatelik bağlamda gölgede kaldığını gösterdiği tespit edilmiştir. Bu bağlamda araştırma, posta pullarının kent hafızasına katkıda bulunan, mimarlık mirasını belgeleyen ve tanıtan önemli bir kültürel araç olduğunu; 1978 serisinin ise geleneksel konut mimarisinin ulusal ölçekte görünürlüğünü artırarak kültürel miras bilincinin gelişimine katkı sunduğunu ortaya koymaktadır.
**Anahtar Kelimeler:** Kültürel miras, Safranbolu, mimarlık, geleneksel ev, posta pulu.

# POSTAGE STAMPS AS DOCUMENTS: SAFRANBOLU SARAÇLAR HOUSE

## ABSTRACT
Since their inception in the 19th century, postage stamps have ceased to be merely a means of displaying postage value, transforming into symbolic products reflecting countries' cultural heritage, significant events, ideological stances, and collective identities. After the proclamation of the Republic of Turkey, stamp designs were effectively used in the construction of national identity and the promotion of cultural values, with architecture becoming a fundamental component of this visual language. This study examines the "Traditional Turkish Houses" themed postage stamp series issued in 1978 and the representation of the Safranbolu Saraçlar Evi (Hatice Hanım Mansion) among the structures featured in this series. The research examines the contribution of stamp designs as philatelic material to architectural representation,

their role in making cultural heritage visible, and the significance of this selection within the context of the cultural policies of the period. The study presents findings on the process of cultural identity construction through the use of architectural elements as a visual language in postal mail. It was determined that five residential buildings selected from Istanbul, İzmit, Kula, Milas, and Safranbolu were depicted in the series to reflect distinct regional architectural characteristics. However, the fact that the Safranbolu building was presented simply as "a house" without a name suggests that the Saraçlar House remained overshadowed in the philatelic context. In this context, the research demonstrates that postage stamps are an important cultural tool that contributes to urban memory, documents, and promotes architectural heritage. The 1978 series, on the other hand, contributed to the development of cultural heritage awareness by increasing the visibility of traditional residential architecture on a national scale.
**Keywords:** Cultural heritage, Safranbolu, architecture, traditional house, postage stamp.

## 1. GİRİŞ

Posta pullarının tarihi, posta hizmetlerinin ücretlendirilmesi ve işlerlik kazanması amacıyla başlayan ve zamanla görsel, kültürel ve ideolojik bir materyale dönüşen uzun bir süreci kapsamaktadır (Aycil, 2021). Puldan önceki dönemlerde posta ücretleri alıcı tarafından ödenmekte ve bu ücretler mesafeye ve kağıt sayısına göre değiştiği için ödemenin hesaplaması oldukça karmaşık ve pahalı olmaktaydı. Alıcı ödemeli sistemde mektupların alınamama sorununa neden olmaktaydı. Posta pulunun modern hale gelmesinden önce bu duruma çözüm arayan birçok isim olmuştur. 1823 yılında İsveç'te De Treffenberg, 1830'larda İngiltere'de Charles Knight ve Charles Whiting, 1839'da ise Fransa'da Piron ve Grasset gibi mucitler, önceden basılmış veya damgalanmış kağıt ve zarflar kullanmayı önermişlerdir. Bununla birlikte, bugünkü posta puluna son şeklini veren kişinin İskoç matbaacı ve gazete müdürü James Chalmers olduğu kabul edilmektedir. Chalmers, gazetelerini abonelerine gönderirken üzerlerine matbaada basıp kestiği yuvarlak etiketleri yapıştırarak pratik bir çözüm geliştirmiştir. Başlangıçta yeterince ilgi görmeyen bu yenilikçi teknik, 1837 yılında bir başka İskoç olan Rowland Hill tarafından yeniden değerlendirilerek posta sisteminin temeli haline getirilmiştir (Düzenli ve Kavuran, 2004).

İlk yapışkanlı posta pulu olan “Penny Black” 1 Mayıs 1840’ta basılmış ve 6 Mayıs’ta kullanıma girmiştir. Üzerinde Kraliçe Victoria’nın profilden bir portresi bulunmaktadır (Şekil 1). Birkaç gün sonra iki penilik mavi bir pul daha çıkartılmıştır.




**Şekil 1.** Penny Black, 1840.

İngiltere'de yaşanan bu reformdan sonra 1843 yılında İsviçre ve Brezilya'da da pul kullanımına başlanmış, 1847'de Amerika'da Benjamin Franklin ve George Washington resimli ilk pullar bastırılmıştır. Osmanlı İmparatorluğu'nda ise 1840 yılında Posta Nezareti kurularak modern posta sistemine geçilmiştir. Sultan Abdulaziz döneminde, 13 Ocak 1863 tarihinde posta nazırı Agah Efendi girişimiyle ilk Osmanlı posta pulları tedavüle çıkarılmıştır (Yurteri ve Hanilçe, 2025). Sultan Abdulaziz'in tuğrasının yer aldığı pul, dikdörtgen biçimindedir ve ortada yer alan



tuğrada "Devlet-i Ali Osmaniye" yazılmıştır (Şekil 2).

**Şekil 2.** Dörtlü blok halindeki ilk Osmanlı posta pulu, 1863.

Cumhuriyetin ilanıyla birlikte pulların üzerindeki tasarımlar değişmiş, Mustafa Kemal Atatürk'ün portreleri ile ülkenin turistik ve kültürel değerleri pullarda yer almaya başlamıştır. Cumhuriyet döneminin ilk posta pulu, Ekim 1923 tarihinde basılan "Ayyıldızlı" seri pullarıdır (Şekil 3). Bu pullarla cumhuriyetin ilan edildiği tüm dünyaya duyurulmak istenmiş ve seri, uzun süre baskıda kalmıştır.



**Şekil 3.** Ayyıldız posta pulları, 1923 (URL-1).

## 2. POSTA PULLARINDA MİMARLIK

Mimari yapıların posta pullarında kullanılması, ülkelerin kimlik inşası süreçlerinde önemli bir araçtır. Pul üzerindeki bir mimari unsur hem yapının kendisini tanıtmakta hem de onun temsil

ettiği kültürel değerleri simgesel bir dile dönüştürmektedir. Türkiye'de de özellikle 1960'lardan itibaren posta pullarında kentler, anıtlar ve geleneksel yapılar sıkça yer almaya başlamıştır. Bu durum, mimari mirasın görsel bir ulusal sembole dönüştürülmesi sürecini, bir sonucu ve parçasıdır. Posta pullarında kültürel mirasın görünür kılınması ve mimari ayrıntıların grafik dile dönüşümü gibi etkenlerden dolayı pullarda mimarlığın kullanımı önem taşımaktadır. Tanıtım ve turizm amaçlı hazırlanan bu posta pullarıyla ulusal kimliğin simgesel inşasına da katkı sağlanmış olunmaktadır.

Posta pullarında yer alan görseller geniş kitlelere ulaşarak, pulda yer alan ögelerin tanınırlığını arttırmaktadır. Bu bağlamda mimarlık, posta pullarında yalnızca estetik bir öge olarak değil, kültürel hafızanın taşıyıcısı ve ulusal tanıtımın önemli bir parçası olarak değerlendirilmelidir. Sınırlı bir yüzeyde sunulan görselle birlikte yapının cephe düzeni, çevresi, malzemesi, dokusu ve oranlarıyla, mimari ayrıntılar grafik bir dile dönüştürülerek, yapı bir kent hafızası olarak tanıtılmış olmaktadır. Bu durum, mimarlığın grafik tasarımla da kurduğu ilişkiyi güçlendirmektedir.

## 3. POSTA PULLARINDA "GELENEKSEL TÜRK EVLERİ, 1978" SERİSİ

1978 yılında basımı gerçekleştirilen posta pulu koleksiyonlarından biri de 'Geleneksel Türk Evleri' başlıklı, beş yapıyı içeren bir seridir (Şekil 4). Bu seride İstanbul'dan Köprülü Amcazade Hasan Paşa Yalısı, (Kocaeli) İzmit'ten Saatçi Ali Efendi Konağı, (Manisa) Kula'dan Beyler Evi, (Muğla) Milas'tan Bahaddin Ağa Konağı (Aslanlı Ev) ve (döneminde Zonguldak, günümüzde Karabük) Safranbolu'dan bir ev görselleri yer almaktadır. Posta pullarından dördünde görselleri verilen evlerin isimleri geçerken, Safranbolu'daki evle ilgili tanımlama yapılmadığı, yalnızca 'bir ev' yazıldığı görülmektedir. Halbuki bu konak, Safranbolu kenti içinde önemli bir yer tutan Saraçlar Evi'dir.

Posta pullarından ikisi yatay (İstanbul ve Safranbolu), üçü dikey (İzmit, Kula, Milas) formda tasarlanmıştır. Pulların boyutlarının 52x36 mm ile 36x52 mm olduğu görülmektedir. Kenarları dantellidir. Pulların fiyatlandırması 1 Lira (İstanbul), 2,5 Lira (İzmit), 3,5 Lira (Kula), 5 Lira (Milas) ve 8 Lira (Safranbolu) olarak belirlenmiştir. Posta pullarının grafik tasarımı Tülin Tolun'a aittir (URL-2). Evler aslına uygun olarak çizilmiş, her birinde çıkmaların olduğu cepheler vurgulanmıştır. Evlerin kendisi ve çevrelerinin renklendirmelerinde de benzer pastel tonlar kullanılmış, gökyüzü için aynı mavi tonu tercih edilmiştir. Seçilen evlerin ikisi Marmara (İstanbul, İzmit), ikisi Ege (Kula, Milas), biri Karadeniz (Safranbolu) Bölgesi'nde yer almaktadır.







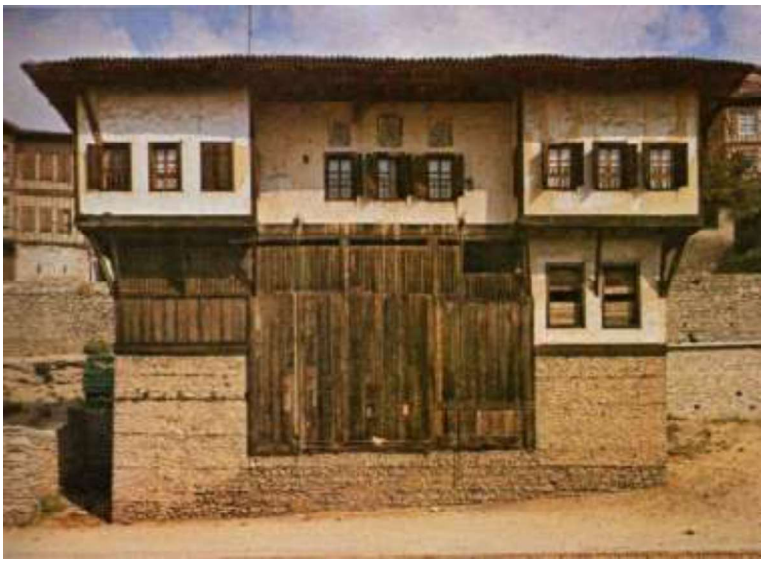





**Şekil 4.** 1978 tarihli geleneksel Türk evleri temalı posta pulu koleksiyonu (Saraçoğlu Gezer arşivi).

## 4. SARAÇLAR EVİ (HATİCE HANIM KONAĞI)

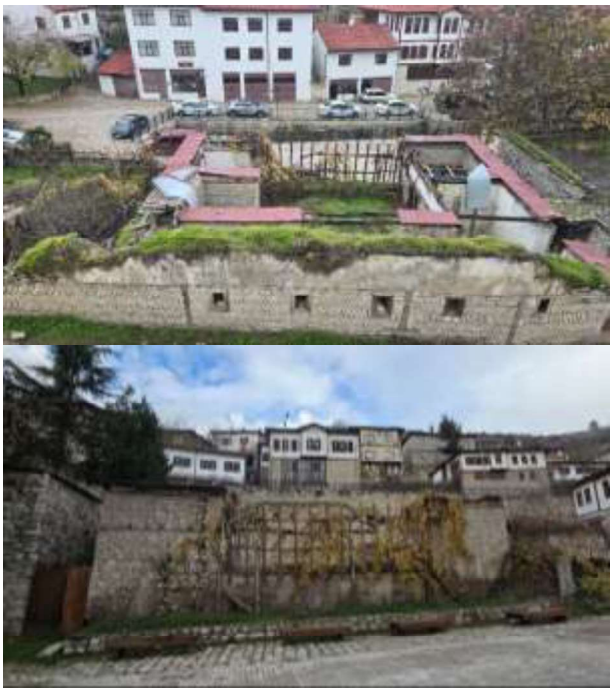
Karabük ili Safranbolu ilçesinde yer alan Saraçlar Evi (Hatice Hanım Konağı), Eski Çarşı Mevkii Pazar Meydanı'nda yer almaktadır (Şekil 5). Yapımı 1535 yılına tarihlenen ve Saraçzade ailesine ait olan yapı, 2003 yılında el değiştirmiş ve restore edilip, on odalı otel olarak kullanılmıştır. 2010 yılında çıkan bir yangında yanan konak (Şekil 6), günümüzde hala onarılamamış ve yanmış haliyle tüm olumsuz çevresel koşullarına açık olduğundan yıpranma süreci devam etmektedir (Şekil 7).



**Şekil 5.** Saraçlar Evi (URL-3).



**Şekil 6.** 2010'da çıkan yangın sonrası Saraçlar Evi (URL-4).



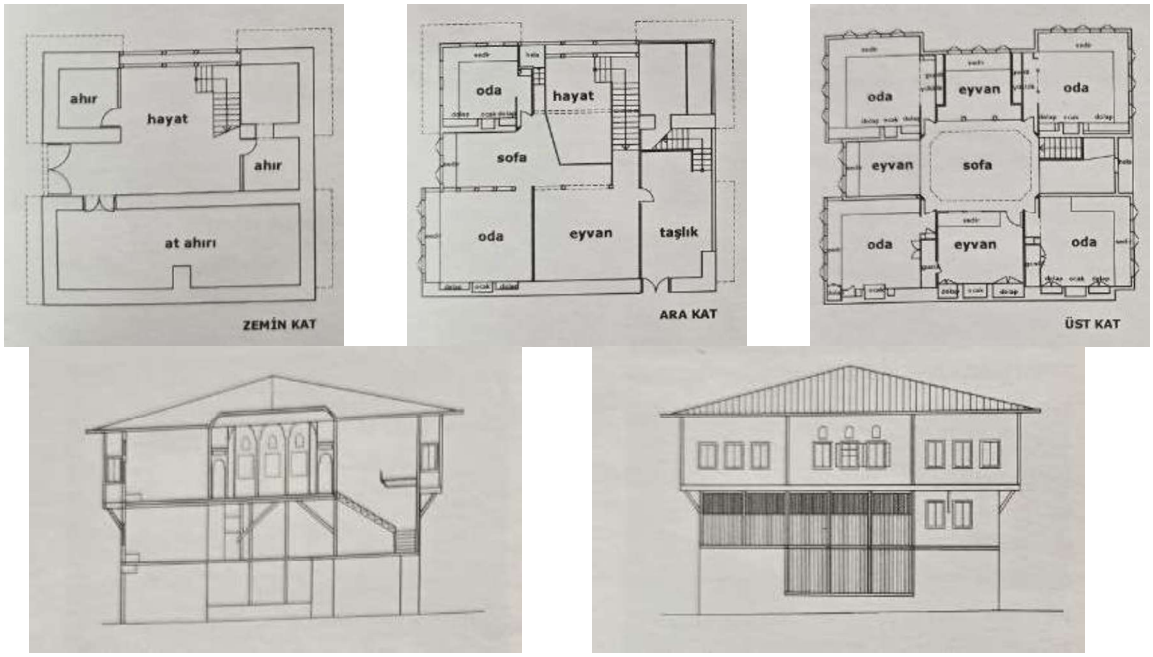
**Şekil 7.** Günümüzde Saraçlar Evi (Saraçoğlu Gezer arşivi).

Safranbolu geleneksel konut mimarisi örneklerinden biri olan Saraçlar Evi, Safranbolu Eski Çarşı Bölgesi'nde bulunan Saraçzade ailesine ait konutlardan biridir (Şekil 8). Yapı, orta sofalı plan tipi örneğindedir (Eldem, 1954). Hanarası Sokak'tan zemin katına girilen yapının bu katında hayat ve ahırlar yer almaktadır. Bu sokak cephesinde, zemin kat ve ara kat yüksekliğinde glisten görülmektedir. Bu kattaki merdivenle ara kata ulaşılmakta, bu katta bir eyvan, iki oda arasında bir sofa ve bir de taşlık bulunmaktadır. Sofadan galeri boşluğuyla hayata bakılabilmektedir. Taşlık, Cinci Han Sokak'tan bir girişe ve ana yaşama alanı olan üst kata çıkan merdivene sahiptir. Üst katta dört oda ve odaların aralarında üç eyvan görülmektedir. ara katta Hanarası Sokak cephesinde, üst katta Cinci Han Sokak cephesinde birer hela bulunmaktadır (Şekil 9).



**Şekil 8.** Saraçlar Evi konumu (URL-5).

Bayazıt'ın aktarımlarına göre (2014), üst kattaki eyvanlardan birisi şeffaf duvarla sofadan bölünerek oda haline getirilmiş, birisi üzeri kemerli ahşap direklerle sofadan ayrılmış, birisi de sabit tefriş olan sedirlerle oturma alanı olarak düzenlenmiştir. Harem girişi zemin kattaki bahçe girişi iken, ara kattan taşlığa girilen giriş selamlık girişi olarak adlandırılmaktadır.




**Şekil 9.** Saraçlar Evi kat planları, kesit ve görünüşü (Bayazıt, 2014).

Saraçlar Evi, 2003 yılında satıldıktan sonra Hatice Hanım Konağı olarak işletildiği için dönemin haritalarında bu isim de yer almıştır (Şekil 10). Yaşanan yangın afeti bu işletme zamanında gerçekleştiği için, medyada haber yapılırken de yapı, yine bu isim üzerinden metinlere yansımıştır. Ancak aynı kitapta 638 numaralı olarak işaretlenen yapı 'Saraçlar Evi' adıyla tanıtılmıştır (Gönenç, 2005).




**Şekil 10.** Saraçlar Evi, 638 nolu yapı (Gönenç, 2005).

## 5. SONUÇ

Bu çalışma, posta pullarının yalnızca bir ücretlendirme aracı olmaktan çıkarak kültürel mirasın, ulusal kimliğin ve mimari değerlerin aktarımında güçlü bir görsel iletişim unsuru hâline geldiğini ortaya koymaktadır. Tarihsel süreçte değişen posta politikalarıyla birlikte pulların taşıdığı anlamlar da dönüşmüş; özellikle Cumhuriyet döneminde mimarlık mirasının tanıtımı açısından önemli bir araç olarak kullanılmıştır.

1978 yılında yayımlanan "Geleneksel Türk Evleri" temalı posta pulu serisi, bu dönüşümün somut örneklerinden biridir. Seride yer alan beş evin Türkiye'nin farklı illerinden seçilmesi, geleneksel konut mimarisinin bölgesel çeşitliliğini ulusal ölçekte görünür kılarken, bu yapıların

grafik bir dile aktarılarak standardize edilmesi mimari kimliğin ortak bir görsel temsilini oluşturmuştur. Bu yönüyle pullar hem tanıtıcı hem de kültürel miras bilinci oluşturucu bir işleve sahiptir.

Safranbolu'dan seçilen ancak pul üzerinde yalnızca "bir ev" olarak adlandırılan Saraçlar Evi'nin (Hatice Hanım Konağı) temsil edilmesi ise ayrı bir önem taşımaktadır. Kentin Osmanlı dönemi sivil mimarisinin karakteristik öğelerini taşıyan bu konak, pul aracılığıyla Safranbolu'nun kültürel değerini erken bir tarihte ulusal dolaşıma sokmuştur. Ne var ki günümüzde yapının yangın sonrası harap durumda olması, mimari mirasın korunması konusundaki kırılganlığı da düşündürmektedir. Bu durum, pulda temsil edilen kültürel varlıkların gerçek hayattaki korunma süreçleriyle ilişkisinin ne kadar önemli olduğunu göstermektedir.

Sonuç olarak, posta pulları mimarlığın estetik, tarihsel ve kültürel boyutlarını geniş kitlelere ulaştıran etkili bir araçtır. 1978 tarihli geleneksel evler serisi ve Saraçlar Evi örneği, görsel temsil gücü yüksek filatelik materyallerin kültürel miras farkındalığı oluşturmadaki rolünü açıkça göstermektedir. Bu tür çalışmalar, hem mimari yapıların belgelenmesine katkı sağlamakta hem de kültürel mirasın korunması ve tanıtılması adına önemli bir hafıza oluşturma işlevi görmektedir

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# CIRCULAR CITY LABS: OPPORTUNITIES, CHALLENGES, AND PATHWAYS FOR URBAN CIRCULARITY

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## ABSTRACT

Circular City Labs (CCLs) have emerged as innovative platforms that support the transition from linear urban systems toward circular, resource-efficient and low-carbon cities. Building on the principles of the circular economy and the methodological foundations of Urban Living Labs, CCLs provide real-world experimentation environments where municipalities, academia, industry and citizens collaboratively design, test and evaluate circular interventions. This paper develops a conceptual framework for CCLs and examines their potential opportunities and limitations within the context of contemporary urban sustainability transitions.

The findings highlight several key opportunities: (i) alignment with national and local sustainability agendas; (ii) measurable environmental and economic benefits through closed material, water and energy loops; (iii) enhanced community participation and social innovation; and (iv) expanded possibilities for digitalization, data-driven planning and technological development. However, the analysis also identifies critical challenges, including fragmented governance structures, financial constraints, limited data interoperability, technical capacity gaps and varying levels of social acceptance.

The discussion emphasizes that the success of CCLs depends on strong multi-actor governance, long-term institutional commitment, integrated data infrastructures and meaningful citizen engagement. The study concludes that while CCLs hold significant transformative potential, they must be embedded within coherent multi-level policy frameworks and supported by sustainable financing and cross-sectoral coordination mechanisms. CCLs can function not only as experimental sites but also as strategic levers for accelerating circular urban transformation.

**Keywords:** Circular City Labs, Opportunities and Limitations, Challenges

## INTRODUCTION

The transition from a linear to a circular economy has become a central agenda in contemporary urban policy, as cities face mounting pressures related to resource scarcity, climate change, and environmental degradation (Eionet, 2022). Circular urbanism seeks to redesign material, water and energy flows in

ways that minimize waste, extend product life cycles and regenerate ecological systems. Within this context, Circular City Labs (CCLs) have gained prominence as experimental, place-based platforms that enable cities to test, monitor and scale circular solutions under real-world conditions (Innella et al., 2024).

Building on the Urban Living Lab (ULL) tradition, CCLs provide multi-actor arenas in which municipalities, universities, private sector actors and citizens co-create interventions that link technological innovation with social practices and governance reforms (Ayala et al., 2022; Lakatos et al., 2023). Rather than one-off pilot projects, CCLs are conceived as iterative, data-driven infrastructures that generate continuous learning about how circular economy principles can be operationalized in complex urban systems. This paper develops a conceptual framing of CCLs and examines, in a generic but policy-relevant manner, their opportunities and limitations as instruments for urban circular transitions.

## CONCEPTUAL FRAMEWORK

The circular city paradigm extends the core principles of the circular economy—such as reduce, reuse, repair, remanufacture and recycle—to the scale of urban systems. It emphasizes closed-loop resource flows, reduced dependency on virgin materials and a shift toward regenerative, low-carbon modes of production and consumption (Falah et al., 2025). In this view, the city is understood as a form of "urban metabolism", in which energy, water and materials enter, circulate and leave the system, and where circular strategies aim to slow, narrow or close these flows (Eionet, 2022).

Urban Living Labs have been widely discussed as key instruments to support sustainability transitions by providing real-life settings for experimentation, co-design and evaluation (Ayala et al., 2022; Innella et al., 2024). Circular City Labs can be conceptualized as a specific subtype of ULLs, explicitly oriented toward circular economy objectives and the measurement of circularity outcomes at neighborhood or city scale. They typically combine (i) a physical testbed (e.g. a district or industrial area), (ii) a governance structure that coordinates multiple stakeholders, and (iii) a digital layer that enables monitoring through indicators, sensor networks and data platforms (European Commission, 2020; Inholland University of Applied Sciences, 2022).

International initiatives such as the EU's Circular Cities and Regions Initiative (CCRI) have further institutionalized this approach by promoting demonstration projects, twinning schemes and knowledge-sharing networks, thereby positioning CCL-like structures as central tools in the European circular transition portfolio (European Commission, 2020).

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## OPPORTUNITIES OF CIRCULAR CITY LABS (CCLS)

### Policy and Institutional Opportunities

CCLs offer a concrete mechanism to translate high-level policy commitments on circular economy and climate neutrality into locally grounded experiments. In many countries, national strategies and green deal roadmaps call for integrated resource management, but lack operational instruments at city level (Ministry of Environment, Urbanization and Climate Change, 2025; Turkish Ministry of Trade, 2024). CCLs can serve as intermediating structures that connect national targets with municipal implementation, and can leverage existing sustainability, climate and smart city initiatives within local governments (Henden Şolt, 2023).

### Environmental and Economic Benefits

By focusing on material, water and energy loops in specific urban areas, CCLs can generate tangible environmental benefits, including reduced waste volumes, increased recycling and reuse rates, lower greenhouse gas emissions and improved resource efficiency (Falah et al., 2025; Sweco, 2023). These environmental gains are often associated with economic advantages, such as lower operational costs for municipalities, new business opportunities for circular enterprises and reduced exposure to volatile resource prices.

### Social and Community-Level Benefits

CCLs can function as catalysts for social innovation, by engaging citizens in co-design processes, participatory monitoring and community-led initiatives such as repair cafés, sharing schemes and local markets (ICLEI Europe, 2020; Innella et al., 2024). Such activities contribute to building trust, strengthening local identities and promoting behavior change toward more sustainable consumption and mobility practices. The visibility of CCL projects in public space can also make otherwise abstract notions of circularity more tangible to residents.

### Technological and Innovation Opportunities

Finally, CCLs offer fertile ground for the integration of digital technologies—such as Internet of Things (IoT) sensors, GIS-based tools and digital twins—into urban management (Ayala et al., 2025; Inholland University of Applied Sciences, 2022). They create living environments in which universities, startups and established firms can test new solutions under real-life conditions, thereby accelerating innovation cycles and enabling data-driven decision-making.

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## CHALLENGES AND LIMITATIONS OF CIRCULAR CITY LABS

### Governance and Institutional Barriers

Despite their promise, CCLs face substantial governance challenges. Urban resource flows are typically managed by multiple departments and utility providers, often with fragmented mandates and limited coordination (Eionet, 2022). Establishing a functioning CCL requires clear role definitions, stable leadership and long-term political support—conditions that are not always present, especially where administrative structures are frequently reconfigured or short-term project logics dominate (Lakatos et al., 2023).

### Financial and Economic Constraints

CCLs frequently entail significant upfront investment in infrastructure, digital systems and coordination capacities. Municipal budgets are often constrained, and experimental initiatives may compete with more immediate service delivery priorities (Sweco, 2023). While national and international funds—such as EU programmes and climate finance—can support demonstration projects, ensuring financial continuity beyond initial project cycles remains a recurrent limitation (European Commission, 2020).

### Technical and Data-Related Limitations

A core promise of CCLs lies in their ability to generate robust, high-quality data on circularity performance. However, many cities lack consistent, interoperable data on material, water and energy flows, and face difficulties in integrating datasets across agencies (Eionet, 2022; Falah et al., 2025). Technical challenges include the deployment and maintenance of sensor networks, the development of standardized indicators and the creation of user-friendly dashboards for practitioners.

### Social and Cultural Constraints

Social acceptance and cultural practices also influence the success of CCLs. Circular interventions often require changes in everyday routines, such as separating waste streams, participating in sharing schemes or adopting new mobility patterns (ICLEI Europe, 2020). Where trust in public institutions is low or previous participatory processes have been tokenistic, citizen engagement in CCLs may be limited. Moreover, narratives of circularity can be contested if residents perceive them as externally imposed or misaligned with local socio-economic realities (The Guardian, 2025).

## DISCUSSION

The opportunities and limitations outlined above highlight the dual nature of CCLs as both promising accelerators and fragile infrastructures of urban circular transitions. On the one hand, CCLs can align with and enhance existing policy frameworks, offer measurable environmental and economic benefits, and activate local communities and innovation ecosystems (Ayala et al., 2022; Innella et al., 2024). On the other hand, their reliance on cross-sectoral collaboration, stable funding and advanced data

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capabilities makes them vulnerable to institutional fragmentation, budgetary pressures and capacity gaps (Eionet, 2022; Lakatos et al., 2023).

Compared with more traditional planning instruments, CCLs foreground experimentation, learning and iteration rather than fixed blueprints. This is consistent with recent calls in sustainability transition studies to embrace uncertainty and to design governance arrangements that can adapt to emerging insights (Ayala et al., 2025). However, as evidenced in critical debates around large-scale environmental initiatives, there is also a risk of "circularity-washing" if CCLs are promoted primarily as branding tools without substantive structural change (Daily Sabah, 2025; The Guardian, 2025).

Hence, the discussion points to the importance of embedding CCLs within broader, long-term strategies that integrate regulatory reforms, economic instruments and social policies. Rather than isolated pilots, CCLs need to be conceived as nodal points within multi-level transition pathways, connecting local experiments to regional and national circular economy agendas (European Commission, 2020; Ministry of Environment, Urbanization and Climate Change, 2025).

## CONCLUSION

Circular City Labs represent a promising, yet complex, mechanism for advancing circular economy transitions in urban contexts. By combining physical experimentation with multi-actor governance and digital monitoring, they can translate abstract circularity principles into concrete interventions and measurable impacts. The analysis in this paper indicates that CCLs can unlock significant policy, environmental, economic, social and technological opportunities, but are simultaneously constrained by governance, financial, technical and socio-cultural barriers.

For CCLs to realize their transformative potential, several priorities emerge:

(i) strengthening cross-departmental coordination and clarifying institutional responsibilities;

(ii) developing stable and diversified funding models beyond time-limited projects;

(iii) investing in data infrastructures and indicator frameworks that allow for robust performance assessment; and

(iv) designing inclusive participatory processes that genuinely empower local communities (Ayala et al., 2022; Falah et al., 2025; ICLEI Europe, 2020).

Ultimately, CCLs should not be seen as standalone solutions but as integral components of multi-level strategies for sustainable urban transformation. When embedded in coherent policy mixes and supported by strong governance and societal engagement, Circular City Labs can make a meaningful contribution to climate neutrality, resource efficiency and resilient urban futures.

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# KENT-HAFIZA-MEKÂN: TEKEL YÖNETİM BİNALARININ YENİDEN İŞLEVLENDİRİLEREK KULLANIMA AÇILMASI ÜZERİNE BİR DEĞERLENDİRME

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## ÖZET

Geç Osmanlı ve Cumhuriyet dönemi kamu yapıları arasında Tekel binaları önemli bir yer tutmaktadır. Bu binalar, 19. yüzyılın ikinci yarısından itibaren Osmanlı Devleti'nde başlayan tekelci uygulamaların ve Cumhuriyet dönemi devletçilik anlayışının bir uzantısı olarak görülmektedir. Tekel binaları olarak ele aldığımız yapılarda tütün, ispirto, alkol, tuz, kibrit, barut ve patlayıcı maddelerin üretim ve dağıtımı devlet tekelinde yapılmış ve ülke genelinde bu ürünlerin işlenmesi için pek çok fabrika, depo, idare, satış ve yönetim binası inşa edilmiştir. Tekel Genel Müdürlüğü, merkez ve taşra örgütünden meydana gelmekte olup, Tekel Genel Müdürlüğü ana binası, merkez teşkilatı kapsamında İstanbul'da bulunmaktadır. Taşra teşkilatında ise yönetim binası olarak Başmüdürlük, İdare Müdürlüğü ve İdare Memurluğu binalarından söz etmek mümkündür. Tekel yönetim binalarını konu alan bu çalışma kapsamında taşra teşkilatına bağlı olarak toplam 43 Başmüdürlük binasından 11 örneğe, 205 İdare Müdürlüğü binasından 4 örneğe, 418 İdare Memurluğu binasından ise 2 örneğe ulaşılmıştır.

Türkiye'de özelleştirme çalışmaları ve binaların güncel işlevini yitirmesi nedeniyle bu binalar turizm tanıtım merkezi, vakıf binası, konut, sanat galerisi, kaymakamlık, PTT, banka, konukevi, şirket binası, müze, otel, savat evi, mağaza, kent tarihi ve arşivi binası gibi farklı işlevler ile günümüz kullanımına yeniden kazandırılmıştır. Bu çalışmanın amacı etkin bir koruma yöntemi olan ve yeniden işlevlendirme yoluyla kullanıma açılan Tekel yönetim binalarının özgün ve güncel durumlarını saptayarak literatüre katkı sağlamak ve gelecekte yapılacak çalışmalara altlık oluşturmaktır.

**Anahtar Kelimeler:** Kamu Binası, Tekel Binası, Yeni İşlev, Sürdürülebilirlik

## CITY-MEMORY-SPACE: AN EVALUATION OF THE RE-FUNCTIONALIZATION AND REOPENING OF THE TEKEL ADMINISTRATIVE BUILDINGS

### ABSTRACT

Among the public buildings of the late Ottoman and Republican periods, the Tekel buildings hold a significant place. These buildings are seen as an extension of the monopolistic practices that began in the Ottoman Empire in the second half of the 19th century and the state-centric approach of the Republican period. In the structures we consider as Tekel buildings, the production and distribution of tobacco, spirits, alcohol, salt, matches, gunpowder, and explosives were carried out under state monopoly, and many factories, warehouses, administration, sales, and management buildings were constructed throughout the country for the processing of these products. The Tekel General Directorate consisted of central and regional organizations, with the main building of the Tekel General Directorate located in Istanbul as part of the central organization. In the regional organization, it is possible to mention the General Directorate, Administrative Directorate, and Administrative Officer buildings as administrative buildings. This study, focusing on the Tekel administrative buildings, included 11 examples out of 43 General Directorate buildings, 4 examples out of 205 Administrative Directorate buildings, and 2 examples out of 418 Administrative Officer buildings, all belonging to the provincial organization.

Due to privatization efforts in Turkey and the loss of the original function of these buildings, they have been repurposed for various uses, including tourism promotion centers, foundation buildings, residences, art galleries, district governor's offices, post offices, banks, guesthouses, company buildings, museums, hotels, savat houses, stores, and city history and archive buildings. The aim of this study is to contribute to the literature by identifying the original and current states of Tekel administrative buildings, which have been repurposed as an effective preservation method, and to provide a basis for future studies.

**Keywords:** Public Building, Tekel Building, Re-function, Sustainability

## 1. GİRİŞ

"Tekel" *Türk Dil Kurumu Sözlüğü*'nde bir mal yapımının sadece tek bir kuruluşun elinde bulunması, inhisâr[1] ve monopol[2] şeklinde tanımlanmaktadır.[3]

Tekeller/İnhisârlar, Osmanlı Devleti'nde devlet kontrolündeki gelirler olup Osmanlı'nın tekelini elinde bulundurduğu tek bütçe gelir kalemidir. Barut, tütün, tuz, meskûkât[4], tömbeki[5], posta ve telgraf gelir ve idareleri devletin inhisârı altında olmuştur. Büyük devletlerin petrol inhisârına izin vermemesi sebebiyle bu inhisâr kurulamamıştır (Öztel, 2007, 163). Tuz inhisârı yaklaşık %34'lük oran ile tüm inhisârlar arasında en fazla gelir getiren üründür. İnhisarların toplam gelirinin yaklaşık %30'unu tütün, yaklaşık %28,1'ini posta ve telgraf gelir ve idareleri, yaklaşık %3,1'ini barut, yaklaşık %1'ini ise tömbeki inhisârı oluşturmuştur (Demirbilek, 2011, 23, 26, 27, 30).

Tekelin ilk uygulaması 1829 yılında afyonun inhisâr altına alınmasıyla başlamış ancak İngiltere'nin baskılarıyla bu inhisâr kaldırılırmıştır. 1862 yılında bir kararname ile de tuz, barut, tütün, meskûkât, tömbeki, posta ve telgraf gelirleri inhisâr altına alınmıştır. Osmanlı'da devlet bütçesinin ortalama %13,4'ünü inhisâr gelirleri oluşturmuştur (Demirbilek, 2011, 21).

19. yüzyılda Osmanlı Devleti ekonomik bakımdan gerilemeye başlamış, iç ve dış borçların yapıldığı ülkede gelir kaynakları vergilendirilmeye başlanmıştır. Kırım Savaşı (1853-1856) sonunda Fransa ve İngiltere'den ilk dış borç alınmış, ayrıca Galata Bankerleri ve Osmanlı Bankası'ndan da iç borç alımı devam etmiştir. Osmanlı Bankası ve Galata Bankerleri borçlarına karşılık "Rüsûm-ı Sitte" olarak adlandırılan alkollü içki, tütün, ipek, tuz, pul ve balık avı olmak üzere altı gelir kaynağının kendilerine bırakılmasını istemiştir. 1879 yılında "Rüsûm-ı Sitte İdaresi" kurulmuş, 1881 yılında "Rüsûm-ı Sitte İdaresi"nin yetkileri "Düyûn-ı Umûmiyye İdaresi"ne bırakılmıştır (Çakır, 2019, 174).

1883 yılında Osmanlı Devleti ile 30 yıllığına anlaşma yapılarak "Düyûn-ı Umûmiyye İdaresi"ne bağlı olarak "Reji Şirketi" kurulmuştur. Berlin'den Banker Bleichröder, Viyana'dan Credit Ansalt ve Osmanlı Bankası şirketin ortakları arasında yer almıştır. Reji Şirketi, tütünün ülke içinde imal edilme, satın alma ve satılma hakkını elinde bulundurmuştur (Oktar ve Alan, 2018, 31). Bu kapsamda tütünleri işlemek ve depolamak amacıyla 1884 yılında Cibali bölgesinde İstanbul Cibali Tütün ve Sigara Fabrikası ile İzmir'de İzmir Tütün ve Sigara Fabrikası'nı, 1887 yılında Samsun'da Samsun Tütün ve Sigara Fabrikası'nı, 1895 yılında Adana'da Adana Tütün ve Sigara Fabrikası'nı inşa etmiştir (Yurtoğlu, 2018, 100-103). Reji Şirketi fabrikalarını dağıtımın kolay olması için tütün üretimi yapılan alanlara kurmuş ve fabrika açılan kentlerde istihdam sağlanmıştır (Derman, 2023, 46-47). Şirketin 30 yıllık imtiyaz

[1] "İnhisâr" kelimesi *Osmanlıca-Türkçe Ansiklopedik Lûgat*'ta bir işi, bir maddeyi ve bir şeyi başkası yapmamak üzere, sadece bir müessese, bir kişiye verme, tekel ve monopol şeklinde tanımlanmaktadır (Devellioğlu, 2002, 438).
[2] Fransızca kökenli monopol kelimesi tekel anlamına gelmektedir (Ertürk, 1999, 488).
[3] https://sozluk.tdk.gov.tr (Erişim tarihi: 24.11.2025)
[4] "Meskûkât" *Türk Dil Kurumu Sözlüğü*'nde sikke, metal para anlamlarına gelmektedir. https://sozluk.tdk.gov.tr (Erişim tarihi: 24.11.2025)
[5] "Tömbeki" *Türk Dil Kurumu Sözlüğü*'nde özellikle İran taraflarında yetiştirilen bir tütün türü olarak tanımlanmaktadır. https://sozluk.tdk.gov.tr (Erişim tarihi: 24.11.2025)

süresinin sonunda Balkan Savaşları (1912-1913) çıktığından, şirketten tekrar borç alınmış ve böylece şirketin imtiyaz hakkı 15 yıl daha uzatılmıştır (Oktar ve Alan, 2018, 31).

1923 yılında İzmir'de I. Türkiye İktisat Kongresi'nde ekonomik büyüme ve bağımsız ekonomi için alınacak tedbirler konuşulmuş, TBMM bu kongrede ön plana çıkan yerli ve milli sermaye düşüncesinden hareketle "Reji Şirketi"nin devletleştirilmesine karar vermiş ve şirketin bütün varlıkları devlete intikal etmiştir. 1926 yılında da tütünün faaliyetleri devlet tekeline geçirilmiştir (Yurtoğlu, 2018, 85).

Tütün üretiminin millileştirilmesiyle üretim, pazarlama, dağıtım ve yönetiminin gerçekleştirilmesi için birçok yapı inşa edilmeye başlanmıştır (Özaydın Çat, 2015, 41). 1939 yılında Malatya Sigara Fabrikası, 1940 yılında Bitlis Sigara Fabrikası, 1969 yılında İstanbul Maltepe Sigara Fabrikası, 1984 yılında Tokat Sigara Fabrikası ve 1997 yılında Samsun Ballıca Sigara Fabrikası üretime başlamıştır (Yaşar, 2004, 75).

1932 yılında "İnhisarlar Umum Müdürlüğü" kurulmuş; tütün, ispirto, tuz, alkollü içkiler, barut ve patlayıcı maddeler ile ilgili inhisâr hizmetlerini yürütme görevi verilmiştir (Karadağ, 2010, 108).

1941 yılında tuz, tütün, ispirto ve ispirtolu içkiler gibi devlet tekelinde bulunanlar ile kibrit, şarap ve bira gibi Tekel dışında bırakılan maddelerin üretimini nicelik ve nitelik bakımından denetlemek, hazineye gelir sağlamak, sosyal ve ekonomik hayata katkıda bulunmak amacıyla "Tekel Genel Müdürlüğü" kurulmuştur. Tütün, alkollü içki, tuz ve kibritin üretim ve satışı, yabancı kökenli içki ile kahvenin ithalat ve pazarlanması ile Çay-Kur'un ürettiği çayın pazarlanması Tekel tarafından yürütülmüştür (Tekel Genel Müdürlüğü, 1979, 3, 9).

Şirket, 1941'den 1983 yılına kadar "Tekel Genel Müdürlüğü" adı altında faaliyetlerini sürdürmüş, 1987 yılında "Tütün, Tütün Mamulleri, Tuz ve Alkol İşletmeleri Genel Müdürlüğü (TEKEL)" adını almıştır (Karadağ, 2010, 108-109).

"Tütün, Tütün Mamulleri, Tuz ve Alkol İşletmeleri Genel Müdürlüğü", Özelleştirme Yüksek Kurulu'nun 2001 tarihli kararı ile özelleştirme kapsamına alınarak 2002 yılında İktisadi Devlet Teşekkülü olarak yeniden yapılandırılmış ve Özelleştirme İdaresi Başkanlığı'na (ÖİB) devredilmiştir. 01.01.2003 tarihi itibari ile de ÖİB tarafından anonim şirkete dönüştürülmüştür (Yılmaz, 2019, 65-66).

## 2. TEKEL BİNALARI

"Tekel Genel Müdürlüğü" Merkez ve Taşra Örgütünden meydana gelir. Merkez Örgüt; genel müdür, genel müdür yardımcıları, müdürler, uzmanlar, komisyonlar, müdürlükler ve bunlara bağlı şube müdürlüklerinden oluşur. Taşra Örgütü ise Genel Müdürlüğe bağlı 17 Müskirat[6] Fabrikası, 7 Sigara Fabrikası, 1 Yedek Parça Fabrikası, 1 Ambalaj Fabrikası, 1 Kibrit Fabrikası, 3 Tuzla, 9 Yaprak Tütün İşletmeleri Merkez Müdürlüğü ve bunlara bağlı 16 Yaprak Tütün İşletme Müdürlükleri ile 43 Başmüdürlük, Başmüdürlüklere bağlı 205 İdare Müdürlüğü, 418

[6] *Türk Dil Kurumu Sözlüğü*'nde "müskirat"ın sarhoş eden şey, alkollü içkiler şeklinde tanımı yapılmıştır. https://sozluk.tdk.gov.tr (Erişim tarihi: 24.11.2025)

İdare Memurluğu, 6 Tuzla Amirliği, 41 Tuzla Memurluğu olmak üzere 768 üniteden oluşur (Tekel Genel Müdürlüğü, 1979, 3-4).

Tekel yönetim binaları yerel ve bölgesel düzeyde TEKEL'in faaliyetlerini yürüten Tekel Genel Müdürlüğü'ne bağlı idare ve yönetim yapılarıdır. Bu binaların Geç Osmanlı ve Cumhuriyet döneminde yapıldığı tespit edilmiştir. Günümüzde Tekel binaları işlevini yitirdiği için bu yapıların bazıları terkedilerek atıl bırakılmış, yıkılmış ya da restorasyon çalışmaları sonunda yapılara yeni işlevler verilmiştir.

Tekel yönetim binalarını konu alan bu çalışma kapsamında taşra teşkilatına bağlı olarak toplam 43 Başmüdürlük binasından 11 örneğe (**Çizelge 1**), 205 İdare Müdürlüğü binasından 4 örneğe (**Çizelge 2**), 418 İdare Memurluğu binasından ise 2 örneğe (**Çizelge 3**) ulaşılmış ve bu binaların özgün ile güncel durumları belirlenmiştir.

### 2.1. Başmüdürlükler

**Çizelge 1. Başmüdürlükler (R. Teke, 2025)**

| | **Başmüdürlükler** |
|---|---|
| **1.** | Manisa Tekel Binası |
| **2.** | İzmir Tekel Başmüdürlük Binası |
| **3.** | Ankara İnhisarlar (Tekel) Başmüdürlük Binası |
| **4.** | Konya İnhisarlar (Tekel) İdare Binası |
| **5.** | Balıkesir Tekel İdare Binası |
| **6.** | Afyonkarahisar Tekel Binası |
| **7.** | Van Tekel Binası |
| **8.** | Kastamonu Tekel Binası |
| **9.** | Diyarbakır Tekel Müdürlük Binası |
| **10.** | Kars Tekel Binası |
| **11.** | Antalya Tekel Başmüdürlük Binası |

Manisa Tekel Binası, Manisa İli, Merkez İlçesi, Utku Mahallesi, Çimentepe Caddesi üzerinde yer almaktadır (**Görsel 1**). 1926 yılında sıhhat yurdu olarak inşa edilen yapı ilerleyen dönemlerde Tekel idaresine bırakılmıştır (Güngör, 2019, 57). 2005 yılında İl Kültür ve Turizm Müdürlüğü Hizmet Binası ve Turizm Tanıtma Merkezi olarak kullanılmak için Kültür ve

Turizm Bakanlığı'na tahsis edilmiş ve 2009-2010 yılları arasında restorasyon geçirmiştir (**Görsel 2**) (Aral vd., 2011, 55).



**Görsel 1.** Manisa Tekel Binası (https://www.facebook.com/photo/?fbid=10159203460500810&set=gm.5967024043403938&idorvanity=701719163267812, Erişim tarihi: 17.03.2025)



**Görsel 2.** İl Kültür ve Turizm Müdürlüğü Hizmet Binası ve Turizm Tanıtım Merkezi (Aral vd., 2011)

İzmir Tekel Başmüdürlük Binası, İzmir İli, Konak İlçesi, Akdeniz Mahallesi, 1012 Ada, 2 Parselde yer almaktadır.[7] (**Görsel 3**) 1926-1933 yılları arasında inşa edildiği tahmin edilmektedir.[8] Kuzey cephesinin bitişiğine 1971-1973 yılları arasında lojman ve ek satış binası yapılmıştır. 1982 ve 2008 yılında Koruma Kurulu tarafından ayrı kararlar ile tescillenmiştir (Karagözler, 2018, 32). 2009 yılında işlevini yitiren yapı restore edilmiş ve otel işlevi verilmiştir (**Görsel 4**).



**Görsel 3.** İzmir Tekel Başmüdürlük Binası (Karagözler, 2018)

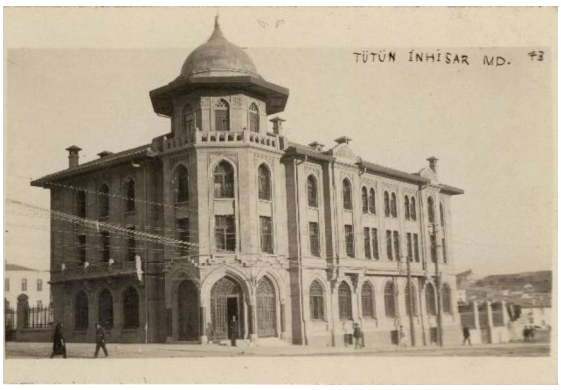


**Görsel 4.** Otel, 2024 (https://maps.app.goo.gl/fEbFdTFsK3PGsZFi7, Erişim tarihi: 17.03.2025)

Ankara'da 1928 yılında inşa edilen İnhisarlar (Tekel) Başmüdürlük Binası'nın mimarı Giulio Mongeri'dir (Aslanoğlu, 2010, 141). (**Görsel 5**) Ulus Meydanı'na yakın bir köşe parsele inşa

[7] https://parselsorgu.tkgm.gov.tr/#ara/idari/151488/1012/2/1751360031240 (Erişim tarihi: 29.06.2025)
[8] https://erolsasmaz.com/?oku=1383 (Erişim tarihi: 15.04.2025)

edilen yapı günümüzde Yunus Emre Enstitüsü'nün genel merkezi olarak kullanılmaktadır (**Görsel 6**).




**Görsel 5.** İnhisarlar (Tekel) Başmüdürlük Binası (https://archives.saltresearch.org/handle/123456789/122025, Erişim tarihi: 10.04.2025)



**Görsel 6.** Yunus Emre Enstitüsü, 2022 (https://kulturenvanteri.com/en/yer/ankara-tekel-binasi/ankara-tekel-binasi-2/, Erişim tarihi: 10.04.2025)

Konya İnhisarlar (Tekel) İdare Binası, Konya İli, Meram İlçesi, Mevlâna Caddesi, 18 Pafta, 588 Ada, 3 Parselde yer almaktadır (Kuştepe, 2011, 158). (**Görsel 7**) Projesi Mimar Nihat tarafından hazırlanmış ancak Mimar Nihat'ın görevinden ayrılması üzerine Mimar Tahir Tuğ yeni ihtiyaçlara göre projeyi düzenleyerek bugünkü hali ile yapı 1935 yılında tamamlanmıştır (Bozkurt, 2015, 310). 2021 yılında restorasyon geçirmiş ve günümüzde Sanat Galerisi (Depo No: 4) olarak hizmet vermektedir (**Görsel 8**).





**Görsel 7.** Konya İnhisarlar (Tekel) İdare Binası, **Görsel 8.** Sanat Galerisi (Depo No: 4) (https://yalin-mimarlik.com/projeler/depo-no4, Erişim tarihi: 12.03.2025)

Balıkesir Tekel İdare Binası, Balıkesir İli, Altıeylül İlçesi, Kasaplar Mahallesi, 8349 Ada, 7 Parselde yer almaktadır.[9] (**Görsel 9**) 1935-1940'lı yıllarda Tekel'in idare binası için inşa edilen yapı, 1986 yılında tescil edilmiştir (Yırcalı, 2019, 87-88). Günümüzde Altıeylül Kaymakamlığı tarafından kaymakamlık binası olarak kullanılmaktadır (**Görsel 10**).

[9] https://parselsorgu.tkgm.gov.tr/#ara/idari/205454/8349/7/1751221677702 (Erişim tarihi: 29.06.2025)




**Görsel 9.** Balıkesir Tekel İdare Binası (Yırcalı, 2019)



**Görsel 10.** Altıeylül Kaymakamlığı (https://directmap.ist/zh-TW/bal%C4%B1kesir/2728#google_vignette, Erişim tarihi: 12.03.2025)

Afyonkarahisar Tekel Binası, Afyonkarahisar İli, Merkez İlçesi, Burmalı Mahallesi, 41 Pafta, 556 Ada, 12 Parselde yer almaktadır.[10] (**Görsel 11**) 1996 yılında tescil edilmiştir (Zor, 2019, 163). Günümüzde yapı özel bir banka tarafından kullanılmaktadır (**Görsel 12**).



**Görsel 11.** Afyonkarahisar Tekel Binası, 2013 (https://www.kulturportali.gov.tr/turkiye/afyonkarahisar/kulturenvanteri/tekel-esk-bnasi?ysclid=m9y5aartu5658427746, Erişim tarihi: 29.06.2025)




**Görsel 12.** Banka (Zor, 2019)

Van Tekel Binası, Van İli, İpekyolu İlçesi, Çarşı Mahallesi, Cumhuriyet Caddesi, 29 Pafta, 189 Ada, 1 Parselde yer almaktadır (**Görsel 13**). 1940 yılında inşa edildiği düşünülen yapı 2005 yılına kadar Tekel'in idaresinde kullanılmıştır (Öztürk ve Direk, 2010, 184). Günümüzde Savat Evi ve Müze olarak hizmet vermektedir (**Görsel 14**).

[10] https://parselsorgu.tkgm.gov.tr/#ara/idari/124620/556/12/1763897217127 (Erişim tarihi: 29.06.2025)



**Görsel 13.** Van Tekel Binası (Öztürk ve Direk, 2010)



**Görsel 14.** Savat Evi ve Müze, 2025 (https://mapspp.goo.gl/k6LoBDSfFJeDhmak6, Erişim tarihi: 29.06.2025)

Kastamonu Tekel Binası, Kastamonu İli, Merkez İlçesi, Cebrail Mahallesi, 178 Ada, 39 Parselde yer almaktadır.[11] 1940'lı yılların başında inşa edilen yapı (Sezer, 2010, 132), 2013 yılında tescil edilmiştir (İshak, 2018, 139). Günümüzde PTT Binası olarak kullanılmaktadır (**Görsel 15**).



**Görsel 15.** PTT Binası, 2023 (https://maps.app.goo.gl/WkrsMnYrEkAd8Y12A, Erişim tarihi: 23.11.2025)

Diyarbakır Tekel Müdürlük Binası, Diyarbakır İli, Yenişehir İlçesi, Yenişehir Mahallesi, 466 Ada, 17 Parselde yer almaktadır.[12] (**Görsel 16**) 1950'lili yıllara doğru inşa edilen yapı, 2009 yılına kadar özgün işlevi ile daha sonra da Gençlik ve Kültür Merkezi olarak kullanılmıştır.[13] Günümüzde Yenişehir Kaymakamlığı Binası olarak hizmet vermektedir (**Görsel 17**).

[11] https://parselsorgu.tkgm.gov.tr/#ara/idari/130316/178/39/1763972854709 (Erişim tarihi: 23.11.2025)
[12] https://parselsorgu.tkgm.gov.tr/#ara/idari/125621/466/17/1761119318697 (Erişim tarihi: 12.08.2025)
[13] http://www.mimarlikdergisi.com/index.cfm?sayfa=mimarlik&DergiSayi=372&RecID=2615 (Erişim tarihi: 28.06.2025)




**Görsel 16.** Diyarbakır Tekel Müdürlük Binası (http://www.mimarlikdergisi.com/dsp_imageNavigasyon.cfm?YaziID=2615&ResimID=68558, Erişim tarihi: 28.06.2025)




**Görsel 17.** Yenişehir Kaymakamlığı, 2025 (https://maps.app.goo.gl/cD43kWJkhcj6aUgz6, Erişim tarihi: 28.06.2025)

Kars Tekel Binası, Kars İli, Merkez İlçesi, Yusufpaşa Mahallesi, 1533 Ada, 21 Parselde yer almaktadır.[14] (**Görsel 18**) 1950'li yıllarda inşa edildiği düşünülmektedir. Bir dönem Tekel binası olarak kullanılan yapıyı 2012 yılında Türk Telekom satın almıştır. 2012-2013 yılları arasında restorasyon geçirmiş ve günümüzde iletişim alanında hizmet vermektedir (**Görsel 19**) (Arslan vd., 2025, 156-157).



**Görsel 18.** Kars Tekel Binası (Turan Kayhan arşivi)



**Görsel 19.** Türk Telekom Müdürlüğü (Arslan vd., 2025)

Antalya Tekel Başmüdürlük Binası, Antalya İli, Muratpaşa İlçesi, Balbey Mahallesi, İsmet Paşa Caddesi üzerinde yer almaktadır.[15] (**Görsel 20**) 1950-1980 yılları arasındaki dönemde inşa edilmiştir. 1970 yılında Tekel binası ve ambar olarak hizmete başlamış, 2002 yılından itibaren de idare binası olarak kullanılmıştır. Tekel'in özelleştirilmesiyle birlikte 2008 yılında işlevini kaybeden yapı günümüzde mağaza olarak kullanılmaktadır (Kıran ve Çetin, 2018, 11). (**Görsel 21**)

[14] https://parselsorgu.tkgm.gov.tr/#ara/idari/130030/1533/21/1761119405731 (Erişim tarihi: 13.09.2025)
[15] https://maps.app.goo.gl/TWSEPqpSeyuRSBaS8 (Erişim tarihi: 23.11.2025)



**Görsel 20.** Antalya Tekel Başmüdürlük Binası (https://www.facebook.com/photo?fbid=941444 9781996708&set=pcb.984090633510708 Erişim tarihi: 27.06.2025)




**Görsel 21.** Mağaza (Fullamoda Antalya Kale), 2024 (https://maps.app.goo.gl/kiJGUiDfuw3E8xnU7, Erişim tarihi: 27.06.2025)

## 2.2. İdare Müdürlükleri

**Çizelge 2. İdare Müdürlükleri ve Bağlı Bulunduğu Başmüdürlükler (R. Teke, 2025)**

| | **İdare Müdürlükleri** | **Bağlı Bulunduğu Başmüdürlük** |
|---|---|---|
| **1.** | Uzunköprü Tekel Binası | Tekirdağ Başmüdürlüğü |
| **2.** | Urla Tekel Binası (Arditi Köşkü) | İzmir Başmüdürlüğü |
| **3.** | Artvin Tekel Müdürlük Binası | Rize Başmüdürlüğü |
| **4.** | Isparta Tekel Müdürlüğü Binası | Antalya Başmüdürlüğü |

Uzunköprü Tekel Binası, Edirne İli, Uzunköprü İlçesi, Rızaefendi Mahallesi, 70 Pafta, 1063 Ada, 15 Parselde yer almaktadır.[16] 19. yüzyılda inşa edilmiştir (Kırçın vd., 2013, 438). Yapı ilçede yaşayan Postacı ailesinin oğlu Mustafa Çakmaklı tarafından yaptırılmış ve aile 1935'li yıllara kadar burada yaşamıştır. 1939 yılında Maliye Hazinesine satılan yapının kullanımı Maliye hazinesi tarafından Tekel yönetimine bırakılmıştır. 2013 yılında Uzunköprü Belediyesi tarafından Uzunköprü Kent Müzesi'ne dönüştürülmüştür.[17] (**Görsel 22**)

[16] https://www.kulturportali.gov.tr/turkiye/edirne/kulturenvanteri/tekel-binasi- (Erişim tarihi: 16.09.2025)
[17] Baynazoğlu, M.E., Uzunköprü Kent Müzesi, (N. Kozak, Ed.), *Online Türkiye Turizm Ansiklopedisi*, 2019. https://turkiyeturizmansiklopedisi.com/uzunkopru-kent-muzesi (Erişim Tarihi: 22.11.2025)



**Görsel 22.** Uzunköprü Kent Müzesi, 2025 (https://www.edirnehaber.com/haber/24437207/uzunkopru-kent-muzesi-bayramda-ziyaretcilerini-bekliyor, Erişim tarihi: 16.09.2025)

Urla Tekel Binası (Arditi Köşkü), İzmir İli, Urla İlçesi, Yelaltı Mahallesi, 3235 Ada, 20 Parselde yer almaktadır.[18] (**Görsel 23**) 19. yüzyılın ikinci yarısında Arditi ailesinin konutu olarak inşa edilen yapı 1930'lu yıllarda ailenin Urla'dan ayrılmasıyla bir süre boş kalmış, daha sonra hükümet konağı, adliye binası ve 1950'lili yılarda Tekel binası olarak hizmet vermiştir. İlk başta tütün deposu, 1970'li yıllarda da arazisine ambar binası eklenmesiyle idari ofis ve lojman olarak kullanılmıştır (Aydın vd., 2015, 14). 1992 yılında bina, 1999 yılında da günümüze ulaşmayan ambar yapısı tescillenmiştir. 2013 yılında çıkan yangında büyük ölçüde hasar gören yapı Urla Belediyesi tarafından restore edilerek Urla Belediyesi Kent Tarihi ve Arşivi (UKTA) Binası olarak kullanıma açılmıştır.[19] (**Görsel 24**)



**Görsel 23.** Urla Tekel Binası (https://ukta.com.tr/konum/16/arditi-kosku-tekel-binasi#gallery-2, Erişim tarihi: 10.06.2025)



**Görsel 24.** Urla Belediyesi Kent Tarihi ve Arşivi (UKTA) Binası (https://ukta.com.tr/konum/16/arditi-kosku-tekel-binasi#gallery-1, Erişim tarihi: 10.06.2025)

Artvin Tekel Müdürlük Binası Artvin İli, Merkez İlçesi, Çarşı Mahallesi, 27-30 V/B Pafta, 7 Ada, 650 Parselde yer almaktadır (**Görsel 25**). Giriş kapısının üstündeki kitabeye göre 1908 yılında kamu binası olarak kullanılmak üzere inşa edildiği düşünülmektedir. Bir dönem Tekel

[18] https://parselsorgu.tkgm.gov.tr/#ara/idari/150862/3235/20/1751223167025 (Erişim tarihi: 29.06.2025)
[19] https://ukta.com.tr/konum/16/arditi-kosku-tekel-binasi (Erişim tarihi: 10.06.2025)

binası olarak kullanılan yapı 1982 yılında tescillenmiş, 2012 yılında restore edildikten sonra günümüzde özel mülk olarak kullanılmaktadır (**Görsel 26**) (Demirel, 2020, 15, 71).





**Görsel 25.** Artvin Tekel Müdürlük Binası, **Görsel 26.** Özel mülk (Demirel, 2020)

Isparta Tekel Müdürlüğü Binası, Isparta İli, Merkez İlçesi, Kepeci Mahallesi, Halil Paşa Caddesi üzerinde yer almaktadır (**Görsel 27**). 1958-1960 yılları arasında inşa edilen yapı, 2006 yılında İl Kültür ve Turizm Müdürlüğü'ne devredilmiş, 2008 yılında yıkılmıştır. 2010 yılında ise bu arsa üzerine İl Kültür ve Turizm Müdürlüğü Hizmet Binası inşa edilmiştir (Çelebi, 2011, 194-195).



**Görsel 27.** Isparta Tekel Müdürlüğü Binası (Çelebi, 2011)

### 2.3. İdare Memurlukları

**Çizelge 3. İdare Memurlukları ve Bağlı Bulunduğu Başmüdürlükler (R. Teke, 2025)**

| | **İdare Memurlukları** | **Bağlı Bulunduğu Başmüdürlük** |
|---|---|---|
| **1.** | Seyitgazi Tekel Binası (Eski Hükümet Konağı) | Eskişehir Başmüdürlüğü |
| **2.** | İznik Tekel Binası | Bursa Başmüdürlüğü |

Bu çalışma kapsamında ulaşılan en eski tarihli yapı Osmanlı dönemi arşiv belgelerine göre 1883 yılı öncesinde inşa edilen Seyitgazi Tekel Binası (Eski Hükümet Konağı)'dır. Eskişehir İli, Seyitgazi İlçesi, İkiçeşme Mahallesi, 5058 Ada, 5 Parselde yer almaktadır.[20] (**Görsel 28**) 1883 yılı öncesi ve Erken Cumhuriyet döneminde hükümet konağı olarak kullanılan yapı 1940-1950'lilerde Tekel Genel Müdürlüğü kullanımına verilmiştir. 2008 yılında geçirdiği yangın sonucunda bir ve ikinci katı yanmış, 2018 yılında Seyitgazi Belediyesi tarafından cephedeki açıklıkları, pencere ve kapı tipleri özgün hali esas alınarak yeniden inşa edilmiştir. Günümüzde konuk evi olarak kullanılmaktadır (**Görsel 29**) (Elmas, 2020, 60).



**Görsel 28.** Seyitgazi Tekel Binası (https://www.patinamimarlik.com.tr/seyitgazi-tekel-binasi?pgid=jqv05yrj-4421e36b-d239-41f8-8439-4ea73b05a070, Erişim tarihi: 28.06.2025)



**Görsel 29.** Konukevi, 2019 (Elmas, 2020)

İznik Tekel Binası, Bursa İli, İznik İlçesi, Yeni Mahallesi, Kılıçarslan Caddesi üzerinde yer almaktadır.[21] (**Görsel 30**) 1927 yılında İznik Hükümet Konağı olarak kamu binası amacıyla yapılmıştır. Uzun dönem Tekel binası olarak kullanılan yapı 2007 yılında restorasyon geçirmiştir. Günümüzde zemin kat İlçe Nüfus Müdürlüğü ve Yazı İşleri Müdürlüğü, birinci kat İznik Kaymakamlığı, konferans ve sergi salonu olarak kullanılmaktadır (Özer, 2024, 114). (**Görsel 31**)





[20] https://parselsorgu.tkgm.gov.tr/#ara/idari/32260/5058/5/1751222585231 (Erişim tarihi: 29.06.2025)
[21] https://maps.app.goo.gl/muogC2tPAs7NBTfSA (Erişim tarihi: 23.11.2025)

**Görsel 30.** İznik Tekel Binası (Özer, 2024)

**Görsel 31.** İznik Kaymakamlığı, 2013 (https://maps.app.goo.gl/5xWWzPY5H4Bnnw3G7, Erişim tarihi: 23.11.2025)

## 3. SONUÇ

Yapılan araştırmalar sonucunda Tekel Müdürlüğü olmak üzere 11 Başmüdürlük binası, 4 İdare Müdürlüğü binası ve 2 İdare Memurluğu binasına ulaşılmıştır.

Tekelin özelleştirilmesi ile binalar yönetim binası olarak işlevini yitirmiş ve farklı amaçlar için kullanılmak üzere yeni işlevler verilmiştir. Günümüzde bu yapılar turizm tanıtım merkezi (Manisa Tekel Binası), vakıf binası (Ankara İnhisarlar (Tekel) Başmüdürlük Binası), kent tarihi ve arşivi binası (Urla Tekel Binası (Arditi Köşkü), konut (Artvin Tekel Müdürlük Binası), sanat galerisi (Konya İnhisarlar (Tekel) İdare Binası), kaymakamlık (İznik Tekel Binası, Balıkesir Tekel İdare Binası, Diyarbakır Tekel Müdürlük Binası), PTT (Kastamonu Tekel Binası), banka (Afyonkarahisar Tekel Binası), konukevi (Seyitgazi Tekel Binası (Eski Hükümet Konağı), müze (Uzunköprü Tekel Binası), otel (İzmir Tekel Başmüdürlük Binası), savat evi ve müze (Van Tekel Binası), ticari işlev-mağaza (Antalya Tekel Başmüdürlük Binası), şirket binası (Kars Tekel Binası)'na dönüştürülmüştür. Bu işlevler binanın konumu, büyüklüğü ve mekânsal esnekliğine bağlı olarak çeşitlilik göstermiştir. Isparta Tekel Müdürlüğü Binası ise günümüze ulaşamamıştır.

Bu yapılardan İzmir Tekel Başmüdürlük Binası, Ankara İnhisarlar (Tekel) Başmüdürlük Binası, Konya İnhisarlar (Tekel) İdare Binası, Balıkesir Tekel İdare Binası, Afyonkarahisar Tekel Binası, Van Tekel Binası, Kastamonu Tekel Binası, Diyarbakır Tekel Müdürlük Binası, Antalya Tekel Başmüdürlük Binası, Isparta Tekel Müdürlüğü Binası, Tekelin yönetim binası işlevi amacıyla inşa edilmiştir (**Çizelge 4**).




**Çizelge 4. Tekel Yönetim Binası İşlevi Amacıyla İnşa Edilen Yapılar ve Yeni İşlevleri (R. Teke, 2025)**

| | **Tekel Binası** | **Yeni İşlev** |
|---|---|---|
| **Başmüdürlükler** | İzmir Tekel Başmüdürlük Binası | Otel |
| | Ankara İnhisarlar (Tekel) Başmüdürlük Binası | Yunus Emre Enstitüsü Genel Merkezi |
| | Konya İnhisarlar (Tekel) İdare Binası | Sanat Galerisi (Depo No: 4) |
| | Balıkesir Tekel İdare Binası | Altıeylül Kaymakamlığı |
| | Afyonkarahisar Tekel Binası | Banka |

| | | |
|---|---|---|
| | Van Tekel Binası | Savat Evi ve Müze |
| | Kastamonu Tekel Binası | PTT |
| | Diyarbakır Tekel Müdürlük Binası | Yenişehir Kaymakamlığı |
| | Antalya Tekel Başmüdürlük Binası | Mağaza |
| **İdare Müdürlükleri** | Isparta Tekel Müdürlüğü Binası | 2008 yılında yıkılarak yerine İl Kültür ve Turizm Müdürlüğü Hizmet Binası inşa edilmiştir. |

Tekelin yönetim binası işlevi amacıyla yapılmış olan binaların yanı sıra Seyitgazi Tekel Binası (Eski Hükümet Konağı), Uzunköprü Tekel Binası, Urla Tekel Binası (Arditi Köşkü), Artvin Tekel Müdürlük Binası, Manisa Tekel Binası ve İznik Tekel Binası gibi başka bir amaç için inşa edilmiş yapılar ile de karşılaşılmıştır. Seyitgazi Tekel Binası ve İznik Tekel Binası hükümet konağı, Uzunköprü Tekel Binası ve Urla Tekel Binası (Arditi Köşkü) konut, Artvin Tekel Müdürlük Binası kamu binası, Manisa Tekel Binası yurt amacıyla kullanılmak üzere yapılmıştır. İlerleyen yıllarda bu yapılar Tekel Genel Müdürlüğü'ne tahsis edilmiştir (**Çizelge 5**).




**Çizelge 5. Tekelin Başka Bir Amaç İçin İnşa Edilen Yapıları ve Yeni İşlevleri (R. Teke, 2025)**

| | **Özgün Bina** | **Tekel Binası** | **Yeni İşlev** |
|---|---|---|---|
| **Başmüdürlükler** | Yurt | Manisa Tekel Binası | İl Kültür ve Turizm Müdürlüğü Hizmet Binası ve Turizm Tanıtım Merkezi |
| **İdare Müdürlükleri** | Konut | Uzunköprü Tekel Binası | Uzunköprü Kent Müzesi |
| | Konut | Urla Tekel Binası (Arditi Köşkü) | Urla Belediyesi Kent Tarihi ve Arşivi (UKTA) Binası |
| | Kamu Binası | Artvin Tekel Müdürlük Binası | Özel Mülkiyet |
| **İdare Memurlukları** | Hükümet Konağı | Seyitgazi Tekel Binası (Eski Hükümet Konağı) | Konukevi |
| | Hükümet Konağı | İznik Tekel Binası | İznik Kaymakamlığı |

Çalışma kapsamında ulaşılan en eski tarihli yapı Osmanlı dönemi arşiv belgelerine göre 1883 yılı öncesinde inşa edilen Seyitgazi Tekel Binası (Eski Hükümet Konağı), en geç örnek 1950-1980 yılları arasında yapılan Antalya Tekel Başmüdürlük Binası'dır.

Binalara yeni işlev verilirken restorasyon çalışmaları sırasında Manisa Tekel Binası, Konya İnhisarlar (Tekel) İdare Binası, Balıkesir Tekel İdare Binası, Afyonkarahisar Tekel Binası, Van Tekel Binası, Diyarbakır Tekel Müdürlük Binası ve Kars Tekel Binası'nın PVC pencereleri ahşap doğramalar ile değiştirilmiştir.

Manisa Tekel Binası, İzmir Tekel Başmüdürlük Binası, Ankara İnhisarlar (Tekel) Başmüdürlük Binası ve Afyonkarahisar Tekel Binası köşe parsele inşa edilmiştir. Manisa Tekel Binası ve İzmir Tekel Başmüdürlük Binası'nın köşeleri pahlanmış, Ankara İnhisarlar (Tekel) Başmüdürlük Binası'nın köşesi çokgen planlıdır. Afyonkarahisar Tekel Binası'nın ise güneydoğu cephesi yuvarlatılarak köşe parsele uyarlanmıştır.

İzmir Tekel Başmüdürlük Binası, İznik Tekel Binası, Ankara İnhisarlar (Tekel) Başmüdürlük Binası ve Balıkesir Tekel İdare Binası'nın cephelerinde görülen çini süslemeciliği, kemerler ve geniş saçaklar vb. I. Ulusal Mimarlık akımı üslubundadır.

Konya İnhisarlar (Tekel) İdare Binası'nın giriş cephesinde görülen ters "T" biçimli cephe çıkma Clemens Holzmeister'in esintileri olarak düşünülebilir.

Diyarbakır Tekel Müdürlük Binası'nda bölgenin iklim şartlarına uygun avlulu ve geleneksel mimariden izler taşıyan bir üslup tercih edilmiştir.

Günümüzde bir mağaza olarak kullanılan Antalya Tekel Başmüdürlük Binası'nın cepheleri reklam panoları ve kompozit kaplama ile çevrelenmiş ve yapı kimliğini büyük ölçüde kaybetmiştir.

Kübik formu ile dikkat çeken Isparta Tekel Müdürlüğü Binası'nın yıkılması ise toplumsal bellek adına büyük bir kayıptır.

İnşa edildiği kentin mimari, sosyal ve kültürel gelişimi hakkında bilgiler veren ve bugün kent hafızasında önemli bir yer tutan Tekel yönetim binaları şehirlerin simgesel yapısı arasında yer alır. Tekel yönetim binaları Türkiye'nin birçok il ve ilçesine inşa edilen denetleyici ve idari yapılardır. Bu yapılar sadece idari ve denetleyici yapılar değil aynı zamanda dönemin ekonomik ve sosyal politikalarının, mimari ve devletçilik anlayışının somut birer göstergeleri olmuştur. Bu nedenle Tekel binalarının korunması ve yeniden işlevlendirilmesi kentsel hafıza ve mimari kimlik bağlamında çok katmanlı bir değere sahiptir.

Uygun koruma yöntemleri ile ele alındığında Tekel binaları, yalnızca fiziksel bir yapı olarak değil aynı zamanda toplumsal hafızanın geleceğe taşınmasına yardımcı olan kamusal mekanlar olarak da işlev görebilir. Bu sebeple Tekel mirasının korunması ve sürdürülebilirliğinin sağlanması kültürel miras alanına da önemli katkı sunar.

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# EL RUHA

## 13th INTERNATIONAL CONFERENCE ON SCIENTIFIC RESEARCH



02-07/2025
JULY
Sharm El Sheik, Egypt

# PROCEEDINGS BOOK

Editors:
Prof. Dr. Omer S.M. Jomah
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# EL RUHA

## 13th INTERNATIONAL CONFERENCE ON SCIENTIFIC RESEARCH

**July 2-7, 2025 / Sharm El Sheik, Egypt**

# CONGRESS PROCEEDINGS BOOK

*EDITOR*

Prof. Dr. Omer S.M. Jomah
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# CONGRESS ID

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EL RUHA 13th INTERNATIONAL CONFERENCE ON SCIENTIFIC RESEARCH

## DATE and PLACE

July 2-7, 2025 / Sharm El Sheik, Egypt

## ORGANIZATION

IKSAD-Institute of Economic Development and Social Research, Türkiye

## CONGRESS COORDINATOR

**Samira KHADHRAOUI ONTUNC**
IKSAD-Institute of Economic Development and Social Research, Türkiye

## NUMBER of ACCEPTED PAPERS-**221** *(Türkiye- 102, Other Countries- 11S)*

## NUMBER of REJECTED PAPERS-**23**

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# 04.07.2025 / 21:00-22:00

***10 minutes for each presentation***

| MODERATOR: Assoc. Prof. Dr. Ceren ORAK | | |
|---|---|---|
| **AUTHORS** | **UNIVERSITY** | **PAPER TITLE** |
| Assoc. Prof. Dr. Ceren ORAK | *Sivas University of Science and Technology, Türkiye* | LaTiO 3 PHOTOCATALYST FOR EFFICIENT WASTEWATER TREATMENT |
| Asst. Prof. Dr. Semra Zeren<br>Asst. Prof. Dr. Fatma Almaz | *Sivas Bilim ve Teknoloji University, Türkiye*<br>*Batman University, Türkiye* | INVARIANT AND ANTI-INVARIANT TOTALLY UMBILICAL SUBMANIFOLDS IN ALMOST POTENT MANIFOLDS |
| Mücahit ÇALIŞAN<br>Nevzat OLGUN<br>Gürkan GÜRGÖZE<br>Ferdi DOĞAN<br>Mehmet NERGİZ<br>İbrahim TÜRKOĞLU | *Bingöl University, Türkiye*<br>*Afyon Kocatepe University, Türkiye*<br>*Elazığ MEB, Türkiye*<br>*Adıyaman University, Türkiye*<br>*Dicle University, Türkiye*<br>*Fırat University, Türkiye* | OBJECT CLASSIFICATION IN NON-LINE-OF-SIGHT ENVIRONMENTS USING SYNCHRONOUS ACOUSTIC SIGNALS |
| *Nevzat OLGUN*<br>*Mücahit ÇALIŞAN*<br>*Gürkan GÜRGÖZE*<br>*Ferdi DOĞAN*<br>*Mehmet NERGİZ*<br>*İbrahim TÜRKOĞLU* | *Afyon Kocatepe University, Türkiye*<br>*Bingöl University, Türkiye*<br>*Elazığ MEB, Türkiye*<br>*Adıyaman University, Türkiye*<br>*Dicle University, Türkiye*<br>*Fırat University, Türkiye* | DETECTION OF THE HUMAN PRESENCE IN NON-LINE-OF-SIGHT ENVIRONMENTS WITH SIMULTANEOUS SOUND SIGNALS |
| *Asst. Prof. Dr. Fatma Almaz*<br>*Asst. Prof. Dr. Semra Zeren* | *Batman University, Türkiye*<br>*Sivas Bilim ve Teknoloji University, Türkiye* | THE ELECTROMAGNETIC VECTOR FIELDS ON SPECIAL SURFACES IN 4D SEMI-EUCLIDEAN SPACE |
| ***The question-and-answer session of the panel***<br>***30 minutes*** | | |

# 04.07.2025 / 22:00-23:45

***10 minutes for each presentation***

| MODERATOR: Prof. Dr. Yusuf SERT | | |
|---|---|---|
| **AUTHORS** | **UNIVERSITY** | **PAPER TITLE** |
| Lect. Semahat Merve TOP | *Karabük University, Türkiye* | EVALUATING BIOPHILIC DESIGN IN THE URBAN CONTEXT: A BIBLIOMETRIC ANALYSIS |
| Abdullah GÖKTAŞ<br>Sultan GÖKTAŞ | *Harran University, Türkiye* | IMPACT OF LA SUBSTITUTION ON THE STRUCTURAL AND PHOTOCATALYTIC PROPERTIES OF ZNS THIN FILMS |
| Prof. Dr. Yusuf SERT | *Yozgat Bozok University, Türkiye* | IN-SILICO ANALYSIS OF 5-CHLOROTHIOPHENE-2-SULFONAMIDE |
| Assoc. Prof. Tansu USKUTOĞLU<br>Prof. Dr. Belgin COŞGE ŞENKAL | *Pamukkale University, Türkiye*<br>*Yozgat Bozok University, Türkiye* | ROLE AND IMPORTANCE OF ENVIRONMENTAL FACTORS IN CULTIVATION OF MEDICINAL PLANTS |
| *Prof. Dr. Belgin COŞGE ŞENKAL* | *Yozgat Bozok University, Türkiye* | EVALUATION OF GERMINATION AND SEEDLING DEVELOPMENT PERFORMANCE OF SALVIA SCLAREA L. DEVELOPED BY USING EMS IN M3 GENERATION |
| *Prof. Dr. Yusuf SERT* | *Yozgat Bozok University, Türkiye* | DFT ANALYSIS OF 5-(THIOPHENE-2-SULFONYL) THIOPHENE-2-SULFONAMIDE |
| *Sultan GÖKTAŞ*<br>*Abdullah GÖKTAŞ* | *Harran University, Türkiye* | PHOTODEGRATION OF METHYLENE ORANGE VIA CUO BASED NANOSTRUCTURES: A MINI REVIEW |
| *Lect. Semahat Merve TOP* | *Karabük University, Türkiye* | SECTORAL APPLICATIONS OF ADDITIVE MANUFACTURING TECHNOLOGY AND ITS POTENTIAL IN THE CONSTRUCTION INDUSTRY |
| ***The question-and-answer session of the panel***<br>***30 minutes*** | | |

# BİYOFİLİK TASARIMIN KENTSEL BAĞLAMDA DEĞERLENDİRİLMESİ: BİR BİBLİYOMETRİK ANALİZ

**Semahat Merve TOP**

Arş. Gör., Karabük Üniversitesi, Mimarlık Bölümü, ORC-ID: 0000-0002-8400-824X

**ÖZET:** Biyofilik tasarım, mimari ve çevresel tasarım süreçlerinde insan ile doğa arasındaki bağın güçlendirilmesini ve doğal unsurların yapı ve mekân kurgusuna entegre edilmesini esas alan bir yaklaşımdır. Bu çalışma, biyofilik tasarımın kentsel bağlamdaki gelişimini ortaya koymak amacıyla, 2010–2025 yılları arasında Web of Science veri tabanında yayımlanan 62 akademik yayını bibliyometrik ve içerik analizi yöntemleriyle incelemektedir. Bibliyometrik analiz bulguları, yıllık ortalama %12,69'luk yayın artışı ve yayın başına ortalama 9,03 atıf ile biyofilik tasarıma yönelik akademik ilginin son yıllarda belirgin biçimde arttığını göstermektedir. Yayınların büyük çoğunluğu Amerika Birleşik Devletleri kaynaklı olsa da, en yüksek atıf sayısı Avustralya'ya aittir. İçerik analizi bulguları doğrultusunda biyofilik tasarımın dört ana tema çerçevesinde ele alındığı belirlenmiştir: (1) biyofilik algı ve doğa deneyimi, (2) eğitim ve çevresel davranış, (3) yer ile kurulan bağ ve kültürel kimlik, (4) iklim değişikliği ve sürdürülebilirlik. Bu temalar kapsamında, doğayla çok katmanlı etkileşim, pedagojik ortamlarda doğa temelli mekânların etkisi, yerel kimlik ve aidiyet duygusunun güçlendirilmesi ile iklim krizine karşı biyofilik stratejilerin çok işlevli katkıları analiz edilmiştir. Elde edilen bulgular, biyofilik tasarımın yalnızca estetik ya da çevresel değil, aynı zamanda sosyal bütünleşme, sağlık, psikolojik iyilik hâli ve iklim adaptasyonu gibi pek çok kentsel dinamiği dönüştüren bütüncül bir yaklaşım olduğunu ortaya koymaktadır. Bu kapsamda çalışma, gelecekteki araştırmaların biyofilik şehircilik, politika geliştirme, çevre eğitimi ve toplumsal katılım gibi alanlarda disiplinler arası yaklaşımlarla derinleştirilmesi gerektiğini vurgulamaktadır.

**Anahtar Kelimeler:** Biyofilik tasarım, sürdürülebilir şehirler, kentsel tasarım, esnek kent, bibliyometrik analiz

## EVALUATING BIOPHILIC DESIGN IN THE URBAN CONTEXT: A BIBLIOMETRIC ANALYSIS

**ABSTRACT:** Biophilic design is an architectural and environmental design approach that emphasises strengthening the connection between humans and the natural world and integrating natural elements into design processes. Recently, interest in biophilic design has grown significantly among architects, planners and urban designers. This approach argues that good design should incorporate nature and natural elements and has the potential to increase human productivity and reduce stress based on the results of studies on environmental psychology. This paper presents a bibliometric analysis to assess the use of biophilic design in urban areas. Using the Web of Science database, studies between 2010 and 2025 are analysed, and 57 publications are found. According to the analysis results, the importance and relevance of biophilic design in the urban context are increasing. The most prolific authors include T. Beatley, while the most cited authors are M. Brengman, Y. Joye, K. Willems and K. Wolf. The United States has the most articles, while Australia is the most cited country. This analysis reveals the potential of biophilic design to improve the sustainability of cities and the quality of human life. The articles highlight biophilic design applications in urban areas, the integration of natural elements and landscape into urban spaces, and the interaction of humans with nature. Furthermore, there is a growing interest in the positive impacts of biophilic design on environmental sustainability and human health. This study highlights the importance of biophilic design in the urban context and its use as a growing area of research. Future research can offer new perspectives on integrating this design approach more effectively in urbanisation by focusing on biophilic urban planning, community engagement and natural space design.

**Keywords:** Biophilic design, sustainable cities, urban design, resilient city, bibliometric analysis

## 1. GİRİŞ

Biyofilik tasarım, mimari ve çevre tasarımında, doğal dünya ile insanlar arasındaki bağlantının güçlendirilmesi

ve doğal unsurların tasarım süreçlerine dahil edilmesini içeren bir yaklaşımdır. Bu tasarım yaklaşımı, insanların doğal ortamlarda kendilerini daha iyi hissetmelerini ve sağlıklarını desteklemeyi amaçlar. "Biyofilik" terimi, "bio" (yaşam) ve "philia" (sevgi) kelimelerinin birleşimiyle oluşmuştur ve aslen "doğaya olan sevgi" anlamına gelir. Bu kavram, insanların doğayla derin ve doğal bir bağa sahip olduğunu ve doğal unsurların varlığının insan sağlığı ve refahı üzerinde olumlu etkileri olduğunu belirtir. Biyofilik tasarım, şehirlerden iç mekanlara kadar çeşitli ölçeklerde uygulanabilir ve içerisine doğal ışık, bitki örtüsü, doğal malzemeler ve doğal peyzaj unsurları gibi doğal öğeleri dahil ederek, insanların yaşam alanlarında doğayla etkileşimini arttırır. Biyofilik tasarım aynı zamanda estetik ve duyusal deneyimlerin yanı sıra insanların stresi azaltmasına, konsantrasyonlarını arttırmasına ve genel ruh hallerini iyileştirmesine yardımcı olabilir.

Biyofilik tasarım, doğayı mekâna yalnızca görsel bir unsur olarak eklemekten öte, insanın doğayla olan ilişkisini fiziksel, psikolojik ve duygusal düzeylerde yeniden kurmayı hedefleyen bir yaklaşımdır. Bu yönüyle, geleneksel tasarım yöntemlerinden ayrılır ve doğanın doğrudan deneyimlenmesini merkeze alır. Günümüz şehir yaşamında bireylerin büyük oranda yapılı çevrelerde vakit geçirmesi, doğayla kurulan bağın zayıflamasına ve bunun sonucunda ekolojik ve duyusal yoksunlukların ortaya çıkmasına neden olmaktadır (Kellert, 2012). Nitekim gelişmiş ülkelerde yaşayan bireylerin yaklaşık %80'inin yoğun kent merkezlerinde ikamet ettiği ve zamanlarının %90'ını kapalı ortamlarda geçirdiği dikkate alındığında, doğayla kurulan ilişkinin giderek azaldığı açıkça görülmektedir. Bu bağlamda biyofilik tasarım, modern kent yaşamında sıkışıp kalan bireyler için bir lüks değil, temel bir ihtiyaç haline gelmiştir.

Kentleşmenin hızla artması, doğal kaynakların tükenmesi ve çevreyle olan bağların zayıflaması insan sağlığı üzerinde ciddi etkiler yaratmakta; bireylerin doğa özlemini ve doğayla bütünleşmiş yaşam alanlarına yönelik arayışlarını giderek derinleştirmektedir. Bu nedenle doğa temelli mimari anlayışlara olan ilgi, hem akademik literatürde hem de tasarım pratiğinde artarak devam etmektedir. Biyofilik tasarım, çevresel psikoloji alanındaki çalışmalarla da desteklenen biçimde, stresin azaltılması, zihinsel iyilik halinin artırılması ve üretkenliğin teşvik edilmesi gibi faydaları ile dikkat çekmektedir. Bu tasarım yaklaşımı, sadece mekânların fiziksel düzenlemeleriyle sınırlı kalmamakta, aynı zamanda kullanıcıların beş duyusuna hitap eden ve atmosferin iyileştirilmesini hedefleyen mekân kurguları oluşturmaktadır. Doğal ışık, bitki örtüsü, doğal sesler ve dokular gibi unsurlar aracılığıyla oluşturulan bu mekânlar, bireylerde hem sakinlik hissi uyandırmakta hem de "iyi olma halini" desteklemektedir.

Biyofilik tasarım, bina, site, şehir ve bölge ölçeğinde doğanın yapılı çevreyle bütünleştirilmesini savunur. Bu yaklaşım, Edward Wilson'ın "biyofili hipotezi"ne dayanan doğa sevgisi fikrini temel almakta olup, Stephen Kellert tarafından mimarlık literatürüne uyarlanmıştır (Wilson, 1984; Wilson, 2007). Kellert (2008), biyofilik tasarımın mekâna entegre edilebilmesi için altı temel tasarım öğesi belirlemiştir: çevresel özellikler, doğal şekil ve formlar, doğal desenler ve süreçler, ışık ve mekân, yer temelli ilişkiler ve insan-doğa etkileşimi. Bu öğeler, yalnızca görsel deneyimi değil, doğayla kurulan çok katmanlı ve duyusal ilişkinin de yeniden inşasını mümkün kılmaktadır. Özellikle yoğun kentleşmeye maruz kalan şehirlerde, bu tür tasarım stratejileri doğa yoksunluğunun azaltılması ve insan-doğa bağının yeniden güçlendirilmesi açısından hayati önem taşımaktadır.

Günümüzde mimarlar, şehir plancıları ve tasarımcılar biyofilik tasarıma artan bir ilgi göstermektedir. Bu ilgi, yalnızca estetik kaygılardan değil, aynı zamanda kentlerde yaşayan bireylerin psikolojik ve fiziksel sağlığını gözeten bütüncül bir yaşam kalitesi anlayışından kaynaklanmaktadır. Doğayla bütünleşik yaşam alanlarına yönelik ihtiyaç, teknolojik ve bilimsel gelişmelerin sunduğu yeni deneyimleme biçimleriyle şekillenmeye devam etmektedir. Bu doğrultuda, doğa ile daha derin, çok yönlü ve kalıcı ilişkiler kurabilen mekân tasarımlarının gelecekte daha da yaygınlaşacağı öngörülmektedir. Sonuç olarak, biyofilik tasarım sadece sürdürülebilirlik perspektifinden değil, aynı zamanda insan-merkezli ve sağlıklı kentlerin inşası açısından da vazgeçilmez bir tasarım paradigması olarak öne çıkmaktadır.

Bu makale, biyofilik tasarımın kentsel alanlarda kullanımını değerlendirmek amacıyla bir bibliyometrik analiz sunmaktadır. Bibliyometri, bilimsel alanların veya disiplinlerin yapısını ve gelişimini değerlendirmek için kullanılan bir yöntemdir. Bu yöntem, belirli disiplinlerin gelişimini haritalandırmak ve analiz etmek amacıyla kullanılmaktadır (Boyack, Klavans ve Börner, 2005). Bibliyometrik araştırmalar, çeşitli istatistiksel teknikler kullanılarak elde edilen verileri değerlendirir (McBurney ve Novak, 2002). Bu değerlendirmeler, yayın yılları, araştırma temaları, yazarlar, kurumlar, kullanılan anahtar kelimeler, alıntılar, yöntemler ve örneklem gibi çeşitli araştırma parametreleri etrafında gerçekleştirilir. Bu incelemeler, bilim dalı, kitap, dergi, bildiri, kurum, ülke vb. unsurların mevcut durumunu ve zaman içindeki gelişimini değerlendirmek için bulgular ve tespitlerle birlikte yapılır (Pritchard, 1969). Ayrıca, çeşitli bibliyometrik göstergeler aracılığıyla ülkelerin, üniversitelerin, enstitülerin bilimsel yayın yapma davranışları ve dinamikleri de belirlenebilir (Pechlaner, Zehrer, Matzler ve

Abfalter, 2004). Bu çalışma, sistematik bir literatür taraması yürüterek Biyofilik Tasarımın Kentsel Bağlamda Değerlendirilmesi yapılacaktır. Bu amaca yönelik olarak ilk olarak dijital bibliyografik veritabanlarında arştırma kapsamına göre sistematik bir arama yapılacak, sonrasında kentsel çalışmalar alanında biyofilik tasarımın Bibliyometrik analizi yapılacaktır.

## 2. Yöntem

Bu çalışma, biyofilik tasarımın kentsel bağlamdaki bilimsel literatürdeki mevcut durumunu analiz etmeyi amaçlayan bibliyometrik bir araştırmadır. Çalışma kapsamında, literatür taraması için Web of Science (WoS) veri tabanı tercih edilmiştir. Bu veri tabanı, farklı disiplinlerden akademik ve bilimsel yayınlara erişim sağlayan, uluslararası düzeyde kabul görmüş, güvenilir bir kaynak olma özelliği taşımaktadır.

Araştırma alanı, biyofilik tasarımın kent ölçeğindeki kullanımına odaklanacak şekilde sınırlandırılmıştır. Bu doğrultuda, tarama sırasında başlık, özet ve anahtar kelimeler içerisinde geçen şu ifadeler kullanılmıştır: "biophilic cit", *"biophilic urban", "biophilic design" ve "biophilic" (Tablo 1). Bu şekilde, yalnızca kent ölçeğinde yapılan çalışmalara odaklanılmıştır. Arama dili olarak İngilizce seçilmiş, yıl aralığı ise literatürdeki güncel eğilimleri değerlendirebilmek amacıyla 2010 ile 2025 yılları arasında sınırlandırılmıştır. Belge türü olarak ise "article", "review", "book chapter" ve "proceedings paper" türündeki yayınlar dahil edilmiş ve toplam 62 adet yayına ulaşılmıştır.

Elde edilen bibliyometrik verilerin analizi ve görselleştirilmesi amacıyla, iki farklı yazılım aracı kullanılmıştır: VOSviewer ve Bibliometrix (R Studio eklentisi). VOSviewer, anahtar kelime eşleşmeleri, ortak yazarlar, işbirliği ağları ve literatür kümelenmeleri gibi bilimsel ilişkileri haritalamak için kullanılırken; Bibliometrix ise yayın eğilimleri, yıllara göre üretkenlik, en çok atıf alan çalışmalar ve ülkeler arası dağılım gibi metriksel analizlerin yapılmasına olanak sağlamıştır.

Bibliyometrik analiz, en çok atıf alan ülkeler, yıllara göre yayın sayısı, ülkelerin toplam yayın sayıları, araştırma alanı, yayınlan platformu, kullanılan anahtar kelimeler ve içerik analizi gibi çeşitli parametreler üzerinden gerçekleştirilmiştir. Bu analizle, biyofilik tasarımın kentsel bağlamına yönelik mevcut literatürün durumu ayrıntılı olarak değerlendirilmiştir.

**Tablo 1:** Araştırmanın yöntemi

| **Araştırmanın Tasarımı** | **Literatür Taramasının Analizi** | **Sonuç ve Tartışma** |
|---|---|---|
| ·Arama kaynağının belirlenmesi (Web of Science)<br>·Yazılım programının belirlenmesi (VOSviewer, Biblioshiny)<br>·Araştırma kriterlerinin belirlenmesi (Anahtar kelime, Araştırma alanı) | Anahtar kelime, Atıf, Yayın Platformu, Ülke, Yıl, Araştırma Alanı | Makalelerin sistematik incelenmesi ve sonuçların değerlendirilmesi |

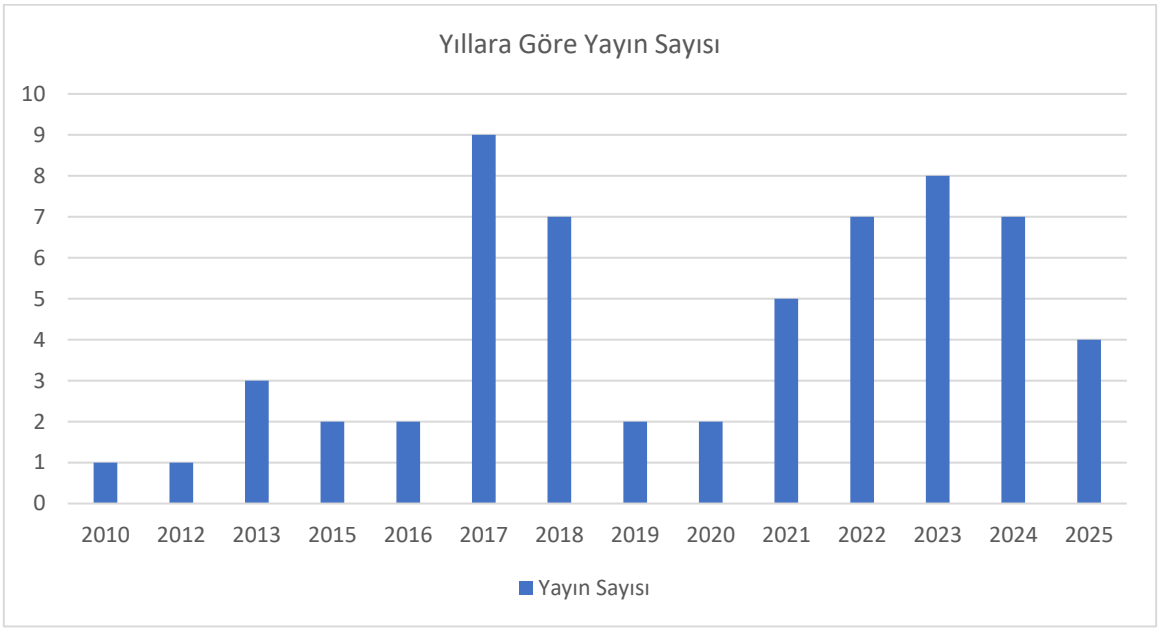
## 3. Analiz Sonuçları

Bu çalışmanın yöntemsel çerçevesinde, nicel araştırma yaklaşımlarından biri olan **bibliyometrik analiz yöntemi** kullanılmıştır. Bu kapsamda, literatürde yer alan yayınlar; yayımlandıkları ülke, atıf sayısı, anahtar kelimeler, yayın dili, yıl gibi belirli bibliyometrik değişkenler doğrultusunda sistematik biçimde incelenmiştir (Al & Coştur, 2007). Yapılan analizler aracılığıyla, ilgili alandaki literatürün mevcut durumu somut verilerle ortaya konmakta; çalışma konusunun tarihsel gelişimi, araştırma eğilimleri ve öne çıkan tematik alanlar belirlenmektedir. Böylece, alandaki güncel boşluklar ve karşılaşılan yapısal sorunlar tespit edilerek, gelecekte

yapılacak araştırmalara yön verebilecek bilgi temelli öneriler sunulması amaçlanmaktadır.

### 3.1. Yıllık Yayın Analizi

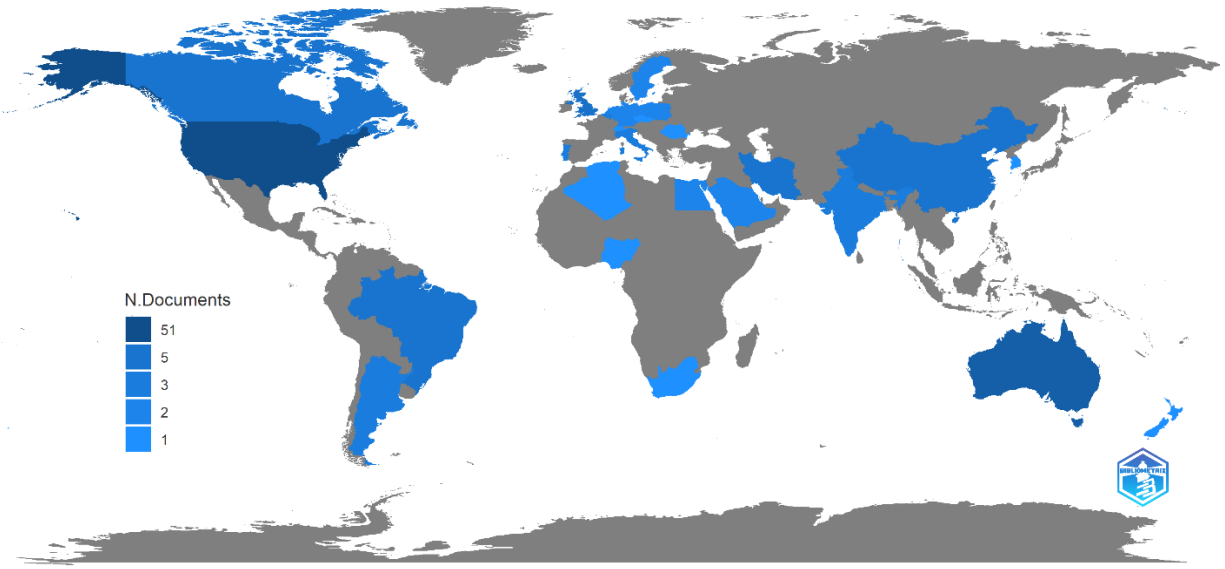
Araştırmaların yıllara göre dağılımı, belirli bir konunun akademik literatürde zaman içerisinde nasıl geliştiğini, ilgi düzeyindeki değişimleri ve araştırma eğilimlerini ortaya koyması açısından önemli bir göstergedir. Bu bağlamda, **Şekil 1**'de 2010–2025 yılları arasında biyofilik tasarım ve kent bağlamında gerçekleştirilen yayınların yıllara göre dağılımı sunulmaktadır. Grafik incelendiğinde, özellikle **2017 ve 2018 yıllarında** bu alandaki akademik üretimde dikkat çekici bir artış yaşandığı görülmektedir. Bu artış, biyofilik tasarımın kentsel çalışmalarda giderek daha fazla ilgi gördüğünü ve araştırma gündeminde ön plana çıkmaya başladığını göstermektedir.




**Şekil 1:** Yayınların Yıllara Göre Dağılımı (Kaynak: WOS)

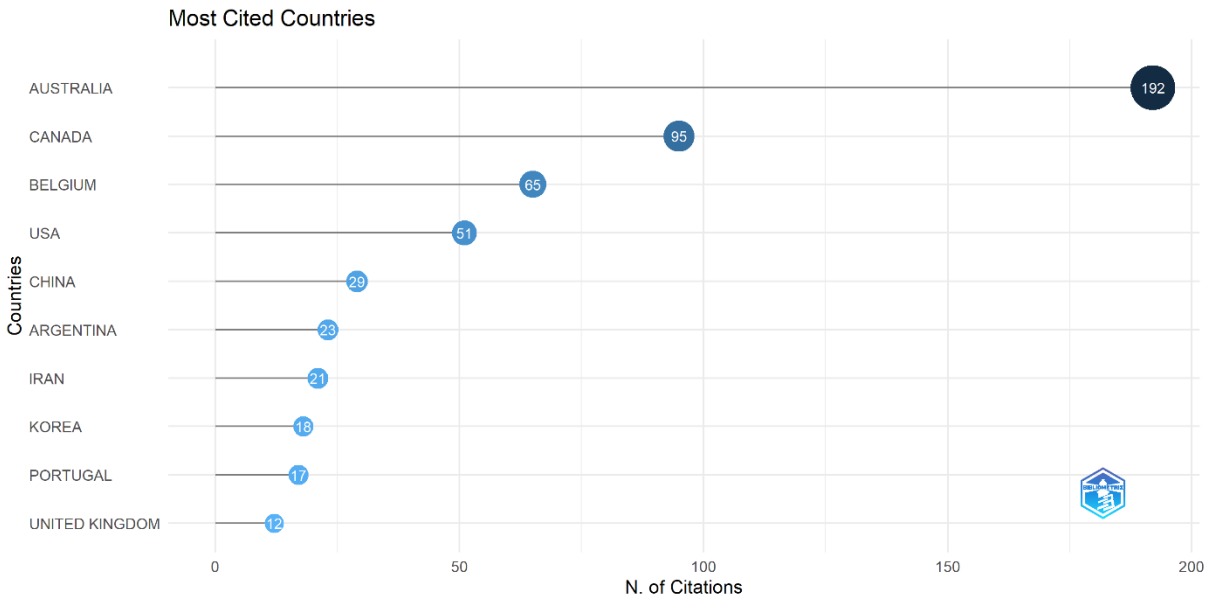
### 3.2. Ülke Analizi

Ülkelere göre yayın dağılımının analizi, çalışılan konunun hangi coğrafyalarda daha fazla önemsendiğini ve akademik ilgi gördüğünü ortaya koyması açısından büyük önem taşımaktadır. Bu çalışmada incelenen toplam **62 yayın**, **26 farklı ülkede** üretilmiştir (**Şekil 2**). Yayın üretiminde **Amerika Birleşik Devletleri** açık ara önde olup, **51 yayınla** ilk sırada yer almaktadır. ABD'yi **18 yayınla Avustralya**, ardından ise **6 yayınla Birleşik Krallık** izlemektedir. Bu dağılım, biyofilik tasarımın kent ölçeğinde ele alınmasına yönelik akademik üretimin özellikle belirli ülkelerde yoğunlaştığını göstermekte; aynı zamanda söz konusu ülkelerin, kentsel biyofilik yaklaşımların araştırılması ve uygulanmasında öncü bir konumda olduklarını ortaya koymaktadır.




**Şekil 2:** Ülkelere Göre Yayın Sayısının Dağılımı (Kaynak: Bibliometrix)

**Şekil 3**, biyofilik tasarımın kentsel bağlamda ele alındığı literatürde en fazla atıf alan ilk **10 ülkeyi** göstermektedir. Atıf sayıları, ülkelerin yalnızca yayın üretiminde değil, aynı zamanda bu yayınların akademik etki düzeyinde de nasıl konumlandığını ortaya koymaktadır. Bu kapsamda, **Avustralya**, toplam **192 atıf** ile ilk sırada yer almakta; onu **95 atıfla Kanada** ve **65 atıfla Belçika** izlemektedir. Bu sıralama, söz konusu ülkelerdeki çalışmaların alan yazında yüksek düzeyde referans alarak literatüre önemli katkılar sunduğunu göstermektedir.

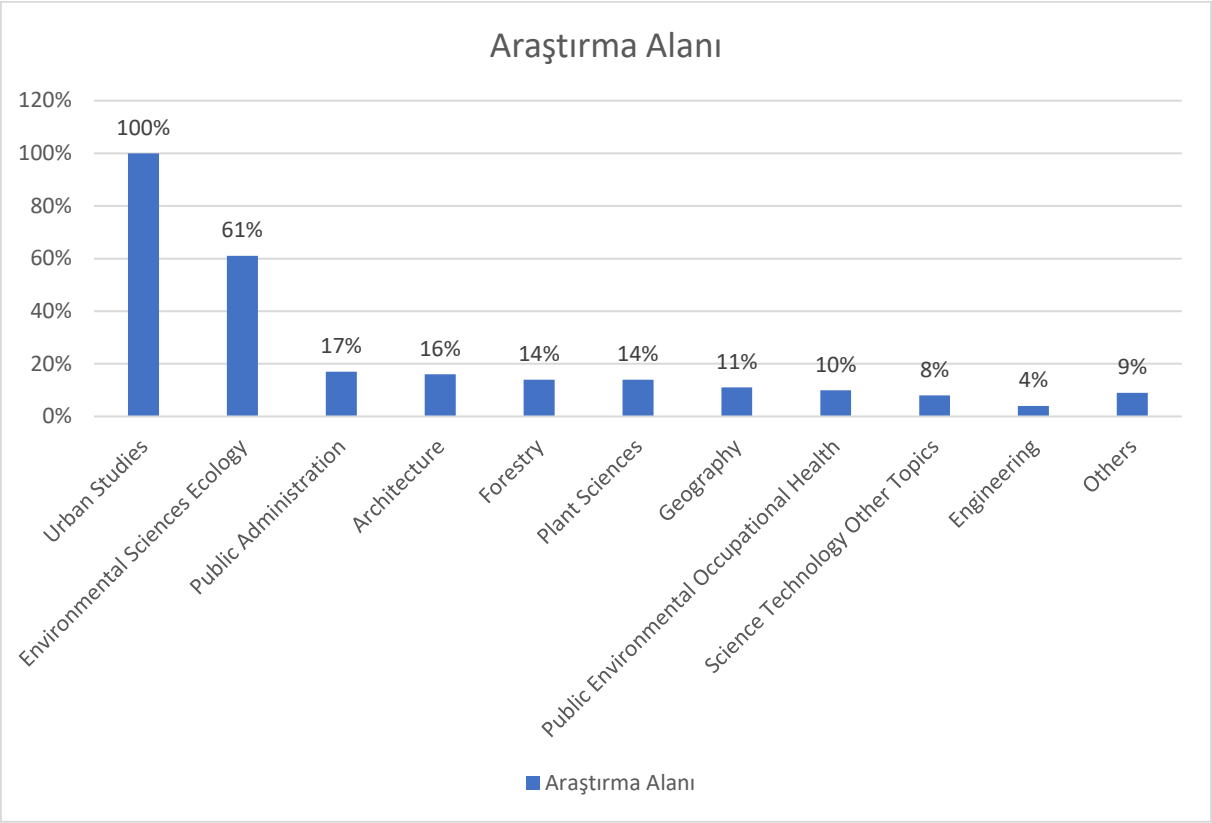



**Şekil 3.** En Çok Atıf Alan 10 Ülke (Kaynak: Bibliometrix)

### 3.3. **Araştırma Alanı Analizi**

İncelenen çalışmaların tamamı (%100), kentsel çalışmalar kapsamında değerlendirilmiştir. **Şekil 4**'te bu yayınların disiplinlere göre dağılımı sunulmaktadır. Buna göre çalışmaların **%61'i Environmental Sciences & Ecology (Çevre Bilimleri ve Ekoloji), %17'si Public Administration (Kamu Yönetimi), %16'sı Mimarlık, %11'i Coğrafya, %10'u Environmental Occupational Health (Çevresel ve İş Sağlığı), %8'i Science and Technology – Other Topics, %4'ü Mühendislik, %4'ü Ormancılık ve Bitki Bilimi**, ve **%9'u diğer alanlarda** sınıflandırılmıştır. Bu dağılım, biyofilik tasarım konusunun belirli disiplinler etrafında yoğunlaşmakla birlikte, aynı zamanda disiplinler arası bir nitelik taşıdığını göstermektedir. Özellikle çevresel bilimler, kamu yönetimi ve mimarlık alanlarındaki yoğunluk, biyofilik tasarımın hem sürdürülebilir çevre politikaları hem de mekânsal tasarım bağlamında ele alındığını ortaya koymaktadır. Bununla birlikte coğrafya,

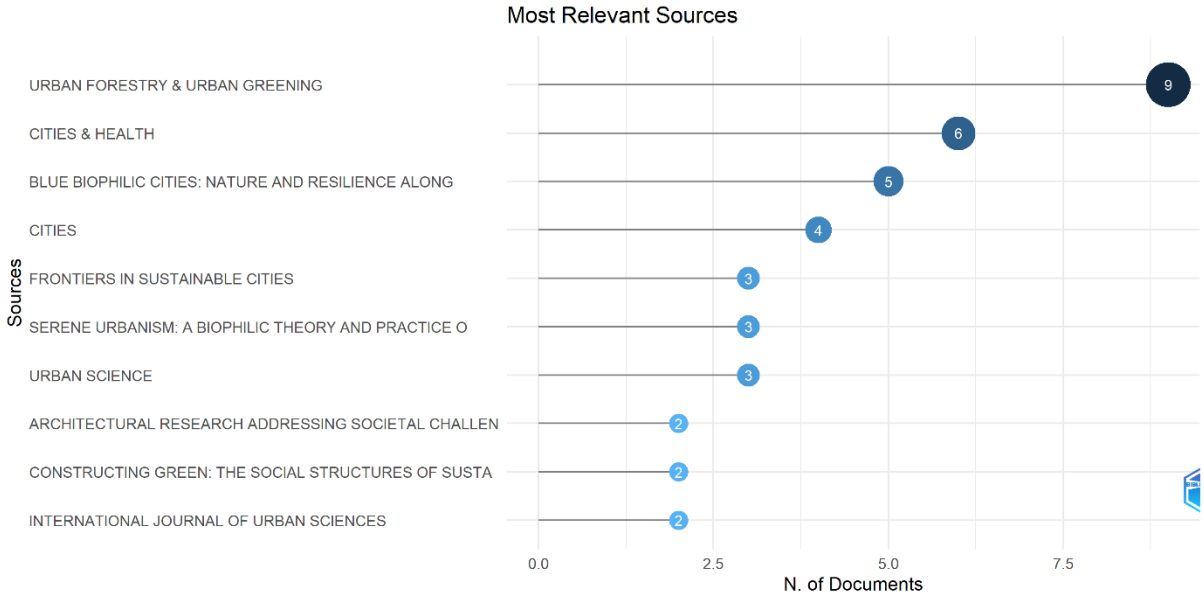
mühendislik ve sağlık gibi farklı disiplinlerin katkısı, konunun çok boyutlu yapısını ve çeşitli araştırma perspektiflerinden değerlendirildiğini yansıtmaktadır.




**Şekil 4:** Araştırma Alanı (WOS'ta Tanımlanan Alanlar)

### 3.4. Yayın Platformu Analizi

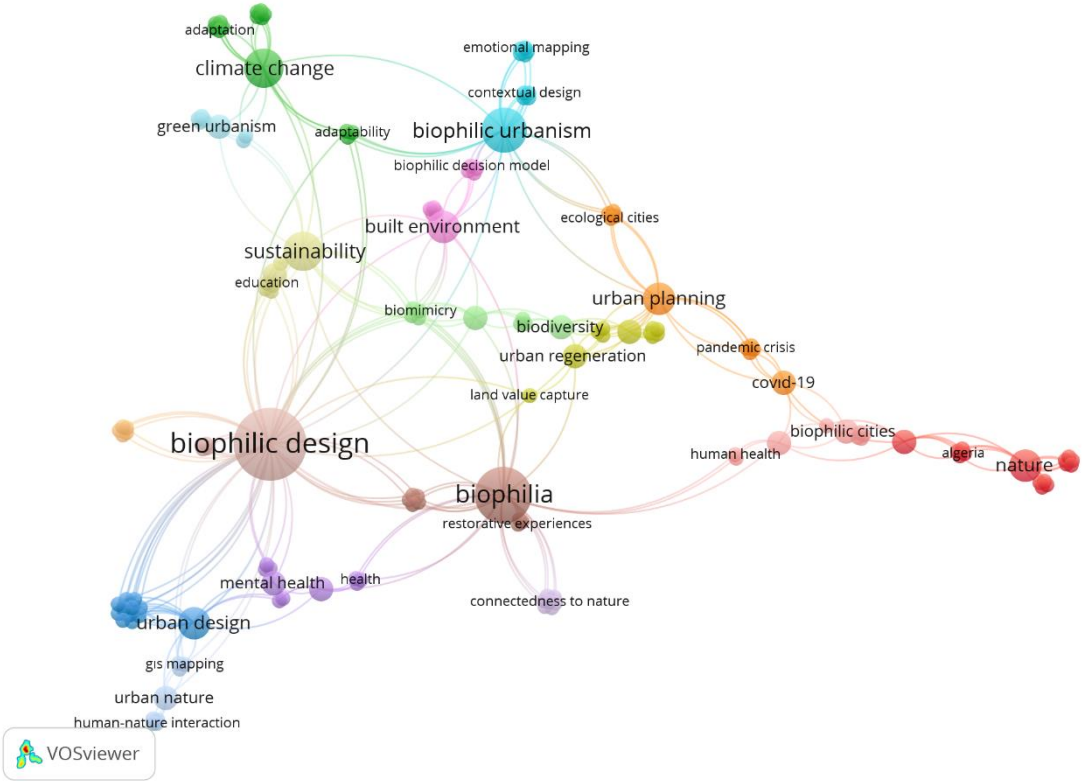
İncelenen literatürde en fazla yayın sayısına sahip ilk 10 akademik kaynak ya da yayın platformunun analizi, biyofilik tasarım konusunun kentsel ölçekte en yoğun biçimde hangi dergi ve yayın mecralarında ele alındığını ortaya koymak açısından önem taşımaktadır. Bu kapsamda yapılan analiz sonuçlarına göre, en fazla yayına sahip olan kaynak "Urban Forestry & Urban Greening" dergisi olup, toplamda 9 yayın ile ilk sırada yer almaktadır (Şekil 5). Bu dergiyi, 6 yayın ile "Cities & Health", ve 5 yayın ile "Blue Biophilic Cities: Nature and Resilience Along the Urban Coast" adlı yayın platformu takip etmektedir. Söz konusu dağılım, biyofilik tasarımın özellikle kentsel ekoloji, sağlık ve dirençli kentler bağlamında ele alındığını ve literatürde bu alanlara odaklanan kaynaklarda yoğunluk kazandığını göstermektedir.




**Şekil 5:** İncelenen Literatürde En Fazla Yayın Sayısına Sahip İlk 10 yayın platformu (Kaynak: Bibliometrix)

### 3.5. **Anahtar Kelime Analizi**

Anahtar kelimelere yönelik gerçekleştirilen haritalama çalışması, literatürde bir veya birden fazla kez yinelenen kavramların birbirleriyle olan ilişkilerini ve birlikte kullanılma düzeylerini ortaya koymaktadır (**Şekil 6**). Bu çalışmada, incelenen yayınlardaki anahtar kelimelerin ilişkisel yapısını, frekanslarını ve toplam bağlantı güçlerini belirlemek amacıyla **VOSviewer** yazılımı kullanılmıştır. Analiz kapsamında, toplam **202 anahtar kelime** değerlendirilmiş ve bu kavramlar arasındaki bağlantılar görselleştirilmiştir. Elde edilen sonuçlara göre, anahtar kelimeler dört temel kümelenme ekseninde gruplaşmaktadır: **"Biophilic Design (Biyofilik Tasarım)"**, **"Biophilia (Biyofili)"**, **"Biophilic Urbanism (Biyofilik Kentsellik)"** ve **"Climate Change (İklim Değişikliği)"**. Bu kümeler, araştırmaların tematik yönelimlerini yansıtmakta ve biyofilik tasarımın özellikle sürdürülebilirlik, doğa-insan ilişkisi ve iklim temelli kentsel stratejilerle olan güçlü bağlantısını ortaya koymaktadır.




**Şekil 6:** Anahtar kelimeler (Kaynak: VOSviewer)

### 3.6. İçerik Analizi

Bu çalışmada, biyofilik tasarımın kentsel bağlamdaki uygulamalarını daha derinlemesine incelemek amacıyla seçilen yayınlara yönelik içerik analizi gerçekleştirilmiştir. Analiz sürecinde, literatürde öne çıkan kavramlara dayalı olarak aşağıda belirtilen tematik başlıklar doğrultusunda kodlama yapılmıştır. Bu temalar, biyofilik tasarımın farklı boyutlarını temsil eden anahtar konuları içermektedir (Şekil 7).




**Şekil 7.** Yayınların araştırma alanları

Biyofilik tasarımın kentlerde uygulanabilirliğini değerlendirmek amacıyla geliştirilen ölçeklerden biri olan *Algılanan Biyofilik Tasarım Ölçeği (PBDs)*, inşa edilmiş çevreye dair kullanıcı algılarını ölçmekte kullanılmaktadır (Hung & Chang, 2022). Bu ölçek aracılığıyla yapılan analizler, yeşil alanlar, su yüzeyleri, bitki örtüsü ve gökyüzü gibi doğal unsurların, insanlarda hayranlık ve dikkat çekici algılar uyandırarak olumlu duygusal durumlara katkı sunduğunu göstermektedir. Araştırmalar, özellikle kent parkları, kampüsler ve mavi-yeşil altyapılar gibi alanların biyofilik özellik taşıma eğiliminde olduğunu ortaya koymaktadır. Dolayısıyla, doğayla bütünleşik çevresel algılar, psikolojik iyilik hali üzerinde belirleyici bir etkiye sahiptir.

Biyofilik şehirler, yalnızca fiziksel çevreye doğal unsurların entegrasyonunu değil, aynı zamanda **vatandaşların doğaya ilişkin tutum, bilgi ve davranışlarını** dönüştürmeyi de hedeflemektedir. Bu bağlamda, Tahran örneği üzerinden gerçekleştirilen bir çalışmada, biyofilik şehircilik yaklaşımının çevresel sürdürülebilirliği artırma potansiyeli analiz edilmiştir (Ziari vd., 2018). Çalışma, biyofilik planlama ve tasarım süreçlerinin, kent sakinlerinin çevresel farkındalıklarını ve "yeşil yaşam tarzı" benimseme düzeylerini doğrudan etkilediğini ortaya koymuştur. Ayrıca, çevre eğitimi, çevresel sivil toplum kuruluşlarının etkinliği, biyolojik çeşitliliğe dair eylem planları ve çevre dostu yapı yönetmelikleri gibi unsurlar, biyofilik şehirlerin gelişiminde belirleyici göstergeler olarak tespit edilmiştir.

Son yıllarda yapılan çalışmalar, biyofilik tasarımın yalnızca konut ve kamusal alanlarda değil, aynı zamanda **eğitim yapılarında** da uygulanabilirliğini araştırmaktadır. Beatley ve Newman (2013), biyofilik okulların hem öğrencilerin refahını artırma hem de doğayla erken yaşta bağ kurmalarını sağlama açısından önemli bir potansiyele sahip olduğunu vurgulamaktadır. Zhong vd. (2022) ise mevcut literatürün, genellikle biyofilik özelliklerin sınıflandırılmasına odaklandığını; oysa tasarımın pedagojik süreçlerle olan etkileşiminin daha derinlemesine ele alınması gerektiğini belirtmektedir. Bu kapsamda, açık alan öğrenme ortamları ve doğaya dayalı pedagojik yaklaşımlar, öğrenci gelişimi ile doğa deneyimi arasındaki ilişkiyi güçlendiren unsurlar olarak öne çıkmaktadır (Chiesi vd., 2024; Russo & Andreucci, 2023).

Biyofilik tasarım yalnızca fiziksel çevre ile doğayı bütünleştirmekle kalmaz; aynı zamanda bireylerin yaşadıkları **yerle kurdukları duygusal ve deneyimsel bağları** da güçlendirir. Bu bağlamda yapılan araştırmalar, biyofilik uygulamaların, yer kimliği ve topluluk hafızası ile uyumlu biçimde geliştiğinde daha yüksek düzeyde kabul gördüğünü ortaya koymaktadır (Wijesooriya & Brambilla, 2020; O'Sullivan vd., 2023). Yerin anlatısı, geçmişten geleceğe uzanan kültürel ve deneyimsel süreklilik aracılığıyla bireylerin çevresel bağlarını derinleştirir. Roberts vd. (2020), doğa temelli deneyimlerin toplumsal refah üzerindeki etkisini vurgularken, Macke vd. (2019) topluluk katılımının biyofilik tasarıma olan sahiplenmeyi artırdığını belirtmektedir.

İklim değişikliği kaynaklı kentsel tehditlerin (örneğin sıcak hava dalgaları, sel, kuraklık) artmasıyla birlikte, biyofilik kentsellik giderek daha fazla **iklim adaptasyonu stratejisi** olarak değerlendirilmektedir. Bu bağlamda Lee ve Kim (2021), farklı ölçek ve tipolojilerdeki biyofilik unsurların sistematik olarak belirlenmesini sağlayan bir biyofilik kentsellik çerçevesi önermiştir. Bu çerçeve, hem niceliksel hem de nitel analizler yoluyla sera gazı salımının azaltılması, hava kalitesinin iyileştirilmesi, ısı adası etkisinin hafifletilmesi gibi birçok çevresel faydanın sağlanmasına katkı sunmaktadır. Ancak yazarlar, biyofilik kentselliğin etkin şekilde uygulanabilmesi için yönetişim yapılarının güçlendirilmesi, uzun vadeli stratejilerin belirlenmesi ve karar alma süreçlerine entegrasyonun önemine dikkat çekmektedir.

Son olarak, biyofilik tasarımın yalnızca insan odaklı iyilik hali değil, aynı zamanda **kentsel ekolojik sürdürülebilirliğe** katkı sunduğu vurgulanmaktadır. Pedersen Zari (2023), biyofilik tasarımın, kentsel ekoloji, iklim değişikliğiyle mücadele, biyolojik çeşitliliğin korunması ve doğa-insan ilişkilerinin psikolojik olarak yeniden yapılandırılması gibi hedefler doğrultusunda çok boyutlu bir sürdürülebilirlik vizyonuna hizmet ettiğini belirtmektedir. Bu perspektif, biyofiliyi yalnızca bireysel faydaların değil, aynı zamanda toplumsal ve ekolojik dönüşümün de aracı olarak konumlandırmaktadır.

## 4. Sonuç ve Tartışma

Bu çalışma, biyofilik tasarımın kentsel bağlamdaki gelişimini ortaya koymak amacıyla 2010–2025 yılları arasında yayımlanmış 62 akademik yayını bibliyometrik ve içerik analizi yöntemleriyle incelemiştir. Elde edilen veriler, araştırmaların yayınlanma yılları, coğrafi dağılımları, anahtar kelimeleri, yayınlandıkları kaynaklar, üretici kurumlar ve atıf sayıları temelinde değerlendirilmiştir.

Bibliyometrik analiz sonuçlarına göre, ilgili alandaki yıllık yayın artış oranı %12,69 olup, her bir yayının ortalama atıf sayısı 9,032'dir. Araştırmalarda toplam 133 farklı yazarın katkısı bulunmakta, yayınların %15'i yalnızca 2017 yılında üretilmiştir. Bu bulgular, biyofilik tasarıma yönelik akademik ilginin son yıllarda istikrarlı bir biçimde arttığını göstermektedir. Yayınların coğrafi dağılımına bakıldığında, en fazla yayın **Amerika Birleşik Devletleri'nde (51 yayın)** yapılmış olmasına karşın, **en yüksek atıf sayısı Avustralya'ya (192 atıf)** aittir. Bu durum, Avustralya'nın nitelikli ve alana yön veren çalışmalarla literatüre önemli katkılar sunduğunu göstermektedir. En fazla yayının yer aldığı akademik dergi ise **Urban Forestry & Urban Greening** olup, 9 çalışma bu kaynakta yayımlanmıştır.

İçerik analizine dayalı bulgular ise, biyofilik tasarımın çok boyutlu bir kavramsal çerçevede ele alındığını ortaya koymaktadır. Elde edilen veriler tematik olarak dört ana başlıkta sınıflandırılmıştır: **biyofilik algı ve doğa deneyimi**, **eğitim ve çevresel davranış**, **yer ile kurulan bağ ve kültürel kimlik**, **iklim değişikliği ve sürdürülebilirlik**.

İlk olarak, doğayla etkileşim teması altında, kent sakinlerinin doğayı yalnızca görsel olarak değil; dokunsal, işitsel ve duygusal düzeyde deneyimlemeleri gerektiği vurgulanmaktadır. PBD (Perceived Biophilic Design Scale) gibi ölçeklerin geliştirilmesi, kullanıcıların doğal unsurlara verdikleri tepkilerin ölçülmesini mümkün kılmakta ve doğayla bütünleşik tasarımların dikkat restorasyonu, stres azaltımı ve genel psikolojik iyilik hâli üzerindeki etkilerini ortaya koymaktadır (Hung & Chang, 2022). Bu bağlamda, biyofilik tasarım yalnızca yeşil alan yaratımıyla sınırlı kalmayıp, gökyüzü, su, ışık ve hayvanlarla etkileşim gibi çok katmanlı deneyim boyutlarını da içermelidir.

İkinci olarak, eğitim alanındaki biyofilik uygulamalar, doğa ile teması güçlü kurgulanmış okul mekânlarının öğrencilerin refahına katkı sunduğunu ortaya koymaktadır. Bununla birlikte, mevcut araştırmalar çoğunlukla strateji sınıflandırmalarına odaklanmakta, biyofilik yaklaşımın pedagojik içeriklerle nasıl bütünleştirileceği konusu hâlen araştırma boşluğu olarak kalmaktadır (Beatley & Newman, 2013; Chiesi vd., 2024). Bu durum, doğa temelli öğrenme ortamlarının potansiyelini daha derinlikli keşfetme ihtiyacını göstermektedir.

Üçüncü olarak, biyofilik tasarımın yalnızca fiziksel çevreyi değil, aynı zamanda yerle kurulan kültürel ve psikolojik bağları da yeniden şekillendirdiği görülmektedir. Yer anlatıları, aidiyet duygusu ve topluluk hafızası biyofilik yaklaşımlar aracılığıyla güçlendirilmekte, tasarımın estetik değerinin ötesinde kimlik inşasına katkı sunmaktadır (O'Sullivan vd., 2023). Katılımcı süreçlerle şekillenen biyofilik planlamalar, mekânları hem işlevsel hem de duygusal anlamda yeniden tanımlamaktadır.

Son olarak, biyofilik şehircilik yaklaşımı, iklim değişikliğiyle mücadelede çok yönlü bir strateji olarak değerlendirilmektedir. Sera gazı salınımlarının azaltılması, enerji tüketiminin düşürülmesi, kent içi biyoçeşitliliğin desteklenmesi ve ısı adası etkisinin hafifletilmesi gibi faydalar, biyofilik unsurların çok işlevli yapısını ortaya koymaktadır (Lee & Kim, 2021). Ancak bu faydaların yönetsel ve ekonomik düzeyde görünür kılınması ve karar alıcılar tarafından desteklenmesi, biyofilik uygulamaların etkinliğini artırmak açısından kritik önemdedir.

Bu bağlamda, biyofilik şehirler yalnızca "yeşil şehirler" değil; doğayla aktif etkileşimin teşvik edildiği, vatandaşların yürüyüş, kuş gözlemi, bahçecilik ve gökyüzü gözlemi gibi etkinliklerle iç içe olduğu, doğayla süreklilik arz eden bir ilişki biçiminin inşa edildiği yaşam alanlarıdır. Biyofilik tasarımın başarıya ulaşabilmesi, kent sakinlerinin doğayla olan ilişkisini yalnızca pasif bir izleyicilikten çıkarıp, aktif bir katılım ve deneyim düzeyine taşıyabilmesine bağlıdır.

Sonuç olarak, hem bibliyometrik veriler hem de içerik analizleri, biyofilik tasarımın kent planlamasında stratejik bir araç olarak giderek daha fazla benimsendiğini göstermektedir. Bu tasarım yaklaşımı, insan sağlığı, çevresel sürdürülebilirlik, topluluk ilişkileri ve iklim adaptasyonu gibi pek çok farklı eksende olumlu etkiler üretmektedir. Gelecekteki araştırmaların, biyofilik şehir planlaması, politika geliştirme, toplumsal katılım ve çevre eğitimi gibi alanlarda disiplinler arası yaklaşımlarla zenginleştirilmesi büyük önem taşımaktadır.

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# TEMSİL ARACI OLARAK MİMARİ FOTOĞRAF

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## ÖZET

Mimari fotoğraf, yapıların biçimsel ve mekânsal özelliklerini görsel olarak aktarma kapasitesi sayesinde mimarlık pratiğinde önemli bir temsil aracıdır. Fotoğraf, yalnızca bir yapının fiziksel görünümünü belgelemekle kalmaz; aynı zamanda mekânın ışık, doku, ölçek ve atmosfer gibi niteliklerini de izleyiciye iletir. Bu yönüyle mimari fotoğraf, tasarım sürecinde fikirlerin geliştirilmesine, mekân algısının sınanmasına ve projelerin görselleştirilmesine hizmet eder. Fotoğrafın çerçeveleme, perspektif ve kompozisyon gibi teknikleri, mekânın karakterini ve yapının anlatmak istediği mesajı etkili bir biçimde ortaya koyar. Modern mimarlık pratiğinde fotoğraf, izleyiciye mekân deneyimini aktarırken, yapının estetik ve işlevsel değerlerini de vurgular. Aynı zamanda mimari fotoğraf, yapıların toplumsal ve kültürel bağlamını kavramada da bir araç olarak kullanılır. Bu bağlamda, mimari fotoğraf sadece bir belgeleme yöntemi olmanın ötesine geçer ve mimarlığın görsel dilini güçlendiren, mekân ve tasarım anlayışını izleyiciye aktaran etkili bir temsil aracı olarak işlev görür.

**Anahtar Kelimeler:** Fotoğraf, mimari fotoğraf, temsil, fotografik temsil

## 1. GİRİŞ: MİMARİ FOTOĞRAF

Fotoğraf kavramı bilimsel literatürde ilk kez 1839 yılında İngiliz bilim insanı Sir John F. W. Herschel (1792–1871) tarafından ortaya atılmıştır. Ancak bu kavramda sözü edilen "çizim", geleneksel anlamda bir sanatçının el emeğiyle ürettiği tasvirden farklı olarak, nesnenin doğal ya da yapay ışık aracılığıyla bir yüzey üzerinde bıraktığı iz sayesinde oluşan bir görüntüyü ifade eder. Bu nedenle fotoğraf, fiziksel gerçekliğin doğrudan bir yansıması olarak değerlendirilir ve bu yönü, onu diğer sanatsal üretim biçimlerinden ayıran temel niteliğini oluşturur. Klasik sanatlarda sanatçı, nesneyi, duyguyu ya da düşünceyi öznel bir biçimde yeniden üretirken; fotoğrafta görüntü, var olanın kendisinin izidir. Bu bağlamda, fotoğrafın ortaya koyduğu imge, sanatçının zihinsel yorumundan ziyade, gerçekliğin kendisini taşıyan bir "ikincil temsil" olarak görülebilir. Dolayısıyla fotoğraf, yalnızca bir görsel temsil aracı değil, aynı zamanda varlığın görsel kanıtı olarak da anlam kazanır (Yıldırım, 2009).

Mimarlık ile fotoğraf, modernleşme döneminden itibaren sürekli bir etkileşim içinde olmuş; birbirlerinin üretim süreçlerini karşılıklı olarak etkileyen ve dönüştüren iki disiplin olarak gelişim göstermiştir. 19. yüzyılda fotoğrafın icadıyla birlikte mimarlık, yalnızca yapıların inşası ve mekânsal deneyimiyle sınırlı bir alan olmaktan çıkmış; fotoğraf sayesinde belgelenebilir, arşivlenebilir ve yeniden temsil edilebilir bir nitelik kazanmıştır. Jonathan Crary'nin (1992) vurguladığı gibi, fotoğraf yalnızca bir görüntü kaydetme aracı değil, aynı zamanda modern öznenin görme biçimlerini kökten değiştiren bir teknolojidir. Görsel algıdaki bu dönüşüm, mimarlığın hem temsil edilme hem de algılanma biçimlerini derinden etkilemiş; yapının deneyimlenmesinde fotoğrafın aracı rolü belirleyici hale gelmiştir.

Fotoğrafın tarihsel gelişimi sürecinde, mimarlık disipliniyle kurduğu etkileşim de paralel bir biçimde biçimlenmiştir. Fotoğrafın ortaya çıkışı, yalnızca yeni bir görsel ifade aracı sunmakla kalmamış; aynı zamanda mimari mekânların belgelenmesi, temsil edilmesi ve arşivlenmesi açısından köklü bir dönüşüm yaratmıştır. Mimarlık ve fotoğraf, her ikisi de ait oldukları dönemin kültürel, siyasal, teknolojik ve estetik özelliklerini yansıtan üretim biçimleri olarak ortak bir tarihsel bağlamda buluşurlar. Mimari yapılar, maddi kalıcılıkları sayesinde dönemin ruhunu somut mekânlarda yaşatırken; fotoğraf, bu mekânları belirli bir zaman diliminde dondurarak geçmişe dair görsel bir hafıza oluşturur. Bu doğrultuda, fotoğrafın mimariyi iki boyutlu bir yüzeye aktarabilme yetisi, onu yalnızca estetik bir temsil aracı olmaktan çıkarıp analitik ve belgesel bir nitelik kazandırmıştır. Nitekim Niépce ve Daguerre'in erken dönem çalışmalarında mimari ögelerin yer alması, bu iki alan arasındaki ilişkinin başlangıçtan itibaren var olduğuna işaret eder (Ercanlı, 2015).

Diğer bir bakış açısına göre ise mimarlık ile fotoğraf arasındaki ilişki, rastlantısal değil, teknolojik koşullardan doğan zorunlu bir bağdır. Fotoğrafın ilk dönemlerinde kullanılan düşük duyarlılıktaki filmler, hareketli nesnelerin görüntülenmesini güçleştirmiş; bu durum, fotoğrafik üretimlerde durağan ve mekânsal ögelerin öne çıkmasına yol açmıştır. Dolayısıyla, fotoğrafın başlangıcından itibaren mimariyle kurduğu ilişki, teknik sınırlamaların belirlediği doğal bir zorunluluk olarak şekillenmiştir (Higgott & Wray, 2012; Bozkurt, 2019).

## 2. TEMSİL VE MİMARİ FOTOĞRAF

Temsil kavramı, uzun süredir sosyal bilimlerin ve sanat kuramlarının merkezinde yer alan temel bir tartışma alanıdır. Stuart Hall (1997), temsilin yalnızca gerçeği yansıtan pasif bir süreç olmadığını; aksine, anlamın üretildiği ve dolaşıma girdiği dinamik bir mekanizma olduğunu ileri sürer. Mimarlık bağlamında temsil, yapının inşa edilmeden önceki tasarım çizimlerinden maketlerine, fotoğraflarına ve dijital modellere kadar uzanan geniş bir ifade alanında ortaya çıkar. Robin Evans (2000) ise mimarlığın, gerçekliğini her zaman belirli "temsil araçları" aracılığıyla kurduğunu dile getirir. Bu çerçevede mimari fotoğraf, yalnızca fiziksel yapının görsel kaydı olmanın ötesinde, yapının zihinsel ve kavramsal düzeyde yeniden inşasını mümkün kılan güçlü bir temsil biçimi olarak değerlendirilebilir.

Mimari fotoğrafın temsili niteliği, yalnızca mekânın görsel özelliklerini aktarmakla sınırlı değildir; aynı zamanda o mekânın bireyde uyandırdığı duygusal deneyimi, mimarın tasarım anlayışını ve yapının tarihsel-kültürel bağlamını da izleyiciye iletmeyi amaçlar. Bununla birlikte, fotoğrafın temsil sayılıp sayılamayacağı konusu tarih boyunca farklı düşünürler tarafından tartışılmıştır. Roland Barthes (1981), fotoğrafın her zaman bir "gösterge" olarak işlediğini ve gerçeklikle kurduğu ilişkinin mutlak olmadığını savunur. Bu kuramsal yaklaşımlar, mimari fotoğrafın hangi koşullar altında temsil olarak değerlendirilebileceği sorusunu yeniden gündeme getirmektedir.

Temsil kavramı, Klasik Alman Felsefesi'nin önemli düşünürlerinden Immanuel Kant tarafından kapsamlı biçimde ele alınmıştır. Kant, temsili iki temel düzeyde inceler: duyusal (sezgisel, nesneye dayalı ve maddi) ve entelektüel (kavramsal, zihinsel ve soyut). Duyusal temsil, nesnelerin görünür biçimlerini yansıtırken; entelektüel temsil, bu nesnelerin özsel ve kavramsal yönlerine odaklanır. Kant ayrıca bu iki bilgi türünü "sensitive" (duyusal) ve "symbolic" (sembolik) kategorileri altında sınıflandırır. Bu yaklaşım, temsilin yalnızca dış dünyanın zihinde oluşan bir kopyası olmadığını; aynı zamanda gerçekliği anlamlandıran, yeniden kuran ve bilinçte dönüştüren bir süreç olduğunu gösterir (Sukla, 2001; Orhan, 2011).

Temsil, bir nesnenin farklı bir bakış açısıyla yeniden yorumlanması ve bu yolla başkalarınca anlaşılabilir hale getirilmesi sürecidir. Bu bağlamda temsil, nesnenin anlam düzeyinde yeniden kurgulanmasını ve algısal olarak yeniden inşasını ifade eder (Ercanlı, 2015). İnsan zihninin ürünü olan temsiller, doğaları gereği yoruma açık, değişken ve sorgulanabilir yapılardır. Çünkü temsilleri üreten de, onlara anlam kazandıran da insandır. Bu nedenle bir temsili bütüncül biçimde kavrayabilmek, yalnızca onun türünü belirlemekle sınırlı değildir; aynı zamanda temsilin üretildiği tarihsel, kültürel ve toplumsal bağlamın da dikkate alınmasını gerektirir (Sönmez, 2022).

İletişim açısından bakıldığında temsil, bireylerin düşünce ve algılarını başkalarına aktarma biçimlerinden biridir. Bununla birlikte temsil, belirli bir kültürel bağlam içinde hangi anlamların üretildiğini ve zaman içerisinde nasıl dönüşüme uğradığını ortaya koyan bir kavramsal çerçeve sunar. Toplumların yaşadığı tarihsel, siyasal, ekonomik ve kültürel değişimler, temsil biçimlerini de dönüştürmüştür. Temsil, bu yönüyle işaretler ve imgeler aracılığıyla kurulan bir anlamlandırma sistemi olarak düşünülebilir (Hall, 1997; Ercanlı, 2015).

Fotoğrafik temsil açısından dikkat çeken bir nokta ise, Walton'un da Scruton gibi temsilin temelini "nedensel bağ" kavramı üzerinden açıklamasıdır. Ancak Walton, bu nedensel ilişkiyi temsili dışlayan değil, bizzat bir temsil biçimini oluşturan unsur olarak görür. Scruton, fotoğrafın nesneyle kurduğu doğrudan ilişki nedeniyle onun temsil niteliği taşıyamayacağını öne sürerken; Walton, bu bağın hem fotoğrafta hem resimde var olduğunu ve sanatın gerçekliği yakalama amacının bu ortak temele dayandığını savunur (Walton, 1990; Orhan, 2011).

### 2.1 Mimari Fotoğrafın Temsil Özelliği

Fotoğrafçılar, fotoğraf makinesinin yalnızca bir çoğaltım aracı mı yoksa bireysel yaratıcılığı ifade eden bir mecra mı olduğu konusunda uzun süredir tartışmalar yürütmüşlerdir. Bu tartışmalar, fotoğrafın sanat statüsüne dair iki temel yaklaşımın ortaya çıkmasına yol açmıştır. Bir tarafta, fotoğrafı bağımsız bir sanat formu olarak gören görüş, teknik süreçlere dayansa da fotoğrafçının estetik kararları, özne-nesne ilişkisi ve kadraj seçimi aracılığıyla yaratıcı bir rol üstlendiğini savunur. Öte yandan, fotoğrafın yalnızca mekanik bir çoğaltım işlemi olduğunu savunan karşıt görüş, sanatsal niteliğini sorgulayarak özgünlükten yoksun olduğunu ileri sürmüştür (Freund, 2007; Ayten, 2008).

Gisèle Freund'e göre (2007), fotoğraf, bilimsel ilerlemeler ile yeni sanatsal ifade biçimlerine duyulan ihtiyacın kesişiminde ortaya çıkmıştır. Bu çok boyutlu doğa, fotoğrafın yalnızca teknik bir araç mı yoksa yaratıcı bir ifade biçimi mi olduğu tartışmalarını da beraberinde getirmiştir. Doğuşundan itibaren fotoğraf, kuramsal ve estetik bağlamlarda yoğun biçimde tartışılmış ve sanat dünyasındaki konumunu belirleme çabası farklı bakış açılarını görünür kılmıştır (Freund, 2007; Ayten, 2008).

Freund'a göre, özellikle 1848 devrimi sonrasında ortaya çıkan toplumsal değişimler, fotoğrafın sanat çevrelerinde ilgi görmesini kolaylaştırmıştır. Bu dönemde fotoğraf, sadece bir görüntü üretim aracı değil, aynı zamanda dönemin sosyo-politik koşullarına yanıt veren bir ifade biçimi olarak değerlendirilmiştir. Sanatsal üretim ile toplumsal dinamiklerin etkileşimi, fotoğrafın estetik olduğu kadar ideolojik anlamlar da taşımasına olanak sağlamıştır. Freund, fotoğrafı demokratikleşme aracı olarak ele almasıyla bu bakış açısını ön plana çıkarmaktadır (Ayten, 2008).

Freund'a göre (2007), fotoğraf başlangıçta "mütevazı bir kendini ifade etme aracı" olarak ortaya çıkmış, kısa sürede ise yaygınlaşarak farklı alanlara yayılan ve hızla büyüyen bir endüstriye dönüşmüştür. Sanat eserlerini geniş kitlelere ulaştırma kapasitesi, estetik deneyimlerin demokratikleşmesine katkıda bulunmuştur. Bu çerçevede fotoğraf, yalnızca teknik bir araç veya sanatsal üretim biçimi olmanın ötesinde, toplumsal eşitlik ve temsil alanında dönüştürücü bir potansiyele sahip bir olgu olarak değerlendirilir (Ayten, 2008).

Susan Sontag'a göre (2008), fotoğrafın temsil niteliği, diğer fotoğraf teorisyenleri gibi, gerçeklikle olan ilişkisi temelinde değerlendirilmelidir. Sontag, fotoğrafın gerçekliği yansıtma kapasitesi ve temsil işlevini şu şekilde ele alır: "*Sanatın tüm modern biçimleri, gerçeklikle kendilerine özgü bir ilişki kurar; ancak bu iddia, fotoğraf söz konusu olduğunda özellikle belirgindir. Fotoğraf, gerçekliği doğrudan yansıtma yeteneği sayesinde diğer sanat formlarından ayrılır. Bir görüntü, gerçek bir şeye benzediği sürece hakiki sayılır; ancak bu*

*benzerliğin ötesinde farklı bir şeyi temsil etmeye çalışırsa, kurguya dönüşür. Fotoğraf, yalnızca bir anı veya kesiti yansıttığı için taşıdığı ahlaki ve duygusal anlam, bağlama göre şekillenir. Dolayısıyla bir fotoğrafın gerçeklik değeri ve etkisi, hem temsil ettiği nesneye hem de sunulduğu bağlama bağlı olarak değişir."*

Sontag'a göre (2008), fotoğraf bağlamında temsil kavramı, kadrajda hangi öğelerin dâhil edileceği kararlarında kendini gösterir; çünkü dünyadaki tüm olayların fotoğrafla aktarılması mümkün değildir. Fotoğraf, gerçekliğin bir kesitini sunar ve bu kesit, olayın kendisini temsil etme işlevi görür (Hasçiftçi, 2019).

Jean Baudrillard ise fotoğrafın kurgusal bir niteliğe sahip olduğunu savunur, ancak bu kurguda fotoğrafı üreten özne ve deklanşörü kullanan kişinin rolünü tamamen göz ardı etmez. Ona göre fotoğraf, salt bir imge olmanın ötesinde, nesnelerin yeniden kurgusal bir biçimde sunulmasıdır. Baudrillard, fotoğrafın doğasını şöyle açıklar: "Fotoğraf, nesnelerin görüntüsünün kurgusudur; çünkü imge değil, kurgunun kendisidir. Temsil olgusu, gerçeklikle karşılıklı ilişki içindedir. Temsil ve gerçeklik birlikte varlıklarını sürdürür; ancak görüntü, temsilin eksikliği üzerinden anlam kazanır. Bu süreçte yalnızca özne değil, dünyanın kendisi de etkin bir rol oynar." (Baudrillard, 1999; Alptürk, 2007; Ayten, 2008).

Roger Scruton ise Fotoğraf ve Temsil adlı eserinde, fotoğrafın temsil yeteneğine sahip olmadığını ileri sürer. Scruton, fotoğrafı "ideal fotoğraf" kavramı üzerinden değerlendirir ve bunu şöyle tanımlar: "İdeal fotoğraf, nesnesiyle nedensel bir ilişki kurar ve nesnesinin görünüşünü yeniden üreterek temsil eder. Bir nesneyi ideal fotoğraf olarak ele aldığımızda, bu nedensel sürecin, temsil edilen nesnede ortaya çıkan bir görünümün kopyası olarak ortaya çıktığını gözlemleriz." (Scruton, 1981).

## 3. TEMSİL ARACI OLARAK MİMARİ FOTOĞRAF

Fotoğraf, mimari temsil yöntemlerinden biri olarak öne çıkmaktadır. Mimari tasarım sürecinde genellikle sürecin son aşamalarında kullanılan bu araç, başlangıçta yapıları belgelemek amacıyla geliştirilmiş olsa da, zamanla mimari eserleri daha geniş kitlelere ulaştıran güçlü bir iletişim aracına dönüşmüştür. Doğrudan deneyim imkânı bulamayan kişiler için fotoğraf, yapıların algılanmasını ve erişilebilirliğini sağlayan temel bir araç hâline gelmiştir (Sönmez, 2007).

Mimarlık, farklı iletişim araçlarıyla etkileşime girerek üretim sürecinin sınırlarını genişletmiştir. Bu bağlamda fotoğraf, yalnızca belge sunan bir araç olmaktan çıkıp, yapıyı yeniden kurgulayan ve izleyiciye sunan bir temsil düzlemi oluşturur. Fotoğraf aracılığıyla mimari yapılar, fiziksel ürün olmanın ötesine geçerek, yeniden inşa edilen ve çok katmanlı biçimlerde yorumlanan temsillere dönüşür. Yapının tamamlanmasının ardından yapılan fotoğraflama süreci, mimari ürünün farklı açılardan temsilini sağlamakla kalmaz, aynı zamanda mimarın tasarım sürecinde geliştirdiği düşünsel kurgunun izleyiciye aktarılmasına da aracılık eder (Ercanlı, 2015).

Fotoğrafın evrimi ile modern mimarinin yükselişi arasında belirgin paralellikler bulunmaktadır. Modern mimarinin önemli eserlerini fotoğraflayan Ezra Stoller (1963), mimari ve fotoğraf

arasındaki ilişkiyi şöyle açıklar: Başarılı bir mimari fotoğraf, yapıyı doğrudan deneyimleme imkânı olmayan izleyici ile mimari eser arasında etkili bir iletişim kurar; fotoğrafın başarısı, bu iletişim işlevini ne ölçüde yerine getirdiğiyle değerlendirilir (Sağdıç, 2024).

Fotoğraf, bir yapının ikonikleşmesini sağlamakla kalmaz; aynı zamanda nesneleştirerek, tekrar üretilebilen ve tüketilebilen bir görsel temsil hâline dönüştürür. Bu tekrarlama süreci, farklı bakış açılarını görünür kılar ve mimari fotoğrafın kendine özgü bir anlatım dili geliştirmesini mümkün kılar (Sönmez, 2007; Sağdıç, 2024). Örneğin, Albert Renger-Patzsch 1920–1940'lı yıllardaki çalışmalarında geometrik öğeler ve ışık-gölge kontrastlarını ön plana çıkaran bir stil benimsemiştir. Buna karşın, László Moholy-Nagy, mimariyi çevresinden soyutlayarak mekân ve zamandan bağımsız bir plastik kompozisyon olarak ele almış, yapıları çizgi, doku, ton ve hacim ilişkileri üzerinden yeniden tasarlamıştır (Ergand, 2012; Sağdıç, 2024).

Modern mimarinin ABD'de "iyi yaşam" idealiyle ilişkilendirilmesiyle birlikte fotoğrafçılar, yapıları mekânsal, zamansal ve uzamsal boyutlarıyla analiz ederek tasarım, işlevsellik ve konfor gibi niteliklerini vurgulayan görselleştirmeler üretmişlerdir. Bu çerçevede Richard Neutra, Frank Lloyd Wright, SOM, Marcel Breuer ve Pierre Koenig gibi modernist mimarların eserleri, Ezra Stoller ve Julius Shulman'ın objektifinden yansıyan fotoğraflarla kalıcı bir görsel temsile kavuşmuştur (Ergand, 2012). Stoller'ın bu alandaki etkisi öylesine büyüktür ki, mimari fotoğraf literatüründe "Stollerized" kavramı ortaya çıkmıştır. Bu terim, genellikle Stoller'ın tarzına sahip veya onun yöntemini benimseyen fotoğrafları tanımlamak için kullanılır. Bu fotoğraflar, sadece belgeleme amacı taşımamakta, özenle tasarlanmış ve üretilmiş imgeler olarak değerlendirilmektedir. Pek çok mimar için yapılarının "Stollerized" fotoğraflarının çekilmesi, üretim sürecinin ayrılmaz bir aşamasını oluşturmaktadır (Acar, 2012; Sağdıç, 2024) Satriya (2013), mimari fotoğrafı, bir yapının veya ürünün geniş kitlelere ulaşmasını sağlayan görsel bir araç olarak tanımlar. Bu perspektife göre mimarlık ve fotoğraf, sanat ve bilim disiplinlerinin kesişim noktasında yer almakta, fotoğraf yalnızca belge sunmakla kalmayıp mimari düşüncenin izleyiciye aktarılmasında da kritik bir rol üstlenmektedir (Sönmez, 2022).

Mimari fotoğraf, inşa edilmiş yapının belirli bir perspektiften yakalanmış durağan bir temsili olarak tanımlanabilir. Bu fotoğraflar, tekil ve benzersiz bir zaman dilimini ölümsüzleştirerek tekrarlanamaz olasılıkları kayda geçirir ve böylece yeni bakış açıları ve özgün düşüncelerin doğmasına zemin hazırlar (Söhmen, 2011). 20. yüzyılda Bauhaus Okulu'nun etkisiyle mimarlık, yalnızca yapı üretimi olmanın ötesine geçerek tüm sanat dallarıyla etkileşim kuran bir ifade biçimine dönüşmüştür. Bu durum, mimarlığın disiplinlerarası kimlik kazanmasına ve "makine estetiği" anlayışının öne çıkmasına olanak sağlamış; mimarlık ile fotoğraf arasındaki ilişkiyi güçlendirmiştir (Ercanlı, 2015).

Mekân tasarımında fotoğraflar, sunum, pazarlama, rölöve, belgeleme ve arşivleme amaçlarıyla üretildiğinde, tasarım sürecinde çekilen fotoğraflardan temel fark, fotoğrafçının doğrudan yapının iç mekânında bulunabilmesidir. Bu görseller, hem fotoğrafçılık hem de mimarlık bağlamında "mimari fotoğraf" niteliği taşır. Mimari fotoğraf, diğer tür fotoğraflarla aynı fiziksel ve kimyasal kurallara sahip olsa da, konusu ve amacı bakımından ayrışır. Yapılı çevre, yerleşim düzeni ve insan-çevre ilişkisi gibi öğeler, mimari fotoğrafın temel konularını

oluştururken; temel amacı, mimari eserleri etkileyici ve belgeleyici bir biçimde sunmaktır (Uluengin, 1997; Arslan, 2022).

## 4. SONUÇ

Mimari fotoğraf, yalnızca bir yapının görsel kaydı olmanın ötesinde, mimarlık alanında kritik bir temsil aracı olarak değerlendirilebilir. İnşa edilmiş yapının mekânsal, biçimsel ve estetik özelliklerini belirli bir perspektiften aktaran fotoğraflar, yapının fiziksel gerçekliğini izleyiciye ulaşılabilir kılar. Doğrudan mekânı deneyimleme imkânı bulamayan kişiler için bu görsel temsil, mimari eserle kurulan ilişkiyi mümkün hâle getirir ve yapıların anlaşılmasını, değerlendirilmesini ve yorumlanmasını kolaylaştırır. Dolayısıyla mimari fotoğraf, hem fiziksel hem de kavramsal düzeyde izleyici ile yapıyı buluşturan bir aracı işlevi görür.

Fotoğrafın mimari temsildeki rolü, sürecin yalnızca belgeleme boyutuyla sınırlı kalmayıp, yapının yeniden yorumlanmasına ve kavramsal düzeyde yeniden inşasına olanak sağlamasıyla daha da belirginleşir. Bir yapının tamamlanmasının ardından yapılan fotoğraflama, mimarın tasarım sürecinde geliştirdiği düşünsel kurguyu, izleyiciye aktarabilmenin bir yolu olarak işlev görür. Böylece fotoğraf, mimari ürünün yalnızca fiziksel bir nesne olmasını önler; yapının mekânsal, tarihsel ve estetik boyutlarını bir araya getirerek çok katmanlı bir temsil düzlemi oluşturur. Bu işlev, mimari fotoğrafı teknik bir belgeleme aracından ziyade, yaratıcı ve analitik bir temsil biçimi hâline getirir.

Modern mimarlık ile mimari fotoğraf arasındaki paralellik, bu temsil işlevini daha da güçlendirmektedir. Bu bağlamda mimari fotoğraf, yalnızca görselleştirme işlevi taşımakla kalmayıp, mimari yapının kültürel ve estetik değerlerini görünür kılan bir iletişim aracı olarak öne çıkar. Fotoğrafın bu rolü, yapıların ikonikleşmesine ve farklı bakış açılarıyla yeniden yorumlanabilmesine de olanak sağlar. Bunun yanı sıra mimari fotoğraf, yapının tarihsel ve toplumsal bağlamını da temsil etme kapasitesine sahiptir. Bir yapının fotoğrafı, yalnızca fiziksel özellikleri değil, aynı zamanda tasarımın arka planındaki düşünsel süreçleri, dönemin estetik anlayışını ve yapının toplumsal bağlamını da izleyiciye aktarabilir. Bu yönüyle mimari fotoğraf, hem estetik hem de kuramsal düzeyde bilgi aktarımını mümkün kılar ve yapının çok boyutlu temsiline hizmet eder.

Sonuç olarak, mimari fotoğraf, mimarlıkta temsilin kritik bir boyutunu oluşturmaktadır. Fotoğraf, yapıyı yalnızca görünür kılmakla kalmaz; yapının mekânsal, estetik, tarihsel ve kültürel boyutlarını bir araya getirerek yeniden inşa eder ve izleyiciye sunar. Bu işlev, mimari fotoğrafı salt bir belgeleme aracı olmaktan çıkarıp, yaratıcı, analitik ve yorumlayıcı bir temsil biçimi hâline getirir. Böylece mimari fotoğraf, hem mimarın tasarım düşüncesinin aktarılmasında hem de yapının geniş izleyici kitleleri tarafından kavranmasında vazgeçilmez bir araç olarak öne çıkar.

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# Evaluation of Emergency Escape Process in Student Dormitories

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***Abstract –*** This study aims to evaluate fire safety and escape route design in student dormitories. Ismail Necati Efendi KYK Dormitory and Hubbi Hatun Dormitory in Karabük province were comparatively examined in terms of space organization, user density, number and placement of stairs and architectural features. Both buildings were found to comply with current regulations; however, design decisions and user density were found to be determinant on evacuation efficiency. In Ismail Necati Efendi Dormitory, the unbalanced distribution of the number of users per staircase poses a risk, while in Hubbi Hatun Dormitory, the high number of floors and the lack of independent emergency exits negatively affect evacuation safety in case of fire. In conclusion, fire safety in student dormitories should not be limited to compliance with legislation; the quality of architectural design, user density and current use should also be included in the evaluation process.

*Keywords – Fire safety, Escape routes, Dormitories, Evacuation analysis, Emergency evacuation*

## I. Student Dormitories And Fire Safety

University education requires students to move to a different location from the city where they usually live. This change brings not only a social and emotional but also a physical environmental change for students [1]. Both the public and private sectors are taking various steps to meet this need. In Turkey, housing services are provided by the Ministry of National Education, the Credit and Dormitories Institution, universities and various public institutions through dormitories and guesthouses. For students living away from their families, dormitory life is not only a process in which individual skills are developed, but is also closely related not only to psycho-social factors, but also to the physical environmental conditions that support a sense of peace and security.

Student dormitories are vulnerable to disasters such as fire and earthquake due to high population density, all-day use, structural failures, mechanical and electrical equipment failures, etc. [2]. Fire hazard is one of the most important safety risks that can cause loss of life and property and the possibility of re-occurrence cannot be completely eliminated.

The fires that have occurred in student dormitories in Turkey and the tragic consequences they have caused reveal the importance of fire safety (Table 1).

Table 1. Dormitory fires in Türkiye

| Place | Date | Reason of the fire | Loss of life / injuries |
|---|---|---|---|
| Adana | 15.03.2013 | Electrical Contact | 15 Students were affected by smoke |
| Aydın | 13.04.2013 | Smoking | 9 Students were affected by smoke |
| Bolu | 27.12.2013 | Oil Fire | 2 Personnel were affected by smoke. |
| Gaziantep | 14.06.2014 | Unknown | 60 Students were affected by smoke. |
| Bursa | 03.06.2016 | Heater Malfunction | 1 student affected by smoke. |
| Adana | 29.11.2016 | Electrical Contact | 12 deaths and many smoke inhalation |
| Eskişehir | 03.02.2017 | Unknown | 1 Personnel affected by smoke. |
| Hakkâri | 06.10.2017 | Unknown | 4 Students were affected by smoke. |
| Bursa | 11.05.2025 | Unknown | 3 Students affected by smoke. |

In particular, in 2016, a fire in a private girls' dormitory in Aladağ district of Adana resulted in the death of 12 people, 11 of whom were students, and it was found that the fire escape door did not have a handle. This finding shows that fire safety measures have serious deficiencies [3]. This situation has painfully revealed the inadequacy of fire safety measures in dormitories [4] (Figure 1).



Fig. 1 Aladağ dormitory fire / Adana (Image from [4])

In 2025, a fire caused by electrical wiring broke out in a girls' dormitory of the Dormitories Institution in Avcılar, Istanbul, and a student was hospitalized due to smoke inhalation [5].

In such buildings where students are collectively present, priority safety measures should be based on life safety. Since these buildings, which are intensively used by young people, are also actively used outside of school, the risk of a possible fire disaster causing loss of life and property makes fire safety a critical element that makes it mandatory to ensure fire safety in these buildings. In this process, buildings need to be re-evaluated in terms of spatial organization and architectural planning.

Although fire safety is a basic requirement in all buildings, it has a higher risk potential especially in accommodation buildings when users are asleep. For this reason, considering that the user group consists of young individuals in buildings with accommodation functions such as student dormitories, it should be considered as a necessity to plan fire safety measures in accordance with the characteristics of this user group [6].

In this context, the importance of the decisions to be made regarding escape routes in the design process of student dormitories in terms of fire safety should be carefully considered. The increase in fire incidents across Turkey, the limited number of academic studies on fire safety in student dormitories, and the fact that existing studies mostly focus on evaluating dormitory buildings only within the framework of the Regulation on Fire Protection of Buildings [7,8] constitute the starting point of this study. It is anticipated that the findings obtained will contribute to the development of design decisions that will allow the evacuation process to be carried out more safely.

## II. Design of Escape Routes in Student Dormitories

One of the most critical elements in establishing fire safety is the evacuation of building occupants. The safe evacuation of occupants in case of fire depends on the presence of effective escape routes. The design of escape routes should not only be physically suitable, but also take into account the behavioral characteristics of the users and the functional structure of the building [9]. In collective use areas such as student dormitories, the fact that users are usually asleep makes the evacuation process even more difficult. In this context, fire safety measures to be taken at building scale vary according to the function of use [10]. Physical components such as the number, location and dimensions of stairs and emergency exit doors according to the number and type of users, the placement and adequacy of security halls, corridor type and width are critical for an effective and safe evacuation process, especially in buildings with shelter function such as student dormitories.

The legislative articles in Table 2 show the basic measures to be taken in dormitory buildings (Table 2).

Table 2. Minimum requirements for ensuring fire safety of dormitory buildings according to BYKHY

| | |
|---|---|
| 1 | If the total number of beds is less than 20 and the height of the building is less than 15.5 m, a single staircase that is protected or pressurized is accepted. If the total number of beds is more than 20 and the number of floors is more than 2, at least 2 exits must be provided. |
| 2 | Bedrooms should be separated by a fire-resistant wall. Room doors should be fire-resistant and equipped with self-closing devices. |
| 3 | Corridors should be ventilated naturally through the gaps in the façade wall, and if natural ventilation cannot be provided, mechanical smoke evacuation should be provided. |
| 4 | In cases where the distance measured from the farthest point in the room to the exit door is below 15 m, a single exit is accepted. In places where escape is only possible in one direction, the escape distance is measured from the exit door of the farthest room. In cases where the distance exceeds 15 m, 2 exits located far from each other should be provided. In cases where escape is provided in two directions, the distance is measured from the door of each room. |
| 5 | If the whole building has a sprinkler system, the distance from the remote point to the exit door can be at most 2m. If the whole building has a sprinkler system, the distance from the remote point to the exit door can be at most 20 m. |

Even in buildings designed in accordance with the legislation, it should be foreseen that various functional failures may occur in terms of user behavior and evacuation dynamics. The adequate number of evacuation elements such as fire escapes and emergency exit doors and their positioning in accordance with the regulations do not guarantee that these elements will be used by all users in a balanced and effective manner. Factors such as users' exit preferences, perceivability of guidance systems and interior organization directly affect the evacuation process. Therefore, instead of an evaluation based solely on legislative provisions, there is a need for tools that can test the functioning through realistic scenarios. For this purpose, performance-based simulation is essential to reach accurate results; such analyses are thought to provide significant benefits in guiding design decisions by identifying potential weak points in advance.

## III. Materials and Method

The dormitory building samples examined in this study were selected among the buildings belonging to the Higher Education Dormitories Institution in Karabük. The data of the dormitories were obtained from Öztürk's (2017) study in which he examined higher education student dormitories according to space organization types. In Öztürk's (2017) study, student dormitories were classified as central, linear and mixed systems based on circulation layout and room layout. Considering this classification, Hubbi Hatun Dormitory and Ismail Necati Efendi Dormitory differ from each other in terms of spatial organization, number of emergencies exits and stairs, and user density (Figure 2-3).



Fig. 2 Hubbi Hatun Dormitory



Fig. 3 İsmail Necati Efendi Dormitory

Within the scope of the study, it is aimed to compare the emergency escape performances of different space organization types among dormitory buildings. For this reason, the selected dormitory buildings were selected among large-scale dormitories with different space organization types [11]. Hubbi Hatun Dormitory consists of four blocks, each of which has 12 floors and accommodates 1506 students in total. Block A, with a capacity of 431 people, has a linear plan scheme and two-sided suites around two centrally located sheltered vertical circulation cores. Although the suites are designed for two people, these rooms are actually used by four people by using the common areas as bedrooms. In addition, there is no independent emergency exit door in the building (Figure 4).

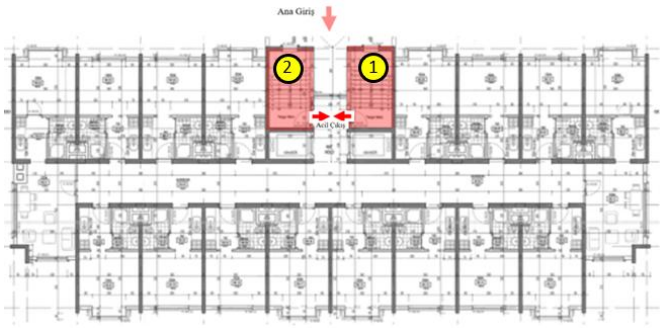



Fig. 4 Hubbi Hatun dormitory normal floor plan

On the other hand, Ismail Necati Efendi Dormitory consists of two 8-storey blocks and Block A has a total capacity of 922 people. The spatial organization of this building is based on a comb (mixed) plan scheme formed by breaking the linear system [12]. The rooms located on both sides of the corridors are integrated with the service areas with three sheltered cores and an unsheltered core located at the intersection points of the blocks. Except for the main staircase, all staircases lead to independent emergency exit doors (Figure 5).

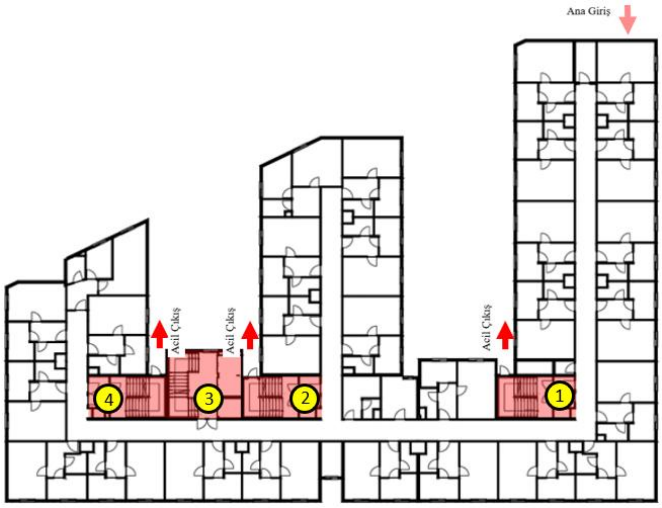
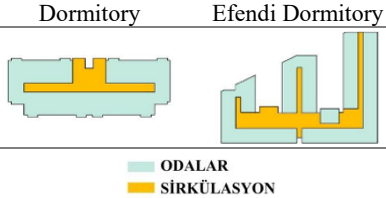



Fig. 5 Ismail Necati Efendi dormitory normal floor plan

The fact that both dormitory buildings have similar functional purposes for student accommodation and that the total number of users is close to each other due to being among the large-scale dormitories has been effective in the selection of these buildings for comparative analysis. However, it is thought that they will exhibit different performances in the escape process with different user numbers, design decisions, number of stairs and circulation solutions (Table 3) [12].

Tablo 3. Spatial Characteristics of Hubbi Hatun and İsmail Necati Efendi Dormitory

| Properties | Hubbi Hatun Dormitory | İsmail Necati Efendi Dormitory |
|---|---|---|
| Spatial Organization Fiction |   | |
| Number of Floors | 12 | 8 |
| Number of Users Single Block | 431<br>1506 | 922<br>1905 |
| All Blocks | | |
| Number of Stairs | 2 | 4 |
| Number of Users per Staircase | 215,5 | 230,5 |
| Number of Users per Square Meter | 18,8 | 12 |

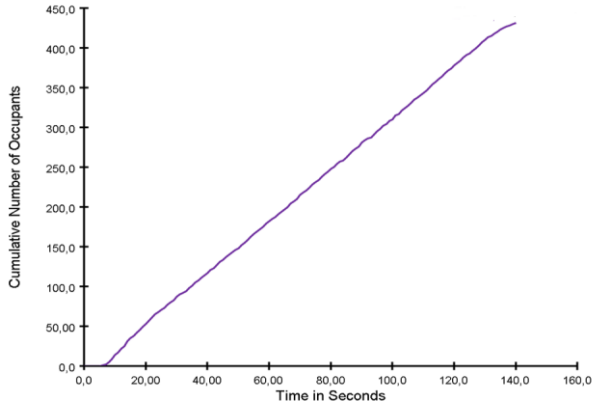
According to the data in Table 3, Hubbi Hatun Dormitory has 12 floors and a capacity of 431 users, while Ismail Necati Efendi Dormitory has 8 floors but accommodates 922 users. This indicates a higher user density in Ismail Necati Efendi Dormitory. In terms of the number of stairs, there are 2 stairs in Hubbi Hatun Dormitory and 4 stairs in Ismail Necati Efendi Dormitory. However, the number of users per staircase is 215.5 and 230.5, respectively, indicating that although there are more stairs in Ismail Necati Efendi Dormitory, the user load is more intense. The number of users per square meter was 18.8 in Hubbi Hatun Dormitory and 12 in Ismail Necati Efendi Dormitory, indicating that Hubbi Hatun Dormitory has a more compact layout. In addition, when the spatial organization schemes of the buildings are examined, the fact that Ismail Necati Efendi Dormitory has a more complex circulation organization may cause users to have difficulty in determining the direction in emergency evacuation scenarios and negatively affect the evacuation process. Especially in panic-inducing situations such as fire, complex spatial constructions may cause confusion for users and pose a risk of disrupting safe and rapid evacuation.

Considering the spatial characteristics and user densities of the buildings, emergency evacuation simulations were carried out through Pathfinder software, and it was assumed that all rooms of both buildings were occupied and serving at maximum capacity. It is also assumed that only stairs are used in the evacuation process within the scope of the emergency scenario. In evacuation analysis for disaster scenarios, the movement speed of individuals is considered as a critical parameter. In a study conducted in Padang, Indonesia, focusing on simulations based on a tsunami scenario, the average running speed of individuals participating in the evacuation process was found to be 3.85 m/s [13]. This data was accepted as a reference speed indicator for the calculation of the evacuation time of the sample buildings. The graphs obtained in this direction provide important data for comparative evaluation of the evacuation performance of the sample buildings.

## IV. Results

In this section, the performance of both dormitory buildings is analyzed comparatively based on the data obtained from emergency evacuation simulations. Within the framework of the analysis results, the relationship between the level of fire safety in the sample buildings and the effectiveness of spatial organization and escape routes is evaluated. The evacuation simulation results of Hubbi Hatun Dormitory are presented graphically to evaluate the performance of the building against emergencies (Graph 1).

Graph 1. Total Evacuation Time Curve of Users in Hubbi Hatun Dormitory




In Graph 1, the horizontal axis shows the time (sec) and the vertical axis shows the cumulative increase in the number of evacuees. According to the simulation data, the evacuation process in the building with 431 people was completed in approximately 139 seconds. The slope of the curve reveals that the evacuation process generally proceeds continuously and smoothly. Especially after the first 20 seconds, it is observed that the exit speed increases steadily. This shows that the capacity of the escape routes of the building can meet the user density and that there is no serious congestion (Figure 6).

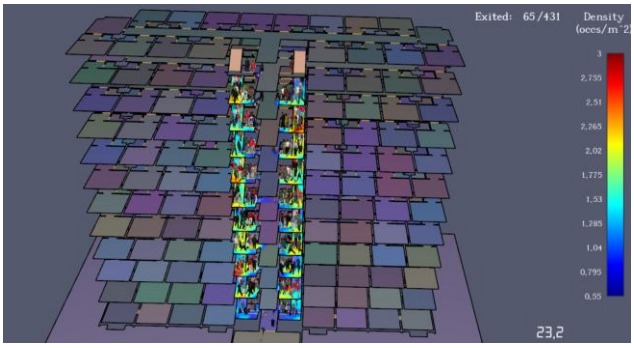
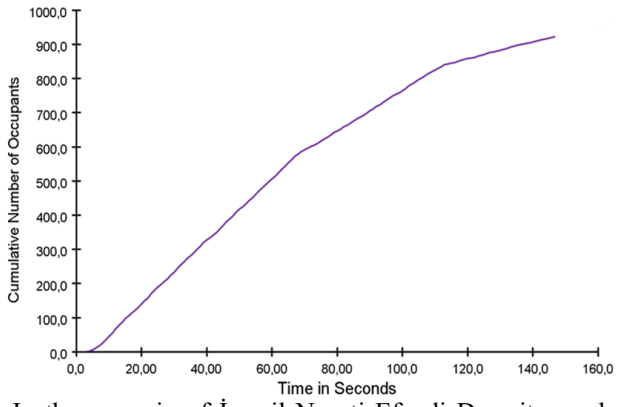



Fig. 6 Hubbi Hatun dormitory evacuation simulation user density analysis

Evacuation simulation results for Ismail Necati Efendi Dormitory are presented in Graph 2.

Graph 2. Total Evacuation Time Curve of Users in İsmail Necati Efendi KYK Dormitory




In the scenario of İsmail Necati Efendi Dormitory where 922 people were evacuated in Graph 2, the evacuation process was completed in approximately 146 seconds. The curve shows a continuous increase in general outlines and reveals that the evacuation takes place in a certain fluidity. However, after 70 and 110 seconds, there is a significant decrease in the slope of the curve, indicating a decrease in the escape rate. This indicates that there was a delay in the last stages of the evacuation process due to a partial congestion on staircase 1 (Figure 7).

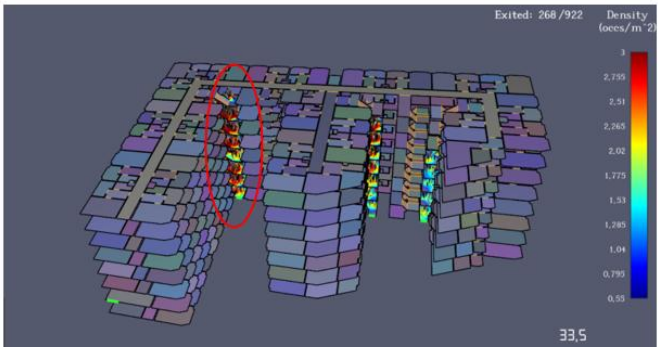



Fig. 7 Ismail Necati Efendi dormitory evacuation simulation user density analysis

## V. Discussion

This study revealed that fire safety in student dormitories should not be limited to compliance with regulations; factors such as architectural design decisions, user density and spatial organization directly affect the success of evacuation in case of fire.

Although there are escape arrangements in accordance with the regulations in both dormitories, the effectiveness of these arrangements varies. Especially in Ismail Necati Efendi Dormitory, the density of the number of users per staircase number 1 is high and this is a risk that may negatively affect evacuation times. In addition, the fact that the organization of the space has the form of a comb system causes an unbalanced distribution of the user load on the stairs.

On the other hand, Hubbi Hatun Dormitory has more direct circulation connections and relatively lower user density, which is an advantage in terms of evacuation scenarios. However, the fact that this building is also multi-storey and does not have independent emergency exits stands out as an important deficiency.

An important finding of the study is that although changes in function, such as the conversion of some common areas into dormitories, put a strain on evacuation capacity, a parallel fire safety update was not carried out. This shows that not only compliance at the design stage is not enough; regular inspections and performance-based assessments are also required during the use process.

## VI. Conclusion

This study evaluated the fire safety design and the effectiveness of evacuation routes in student dormitories through two different dormitories in Karabük province. The analyses show that the buildings comply with the current regulations on paper, but architectural design details and user density directly affect the evacuation success in case of fire.

Although the number of escape stairs in Ismail Necati Efendi Dormitory is sufficient, the density per user is high and poses risks in terms of emergency evacuation safety. Hubbi Hatun Dormitory, on the other hand, has a simpler circulation structure, but poses risks due to its many floors and lack of independent emergency exits.

In conclusion, fire safety in student dormitories should not be limited to compliance with legislation; design performance, user behavior, changes in building use and evacuation scenarios should also be taken into consideration. Architectural solutions such as visual guidance, refuge areas, smoke control, pressurized staircases and compact escape routes should be prioritized in new projects and improvement processes of existing buildings.

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# KENTSEL MEKANDA ARAÇ TRAFİĞİNE KAPALI CADDELERDE ESTETİK VE FONKSİYONEL KAYGILAR ÜZERİNE BİR ARAŞTIRMA: KEMAL GÜNEŞ CADDESİ ÖRNEĞİ

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## ÖZET

Günümüzde sürdürülebilir ulaşım kapsamında artan yayalaştırma çalışmaları giderek yaygınlaşmış ve bu alanlar ulaşım amacının dışında toplumdaki sosyal etkileşim, kent kimliği oluşumu ve bölgeyi kullanan bireylerin yaşam kalitesi açısından da önem kazanmaya başlamıştır. Yapılan kapsamlı literatür taraması ve yerinde gözlem yöntemleri kullanılarak yürütülen çalışmada, dünya genelinden ve Türkiye'de yer alan Karabük şehrinden örnek bir cadde incelenmiştir. Çalışmada incelenen ve dünya genelinden başarılı örnek olarak kabul edilen Stroget (Kopenhag), La Rambla (Barselona), Limbecker Strasse (Essen) ve Manski (Kouvola) ile karşılaştırmalı analizler gerçekleştirilmiştir. Söz konusu bu örneklerde kullanıcı ve kent imgesine uygun odaklı tasarım, estetik bütünlük, evrensel tasarıma uygun erişilebilirlik düzeyi ve gece – gündüz süreklilik gösteren tasarımların, yayalaştırılan kamusal mekanların başarı düzeyini arttırdığı tespit edilmiştir. Yine bu çalışma kapsamında incelenen Karabük kent merkezinde yer alan Kemal Güneş Caddesi, söz konusu yayalaştırma alanının mevcut durumu üzerine mekânsal analizler sunmayı amaçlamaktadır. Caddenin belirli saatlerde araç trafiğine kapatılarak yaya kullanımına açıldığı belirlenmiştir. Ancak yetersiz kent mobilyaları, cephe düzensizlikleri, sınırlı erişilebilirlik olanakları ve sosyal kullanım alanlarının eksikliği nedeniyle, alanın kullanıcılar tarafından büyük oranda yalnızca bir geçiş güzergâhı olarak kullanıldığı gözlemlenmiştir. Karabük Kemal Güneş Caddesi için geliştirilen tasarım ilkeleri doğrultusunda bu alanın daha konforlu ve yaşanabilir bir hale getirilebileceği sonucuna ulaşılmıştır.

Sonuç olarak yayalaştırma uygulamalarının fiziksel bir düzenleme olmaktan çıkıp sosyal, kültürel ve psikolojik ihtiyaçlara da yanıt verebilen çok merkezli bir kentsel dönüşüm aracı olarak kullanılması gerekmektedir. Bu kapsamda da yerel yönetim merkezlerinin, bölgenin kullanıcı davranışlarını dikkate alan, mekânsal ihtiyaçları ve kent bütünlüğüne dikkat eden, erişilebilirliği yüksek ve sürdürülebilir kamusal alanlar tasarlamaları bir ihtiyaç haline gelmiştir.

**Anahtar Kelimeler:** Yaya, yaya hareketi, yayalaştırılmış cadde, kentsel dönüşüm

## A STUDY ON AESTHETIC AND FUNCTIONAL CONCERNS IN STREETS CLOSED TO PEDESTRIAN TRAFFIC IN URBAN SPACE: THE EXAMPLE OF KEMAL GÜNEŞ STREET

**ABSTRACT**

In recent years, pedestrianization efforts within the scope of sustainable transportation have become increasingly widespread. These areas have gained importance not only in terms of transportation but also in relation to social interaction, the formation of urban identity, and the improvement of the quality of life for individuals using these spaces. This study, conducted through a comprehensive literature review and on-site observation methods, examined an exemplary pedestrian street from the city of Karabük, Türkiye, alongside globally recognized successful pedestrian zones. Comparative analyses were carried out with well-established cases such as Strøget (Copenhagen), La Rambla (Barcelona), Limbecker Strasse (Essen), and Manski (Kouvola). These examples demonstrated that user-centered and city-identity-sensitive design approaches, aesthetic cohesion, accessibility in line with universal design principles, and spatial continuity during both day and night significantly contribute to the success of pedestrianized public spaces.The study focused on Kemal Güneş Street, located in the city center of Karabük, with the aim of presenting spatial analyses of its current pedestrianization condition. It was determined that the street is closed to vehicular traffic during specific hours and opened for pedestrian use. However, due to the lack of adequate urban furniture, irregular building façades, insufficient accessibility features, and limited social spaces, the area has predominantly been used as a transit route rather than a vibrant public space. Based on the design principles proposed for Kemal Güneş Street, it was concluded that the area could be transformed into a more comfortable and livable environment.

In conclusion, pedestrianization practices should be regarded not merely as physical interventions, but as multidimensional tools of urban transformation that respond to social, cultural, and psychological needs. Accordingly, local governments must design inclusive, accessible, and sustainable public spaces by considering user behaviors, spatial needs, and overall urban integrity.

**Keywords:** Pedestrian, pedestrian movement, pedestrianized street, urban transformation

***GİRİŞ***

Yaya, trafikte herhangi bir taşıta binmeksizin yürüyen ya da koşan en temel ulaşım birimi olarak tanımlar (TDK, 2025). Kentte, kamuya açık ortak kullanım alanında yaya olarak var olmak, çevreyle ve diğer insanlarla fiziksel ve sosyal ilişki kurabilmek adına iyi bir olanaktır. (Gehl 1987), yaya olarak var olmanın kentsel çevre ve toplumla kaynaşabilmeyi büyük oranda sağladığını belirtmektedir. (Rapoport 1987) ise yayaların düşük hızda hareket etmeleri sebebiyle çevredeki biçim ve işlevlere yönelik pek çok farklılığı algılayabildiklerini ve bu şekilde kent mekanlarını ve kentteki etkinlikleri daha çok hissedebildiklerini belirtir.

(Keleş 1980) ise *yaya*yı, ‘’kent içindeki belli mesafedeki uzaklıklara yürüyerek ulaşan kimse’’ olarak tanımlar. Yayanın kent içindeki temel eylemi olan ‘’yürümek’’, kentsel çevreyi daha iyi gözlemlemeyi, çevreyle ilgili daha detaylı bilgilere sahip olabilmeyi ve yayanın içinde bulunduğu çevreyle daha etkili bir şekilde bütünleşebilmesini sağlar. Ayrıca detayları algılayabilmesi dolayısıyla da kentsel mekanları daha iyi ayırt edip değerlendirebilir. (Yıldız 1996) ise yürümenin algısal ve sosyal yönüne vurgu yaparak yayaların çevreyi çok yönlü ve güçlü olarak algıladığına, birbirleriyle karşılaşması ve iletişim kurma olasılığını arttırmasına katkı sağlayacağına değinmiştir. Bu anlamda ise kent mekanlarındaki yaya varlığının ve yoğunluğunun, kentin yaşayıp yaşamadığına dair bir ölçüt olduğu söylenebilir (Robertson 1994).

Yürümek insanoğlunun var olduğu günden bu yana en belirgin özelliklerinden biri olmuştur. İlk kentlerin oluşmasından bu yana varlığını sürdürmüştür. Kentler yayaların rahat hareket etmesini hedefleyerek şekillendirilmiştir. Fakat ulaşım araçlarının keşfi kentlerin yeniden şekillenmesine ve bu araçların kent içine girmesine neden olmuştur. Araçlar gürültü ve kirliliğe neden olmuş kentteki yaşamın kalitesine ve sürdürülebilirliğine bir tehdit oluşturmuştur(Fruin 1971). Yayalaştırma kavramı ise bu noktada hayatımıza girmiş ve sokakların yeniden yapılandırılma yöntemlerinden en etkilisi olmuştur.

Yayalaştırma kavramı, kent yollarından bir kısmının yalnızca yürümeye uygun duruma getirilmesi ya da yeniden düzenleme ve tasarımla yürümeye ve yayalara daha geniş alanlar ayrılması işlemine verilen isimdir(Keleş 1980). Pek çok kentin sokak dokusunu değiştirmeyi hedefleyen yayalaştırma, en temelde araçlar hayatımıza girmeden olduğu gibi sokağı yayaya geri vermeyi ya da yayalara öncelik vermeyi amaçlar. Yayalaştırma, bir kenti yürünebilir kılmak için yapılan düzenleme olarak da tanımlanabilir. Yayalaştırılmış kent mekanları bir

diğer adıyla yaya mekanları, taşıt trafiğinden arındırılmış, taşıtların sadece belli zaman dilimlerinde kullanabileceği bunun dışında sadece yayalar tarafından kullanılan alanlardır(Döllük 2005).Yaya mekanları, yayalara ayrılan ya da yayaların bu alanlarda öncelikli olduğu, yaya hareketinin bir noktadan başka bir noktaya aktarılmasını sağlayan mekanlardır. (Otaner 2003) ise yaya mekanlarını, yayalara yönelik düzenlemelerin uygulandığı, çeşitli sosyal faaliyetlerle zenginleştirilmiş, donatıların ve farklı kullanım alanlarının olduğu toplu yaşam alanları olarak tanımlar.




*Şekil 12: a- Yayalaştırma öncesi Limbecker Strasse, b- Yayalaştıma Sonrası Limbecker Strasse*

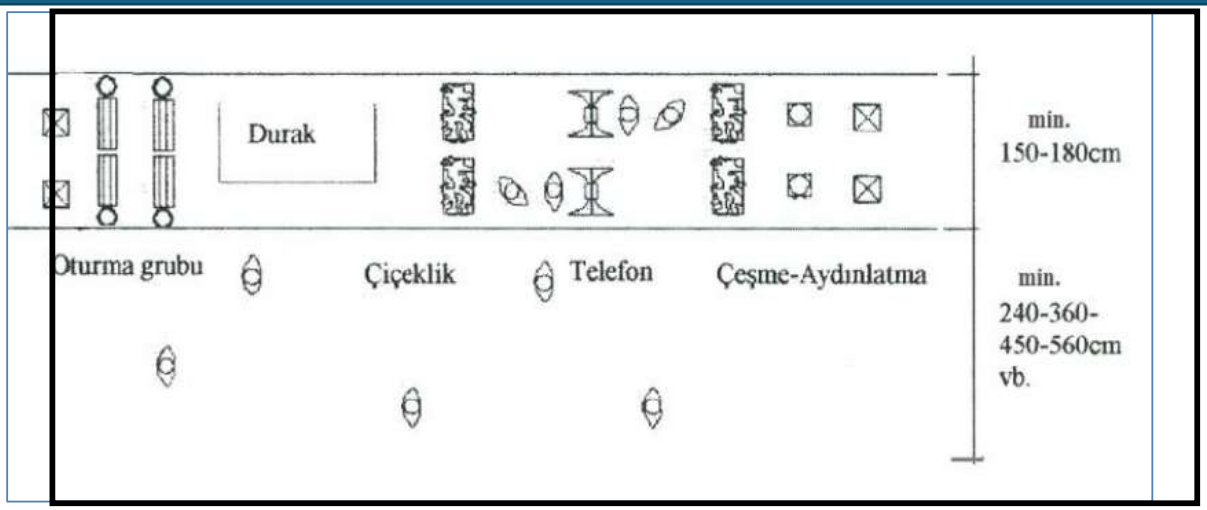
Cadde ve sokakların yaya alanlarına dönüştürülmesi ilk olarak 1926'da Almanya'nın Essen şehrindeki Limbecker Strase (Şekil 1.) de gerçekleştirilmiştir. Yapılan bu çalışma yayalaştırma çalışmasına döneminin en iyi örneğidir.(Robertson 1994)

Bir kentte, iletişimi sağlamak ve insan ilişkilerini güçlendirmek adına yaya bölgelerinin nitelikli bir şekilde tasarlanması gerekmektedir(Gülgeç 1998). Bunun için dikkat edilmesi gereken birtakım kriterler bulunmaktadır. Bunlar;

Yayalar bir noktadan diğerine en güvenli ve en kısa yoldan ulaşmaları ve bu mesafe 1kmyi aşmayacak şekilde tasarlanmalıdır(Çınar 2007).

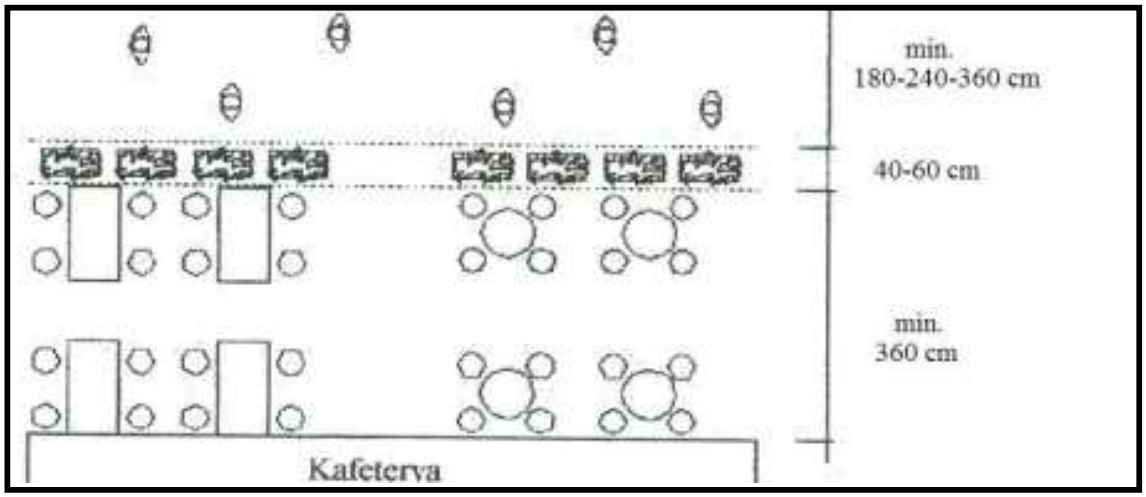
Alanda yayaları yönlendirecek düzenlemeler yapılmalı levha amblem gibi elemanlar bulundurulmalıdır(Aksoy and Sunar 2008).

Yaya aksı bulunduğu durum ve hizmet ettiği amaç kapsamında çeşitli fonksiyonları ve kent mobilyalarını içermesi gerekiyorsa, bu aksam minimum 150-180cm'lik bir donatı şeridi eklenmesi gerekir. Bu şeritte çöp kutusu, su öğesi, oturma alanları (Şekil 2.) ve aydınlatma elemanları gibi farklı öğelere yer verilir(Pakdil 2001).



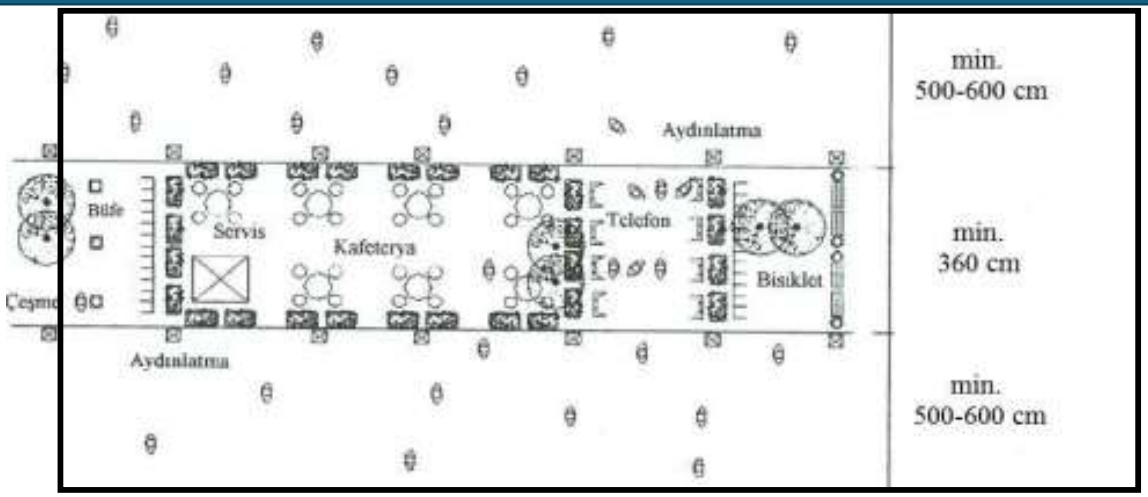

*Şekil 13: Yaya bölgelerinde oluşturulacak donatı alanı şeridi*(Pakdil 2001)

Aks boyunca yer alan kafe ve restoranlar önlerinde bir oturma alanı bırakmak istiyorsa en az 360cm'lik bir alan olmalıdır. Bu alanın yolla ilişkisi sınırlandırılmak istenirse ise 40-60 cm aralığında bir tampon bölge (Şekil 3.) oluşturabilir(Pakdil 2001).




*Şekil 14: Tesislerin önünde bırakılması gereken genişlikler*(Pakdil 2001)

Çalışmaya konu olan cadde ve meydanların yayalaştırıldığı uygulamalarda, donatı alanı şeridi/aksı ve bu akstaki tesisler yaya yolunun ortasında (Şekil 4.) da tasarlanabilir. Eğer orta aksta kullanılacaksa bu şeridin minimum ölçüsünün 360cm olması beklenmektedir. Yol genişliği ise minimum 500-600 cm aralığında olmalıdır(Pakdil 2001).




*Şekil 15: Orta şeritte oluşturulacak tesis aksı*(Pakdil 2001)

Bu bölgelerde gereklilik oluşturmadığı sürece merdiven kullanılmamalıdır. Eğer bu durum zorunlu hale geldiyse engelli bireyler de düşünülerek bir tasarım önerisi sunulmalı ve merdiven yanına rampa eklenmelidir. Rampa eğimi %5-8 arasında olmalıdır(Pakdil 2001). Tasarlanan merdiven en az iki kişinin aynı zaman diliminde kullanmasına izin vercek şekilde minimum 125cm olmalıdır. Rampa genişliği minimum 90cm olacak şekilde tasarlanmalıdır(Gülgün and Altuğ 2006).

Yaya aksı tasarımında engelli kullanıcıların gereksinimleri de göz önünde bulundurulmalıdır. Görme engelli bireyler için zeminde kabartmalı yürüme bantları tasarlanmalıdır. Tekerlekli sandalyeli bireylerin görme yükseklikleri 11 ila 130 cm arasında değişmektedir. Bu sebeple yapılacak bir tasarımda yüksek duvarlar ve parmaklık kullanılmaması ve görüş alanının kısıtlanmaması gerekmektedir(Pakdil 2001).

Yaya aksı içinde bisiklet yolları için yer ayrılmalıdır. Bu yolların genişliği minimum 2.00-2.50 m olmalıdır. Ayrıca kullanıcıların bisikletleri için güvenli bisiklet park alanları oluşturulmalıdır(Uz and Karaşahin 2004).

(Özkal 1990)'a göre ise yayalaştırılmış bölgelerde dikkat edilmesi gereken hususlar aşağıda yer almaktadır.

Yaya bölgeleri, yaya hareketlerine öncelik vermeli, yayaların hareketlerini kolaylaştırmalı, keskin ve dik dönüşlerden kaçınmalıdır.

Yaya bölgelerinde sirkülasyon ve akışı etkileyen engeller bulunmamalıdır.

Yaya bölgeleri tasarlanırken çocuk, yaşlı gibi farklı yaş gruplarındaki insanlar düşünülmeli ve tasarım her yaş grubuna uygun olacak şekilde yapılmalıdır. Bunun yanında engelsiz tasarımlar yapılmalı ve engelli bireyler için alanlar yaratılmalıdır. Bu bölgelerde kullanılacak merdivenler min. 150 cm boyunda olmalıdır.

Yaya yollarında yer alan kesişim noktaları çevresiyle bütünlük içinde hareket etmelidir.

Yaya bölgelerinde yer alan uzak bölgelerin uzaklık etkisinin azaltılması için perdeleme uygulaması yapılabilir.

Hâkim rüzgâr yönü dikkate alınmalı ve uygulamalar buna göre yapılmalı.

Bu bölgeler kente işlevsellik katmalı ve farklı fonksiyonları içerisinde barındırmalıdır.

Yaya bölgelerinin bir kısmı bisiklet yoluna ayrılmalı ve bu yollar otoparklarla bölünmemelidir.

Yaya bölgelerinde bulunan kent mobilyaları birbirleriyle ve çevresiyle uyum içinde olmalıdır.

Yaya bölgelerindeki döşemeler için uygun malzemeler seçilmeli, rahat ve konforlu bir yürüyüş sağlamalı farklı hava koşullarına uyum sağlayabilmelidir.

Yaya bölgeleri kent dokuna uygun tasarlanmalıdır.

Olabildiğince taşıt trafiğinden uzaklaştırılmalıdır.

Kent merkezlerinin yeniden düzenlenmesi kapsamında birçok belediye yaya bölgesi kavramını ilerletmiş ve kentin bir bölümünün tamamen yayalaştırılması yoluna gitmişleridir. Yapılan bu uygulamalar, kentlerdeki mahallelerde ve komşuluk birimlerinde de benzer düzenlemeler yapılmasına neden olmuştur. Özellikle kent meydanları yeniden düzenlenmiş, taşıt girişinin kısıtlandırıldığı alanlar tasarlanmıştır.

***METARYAL VE METOD***

**Hürriyet Caddesi (Merkez, Karabük)**

Karabük, 1937 yılına kadar Safranbolu'ya bağlı bir mahalleydi. 1935 yılında açılan Ankara-Zonguldak demir yolu üzerinde yer alması ve kömür yataklarına olan yakınlığı nedeniyle burada bir demir çelik fabrikası kurulması kararlaştırıldı(Fındıkoğlu and Kütükçüoğlu 1963). Bu sanayileşme sürecine bağlı olarak şehir yoğun bir göç altında kalmıştır(Kalyoncu 2007). 25 Haziran 1939'da belediye teşkilatı kurulmuştur. Sanayinin gelişmesi ve artan göçlerle birlikte Karabük'ün nüfusu giderek artmış fakat şehir planı sorununa 1945 yılına kadar bir çözüm getirilememiştir.

| Karabük, Türkiye | Kemal Güneş Caddesi |
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*Şekil 16 :Karabük Şehri ve Kemal Güneş Caddesi harita görünümü a-cadde girişi, b-cadde çıkışı [Google Earth]*

Karabük Kemal Güneş Caddesi 7 Kasım 2012 tarihinde Trafik Komisyonu'nun 2012/42 sayılı kararı ile araç trafiğine kapatılmıştır. Caddede ticari fonksiyonların bulunması sebebiyle sabah 07.00 ve 10.00 arası araç girişine izin verilmekte günün geri kalan saatleri yayalara ayrılmaktadır. Haritada Kemal Güneş Caddesi olarak anılmasına karşın halk bu alana Hürriyet Caddesi adını vermiştir. Aşağıdaki tabloda bu caddeyle ilgili kriterler yer almaktadır.




*Şekil 17: Kemal Güneş Caddesi yayalaştırılmış alan*

| | | | |
|---|---|---|---|
| **KENT ESTETİĞİ** | ***CEPHE*** | a<br>  <br><br>  <br> | Bina cephelerinde yer alan düzensizlik ve görsel kirlilik cadde görünüşünü kötü yönde etkilemektedir. Ayrıca Karabük'te yer alan sanayi tesisinin kentin içinde yer alması sebebiyle cephelerde oluşan kirlilik sokak görüntüsünün bozulmasına neden olmaktadır. |

| | | | |
|---|---|---|---|
| | |    | |
| | ***TABELA*** |      | Cephede yer alan tabelaların çeşitliliği düzensizliklere ve karmaşık bir görüntüye sebep olmaktadır. Yeni yapılan binalarda bu anlayış düzeltilmeye çalışılsa da var olan düzene yenik düşmüştür. |

| | | | |
|---|---|---|---|
| **SÜRDÜRÜLEBİLİRLİK** | ***YEŞİL ELEMANLAR*** |   | Cadde yeşil elemanlarla desteklenmeye çalışılmıştır. Herhangi bir su öğesi bulunmamaktadır. |

| | | | |
|---|---|---|---|
| **ERİŞİLEBİLİRLİK** | ***MERDİVEN, RAMPA VE ENGELLİ BİREYLER İÇİN TASARIMLAR*** |  <br>  <br>  | Cadde girişi ve çıkışı düz ayaktır. Fakat iki caddeyi birbirine bağlayan ulaşım ağında sadece merdiven bulunmaktadır. Caddede görme engelli bireyler için olması gerek kabartmalı yol bandı bulunmamaktadır. 2018 tarihinde alınan görsellerde bulunmasına rağmen bugün bu kabartma caddede yer almamaktadır. Bu da caddenin engelli bireyler için olan erişebilirliğini ortadan kaldırmaktadır. Bunun yanı sıra duyma engelli bireyler için de sesli anons sistemi bulunmamaktadır. |

| | | | | |
|---|---|---|---|---|
| | |  |  | Caddeden AVM'ye doğrudan bir geçiş bulunmaktadır. |

| | | | |
|---|---|---|---|
| **DONATILAR** | ***Aydınlatma elemanları, Çöp kutuları ve Otuma birimleri*** |   | Caddede yer alan oturma elemanları gelişigüzel yerleştirilmiş ve sokakla bir bütünlük sağlayamamıştır. Durağan yaya hareketlerine uygun olmayan sokak yapısında oturma alanları yetersiz kalmıştır. Tesislerden sadece birinin önünde yer alan açık hava oturma alanı küçük bir alana sıkıştırılmış ve yetersiz kalmıştır. Caddenin genişliğinin arttığı ve meydanını oluşturan alana yerleştirilen ve sırtı olamayan banklar yayaya konforlu bir deneyim sunmamaktadır. Caddede yer alan çöp kovaları her ne kadar renklendirilmeyle görsel bir bütünlük sağlamaya çalışsa da |

| | | | |
|---|---|---|---|
| | |  <br>  <br>  | caddeyle bir bağlantı kuramamıştır.<br>Yer döşemesinde yer alan ve kötü bir görüntüye sebep veren rögar kapakları yatay düzlemde bütünlüğe zarar vermektedir.<br>Aydınlatma elemanları dönemlik bir süslemeyle güzelleştirilmiş fakat güvenlik hissi için yeterli bulunmamıştır. |

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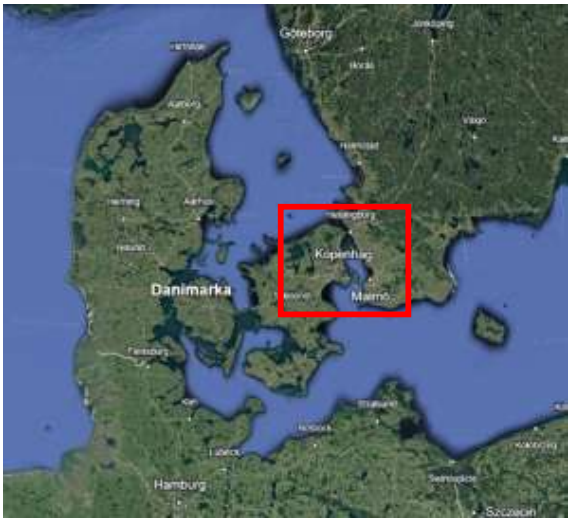
Karabük'te yer alan Hürriyet Caddesi yapılan yayalaştırılmış cadde uygulamaları şehir için olumlu sonuçlar doğurmuştur. Yapılan gözlemlerde kullanıcıların bu caddeyi sıklıkla ziyaret ettiği ve bu caddeye ihtiyaç duydukları gözlemlenmiştir. Fakat yine yapılan gözlemlerde kullanıcıların bu caddede keyifli vakit geçirmedikleri sadece ihtiyaçları doğrultusunda kullandıkları sonucuna varılmıştır. Ayrıca kentte sosyal yaşamın da erken bitmesiyle caddede herhangi bir güvenlik önleminin bulunmayışı güvenlik hissinin oluşmamasına sebep olmaktadır.

***DÜNAYADA ve TÜRKİYE'DE BULUNAN YAYALAŞTIRILMIŞ CADDE VE SOKAK ÖRNEKLERİNİN DEĞERLENDİRİLMESİ***

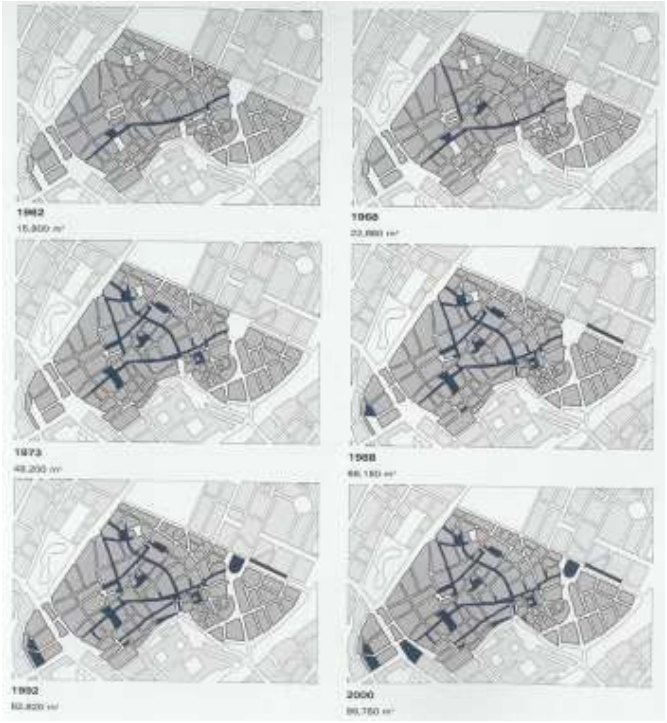
**Stroget Caddesi (Kopenhag, Danimarka)**

Danimarka dilinde (Danca) ''stroget'', gezme, dolaşma anlamına gelmektedir. Kopenhag'da Danimarka'nın ilk yaya merkezi olması sebebiyle bu ismi almıştır. Kopenhag yayalaştırma çalışmaları, yayalaştırma uygulamalarına en iyi örneklerden biridir. 1960'lı yıllarda başlamış ve 1990'ların ortasına kadar aşamalı bir şekilde sürmüştür. Yapılan uygulamalarla büyük başarılar elde etmiş ve Avrupa kentinde yapılan çalışmalara örnek teşkil etmiştir(Gehl and Gemzøe 2001) .

| **Kopenhag, Danimarka** | **Stroget Caddesi** |
|---|---|
|  |  <br>  <br>  <br>  |

*Şekil 18: Kopenhag Şehri ve Stroget Caddesi harita görünümü a-cadde girişi, b-cadde meydanı, c-cadde çıkışı*

Kopenhag'daki yayalaştırma çalışmalarına 1962 yılında, kentin ana alışveriş caddesi olan Stroget'in (Şekil 7.) yayalaştırılmasıyla başlanmış olup zamanla diğer caddeler de sistemli olarak yaya mekânlarına dönüştürülmüştür. 1962-1996 yılları arasında kentte yayalara ayrılan alanlar büyük ölçüde artmış ve kent yaşayan bir yer haline gelmiştir. Şehir sakinleri yayalaştırılmış sokak fikrini benimsemiş ve bu alanları yoğun bir şekilde kullanmıştır. Zamanla fonksiyonel kullanımlar artmış ve kent yaşamı şekillenmiştir(Beatley 2012).



*Şekil 19: Araç trafiğine kapatılmış caddenin yıllara göre değişimi*(Gehl and Gemzøe 2001)

Kopenhag'da arabasız alanlar (Şekil 8.) son dört yılda oldukça artmıştır. Kopenhag'da şu anda 5.000'den fazla kafe ve oturma alanları bulunur. Danimarka'nın iklim şartlarının her ne kadar halk yaşamını kısıtlayacağı düşünülse de açık hava kafeleri ve oturma alanları giderek sayısını arttırmıştır(Gemzoe 2001).



*Şekil 20: Stroget yayalaştırma öncesi ve sonrası görünümü [URL-1]*

Kentte on aşamalı bir program kapsamında geliştirilen yayalaştırma uygulamaları şunlardır:
Bölgede yer alan eski ve tarihi binalar restore edilerek yenilenmiş ve yeni fonksiyonlarla tekrardan kullanıma açılmıştır. Bu sayede devamlılık sağlanmıştır.
Yayalaştırılan alanlar farklı iklim koşullarına uygun fiziksel düzenlemeler yapılmıştır.
Düzenlenen alanda belirli aralıklarla bakım ve onarım çalışmaları yapılmış, yaya memnuniyeti ve yaşam kalitesi yüksek seviyede tutulmuştur.
Yaya alanlarındaki sirkülasyonu sağlayan alışveriş dükkanlarının bir kısmı Açıkhava kafelerine dönüştürülmüş, restoran gibi kentsel fonksiyonların sayısı arttırılmıştır. Bu sayede yayaların bu alana çekilmesi planlanmıştır.
Yaya mekanına taşan kafeler ve oturma alanlarıyla (Şekil 9.), durağan yaya aktivitelerin de olanak sağlamıştır.



*Şekil 21: Stroget Caddesi yaya oturma alanları [URL-2]*

Caddede bulunan ticari dükkanların gece vitrinlerini kapatmaları yasaklanmıştır. Böylece daima ışıklandırılmış bir ortam sunarak güvenlik hissini sağlamayı hedeflemişlerdir.

Ana cadde(Şekil 10.) 1996 yılında heykeltıraş Bjorn Norgaard'ın tasarladığı özel stil granit döşeme ile kaplanmıştır(Gehl and Gemzøe 2001).




*Şekil 22: Ana cadde granit döşeme [URL-3]*

Geceleri insan hareketliliğinin oluşması ve alana ışık sağlaması amacıyla konut kullanımını arttırmışladır. Hatta nüfusun önemli bir kısmının kafe ve restoran gibi alanların üst katlarında konumlanması sağlanmıştır. Böylelikle yaya mekanlarını gece kullanımı için konforlu hale getirmiş aynı zamanda bu konutların pencereleri sayesinde güvenlik hissi oluşturmuşlardır (Ocakçı,2004).

Bu çalışmalar sayesinde Kopenhag araçlara yönelik bir yapıdan halka yönelik bir yapıya geçmiştir. Yayalaştırma uygulamaları kent için pozitif sonuçlar doğurmuş, şehir merkezindeki faaliyetlerin artmasına, güven duygusunun gelişmesine ve yaya yoğunluğunun artmasına katkı sağlamıştır. Kullanıcılara uygulanan anketler vasıtasıyla onları neyin bu mekânda var olmaya ihtiyaç duydukları saptanmıştır. Bu faktörler; ortamdaki atmosfer, alanda bulunan insan varlığı ve hareket yoğunluğu ve mekanda tarihsel yapıların bulunması olarak saptanmıştır. Bir kısım gözlemci ise caddenin dar sokaklarını, dikey düşlemde dikkat çeken binalarını, sayısı fazla olan kapı ve pencereleri genelleme yapılacak olursa da caddede ulunan bina cephelerini söylemiştir(Beatley 2012). Yapılan uygulamalarda sadece gündüz değil bu alanların gece kullanımına da olanak sağlamışlardır. Ticari alan, durağan aktivite ve yerleşim alanlarının dengeli kullanımı sayesinde Kopenhag doğru ve etkin yayalaştırma kavramına uygun bir sonuç elde etmiştir.

Stroget caddesi, ulaşım, gece gündüz kullanımı, etkinlikler, sosyal yaşam vb kriterler açısından incelendiğinde başarılı bir meydan örneği sergilemektedir.

**La Rambla (Barselona, İspanya)**

| **Barselona, İspanya** | **La Rambla Caddesi** |
|---|---|
|  |    |

*Şekil 23: Barselona Şehri ve La Rambla Caddesi harita görünümü a-cadde girişi, b-cadde meydanı [Google Earth]*

Barselona'nın kent politikasını insanların toplanabileceği kamusal alanlar oluşturur. İnsanlara vakit geçirecekleri alanlar yaratmak amacıyla şehir merkezinde bulunan eski ve köhnemiş binalar yıkılarak yeni buluşma noktaları oluşturulmuştur. Bu uygulamaların amacı 1960'larda

ortaya çıkan kamu alanı ihtiyacı ve şehrin kimlik sorununun eksikliğidir. Mimarlık ve heykel Barselona'nın kent kimliğinde bir anahtar rolü üstelenmiştir. Bu sebeple yeni park ve meydanlar ''Müzeleri sokağa taşıyalım'' sloganıyla şekillenmiştir. Oluşturulan kamu alanları ünlü sanatçıların sanat eserleriyle donatılmış ve bütün meydanların kendi özel kimliklerini elde etmesi amaçlanmıştır. Bu sebeple de eski binalar yıkılarak yeni meydanlar oluşturulmuştur. Bunlardan en önemlisi ise yayalaştırılan La Rambla Caddesi'dir(Şekil 12.)(Gehl 2007).



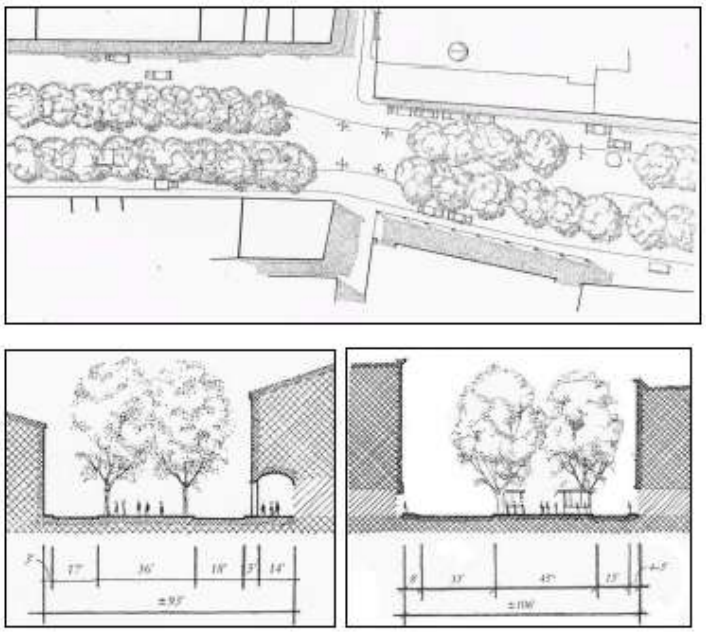

*Şekil 24: La Rambla Bulvarı yayalaştırılmadan a- önceki ve b-sonraki hali [URL-4, URL-5]*

La Rambla Caddesi Barselona şehrinin en merkezi caddesidir. Yaklaşık 2 km uzunluğunda ve 30m genişliğindedir. Yürüyüş yaya alanı yolun ortasında tasarlanmıştır. Yaya yolunun üzerini büyük Londra çınarları (Şekil 13.) örter. Yol ağacı olarak bu çınarlarının seçilmesinin nedeni kışın yapraklarını döktüklerinde güneş, yazın ise yaprakları ile gölge sağlayarak yayalar için konforlu bir alan sağlamasıdır. Ayrıca araç trafiğinin neden olduğu toz ve gürültüyü de perde rolü üstlenerek engellemektedir(Jacobs 1996).



*Şekil 25: La Rambla Caddesi Üstten Görünümü [URL-6]*

*Tasarım sade olmasına karşın şaşırtıcı bir etkileyiciliği bulunmaktadır. Cadde geniş ve ferah görünüme sahip olup lineer bir kent parkı niteliğindedir.*



*Şekil 26: La Rambla Bulvarının Carrer Dels Talles bölümünün plan ve kesitleri (Jacobs,1996)*

Caddenin bir diğer önemli özelliği ise Barselona'nın kent kimliğini oluşturan canlı heykellerin (Şekil 15.) bulunmasıdır.



*Şekil 27: La Rambla caddesinde bulunan canlı heykeller[URL-7, URL-8, URL-9]*

La Rambla birçok bölümden oluştuğundan ''Les Rambles'' şeklide çoğul olarak da anılmaktadır. Bu geniş cadde kuzeyde yer alan Plaça de Catalunya meydanı ile güneyde ise liman tarafında bulunan Christoffel Columbus adına dikilen heykel Monument a Colombus meydanını (Şekil 16.) birbirine bağlamaktadır.




*Şekil 28: a-Plaça de Catalunya meydanı ve b- Monument a Colombus heykeli [URL-10, URL-11]*

**Limbecker Strasse (Essen, Almanya)**

| **Essen, Almanya** | **Limbecker Strasse Caddesi** |
|---|---|
|  |  |



*Şekil 29: Essen Şehri ve Limbesker Strasse Caddesi harita görünümü a-cadde girişi, b-cadde çıkışı [Google Earth]*

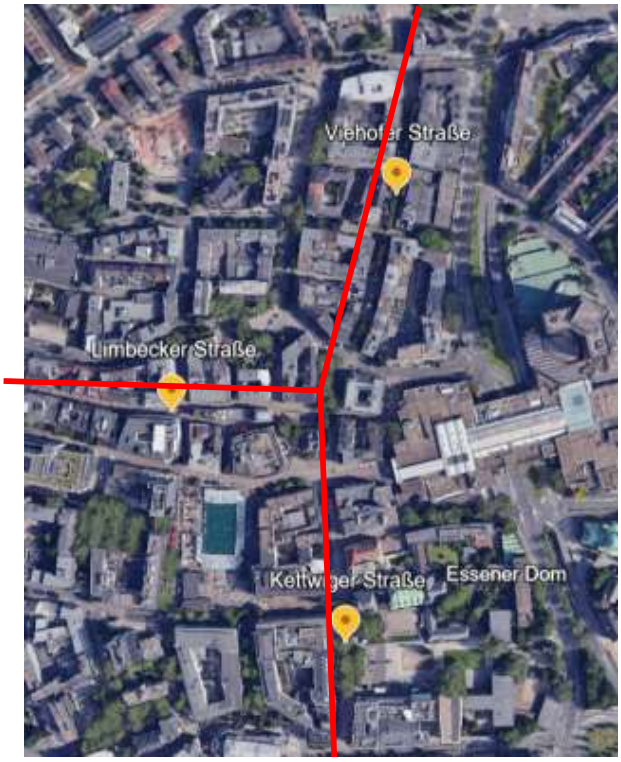
Yayalaştırma çalışmalarının ilk kez başladığı yer olan 'Limbecker Strasse'' Batı Almanya'nın Essen kentinde yer almaktadır(Rubenstein 1992). Birçok kentte yaya sokaklarının doğuş ve ilham noktası olarak anılmaktadır. Batı Almanya'nın yaya sokaklarını hızla arttıran ilk Avrupa şehirlerinden biridir. Bu durumun başlıca sebepleri,

Savaş sonrası yeniden planlanan şehrin daha modern bir anlayışla o dönemki koşullara uygun tasarımlar, gerçekleştiriliyor olması

Şehir trafiğinde araç yollarının daha geniş planlanarak trafik akışının değiştirilmesidir.

Yapılan bu uygulamalar sonucu şehir merkezinde bulunan dar yollar araç trafiğinden arındırılmış ve yaya alanlarına dönüştürülmüştür(Robertson 1994). Kentteki trafik akışı düzenlenmiş, tarihi yapı ve anıtlar korunmuş ve insanlara daha tarihi, fiziksel ve sosyal bir çevrede yaşama imkanı verilmiştir(Hajdu 1988).

Kentin merkezinde bulunan ve 2.3km uzunluğa sahip olan Limbecker, Viehofer ve Kettwiger caddeleri meydanlarla birbirlerine bağlanmaktadır (Peters, 2007).




*Şekil 30: Limbecker, Viehofer ve Kettwiger caddeleri kesişimi[Google Earth]*

Caddeler enerjik, ilgi çekici ve modern bir şekilde planlanmıştır ve ‘’T’’ şeklini (Şekil 18.) almaktadır. Bu uygulamalardan kısa bir süre sonra ticaret fonksiyonunda önemli gelişmeler yaşanmıştır. Cadde sabah 10:00’a kadar içeride bulunan ticari fonksiyonlar için araç trafiğine açıktır. Daha sonrasında araç girişine izin verilmemektedir. Ulaşım elemanları alanın çevresinde planlanmıştır. Otobüs, tramvay ve metro ile desteklenmiş ve park alanları oluşturulmuştur. Cadde bir alışveriş sokağı olarak planlanmıştır. İnsanların sosyal aktivitelerini gerçekleştireceği tiyatro, kilise gibi yapılar ise cadde çevresini kuşatmaktadır (Peters, 2007).







*Şekil 31: a-Limbecker, b-Viehofer ve c-Kettwiger caddeleri [URL-12, URL-13, URL-14]*



**Manski Ana Yaya Sokağı (Kouvola – Finlandiya)**

| Kouvola, Finlandiya | Manski Ana Yaya Sokağı |
|---|---|
|  |  |

*Şekil 32: Kouvola Şehri ve Manski Caddesi harita görünümü a-cadde görünümü, b-yağmur taşları [Google Earth]*

Avrupa'daki önemli şehirlerin yanında birçok küçük şehirde de yaya alanları tasarımında özverili bir çalışma yürütülmüştür. Finlandiya'nın güney doğusunda yer alan ve nitekim kırsal bir şehir olarak anılan Kouvola'da bulunan ana cadde de yayalaştırılmış sokaklara örnek olabilir (Şekil 17). Bu sokak Finlandiya kent bütünlüğüne uygun olacak şekilde sade ve estetik bir şekilde düzenlenmiştir(Gehl and Gemzøe 2001).

Kouvola Finlandiya'nın 32.000 nüfuslu küçük bir şehridir (Wikipedia). Kauppalankatu'nun 26 metre genişliğindeki ana caddesi, 1995 yılında Manski (Şekil 21.) ismini almış ve yayalaştırılmıştır. 1998 yılında ise cadde yeniden ele alınmış ve 2. Kez kent kullanıcılarının kullanımına açılmıştır. Yaya bölgesi son yıllarda genişlemeye devam etmektedir(Gehl 2007).



*Şekil 33: Manski yayalaştırılmış cadde görüntüsü[URL-15]*

Kouvola bir su kaynağına kıyısı bulunmamaktadır. Bu nedenle de sokağın tasarımındaki ana tema 'su' olarak seçilmiştir. Bu temaya uygun olarak sokağa üç farklı heykelimsi eleman eklenmiştir. Htrita taşı, delta taşı ve yağmur taşı (Şekil 22.) adını verdikleri bu üç heykelimsi öğe 150m uzunluğundaki su kanalı ile birbirine bağlanmıştır. Finlandiya'ya özgü bir granitten hazırlanan harita taşı bölgede yer alan Kymi nehrinin kaynağını simgelemesi adına tasarlanmıştır(Gehl and Gemzøe 2001).



*Şekil 34: a-Yağmur taşları, b-harita taşı, c-taşları birbirine bağlayan su kanalı*(Gehl and Gemzøe 2001)

1998 yılında Manski caddesinin daha çağdaş bir görünüme kavuşması adına çalışmalar yapılmıştır. Zemin kaplamları yenilenmiş, aydınlatma elemanları, ızgaralar, çöp kutuları (Şekil 23.) vb. bütün kentsel donatılar yerel kent kimliğinin oluşması adına, şehrin kendine özgü sokak yapısı olması gerektiğine bağlı kalarak tasarlanmıştır(Döllük 2005).



*Şekil 35: Manski yaya caddesindeki kentsel donatı elemanları görselleri*(Döllük 2005)

Sokakta bulunan ve şehrin önemli bir parçası haline gelen su kanalı harita taşı ile başlayıp yağmur taşları ile sonlanmaktadır. Bu taşların üstünde bulunan küçük deliklerden sızan su, Finlandiya'ya özgü olan bir çeşit granite taşının üzerinde sürekli akan bir su yüzeyi oluşturmaktadır. Akan bu su granit taşı üzerinde mekânı yumuşatacak bir ses çıkarmakta ve kullanıcılara keyifli bir alan yaratmaktadır. Kanal cadde içinde çok küçük bir alanda bulunmasına rağmen kent için en nitelikli öğe haline gelmiştir. Tasarımın amaçlarından biri de sokağı yalnızca yetişkinler için değil çocuklar için de çekici kılabilmektir. Sokak boyunca akan ve yer yer yükselen su öğesi (Şekil 24.) insanları sokak boyunca etkisi altına almaktadır(Gehl and Gemzøe 2001).



*Şekil 36: Manski su kanalları görüntüsü [URL-16]*

Kış aylarında sokak mekanının görüntüsünde dramatik bir görüntü oluşur. Tüm cadde karla kaplanır, kanallar ahşap kapaklarla kapatılır. Uzun ve karanlık süren kış mevsimi boyunca cadde yapay aydınlatmalarla aydınlatılır (Şekil 25). Aydınlatma öğeleri karda dekoratif desenler oluşturacak şekilde tasarlanmıştır. Konumu itibariyle kış mevsimi karanlık olmasının yanında çok soğuk geçmekte hava sıcaklıkları 0 ve -20 derece arasında değişmektedir. Buna rağmen yüzeye vuran ışıklar caddeyi göz kamaştırıcı bir şekilde aydınlatmaktadır(Gehl and Gemzøe 2001).



*Şekil 37: Manski ana yaya sokağı kış görüntüsü [URL-17]*

Nüfusu düşük olan ve hava koşullarının kent kullanıcılarını zorladığı bu bölgede Manski ana yaya sokağı her türlü detayın üzerinde titizlikle durulduğu, tasarımların kent imgesine uygun olacak şekilde planlandığı lineer bir yayalaştırılmış cadde konumuna erişmiştir.

**SONUÇ VE DEĞERLENDİRME**

Bu çalışma kapsamlı bir literatür taramasıyla yaya trafiğine kapatılan caddelerin estetik ve fonksiyonel açıdan nasıl şekillendiğini, bu alanı kullanan yayaların deneyimlerini ve dünyadaki yayalaştırılan caddelerin incelemelerini içermektedir. Karabük Kemal Güneş Caddesi'nin de bu kapsamda incelenmesini ve alana getirilen çözüm önerileriyle bu caddenin estetik ve fonksiyonel açıdan iyileştirilmesini hedeflemektedir.

Yayalaştırılmış alanların başarılı olabilmesi, yalnızca araç trafiğinden arındırılmasına bağlı değildir. Bu bölgelerin kullanıcıların günlük ihtiyaçlarına yanıt veren, kullanıcıların sosyal etkileşimine olanak sağlayan, estetik duyarlılıklara cevap veren ve her yaştan kullanıcıya hitap edebilen mekanlar olması gerekmektedir. Yapılan gözlemler sonucunda, başarılı kabul edilen

yayalaştırma projelerinde mekânın tasarım kalitesi, sürdürülebilir oluşu, erişim kolaylığı ve fonksiyonel kullanım çeşitliliği ile anlam kazandığı gözükmektedir.

Karabük Kemal Güneş Caddesi örneğinde yayalaştırma uygulaması kente önemli ölçüde katkı sağlamıştır. Bu bölgedeki yaya hareketliliğinin artmasına ve bölge ticaretinin canlanmasına olanak sağlamıştır. Ancak alanın tasarım kalitesi, cephe düzenlemeleri, yetersiz kalan donatı elemanları, engelli bireylerin erişim yetersizliği konusunda gerekli düzenlemeler yapılamamış ve sosyal etkileşime olanak vermeyen mekânsal organizasyonlar oluşmuştur. Bu gibi eksik uygulamalar caddenin sadece bir geçiş alanı olarak kalmasına ve kullanıcıların ‘’kalma’’ ve ‘’aidiyet’’ hissinin oluşamamasına sebep olmuştur. Bu bağlamda Karabük Kemal Güneş Caddesi için önerilen çözüm yolları şu şekildedir:

***Kentsel Tasarım Estetiği ve Cephe Düzenlemeleri:***

Cadde boyunca yer alan dükkân tabelası ve cephe kirliliği estetik ilkelere bağlı kalınarak yeniden düzenlenmelidir. Bu düzenlemeler yapılırken Karabük şehrinin kent imgeleri öne çıkarılmalıdır.

***Donatı Elemanlarının Planlı Yerleştirilmesi:***

Oturma elemanları, çöp kutuları ve aydınlatma elemanlarının mekanla bütünleşmeli, estetik ve ergonomik tasarımlar yapılmalı ve yaya hareketlerine uygun bir şekilde konumlandırılmalıdır. Sırtlıklı oturma grupları tercih edilmeli, çöp kovası oturma gruplarından uzağa, aydınlatma elemanları ise bu alanlara yakın yerlere konumlandırılmalıdır.

***Erişilebilirlik ve Kapsayıcı Tasarım:***

Yayalaştırılan caddede görme engelli bireylerin rahatça hareket edebilmesi için evrensel tasarım ilkelerine uygun kabartmalı yürüyüş yolları, ara yollarda rampalar ve sesli betimlemeler entegre edilmelidir.

***Sosyal Kullanım Alanları Oluşturulması:***

Açık hava oturma alanları, kafeler ve geçici etkinlik alanları gibi durağan aktivitelere izin verem ve destekleyen sosyal mekanlar tasarlanmalıdır. Bu sayede cadde bir geçiş alanı olmaktan çıkarak yayaların caddeyle sosyal bir bağ kurmaları ve aidiyet duyguları güçlendirilmelidir.

***Aydınlatma ve Güvenlik:***

Caddenin gece de kullanımını teşvik edecek, aynı zamanda güvenli alan hissiyatı oluşturacak bir aydınlatma sistemi kurulmalıdır. Dükkanların vitrin aydınlatmalarının gece boyu açık kalması güvenlik hissiyatının artmasında faydalı olacaktır.

***Yeşil Alan ve Su Öğeleri:***

Yeterli sayıda peyzaj alanı bulunmayan cadde yeşil elemanlar ve su öğeleriyle desteklenmeli hem termal konfor hem de estetik çeşitlilik sağlanmalıdır.

***Gece – Gündüz Dengeli Kullanım:***

Caddede konut ve ticari yapıların birlikte yer alması teşvik edilerek, alanın yalnızca gündüz değil gece de aktif kullanılması sağlanmalıdır. Bu sayede artan güvenlik hissiyatı kullanıcının alanı benimsemesine yardım edecektir.

Sonuç olarak başarılı bir yayalaştırma uygulaması yalnızca taşıtların dışlanması olarak kabul edilmemelidir. Bölge, alanın yaşanabilirliğine, erişilebilirliğine, sürdürülebilirliğine ve kentsel bir imge haline gelebilmesine de olanak sağlamalıdır. Bu kapsamda kentlerdeki yayalaştırma politikalarının; kullanıcı davranışlarına, sosyal ihtiyaçlara ve kültürel dinamiklere cevap verecek şekilde yeniden değerlendirilmesi, daha yaşanabilir ve kapsayıcı kent mekanlarının oluşturulmasına olanak sağlayacaktır.

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**[9]** https://www.barcellonafacile.it/cosa-vedere/la-rambla/
**[10]** https://en.wikipedia.org/wiki/Pla%C3%A7a_de_Catalunya
**[11]** https://barcelonahacks.com/columbus-monument-barcelona/
**[12]** https://www.essen.de/meldungen/pressemeldung_1443560.de.html
**[13]** https://www.architektur-bildarchiv.de/image/Gesch%C3%A4ftshaus-Viehofer-Stra%C3%9Fe-11-Essen-51545.html
**[14]**https://de.wikipedia.org/wiki/Kettwiger_Stra%C3%9Fe#/media/Datei:Essen,_Kettwiger_Stra%C3%9Fe_01.jpg
**[15]** https://es.123rf.com/photo_145359808_kouvola-finlandia-12-de-octubre-de-2019-calle-manski-en-un-oscuro-d%C3%ADa-lluvioso-de-oto%C3%B1o.html
**[16]** https://www.dreamstime.com/kouvola-finland-october-street-manski-dark-rainy-autumn-day-image165211192
**[17]** https://www.dreamstime.com/kouvola-finland-november-christmas-decorations-street-manski-evening-light-illumination-image164446030

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# Comparative research of historical and modern train stations in Türkiye in terms of scale, function and architecture

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**Abstract.** The history of railways and train stations in Anatolia began with the construction of the İzmir-Aydın railway and the first train stations, İzmir-Alsancak and Aydın Railheads, between 1856 and 1866, with the privilege given to the British during the reign of Sultan Abdülmecit. Especially after the proclamation of the Turkish Republic in 1923, 'weaving the country with iron nets' was seen as an important national goal. Train stations have been influenced by movements such as the First and Second National Architecture and modernism, which reflect the political and cultural situation, technological and economic development and expectations of the society of the period in which they were built. Since the 2000s, high-speed train lines and stations began to be planned in Turkey and in 2009, the Ankara and Eskişehir High Speed Train Stations have started to be used. Train stations of Turkey have been the subject of academic studies in many fields due to their effects on Turkey's urban, social, economic and political aspects. Today, architectural structures belonging to railways in Turkey consist of 4 main groups: Railheads (important train stations where the railway ends), Train Stations (at the middle of the railway) Suburban Stations and High-Speed Train Stations. This research examines the architectural, aesthetic and material features of train stations in Turkey, their changes and their effects on the urban texture and morphology in the past and today, how they were constructed, used and repaired structurally and materially, how they were re-used for different purposes. Three case studies of historical train stations as İstanbul, Ankara and Konya Train Stations, which are located on the high-speed railway network of Turkey, were analysed in architectural and structural aspects and at urban, regional and national scales, with considering their relations with newly built high-speed train stations.

**Keywords:** Historic train stations; High-Speed Train Station; Conservation of cultural heritage; Modern Turkish Architecture; Ankara train station; İstanbul train station, Konya train station.

## 1. Introduction

Railways, which have been instrumental in important developments in the world and in Türkiye, have led to the formation of new structures and urban areas, and have brought with them many effects reflected in urban architecture. In every settlement area where railway buildings and rails pass, effects such as acceleration of transportation and raw material supply, improvement of infrastructure, revival of production and employment, increase in cultural interactions, urbanization and migration have been observed (Başar & Erdoğan, 2009, 29-30).

The station buildings constructed with the construction of railways, although they were mostly located outside the city settlement during the period they were built, created a force of attraction over time and paved the way for physical, social, cultural and economic transformation in their surroundings. Railway buildings reflected the characteristics of both the city they were located in and the period, and at the same time became a symbol of the change they created in the city, the development they provided and the new areas they created. Station buildings may reflect the culture of the region they were built in or the culture of the country that built them, and may also include the interpretation of the old architectural language with today's conditions (Başar & Erdoğan, 2009, 30-32). With the change and development of train technology, new technologies and architectures have also begun to be used in addition to old systems and structures. For these reasons, the architecture of railway structures, their interaction with the city and the relationship of old structures with the new are multifaceted and worth researching.

The fact that train station structures were built by foreign architects in those periods led to the emergence of structures inspired by different geographies. The station buildings built by European states served as an educational

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tool for local architects, leading to the more frequent use of new trends and architectural technologies in the country (Başar & Erdoğan, 2009, 32).

Then, the national architectural movement, which started in Anatolia close to the declaration of the Republic of Türkiye, led to the formation of national architectural structures in cities such as Ankara, Eskişehir, Konya, Adana and Kayseri. Before World War II, the New German Nationalist Movement that emerged in Germany also affected Turkish architecture, and traditional motifs in architecture faded away. During this period, rational uses of reinforced concrete and steel began to prevail on an international scale. This situation is especially seen in Ankara Train Station and its surroundings and in Eskişehir's new train station building. Especially after 1931, local architects were supported to produce architectural works using local materials (Tankut, 1994, 23, as cited in Yakın, 2021, 42). From the 1960s onwards, architectural design concerns and aesthetic efforts began to disappear in train stations built in Türkiye (Yılmazyiğit, 1991, as cited in Başar & Erdoğan, 2009, 32). After these dates, the increase in investments in road transportation caused the railways to become secondary. The railway structures built by the state began to become ordinary buildings with no concern for style.

From past to present, train stations have held an important place in the memory of the city dwellers as public structures that form the identity of the city, the prestige and symbolic structure of the city (Özkaynak & Korkmaz, 2019, 216). The place of train stations in the architectural memory of the society has been used as an ideological, cultural, economic tool and/or symbol (Yakın, 2021, 38-39).

## 2. Materials and Methods

### 2.1. Train Stations in Architectural and Urban Scales and Relationships between Old and New Structures

Train station structures, due to both their functions and architectural characteristics, create a focal point for the surrounding area. They create a gravitational effect similar to that of a square or a bazaar that brings people together in the settlement they are located in (Akdemir & Keskin, 1993, as cited in Başar & Erdoğan, 2009, 39). Railways, on the other hand, enabled rapid product transportation and passenger travel in the areas where they were located, accelerated trade and production in the areas where the railways passed, revived cultural interaction with the outside world, and increased population and investments through migration (Ayvaz & Halaç, 2023, 65). In short, an important determining factor of the city identity (Uslu et al, 2025, 430), railway structures act like a magnet in the urban fabric of the city they are located in, becoming

Although there are many station structures on the railway line, the most important ones are the main stations, which serve as an ending and a beginning, are generally located in the city center or close to the center, and become an urban image and landmark for the city. These structures were generally designed by famous architects, and since the political, economic, cultural and social structure of the period was greatly influential in their design, they have become important historical documents. Train stations have served as a gateway to the outside world for city dwellers, and have held an important place in the memories of visitors as the first structure they encountered in the city (Yıldız, 2013, 52).

Railway lines and structures are entering a transformation process, where the effects of the 21st century in transportation are intensified, systems are modernized, and passenger and freight capacity is increasing. In particular, new technology high-speed train systems and the construction of new high-speed train stations are replacing existing railway structures (Sedes & Çıkrıkçı, 2022, 1554). Due to new technologies, historical train stations are in danger of losing their function that has a place in the memory of the society or becoming the focus of other profit-oriented investments.The High Speed Train Lines under construction are located very close to the historical station buildings in many cities such as Ankara, İstanbul, Konya, Eskişehir and Sivas. However, these new structures are far from complementing the existing station buildings, but they are a dominant structure that is integrated into the urban fabric. In fact, these new High Speed Train Stations located in the city center stand out by being significantly different from the existing settlement texture in terms of volume, ratio, proportion, facade and material (Sedes & Çıkrıkçı, 2022, 1554), causing the historical railway axes to become secondary and the station buildings to become dysfunctional. This situation creates physical, social and economic transformative and transformative effects on the urban fabric that has been shaped around the historical station for many years.

### 2.2. Selected Examples of Train Stations of Three Cities of Turkey: İstanbul, Ankara, Konya

In this article, the main station buildings (railhead stuctures) of historical railways and the main high-speed train lines from three metropolitan cities in Türkiye (İstanbul, Ankara, Konya) were examined comparatively. In the selection of these cities, the criteria has been determined as having both a historical station structure that has become the image of the city and high-speed train lines associated with it. The relationship between these historical and new station structures and how the stations and stations built with new technologies affect the urban texture that developed around the old station were examined.

2.4.1. İstanbul Train Stations

From 1872 onwards, the opportunities provided by the railway caused the trade volume to increase gradually in Haydarpaşa, and the Ottoman Empire gave the railway and port constructions to German companies due to the political circumstances. The first Haydarpaşa Train Station was a wooden 2-storey building, which existed between 1872 and 1939. This structure served a single-track railway between Haydarpaşa and Pendik (passing through Kızıltoprak, Feneryolu, Göztepe, Bostancı, Maltepe and Kartal stations). Haydarpaşa Port, designed and built by the Philipp Hollzmann company, was opened in 1903, which increased passenger traffic, and therefore a comprehensive train station structure that could serve together with the port was needed (Kösebay Erkan, 2013, 103-104). The station to be built would be the starting point of major projects connecting Istanbul to Baghdad and connecting Europe to the Hejaz and the Persian Gulf (Başar & Erdoğan, 2009, 33).

Todays Haydarpaşa Train Station in Kadıköy, İstanbul, has been built in 1908 with the Concession given by the Ottoman Empire to the Germans, designed by Hellmuth Cuno and Otto Ritter. The building has become an urban, architectural, aesthetic and social image of the city and a landmark with its striking appearance on the shores of the Bosphorus since the beginning of the 20th century. Haydarpaşa was designed at the request of Abdülhamit II, reflecting the magnificence of the period and containing a variety of forms. It has an eclectic style that bears the symbols of the Ottoman Empire, Middle Europe Baroque, German Renaissance, with its empire style decorations (Kösebay Erkan, 2013, 108), which are considered the second phase of neoclassicism (Fersan, 1991, Koçer, 1995, Soğancı 2001, as cited in Başar & Erdoğan, 2009, 33). The structure is a masonry system supported by steel beams in places and its foundations resting on wooden piles. The north door of the building served arriving passengers, while the south door served departing passengers. In first floor plan, there are sections such as offices, waiting rooms, conference rooms, glass-fronted offices above the passenger lounge. There is a manager's office in the north tower, and a general manager's office in the south tower. There are also offices in the short arm, and an inspector's room, telephone and telegraph rooms in the long arm. The most important feature of Haydarpaşa today on an environmental scale is that it is a symbolic structure that has been used by the masses for over a century.

Yonca Kösebay Erkan has worked on the interaction of Istanbul's railway heritage with the Marmaray project, which connects the Asia and Europe continents with an undersea railway tunnel (Kösebay Erkan, 2012a, 2012b). After the Marmaray Project began to take shape in 2004, the presentation of Haydarpaşa Train Station to urban competition brought about discussions. The Marmaray Project connect the Anatolian side of Istanbul to the European side with a tunnel passing under the Bosphorus, which has removed Haydarpaşa from being a starting or ending point in urban transportation. This situation led to legal changes that allowed the 1 million square meter area, which includes the Haydarpaşa Train Station and its surrounding area, to be reused for functions such as hotels, etc., instead of serving the original function of the building. Although TCDD officials applied to the Constitutional Court to cancel the decision to declare Haydarpaşa and its surroundings an urban protected area, the decision has not changed. The 1/5000 scale conservation zoning plan prepared for Haydarpaşa and its surroundings in 2009 was rejected as unconstitutional, and the new zoning plan study was approved by the Istanbul Metropolitan Municipality Council in 2011. The Conservation Development Plan prepared for the Haydarpaşa area in 2012 proposes a multifunctional, mixed use in the area and includes the use of the Haydarpaşa Train Station building for accommodation purposes (Kösebay Erkan, 2013, 99-101).Finally, although the Ministry of Transport of the Republic of Turkey announced that the building could not be a hotel, the function to be given was left unclear.

With the decision to connect the Rumelia railways, the most important railway of the Ottoman Empire opening to Europe, to Sirkeci, two small-scale two-storey and two four-storey station buildings, which do not exist today, were built on the seashore in 1872. However, the construction of the main station building (Sirkeci Train Station) began in 1888 upon the order of Abdulhamid II (Ayvaz and Halaç, 2023, 70). As the beginning of the Rumelia Railway Line, the structure serves as a gateway to Europe and foreign trade (Ayvaz & Halaç, 2023, 62). After the construction of Sirkeci Train Station was completed, it was called "The Gate of the East" by the Western states and "The Gate of the West" by the Ottomans (Durmaz Aktaş, 2019, 6, as cited in Ayvaz & Halaç, 2023, 65). Designed by German architect August Jasmund, who wanted to reflect Middle and Far Eastern influences, Sirkeci Train Station was put into service in 1890 as the starting point of the Istanbul-Sirkeci-Pythion railway. The building is Jahmund's only work in this style, and it influenced the styles of stations that would later be built in Central Europe (Büyükdemir 1999, as cited in Başar & Erdoğan, 2009, 34). There are eight railway structures in the Sirkeci Train Station Area. The first structure, built in 1972, is currently used as the Old Chieftainship Building. The structure of the State Railways Directorate of the Republic of Turkey was destroyed by fire, and the Section Chief, Locomotive Maintenance Workshop, Wagon Chief Service and warehouse structures remain idle and are not used due to the Halkalı station put into service (Ayvaz & Halaç, 2023, 73-74).

Although the Sirkeci Train Station area was declared a cultural area in 1995, the project aiming at a transformation focused on culture and arts has not yet been determined in its final lines (Ayvaz & Halaç, 2023, 74). The Istanbul Railway Museum was opened in Sirkeci Station on September 23, 2005. With the commencement of the Marmaray project on October 29, 2013, Sirkeci Station was closed. On March 12, 2019, it

was decided that the railway line between Sirkeci and Kazlıçeşme would be used as both a railway and a recreational area, and trains returned to Sirkeci Station on February 26, 2024. between the State Railways of the Republic of Turkey and the General Directorate of Cultural Heritage and Museums in 2024, Today, Sirkeci Station is on the industrial heritage routes determined by ERIH (Geyyas Gören & Manisa, 2021, 882).

With the protocol signed between the General Directorate of TCDD Operations and the General Directorate of Cultural Heritage and Museums in 2024, the Haydarpaşa and Sirkeci Station buildings and areas outside the railway function were transferred to the Ministry of Culture and Tourism for 29 years to be used for "culture and tourism" purposes ("Haydarpaşa ve Sirkeci garları 29 yıllığına devredildi", 2024). The threat of losing the original functions of Istanbul's most important train stations has been met with public reaction.

It is known that there is no symbolic railway structure in the area where the Söğütlüçeşme High Speed Train Station is located. The Söğütlüçeşme Main Station Project is planned to be built in this area ("Söğütlüçeşme Anagar Projesi", n.d.)



Fig 1. Haydarpaşa Train Station (Retrieved from http://www.kadikoy.gov.tr/haydarpasa-gari-ilcemiz#gallery-1)

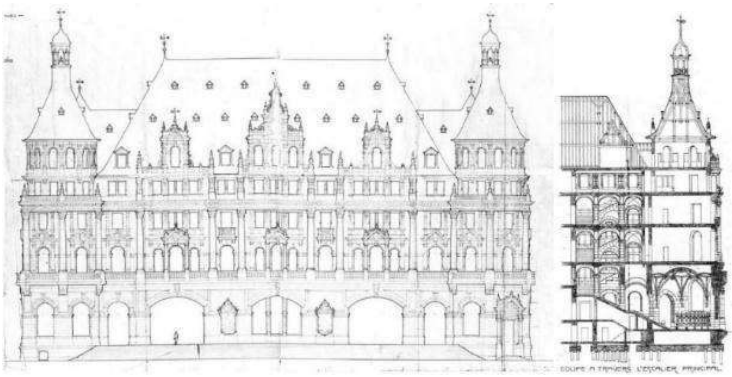

Fig 2. Main Façade and South Tower Detail of Haydarpaşa Train Station (Istanbul Railway Museum Archive, as cited in Kösebay Erkan, 2013, 108-109).

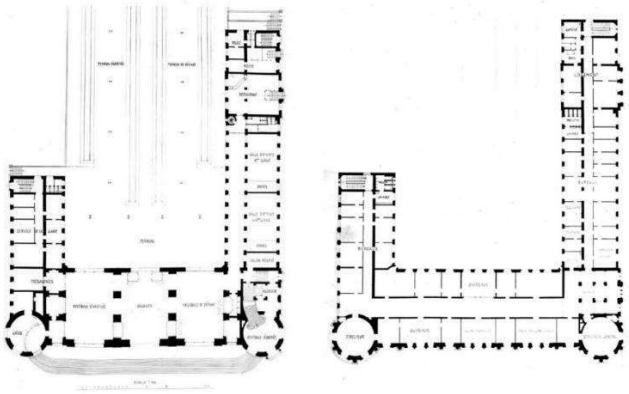

Fig 3 . Ground and First Floor Plan drawings of Haydarpaşa Train Station (Franfurt Institut für Stadtgeschichte Archive, as cited in Kösebay Erkan, 2013, 106).



Fig 4. Sirkeci Train Station (Retrieved from https://esenler.bel.tr/esgev/takvim/sirkeci-tren-gari-muzesi/)

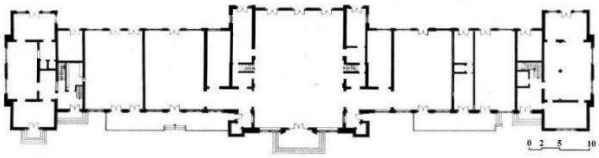

Fig 5. Ground Floor Plan of Sirkeci Train Station
(Sözen, 1973, as cited in Başar & Erdoğan, 2009, 34).

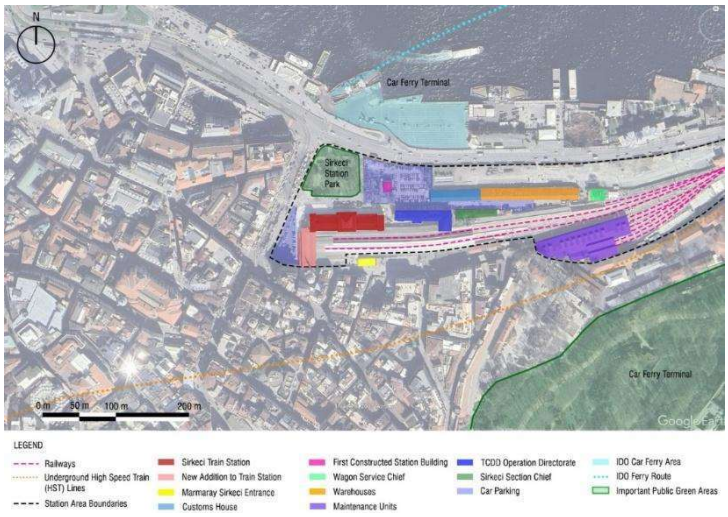


Fig 6. Building Functions Around Sirkeci Station Complex (Google Earth, 2025, Ayvaz & Hanım Halaç, 2023, 72; https://tr.railturkey.org/wp-content/uploads/2021/09/sirkeci-kazlicesme-rayli-sistem-guzergahi.png?w=800 , Reproduced by authors.)

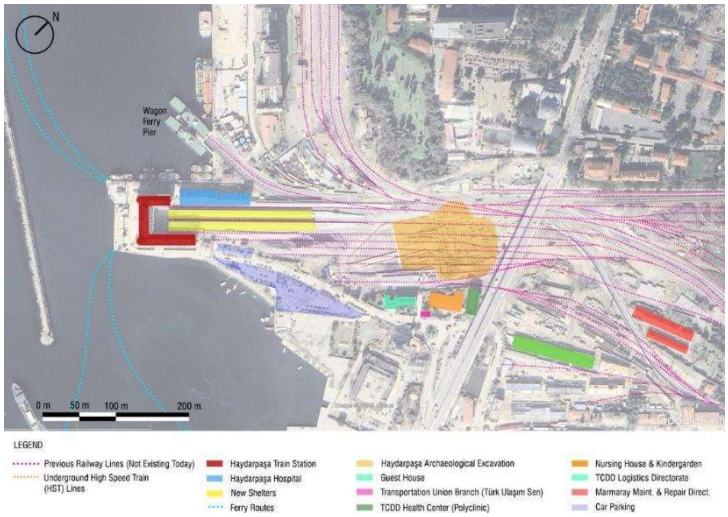


Fig 7. Building Functions Around Haydarpaşa Station Complex (Google Earth, 2025, Reproduced by authors.)

2.4.2. Ankara Train Stations

The old Ankara Train Station, which no longer exists, was built when the first locomotive arrived in Ankara in 1892. This structure has the same plan and facade layout as the first train station of Eskişehir, and very similar to the train station of Konya (Başar & Erdoğan, 2009, 35). Later, Ankara Gazi Station, which is designed by Ahmet Burhanettin Tamcı in 1926, the project became a symbol for the capital Ankara as one of the first station buildings of the National Architecture Period (Başar & Erdoğan, 2009, 36). Then, Ankara Train Station Building of today, described as the entrance gate of Ankara and one of the important structures of the Republic Period, has been constructed in 1937 and became a symbolic structure due to its architectural features. It was designed by architect Şekip Akalın, with the views of Professor Blum from Germany about the size and location of the station, and put into service in 1937. The role of the station structure is to reflect the power of the young republic and to create squares and spaces for the modern city dweller to pass through. Since the station is the first gate that those coming to the city pass through, it was aimed to meet the Youth Park with its landscaping and pools, in contrast to the arid and barren climate created by the geography. (Yakın, 2021, 42-43).

The building has a symmetrical volume and has 4 floors starting from the basement. There are circular staircase blocks on both sides of the entrance tower. The ceiling of the waiting hall is made of opaque laminated glass on a metal construction and allows daylight in. While the ground floor entrance hall contains buffets, ticket offices, luggage storage, staff offices, a barber and a lounge of honour, the upper floor of the side areas connected to the waiting room serve as lodgings (Uslu et al, 2025, 431). The reinforced concrete structure is covered with the characteristic pink Ankara Stone.

The important buildings around the Station Building, such as TR State Railways General Directorate Building, Direction Building, Ankara Hotel, 2nd Region Building, Train Maintenance House, Station Casino, lodging and guest houses, form a complex (Uslu et al, 2025, 432). Also, this structures are in a close physical relation with the newly constructed Ankara HST station. In 2019, a portion of the Ankara station buildings and the southeastern half of the Ankara station area were transferred to the use of a private university (Altın, 2025, 370). Located close to the station and built in 1927, Maintenance Units (*Cer Atölyeleri*) has been used as a modern arts center and art gallery with a since 2010, Wwith adaptive reuse found to be architecturally successful (Uysal et al., 2019, 76, Geyyas Gören & Manisa, 2021, 890).

Ankara HST Station was built on October 29, 2016, on the land next to Ankara Train Station, as a commercial complex consisting of the main high-speed train station and social areas such as a shopping mall, cinema, hotel, meeting halls, etc. Ankara HST Station was built as a total of 8 floors, approximately 400 meters long and 220,000 square meters of closed area. Ankara HST Station, unlike the old train stations, was built with the "build-operate-transfer" model. As a result, it has moved away from being a purely service-oriented public structure and has become a partially commercial investment. The structure was designed not only as a transportation venue but also as an urban center, even similar to a shopping mall. (Yakın, 2021, 49-50). It is seen that the station buildings in Ankara have transformed from a single small-scale building to a campus consisting of many buildings, and following the high-speed train technology, they have been designed as a large mass where all functions are gathered. In fact, it has been discussed architecturally that the new station, so close to the old station but so different in terms of scale, almost makes the old station structure invisible.

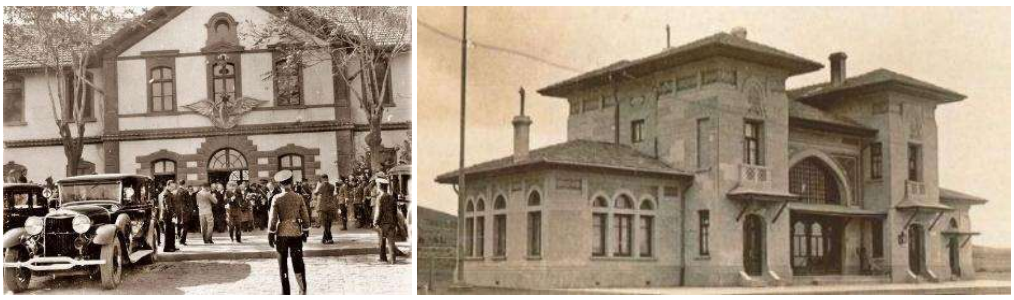

Fig 8. Old Ankara Train Station and Gazi Station
(Retrieved from http://www.eskiturkiye.net/2577/eski-ankara-tren-istasyonu-1930-lar/ and https://kulturenvanteri.com/yer/gazi-tren-istasyonu/)




Fig 9. Ankara Train Station in 2024 (Photographed by the authors.)

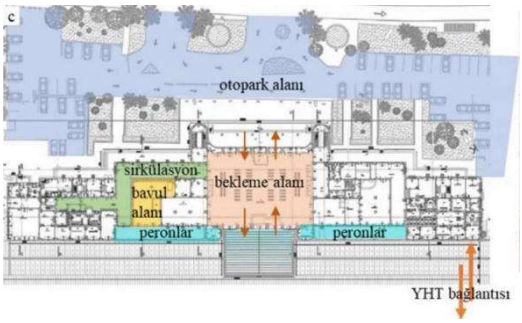


Fig 10. Ground Floor Plan of Ankara Train Station (Uslu et al., 2025, 431)

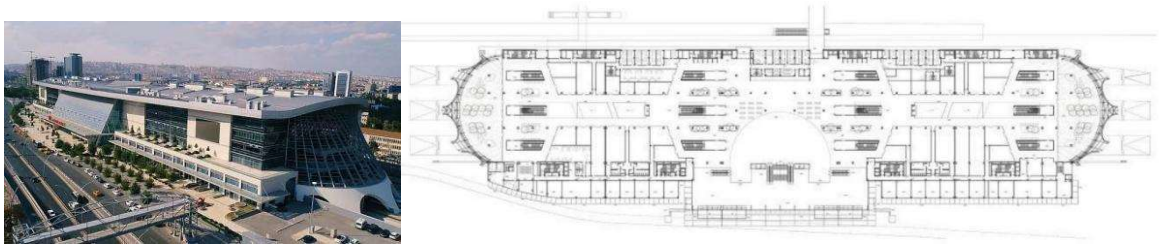

Fig 11. Ankara HST Train Station (Yakın, 2021, 49 & https://raillynews.com/2018/10/ankara-yht-gari-became-the-new-life-center-of-the-capital/)

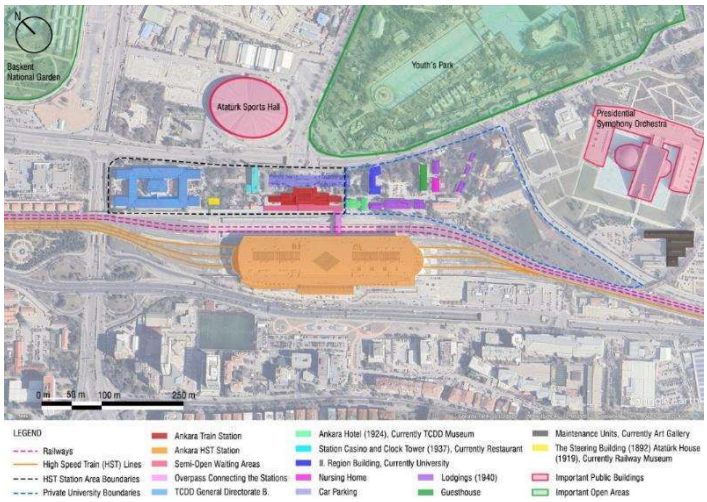


Fig 12. Building Functions Around Ankara Station Complex (Google Earth, 2025, Uslu et al., 2025, 432, Reproduced by authors.)

2.4.3. Konya Train Stations

First Konya Train Station was built in 1896 as the end point of the Eskişehir-Afyonkarahisar-Konya railway, which was built by the Chemins de Fer Ottomans d'Anatolie / Ottoman Anatolian Railways (CFOA) Company between 1894 and 1896 with an eclectic style (özkaynak & Korkmaz, 2019, 220). Konya station buildings were built as a complex along with other complementary structures, on a 160 x 22 m land (Yavuz Pakih & Sarıman Özen, 2022, 885).

For the main station building, stone, brick and wood materials were used in the masonry structure and the walls were plastered. Windows and doors on the facades are emphasized with stone arches. The arc-shaped structure located northwest of the Main Station building is a maintenance workshop structure consisting of 13 sections and houses a circular platform used to turn the locomotives in the direction they will enter. A section of this structure was demolished due to the road changes planned around it (Uysal et al., 2019, 80). After the 2014-2015 restorations, the 14 lodging structures were rented to the municipality and private institutions and started to be used for other purposes (Yavuz Pakih & Sarıman Özen, 2022, 886). Today, it is observed that the Konya Train Station Complex cannot keep up with changing conditions, developing technology and urbanization, and reuse proposals are being developed for the structures (Uysal et al., 2019; Yavuz Pakih & Sarıman Özen, 2022).

As addition to historical train station, a new station building is constructed in 1956 (Özkaynak & Korkmaz, 2019, 216). While the scale of the building can be considered compatible with the old building, its incompatibility in terms of architectural language has been subject to criticism. Konya Train Station has also started to be used as a stop for the High Speed Train. However, due to the expansion works to be carried out on the Meram Yeniyol Bridge, it will not be able to provide service for three months as of March 10, 2025 (Elmas, 2025).

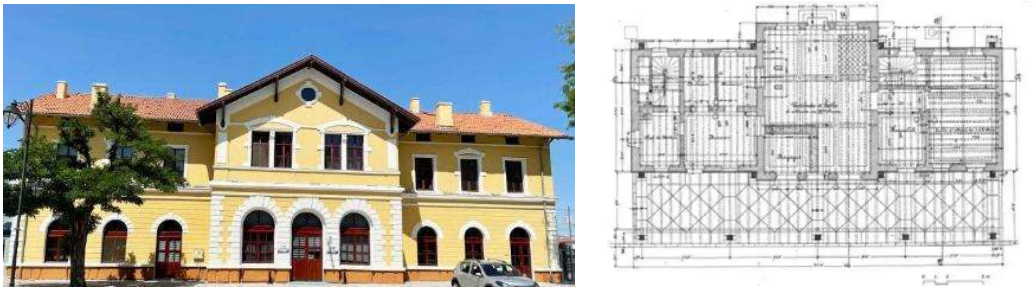

Fig 13. Konya Historical Train Station
(Selman Bayrakçı, Retrieved from http://turkiyeturizmansiklopedisi.com/konya-tren-gari and https://www.dogrulukpayi.com/dogruluk-kontrolu/konya-daki-tarihi-tren-gari-yikilip-yerine-yenisi-mi-yapildi)




Fig 14. Konya New Train Station constructed in 1956 (Retrieved from https://www.ilgihaber.com/konya/konya_meram_yuksek_hizli_tren_gari_kapatildi_yht_yolcularini_neler_bekliyor-162535h#google_vignette & https://www.yenikonya.com.tr/konya /konya_meram_yht_gari_kapatildi_ konya_meram_yht_gari_ne_zaman_acilacak_iste_alternatif_ulasim_secenekleri-1946145)

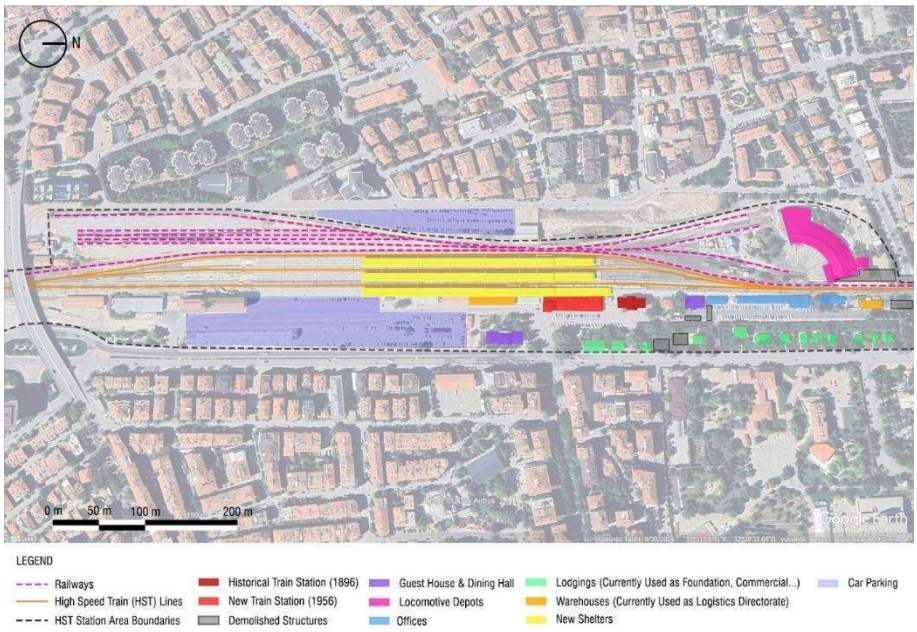


Fig 15. Building Functions Around Historical Konya Train Station
(Google Earth, 2025, Yavuz Pakih & Sarıman Özen, 2022, 885, Reproduced by authors.)

With the arrival of high-speed train technology in Konya in 2011, the Selçuklu Station Building, whose project was prepared in 2013, put into service on October 2, 2020. Currently, there are two high-speed train stations in Konya city. Selçuklu YHT Station is the first stop for high speed trains coming to Konya city, close to commercial areas and the tram stop, constructed in October 2021, which is 4.5 km far away from the city center. The second Konya HST Station, located on the site of the old Konya Train Station, consists of only a superstructure. On the other hand, Selçuklu HST Station onsists of a vertical big rectangular mass on a horizontal road route and platform structures adjacent to it parallel to the road. It is considerably larger and more dominant than the surrounding buildings in terms of scale and silhouette.

## 3. Results and Discussions

Effect of high-speed train stations on existing urban texture around train stations in selected examples are examined in this section with comparison of aerial photograos from different years.

### 3.1 İstanbul

When the existing port activities in Sirkeci and Haydarpaşa were supported by the railway, the trade volume of the area reached its highest level and it became an important logistics and commercial center in freight transportation. With Haydarpaşa and Sirkeci Train Station Areas, the city has experienced developments in social and economic areas, and with increasing industrialization, production facilities, shipyards, warehouses, and industrial enterprises have been put into service in the port and coastal areas close to Haydarpaşa and Sirkeci (Ayvaz & Halaç, 2023, 68, 71).

In addition to the construction of the Sirkeci Train Station, the construction of warehouses and docks in the area changed the character of the area and allowed the city to take on a new identity (Kuban, 2010, 99, as cited in Ayvaz & Halaç, 2023, 72). Around Sirkeci Train Station, there are important city places such as Topkapı Palace, Gülhane Park, Sultanahmet Mosque, Hagia Sophia Mosque, Mısır Bazaar, Galata and Golden Horn bridges.

The opening of the Marmaray Tunnel (for railways) in 2013 and Avrasya Tunnel (for automobiles) in 2016, which connect the Asian continent to Europe and passes under the Bosphorus, and the construction of the High Speed Train 2014 have caused Istanbul to undergo many changes on an urban scale. The facilitation of intercontinental and intercity railway transportation for Istanbul has paved the way for new investments. Two city parks, one of which is the largest in the world, were built by filling the sea in Maltepe and Yenikapı in Istanbul in 2014, increasing the surface area of İstanbul by approximately 2 square kilometers. In the Kadıköy-Fikirtepe neighborhood, which is very close to Söğütlüçeşme HST station, a comprehensive urban transformation project and the construction of multi-storey residential buildings have greatly affected the urban fabric. The Fikirtepe urban transformation area is an example of the changing and transformative effect of newly constructed railways on the city.

3.2. Ankara

Ankara was chosen to lead the country entering a new era in the Republican Period, and planned development was implemented as a method of achieving this (Tankurt, 1994, 23, as cited in Yakın, 2021, 42). In 1925, with the efforts to modernize and strengthen production, Atatürk Forest Farm (AFF) was established by Mustafa Kemal Atatürk on a 50,000,000 m² land, in order to realize pioneering developments in production. Ankara Gazi Station is also located within the borders of Atatürk Forest Farm.

Throughout time, the capital Ankara has become a much more traveled place compared to the past, which has led to the inadequacy of Gazi Station and the need for a new train station. The new train station is located between Anıtkabir and Gençlik Park, at the intersection of Talatpaşa Boulevard, Cumhuriyet Avenue and Hipodrom Avenue, which are important transportation axes of Ankara. Then, with the arrival of high-speed train technology in Ankara, the High Speed Train Station, which is closely related to Ankara Train Station, was built, and this led to an increase in investments and construction around the station.

For Ankara, it is seen that the Atatürk Forest Farm, which started to disintegrate in Ankara in 2006, is gradually losing its green land due to new constructions. Reasons such as the failure to protect the Atatürk Forest Farm as a whole and the construction taking place on lands allocated for agriculture have caused the farm to disintegrate. In this case, it can be investigated whether the construction investments that started after the Ankara High Speed Train project have an effect on this disintegration.

3.3. Konya

While the old train structures of Konya are located as a campus in the city center, Selçuklu HST station is located next to the industrial center, 4.5 km away from the city center, as a large mass that includes all functions. The nearest residential area is 300 meters away. The structure is designed to serve as a bridge connecting the two sides of the city by crossing over the railway line. With the selection of the location of the HST station, it was aimed to transform the surrounding small industrial center into a new center with residential, social and commercial structures by joining the urban transformation areas. It was aimed for the HST station to be integrated with transportation axes such as tram, bus, suburban train, light rail system, etc. and to give the city a new identity (Özkaynak & Korkmaz, 2019, 222). In fact, it can be observed from aerial photographs that there are urban transformation areas around the train stations in Konya, and that the urban fabric has been completely renewed in a fairly large area.




Fig 16. İstanbul Aerial Photograps in 2007, before the construction of HST and Marmaray Tunnel. (Google Earth, 2025, Reproduced by authors.)




Fig 17. İstanbul Aerial Photograps in 2025. (Google Earth, 2025, Reproduced by authors.)

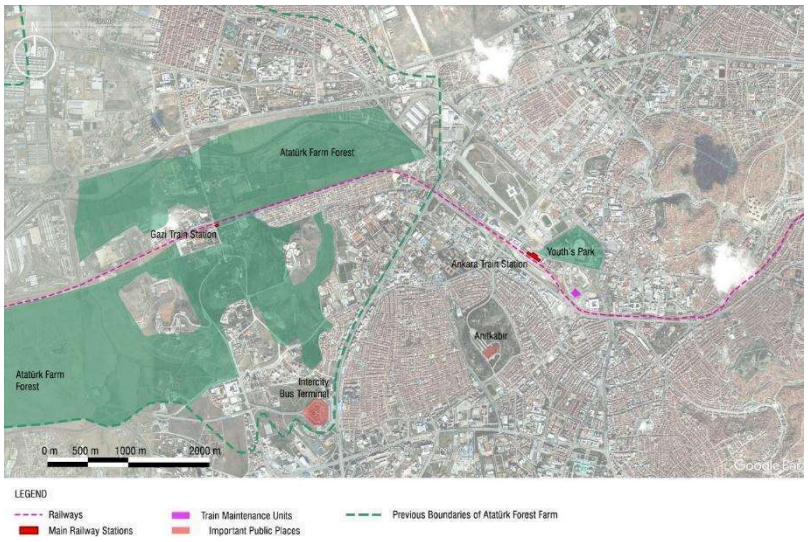


Fig 18. Ankara Aerial Photograps in 2007, before the construction of HST. (Google Earth, 2025, Reproduced by authors.)

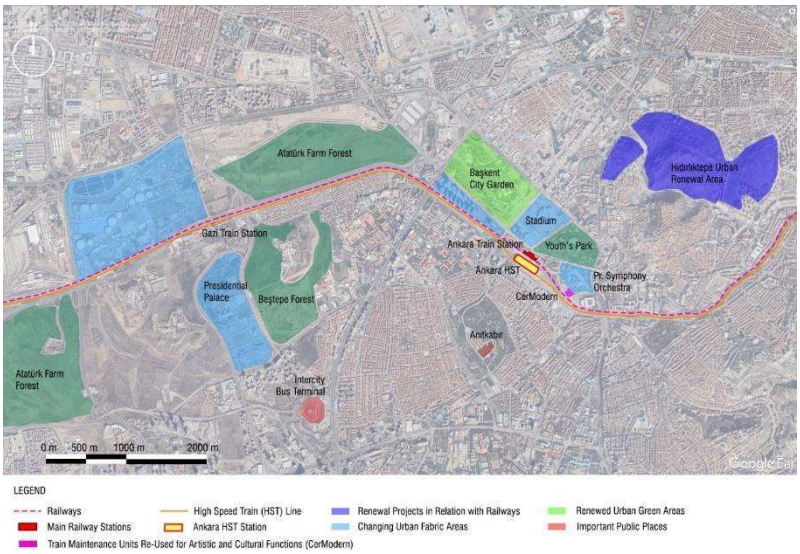


Fig 19. Ankara Aerial Photograps in 2025. (Google Earth, 2025, Reproduced by authors.)

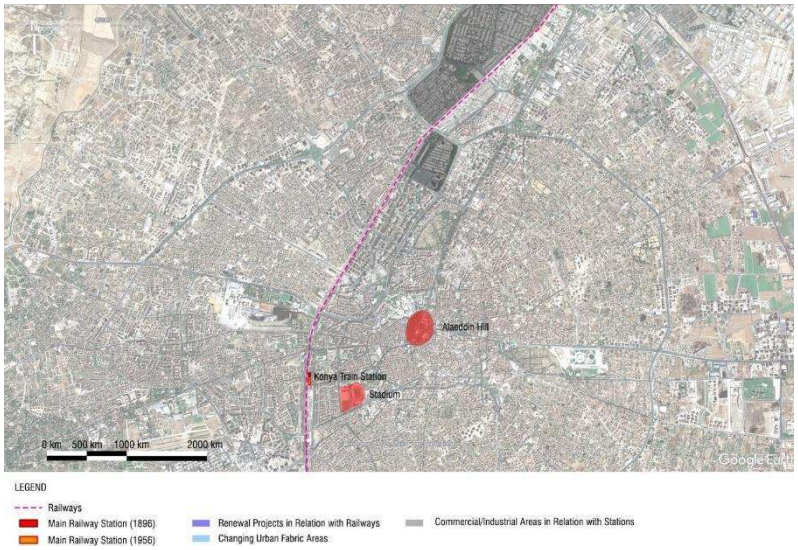


Fig 20. Konya Aerial Photograps in 2007, before the construction of HST. (Google Earth, 2025, Reproduced by authors.)

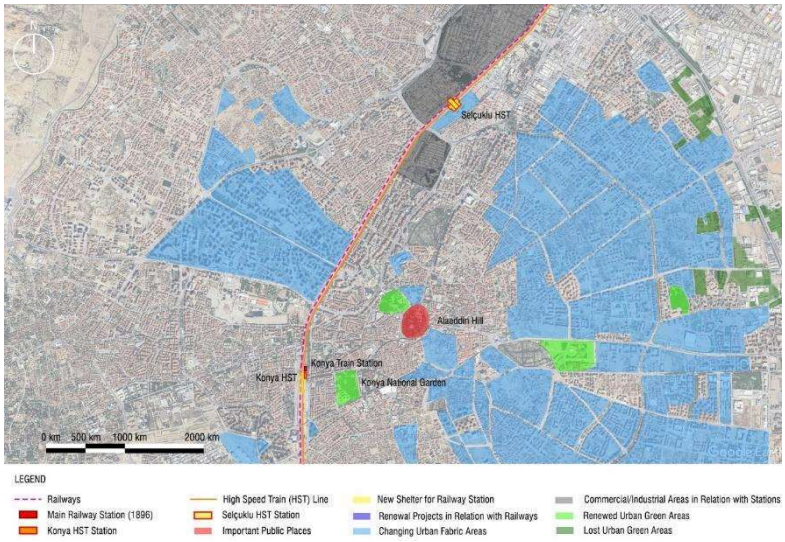


Fig 21. Konya Aerial Photograps in 2025. (Google Earth, 2025, Reproduced by authors.)

**4. Conclusions**

The crumbling Ottoman Empire made efforts to keep up with global developments, to make cities livable by granting privileges to foreigners, and to build railways and train stations. The advancement of railway technology and the constant change and transformation of station structures in terms of architecture were shaped by factors such as political policies, the socio-cultural situation of the period, and the economic structure of the state. Railways are versatile connecting elements that are not limited to space, in terms of establishing connections between other cities, ensuring the flow of goods and people, and ensuring integration between regions (Sedes & Çıkrıkçı, 2022, 1552). Station buildings, generally positioned close to the city but not restricting city development, are designed as a living campus within themselves (Uysal et al., 2019, 68).

The High Speed Train technology, which was put into service in Japan in 1964, started to be used in Türkiye with the commissioning of the Ankara-Eskişehir HST line on March 13, 2009. HST, which is preferred by passengers more because of the time and comfort it saves, has caused traditional train systems to become secondary and even some train station structures to become idle. In some cases, since it is not possible to transfer old train structures to future generations and maintain their current functions (Ayvaz & Halaç, 2023, 65), adaptable reuse proposals have been made for the structures.

On the other hand, high-speed train stations under construction may be dominant and contemporary structures that are integrated into the urban fabric, far from being complementary to historical station structures. These structures, which differ in volume, proportion and facade, may have negative effects on historical stations (Sedes & Çıkrıkçı, 2022, 1554) and may also cause changing and transforming effects on the urban fabric. HST stations,

which change the linear and multi-part campus/complex pattern of the railway structure, gather all the functions in a large mass, create a focus within the city and cause differentiation in the settlement texture. This situation distances them from integrating with the old station structures, on the contrary, makes it difficult to perceive the original stations. In addition, HST stations as macro projects at the urban scale can cause significant changes in the settlement texture, landmarks and focal points, silhouette and socio-economic structure in historical areas. They may also lead to the loss and loss of identity of old train stations (Markoç & Elyazıcıoğlu, 2014, s cited in Sedes & Çıkrıkçı, 2022, 1557).

Railway structures can be evaluated within the scope of architectural, historical, cultural and industrial heritage. However, preserving these structures, which have been damaged and relegated to the background over time, with sustainable strategies and transferring the values they contain to future generations requires close cooperation between institutions such as the Republic of Turkey State Railways, Cultural and Natural Heritage Protection Regional Boards and the Ministry of Culture and Tourism.

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# A SYSTEMATIC REVIEW ON INDOOR AIR QUALITY IN PASSIVE BUILDINGS

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## ABSTRACT

Despite significant advances in energy efficiency, the passive building approach may vary in terms of indoor air quality (IAQ) applications. The effects of passive buildings with high airtightness and mechanical ventilation on user health and comfort are of particular interest.

This systematic review evaluates IAQ studies in passive buildings published over the last decade. A search of the Scopus database initially identified 81 studies, but only 9 studies focused directly on indoor air quality in passive buildings. This finding highlights the limited literature and the need for more comprehensive research. The selected studies were examined in terms of the number of buildings evaluated, the IAQ parameters measured, the recording periods, and the reported findings. The results showed that well-designed heat recovery mechanical ventilation systems (MVHR/HRV) in passive buildings reduce carbon dioxide ($CO_2$), particulate matter, and volatile organic compounds (VOCs) thanks to their high air exchange rate. However, cooking-related pollutants in kitchens, outdoor pollution, and inadequate particulate filtration can have negative effects on IAQ.

Based on the findings, three key requirements stand out for the sustainable improvement of IAQ in passive buildings: (i) Clarifying standards for design, filter selection, and maintenance processes in MVHR/HRV systems, (ii) conducting long-term field measurements that include not only $CO_2$ but also other pollutants, and (iii) performing multi-parameter long-term measurements in different climate zones outside Europe. Future research covering different building types will strengthen the health-focused sustainability dimension of the passive building approach.

**Keywords:** Passive building, indoor air quality, IAQ, healthy indoor environments.

## Introduction

Passive buildings are designed to minimize energy consumption while ensuring user comfort. The first example of a passive house was built in 1991 by Prof. Wolfgang Feist in Darmstadt, Germany. A passive building has five key components to retain its internal heat, reduce energy loss arising from heating and cooling activities, and shield the interior environment from adverse external factors (IPHA, 2018). These components are: (i) high-level insulation, (ii) triple glazing technology, (iii) airtightness, (iv) absence of thermal bridges, and (v) heat recovery ventilation system (Figure 1).

Air tightness in buildings is closely related to energy efficiency (Miszczuk, 2017). Furthermore, mechanical heat recovery ventilation (MHRV) provides high energy savings because it adapts the fresh air to the requirements of the indoor environment, by transferring the heat of exhaust air to the fresh air, before it is released into the indoor environment. MHRV systems can save 60-95% of energy exist in the exhaust air (Pekdoğan et al. 2021).

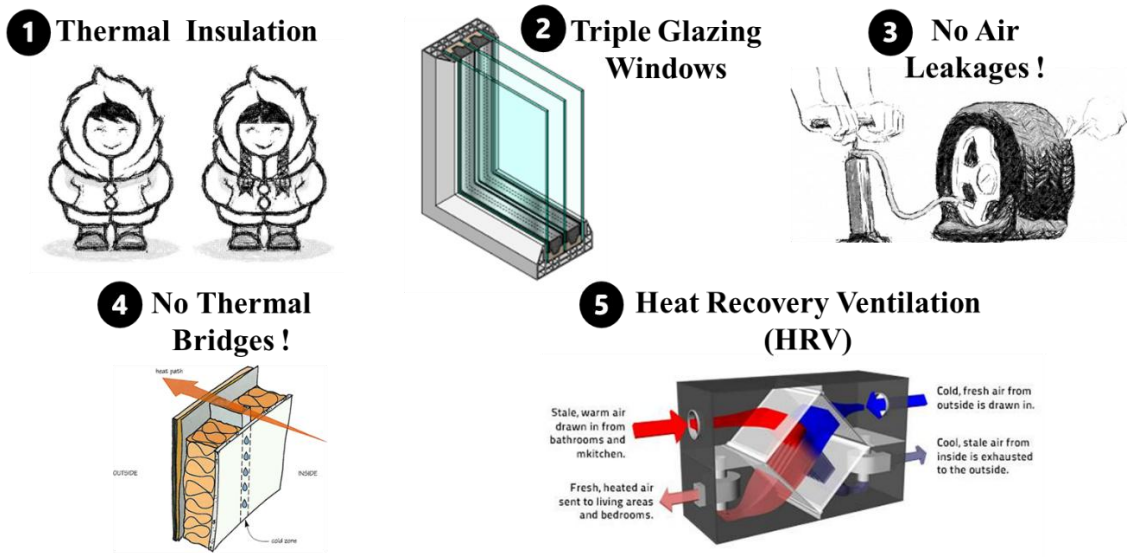


**Figure 1.** Passive House Standard principles (designed by author)

Some of the indoor air pollutants can be specified as carbon dioxide ($CO_2$), volatile organic compounds (VOCs), formaldehyde (HCHO), fine particulate matter (PM2.5), and radon. Indoor air temperature and humidity should be evaluated together with these pollutants, as they directly affect the concentrations of such pollutants indoors (Figure 2).

Temperature and relative humidity are closely related. Building materials and furniture emit or absorb gases depending on these indoor environmental parameters (Tham, 2016). Indoor air temperature affects emission rates, the perceived level of air quality, and the need for fresh air (Vardoulakis et al., 2020). On the other hand, levels of volatile pollutants such as VOCs and formaldehyde increase indoors as temperature rises. It is known that indoor $SO_2$ and $NO_2$ concentrations increase in winter due to reduced ventilation and the use of gas heaters (Vardoulakis et al. 2020).

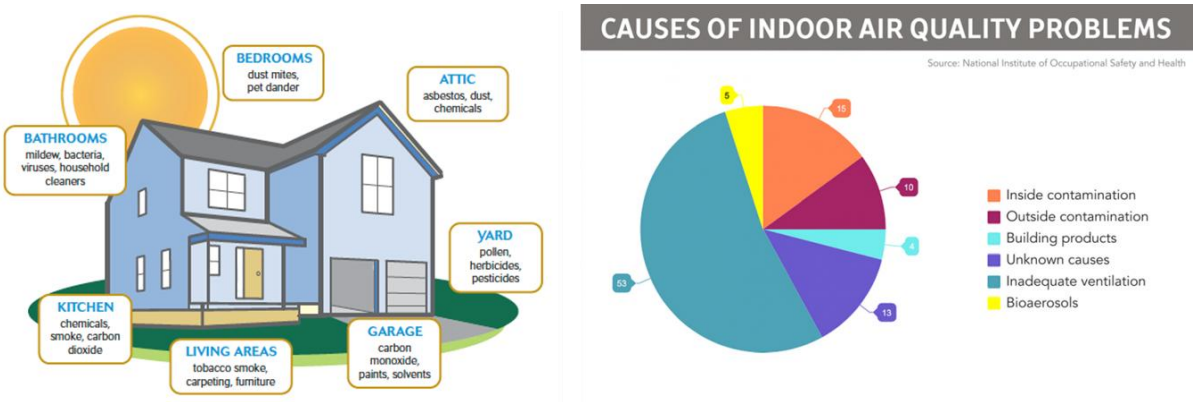


**Figure 2.** IAQ problems and causes in built environment (Tunza Eco Generation, 2011; NIOSH, as cited in Best Custom Screens, 2025)

Indoor carbon dioxide ($CO_2$) concentration affects human health, performance, and indoor air quality (IAQ). However, the 1000 ppm threshold value used in most studies cannot be considered as an indicator of IAQ on its own (Fisk et al. 2019; ASHRAE, 2019). Moreover, OSHA stated exposure limits as 5000 ppm per 8-hour time-weighted average (TWA) (OSHA, n.d.).

Volatile organic compounds (VOCs) can increase indoors due to various reasons such as smoking, new furniture purchases, renovations, and solvent use (Vardoulakis et al. 2020). Formaldehyde is a carcinogenic, allergenic pollutant that causes throat, eye, and nose irritation, fatigue, etc. (EPA, 2025). Formaldehyde levels rise in new homes, particularly due to the presence of new furniture and laminate flooring, also in painting studios due to solvent use. According to the Occupational Safety and Health Administration (OSHA) (EPA,

2025), the permissible exposure limit for HCHO is 0.75 ppm for 8-hour exposure. In homes, this value should be below 0.03 ppm (Koç, 2019).

Sources of fine particulate matter (PM2.5) include cooking, smoking, candles, heating, cleaning, movement, pet care, etc. (Vardoulakis et al. 2020). Outdoor air is also a source of small particles entering indoors through natural ventilation, especially in homes near roads and construction zones (Vardoulakis et al. 2020).

Radon is a colorless, odorless, and tasteless naturally occurring radioactive gas. It enters enclosed spaces through cracks in the ground or gaps around pipes and cables. The World Health Organization (WHO) classifies radon as carcinogenic to humans, and it is known to cause lung cancer (WHO, 2009). Radon is responsible for 1100 deaths per year in the United Kingdom and is the second leading cause of lung cancer after smoking (Milner et al. 2014). In Ireland, approximately 300 lung cancer cases per year can be attributed to radon (Dowdall et al. 2017). The WHO recommended value for radon is 100 Bq/m³ (WHO, 2009). There are few academic studies on radon in homes (Carron et al. 2020).

The importance of breathable natural building materials and natural ventilation used in traditional buildings are among the first examples that naturally arise when considering ways to eliminate these types of pollutants from indoor spaces. Breathable building materials are known to be effective in maintaining indoor humidity balance, improving IAQ, and preventing airborne diseases (Kuru & Aksoy, 2024). Furthermore, natural ventilation can refresh the indoor air without consuming energy by increasing the air flow speed based on the temperature difference (buoyancy-driven) or the effect of the wind (wind-driven) (Jihong et al. 2018).

The airtightness required in passive buildings compared to conventional buildings we are accustomed to, and the prioritization of mechanical ventilation over natural ventilation, raises the following questions, which also form the research questions of this study:

- How does airtightness affect IAQ?
- Is the MHRV system more effective than natural ventilation for removing indoor pollutants?
- What advantages and disadvantages does a passive building offer its occupants in terms of IAQ?

## Materials and Methods

A systematic review is conducted to find out the answers to the research questions. According to the methodology of this study, the keywords “Passive house” OR “Passivhaus” AND “indoor air quality” OR “IAQ” OR “VOC” OR “PM2.5” OR “formaldehyde” OR “radon” were searched in the titles, abstracts and keywords of studies in the Scopus database. At this stage, 81 papers written in English were found. Secondly, research areas, publication date, document types, and publication types were determined. Articles published within the last ten years with open access options were selected in the predefined research areas. Eighteen papers were obtained in the second stage. Finally, some studies were excluded due to irrelevance, superficial explanations, and lack of measurement (Figure 3).

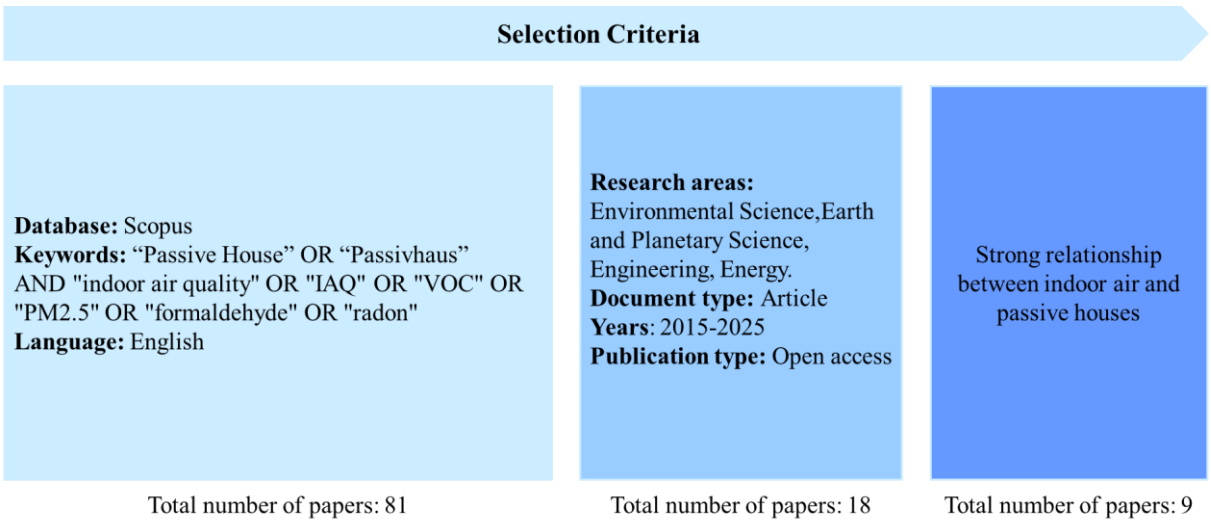


**Figure 3.** Methodology of the study (prepared by the author)

## Findings and Discussion

A total of nine academic studies were analyzed in terms of the number of buildings surveyed, building types, climate, measurement duration, and methods applied. While most of the articles examined dealt with 1 to 5 buildings, three articles focused on more than 15 buildings, and the number of units examined reaches up to 123. Approximately 90% of the studies targeted passive buildings used as residences, while only one was an accommodation and education complex. Most of the buildings were in Europe, while only one was in Latin America. Measurements were taken both periodically and continuously. The maximum monitoring period for IAQ was three years. Half of the studies considered both indoor air perception and real-time measurements, while the other half relied solely on measurements taken indoors (Table 1).

**Table 1.** Research documentation and investigation parameters

| Reference | No. of buildings | Building types | Region - Climate | Measurement period | Method |
|---|---|---|---|---|---|
| Foster et al. (2016) | 5 | Residential (passive) | Scotland (warm-temperate) | 1 year (2013) | Measurements |
| Wallner et al. (2017) | 123 | Residential (low- energy or passive) | All provinces of Austria | Transiently, twice (2010, 2012) | Questionnaires (575) and measurements |
| Lolli & Lien, (2019) | 2 | Accommodation & education (CLT) (passive) | Norway (humid continental) | January-February July-August (2018) | Questionnaires (173) and measurements |
| Carron et al. (2020) | 97 | Residential (passive) | UK and Ireland (temperate-oceanic) | 3 months | Measurements |
| Feist et al. (2020) | 1 | Residential (passive) | Germany (mild-moderate) | 1 month (CO2, relative humidity) 25 years (energy consumption) | Measurements |
| Moreno-Rangel et al. (2021) | 1 | Residential (passive) | Mexico (oceanic-subtropical) | 1 year (June 2016-May 2017) | Questionnaires (6) and measurements |
| Moreno-Rangel et al. (2023) | 3 | Residential (passive) | Scotland (oceanic-subtropical) | 8 months (2017) | Questionnaires (9) and measurements |
| Szabados et al. (2023) | 15 | Residential (passive) | Hungary (temperate-dry) | 2 years (2019-2021) | Measurements |
| Rodriguez-Vidal et al. (2024) | 1 | Residential (passive) | Spain (temperate-oceanic) | 3 years (2020-2022) | Questionnaires (218) and measurements |

Foster at al. (2016) examined 5 Scottish passive houses with floor areas from 87 to 104 m² and their rooms. They inspected the indoor air temperature, relative humidity, absolute humidity and $CO_2$ levels. Here, it is useful to provide information about these two different types of humidity. While both relative humidity and absolute humidity are associated with the moisture (water vapor), absolute humidity is the actual amount of water vapor within a specific volume of air and does not affect from the temperature. However, relative humidity can instantly change depending on the air temperature. Optimum absolute humidity is specified in Passive House Standard as 6-9.5 g/m³. The results of this study indicated that:

- Most of the time the absolute air humidity was found within the guideline limits.
- Some residences were found to overheat with peak temperatures above 30°C.
- It was reported that IAQ was poor in approximately 80% of buildings due to unbalanced mechanical ventilation.

Wallner et al. (2017) compared mechanically ventilated buildings with the control group which are naturally ventilated. HCHO and $CO_2$ concentrations were measured. According to the results:

- The users of buildings which are mechanically ventilated (test group) claimed that they feel more comfortable with indoor air than the control group.

- Adults of the test group reported dry eyes more frequently than the control group.
- The relative humidity found lower in test group compared to control group.

Lolli & Lien (2019) conducted a survey and measured indoor air temperature, relative humidity and $CO_2$ levels of two passive buildings. The results showed that:

- The dissatisfaction claimed in the survey was higher than the measurements.
- 90% of the participants indicated the thermal environment as acceptable.
- IAQ was found acceptable by 76-80% of the respondents.
- 28% of the students were dissatisfied with the noise level.
- 15% of them need to open the window for fresh air.

Carron et al. (2020) focused on indoor radon concentrations. They compared 39 timber-framed buildings with 58 masonries; 5 existing with 92 newly built buildings; 97 passive houses with 25 standard ones. They particularly paid attention to the concentration difference between upstairs and downstairs. The findings demonstrated that:

- Passive houses have lower radon levels than standard buildings.
- Due to the principles of airtightness and mechanical ventilation, passive houses presented an average of 36 Bq/m³ radon level, which is acceptable.
- Timber-framed buildings have lower radon levels (32 Bq/m³) than the masonry buildings (38 Bq/m³).
- The passive buildings with EnerPHit Standard have higher (72 Bq/m³) radon concentration than other passive buildings (36 Bq/m³), which is still lower than control sample and national survey results.
- In previous studies, it is stated that upper levels have 35% less radon concentrations than ground levels in standard buildings (Denman et al. 2006). The difference is less in passive buildings due to balanced ventilation in this study which is 6%.

Feist et al. (2020) examined the first passive house in terms of the durability of its components, energy consumption, and $CO_2$ concentrations. It was found that:

- Even 25 years after the building's construction, indoor pollutant levels remained satisfactory, and the system continued to function effectively.
- When the ventilation system was turned off, $CO_2$ levels increased, which is quite understandable.

Moreno-Rangel et al. (2021) studied and compared passive and standard houses in terms of PM2.5, $CO_2$, and total volatile organic compounds (TVOC). The results indicated that:

- Annual $CO_2$, PM2.5 and TVOC values in the passive house were lower than the standard dwelling.
- The peak values of air pollution take longer time to dissipate in the passive house. For instance, PM2.5 concentration arising from cooking took 1.1/h to decay while it is 0.24/h in conventional building with natural ventilation. The reason for this might be the intermittent ventilation system. In this case, the mechanical ventilation was on for 34 min and off for 26 min.
- Even if F7 filters are recommended for PM2.5 filtration, it was observed that they may cause higher fan rate, noise, and maintenance cost.

Moreno-Rangel et al. (2023) emphasized that:

- The seasonal changes can be highly effective for indoor pollutant levels.
- All passive houses have overheating issues.
- Hygrothermal values are ideal range with 56-66%.
- Indoor PM2.5 values are below the limit values for 78% of the time.

Szabados et al. (2023) considered the effects of heating and cooling seasons, air change rates and contextual parameters on IAQ. A variety of indoor pollutants such as $CO_2$, $O_3$, $NO_2$, PM2.5, VOCs, bacteria, fungi, and pollen were tracked. According to these:

- Overheating, low air change rate, lack of suitable particle filters and low relative humidity were detected as IAQ problems in passive houses.
- Some indoor pollutants showed remarkable seasonal differences.
- Risk reduction measures were required due to proximity of construction field, allergenic vegetation and furniture that release organic gases.

Rodriguez-Vidal et al. (2024) inspected indoor air temperature, relative humidity, and $CO_2$. They also analyzed operational energy use and thermal comfort of a passive house for 3 years. The results showed that:

- Overheating problems occur during warmer months, especially in living room and bedroom with 31.3ºC peak temperature. In milder climates, overheating is a critical issue for passive houses.
- Most of the respondents report excessive heat during nighttime as a major problem. This depends on the excessive insulation and airtightness, which are seen unnecessary for milder climates.

**Conclusion and Recommendations**

All in all, passive houses perform better than standard houses in terms of air exchange rates, IAQ perception, indoor pollutant levels, etc. However, IAQ perception may be low in some studies due to unbalanced MVHR or unconscious use.

The results show that well-designed MVHR systems in passive buildings reduce pollutant levels indoors thanks to high air exchange rates. However, pollutants from cooking, outdoor pollution, and inadequate particulate matter filtration can have negative effects on IAQ. Furthermore, the fact that measurements were mostly taken in residential areas in Europe and in climate zones specific to this geography indicates that the subject requires further research on an international scale.

More research could be conducted on newly built or planned passive houses in different climates. Simulations and measurements are popular statistical methods used to record changes occurring in accordance with Passive House Standard principles. It is necessary to record various indoor pollutants simultaneously and to conduct long-term measurements of these. These two parameters have never been observed in the same study. Some studies have revealed inconsistencies between survey results and measurements; therefore, the areas measured by devices and covered in the survey should be consistent in studies. As the number of passive houses increases, studies related to IAQ are also expected to increase.

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# SELJUK TRACES IN OTTOMAN FOUNTAINS: THE BÜNGÜLDEKS

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## ABSTRACT

In Turkish-Islamic art and architecture, water structures occupy a significant place with both their functional and symbolic dimensions. Emerging in the Seljuk period, the type of fountain known as the *büngüldek* is distinguished by its hydrotechnical system, in which water spurts from the center and falls back into the basin. These structures not only met practical water needs but also generated aesthetic and symbolic meanings within architectural settings. In the Ottoman period, however, *büngüldek* basins that had lost their original function or could no longer be used were repurposed, most notably as spandrel stones in fountains. Thus, a hydrotechnical element of the Seljuks was transformed into a decorative aesthetic component within Ottoman fountain architecture.

This paper examines the use of Seljuk-origin *büngüldek* basins in six Ottoman fountains identified in the Karatay district of Konya (Şeref Şirin, Mıtrıp Sokak, Hoca Habip, Baba Sultan, Müftü Abdullah Efendi, and Biçyemez). Comparative analysis reveals that these basins were generally carved from marble, featured square or nearly rectangular forms, contained a central nozzle hole, and displayed radial geometric ornamentation. Despite minor differences in depth, size, and decorative variety, they show strong similarities to the prototype *büngüldek* basin located in the Karatay Madrasa.

The findings demonstrate that *büngüldeks* reflect an architectural continuity extending from the Seljuk to the Ottoman periods. While these structures visualized the dynamic movement of water in a functional manner during the Seljuk era, they were reinterpreted in the Ottoman period with an emphasis on their aesthetic qualities, becoming central ornamental elements of fountain architecture. This transformation illustrates that historical water structures embodied not only functional but also cultural and artistic continuity. The study thus underscores the significance of the adaptive reuse of traditional water architecture as a means of preserving cultural continuity and safeguarding architectural heritage.

**Keywords:** Büngüldek, Seljuk, Ottoman, Fountain, Water Architecture, Konya.

## 1. GİRİŞ

Turkish culture has produced rich examples in almost every field of art and architecture, presenting not only well-known types of works but also unique structures specific to certain periods. One such distinctive structure is the *büngüldek*, a type of fountain known to have been used during the Seljuk period.

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Although not widely used in contemporary Turkish, the verb *büngüldemek*, which has survived in local dialects, means the gushing or bubbling of water from the ground, or its forceful and noisy flow or eruption (Sır Dündar, 2021, p. 909). Derived from this verb, the word *büngüldek* was employed during the Seljuk period as a designation for a particular group of fountains (Önge, 1991, p. 99).

Although some examples have survived to the present day, none of them remain functional. However, the operating principles of the *büngüldeks* can be understood through the examination of examples located in structures regarded as the earliest instances, each dating to the 13th century, such as the Divriği Melike Turhan Darüşşifa, the Karatay Madrasa in Konya, and the Gök Medrese Mosque in Amasya. These studies reveal that the water, reaching the basin, would spout upward through a centrally placed opening, fall back into the basin, and then be discharged through drainage holes carved into it. In some cases, as observed in the Karatay Madrasa in Konya, basins without drainage holes were employed, or existing holes were sealed so that the collected water could be redirected via a small channel into an adjacent pool (Figure 1). The *büngüldeks* were not only functional water structures but also architectural elements that contributed aesthetically to their settings by visualizing the movement of water.

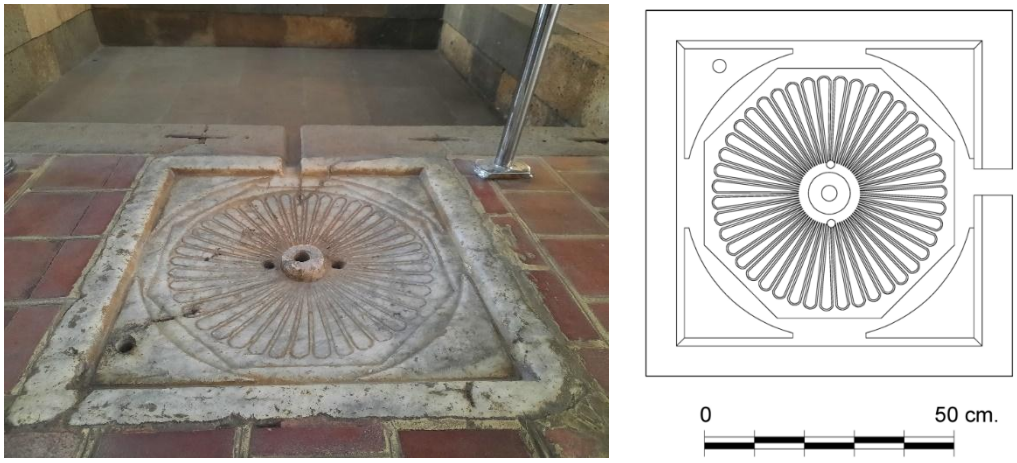



**Figure 1. The *Büngüldek* Fountain of the Karatay Madrasa and Its Connection to the Pool (Author's archive)**

The fact that all surviving *büngüldek* basins have been preserved in their original locations and remain attached to architectural structures has been a decisive factor in their transmission to the present day. However, these examples do not provide a definitive answer to the question of whether *büngüldeks* in the Seljuk period were positioned entirely at ground level or elevated on a raised platform.

In contrast, findings from Ottoman-period fountains -where numerous examples of *büngüldeks* were widely used- as well as discoveries from archaeological excavations conducted in different parts of the city center of Konya, reveal that *büngüldeks* were not solely elements attached to buildings. They were also constructed as independent water structures, providing opportunities for stand-alone use. These findings demonstrate that *büngüldeks* were widely employed as indispensable components of urban water architecture during the Seljuk period.

One of the essential elements of Ottoman fountain architecture is the section referred to as the *"palandız"*, *"ayna taşı"* (mirror-stone), or *"zank taşı"* (Sözen & Tanyeli, 2010, p. 41; Hasol, 1990, pp. 62, 396, 566). These stone elements are placed vertically on the flat part of the fountain where the mirror-stone, called *"aynalık"* in Turkish, is located, that is, on the area where the spout or faucet is located. They were often of aesthetic character and occupied a central position within the decorative program. Typically carved from monolithic blocks, mirror-stones were most often made of marble.

Due to their material, form, and aesthetic qualities, *büngüldek* basins, even after losing their original function, found reuse in the mirror-stone sections of Ottoman fountains. This situation indicates that *büngüldeks* were regarded not merely as hydrotechnical devices but also as elements valued for their aesthetic qualities, contributing to the decorative conception of architecture of the period. In Konya, six Ottoman-period fountains have been identified as incorporating *büngüldek* basins from the Seljuk period. All of these are located within the boundaries of the central Karatay district: the Baba Sultan, Biçyemez, Hoca Habip, Mıtrıp Sokak, Müftü Abdullah Efendi, and Şeref Şirin fountains.

## 2. THE USE OF BÜNGÜLDEKS IN OTTOMAN FOUNTAINS

### 2.1. Şeref Şirin Fountain

The fountain located in Şeref Şirin Street, Şeref Şirin Neighborhood, in the Karatay district, was constructed in A.H. 1301 (A.D. 1883-84), according to its inscription (Mutlu, 2014, p. 129). The patron and the master builder of the work are unknown. Typologically, it belongs to the group of independent, single-faced fountains with a tangent arch (Figure 2).

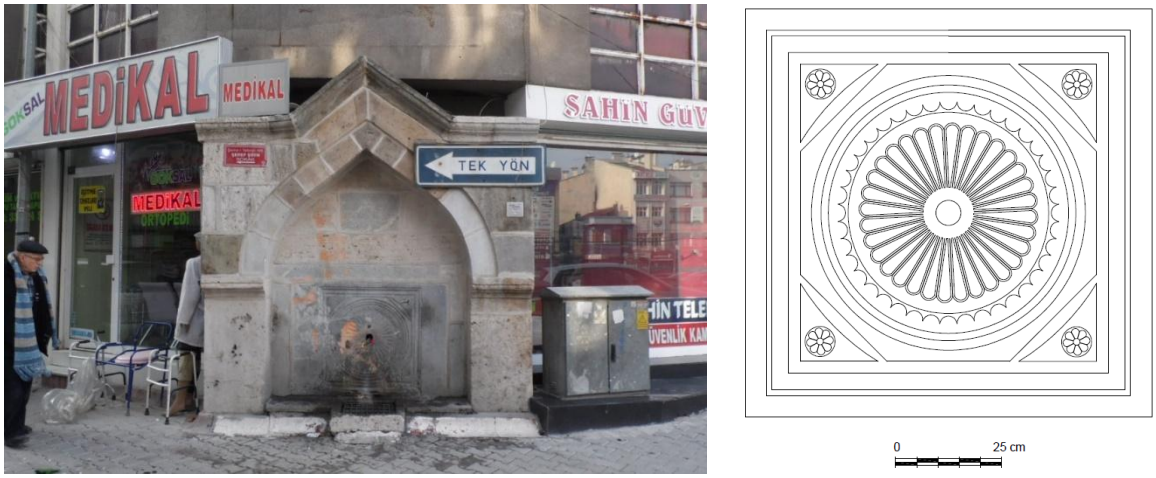



**Figure 2. General View of the Şeref Şirin Fountain and Detail of the Mirror-Stone (*Büngüldek* Basin) (Author's archive)**

In the part of the fountain referred to in Turkish as the *"aynalık"*, there is a rectangular marble block measuring approximately 155 cm in width and 115 cm in height. At the center of this block, a section measuring 1.02 x 1.02 m has been delineated and carved in relief. It is understood that this element originally functioned as a *büngüldek* basin (Figure 2). Furthermore, the fact that the boundaries of the marble block extend beyond those of the section

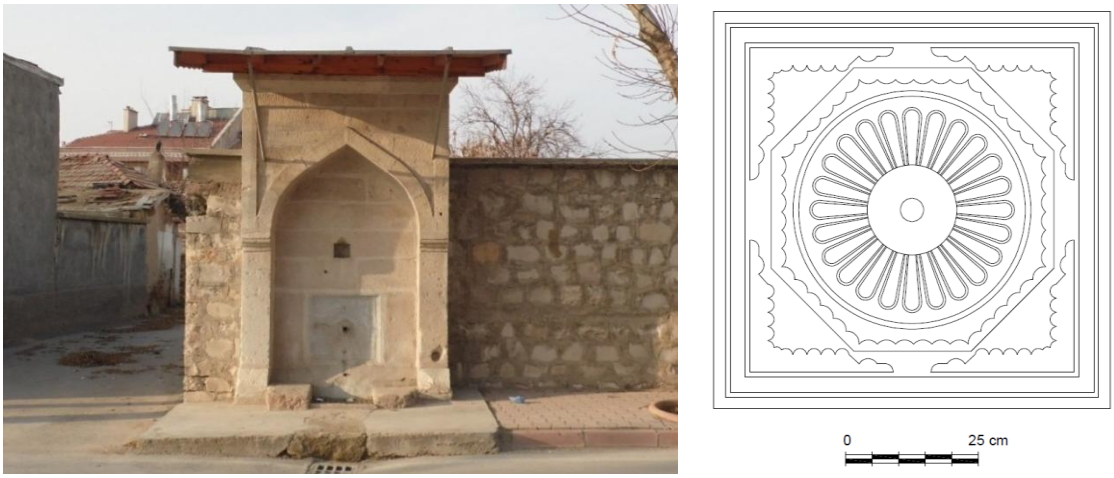
designed as a basin reinforces the likelihood that, in its initial use, the *büngüldek* basin was conceived either embedded in the ground or placed at the same level as the ground surface.

The square-shaped basin features a spout hole at its center, which forms the focal point of the composition. Surrounding the center is a radially arranged geometric ornament composed of thirty-two segments. This circular arrangement is accentuated by successively rising concentric rings and bounded on the outer edge by an octagonal form. Within the triangular spaces created by the octagon at the corners of the square, eight-petaled penç motifs are placed. Extending from the center toward the corners, this composition reflects a holistic decorative conception in which geometric and vegetal elements are harmoniously combined.

The basin has a depth of approximately 12 cm. In its original function, several drainage holes were made at different points to discharge the accumulated water; however, due to a later change in function, these holes have been sealed with cement.

### 2.2. Mıtrıp Street Fountain

The fountain located at the entrance of Mıtrıp Street on Sedirler Avenue in the Karatay district, though lacking an inscription, is stylistically dated to the late 19th or early 20th century. No information is available regarding its patron or master builder. Typologically, the structure belongs to the group of independent, single-faced fountains with a tangent arch (Figure 3).




**Görsel 3. Figure 3. General View of the Mıtrıp Street Fountain and Detail of the *Büngüldek* Basin (Author's archive)**

In the part of the fountain referred to as the *"aynalık"*, there is a mirror-stone measuring approximately 0.70 x 0.70 m, which is understood to have originally functioned as a *büngüldek* basin. The square-shaped basin has a spout hole at its center, forming the focal point of the composition. The center is surrounded by a radially arranged geometric ornament composed of twenty-four segments. This circular arrangement is accentuated by successively rising concentric rings and is bounded on the outer edge by an octagonal section with convex curved edges.

Although traces of geometric ornamentation can be identified within the triangular spaces created by the octagon at the corners of the square, the details cannot be fully discerned due to extensive deterioration. This example shares a similar decorative approach with the *büngüldek*

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basin of the Şeref Şirin Fountain, although it is smaller in size. The depth of the basin is approximately 7 cm.

### 2.3. Hoca Habip Fountain

The fountain located in Kadılar-2 Street, Aziziye Neighborhood, in the Karatay district, opposite the Tahtalı Mosque, was constructed in A.H. 1327 (A.D. 1909-10), according to its inscription. No information is available regarding its patron or master builder (Mutlu, 2014, p. 165). Typologically, the structure is classified within the group of independent, single-faced fountains with a tangent arch (Figure 4).

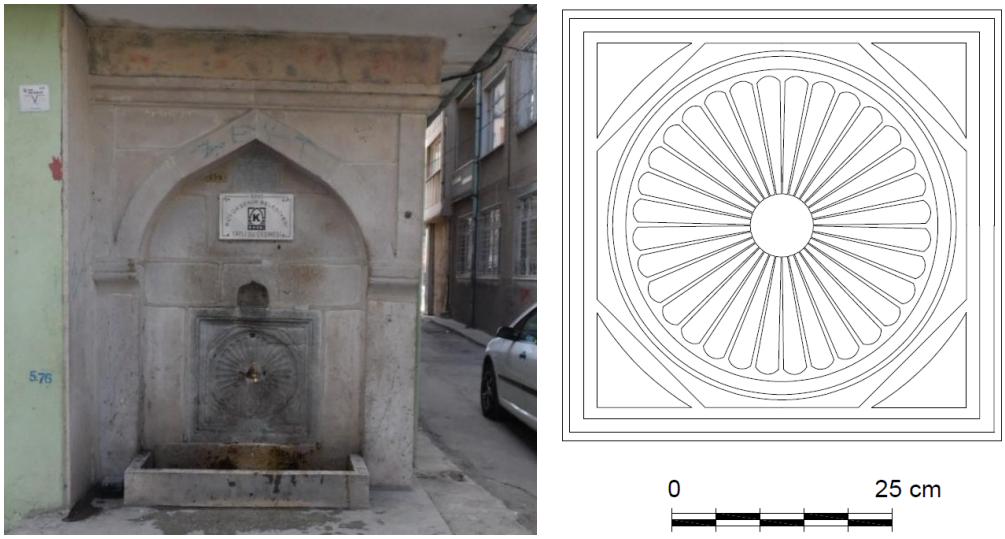


**Figure 4. General View of the Hoca Habip Fountain and Detail of the*Büngüldek* Basin (Author's archive)**

In the part of the fountain referred to as the *"aynalık"*, there is a mirror-stone measuring approximately 0.60 x 0.60 m. Considering the material and carving technique, it is understood that this stone originally functioned as a *büngüldek* basin. The square-shaped basin features a spout hole at its center, which is surrounded by a radially arranged geometric decorative band composed of thirty-two segments. The circular arrangement is accentuated by progressively rising concentric rings and is bounded on the outer edge by an octagonal section (Figure 4).

The triangular spaces formed by the octagon at the corners of the square remain plain. The composition, with its thirty-two-segment circular ornamentation and overall design, bears resemblance to the *büngüldek* basin of the Şeref Şirin Fountain; however, this example is considerably smaller in size. The depth of the basin is approximately 10 cm.

### 2.4. Baba Sultan Fountain

The fountain located on the east façade of the Baba Sultan Mosque, on Baba Sultan Street in the Şemsitebrizi Neighborhood of the Karatay district, was constructed in A.H. 1340 (A.D. 1921-22), according to its inscription. No information is available regarding its patron or master builder. Typologically, the structure belongs to the group of independent, single-faced fountains with a tangent arch (Figure 5).

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In the part of the fountain referred to as the *"aynalık"*, there is a mirror-stone measuring 0.78 x 0.76 m. Considering its material and form, it is understood that this stone originally functioned as a *büngüldek* basin. The square-shaped basin, made of dark-colored marble, features a spout hole at its center, which is surrounded by a radially arranged geometric decorative band composed of twenty segments. The circular arrangement is accentuated by progressively rising concentric rings and is bounded on the outer edge by an octagonal section.

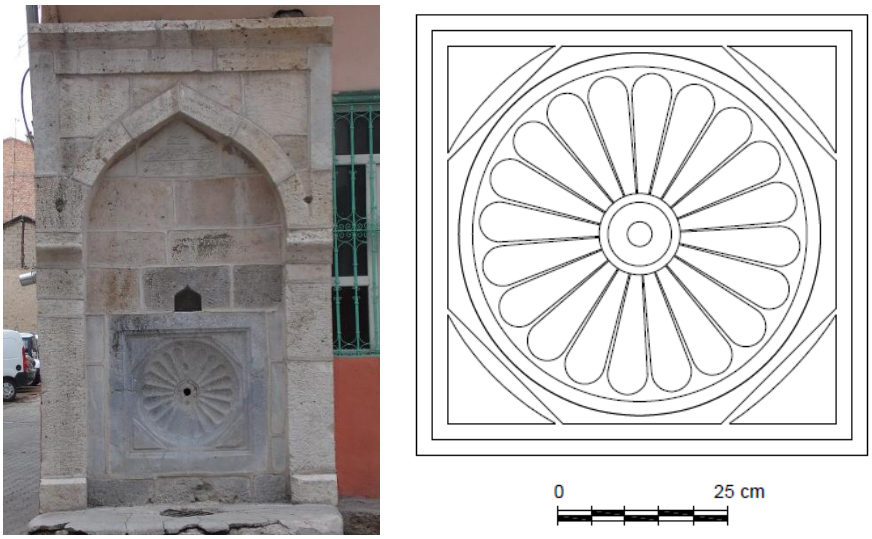


**Figure 5. General View of the Baba Sultan Fountain and Detail of the *Büngüldek* Basin (Author's archive)**

The triangular spaces formed by the octagon at the corners of the square remain plain. This example bears similarities to the Karatay Madrasa, Şeref Şirin, Mıtrıp Street, and Hoca Habip fountains; however, it differs in terms of the number of segments in the central geometric ornament, the decorative details, and the dimensions of the basin. The depth of the basin is approximately 10 cm.

### 2.5. Müftü Abdullah Efendi Fountain

The fountain located at the southwest corner of the Müftü Abdullah Efendi Mosque on Köprübaşı Avenue in the Karatay district was constructed in A.H. 1342 (A.D. 1923-24), according to its inscription. No information is available regarding its patron or master builder. Typologically, the structure is classified within the group of independent, single-faced fountains with a low arch (Figure 6).

In the *"aynalık"* of the fountain, there is a mirror-stone measuring approximately 0.80 x 0.85 m. Considering its material, carving technique, and dimensions, it is suggested that this stone may have originally functioned as a *büngüldek* basin. However, the absence of the lower part of the five-petaled *gülbezek* motif -which is symmetrically placed on the upper portions of the mirror-stone- raises some doubts regarding its identification as a *büngüldek* basin (Figure 6).

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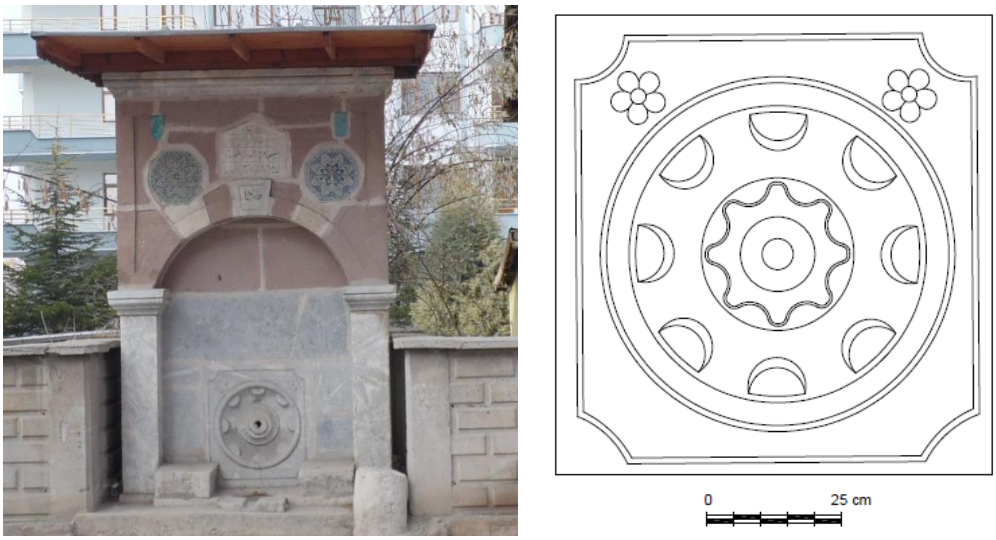


**Figure 6. General View of the Müftü Abdullah Efendi Fountain and Detail of the *Büngüldek* Basin (Author's archive)**

The section at the center of the marble mirror-stone, where the spout is located -referred to in Turkish as the "*lüle"*- is highlighted with an eight-armed geometric ornament surrounding a raised central projection. The circular basin created around this ornament has a depth of approximately 9 cm, with eight smoothly curved semicircles positioned along its outer edge. The outer frame, completed with a circular molding, is enclosed within a cornered frame softened by inwardly curved corners. In the upper two corners of this frame, five-petaled vegetal motifs, referred to in Turkish as *"gülbezek"*, are placed (Figure 6).

### 2.6. Biçyemez Fountain

The fountain located adjacent to the east wall of the Biçyemez Mosque on Hacı Hasanbaşı Avenue in the Karatay district, although lacking an inscription, is dated to the early 20th century. No information is available regarding its patron or master builder. Typologically, the structure belongs to the group of independent, single-faced fountains with a tangent arch (Figure 7).

In the part of the fountain referred to as the *"aynalık"*, there is a marble mirror-stone measuring approximately 1.10 x 0.78 m, while the fountain itself is entirely constructed of Sille stone. Considering the technical and aesthetic characteristics of the material, it is suggested that this stone may originally have been used as a *büngüldek* basin.

The spout hole at the center of the mirror-stone is surrounded by a twenty-armed motif referred to in Turkish as a *"çarkıfelek"*. In addition, the composition is completed with frames delineated by geometric forms and rising in successive steps. The outermost frame is square with chamfered corners, concluding with a profiled frame. This outer frame measures approximately 0.80 x 0.63 m, presenting a nearly square rectangular form. The depth of the basin is approximately 8 cm.

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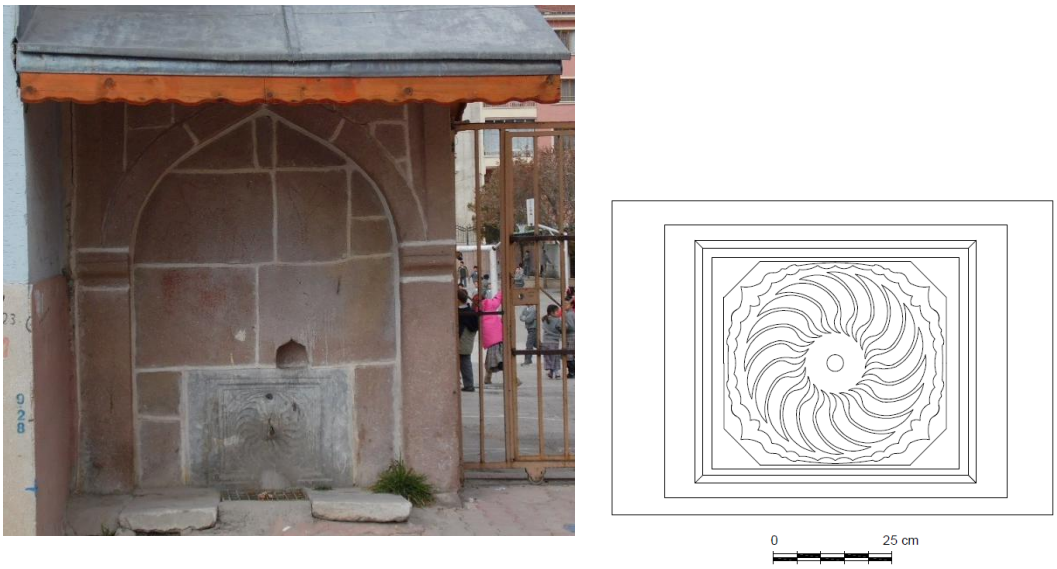


**Figure 7. General View of the Biçyemez Fountain and Detail of the *Büngüldek* Basin (Author's archive)**

## 3. EVALUATION AND CONCLUSION

*Büngüldek* basins observed in certain Ottoman fountains reveal traces of Seljuk-period fountain elements through evaluations of the extant examples. Although they are no longer functional today, *büngüldek* basins that have survived in good condition were reutilized as mirror-stone (in Turkish *"ayna taşı")* in some Ottoman fountains. This indicates that *büngüldeks*, originally designed as functional hydraulic elements during the Seljuk period, were transformed into aesthetic architectural components in the Ottoman era, demonstrating a continuity of use that evolved from function to ornamentation.

In addition to the *büngüldek* examples that have survived from the Seljuk period, fountains with spouts similar in style to *büngüldeks* were used in gardens with private functions until the early 20th century, i.e., the late Ottoman period. Examples observed in the gardens of Hasip Dede Mansion and Meram Yıldız Mansion in Konya provide evidence of this practice (Önge, 1991, pp. 113–114).

Identifying mirror-stone in some Ottoman fountains as *büngüldek* basins is only possible by comparing these examples with extant original *büngüldek* basins. The distinguishing characteristics of *büngüldek* basins are as follows:

- They are large and made from a single block of material,
- They are shaped using a deep carving technique, forming a small pool or open reservoir,
- Marble, a water-resistant material, is typically preferred,
- The central section is raised and deepened in a way that does not obstruct the water's flow,
- Public examples particularly display similar decorative approaches.

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The square or nearly square rectangular examples range from 60 cm to 102 cm in side length. The Şeref Şirin Fountain basin, measuring 1.02 x 1.02 m, is the largest, while the Hoca Habip Fountain basin, measuring 0.60 x 0.60 m, is the smallest. The Karatay Madrasa example, which can be considered a prototype, measures 0.95 x 0.95 m. Basin depths range from 7 cm to 13 cm, with the *Şeref Şirin* Fountain being the deepest at 13 cm, and the Mıtrıp Street Fountain being the shallowest at 7 cm. The basin in the Karatay Madrasa has a depth of 8 cm (Table 1).

**Table 1. Technical Characteristics of *Büngüldek* Basins in Selected Ottoman Fountains in the Karatay District**

| NAME OF THE ASSOCIATED MONUMENT | DATE OF THE ASSOCIATED MONUMENT | | CENTURY | DIMENSIONS OF THE BÜNGÜLDEK SECTION (cm) | | | MATERIAL DIMENSIONS (cm) | | MATERIAL |
|---|---|---|---|---|---|---|---|---|---|
| | Anno Hegirae | Anno Domini | | L | W | D | L | W | |
| Karatay Madrasa | 649 | 1251-52 | 13 | 95 | 95 | 8 | Same | Same | Marble |
| Şeref Şirin Fountain | 1301 | 1883-84 | 19 | 102 | 102 | 13 | 155 | 115 | Marble |
| Mıtrıp Sokak Fountain | - | - | 20 | 70 | 70 | 7 | Same | Same | Marble |
| Hoca Habip Fountain | 1327 | 1909-10 | 20 | 60 | 60 | 10 | Same | Same | Marble |
| Baba Sultan Fountain | 1340 | 1921-22 | 20 | 78 | 76 | 10 | Same | Same | Marble |
| Müftü Abdullah Efendi Fountain | 1342 | 1923-24 | 20 | 85 | 80 | 9 | Same | Same | Marble |
| Biçyemez Fountain | - | - | 20 | 80 | 63 | 8 | 110 | 78 | Marble |

Based on these evaluations, the mirror-stone of the Şeref Şirin, Mıtrıp Street, Hoca Habip, and Baba Sultan fountains, as described in the catalog section, share significant similarities with the *büngüldek* basin at the Karatay Madrasa. While the Karatay Madrasa basin features a geometric decoration with forty-three segments, the basins of the Şeref Şirin and Hoca Habip fountains have thirty-two segments, the Mıtrıp Street Fountain has twenty-four segments, and the Baba Sultan Fountain has twenty segments. In both the Karatay Madrasa and other examples, the corners outside the circular decoration are generally left plain; only the four corners of the Şeref Şirin Fountain contain eight-petal floral (*gülbezek*) motifs (Figure 8).

The mirror-stone of the Müftü Abdullah Efendi Fountain demonstrates the characteristics of a *büngüldek* basin in terms of its dimensions and basin depth. In terms of decorative features, this basin, which differs from the previously described examples, features five-petal *(penç)* motifs placed in two corners (Figure 8).

Another example that differs from the other basins in terms of its characteristics is the mirror-stone of the Biçyemez Fountain. In this example, the decorative technique, material, and basin depth clearly exhibit the features of a *büngüldek* basin. The mirror-stone of the Biçyemez Fountain features a rosette *(çarkıfelek)* motif, while the corners are left plain (Figure 8). Although this example shows similarities with the other basins in terms of the functional section's dimensions and features, it differs regarding the dimensions of the material. The stone is a rectangular monolithic marble block measuring 110 x 78 cm, which suggests that the *büngüldek* basin may have originally been used at ground level, as in the Karatay Madrasa example.

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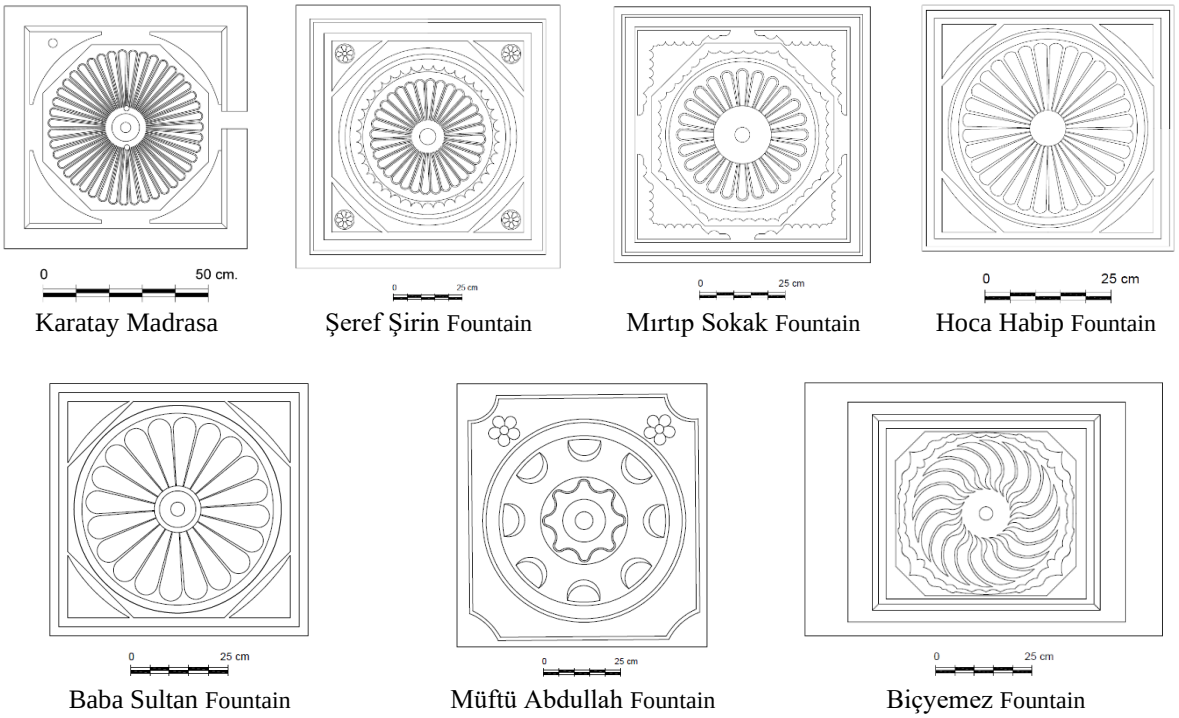


**Figure 8. Mirror-Stone Originally Containing Büngüldek Basins in Selected Ottoman Fountains in the Karatay District (Author's archive)**

The conducted examinations and comparisons reveal that *büngüldek* basins reflect an architectural and cultural continuity extending from the Seljuk to the Ottoman period. While *büngüldeks* were originally designed as functional hydraulic elements during the Seljuk era, in the Ottoman period they were reutilized in fountain mirror-stone sections as aesthetic features, owing to their decorative elements. Measurements, forms, and decorative comparisons based on Konya examples indicate that these basins followed a certain standard in terms of design and function, yet could vary according to the unique usage conditions of each period and structure. In this context, *büngüldek* basins serve as tangible evidence of both the Seljuk water culture and the architectural and aesthetic heritage of the Ottoman fountain tradition. The findings also demonstrate that analyzing historical water structures in terms of function, construction, and decoration provides an important methodological approach for studies on traditional water architecture and cultural continuity.

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INTERNATIONAL SCIENCE AND ART RESEARCH CENTER

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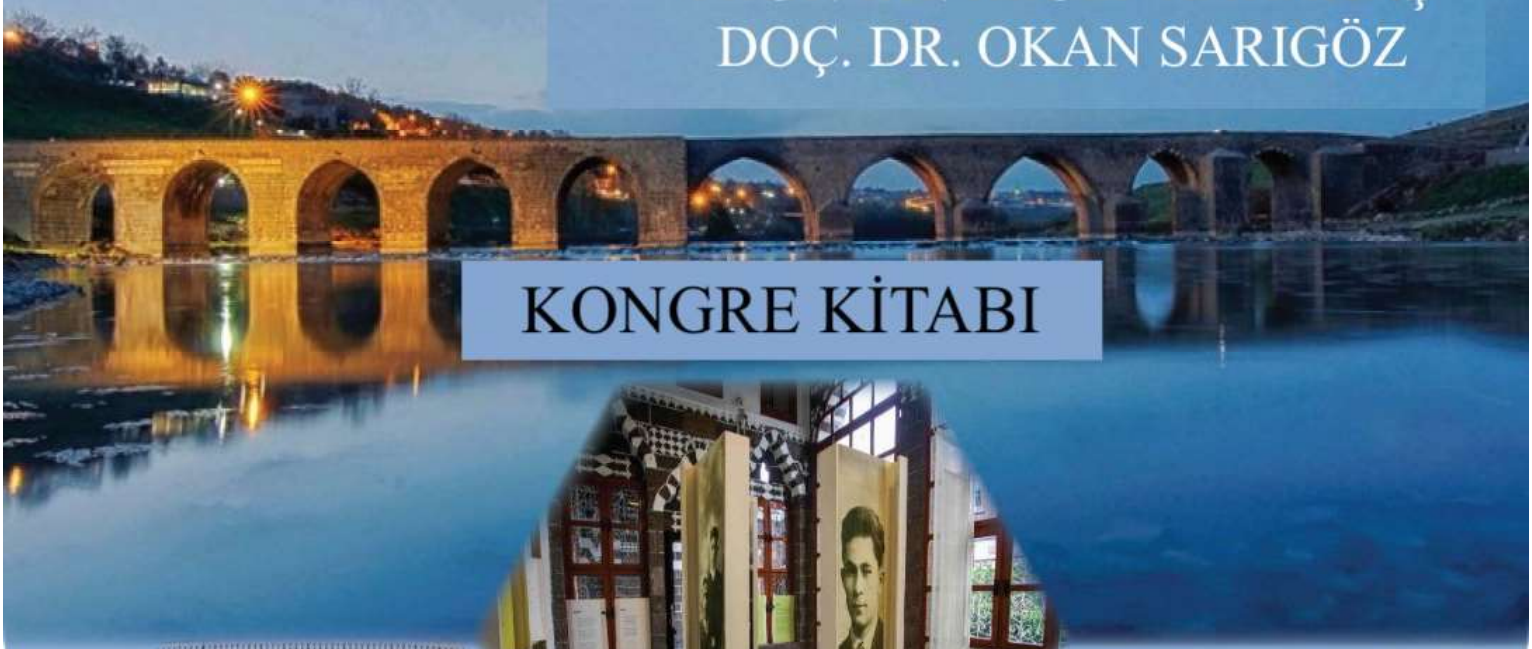

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# KENT İMGESİ VE HAFIZA BAĞLAMINDA 1958-1960 TARİHLİ"BÜYÜK MEMLEKET ŞEHİRLERİ" POSTA PULLARI SERİSİNİN İNCELENMESİ

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## ÖZET

Posta pulları, işlevsel değerlerinin ötesinde, devletlerin kültürel politikalarını ve dönemin mekânsal algısını yansıtan belgelerdir. Şehirlerin tanıtımında, turizm stratejilerinde ve ulusal kimliğin inşasında posta pulları görsel bir iletişim aracı olarak kullanılmaktadır. Ülkeler, kendilerini konumlandırmak istedikleri imaja göre pulları bir "şehir markalaşması" olarak değerlendirebilmektedirler. Türkiye'de de tarihsel süreçte belirgin bir strateji değişimi göze çarpmaktadır. Osmanlı Dönemi'ndeki 1914 Londra Serisi, İstanbul'un anıtsal yapıları üzerinden İmparatorluk prestijini dış dünyaya sunmayı hedeflerken; Cumhuriyet Dönemi'ndeki 1958-1960 Büyük Memleket Şehirleri Serisi, ülkenin tüm illerini görselleştirerek, kapsayıcı bir "vatan" imgesi ve iç turizm bilinci yaratmayı amaçlamıştır. Bu çalışma, Türkiye Cumhuriyeti filatelisinde en kapsamlı şehir envanteri olan bu posta pulu serisi üzerinden, dönemin kent imajını ve kentleşme özelliklerini incelemeyi amaçlamaktadır. Çalışma kapsamında, seride yer alan şehir görselleri; seçilen mimari simgeler, kentsel doku ve perspektif tercihleri üzerinden analiz edilmiştir. 1950'li yıllar, Türkiye'de hızlı kentleşme dinamiklerinin ve modernleşme hamlelerinin mekâna yansıdığı kritik bir eşiktir. Bu bağlamda 1958 serisi, şehirlerin henüz büyük yapısal dönüşümlere uğramadan önceki "idealize edilmiş" son görünümlerini kayda geçirmesi bakımından eşsiz bir kent hafızası sunmaktadır. Şehirlerin mimari ve kültürel değerlerinin pullara taşınması, sadece estetik bir tercih değil, o şehrin küresel hafızadaki yerini belirleyen politik bir iletişim hamlesidir. Pullar, birer "yumuşak güç" (soft power) aracı olarak, şehirlerin tarihsel ve kültürel katmanlarını görsel bir arşiv niteliğinde bugüne taşıyarak, kent kimliği araştırmaları için özgün bir veri seti oluşturmaktadır. Dijitalleşen dünyada fiziksel mektup kullanımı azalmış olsa da pulların temsil ettiği "imaj yönetimi" disiplini, dijital şehir markalaşması çalışmaları için köklü bir referans olmaya devam etmektedir.

**Anahtar Kelimeler:** Kentleşme, kent hafızası, Büyük Memleket Şehirleri, posta pulu.

# AN ANALYSIS OF THE "GREAT NATIONAL CITIES" POSTAL STAMP SERIES DATED 1958-1960 IN THE CONTEXT OF URBAN IMAGE AND MEMORY

**ABSTRACT**

Beyond their functional value, postage stamps are documents that reflect the cultural policies of states and the spatial perception of their time. They are used as a visual communication tool in the promotion of cities, tourism strategies, and the construction of national identity. Countries may consider stamps as a form of "city branding" based on the image they wish to position themselves. A distinct strategic shift is also evident in Turkey throughout history. While the 1914 London Series of the Ottoman Period aimed to present the imperial prestige to the outside world through the monumental structures of Istanbul, the 1958-1960 Great National Cities Series of the Republican Period aimed to visualize all provinces of the country, creating an overarching "homeland" image and domestic tourism awareness. This study aims to examine the urban image and urbanization characteristics of the period through this postage stamp series, the most comprehensive city inventory in the philatelic history of the Republic of Turkey. Within the scope of this study, the city images in the series are analyzed based on selected architectural symbols, urban texture, and perspective choices. The 1950s were a critical juncture in Turkey, where rapid urbanization dynamics and modernization initiatives were reflected in the city's spatial landscape. In this context, the 1958 series offer a unique urban memory by recording the "idealized" final appearances of cities before they underwent major structural transformations. The inclusion of cities' architectural and cultural values on stamps is not merely an aesthetic choice, but a political communication move that defines a city's place in global memory. As a tool of "soft power," stamps carry the historical and cultural layers of cities into the present day as a visual archive, creating a unique dataset for urban identity research. While the use of physical letters has diminished in the digital world, the discipline of "image management" represented by stamps continues to be a well-established reference for digital city branding efforts.

**Keywords:** Urbanization, urban memory, Great National Cities, postage stamp.

## 1. GİRİŞ

Posta ile gönderilen şeylere yapıştırılan ve para karşılığında alınan pul anlamına gelen posta pulu (URL-1), ödeme makbuzu olarak kullanılmasının yanında ülkelerin kültürel kimliğinin inşasında, turizm stratejilerinde ve şehirlerin tanıtımında görsel bir iletişim aracı olarak kullanılmaktadır. Posta pullarında mimari yapıların eklenmesi, estetik bir tercihin yanında ulusal değerlerin küresel hafızadaki yerini belirleyen politik bir iletişim hamlesi olarak görülmektedir. Pullar, şehirlerin tarihsel ve kültürel katmanlarını görsel bir arşiv niteliğinde bugüne taşımaktadır.

Posta pullarının ortaya çıkmasından önce posta hizmetleri, alıcıdan ücret tahsil etmeye dayalı bir modelle işletilmektedir. Bu durum karmaşık ve kimi zaman alıcı için maliyetli bir işlem olduğundan, mektubun reddedilme ihtimaline de sebep olmuştur. Sir Rowland Hill, bu duruma çözüm olması için 'üzerinde damga taşımaya yetecek büyüklükte ve arkası zamklı bir kağıt parçası' kullanılmasını önermiştir (URL-2). Bunun sonucunda da dünyanın ilk resmi yapışkan posta pulu olarak Penny Black icat edilmiştir. 1840'ta geçerli hale gelen bu posta pulunun üzerinde Kraliçe Victoria'nın portresi bulunmaktadır (Şekil 1). Siyah renkli, bir penny'lik bu puldan birkaç gün sonra mavi renkli, iki penny'lik posta pulu da piyasaya sürülmüştür (Düzenli ve Kavuran, 2004).




**Şekil 1.** Penny Black, 1840.

Osmanlı Devleti dönemindeki ilk posta pulu ise Sultan Abdulaziz dönemindeki atılımlarla ortaya çıkmıştır. Posta nazırı Agah Efendi'nin 1863'teki girişimleriyle, üzerinde Sultan Abdulaziz'in tuğrasının yer aldığı, ilk posta pulları tedavüle çıkarılmıştır (Yurteri ve Hanilçe, 2025). Bu pullar dikdörtgen şeklindedir ve tuğranın altında yer alan hilalin içine 'Devlet-i Ali Osmaniye' yazısı yerleştirilmiştir (Şekil 2). "Tuğralı Pullar" olarak anılmakta olan bu serideki pullar 20 paralık sarı, 1 kuruşluk mor, 2 kuruşluk mavi ve 5 kuruşluk kırmızı renklerde

bastırılmıştır. Ayrıca postane bulunmayan yerlerden gelen, posta ücreti ödenmemiş mektuplar için de varışta uygulanmak üzere aynı değerlerde kahverengi pullar bastırılmıştır.



**Şekil 2.** Dörtlü blok halindeki ilk Osmanlı posta pulu, 1863.

Türkiye'de posta pullarının görsel bir tanıtım aracı olarak kullanılması, Osmanlı'nın son dönemlerine kadar uzanmaktadır. İlk basılan posta pullarında herhangi bir görsel tasvir bulunmamakta, üzerinde yalnızca dönemin padişahının imzası olan tuğra görselleri basılmaktaydı. 1914 yılında ilk kez şehir tanıtımı için önemli olan Londra basımları gerçekleştirildi. Oskan Efendi tarafından tasarlanan bu pulların hedefi, İstanbul'un anıtsal yapıları aracılığıyla İmparatorluk prestijini dünyaya sunmaktır. 1. Dünya Savaşı'nın başlamasının ardından, Londra'da basılan pullar durdurulmuş, 1916'da bu kez Viyana'da, şehir postasının kuruluşunun 50. Yılı anısına, üzerinde postane binasının ve Dolmabahçe Sarayı'nın olduğu pullar bastırılmıştır. (URL-3). Posta pulları, bir devletin hem kendi vatandaşlarına hem de diğer ülkelere kendini göstermek ve tanıtmak istediği bir vitrin olarak tanımlanabilmektedir. Devletin neleri anmak, onurlandırmak, sergilemek ve reklamını yapmak istediğini yansıtmaktadır. Pullar, tıpkı bayraklar, marşlar ve para birimleri gibi devlet "ikonografisinin" (simgeler sisteminin) temel bir parçasıdır (Brunn, 2000). 2. Meşrutiyet döneminin etkisinde uygulanan bu atılımlar, 35. Osmanlı padişahı Sultan Mehmed Reşat (V. Mehmet) zamanında gerçekleştirilmiştir. Mimari yapıların posta pullarında sergilenmesi, Türkiye tarihindeki şehir tanıtımı açısından da ilk örnek olması nedeniyle değerli ve önemli görülmektedir (Şekil 3).



**Şekil 3.** 1914 yılında Londra'da ve 1916 yılında Viyana'da basılan Osmanlı posta pullarında mimari yapılar (URL-3).

## 2. POSTA PULLARININ TURİZM AMAÇLI KULLANILMASI

Posta pulları, turizmi, kültürel mirası ve ulusal kimliği tanıtmak için benzersiz ve görsel açıdan etkileyici araçlardır. Turistik yerleri sergileyerek ve ulusal hikayeler anlatarak küresel kitlelere ulaşmakta, seyahati ve kültürel takdiri gizlice teşvik etmektedirler. Turist davranışları üzerindeki doğrudan etkilerini ölçmek mümkün olmasa da kayıt altına alınabilmeleri ve dönemin bakış açısını yansıtmaları açısından, bir belge olmaya devam etmektedirler.

Pullar, bir ülkenin kültürel mesajlarını taşıyan "görsel metinler" olarak, o ülkenin dünyadaki varlığını kanıtlamaktadır. Devletler tarafından kullanılan bir yer tanıtım ve pazarlama aracı olarak, "mini seyahat posterleri" tasarlanması ülkelerin cazibe merkezlerini dünyaya tanıtmaktadırlar. Bu yöntem kendini tanıtma biçimi olarak benimsenmekte ve tasarımlarına büyük önem verilmektedir. Aynı zamanda posta pulu koleksiyonerliğine de teşvik etmekte, doğrudan turist çekim noktası haline gelmektedir. Koleksiyoncular için pulları doğrudan pulların kendi ülkesinden, kaynağından almak, bir bayiden almaktan daha tatmin edicidir (Timothy, 2001).

Bazı ülkelerde Parlamento kararıyla turistik yerlerin pullara basılması zorunlu kılınmıştır ve bu bir Turizm Stratejik Planı parçasıdır. Bu kapsamda pullarda yer alacak konuların, ülkenin

kültürel kimliği ile bağlantılı olması ve kültürel mirası yayması beklenmektedir. Tasarım süreçlerinde ortaya çıkan görseller, resmi tarihsel kayıtlar olarak ülkenin tarihini inşa etmede birer araç haline gelmektedirler. Pulları ülkelerin gezici büyükelçisi olarak tanımlayan çalışmalar da bulunmaktadır (Libera, 2020).

## 3. "BÜYÜK MEMLEKET ŞEHİRLERİ" SERİSİNİN TARİHSEL BAĞLAMI

Türkiye'nin tarihsel sürecinde pul stratejilerinde belirgin bir değişim gözlemlenmektedir. Cumhuriyet döneminde basılan "Büyük Memleket Şehirleri" serisinde ülkenin tüm illeri görselleştirilerek, kapsayıcı bir vatan imgesi ve iç turizm bilincinin oluşturulması amaçlanmıştır. 1958-1960 yılları arasında basılan bu seri, kent imajı ve kent hafızası üzerinden incelendiğinde, Türkiye'de önemli toplumsal ve mekânsal değişimlerin yaşandığı bir döneme denk gelmektedir. Bu yıllar, hızlı kentleşme dinamiklerinin ve modernleşme hamlelerinin ülkenin mekânına güçlü bir şekilde yansıdığı kritik bir eşiktir.

Bu bağlamda çıkarılan "Büyük Memleket Şehirleri" serisi, Osmanlı dönemindeki İstanbul odaklı, dışa dönük stratejinin aksine, içeride bir ulusal bütünlük ve kapsayıcılık bilinci oluşturmayı amaçlamıştır. Seri, Türkiye Cumhuriyeti filatelisi içinde en kapsamlı şehir envanterini sunma özelliğine sahiptir. Basımı 7 grup şeklinde gerçekleştirilmiştir. PTT Pul Müzesi sergisinde yer alan bu seride 67 adet şehir bulunmaktadır. Gruplara göre tarihler ve yerleşim bölgeleri şu şekildedir (URL-4, URL-5):

I. GRUP (1958, 5 Ocak): Adana, Adapazarı, Adıyaman, Afyon, Amasya, Ankara, Antakya, Antalya, Artvin, Aydın (10 adet),
II. GRUP (1958, 5 Mart): Balıkesir, Bilecik, Bingöl, Bitlis, Bolu, Burdur (6 adet),
III. GRUP (1958, 5 Mayıs): Bursa, Çanakkale, Çankırı, Çorum, Denizli, Diyarbakır (6 adet),
IV. GRUP (1959, 3 Ağustos): Edirne, Elazığ, Erzincan, Erzurum, Eskişehir, Gaziantep, Giresun, Gümüşhane, Hakkari, Isparta, İstanbul, İzmir (12 adet),
V. GRUP (1959, 2 Kasım): İzmit, Kars, Karaköse, Kastamonu, Kayseri, Kırklareli, Kırşehir, Konya, Kütahya, Malatya (10 adet),
VI. GRUP (1960, 15 Ocak): Manisa, Mardin, Maraş, Mersin, Muğla, Muş, Nevşehir, Niğde, Ordu, Rize (10 adet),
VII. GRUP (1960, 15 Ocak): Samsun, Siirt, Sinop, Sivas, Tekirdağ, Tokat, Trabzon, Tunceli, Urfa, Uşak, Van, Yozgat, Zonguldak (13 adet).


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**Şekil 1.** Büyük memleket şehirleri posta pulu serisi.




**Şekil 1.** (devamı)

Büyük memleket şehirleri posta pulu serisi İsviçre'nin La Chaux-de-Fonds şehrinde, Courvoisier S. A. Matbaasında basılmıştır. Grafik tasarımcısı bilinmemektedir. 67 şehrin her birinin 50 kuruş ve 200 kuruş değerlerinde iki çeşidi bulunmaktadır. Bu çalışmada 200 kuruş değerindeki posta pullarının görsellerine yer verilmiştir (Şekil 1), 50 kuruş değerindeki posta pullarında da aynı görseller kullanılmıştır. 50 kuruş değerindeki pulların boyutları 29 x 24 mm iken, 200 kuruş değerindeki pullarda 36 x 26 mm boyutu tercih edilmiştir.

1958 serisinin en önemli filatelik ve sosyo-kültürel katkısı, kent hafızasını somutlaştırmasıdır. Seri, şehirlerin henüz büyük ölçekli ve geri dönüşü olmayan yapısal dönüşümlere uğramadan önceki "idealize edilmiş" son görünümlerini bir kayda geçirmektedir. Bu durum, seriyi kent kimliği araştırmaları için özgün bir veri seti haline getirmektedir. Çalışma kapsamında seride yer alan görsellerle ilgili perspektif, kent dokusu ve mimari yapı olmak üzere üç ortak nokta tespit edilmiştir. Her pulda görseller aynı perspektiften çekilmiş fotoğraflarla sunulmuş, her şehrin genel yerleşimi ve yapılaşma biçimi yansıtılmış, her pulda o şehri temsil etmek için mimari simge yapılar seçilmiştir. Bu görsel tercihlerin analizi, dönemin modernleşme hamlelerinin ve şehirlerin nasıl tanımlanması istendiğini göstermektedir.

## 4. SONUÇ

1958-1960 tarihli "Büyük Memleket Şehirleri" posta pulları serisi, Türkiye Cumhuriyeti'nin ulusal kimlik inşası ve mekânsal politikaları açısından küçük ama güçlü bir iletişim aracı olarak işlev görmüştür. Bu pullar, sadece posta ücretinin ödendiğini gösteren etiketler değil, aynı zamanda politik bir iletişim hamlesi ve kentlerin tarihsel ve kültürel katmanlarını içeren görsel bir arşivdir.

1950'ler, Türkiye'de köyden kente göçün ve hızlı çarpık kentleşmenin başladığı yıllardır. Ancak pullar, şehirleri genellikle bu bozulmadan arınmış, idealize edilmiş halleriyle sunar. Bu seri, şehirlerin betonlaşmadan önceki son "temiz" hallerini donduran bir görsel arşiv niteliğindedir. Bu seriyle birlikte, illerimizdeki kaybolan kent dokusunun izlerini sürmek mümkün olabilmektedir. Bu bağlamda da serinin, hızlı kentleşme öncesi son kent hafızası olduğunu söylemek mümkündür.

1989 yılına kadar Türkiye'de 67 il bulunmaktaydı. Bu 67 ilin tamamını kapsayan ve detaylı bir çalışma olan bu seride yer alan bazı il isimlerinin günümüzden farklı olduğu görülmektedir. "Karaköse" olarak yazan ilimizin adı 1938 yılında "Ağrı" olarak değiştirilmesine rağmen, bu seride hala bir önceki ismi kullanılmıştır. "Antakya", "Adapazarı" ve "İzmit" adları merkez ilçe isimleri olarak sırasıyla "Hatay", "Sakarya" ve "Kocaeli" illerine bağlıdırlar.

Günümüz dijitalleşen dünyasında fiziksel mektup kullanımı azalmasına rağmen, pulların temsil ettiği imaj yönetimi disiplini, güncel dijital şehir markalaşması çalışmaları için hala köklü bir referans olmaya devam etmektedir. Bu serinin incelenmesi, 1950'ler Türkiye'sindeki kentleşme dinamiklerini anlamak ve şehirlerin dönüşüm öncesi hafızasını kayda geçirmek açısından akademik bir gerekliliktir.

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# TOWARD CIRCULAR URBAN TRANSFORMATION: A FRAMEWORK AND ROADMAP FOR CIRCULAR CITY LABS IN TÜRKİYE

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## ABSTRACT

The transition toward a circular economy has become a strategic priority for cities worldwide, driven by increasing resource pressures, climate risks, and sustainability imperatives. Circular City Labs (CCLs) offer an experimental and multi-actor framework for testing, monitoring, and scaling circular interventions within real urban contexts. This paper explores the feasibility of establishing CCLs in Türkiye by presenting a conceptual framework, analyzing national conditions, and proposing a structured roadmap for implementation.

The study first outlines the principles of the circular city approach, emphasizing closed-loop material, water, and energy systems, and highlights the relevance of living-lab methodologies to urban sustainability transitions. It then evaluates Türkiye's current policy landscape—including the Zero Waste Project, the Green Deal Action Plan, and the emerging National Circular Economy Strategy—alongside the institutional capacities of local governments and the academic and technological ecosystem. Despite growing national momentum, challenges remain regarding fragmented governance structures, limited data integration, uneven digital infrastructures, and insufficient mechanisms for co-creation and citizen engagement.

A four-stage roadmap is proposed, consisting of preparation, pilot implementation, digital integration, and scaling-up. The findings suggest that Türkiye has strong potential to adopt CCLs, provided that multi-actor governance, data-driven decision-making, and community participation are strengthened. Establishing Circular City Labs could position Türkiye as a regional leader in circular urban experimentation and support long-term goals related to climate action, resource efficiency, and sustainable urban transformation.

**Keywords:** Circular City Labs, Türkiye, Roadmap

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## INTRODUCTION

Circular economy has emerged in recent years as a prominent paradigm within both European Union policies and national strategies, offering an alternative to the traditional linear "take–make–dispose" model. Cities constitute the most critical yet vulnerable scale of this transition due to their high population density, intensive resource consumption, and substantial waste generation. In this context, the "circular city" approach seeks to redesign urban flows of materials, water, and energy within closed-loop systems and to reinterpret urban metabolism from a sustainability perspective (Falah et al., 2025; Eionet, 2022).

Circular City Labs (CCLs) are defined as living laboratory models that enable this transformation to be experimentally tested, monitored, and scaled within real urban settings. These labs function as multi-actor interfaces in which municipalities, universities, the private sector, and citizens collaboratively design circular interventions, test small-scale pilots, and channel the resulting evidence back into planning and policy processes (Ayala et al., 2022; Innella et al., 2024).

In Türkiye, challenges such as the climate crisis, rapid urbanization, energy dependency, and persistent waste management issues have made the circular city concept an increasingly strategic agenda item. National frameworks—including the Zero Waste Project, the Green Deal Action Plan, and the emerging National Circular Economy Strategy—have strengthened this orientation; however, experimental and integrative models at the urban scale remain limited (MoEUCC, 2025; Henden Şolt, 2023).

This study aims to explore the feasibility of establishing Circular City Labs in Türkiye. To this end, it first presents the conceptual framework, then outlines the current national context, and finally proposes a roadmap for the development and implementation of CCLs.

## CONCEPTUAL FRAMEWORK

### Circular City Approach

The circular city approach represents a holistic framework aimed at minimizing resource consumption and waste generation within urban systems, while retaining material, water, and energy flows within the system for as long as possible. Its objective is to establish an urban metabolism that is aligned with ecological limits and regenerative principles. Within this paradigm, the hierarchy of prevention, reuse, repair, remanufacturing, and recycling is integrated into urban policy and planning instruments (Eionet, 2022).

In recent years, the development of indicator sets, decision-support tools, and monitoring frameworks for circular cities has enhanced the measurability and manageability of this transition. For example, Falah et al. (2025) propose a circular city indicator framework aligned with SDG 11, using machine learning and text analytics, and emphasize that such a framework can be further integrated into experimental structures such as Circular City Labs.

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### Circular City Laboratory (CCL)

A Circular City Laboratory is a "living laboratory" structured around experimental and replicable interventions conducted within real urban environments through multi-stakeholder collaboration. Unlike conventional pilot projects, a CCL functions as a continuously learning testbed that collects data, generates evidence, and feeds this knowledge back into planning and policy processes (Innella et al., 2024).

Conceptually, CCLs can be understood as the circular economy–oriented extension of the Urban Living Lab (ULL) model. Florez Ayala et al. (2022; 2025) demonstrate that ULLs play a crucial role in sustainability transitions and the construction of circular cities by enabling multi-actor governance, co-design processes, and experimental interventions that foster innovative solutions.

### International Models and Initiatives

The European Union's Circular Cities and Regions Initiative (CCRI) provides a multi-stakeholder support mechanism aimed at accelerating the implementation of circular economy principles at the regional and urban scales. The initiative offers technical guidance, knowledge exchange platforms, and twinning programs that strengthen institutional capacity (European Commission, 2020).

A noteworthy example is the 800 m² circular city laboratory developed within the Potterij project in Mechelen, Belgium, where material loops, service models, logistics chains, and spatial transitions are tested simultaneously. Similarly, the Inholland Circular City Lab in the Netherlands adopts a layered, systemic approach to address urban transition challenges related to materials, energy, social equity, and biodiversity (Inholland University of Applied Sciences, 2022). These examples provide valuable methodological and managerial insights for designing feasible Circular City Labs in Türkiye.

## CURRENT CONTEXT IN TÜRKİYE

### National Policies and Regulatory Framework

Türkiye has increasingly aligned its policy agenda with circular economy and climate action targets, particularly following its ratification of the Paris Agreement in 2021. The Zero Waste Project, initiated in 2017, represents the most widespread national initiative aimed at restructuring waste management practices through prevention, separation at source, reuse, and recycling. The project has gained international recognition and has been highlighted as a best-practice model within the context of the UN Sustainable Development Goals (UNDP Türkiye, 2021).

The Green Deal Action Plan (2021) and the emerging National Circular Economy Strategy and Action Plan (MoEUCC, 2025) further strengthen the strategic direction toward circularity by addressing resource efficiency, sustainable production, waste valorization, and low-carbon transitions. However, despite this policy momentum, the operationalization of circular economy principles in urban settings

often remains fragmented due to gaps in local governance, data availability, and cross-sectoral coordination (Eionet, 2022).

**Institutional Capacities of Local Governments**

Metropolitan municipalities in Türkiye have shown increasing interest in sustainability and climate-oriented urban governance. Many have prepared Climate Action Plans, Smart City Strategies, and Integrated Waste Management Plans. For example, a recent evaluation of Istanbul district municipalities demonstrates that the Zero Waste Project has enhanced source separation and public awareness but still lacks deeper integration with circular approaches such as reuse systems, repair infrastructures, and material valorization (Henden Şolt, 2023).

Some municipalities—such as Kadıköy, Eskişehir, and İzmir—have launched community-oriented circular initiatives including repair cafés, waste-free shops, organic waste composting, and local producer markets that support circular consumption models (ICLEI Europe, 2020). Despite these advancements, many municipalities continue to face challenges such as fragmented waste infrastructure, insufficient monitoring systems, and limited financial and technical capacity to implement experimental urban projects similar to Circular City Labs (Eionet, 2022).

**Academic and Technological Ecosystem**

Türkiye possesses a strong academic and innovation ecosystem, with universities, teknoparks, and research centers conducting extensive work in areas such as renewable energy, waste valorization, sustainable materials, and smart city technologies. This ecosystem provides a valuable foundation for university–city collaboration models that are essential for the establishment of CCLs.

Following recent policy changes and increased access to EU-aligned climate funds, research networks related to digital twins, IoT-based monitoring, GIS-supported planning, and urban analytics have expanded. However, these capabilities have not yet been systematically integrated into urban living laboratory frameworks. As noted by Ayala et al. (2022), the absence of structured platforms for co-creation and experimentation often limits the translation of academic knowledge into urban-scale innovation.

**Structural Barriers**

Despite the existing policy momentum, Türkiye faces several structural challenges that constrain the development of Circular City Labs:

*Fragmented infrastructure:* Urban water, energy, and waste systems are often managed by separate institutions with limited integration.

*Insufficient data transparency:* Real-time material flow data, essential for circular city monitoring, are largely unavailable.

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*Institutional coordination gaps:* Cross-sectoral collaboration mechanisms are weak, hindering multi-actor governance models.

*Financial constraints:* Municipalities face resource limitations that affect their ability to invest in experimental and long-term sustainability projects.

These barriers demonstrate that while Türkiye has made important progress in policy development, the operational capacity required for implementing CCLs remains emergent and requires systematic strengthening (MoEUCC, 2025; Eionet, 2022).

## A ROADMAP FOR ESTABLISHING CIRCULAR CITY LABS IN TÜRKİYE

Designing a feasible roadmap for Circular City Labs (CCLs) in Türkiye requires a phased, systemic, and multi-actor approach. Based on international experiences and Türkiye's institutional context, four core stages are proposed: preparatory phase, pilot implementation, data and digital integration, and scaling-up and institutionalization. This structure aligns with living-lab methodologies applied in European circular city transitions (Ayala et al., 2025; Innella et al., 2024).

### Preparatory Phase

The preparatory stage focuses on selecting suitable pilot cities or districts and establishing the necessary governance framework. Pilot site selection should consider:

- ✧ the existence of climate action or sustainability plans,
- ✧ the availability of digital infrastructure (GIS systems, sensor networks, smart meters),
- ✧ institutional capacity within municipal departments, and
- ✧ potential for university–city collaboration.

Such criteria are consistent with European circular city initiatives that emphasize readiness, data capacity, and multi-actor commitment (European Commission, 2020).

A comprehensive stakeholder mapping should be conducted to define roles for municipalities, universities, ministries, private sector actors, NGOs, and citizen groups. Establishing a governance structure—such as a Steering Committee or Living Lab Coordination Office—enhances long-term continuity.

Finally, a core set of Key Performance Indicators (KPIs) must be designed to guide monitoring. These may include reductions in municipal solid waste, increases in material recovery rates, decreases in per capita water consumption, and growth in renewable energy share. Such KPI-driven frameworks have been shown to support decision-making in circular city transitions (Falah et al., 2025).

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**Pilot Implementation Phase**

In the second stage, experimental interventions are deployed within a selected neighborhood or district. Pilot projects should target multiple resource loops:

*Material loop:* community repair centers, reuse hubs, material banks, on-site composting facilities.

*Water loop:* greywater recycling, rainwater harvesting, decentralized nature-based solutions.

*Energy loop:* building-level efficiency retrofits, rooftop photovoltaics, shared energy systems.

These interventions must be co-designed with local residents and stakeholders, consistent with Urban Living Lab principles that highlight co-creation as vital for socio-technical transitions (Ayala et al., 2022). Pilot interventions allow the CCL to function not merely as an infrastructure site but as an experimental ecosystem where behavioral, social, and technological dynamics interact.

**Data and Digital Integration Phase**

CCLs require strong data ecosystems to function as evidence-generating platforms. This phase involves deploying digital tools such as:

✧ Internet of Things (IoT) sensors for real-time monitoring of water, waste, and energy flows,

✧ GIS-based mapping of material and infrastructure networks,

✧ digital twins for scenario modeling and predictive analytics.

International cases demonstrate that measurable outcomes and robust traceability significantly enhance the credibility and scalability of circular interventions (Innella et al., 2024). Türkiye's rapidly expanding digital infrastructure provides an opportunity to integrate advanced analytics into urban decision-making. However, this requires structured data governance frameworks, including data-sharing protocols and standardized indicators.

**Scaling-Up and Institutionalization**

Once pilot projects produce measurable outcomes, the CCL model should be expanded across additional districts and replicated in other cities. Scaling-up requires:

✧ integrating pilot results into municipal planning processes,

✧ establishing long-term funding mechanisms (e.g., national climate funds, EU Green Deal financing),

✧ supporting inter-municipal learning networks similar to the EU's twinning programs under CCRI (European Commission, 2020).

In the Turkish context, creating a National Circular City Labs Network would facilitate knowledge transfer, harmonize monitoring standards, and strengthen collaboration among municipalities,

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universities, and ministries. Long-term institutionalization should also involve embedding circular economy objectives into zoning regulations, municipal investment frameworks, and urban service delivery models.

## DISCUSSION

Türkiye's capacity to establish Circular City Labs (CCLs) shows both promising strengths and considerable challenges when assessed in comparison with international experiences. National policy momentum—driven by the Zero Waste Project, the Green Deal Action Plan, and the forthcoming Circular Economy Strategy—provides an enabling macro-framework for circular transitions (MoEUCC, 2025; UNDP Türkiye, 2021). However, translating these national strategies into urban-scale experimental infrastructures remains an ongoing challenge.

From a governance perspective, international literature emphasizes that circular city transitions depend heavily on multi-actor coordination, shared decision-making, and co-creation practices, all of which are fundamental features of Urban Living Labs (Ayala et al., 2022; Lakatos et al., 2023). Although many Turkish municipalities have established sustainability departments and initiated climate action processes, the institutional mechanisms needed for continuous collaboration among municipalities, universities, private sector actors, and communities are still emerging. This limits the potential for living-lab-style experimentation and iterative learning.

Another challenge concerns data governance and infrastructure integration. Successful circular city labs—such as those in Amsterdam, Helsinki, and Mechelen—rely on comprehensive digital ecosystems including real-time material flow monitoring, digital twins, and standardized performance indicators (European Commission, 2020; Innella et al., 2024). In Türkiye, the availability of spatial, environmental, and infrastructural data varies significantly between municipalities. Fragmented responsibilities across water, waste, and energy utilities further constrain the development of integrated, data-driven circular interventions (Eionet, 2022).

Socio-cultural dynamics also influence the feasibility of CCLs. Studies indicate that citizen engagement and behavioral change are crucial for the long-term success of circular systems, particularly those related to reuse, repair, waste separation, and sustainable consumption (ICLEI Europe, 2020). While public awareness around recycling and waste reduction has increased through the Zero Waste Project, practices such as repair culture, community-led resource sharing, and consumption reduction are not yet widespread, potentially limiting social uptake of circular interventions.

Nevertheless, Türkiye also has significant strengths. The presence of a dynamic academic ecosystem, expanding digital infrastructure, and municipal interest in sustainability innovation provides a solid foundation for pilot CCLs. Moreover, Türkiye's rapid urban transformation creates a unique opportunity to embed circularity principles into emerging urban planning and redevelopment projects—an opportunity not always available in more mature urban systems.

Overall, the discussion highlights that the establishment of CCLs in Türkiye will require a balanced approach combining institutional reforms, capacity building, data integration, and localized co-creation strategies. With coordinated efforts, Türkiye can leverage its policy alignment and growing sustainability agenda to become a regional leader in circular urban experimentation.

## CONCLUSION AND RECOMMENDATIONS

This study examined the feasibility of establishing Circular City Labs (CCLs) in Türkiye by presenting a conceptual framework, analyzing the national context, and proposing a structured roadmap for implementation. The findings indicate that Türkiye has developed a strong policy foundation for circular transitions, supported by the Zero Waste Project, the Green Deal Action Plan, and the emerging National Circular Economy Strategy (MoEUCC, 2025; UNDP Türkiye, 2021). These national initiatives provide momentum; however, operationalizing circularity at the urban scale requires more integrated, experimental, and data-driven models, such as CCLs.

### Key Conclusions

First, while Türkiye's cities exhibit growing interest in sustainability, climate action, and waste reduction, the current governance landscape remains fragmented. Effective circular city transitions depend on multi-actor governance, structured co-creation processes, and long-term institutional commitment—conditions that international cases identify as essential for Urban Living Labs and circular innovation systems (Ayala et al., 2022; Lakatoset al., 2023).

Second, the technical and digital infrastructures required for CCLs—such as real-time monitoring tools, digital twins, and standardized indicators—are developing rapidly but remain uneven across municipalities. Strengthening data governance frameworks and inter-institutional cooperation will be crucial for enabling evidence-based decision-making and measurable circular outcomes (Innella et al., 2024).

Third, socio-cultural aspects, including citizen participation and behavioral change, represent both a challenge and an opportunity. While recycling awareness has improved, deeper circular practices such as reuse, repair, and sharing economies require further societal engagement and local initiatives (ICLEI Europe, 2020). Embedding community-led practices into CCL activities will enhance their long-term impact.

### Recommendations

Based on the analysis, several strategic recommendations are proposed:

*For municipalities:*

- ✓ Establish CCL pilot districts that integrate material, water, and energy loops.

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✓ Strengthen partnerships with universities to develop co-creation, monitoring, and evaluation systems.

✓ Adopt KPI-based monitoring frameworks aligned with international circular city indicators (Falah et al., 2025).

*For national policymakers:*

✓ Create enabling legislation and financial mechanisms that support experimental urban sustainability projects.

✓ Develop national standards for circular city metrics and data-sharing.

✓ Integrate circularity criteria into urban planning regulations and large-scale redevelopment programs.

*For academic and private sector actors:*

✓ Expand research and innovation activities on digital twins, IoT-based monitoring, circular materials, and socio-technical transitions.

✓ Support municipalities with technical capacity-building and collaborative innovation platforms.

✓ For civil society and local communities:

✓ Promote behavioral change initiatives focused on repair, reuse, and conscious consumption.

✓ Engage actively in co-design processes during pilot development phases to ensure locally grounded solutions.

**Final Outlook**

If Türkiye successfully integrates governance reform, digital innovation, and community engagement within a structured Circular City Lab framework, it has the potential to become a leading example of circular urban experimentation in its region. Such initiatives would not only contribute to achieving national climate and sustainability goals but also support the broader transition toward resilient, resource-efficient, and inclusive cities.

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# ULUSLARARASI EKOLOJİK KÖPRÜ ÖRNEKLERİ BAĞLAMINDA KARABÜK-ESKİPAZAR KARAYOLU PEYZAJI İÇİN ÖNERİLER

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## ÖZET

Kentsel ve kırsal alanlar arasındaki ekolojik sürekliliğin korunması ve sağlanması, doğal yaşamın desteklenerek ekosistem hizmetlerinin sürdürülebilir biçimde yönetilmesi çağdaş peyzaj planlamasının temel amaçlarındandır. Ancak karayolları, habitat parçalanmasına yol açarak yaban hayatı hareketliliğini kısıtlamakta, doğal koridorları kesintiye uğratmakta ve ekosistem işlevlerini olumsuz etkilemektedir.

Bu bildiride öncelikle ekosistem, karayolu peyzajı ve habitat parçalanmasıyla ilgili temel kavramlar ele alınmış; ardından Karabük'ün topografik yapısı, biyolojik çeşitliliği, karayolu ağı ve mevcut peyzaj uygulamaları ayrıntılı olarak incelenmiştir. Uluslararası ölçekte başarı sağlamış örnekler - Hollanda'daki Natuurbrug Zanderij Crailoo , Kanada'daki Trans-Canada Highway , Almanya'daki Grünbrücke System , İsviçre'deki Wildtierbrücke Neuenkirch , Güney Kore'deki Yangjae Ecobridge ve ABD'deki Wallis Annenberg Wildlife Crossing - tasarım amaç ve kavramsal yaklaşımı, teknik ve peyzaj özellikleri, ekolojik ve sosyal işlevsellik gibi kriterler bakımından değerlendirilmiş ve Karabük- Eskipazar karayolu peyzajı için uyarlanabilir ilkeler geliştirilmiştir.

Bu doğrultuda çalışma, ekosistem hizmetlerini desteklemeyi temel alan bütüncül bir peyzaj yaklaşımıyla güzergah üzerinde uygun bir noktada ekolojik köprü tasarlanmasını önermektedir. Önerilen model, hem biyolojik çeşitliliğin korunmasına hem de yol peyzajının uzun vadeli ekolojik sürdürülebilirliğinin güçlendirilmesine katkı sağlamayı amaçlamaktadır.

**Anahtar kelimeler:** Ekolojik köprü, karayolu peyzajı, biyolojik koridor, Karabük

**PROPOSALS FOR THE KARABUK-ESKIPAZAR HIGHWAY LANDSCAPE IN TE CONTEXT OF INTERNATIONAL ECOLOGICAL BRIDGE EXAMPLES**


## ABSTRACT

Preserving and maintaining ecological continuity between urban and rural areas, supporting natural life, and managing ecosystem services in a sustainable manner are among the fundamental objectives of contemporary landscape planning. However, highways lead to habitat fragmentation, restrict wildlife mobility, disrupt natural corridors, and negatively affect ecosystem functions.

In this paper, fundamental concepts related to ecosystems, highway landscapes, and habitat fragmentation are first examined; subsequently, Karabük's topography, biological diversity, highway network, and existing landscape practices are analyzed in detail. Internationally successful examples—Natuurbrug Zanderij Crailoo in the Netherlands, the Trans-Canada Highway in Canada, the Grünbrücke System in Germany, Wildtierbrücke Neuenkirch in Switzerland, Yangjae Ecobridge in South Korea, and the Wallis Annenberg Wildlife Crossing in the United States—are evaluated in terms of design goals and conceptual approaches, technical and landscape characteristics, and ecological and social functionality. Based on these evaluations, adaptable principles for the Karabük–Eskipazar highway landscape have been developed.

Accordingly, the study proposes the design of an ecological bridge at a suitable point along the route, adopting a holistic landscape approach that prioritizes the support of ecosystem services. The proposed model aims to contribute both to the conservation of biodiversity and to strengthening the long-term ecological sustainability of the highway landscape.



**Keywords:** Ecological bridge, highway landscape, biological corridor, Karabük.


## 1. GİRİŞ

Doğal ekosistemlerin sürekliliği, ekolojik dengenin korunması ve yaban hayatının sürdürülebilirliği, günümüzde çevresel planlama ve peyzaj mimarlığının temel çalışma alanları arasında yer almaktadır. Ekosistem, canlı (biyotik) ve cansız (abiyotik) bileşenlerin karşılıklı etkileşim hâlinde bulunduğu, enerji akışı ve madde döngüsünün gerçekleştiği dinamik bir sistemler bütünü olarak tanımlanmaktadır (Aslım, Yiğit ve Yaşar, 2010). Ekosistemlerin işleyişi; habitat bütünlüğü, türler arası ilişkiler, ekolojik bağlantılılık ve çevresel etkileşimlerin sürekliliğine bağlıdır. Modern ekoloji literatüründe ekosistemlerin yalnızca biyolojik çeşitlilik açısından değil, aynı zamanda sundukları ekosistem hizmetleri bakımından da değerlendirilmesi gerektiği vurgulanmaktadır (Zeybek, Keser ve Yıldırım, 2021). Bu ekosistem hizmetleri; su döngüsü, karbon depolama, iklim düzenleme, toprak oluşumu, besin üretimi,

habitat temini ve rekreasyon gibi doğal süreçlerin sürekliliğini sağlayan temel işlevleri kapsamaktadır (Aslım ve ark., 2010).

Ancak son yüzyılda hızla artan insan faaliyetleri, doğal ekosistemler üzerinde yoğun baskı oluşturmaya başlamıştır. Nüfus artışı, sanayileşme, kentleşme, tarım alanlarının genişlemesi ve ulaşım ağlarının yaygınlaşması, ekosistemlerin parçalanmasına, habitat kaybına ve biyolojik çeşitlilikte azalmaya neden olmuştur . Bu etkiler, yalnızca doğal yaşam alanlarının fiziki olarak bölünmesiyle sınırlı kalmamakta; aynı zamanda ekolojik bağlantılılığın azalması, türlerin göç yollarının kesintiye uğraması, genetik izolasyon, popülasyon küçülmesi ve davranışsal adaptasyon kayıpları gibi ekosistem temelli sorunları da beraberinde getirmektedir (Gülci, Akay ve Gülci, 2014). Tunay, Yılmaz ve Ateşoğlu (2008), özellikle yol ağlarının geçtiği kırsal ve ormanlık alanlarda habitat sürekliliğinin bozulduğunu, türlerin yaşam alanlarının birbirinden ayrıldığını ve bu durumun ekolojik koridorlarda ciddi kopmalara yol açtığını belirtmektedir.

Habitat parçalanması, peyzaj ekolojisinin en kritik problemlerinden biri olarak karşımıza çıkmaktadır. Peyzaj ekolojisine göre doğal alanlar; çekirdek habitatlar, tampon bölgeler, bağlantı koridorları ve geçiş zonları olmak üzere çeşitli ekolojik bileşenlerden oluşur (Bayraktaroğlu, 2013). Karayolları, bu bileşenler arasında bariyer etkisi yaratarak ekolojik bağlantılılık ağlarını kesintiye uğratmakta ve türlerin çekirdek habitatlar arasında güvenli geçişini engellemektedir . Özellikle memeli türlerin, habitatlar arasında göç, beslenme, barınma ve üreme faaliyetlerini sürdürebilmeleri için ekolojik koridorlara ihtiyaç duyduğu bilinmektedir (Özcan, 2020). Bu nedenle habitatların bağlantılılık seviyesini korumak, peyzaj ekosistem planlaması açısından kritik öneme sahiptir.

Peyzaj ekolojisi yaklaşımı, doğal alanların yalnızca korunması değil, aynı zamanda doğal süreçlerin devamlılığını sağlayacak ekolojik ağların planlanması ve yeniden bağlanması gerektiğini savunmaktadır (Zeybek ve ark., 2021). Bu bağlamda, ekolojik koridorlar, kervan yolları, yaban hayatı geçitleri, ekosistem köprüleri (ekodük) ve ekolojik sanat yapıları, habitat parçalanmasının olumsuz etkilerini azaltmak amacıyla geliştirilen yapısal çözümler olarak görülmektedir (Gülci ve ark., 2014). Ekolojik geçitler; türlerin doğal davranışlarını sürdürebilmeleri, yaşam alanları arasında güvenli geçiş yapabilmeleri ve genetik çeşitliliğin korunması için geliştirilen stratejik yapılardır.

Ekolojik köprüler (ekodük), özellikle Avrupa'da 1950'lerden itibaren yaygın olarak kullanılmaya başlamış ve yaban hayatı koruma stratejilerinin merkezinde yer almıştır. İlk ekodük uygulamalarının Hollanda'da yapıldığı bilinirken, bu yapıların zamanla Almanya, Fransa, Kanada ve ABD gibi birçok ülkede yaygınlaştığı görülmüştür (Aslım ve ark., 2010). Bu ülkelerde ekolojik köprülerin yalnızca yaban hayatı geçişini sağlamadığı, aynı zamanda

peyzaj estetiği, rekreasyon, orman bağlantılılığı ve otoban güvenliği açısından da ek faydalar sunduğu belirtilmektedir (Özcan, 2020).

Türkiye'de ekolojik köprü kavramı görece yeni olmakla birlikte, özellikle Kuzey Anadolu, Akdeniz ve İç Anadolu bölgelerinde yer alan ormanlık yol ağlarında habitat parçalanması sorunu giderek artmaktadır (Zeybek ve ark., 2021). Özellikle orman içi ve kenarı yol güzergâhlarında ekolojik sanat yapılarının geliştirilmesi, uluslararası literatürde olduğu gibi Türkiye'de de peyzaj ekolojisi ve ekolojik mühendislik çözümlerinin birlikte kullanılmasını gerekli kılmıştır (Gülci, Akay ve Gülci, 2014). Bu bağlamda, ekolojik geçitlerin yalnızca doğal yaşamı koruma amacıyla değil, aynı zamanda güvenli ulaşım, yaban hayatı kazaları ve ekonomik kayıpların önlenmesi açısından da büyük önem taşıdığı belirtilmektedir (Tunay ve ark., 2008).

Sonuç olarak, ekosistem temelli peyzaj planlama yaklaşımı, ulaşım altyapıları ile doğal ekosistemlerin karşı karşıya gelmesini değil, birlikte var olmasını savunan yeni bir perspektif sunmaktadır. Bu bağlamda ekolojik köprüler, habitat parçalanmasının azaltılması, ekolojik bağlantılılığın yeniden tesisi, yaban hayatı koridorlarının sürdürülebilirliği ve peyzaj bütünlüğünün sağlanması açısından çevresel planlama ve tasarımda önemli bir yer edinmiştir (Bayraktaroğlu, 2013).

## 2. MATERYAL VE YÖNTEM

Batı Karadeniz Bölgesi'nde yer alan Karabük, topoğrafik açıdan yüksek eğimli dağlık alanlar, derin vadiler, orman ekosistemleri ve su koridorlarıyla karakterize edilen karmaşık bir peyzaj sistemine sahiptir. Bölge, Keltepe (2.079 m), Köroğlu ve Ilgaz dağ silsilelerinin etkisiyle yükselti farklarının kısa mesafelerde değiştiği, bu nedenle biyolojik çeşitlilik açısından doğal geçiş alanları barındıran bir coğrafi yapıya sahiptir. Eğimin yer yer %40'ın üzerine çıkması, Karabük'ün topoğrafyasını yalnızca mühendislik açısından değil, aynı zamanda ekolojik ağların sürekliliği bakımından da kritik hale getirmektedir (Ertekin & Çorbacı, 2010).

Karabük'ün peyzaj karakteri, ormanlık alanlar, dere vadileri, tarımsal platolar ve yerleşim dokuları arasında keskin geçişler içermektedir. Bu çeşitlilik, peyzaj ekolojisi açısından hem habitat farklılığı hem de geçiş zonları açısından zengin bir yapı oluşturmakta; fauna türlerinin mevsimsel geçişlerini destekleyen doğal koridorlar yaratmaktadır (Koçan, 2007). Özellikle Eskipazar vadileri, Araç Çayı çevresi, Yenice Ormanları ve Safranbolu kırsalı, yaban hayatı türlerinin yoğunlukla kullandığı habitat bağlantılarının bulunduğu alanlardır.

Karabük, floristik çeşitlilik açısından Türkiye'nin önemli orman ekosistemlerinden biri olan Yenice Ormanları'na ev sahipliği yapmaktadır. Bu alan; kayın (*Fagus orientalis*), gürgen (*Carpinus betulus*), karaçam (*Pinus nigra*), sarıçam (*Pinus sylvestris*), meşe (*Quercus spp.*) ve

kestane (*Castanea sativa*) türlerinden oluşan karışık orman formasyonuna sahiptir. Fauna açısından kızıl geyik (*Cervus elaphus*), karaca (*Capreolus capreolus*), yaban domuzu (*Sus scrofa*), tilki (*Vulpes vulpes*), sansar (*Martes foina*) ve porsuk (*Meles meles*) gibi türler, bölgenin habitat sürekliliğine ihtiyaç duyan türlerindendir (Zeybek, Keser & Yıldırım, 2021). Bu türler özellikle Yenice–Eskipazar–Araç Çayı bağlantı hattında doğal geçiş güzergâhları kullanmaktadır.

Ancak Karabük–Eskipazar karayolu güzergâhının bu doğal koridorları yatay olarak kesmesi, habitat parçalanması, bariyer etkisi ve yaban hayatı-araç çarpışması risklerinin artmasına neden olmaktadır. Literatüre göre inşa edilen yollar yalnızca fiziksel bariyer oluşturmakla kalmaz; aynı zamanda hayvanların hareket kabiliyetini davranışsal düzeyde de sınırlar; ışık, gürültü, koku ve titreşim faktörleriyle hayvan türlerinin ekolojik süreçlerini olumsuz etkiler (Ekosistem Köprülerinin Ekoduk Yaban Hayatı, 2020).

Türkiye'de karayolu kaynaklı habitat bozulmasının en yoğun yaşandığı alanlardan biri Karadeniz orman ekosistemlerinin parçalandığı iç geçiş hatlarıdır. Karabük'te özellikle karayolu çalışmalarının araziyi ikiye böldüğü geçiş zonları; orman içi geçitler, dere kenarı vadiler, sırt-topuk geçişleri ve orman açıklıklarıdır.

Mevcut peyzaj uygulamalarına bakıldığında Karabük'te yol kenarı yeşillendirmeleri, erozyon önleme uygulamaları ve sınırlı ağaçlandırma çalışmaları yapılmış olmasına rağmen, ekolojik koridor sürekliliğini sağlayan bir yaklaşım henüz yoktur. Yani Karabük'te yapılan peyzaj müdahaleleri estetik, mühendislik ve güvenlik odaklıdır; habitat bağlantısını güçlendiren ekolojik sanat yapıları (ekodük, menfez, viyadük, yaban hayatı tüneli) bulunmamaktadır (Zeybek, Keser & Yıldırım, 2021).

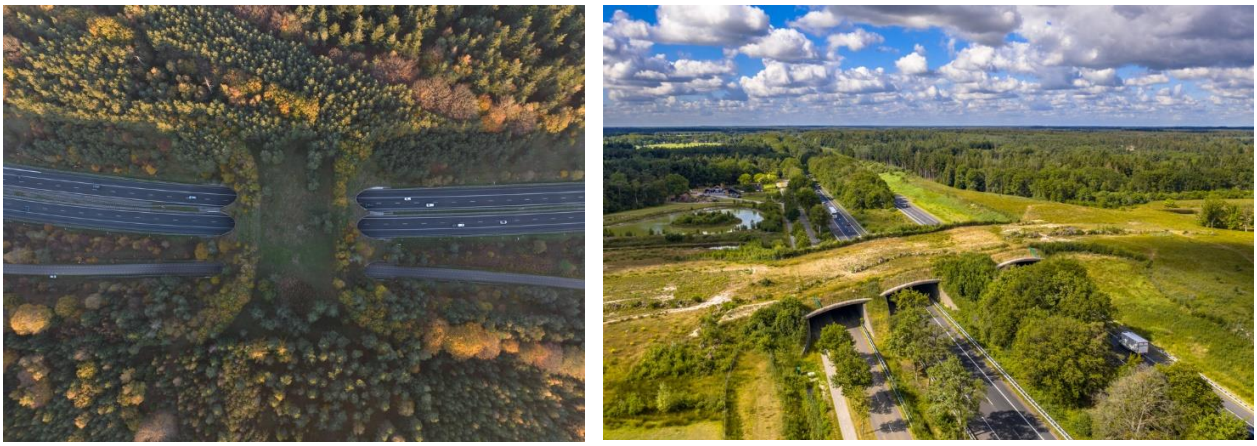
Karayolu peyzajının doğal çevreyle uyumsuz şekilde tasarlanması yalnızca ekolojik değil, aynı zamanda görsel peyzaj kalitesi açısından da sorun yaratmaktadır. Karayolunun, içinden geçtiği peyzajı bölmek yerine onunla bütünleşmesi gerektiği, peyzaj mimarlarının karayolu güzergâh planlamasında aktif rol alması gerektiği vurgulanmaktadır (Seçkin, 1986).

**ULUSLARARASI ÖRNEKLER**

**1.Natuurbrug Zanderij Crailoo (Hollanda)**

Avrupa'nın en büyük ekolojik köprülerinden biri olan Natuurbrug Zanderij Crailoo, parçalanmış orman habitatlarını yeniden birleştirmek amacıyla peyzaj entegrasyonuna dayalı bir yaklaşımla tasarlanmıştır. Yapı, sadece bir geçiş noktası olarak değil, doğal topoğrafyanın devamı niteliğinde, toprak dolgusu, yöresel bitkiler ve çalı grupları kullanılarak ekolojik bir koridor şeklinde modellenmiştir. Köprü, büyük memelilerden sürüngenlere kadar geniş tür yelpazesine hizmet veren habitat odaklı bir geçiş sistemi sunar. Sosyal erişime kapalı,

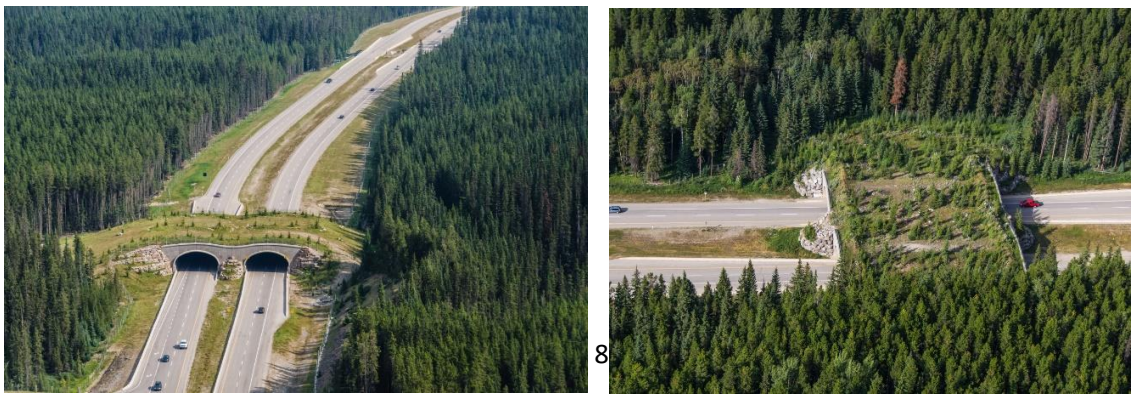
tamamen ekolojik odaklı bir geçit olması, Karabük'te özellikle Yenice Ormanları ile Araç Çayı havzası arasında tür odaklı değil habitat odaklı bir bağlantı kurulması gerektiğini göstermektedir. Bu örnek, Karabük–Eskipazar karayolu üzerinde "doğal peyzajın mühendislik yapısına dönüştürülmesi" açısından önemli bir referans niteliği taşır.



**Şekil 1, 2 .** Natuurbrug Zanderij Crailoo Genel Görünüş (Url 1)

**2. Trans-Canada Highway Wildlife Overpasses (Kanada / Banff)**

Banff Ulusal Parkı'nda uygulanan Trans-Canada Highway Wildlife Overpasses projesi, yalnızca habitat bağlantısını sağlamakla kalmayıp, aynı zamanda hayvan-araç çarpışmalarını azaltmaya yönelik güvenlik odaklı bir kavramsal yaklaşıma sahiptir. Çit sistemleri, yönlendirme bariyerleri ve izleme teknolojileriyle desteklenen köprüler, ekolojik geçiş yüzeyinden çok daha fazlası olarak, uzun vadeli veri takibi ve tür davranış analizine olanak tanıyan dinamik izleme koridorları şeklinde çalışmaktadır. Bu yönüyle proje, Karabük–Eskipazar karayolunda özellikle karaca, kızıl geyik ve yaban domuzu gibi türlerle sürücü güvenliğini tehdit eden bölgelerde ekolojik geçiş yapılarının yalnızca çevresel değil, aynı zamanda güvenlik temelli ele alınması gerektiğini göstermektedir. Bu model, Karabük örneğinde "ekolojik işlevsellik + trafik güvenliği" yaklaşımını destekler.



**Şekil 3, 4 .** Trans-Canada Highway Wildlife Overpasses Genel Görünüş (Url 2)



**Şekil 5.** Trans-Canada Highway Wildlife Overpasses Yabani Hayvan Geçidi (Url 2)

### 3.Grünbrücke System (Almanya)

Almanya'daki Grünbrücke sistemi, ekolojik geçişi geniş ölçekli peyzaj bütünlüğü içinde ele alan entegre bir modeldir. Orman alanları, tarım yüzeyleri ve su koridorlarını birbirine bağlayan bu sistem, çok katmanlı habitat geçişi sağlayarak biyolojik çeşitliliği sadece büyük memelilerle sınırlamaz; küçük memeliler, sürüngenler ve kuş türleri için de erişilebilir hale getirir. Gürültü bariyerleri, eğimli giriş rampaları ve peyzajla uyumlu bitkilendirme teknikleri, bu yapıları doğal bir peyzaj geçidi haline getirmiştir. Karabük peyzajında orman–vadi–tarım alanı geçişlerinin sık görüldüğü kesimlerde bu model uygulanabilir; çünkü Eskipazar vadisi ile Yenice Ormanları arasındaki kopukluk, sadece bir ekodük değil, "peyzaj ekolojisini yeniden kuran bir bağlantı sistemi" gerektirir.

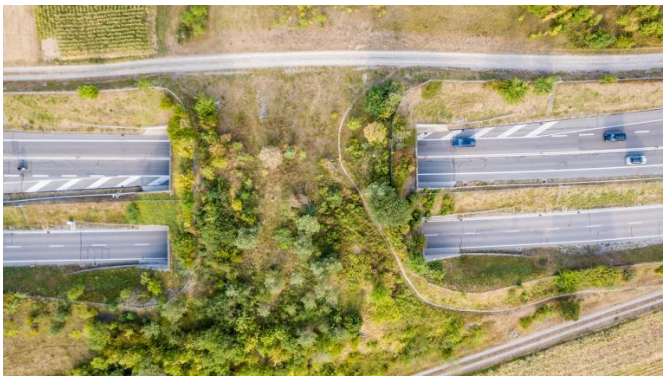


**Şekil 6, 7.** Grünbrücke System Genel Görünüş (Url 3)

### 4. Wildtierbrücke Neuenkirch (İsviçre)

İsviçre'deki Wildtierbrücke Neuenkirch, ekolojik köprülerin yalnızca mühendislik değil, aynı zamanda peyzaj karakterine bağlı biçimlenmesi gerektiğini savunan bir tasarım anlayışına sahiptir. Bu köprü, tamamen yöresel toprak dolgusu, doğal taş, orman altı bitkileri ve çalı örtüsüyle inşa edilerek yapıdan çok geçmiş bir orman koridoru görünümü kazanmıştır. 2022

izleme raporlarına göre sadece geyik veya domuz gibi büyük memeliler değil, 200'den fazla tür bu köprüyü aktif olarak kullanmaktadır. Bu yaklaşım Karabük örneğinde özellikle "köprüyü yapıdan çok doğal bir peyzaj geçidi olarak" tasarlamak gerektiğini, ayrıca Karabük'ün doğal ve baskın tür kompozisyonuna göre bitkilendirme yapılmasının önemini vurgular. Bu örnek, Karabük için en "ekolojik olarak yaşayan köprü" modelidir.

**Şekil 8, 9.** Wildtierbrücke Neuenkirch Genel Görünüş (Url 4,5)

## 5.Yangjae Ecobridge (Güney Kore)

Yangjae Ecobridge, klasik ekolojik köprülerden farklı olarak kent ekolojisini doğayla bütünleştiren hibrit bir modeldir. Yalnızca hayvan geçişi değil, insanların doğayla temasını artıran, çevre eğitimi, rekreasyon ve farkındalık gibi sosyal işlevler de içeren bir peyzaj koridoru niteliğindedir. Bitkilendirme, yürüyüş parkuru, gözlem alanı ve ekolojik




**Şekil 10, 11.** Yangjae Ecobridge Genel Görünüş (Url 6)

## 6.Wallis Annenberg Wildlife Crossing (ABD)

ABD'de güncel bir örnek olan Wallis Annenberg Wildlife Crossing, sadece geçiş işlevi değil, genetik izolasyon riskine karşı fauna popülasyonlarının korunmasını hedefleyen bilimsel temelli bir ekolojik köprü yaklaşımı sunar. Özellikle dağ aslanı gibi geniş alan kullanan türlerde, habitat ayrımı genetik bozulmaya ve türün yok oluş riskine yol açmaktadır. Bu köprü, tür geçişlerinin aktif olarak izlenebildiği, yapay zekâ tabanlı takip sistemlerinin kullanıldığı,

uzun vadeli bilimsel izleme koridoru olarak tasarlanmıştır. Karabük–Eskipazar karayolu üzerinde kızıl geyik, karaca gibi geniş alan gereksinimli türlerin popülasyon sürekliliği açısından bu model örnek alınabilir. Bu örnek, Karabük için "izleme temelli, bilimsel veri üreten, uzun süreli ekolojik geçit" anlayışını destekler.



**Şekil 12.** Wallis Annenberg Wildlife Crossing Genel Görünüş (Url 7)

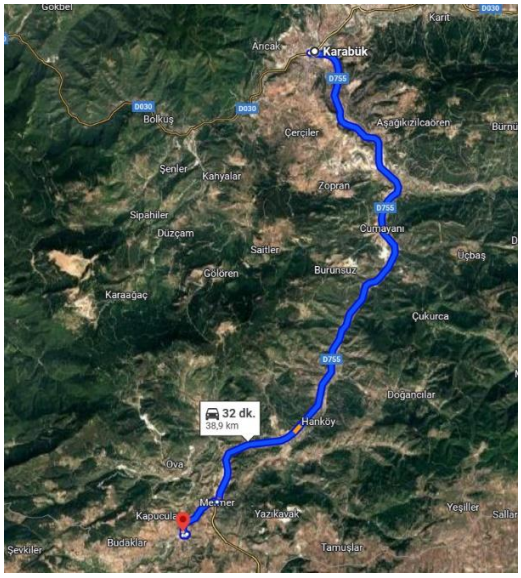





**Şekil 13, 14.** Wallis Annenberg Wildlife Crossing Genel Görünüş (Url 8,9)

## Karabük-Eskipazar Karayolu

Karabük–Eskipazar güzergâhında yer alan D755 karayolu, Karadeniz Bölgesi'ni İç Anadolu'ya bağlayan önemli ulaşım akslarından biridir. Bölgesel ölçekte hem ekonomik hem de lojistik açıdan stratejik bir geçiş güzergâhı niteliği taşır. Karayolunun geçtiği alan, topoğrafik olarak dağlık, ormanlık ve ekolojik açıdan hassas nitelikli bir geçiş zonunda yer almaktadır. Yol, doğal habitatları kuzey–güney yönünde keserek orman ekosistemlerini ikiye ayırmakta ve bu durum habitat parçalanmasına, yaban hayatı geçişlerinin kesintiye uğramasına neden olmaktadır.








**Şekil 15, 16, 17.** Karabük-Eskipazar Karayolu Güzergahı Uydu Görüntüsü

D755 karayolu, yerleşim alanları açısından incelendiğinde bazı bölümlerde köylere yakın geçse de, Burunsuz–Hanköy arası kesimde yerleşim baskısı oldukça düşüktür. Bu özellik, ekolojik köprü uygulamaları için uygun bir çevresel bağlam sunar. Aynı zamanda yolun geniş şeritli ve yüksek hız limitli olması, yaban hayvanları için geçiş riskini artırmakta, hem ekosistem hem de trafik güvenliği açısından olumsuz durumlar oluşturmaktadır. Bu nedenle, bu güzergahta ekolojik köprü önerisinin yalnızca ekolojik değil, aynı zamanda sosyal, mekânsal ve güvenlik boyutuyla da gerekçelendirilmiş olduğu söylenebilir.

Bu karayolunun orman ekosistemlerini kesintiye uğratan doğrusal bariyer niteliği, onu ekolojik köprü ihtiyacının en belirgin olduğu alanlardan biri hâline getirmektedir. Bu bağlamda Burunsuz–Hanköy arası seçilen bölge, hem ekolojik süreklilik, hem trafik güvenliği, hem de uygulanabilirlik açısından optimum koşulları sağlamaktadır.

Bu doğrultuda, Burunsuz–Hanköy arasındaki ekolojik koridor üzerinde seçilen geçiş noktasında, habitat sürekliliğinin yeniden sağlanabilmesi için ekolojik köprü tasarımları geliştirilmiştir. Tasarım önerileri, alanın topoğrafik yapısı, mevcut doğal peyzaj karakteri ve yaban hayatı hareketliliği dikkate alınarak hazırlanmış olup, ayrıca mekânsal bağlamı güçlendirmek amacıyla gerçek uydu görüntüleri üzerine yapay zekâ destekli görselleştirme teknikleri kullanılarak oluşturulmuştur. Bu sayede önerilen ekolojik köprü modelleri, hem yer seçimi kararını görsel olarak desteklemekte hem de doğayla uyumlu, uygulanabilir ve çağdaş koruma yaklaşımına uygun örnekler sunmaktadır.




**Şekil 18.** Seçilen Alan için Ekolojik Köprü Önerileri






**Şekil 18, 19.** Seçilen Alan için Ekolojik Köprü Önerileri




**Şekil 20.** Seçilen Alan için Ekolojik Köprü Önerileri

## 3. SONUÇ

Doğal peyzaj sistemlerinin sürekliliğinin korunması, habitat bütünlüğünün desteklenmesi ve yaban hayatı hareketliliğinin kesintisiz devam edebilmesi, çağdaş ekolojik planlama

yaklaşımlarının temel bileşenlerini oluşturmaktadır. Bu bağlamda ekolojik köprüler, yalnızca geçiş sağlayan yapılar olarak değil; parçalanmış peyzajların yeniden bütünleştirilmesi, ekosistem hizmetlerinin korunması ve doğal alanlar arasında sürekliliğin yeniden tesisi açısından kritik öneme sahip peyzaj temelli uygulamalardır.

Çalışma kapsamında Karabük–Eskipazar karayolu boyunca yapılan değerlendirmeler, bu güzergâhın yalnızca bir ulaşım hattı olmadığını; aynı zamanda orman ekosistemleri, dere vadileri, yaban hayatı geçiş aksları ve doğal koridorların kesintiye uğradığı ekolojik açıdan hassas bir alan olduğunu ortaya koymuştur. Özellikle Burunsuz–Hanköy geçiş zonu, habitat sürekliliğinin yeniden sağlanması için uygun doğal bağlamı sunmakta; yerleşim baskısının düşük olması, flora ve fauna çeşitliliğinin yüksekliği ve orman dokusunun kesintisiz niteliği açısından önemli bir ekolojik bağlantı noktası oluşturmaktadır.

Uluslararası örneklerden elde edilen veriler, ekolojik köprülerin yalnızca tür geçişini destekleyen geçitler değil; aynı zamanda peyzaj bütünlüğünü yeniden tesis eden, biyolojik ağları birbirine bağlayan ve ekosistem temelli planlamayı destekleyen ekolojik restorasyon araçları olduğunu göstermektedir. Bu bağlamda çalışma, Karabük peyzajı için önerilen ekolojik köprü modelinin yalnızca fiziksel bir çözüm değil, aynı zamanda bir peyzaj onarımı, ekolojik süreklilik güçlendirme ve biyolojik çeşitliliği koruma yaklaşımı olduğunu ortaya koymuştur.

Sonuç olarak geliştirilen yer seçimi, tasarım ilkeleri ve peyzaj odaklı değerlendirme modeli; Karabük–Eskipazar karayolunun ekosistem temelli bir yaklaşımla ele alınması gerektiğini vurgulamakta, doğal koridorların yeniden bütünleştirilmesine yönelik uygulanabilir ve yere özgü bir çözüm sunmaktadır. Bu çalışma, bölgesel biyolojik çeşitliliğin korunması, ekolojik peyzaj bağlantılarının güçlendirilmesi ve habitat sürekliliğinin desteklenmesi açısından örnek teşkil edebilecek nitelikte olup, Türkiye'de ekolojik köprü planlamasına yönelik önemli bir referans değeri taşımaktadır.

## 4. ÖNERİ

Karabük–Eskipazar karayolu peyzajında önerilen ekolojik köprü uygulaması, yalnızca mekânsal bir geçiş yapısı değil; parçalanmış ekosistem bileşenlerini yeniden bütünleştirerek peyzajın ekolojik sürekliliğini tesis eden, tür hareketliliğini destekleyen ve uzun vadeli ekosistem hizmetlerini güvence altına alan bir restorasyon müdahalesi olarak ele alınmalıdır. Bu bağlamda Burunsuz–Hanköy geçiş zonu, habitat bağlantılılığının kesintiye uğradığı, flora ve fauna çeşitliliğinin yüksek olduğu ve yerleşim baskısının görece düşük seyrettiği eşi değerli bir ekolojik düğüm noktası niteliği taşımakta olup, ekolojik köprü yer seçimi açısından optimum konumsal nitelik göstermektedir. Ekolojik köprü tasarımı, mühendislik odaklı bir

altyapı çözümünden ziyade, peyzaj ekolojisi, habitat bütünlüğü ve ekosistem temelli planlama ilkeleri doğrultusunda biçimlenmeli; köprü formunun doğal topoğrafya ile uyumlu eğimli kütlelerden oluşması, geçirgen yüzeylerin kullanılması ve yerel bitki türleri, orman altı örtüleri ve maki formasyonu ile doğallaştırılması, yapının peyzajla estetize edilmiş bir geçit olmaktan çok, yaşayan bir habitat koridoru niteliği kazanmasını sağlayacaktır. Önerilen model, uluslararası örneklerde olduğu gibi biyolojik çeşitlilik odaklı, tür davranışlarını destekleyen, izleme-temelli ve ölçeklenebilir bir ekolojik altyapı prototipi olarak değerlendirilmelidir. Bu doğrultuda geçit yalnızca büyük memeliler için değil; sürüngen, kuş ve küçük memeliler gibi farklı tür gruplarının ekolojik gereksinimlerini de kapsayan çok katmanlı ekolojik işlevsellik sunmalı; yapıya eşlik eden hayvan yönlendirme bariyerleri, izleme kamera sistemleri, doğal kapan zonları ve habitat restorasyon unsurlarıyla fonksiyonel bir ekosistem köprüsüne dönüşmelidir. Yerel ve ulusal ölçekte ekolojik peyzaj planlaması bağlamında yapının yalnızca tekil bir örnek olarak değil, bölgesel habitat sürekliliğini güçlendiren, peyzaj ağlarını yeniden inşa eden ve Türkiye'de ekolojik koridor planlamasına referans teşkil edebilecek nitelikte pilot bir uygulama olarak değerlendirilmesi önerilmektedir. Bu kapsamda Karayolları Genel Müdürlüğü, Orman Genel Müdürlüğü, üniversiteler ve yerel yönetimler arasında disiplinlerarası bir iş birliği modeli tesis edilmeli; uzun vadeli ekosistem izleme, habitat restorasyonu, peyzaj yönetimi ve veri temelli ekolojik değerlendirme süreçlerini içeren sürdürülebilir bir yönetim mekanizması oluşturulmalıdır.

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# The millennium tent: A critical review on Astana Khan Shatyr

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**Abstract.** Tents, the most primitive form of shelter, can be seen as traditional tensile architecture. Although the tent structure has existed for thousands of years, tents still offer a valuable starting point for designing modern tensile buildings. However, to enhance large-span modern tensile architecture, it is crucial to understand the inherent structural characteristics of the membrane rather than simply mimicking the form of tents. Thus, the rediscovery of traditional tensile buildings through advanced technology presents an opportunity to liberate architecture from the constraints of heavy formal designs. In this context, this paper examines the impact of tensile structures on form development and focuses on one notable modern tent-like building, Khan Shatyr (Tent of the Khan). This research introduces the Khan Shatyr project by Foster and Partners and explores its significance within modern tensile structures. The relationships between form and concept, material properties, and structural behavior of the Khan Shatyr are evaluated. In conclusion, the Khan Shatyr project is critically analyzed in terms of its architectural form, its interplay with its structural design, and its role as a megastructure. The study highlights how the project transcends traditional tensile design principles by leveraging advanced materials and innovative engineering. This examination underscores the redefined modern architecture by balancing form, functionality, and structural efficiency. Ultimately, the study highlights the challenges of translating traditional tensile principles into modern megastructures, raising questions about the balance between architectural expression and structural behavior in contemporary design.

**Keywords:** Millennium tent; Tensile structures; Megastructures; Astana Khan Shatyr

## 1. Introduction

Tents were some of the first and most successful fabric tensile constructions. Tent structures were built to provide a big enclosed space, seclusion, environmental adjustment, and protection under a fabric covering. Modern and complicated fabric structures originated from primordial tent structures by breaking away from the symbolic shape of vernacular tents. Furthermore, with technological advances in structural engineering, architects made structures more appealing by focusing on the new functional aesthetic (Kamal, 2020). Fabric membrane constructions have existed for millennia as simple, tent-like shelters. The guy ropes and tent poles in tents provide pretension to the fabric, allowing the structure to endure wind, rain, and snow loads.

This paper investigates the influence of tensile structures on form evaluation, with a focus on one noteworthy modern tent-like structure, Khan Shatyr (Tent of the Khan). The structural features of tensile structures are investigated. In the context of this paper, prior knowledge about cable structural systems is provided. The Khan Shatyr Entertainment Center in Astana is examined as a case study of cable-net tensile structures. The Khan Shatyr's form-concept relationships, material qualities, and structural behavior are all analyzed. Finally, the Khan Shatyr project is critically examined in terms of architectural form, structural design, and megastructure function.

## 2. Tensile Structures

Tensile membrane systems, which include cable net structures, shells, folded plates, and grid-domes, can only withstand tension loads (Berger, 1999), not compression or bending. These structures may span huge distances with little weight on their supports (Kamal, 2020), and advances in fabric technology are influencing building design methodologies. Tensile structures stretch membranes to form a three-dimensional surface, which is often supported by compression or bending elements such as masts, compression rings, and beams. Tensile structures have the advantage of being lightweight; the prestressed forms of the membranes provide design flexibility, allowing for large spans with less weight. Furthermore, the lightweight nature of these tensile components allows for easier transportation and assembly of the structures. The Olympia Roof in Munich, 1972, designed by Frei Otto and Bennish & Partners (Henrysson, 2012) can be considered a tension structural milestone. Its cable net structure on a vast scale gives up new possibilities in computer structural analysis and shape finding approaches.

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One of the most significant stages in designing tensile structures is the form finding process. According to Henrysson's (2012) research, tensile fabric structures only bear tension stresses, hence the majority of tensile fabric systems are anticlastic. Fig. 1 depicts some of these anticlastic shapes, including a conic, a hyper, and a barrel vault/arch support. Under heavy loads, prestressed anticlastic textiles are in tension in at least one direction.

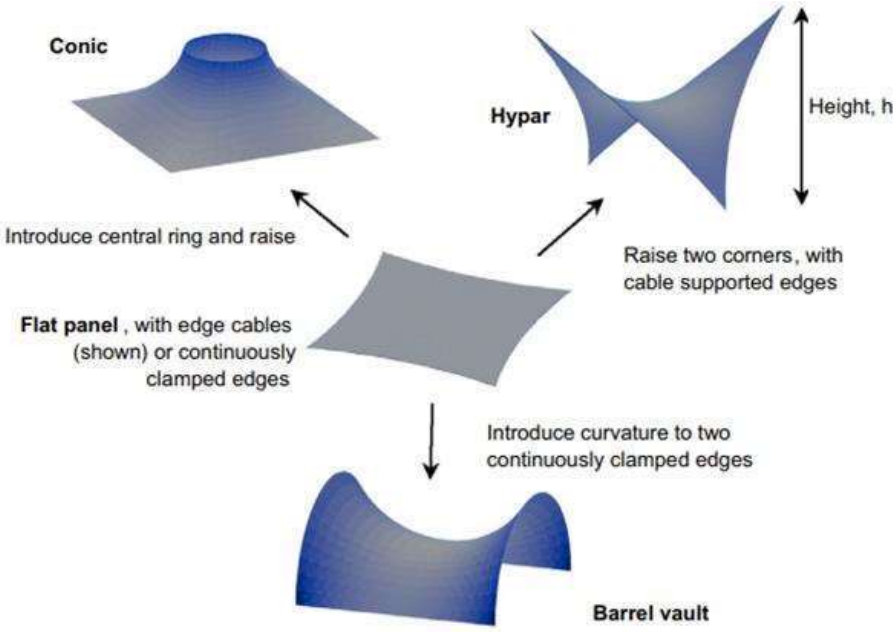



Fig. 1. Anticlastic structures with (a) conic (b) hypar (c) arch supports (Bridgens and Birchall, M, 2012)

A variety of tensile fabric systems can be used while developing the notion of tension fabric design. To create more intriguing and complicated designs, designed systems for anticlastic surface fabrics are integrated. According to Son (2007), the following systems exist: arch-supported structures, primary support structures, ridge-and-valley structures, and mast structures. These systems are explained in the following table (Table 1).

Table 1. Tensile Fabric System Types (Escrig and Sánchez-Sánchez, 2015)

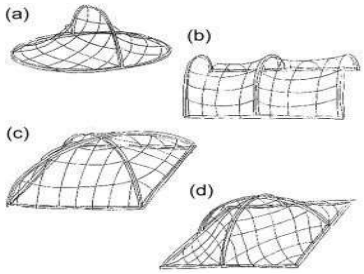
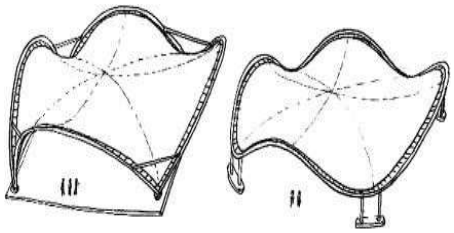
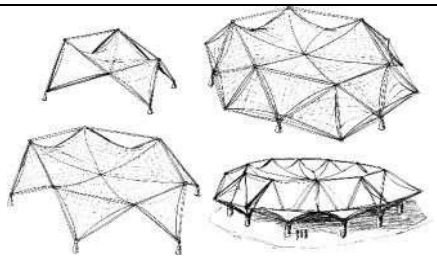
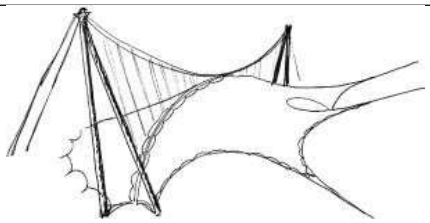
| Membrane Types | System Examples |
|---|---|
| **Arch-Supported Structures**<br><br>The membrane in arch-supported systems is in entire tension, whereas the arch should be in complete compression. The contact between the membrane and the arch, which results in the fabric's saddle curve, provides appropriate buckling resistance for shorter span arches. |  |
| **Structures with Primary Supports**<br><br>Saddle surfaces can also be formed in the membrane using primary point supports that, unlike the arch-supported system, do not lie on the same plane. The cable stays must be kept in tension regardless of the loading. |  |

Table 1. continued

| | |
|---|---|
| **Ridge-and-Valley Structures**<br><br>Ridge-and-valley constructions are designed to create a minor saddle by putting cables in an adjacent pattern with opposing curvature. The membrane is formed and supported by alternating ridge and valley cables. |  |
| **Mast Structures**<br><br>Fabric is suspended from cables strung off masts or other compression elements in tensioned fabric structures with masts as its supporting framework. This type of technology is perfect for long-span roofs. |  |

## 3. Materials and Method

This study demonstrates how the transcends typical tensile design concepts by utilizing new materials and inventive engineering. In this regard, the Khan Shatyr, a mega tensile structure, is critically examined in terms of architectural form, interaction with structural design.

### 3.1. Case Study- The Khan Shatyr

The Khan Shatyr ("Tent of the Khan") Entertainment Centre is one of the world's largest tensile constructions, and it offers a comfortable climate throughout the year. Foster and Partners designed the structure in 2006 as a huge transparent tent inspired by traditional nomadic construction forms (Foster + Partners, 2010). The massive edifice of Khan Shatyr incorporates a created icon of Kazakh nomadic history into Astana's architectural surroundings. The design concept is based on the traditional Kazakh yurt, emphasizing the importance of ethnicity in Kazakhstan's nation-building. Thus, the building in the shape of a traditional yurt awakens the Kazakh population's national memory; historical ideals of community are portrayed in a modern structure (Mkrtchyan 2013). In addition to producing symbolic strength with this massive structure, the design concept includes creating a strong iconic form on the skyline and designing a huge, free-spanning enclosure with minimal support (Dancey, 2010). The Khan Shatyr has a 200 m by 195 m circular base placed at the north end of the city's axis and is the highest point on the Astana skyline with its 150 m tall mast-stayed. The structure has 100,000 m² of internal space and includes an urban-scale park with a 450 m running track, shops, and leisure facilities like restaurants, cinema, wave swimming pools, and exhibition and event areas (Dancey, 2010).

The structural engineer for Khan Shatyr is Buro Happold. The structure is conceived as a tubular steel tripod mast that rises from the 195x200-meter elliptical base and supports the cable net in a conical shape. The tubular-steel tripod framework supports a suspended net of steel radial and circumferential wires, which is wrapped with a three-layer ETFE envelope constructed as 3.5 x 30-meter cushions - a lightweight, cost-effective, and thermally efficient solution. Fig. 2 shows the key structural pieces, tripod, cable net, and ETFE cushion.

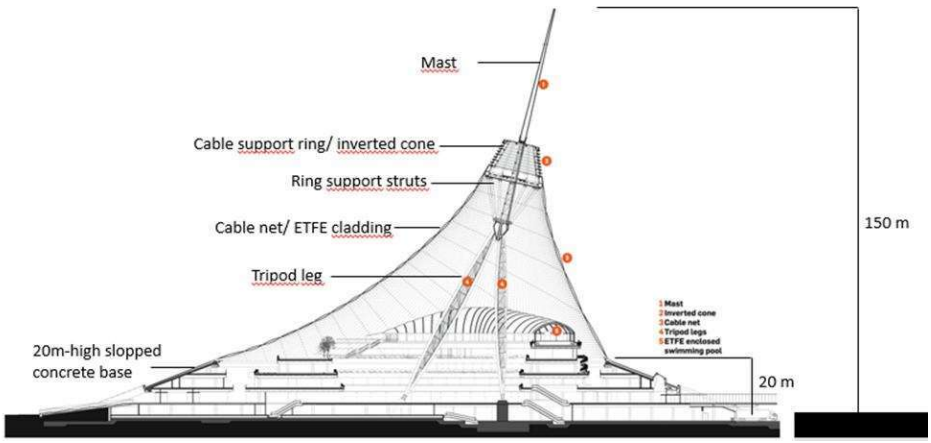



Fig. 2. Section through The Khan Shatyr shows structural elements of the building (URL-1)

The single-masted cable net is the obvious choice for providing such a massive, free-spanning enclosure with the least amount of support: a single compression mast elevates the cable net, creating a big volume beneath. The tensioned roof is constructed as a cable net, with cables being particularly effective load-carrying structural elements due to their efficient weight transfer via pure tension (Geyer et al., 2017).

The entire membrane structure is supported by a gigantic compression mast composed of three truss columns to withstand the massive compression force generated by the supported membrane structure. The steel tripod supports the entire cable net system. The basic premise behind its operation is to provide a single point of support to the core of the cable network. The roof skin is tensioned by a single compression mast, which lifts the net and creates a vast volume beneath. The entire mast (Fig. 3), including the tip, stands 150 metres tall and weighs around 2.500 tons of steel. The tripod is made up of one vertical rear leg that is 60 meters tall and two spread front legs that are 70 meters long. Legs are built of triangular tubular steel trusses grouped into three-chord trusses with 1000 mm diameter round hollow sections made of 40-millimeter-thick tin. The three-legged mast creates a sturdy ring in the air that the cables may be attached to on-site. A single mast was deemed too challenging to handle on-site at this vast scale. The mast's legs meet at a 7-meter-high hub made of 150-millimeter-thick steel plate; the hub center line corresponds to the axis of the cable net's axial force under prestress. A hub holds 12 pin ended struts of 800 mm diameter that reach the cable net's top ring. A 20-meter-diameter top ring is fixed. This is formed from a circular portion of 1.6m diameter and 40mm thick; its job is to gather the cables together (Numanova et al., 2020).

Building a massive cable net structure is thought to be the most efficient and cost-effective solution to cover such a big area because it only requires one central column, which is then surrounded by a giant roof. The cable net is shaped like a classic cone that has been pulled to one side. This creates the Entertainment Centre's characteristic sloping architectural form. The cable net consists of 192 radial cables and 16 circumferential cables (Birch 2009). To enhance handling, cable diameters were kept below 76mm, and cables are typically put in pairs to provide strength, which also simplifies clamping between radial and circumferential cables. Radial wires connect the top ring to the concrete plinth around the circumference. These support both the roof weight and the weight of any snow, which is significant in Kazakhstan's winters. The circumferential cables are used to stabilize the radial ones by pulling against them, as well as to confine the roof against wind stresses. Fig. 4 depicts 192 pairs of 38mm diameter radial wires that range in length from 125m at the tent's front to 70m at the back.

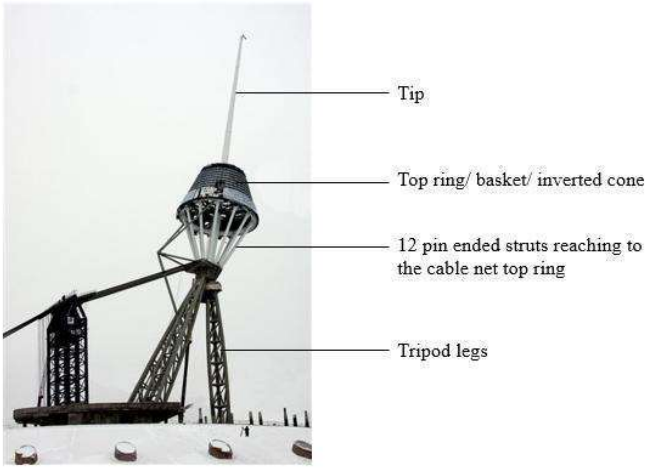



Fig. 3. Whole mast structure of the Khan Shatyr (Geyer et al., 2017)

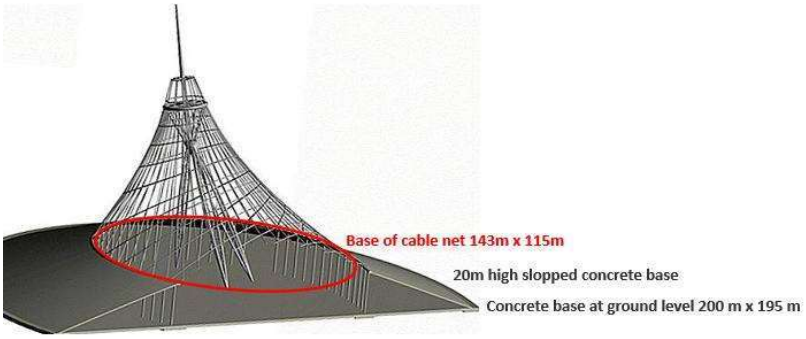



Fig. 4. The roof's cable net, attached to the basket and concrete base (URL-2)

## 4. Conclusions

The Khan Shatyr, like most preferred tensile buildings since the 1960s, is supported by a mast, which acts as a compression element. The constructions often have a tensile membrane consisting of ETFE cushions, with bigger schemes necessitating cable netting for additional support. Their lightweight and cost-effective construction makes them perfect for covering vast areas like as exposition venues and sports stadiums. The Khan Shatyr's form-finding research began with standard hanging models to determine the overall behavior and contour of the cable net. The inclined cone shape was selected, and computer models were created to determine the overall shape and cable arrangements. The central support pole is meant to function as a solid tripod, allowing the net to move under various stresses. The ETFE cladding on the cable net maximizes the transparency that this type of construction enables, eliminating the need for a smaller glazing grid and making it flexible enough to withstand the rather large predicted movement of this tensile structure (Mangelsdorf, 2010). As a result, structurally optimum alternatives were identified. However, from an architectural standpoint, it is difficult to answer the questions of whether the Khan Shatyr is a modern building, whether the final form of the Khan Shatyr, which resembles a primitive tent, is the optimal form, and whether learning from or referring to history is the same as imitating it. To summarize, the Khan Shatyr's structural design accomplishment resulted in a rudimentary tent form on a massive scale. In the 2000s, a millennium structure, a landmark building in Astana, was constructed by directly scaling a traditional tent rather than exploring new designs.

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GLOBAL SUSTAINABILITY AND DEVELOPMENT CONGRESS

# WASTE-BASED BUILDING MATERIALS AND INDOOR AIR QUALITY: RISKS, POTENTIALS AND GAPS

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## ABSTRACT

Waste-derived building materials demonstrate noteworthy results in terms of energy efficiency, mechanical strength, and thermal performance. However, the use of materials derived from industrial and municipal waste, which may contain potentially harmful substances such as heavy metals and volatile organic compounds (VOCs), poses risks in terms of creating healthy indoor environmental conditions. This systematic review examines the effects of various waste-based building materials, such as recycled wood, insulation materials produced from industrial and agricultural waste, and clay bricks containing urban waste, on indoor air quality (IAQ).

The literature between 2015 and 2025 was searched using the Scopus and Web of Science databases. Initially, 77 studies were identified, but this number was reduced to 5 after selecting studies that focused directly on the topic and remained within the defined research areas. The limited number of studies in this field highlights the research value of the topic. The indoor pollutants examined were classified under four headings: (i) VOCs and formaldehyde; (ii) heavy metals, (iii) inorganic gases and particulate matter and (iv) mold growth.

The findings show that the use of low levels of waste in building materials does not pose a significant risk to IAQ. However, the limited number of studies on the health risks that industrial wastes may lead to due to their heavy metal content increases the uncertainties in this area. This study aims to highlight the gaps in the available literature and emphasize the IAQ dimension of sustainable building practices.

**Keywords:** Waste-based building materials, industrial and municipal waste, indoor air quality, IAQ, indoor pollutants.

## Introduction

The circular economy aims to minimize raw material consumption, conserve resources and transform waste into a valuable resource in order to create new materials and products (EPA, 2025). This is particularly significant when considering the environmental impact of the construction sector, which is responsible for 40% of the global energy demand and 30% increase in carbon emissions (Shooshtarian et al., 2022). Both operational and embodied energy use and carbon emissions of a building throughout its lifecycle are quite high. Even if innovative building materials can reduce energy consumption and provide thermal comfort, high initial embodied energy and capital cost often hinder adoption of these materials (Ching, 2014; Weeransinghe and Ramachandra, 2018).

Embodied carbon encompasses nearly every stage of a building's life cycle. Although a building consumes much more energy during operation (80-90%) than during its embodied stages (10-20%) (Ramesh et al. 2010), the fact that embodied use covers so many stages and is present at every stage from a building's birth to its death makes it noteworthy in terms of the measures that need to be taken (Figure 1).

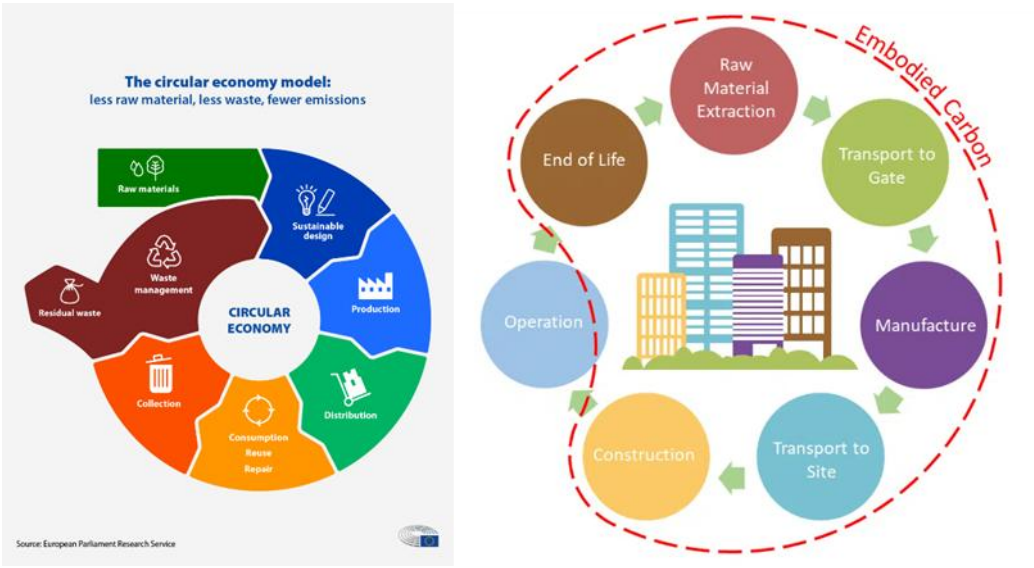


**Figure 1.** Circular economy model (left) (European Parliament, 2023) and building life cycle carbon emissions (right) (Circular Ecology, 2024)

The use of waste-based materials is not only effective in reducing embodied energy, but is also closely linked to three of the Sustainable Development Goals, defined by the United Nations, which are;

- *Affordable and Clean Energy (Goal 7)*: Studies show that waste-based construction materials can play a supporting role in converting solar energy into heat, thereby achieving passive heating. Using a novel phase change material (PCM) produced with expanded glass aggregate and fly ash, the thermal performance of cement mortar can be increased up to 74%, and energy consumption can be reduced by 35% (Yousefi et al. 2021). In another study, waste cooking oil was converted into PCM, which stores 193 joules of energy per gram, thus proving that materials obtained from waste can contribute to the conservation of renewable energy (Baldassarri et al. 2017).
- *Sustainable Cities and Communities (Goal 11)*: Materials obtained from waste can contribute to sustainable cities by increasing the thermal resistance of building facades and ensuring user comfort. It is stated that PCM containing hemp shives lowers indoor temperature in warmer seasons and increases indoor temperature in colder seasons compared to outdoor temperature (Gencel et al. 2024).
- *Climate Action (Goal 13)*: Due to global temperature rise, new technologies and materials must be developed. Waste-based building materials are emerging as environmentally friendly technologies in combatting climate change. Kumar et al. (2023) found that constructional waste can be used in the production of concrete panels, thereby reducing lifecycle energy by 4.5%, carbon emissions by 12%, and energy consumption by 5%.

On the other hand, waste may contain or cause a variety of indoor pollutants such as heavy metal, mold growth, organic and inorganic gas emissions etc. (Figure 2). Therefore, it is foremost concern to examine their effects on indoor air quality (IAQ).

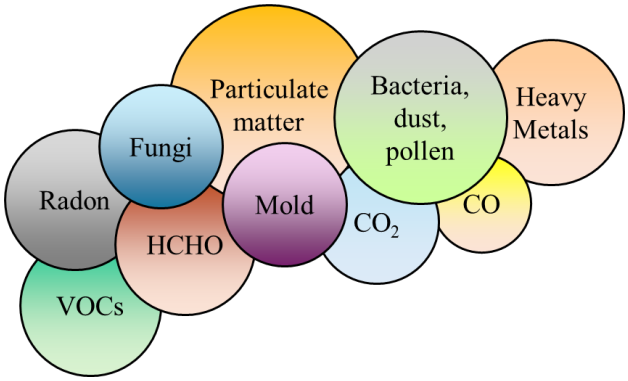


**Figure 2.** Well-known indoor pollutants (prepared by the author)

In the literature, there are studies analyzing the mechanical properties, and thermal performance of the building materials produced from various waste. However, their relationship with IAQ is often disregarded (Petcu et al. 2023). Therefore, this study aims to conduct a systematic review highlighting the potential and risks of waste-based building materials when used indoors and identifying gaps in this research area.

## Materials and Methods

According to the methodology of this study, the keywords "waste" OR "recycle*" AND "building material*" AND "indoor air quality" OR "VOC" OR "TVOC" OR "PM2.5" OR "particulate matter" were searched in the titles, abstracts and keywords of studies in Web of Science (WoS) and Scopus databases. At this stage, 77 papers written in English were found. Secondly, research areas, publication date, document types, and publication types were determined. Articles or proceeding papers published within the last ten years with open access were selected in the predefined research areas. Twenty-one papers were obtained in the second stage. Finally, some studies were excluded due to irrelevance, superficial explanations, and lack of measurement (Figure 3). The selected studies were classified under four headings based on the indoor pollutant types examined:

i. VOCs and formaldehyde
ii. Heavy metals
iii. Inorganic gases and particulate matter
iv. Mold growth

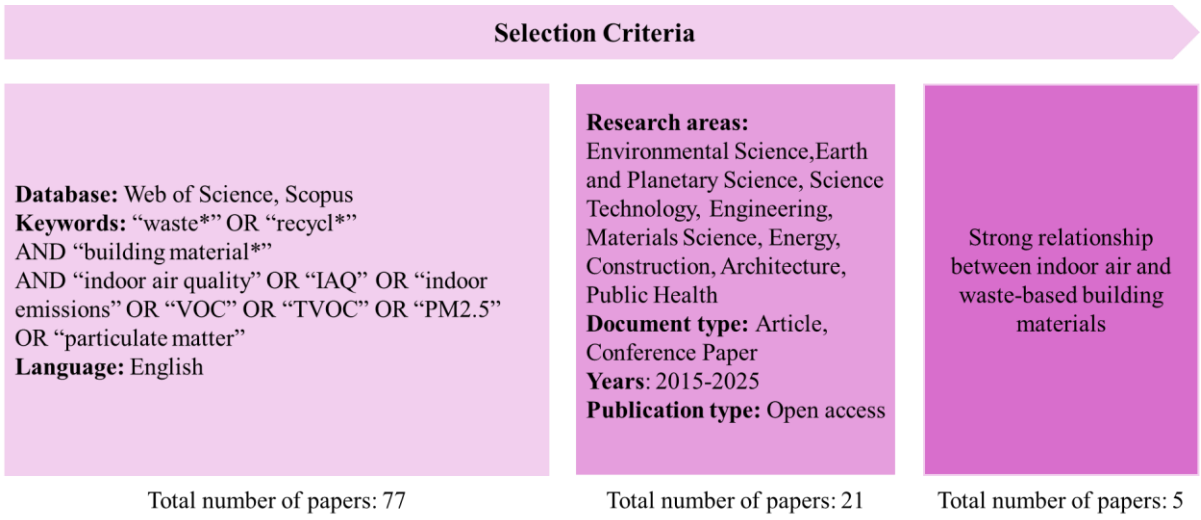


**Figure 3.** Methodology of the study (prepared by the author)

## Findings and Discussion

Four articles and one conference paper are examined due to waste types, produced building material and inspected indoor pollutants. Three of the selected waste consisted of sludge obtained from various industries. One is urban waste, one is from the paper industry, and the other is from the aluminum industry. The waste is generally used in the production of clay bricks. Insulation materials containing cellulose and animal waste were further examined within the scope of the research. Wood can be used as waste material in the form of wood chips in construction. Formaldehyde (HCHO), volatile organic compounds (VOCs), coarse particulate matter ($PM_{10}$), inorganic gases and mold occurrence are particular interest of these studies (Table 1).

**Table 1.** Documentation and content of the studies reviewed

| Reference | Document type | Waste | Building material | Inspected indoor pollutants |
|---|---|---|---|---|
| Cusido et al. (2015) | Article | Paper sludge | Clay brick | VOCs, heavy metals |
| Abdul Kadir et al. (2023) | Article | Electroplating sludge | Clay brick | $CO_2$, CO, $O_3$, HCHO, $PM_{10}$ |
| Abdul Salim et al. (2023) | Article | Sewage sludge | Clay brick | $SO_2$, NO, VOCs, $CO_2$, CO, $O_3$, HCHO, $PM_{10}$ |
| Petcu et al. (2023) | Article | Cellulosic and/or animal waste | Insulation | Mold |
| Patko et al. (2024) | Conference paper | Wood chips | Wooden frames | VOCs, HCHO |

***Volatile organic compounds (VOCs) and formaldehyde (HCHO)***

In a study investigating the IAQ of a passive, low-energy, timber-framed house, TVOC and formaldehyde values were measured. Except for the unusual human activities such as cutting wood pieces, the indoor VOCs and HCHO levels were below the threshold limits. Indoor VOCs level increases due to higher indoor air temperature. Ventilation is a key action in order to remove these kinds of pollutants (Patko et al. 2024). It is proven that by controlling the release of harmful chemicals from pressed wood products, these materials can be recycled as low-emission alternatives (Figure 4).

In another study, clay bricks made of electroplating sludge (ES) waste were shaped in the form of column, cube and wall. Their indoor pollutant levels were analyzed compared to standards and control bricks which contain no waste. The IAQ test was conducted in a Walk-in Stability Chamber under controlled temperature and humidity, following BS EN ISO 16000–9:2006 — *Determination of VOC Emissions from Building Products and Furnishings: Emission Test Chamber Method*. It was found that HCHO emissions of control bricks were higher than the test bricks. However, all the samples performed below the limit values, which is 0.1 ppm (Figure 5). It can be stated that the use of ES in clay bricks by 4% is safe (Abdul Kadir et al. 2023).

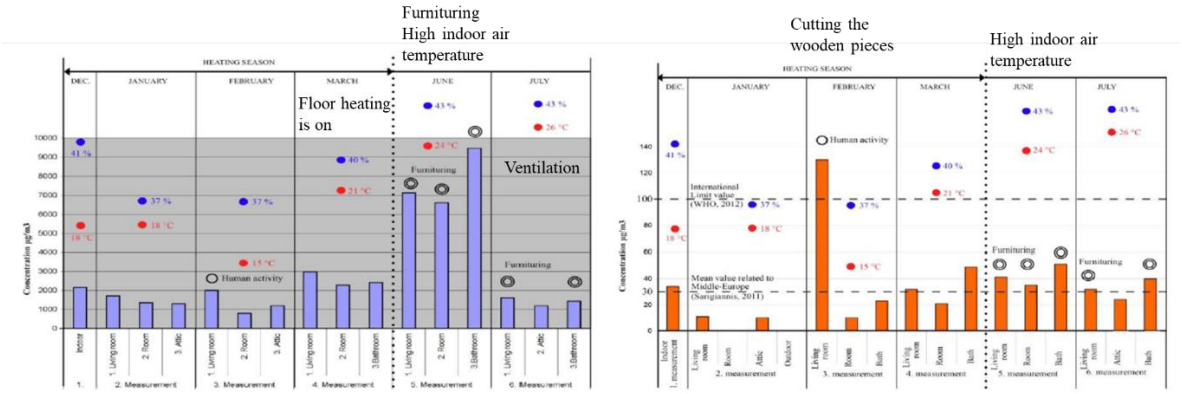


**Figure 4.** TVOC (left) and HCHO (right) results of the passive, wooden-framed house (red dots represent indoor temperature and blue demonstrates indoor relative humidity (Patko et al. 2024)

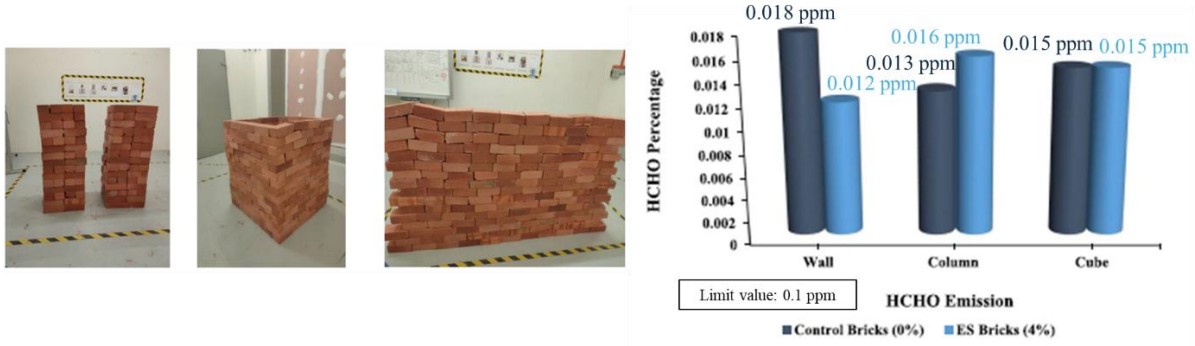


**Figure 5.** Clay bricks made of ES in the form of column, cube and wall (left), HCHO emissions of control sample and samples with ES (Abdul Kadir et al. 2023)

***Heavy metals***

Some of the industrial waste may contain harmful substances which are called heavy metals. For instance, ES has 9% chromium (Cr), 0.8% copper (Cu), 1% nickel (Ni) and 16% zinc (Zn). All of these have negative effects on human body. Therefore, it should be used with caution as a building material indoors (Abdul Kadir et al. 2023). Abdul Salim et al. (2023) studied sewage sludge, which is used in the production of clay brick. They used 5% of sludge for clay bricks and they found that even if the test bricks have heavy metals such as Mn, Ti, and Fe, their concentrations are close to the control samples.

When a new material or product is derived from hazardous waste, it must undergo rigorous testing to ensure environmental and user safety, furthermore, to evaluate potential health risks. The most common method for assessing these risks is the leaching test. Cusido et al. (2015) conducted a leaching test of the sample and control bricks they have made. Sample bricks include 15% paper sludge and 85% clay. The results confirmed that heavy metal concentrations in the clay and sludge were relatively similar, and below the limit values.

***Inorganic gases and particulate matter***

Abdul Kadir et al. (2023) studied other gas emissions apart from HCHO. They focused on carbon monoxide (CO), ozone ($O_3$), carbon dioxide ($CO_2$) and coarse particulate matter ($PM_{10}$) emissions. CO levels of control bricks were higher than the sample bricks due to the high organic content. Even if $PM_{10}$ and $O_3$ emissions were lower in control bricks, all bricks complied with the standards and did not exceed the limit values. Therefore, it can be concluded that ES bricks are reliable to be used as indoor building materials (Figure 6).

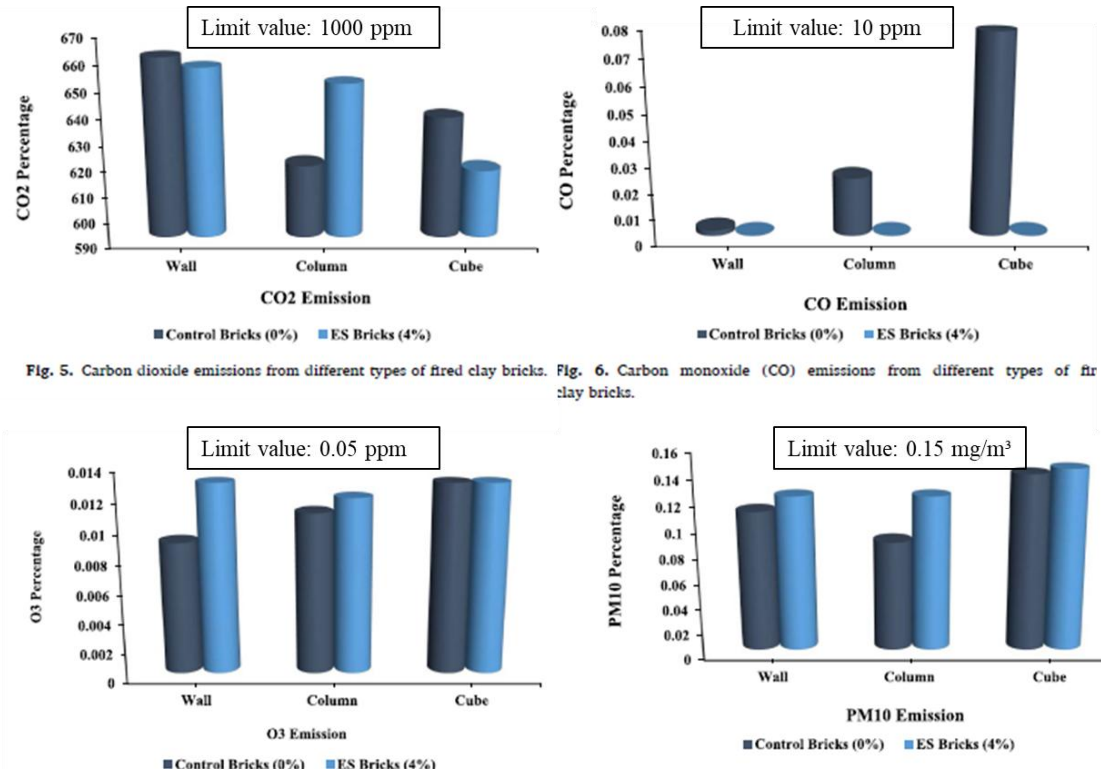


Fig. 5. Carbon dioxide emissions from different types of fired clay bricks. Fig. 6. Carbon monoxide (CO) emissions from different types of fir clay bricks.

**Figure 6.** Ozone and Particulate matter (PM10) emissions of control sample and samples with electroplating sludge (ES) (Abdul Kadir et al. 2023)

### *Mold growth*

Biological waste can be a source of environmentally friendly insulation materials. In the study by Petcu and colleagues (2023), ten different types of waste and their combinations were examined in terms of mold formation. The types of waste included wastepaper, cardboard, sheep wool, rice husk, wood fiber, cellulose acetate, and cigarette paper waste. These wastes were analyzed in both dry and moist environments. Visual analyses showed that these materials experienced changes in appearance, such as discoloration. Mold growth was observed in all samples except for one made from cellulose acetate. However, the results have shown that antifungal treatment and precautions are necessary. If these types of waste are to be used as insulation material, technology must be provided to reduce contact between the material and the moist environment.

### *Other material properties*

Other structural properties such as mechanical strength, thermal conductivity, density, water absorption, etc., have also been examined in building materials produced from waste. The compression strength of clay bricks made of paper sludge (15%) was found above the recommended limits for ceramics, which is 10 MPa. It was seen that water absorption increases with added sludge content. Thermal conductivity was lower in the samples with higher paper sludge concentration. The level of VOCs was below the odor limit compared to the control sample with 100% clay. Metal leaching tests showed that the concentrations were below the limits according to EN 12457 Standard (Cusido et al. 2015).

ES waste increased thermal conductivity and density in the clay brick samples. The optimum waste ratio was found to be 4%, which has suitable thermal conductivity (0.35 W/mK). This ratio was also safe to use in terms of inorganic gas emissions (Abdul Kadir et al. 2023).

An increase in density leads to a decrease in thermal conductivity due to the uniformly distributed air gaps in the waste-based insulation materials. The most obvious increase in sorption was observed for the thermal insulation material made from wood fibers and waste cardboard (Petcu et al. 2023).

TVOC values are affected by indoor temperature, relative humidity and air change rates. Human activities and new furniture emission have the biggest impact on TVOC. By selecting appropriate building materials such as low-emission materials and technologies, adverse impacts on IAQ can be eliminated (Patko et al. 2024).

## Conclusion and Recommendations

The findings show that the use of low levels of waste (4-15%) in building materials does not pose a significant risk to IAQ. Even if the emission values might be higher than the control samples, the waste-based building materials have promising results by performing in compliance with the limits specified in the international standards for pollutants released into the indoor environment.

However, limited number of studies may lead to the disregard of health risks associated with waste-based building materials indoors. The waste with high harmful substance content is emerging as least studied topics. Therefore, further studies are needed, especially in this research field.

It is expected that the number of studies on this subject will increase soon and that the use of a wider variety of waste as construction materials within the framework of the circular economy will be encouraged. Identifying the content of waste and searching for simple and economical methods to remove harmful components from waste are other noteworthy topics that merit research.

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# CONFERENCE BOOK




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# SAFRANBOLU NAMAZGÂHLARI

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## ÖZET

Bu çalışma, Safranbolu Hıdırlık Tepesi'nde yer alan iki açık hava ibadet yapısını; "Minberli Namazgâh" ve "Küçük Namazgâh"ı mimari özellikleri, tarihsel bağlamları ve kentsel konumlarıyla ele almaktadır. Namazgâhlar, İslam mimarisinin erken dönemlerinden itibaren bayram ve cuma namazlarının yanı sıra toplu ibadetlerin gerçekleştirildiği, genellikle yüksek ve geniş alanlarda konumlanan açık hava düzenlemeleridir. Safranbolu örnekleri, Anadolu'daki benzerleri arasında hem konum seçimleri hem de plan şemaları ve mimari detaylarıyla dikkat çekici bir yere sahiptir. Minberli Namazgâh, taş malzemeden inşa edilmiş mihrap ve minber unsurlarıyla sade ancak anıtsal bir ifade taşırken; Küçük Namazgâh, yakınındaki Hasan Paşa Türbesi ile malzeme, işçilik ve üslup birliği göstermesi bakımından 19. yüzyıl ortalarına tarihlenmektedir. Her iki yapıda da kullanılan yerel Yazıköy taşı, bölgenin özgün malzeme geleneğini yansıtmaktadır. Safranbolu namazgâhları, dini mimarinin işlevsel ve mütevazı yönünü temsil etmekle birlikte, kentin Türk-İslam kimliğinin erken dönem izlerini somutlaştıran ve kültürel sürekliliğin korunmasında önemli rol oynayan özgün mimari miras örnekleridir.

**Anahtar Kelimeler:** Safranbolu, namazgâh, dini mimari

## 1. GİRİŞ

"Namaz kılınan yer" anlamına gelen namazgâh sözcüğü, Arapça kökenli salat (dua) mastarının Farsça karşılığı olan namaz kelimesi ile yine Farsça "yer" anlamındaki gâh ekinin birleşmesiyle oluşmuştur (Gül, 2014, s. 6). Arapça'da namazgâh "cebbâne" (sahra) olarak adlandırılırken, Farsça'da bu yerlere "ıydgâh" da (bayram yeri) denir (Bozkurt, 2006, s. 357). Türk kültüründe, açık havada namaz kılmak amacıyla inşa edilen ve zeminden bir miktar yükseltilerek sınırları belirlenen alanlara namazgâh denir. Bu yapılar genellikle yollar üzerinde veya kentlerin sayfiye bölgelerinde yer alır. Namazgâhlarda, kıble yönünü göstermek üzere sade biçimde tasarlanmış bir mihrap bulunur; ibadet alanı ise güneşten korunmayı sağlamak için genellikle ağaçlarla çevrilerek yeşillendirilirdi. Mihrap, namazgâhların ortak bir unsuru olmakla birlikte, bazı örneklerde minber de yer almaktadır (Sözen ve Tanyeli, 2017, s. 220). Anadolu'da çokça bulunan namazgâhlarda nadiren görülen bölümlerden bir tanesi de müezzin mahfilidir (Bozkurt, 2014, s. 13).

İslamiyet'in erken dönemlerinden itibaren Müslümanlar tarafından inşa edilen namazgâhlar, genellikle şehir dışındaki alanlarda yer almıştır. Geniş bir açık mekân üzerine kurulan ve çevresi

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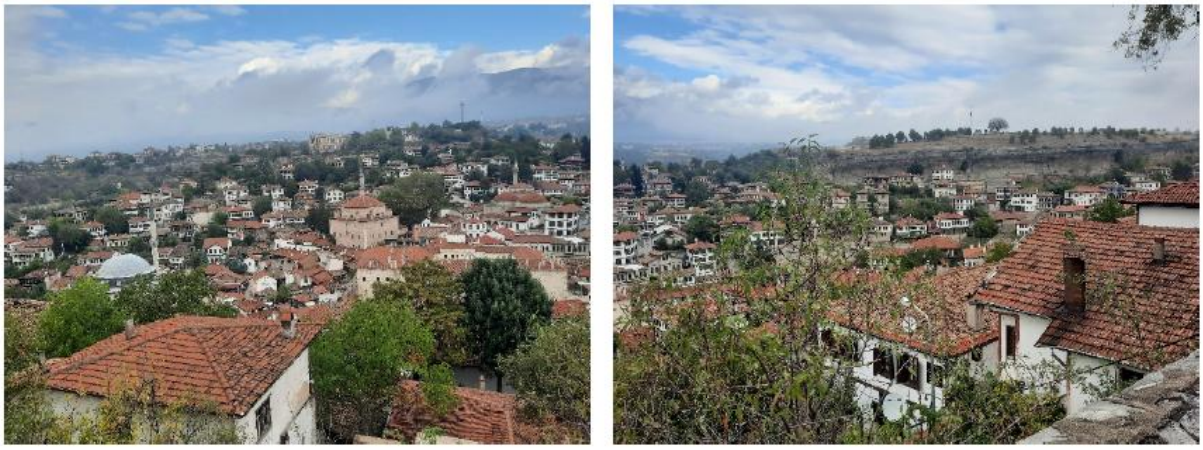
duvarla sınırlandırılan bu yapılar, özellikle bayram günlerinde kalabalık cemaatlerin ibadetine hizmet etmiştir. Ayrıca, bazı kaynaklarda namazgâhların yağmur duası yapıldığı, cenaze namazı kılındığı ve hatta suçluların idam edildiği yerler olarak da kullanıldığı belirtilmektedir (Gül, 201, s. 8).

İslam mimarisinde bilinen ilk namazgâh, Medine'de Mescid-i Nebevî'nin biraz ilerisinde yer alan ve günümüzde Gamame Mescidi'nin bulunduğu mekândır. Hz. Muhammed, Medine'ye hicret ettikten sonra inşa edilen Mescid-i Nebevî'de namazları kıldırmış; ancak zamanla, özellikle cuma ve bayram namazları gibi kalabalık katılımlı ibadetlerde mescidin yetersiz kalması üzerine, bu tür toplu ibadetleri açık alanda gerçekleştirmeye başlamıştır. Bu amaçla Mescid-i Nebevî'nin yakınındaki bir meydan kullanılmış, Hz. Muhammed'in namaz kıldırdığı bu alan, sonraki dönemde dört halife zamanında da aynı işlevle kullanılmaya devam etmiştir (Uğurluel, 2009, s. 201). İslâm'ın ilk döneminde genişçe bir alandan oluşan namazgâhlara dört halife devrinden sonra mihrap ve minber eklenmiştir (Tiryaki, 2006, s. 359).

Safranbolu Türklerin eline çok erken bir zamanda, Orhan Gazi döneminde geçmiştir (Merçil, 2003, s. 2; Emecen, 2003, s. 16). Türkler Safranbolu'ya geldiklerinde ilk olarak şehre hakim bir noktada yer alan (Görsel 1) ve Hıdırlık Tepesi olarak isimlendirilen bu tepeye konuşlanmışlardır (Yaşar, 2004, s. 101). Bu alanda, başta alana ismini veren, Orhan Gazi dönemimde yaşamış Şehzade Gazi Süleyman Paşa'nın kumandanlarından Hıdır Bey'in türbesi, Kurtuluş Savaşı kahramanlarından Dr. Ali Yaver Ataman'ın anıt mezarı ve Köstendil Kaymakamı Hasan Paşa'nın Türbesi'nin yanı sıra iki adet namazgâh da bulunmaktadır. Bunlardan daha eski tarihli olan namazgâh kaynaklarda "Minberli Namazgâh" ismiyle geçerken, daha geç tarihli inşa edilmiş olan ise "Küçük Namazgâh" olarak adlandırılmaktadır.



**Görsel 1. Hıdırlık Tepesi'nden Safranbolu tarihi yerleşkesinin görünümü (Yazar arşivi)**

## 2. SAFRANBOLU MİNBERLİ NAMAZGÂH

Safranbolu Hıdırlık Tepesi'nde bulunan iki adet namazgâhtan, doğuda olan namazgâhtır. İnşa tarihi ve banisi bilinmeyen namazgâhın üzerinde herhangi bir kitabe de bulunmamaktadır. Uğurluel'in (2022) Demirarslan'dan aktardığına göre namazgâhın, Türklerin Safranbolu'yu hakimiyetleri altına aldıkları dönemde inşa edilmiş olduğuna dair değerlendirmeler bulunsa da yaptığımız araştırmalarda bu bilgiye doğrulayacak bir belgeye rastlanmamıştır. Yapı, bir mihrabın yanı sıra, mihrabın batı tarafında bulunan ve yedi basamaktan meydana gelen bir

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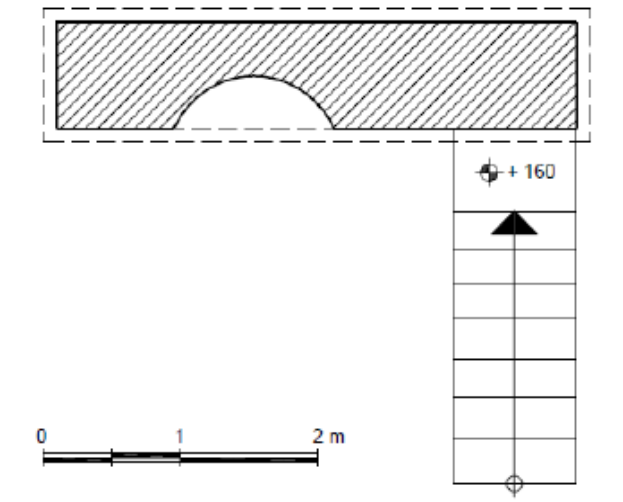
minberden müteşekkildir (Görsel 2). Namazgâhın inşasında yörede bolca bulunan ve aynı isimli köydeki ocaklardan çıkartılan Yazıköy taşı kullanılmıştır.

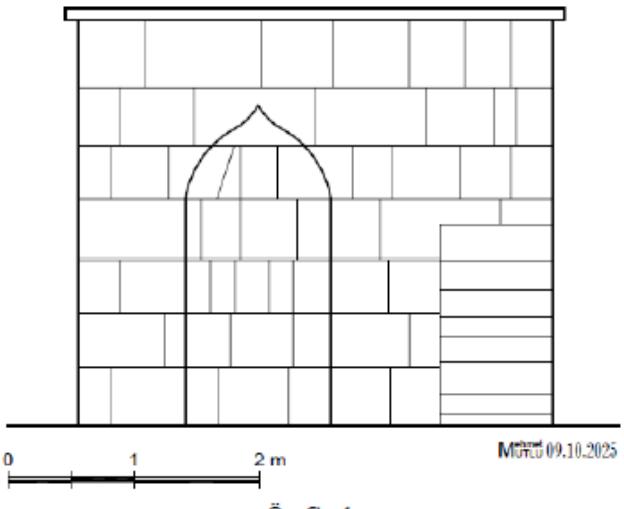


Genel Görünüm Ön Cephe

**Görsel 2. Minberli Namazgâh genel ve ön cephe görünümü (Yazar arşivi)**




Plan




Ön Cephe

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**Görsel 3. Minberli Namazgâh planı ve ön cephesi (Yazar arşivi)**

Namazgâhın mihrap kısmı 377 cm uzunluğunda iken genişliği ise 77 cm'dir. Üst kısmı düz bir taş saçakla sonlanan yapının yüksekliği yaklaşık 330 cm'dir. Mihrap nişi, duvar bloğunun minber dışında kalan kısmının merkezine yerleştirilmiştir. 116 cm genişliğe sahip mihrap nişinin derinliği 38 cm'dir. Mihrap üst kısımda yüksek kaş kemer formlu bir kavsara ile sonlanmaktadır (Görsel 2-3).

Yapının batı tarafında minber inşa edilmiştir. Yedi basamaktan meydana gelen minber yaklaşık 260 cm uzunluğa, 90 cm genişliğe sahiptir. Basamak genişlikleri 25 cm ile 33 cm arasında değişirken minberin +160 cm kotunda bulunan hutbe irad olunan en üst bölümünde ise genişlik 60 cm olarak alınmıştır (Görsel 2-3). Alanın güney tarafında bulunan minber ve mihrap elemanlarının olduğu taraf alçak bir taş duvarla çevrilmiştir.

Namazgâhın ibadete ayrılan bölümü özgününde çok daha geniş iken, günümüzde ibadet alanı sembolik olarak düzenlenmiş küçük bir kare alandan meydana gelmektedir.

## 3. SAFRANBOLU KÜÇÜK NAMAZGÂH

Safranbolu Hıdırlık Tepesi'nde bulunan ikinci namazgâh, Küçük Namazgâh olarak isimlendirilen namazgâhtır. Bu namazgâh, Minberli Namazgâhın batı tarafında, Hasan Paşa Türbesi'nin 2,55 m doğu kısmında bulunmaktadır (Görsel 4). Üzerinde herhangi bir kitabesi bulunmayan namazgâhın inşa tarihi ve bani bilgilerine kaynaklarda da rastlanmamıştır. Bununla beraber namazgâhın, Hasan Paşa Türbesi'nin çok yakınında bulunması, türbe ile aynı malzemeden (Yazıköy taşı) inşa edilmiş olması ve türbe yapısı ile duvar örgü tekniğindeki benzerlikleri açısından değerlendirildiğinde her iki eserin de aynı dönemde inşa edilmiş olma ihtimali kuvvetle muhtemel görünmektedir.

Namazgâhın hemen yanında bulunan Hasan Paşa Türbesi'nin (kitabesinde bu yönde bir bilgi bulunmamakla beraber) I. Abdülhamit tarafından inşa ettirilmiş olduğuna dair bilgiler bulunmaktadır (Kalafat, 2003, s. 32).




**Görsel 4. Küçük Namazgâh genel ve ön cephe görünümü (Yazar arşivi)**

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Türbenin giriş kapısının üstünde, mermer malzeme üzerine kabartma tekniği ile dört satır olarak ilk satırı Arapça, diğer üç satırı ise Osmanlı Türkçesiyle yazılmış bir inşa kitabesi bulunmaktadır. Kitabenin ilk satırında "*Yeryüzünde bulunanların hepsi fânidir. Azamet ve kerem sahibi rabbinin zâtı ise bâki kalır.*" (Url-1) anlamındaki Kur'an-ı Kerim'den Rahman Suresi'nin 26. ve 27. ayeti yazılmıştır (Görsel 4-5). Kitabenin transkripsiyonu şöyledir (Karaca, vd., 2013, s. 102):

***1-*** *Küllü men aleyhâ fân. Veyebkâ vechü rabbike zü'l-celâli ve'l-ikrâm*

***2-*** *Hasbe'l-kader bu beldede ma'zûlen ikâmete memûr iken hulûl-i ecel-i mev'ûduyla veda-i*

***3-*** *Alem-i fânî eden Kalkandelenli Meşhur Koca Receb Paşa merhumun oğlu esbak Köstendil*

***4-*** *Sancağı Kâim-makâmı merhûm ve mağfurun leh Hasan Paşa'nın rûhiçün fâtiha. 21 Câ. Sene 1261*

Anlamı: *"Hasbelkader bu beldede mazulen ikamete memur iken, hulul-i ecel-i mevcudu ile veda-i alim-i fani eden Kalkandilli, meşhur Koca Ragıp Paşa merhumun oğlu esbak, Köstendil Sancağı Kaymakamı merhum ve mağfur Hasan Paşa'nın ruhu için el Fatiha, 21 Câ. 1261"* (Uğurluel, 2022, s. 85).

Kitabeden, Köstendil kaymakamlığı görevinde bulunan Hasan Paşa'nın Safranbolu'ya sürgün edildiği ve sürgünde iken vefat ederek bu tepeye defnedildiği anlaşılmaktadır. Kitabe Hasan Paşa'nın vefat tarihi olarak da H. 21 Cemâziyelevvel 1261 (M. 28 Mayıs 1845) tarihini vermektedir. Buna göre türbenin 1845 yılından sonra inşa edildiği düşünüldüğünde, namazgâhın inşası ile de net bir tarih verememekle beraber, 19. yüzyılın ortalarında inşa edilmiş olduğunu söylemek mümkündür.



Türbe genel görünümü (Yazar arşivi)



Türbenin inşa kitabesi (Karaca, vd., 2013, s. 102)

**Görsel 5. Hasan Paşa Türbesi'nin genel görünümü ve inşa kitabesi**

Küçük Namazgâh'ın mihrabı 225 cm genişliğinde ve yaklaşık 300 cm yüksekliğindedir. 80 cm kalınlığında inşa edilen mihrap duvarının orta kısmına mihrap nişi yerleştirilmiştir. Yarım daire planlı mihrap nişinin genişliği 77 cm, derinliği ise 44 cm'dir. Mihrabın 170 cm yükseklikten başlayan kavsara kısmında kullanılan taş sırası nişe taşırılarak dairesel bir silme ile profillendirilmiş ve kavsara kısmı bu bölümde 50 cm genişliğe düşürülmüştür. Kalan üst kısım ise tam kemer formunda tamamlanarak kavsara kısmı oluşturulmuştur (Görsel 4-6).

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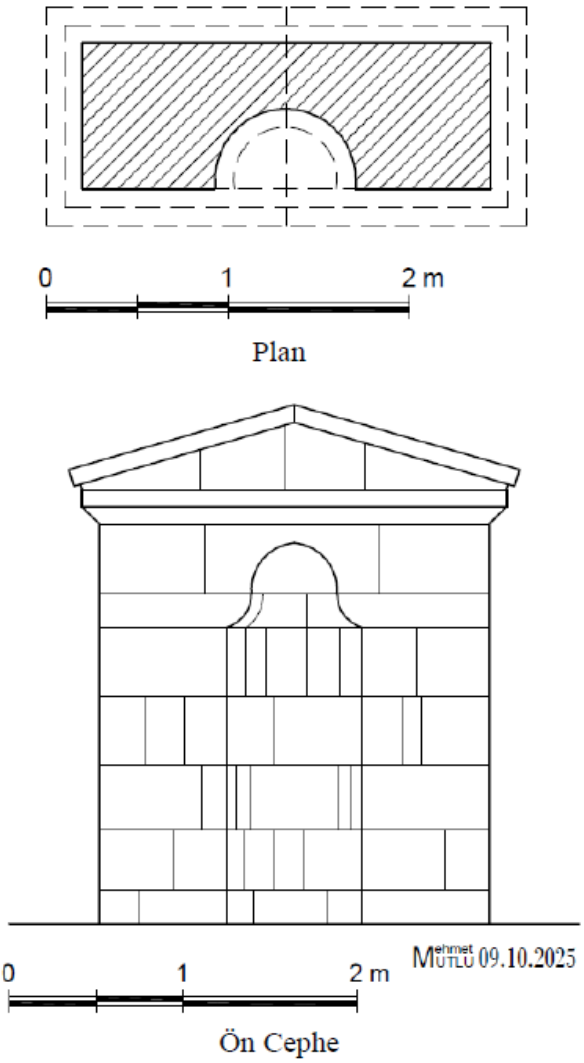
Mihrabın üst kısmında iki bölümlü bir düzenleme göze çarpmaktadır. Üst kısım önce dışa taşırılan silmeli bir saçakla tamamlanmış sonra da bu bölümün üzerine beşik formlu örtü inşa edilerek cephede bir üçgen alınlık meydana getirilmiştir. Alınlık kısmının üzeri de bir miktar dışa taşırılmak suretiyle saçak oluşturularak mihrap kompozisyonu tamamlanmıştır.




**Görsel 6. Küçük Namazgâh planı ve ön cephesi (Yazar arşivi)**

Küçük namazgâhta minber bulunmamaktadır. Günümüzde ibadet alanı olarak kullanılan bölümde küçük bir alan bırakılmış ve bu alan dışında kalan kısımlar peyzaj düzenlemesi kapsamında değerlendirilmiştir.

## 4. SONUÇ

Safranbolu'da, Hıdırlık Tepesi üzerinde yer alan iki namazgâh, Anadolu'da açık hava ibadet mekânlarının karakteristik özelliklerini yansıtan önemli örneklerdendir. Her iki yapının da kıble yönünü belirleyen mihraplarıyla sınırlı, sade düzenleri; namazgâhların İslam mimarisinde işlev öncelikli, gösterişten uzak bir yaklaşımla ele alındığını göstermektedir. "Minberli Namazgâh", yapısında yer alan taş minberiyle Anadolu'daki benzerleri arasında özgün bir konuma sahiptir. "Küçük Namazgâh" ise form, malzeme ve inşa tekniği açısından yakınında bulunan Hasan Paşa Türbesi ile benzerlik göstermekte olup, 19. yüzyıl ortalarına tarihlenebilmektedir. Her iki

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yapının da inşasında kullanılan Yazıköy taşı, Safranbolu'nun yerel malzeme geleneğinin sürekliliğini ortaya koymaktadır.

Bu yapılar, Safranbolu'nun Türk-İslam kimliğinin erken dönemden itibaren mekânsal düzlemde nasıl somutlaştığını göstermesi bakımından önem taşımaktadır. Ayrıca, açık hava ibadet alanlarının kentsel hafızadaki yerini koruması, dini mimarinin toplumsal yaşamla olan sürekliliğini de vurgular niteliktedir. Dolayısıyla Safranbolu namazgâhları hem dini mimarinin sade örnekleri hem de kültürel sürekliliğin mekânsal tanıkları olarak korunması gereken yapılar arasındadır.

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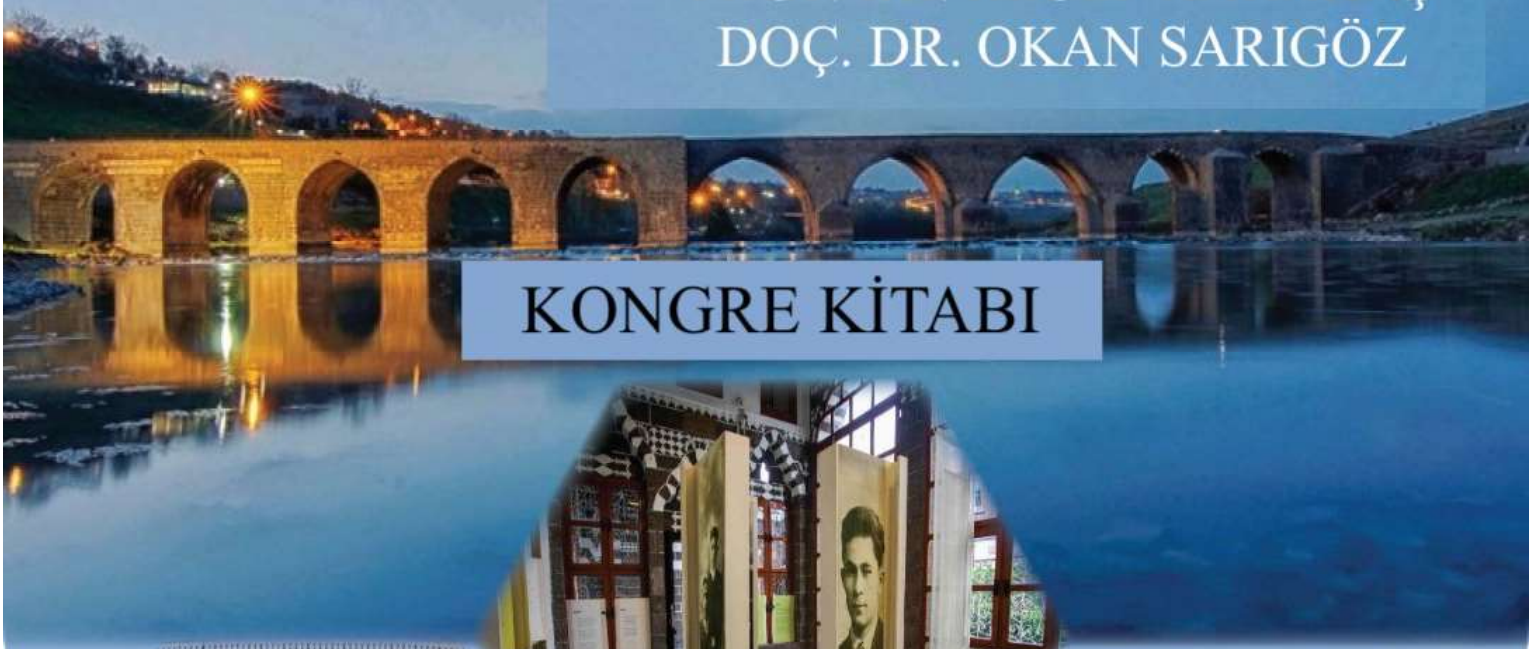

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# KONUT ÜRETİMİNDE KATILIMCI YÖNTEMLER, PAYDAŞ İLİŞKİLERİ VE YAŞAM KALİTESİ KRİTERLERİ***

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## ÖZET

Konut üretimi, kentleşme süreçlerinin mekânsal bir yansıması ve kentsel gelişimin yönünü belirleyen temel bir yapı taşı olarak ele alınmalıdır. Kent kavramının kökeni Latince vatandaşlık anlamına gelen 'civitas' kelimesine dayansa da şehirlerin gelişimi süreç içinde toplumu oluşturan insanların kültürel, sosyal, ekonomik ve teknolojik gelişimine bağlıdır. Tarihsel süreçte şehirler, ekonomik güce ve kendine ait siyasi yapıya sahip olmuştur. Konut üretim biçimleri ise geleneksel pratiklerden merkezi planlama ile inşa edilen lojmanlara, apartmanlaşma süreçlerinden plansız gelişen gecekondu alanlarına kadar çeşitlenmiş; bu durum, konutun yalnızca mekânsal değil, aynı zamanda sosyolojik ve politik bir olgu olduğunu ortaya koymuştur. Konut seçiminde sadece barınmak artık yeterli gelmemekte; konutun kişinin değerlerini, sınıfsal durumunu, sosyal statüsünü ve sosyal kabul görmesini de kapsayan beklentileri karşılaması beklenmektedir. Bu çalışmada, konut üretim süreçlerinin planlanma, inşa edilme, tercih edilme ve içinde yaşama aşamalarında, kullanıcıların mutlak memnuniyetinden ziyade ortak memnuniyetleri ile meydana getirilebileceği düşüncesi temel alınarak katılımcı bir yöntem önerisi oluşturulmuştur. Önerilen bu yöntemle, konutların yerel ihtiyaçlara daha uygun, daha sürdürülebilir ve uygun maliyetli inşa edilmesi hedeflenmektedir. Yöntem, hükümetlerin, yerel yönetimlerin, mimarların, mühendislerin, üretici ve kullanıcıların iş birliği yapmasını zorunlu kılmaktadır. Başarılı ve sürdürülebilir konut projelerinin gerçekleştirilmesi için, tüm paydaşlar arasındaki ilişkilerin hayati öneme sahip olduğu düşünülmektedir. Ayrıca, bu bağlamda, bireylerin genel refahını ve memnuniyetini değerlendirmeyi amaçlayan "Yaşam Kalitesi" yöntemi incelenmiştir. Yaşam kalitesi değerlendirmeleri, projelerin başarısının değerlendirilmesinde ve toplumun bilinçlenerek katılımcı modellere katkı sağlamasında kritik rol oynamaktadır.

**Anahtar Kelimeler:** Kentleşme, konut üretimi, katılımcı tasarım, yaşam kalitesi.

*** Bu çalışma, "Karabük Kent Bütününde Konut Üretim Dinamiklerinin İrdelenmesi" başlıklı doktora tezinden üretilmiştir (Karabük Üniversitesi, Lisansüstü Eğitim Enstitüsü, Mimarlık Anabilim Dalı, Doktora Programı).

# PARTICIPATORY METHODS, STAKEHOLDER RELATIONS AND QUALITY OF LIFE CRITERIA IN HOUSING PRODUCTION

## ABSTRACT

Housing production should be considered a spatial reflection of urbanization processes and a fundamental building block that determines the direction of urban development. While the concept of city originates from the Latin word "civitas," meaning citizenship, the development of cities is dependent on the cultural, social, economic, and technological development of the people who constitute society. Historically, cities have acquired economic power and their own political structures. Housing production methods have diversified, ranging from traditional practices to centrally planned housing, from apartment complexes to unplanned shantytowns. This has demonstrated that housing is not only a spatial phenomenon but also a sociological and political one. Simply sheltering is no longer sufficient in housing selection; it is expected to meet expectations encompassing a person's values, class status, social status, and social acceptance. This study proposes a participatory methodology based on the idea that housing production processes can be shaped by shared satisfaction rather than the absolute satisfaction of users, rather than by their own needs, throughout the planning, construction, selection, and occupancy stages. This proposed method aims to build housing that is more suitable for local needs, more sustainable, and more cost-effective. The method requires collaboration among governments, local authorities, architects, engineers, producers, and users. Relationships among all stakeholders are considered vital for the implementation of successful and sustainable housing projects. Furthermore, the "Quality of Life" method, which aims to assess individuals' overall well-being and satisfaction, was examined in this context. Quality of life assessments play a critical role in assessing project success and raising public awareness and contributing to participatory models.

**Keywords:** Urbanization, housing production, participatory design, quality of life

## 1. GİRİŞ

Kent kavramı, Avrupa'da Latince vatandaşlık anlamına gelen *'civitas'* kelimesinden türetilerek İngilizcede *city*, Fransızcada *cité*, İtalyancada *citte*, İspanyolcada *ciudad* şeklinde kullanılmaktadır. Zamanla kent anlamına gelen *urb* kökünden türeyen terimler de benimsenmiş, kentsel anlamında *urban*, kentleşme anlamında *urbanization* ve kentsel alan anlamında *urban area* kavramları ortaya çıkmıştır. Osmanlıcadaki *şehir* sözcüğünün Türkçe karşılığı *kent* sözcüğüne karşılık gelmektedir (Bal, 2015). Bu bağlamda, süreç içinde toplumu oluşturan insanların gelişimiyle kentlerin gelişimi doğru orantılıdır ve bu gelişimi sağlayan kültürel, sosyal, ekonomik, teknolojik yeniliklerle de kentleşmeye katkısı olan faktörlerdir.

Konut üretimi, kentleşme süreçlerinin mekânsal yansıması olarak değerlendirilebilecek temel bir unsurdur. Toplumsal yapıdaki dönüşümler, nüfus hareketleri, ekonomik modeller ve planlama politikaları, konutun biçimini ve üretim yöntemlerini doğrudan şekillendirmiştir. Bu açıdan bakıldığında, konut yalnızca bireysel bir barınma mekânı değil, aynı zamanda kentsel gelişimin yönünü belirleyen bir yapı taşı olarak da ele alınmalıdır. Kentleşmenin farklı evrelerinde ortaya çıkan konut üretim biçimleri hem fiziksel çevrenin niteliğini hem de toplumsal ilişkilerin örüntüsünü etkilemiştir (Sadıkoğlu ve Özsoy, 2017). Bu üretim biçimleri; mimari formdan malzeme kullanımına, mülkiyet yapısından sosyal tabakalaşmaya kadar çok boyutlu etkilere sahiptir. Bireysel üretim pratiklerinden merkezi planlama ile inşa edilen lojmanlara, apartmanlaşma süreçlerinden plansız gelişen gecekondu alanlarına kadar uzanan çeşitlilik, konutun yalnızca mekânsal değil, aynı zamanda sosyolojik ve politik bir olgu olduğunu da ortaya koymaktadır.

Konut, bir ailenin günlük ve ömürlük yaşantısında en çok vakit geçirdiği mekân olduğundan, konutun fiziksel, ekonomik, sosyal ve psikolojik etkenleri içinde barınan ailenin mutluluğuyla ilişkilidir. Günümüzde, konut seçiminde artık sadece ‘barınmak’ yeterli gelmemekte; kişinin değerlerini, sınıfsal durumunu, sosyal statüsünü ve sosyal kabul görmesini de kapsayan beklentilerin karşılanması beklenmektedir (Kellekci ve Berköz, 2006). Bu da herkes için konut memnuniyetinin sağlanabileceği, konut üretimi için katılımcı bir yöntem oluşturulması tartışması gündeme gelmektedir. Bu yöntemin, konut projelerinde yerel ihtiyaçlara daha uygun olmasının sağlanması, aynı zamanda topluluklar arasında dayanışmayı ve aidiyet hissini artırması gibi katkılarda bulunması beklenmektedir.

## 2. KONUT ÜRETİMİNDE PAYDAŞ İLİŞKİLERİ

Konut üretiminde kullanıcı, tasarımcı, uygulayıcı ve denetleyici arasındaki ilişkiler, başarılı ve sürdürülebilir projelerin gerçekleştirilmesi için hayati bir öneme sahiptir. Bu ilişkiler, paydaşlar arasındaki etkileşimlerle ve her bir paydaşın sağladığı katılım oranına bağlı olarak şekillenmektedir. Bu gruplar aşağıdaki gibi özetlenebilecektir:

***Kullanıcı:*** Üretimin son aşamasındaki ürünle ilgilenen, tüketici olan kullanıcı, konut projelerinin nihai hedef kitlesidir ve projelerin başarısı için ihtiyaçlarının ve beklentilerinin doğru anlaşılması esastır. Bunun gerçekleşebilmesi için kullanıcıların konum, büyüklük, mekan düzenlemeleri gibi özellikler konusunda taleplerinin belirlenmesi gerekmektedir. Kullanıcıların yaşam kalitesini artırmak için tasarım ve uygulama süreçlerinde kişilerin ihtiyaçlarına ve isteklerine odaklanılması kullanıcı memnuniyetlerini de doğrudan artıracaktır.

***Tasarımcı:*** Mimar ve mühendisler olarak tanımlayabileceğimiz tasarımcılar, kullanıcıların ihtiyaçlarını estetik, işlevsel ve teknik açıdan karşılayan çözümleri geliştiren profesyonellerdir. Kullanıcı odaklı bir yaklaşımın benimsendiği, tasarım sürecinde estetik ve işlevsel dengenin sağlandığı, yenilikçi ve sürdürülebilir çözümlerin geliştirildiği projeler üretmek bu grubun ana amaçları arasındadır. Bu da tasarımcılar, uygulayıcılar ve kullanıcılarla sürekli iletişim halinde kalınması, tüm aşamalarda iş birliğinin sürdürülebilmesi ile gerçekleşebilmektedir.

***Uygulayıcı:*** Müteahhitler ya da genel olarak inşaat firmaları şeklinde tanımladığımız uygulayıcılar ise, tasarımcılar tarafından geliştirilen projeleri hayata geçiren ve inşaat sürecini yöneten sermaye sahibi profesyonellerdir. Projelerin zamanında ve bütçeye uygun olarak tamamlanmasını, tasarım ve teknik şartnamelere uygun olarak gerçekleştirilmesini sağlamak, inşaat sürecinde malzeme ve işçilik kalitesini denetlemek gerekli planlama ve koordinasyonu yapmaktadırlar. Aynı zamanda sürdürülebilir inşaat teknikleri ve malzemeleri kullanarak çevresel etkileri de dikkat etmeleri uygulayıcıların da sorumlulukları arasındadır.

***Denetleyici (Yerel Yönetimler):*** Konut üretim sürecinde devreye giren bir başka birim daha bulunmaktadır; denetleyici diye tanımlayabileceğimiz yerel yönetimler yani belediyeler de konut üretim süreçlerinin dördüncü muhatabı olarak karşımıza çıkmaktadır. Konut üretiminde yerel yönetim birimleri ve belediyeler, önemli bir denetleyici ve düzenleyici konumdadır. Bu kurumlar, konut projelerinin yasalara uygun, güvenli, kaliteli ve sürdürülebilir bir şekilde gerçekleştirilmesini sağlamak için kritik bir denetleyici ve düzenleyici rol oynamaktadır.

Konut üretiminde kullanıcı, tasarımcı ve uygulayıcı ilişkileri, projenin her aşamasında etkin iletişim, iş birliği ve geri bildirim döngüleri üzerine kuruludur (Salihoğlu ve Türkoğlu, 2019).

Bu ilişkilerin iyi yönetilmesi, kullanıcıların ihtiyaçlarına uygun, estetik ve işlevsel açıdan tatmin edici, sürdürülebilir ve kaliteli konut projelerinin hayata geçirilmesini sağlamaktadır.

## 3. KATILIMCI YÖNTEM ÖNERİSİ

Konut üretimi için katılımcı bir yöntem oluşturulmasının tartışıldığı bu çalışmada; bir konutun planlanma, inşa edilme, tercih edilme ve içinde yaşama süreçlerinde mutlak memnuniyetten ziyade ortak memnuniyet ile çözülebileceği düşüncesi ağır basmaktadır. Konut üretimi için katılımcı bir yöntem oluşturulabilir ve bu yöntem, yerel toplulukların, hükümetlerin, mimarların, mühendislerin ve diğer paydaşların iş birliği yapmasını sağlayarak daha sürdürülebilir, uygun maliyetli ve ihtiyaçlara uygun konutlar inşa etmeyi hedeflemektedir. Olası yöntem için atılacak adımlar şu şekilde sıralanabilmektedir (Saraçoğlu Gezer, 2025):

***İhtiyaç Analizi ve Katılımın Sağlanması:*** Yerel topluluklarla doğrudan etkileşime geçilerek ihtiyaçları, beklentileri ve mevcut durum hakkında bilgi toplanması ve topluluk üyelerinin karar alma süreçlerine aktif olarak katılmalarının teşvik edilmesi için daha etkin adımlar atılmalıdır. Yerel topluluklarla doğrudan etkileşime geçme yöntemleri için anket ve görüşme teknikleri kullanılabilmektedir; anketler nicel veriler sağlarken, açık uçlu sorular derinlemesine bilgi ve spesifik ihtiyaçları ortaya çıkarabilmektedir (Baş, 2013).

***Paydaşların Belirlenmesi:*** Yerel yönetimler, mimarlar, mühendisler, inşaat firmaları, finans kuruluşları ve sivil toplum örgütleri gibi ilgili tüm paydaşların önceden belirlenmesi ve proje planlama aşamasındayken, tüm paydaşların projeye dahil edilmesi süreçte yaşanabilecek aksaklıkların önüne geçecektir.

***Ortak Vizyon ve Hedefler:*** Tüm paydaşlarla birlikte projenin sürdürülebilirliği, maliyet etkinliği, estetik ve sosyal uyum gibi kriterlerle ortak bir vizyon ve hedef belirlenmesi, sonuç ürünün değerini artıracaktır.

***Tasarım Süreci:*** Mimarlar ve mühendislerin, topluluk üyeleriyle birlikte, katılımcı tasarım görüşmeleri düzenlemesiyle; geliştirilen tasarımlar hakkında prototipler ve üç boyutlu modellemeler üzerinden tartışılması, süreçte uyumsuzluk sorunlarının önüne geçecektir. İşbirlikçi yaklaşımlar ve ortak proje üzerinden çalışılması da farklı projeler arası çakışma problemlerinin önüne geçecek ve şantiye aşamasında değişikliğe ihtimal vermeyecektir.

***Finansman ve Kaynak Temini:*** Proje için kamu-özel sektör ortaklıkları, mikro finansman, kooperatif modelleri veya devlet sübvansiyonları gibi çeşitli yöntemlerin araştırılması ve kullanılacak malzemelerin yerel ve sürdürülebilir olmasına dikkat edilmesi gerekmektedir.

***İnşaat Süreci:*** İnşaat sürecinin her aşamasında şeffaflık sağlanması, topluluk üyelerinin süreç hakkında bilgilendirilmesi, yerel iş gücünün projeye dahil edilmesi ve ihtiyaç duyulan eğitimlerin verilmesinin sağlanması, yapım sürecinin dengeli ve sistemli ilerleyebilmesi için uygulanması gereken iş adımlarıdır.

***Değerlendirme ve Geri Bildirim:*** Proje sürecinde sürekli geri bildirim alınarak gerekirse değişiklikler yapılması ve proje tamamlandığında tüm paydaşlarla değerlendirme toplantıları yapılarak sonuçların analiz edilmesi iş birliği kapsamında önemli görülmektedir.

***Uzun Vadeli Sürdürülebilirlik:*** İnşa edilen konutların uzun vadeli yönetimi için topluluk temelli yönetim modelleri oluşturulması ve bakım-onarım süreçlerinde topluluk üyelerinin aktif rol almasının teşvik edilmesi gerekmektedir.

## 4. KONUT ÜRETİMİNDE YAŞAM KALİTESİ KRİTERLERİ

Konut üretiminin hedef kitlesi ailedir ve bir ailenin günlük ve ömürlük yaşantısında en çok vakit geçirdiği mekân konuttur. Konut tasarımında önemsenmesi gereken konuların başında; içinde yaşayacak kişilere mahremiyet sağlaması, ihtiyaç olan minimum yaşama alanlarını içermesi, konforlu ve rahat hissettirmesi gelmektedir. Kişinin değerlerini, sınıfsal durumunu, sosyal statüsünü, başarısını ve sosyal kabul görmesini de kapsayan bir konut seçimi söz konusudur. Sadece barınmak yeterli gelmemekte, tasarlanacak konutun da bu beklentileri karşılaması beklenmektedir.

Bu kapsamda "Yaşam Kalitesi" yöntemi, konut üretimi çalışmalarında ve şehir planlamasında kullanılan önemli bir yaklaşımdır. Bu yöntem, bireylerin ve toplulukların genel refahını, memnuniyetini ve yaşam koşullarını değerlendirmeyi amaçlamaktadır (Edisan ve Kadıoğlu, 2013). Konut projelerinde yaşam kalitesini ölçmek ve artırmak için kullanılan temel kriterler şunlardır:

***Fiziksel Çevre ve Altyapı:*** Konutların fiziksel durumu, yapı kalitesi, güvenlik, sağlamlık; su, elektrik, internet gibi temel hizmetlere erişim ve toplu taşıma olanakları.

***Sosyal ve Kültürel Faktörler:*** Topluluk üyeleri arasındaki sosyal bağlar, parklar, spor alanları, kültürel merkezler, okullar ve hastanelere erişim.

***Ekonomik Faktörler:*** İş imkanlarına yakınlık, bölgedeki gelir düzeyi, konut maliyetlerinin gelir düzeyine oranı.

***Çevresel Faktörler:*** Yeşil alanlar, hava-su kalitesi, gürültü seviyeleri, enerji verimliliği ve çevre dostu yapı malzemelerinin kullanımı.

***Sağlık ve Güvenlik:*** Sağlık hizmetlerine erişim, suç oranları ve genel güvenlik durumu.

***Toplum Katılımı ve Yönetişim:*** Topluluk üyelerinin projelere aktif katılımı ve yerel yönetimlerin şeffaflığı.

"Yaşam Kalitesi" yöntemi, konut üretiminde sadece fiziksel yapıların değil, aynı zamanda sosyal, ekonomik ve çevresel faktörlerin de göz önünde bulundurulmasını sağlayarak daha bütüncül ve sürdürülebilir yaşam alanları yaratmayı hedeflemektedir (Matarrita Cascante, 2010).

## 5. SONUÇ

Eskiyen, değişen ya da dönüşen kent alanlarının yeniden geliştirilmesinde, yeni konut alanlarının planlanmasında yaşam kalitesi kriterlerine göre değerlendirme yapılması, elde edilen verimi ve memnuniyeti artıracaktır. Yaşam kalitesi değerlendirmeleri, konut projelerinin tasarımında ve planlanmasında, yerel yönetimlerin elde edilen veriler doğrultusunda daha etkin politikalar geliştirmesinde de yol gösterici olacaktır (Arabacıoğlu, 2006).

Bu çalışmada önerilen katılımcı yöntem ile konut projelerinin yerel ihtiyaçlara daha uygun olmasına dikkat edilirken, aynı zamanda topluluklar arasında dayanışmaya katkı sağlamakta ve aidiyet hissinin artmasına, dolayısıyla memnuniyet duygusunun da artmasına katkıda bulunabileceği düşünülmektedir. Bilinçli insanlar, bilinçli tercihler yapabilmekte ve sağladıkları geri bildirimler sayesinde de katılımcı modeller hazırlanmasında etkin görev ve sorumluluklar üstlenebilmektedirler. Konut üretimi sürecinin bütüncül ve kullanıcı odaklı bir yaklaşımla yönetilmesi bu sayede mümkün olabilecektir (Şekil 1).




**Şekil 1.** Konut üretiminde katımlı model önerisi.

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# EXPLORING 15-MINUTE CITY STRATEGIES FOR URBAN SUSTAINABILITY: A COMPARATIVE ANALYSIS OF PARIS AND HAMBURG

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## ABSTRACT

This paper presents a comparative analysis of the implementation of the 15-Minute City (15mC) concept in Paris and Hamburg, with a specific focus on its contributions to urban sustainability goals. Conceptually, the 15mC model aims to foster environmental and social sustainability through enhanced accessibility, proximity-based living, active mobility, and multifunctional urban spaces. The primary objective of this study is to examine how the concept, when applied at different scales and through varying strategies, translates into tangible sustainability outcomes. The scope of the paper encompasses Paris's transformation-oriented approach—focused on restructuring the existing urban fabric—and Hamburg's planning of a new urban district, Grasbrook, with innovative logistics and mobility strategies. The methodology involves a qualitative analysis of local policies, urban interventions, and assessment tools, interpreted through comparative content analysis. The findings reveal that both cities have developed practices that contribute to sustainability, though these contributions manifest at different scales and reflect differing priorities. Paris stands out with its multifunctional building strategies, participatory budgeting mechanisms, and active mobility-oriented spatial transformations. In contrast, Hamburg's approach is characterized by a rethinking of urban logistics and the design of short-distance neighborhood planning. These two cases demonstrate the adaptive and transformative potential of the 15mC model in advancing urban sustainability. Accordingly, it is recommended that cities aiming to formulate sustainable urban planning strategies consider recontextualizing the 15mC approach to suit their local conditions—particularly by integrating mobility, logistics, public space, and local economy within an inclusive and participatory planning framework.

**Keywords:** 15-Minute City, Sustainability, Paris, Hamburg

## INTRODUCTION

Global cities are currently facing multilayered crises, including climate change, resource depletion, and social inequality. In this context, urban sustainability must be redefined not only in terms of reducing environmental impacts but also by addressing social dimensions such as accessibility, quality of life,

and social inclusion (Sharifi, 2022). The COVID-19 pandemic, in particular, has intensified the need for spatial reorganization, leading to the emergence of alternative models in urban planning (Moreno et al., 2021). Among these models, the 15-Minute City (15mC) has emerged as one of the most prominent and widely discussed concepts.

Initially proposed by Carlos Moreno, the 15mC model was operationalized as an urban transformation policy under the leadership of the Paris Municipality. Its primary goal is to ensure that individuals can meet their daily needs within a 15-minute walking or cycling radius from their residence (Moreno, Allam, Chabaud, Gall, & Pratlong, 2021). The model emphasizes active mobility, multifunctional urban spaces, local economic networks, and participatory governance, thereby contributing to both environmental and social sustainability objectives (Pozoukidou & Chatziyiannaki, 2021).

The main objective of this study is to conduct a comparative analysis of how the 15-Minute City model is operationalized from a sustainability perspective in two different urban contexts: Paris and Hamburg. While Paris adopts a transformation-oriented strategy that intervenes in the existing urban fabric, Hamburg seeks to implement sustainability through the design of a newly developed neighborhood—Grasbrook. This duality offers a meaningful basis for comparison between retrofit and planned development strategies. The study employs a comparative content analysis methodology, drawing on policy documents, implementation examples, and strategic urban plans from both cities. Through this approach, the research aims to reveal the sustainability outcomes of the 15mC model as applied in distinct spatial and governance contexts.

## THE 15-MINUTE CITY APPROACH

The concept of the 15-Minute City (15mC) is a spatial planning model that aims to enable urban residents to access essential services—such as housing, education, healthcare, shopping, and leisure—within a 15-minute walk or bike ride from their homes. The idea builds on earlier notions such as Clarence Perry's "neighborhood unit" (developed in the 1920s) and was later echoed by the New Urbanism movement in the 1980s, which emphasized walkable urban design in the United States. Similar models, such as urban cells and 20- or 30-minute neighborhoods, have also emerged globally in the past decade. However, the 15mC model, as theorized by Carlos Moreno, gained significant traction in urban planning discourse, particularly in the post-COVID-19 context (Moreno et al., 2021).

The 15-Minute City framework is structured around four core principles:

Proximity: Ensuring that residents have geographical access to key services like housing, education, healthcare, retail, and recreation within a short distance.

Multifunctionality: Promoting the use of urban spaces for multiple purposes—for instance, repurposing schoolyards as community parks during weekends (Pozoukidou & Chatziyiannaki, 2021).

Active Mobility: Strengthening pedestrian and cycling infrastructure to reduce car dependency.

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Local Economy: Supporting small businesses, neighborhood-scale production, and circular economic practices (Bibri & Krogstie, 2021).

These principles are directly linked to critical indicators of sustainable urbanism, including energy efficiency, carbon emission reduction, social inclusion, and community resilience. While Sharifi (2022) underscores the model's potential to foster sustainability, he also cautions that without context-sensitive implementation, it may inadvertently reinforce spatial inequalities. Urban sustainability is typically assessed through three interrelated dimensions: environmental, social, and economic.

*Environmental Sustainability*: Includes goals such as reducing carbon emissions, expanding green infrastructure, and lowering fossil fuel dependence in urban transport. The 15mC promotes walking and cycling, thereby offering significant potential to curb urban carbon outputs (Honey-Rosés et al., 2021).

*Social Sustainability:* Encompasses equitable access, social justice, inclusion, and participatory governance. By ensuring service provision at the neighborhood scale, the 15mC supports accessibility, particularly for vulnerable populations such as the elderly, children, and individuals with mobility limitations (Gupta et al., 2022).

*Economic Sustainability:* Refers to strengthening local businesses, creating localized employment opportunities, and fostering urban-scale production. The local economic structure aligns with principles of the circular economy, reducing systemic vulnerabilities (Bibri & Krogstie, 2022).

Measurable indicators of these dimensions may include accessibility rates, the length of pedestrian and cycling infrastructure, time to access green spaces, levels of urban carbon emissions, frequency of public space use, and logistics infrastructure density (Sharifi, 2022). These indicators provide an analytical basis for evaluating the extent to which the 15mC model aligns with urban sustainability goals.

**THE PARIS CASE: "Ville du Quart d'Heure"**

The implementation of the 15-Minute City approach in Paris was first introduced as a political vision by Mayor Anne Hidalgo during her 2014 term but gained significant momentum during the COVID-19 pandemic. The crisis heightened residents' reliance on their immediate surroundings and reinforced interest in neighborhood-based urban models (Moreno, 2024). In response, the City of Paris launched structural reforms in mobility, public space usage, and local production systems (Christoforaki & NTUA, 2024). These initiatives are detailed below:

✧ *Multifunctional Spaces: Les Cours Oasis*

In Paris, schoolyards have been repurposed to function as neighborhood parks, forming part of the Les Cours Oasis initiative. Under this program, over 700 schoolyards have been redesigned with shading structures, green areas, and play zones. This transformation not only enhances social inclusion but also contributes to mitigating urban heat island effects (Mohamed & Abdelhamid, 2024).

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✧ *Pedestrianization and "Rues aux Enfants"*

In the post-COVID era, over 50 kilometers of roads have been closed to vehicular traffic. The city introduced the concept of "rues aux enfants" (children's streets) to create pedestrian-priority zones within neighborhoods. These efforts reduce carbon emissions while promoting a child-friendly urban environment (Pozoukidou & Chatziyiannaki, 2021).

✧ *Local Production: Agri-Paris and Made in Paris*

Programs such as Agri-Paris and Made in Paris aim to foster urban agriculture and local production. Through city-supported cooperatives, the municipality encourages the consumption of fresh, locally produced goods, thereby reducing transport-related emissions associated with food logistics (Pozoukidou et al., 2021).

✧ *Participatory Budgeting (5% of Municipal Budget)*

Paris allocates 5% of its municipal budget to the Budget Participatif, a participatory budgeting process shaped directly by citizens. This model enhances transparency and inclusiveness in urban governance by allowing residents to propose and vote on local projects (Paredes, 2024).

The 15-Minute City model in Paris contributes to reducing the city's carbon footprint, reclaiming public spaces, enhancing social justice, and supporting the local economy.

*Environmental Sustainability:* Through pedestrianization and active mobility projects, transport-related emissions have been significantly reduced, while green infrastructures have been expanded.

*Social Sustainability:* The provision of services at the neighborhood scale enables a more equitable urban experience, particularly for disadvantaged groups such as the elderly, children, and individuals with limited mobility.

*Economic Sustainability:* By promoting local production and consumption chains, the internal urban economy has been reinforced (Pozoukidou et al., 2021; Moreno, 2024).

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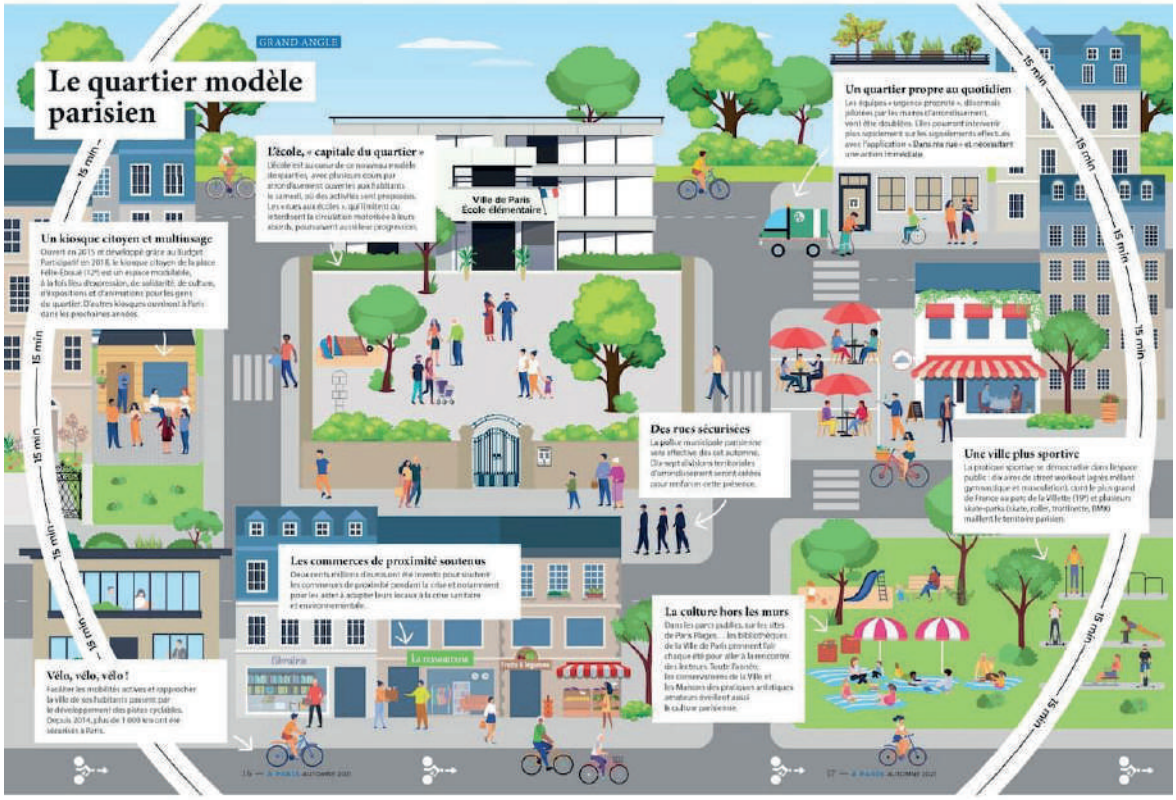


**Figure 1.** Ville du Quart d'Heure: A Diagram of the 15-Minute City Model

## THE HAMBURG CASE: Grasbrook District

Hamburg represents a city that implements the 15-Minute City (15mC) model through new urban development zones. Within this framework, the Grasbrook District, located in the southern part of the city, is a large-scale redevelopment project that aims to transform a former port area into a sustainable, accessible, and multifunctional urban neighborhood. The planning process integrates components such as local development, logistics restructuring, and low-carbon mobility solutions (Büttner et al., 2024).

*Mixed-Use Spaces and Functional Density:*

Grasbrook is designed as a mixed-use neighborhood encompassing residential units, workspaces, social infrastructure, and cultural facilities. This urban model reduces the need for intra-city commuting and facilitates neighborhood-scale access to essential services (Freije, 2023).

*Short-Distance Mobility and Active Transportation:*

The project prioritizes bicycle lanes and pedestrian-friendly environments, while motorized traffic is deliberately limited. The urban layout includes defined "15-minute access radii", ensuring that all basic services are reachable within this timeframe (Zakariasson, 2022).

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*Logistics Restructuring:*

Grasbrook adopts a reimagined urban logistics strategy, integrating eco-friendly freight and delivery systems. Key interventions include micro-distribution hubs, low-emission delivery networks, and night-time delivery scheduling, all of which contribute to lowering the environmental impact of logistics (Mauri, 2020).

✧ *Public Space and Waterfront Integratio*

Thanks to its strategic location along the Elbe River, the Grasbrook project incorporates blue-green infrastructure into its urban design. Public parks, riverside promenades, and areas for social interaction have been planned to strengthen community ties (Büttner et al., 2024).

Hamburg's Grasbrook project frames sustainability within a multidimensional structure, addressing the built environment, mobility, logistics, and public space usage:

*Environmental Sustainability:* Active transportation infrastructure and green space integration aim to reduce carbon emissions.

*Economic Sustainability:* Localized logistics and the integration of commercial and service activities within the neighborhood support economic vibrancy.

*Social Sustainability:* Public amenities and inclusive spaces are designed to foster community cohesion and accessibility.

The Hamburg case illustrates that when new urban development zones are strategically integrated with the 15mC model, they can offer substantial opportunities for advancing sustainable urban transformation.

## COMPARATIVE ANALYSIS OF PARIS AND HAMBURG FROM A SUSTAINABILITY PERSPECTIVE

Although Paris and Hamburg share similar goals in implementing the 15-Minute City (15mC) model, they differ significantly in terms of strategic approach and implementation tools (Table 1).

The Paris model applies the 15mC principles through the retrofitting of existing urban fabric. This approach allows for rapid scalability and provides direct contributions to social integration. Particularly, the use of participatory budgeting and neighborhood initiatives facilitates the involvement of local residents in planning processes, thereby strengthening urban legitimacy and promoting collective ownership of sustainability efforts (Moreno et al., 2021; Pozoukidou & Angelidou, 2022).

In contrast, Hamburg adopts a more systematic and planned approach by implementing the 15mC framework within the newly developed Grasbrook district. This enables the design of infrastructure and logistics systems according to sustainability principles from the outset. Hamburg's strategies, such as

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logistics decentralization and micro-distribution, present significant potential for reducing the carbon footprint (Büttner et al., 2024).

In terms of mobility, Paris prioritizes active transportation and social accessibility, while Hamburg emphasizes short-distance mobility and low-emission logistics. Both cities contribute to sustainability within their specific contexts, but they differ in terms of scale and priority areas of intervention.

**Table 1.** Comparative Overview of Paris and Hamburg Cities

| **Kriter** | **Paris (Ville du Quart d'Heure)** | **Hamburg (Grasbrook)** |
|---|---|---|
| Strategic Approach | Transformation of existing urban fabric (retrofit); refunctionalization of spaces | New development area planning; integrated neighborhood design from scratch |
| Transport Policies | Pedestrianization, bicycle lanes, "children's streets", pedestrian integration with public transport | Cargo bikes, short-distance access networks, low-speed streets |
| Logistics | Short supply chains supporting local production, micro logistics hubs | Decentralized logistics systems, sustainable freight distribution strategies |
| Participation | Participatory budgeting (5%), neighborhood forums, local proposal platforms | Formal consultation mechanisms in the planning process, guided stakeholder engagement |
| Social Dimension | Social inclusion, accessible spaces for low-income groups, local employment | Mixed-use spaces combining housing and commerce, goal of social diversity |

In conclusion, Paris stands out in the domain of social sustainability, whereas Hamburg provides a strong example of spatial and logistics-based sustainability integration. Each approach demonstrates the potential for context-sensitive adaptation of the 15mC model in other urban contexts, offering distinct pathways to achieving comprehensive urban sustainability.

## CONCLUSION AND RECOMMENDATIONS

This study has provided a comparative analysis of 15-Minute City (15mC) strategies implemented in Paris and Hamburg from a sustainability perspective. The findings reveal that both cities interpret and apply the 15mC model in alignment with their context-specific dynamics, contributing to sustainability goals at different scales.

In the case of Paris, the retrofit approach, based on transforming the existing urban fabric, has demonstrated strong impacts in the areas of social inclusion, citizen participation, and active mobility. Participatory budgeting has strengthened local democracy at the neighborhood level, while initiatives such as Les Cours Oasis have diversified the use of public space. Policies supporting local production and circular economy have contributed to emissions reduction and enhanced economic localization.

In Hamburg, strategies developed through the newly planned Grasbrook district have prioritized spatial integration, the restructuring of logistics infrastructure, and short-distance mobility planning. The use of cargo bikes and micro-distribution hubs illustrates the integration of environmentally friendly logistics into urban planning. Furthermore, mixed-use space design has supported economic vibrancy

by promoting a work-life balance within the neighborhood. Based on these findings, the following recommendations are proposed:

- The 15mC model cannot be universally applied; it must be adapted to the specific social, spatial, and governance contexts of each city.
- Urban planning processes should adopt an inclusive approach that prioritizes the needs of disadvantaged groups such as the elderly, children, and individuals with limited mobility.
- Achieving urban sustainability requires the restructuring of logistics systems to be low-emission and localized.
- Participatory democracy tools, such as citizen budgets and local initiatives, should be scaled up and institutionalized.

Comparative analyses of cities like Paris and Hamburg can serve as instructive references for other urban areas developing their own strategies.

In conclusion, the 15-Minute City model is a multi-dimensional sustainability tool, extending beyond transportation and spatial planning to encompass social equity, economic resilience, and environmental integration. To ensure the success of this model, it must be implemented through holistic planning, community-based governance, and contextual flexibility.

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# ŞAM'DA SAVAŞ SONRASI BOŞLUKLARIN MAVİ-YEŞİL ALTYAPI VE SOSYAL KAMUSAL MEKÂNLAR OLARAK YENİDEN İŞLEVLENDİRİLMESİNE YÖNELİK BİR ÇALIŞMA

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## ÖZET

Savaş sonrası kentlerde ortaya çıkan fiziksel ve ekolojik yıkım, yalnızca mimari yapı stokunun kaybı değil, aynı zamanda sosyal yaşamın, kolektif hafızanın ve ekolojik altyapıların da çöküşü anlamına gelmektedir. Suriye'nin başkenti Şam'da çatışmalar sonrası oluşan "kentsel boşluklar", hem fiziksel altyapının iflasını hem de toplumsal bağların kopuşunu temsil eden âtıl alanlar olarak öne çıkmaktadır. Bu bağlamda, tahrip olmuş bu alanların yeniden işlevlendirilmesi, sürdürülebilir kentsel kalkınma ve toplumsal iyileşme için kritik bir gereklilik haline gelmiştir. Bu çalışma, Şam'daki söz konusu boşluklara müdahale stratejileri geliştirirken uluslararası başarılı modelleri analiz etmektedir. Bu kapsamda, Berlin'in kent boşluklarını "sosyal hafıza mekanları" ve "topluluk bahçeleri" ile iyileştiren onarım stratejileri ile Rotterdam'ın iklim adaptasyonunu sağlayan yenilikçi "Mavi-Yeşil Altyapı" modelleri incelenmiştir. Makale, bu modern ve "kamusal" müdahale biçimlerinin, Şam'ın geleneksel, mahremiyet esaslı ve "içe dönük" birer özel alan olan "avlu" ve "bahre" mirası ile nasıl bütünleştirilebileceğini temel bir tasarım sorunsalı olarak ele almaktadır.

Çalışma, bu iki farklı mekânsal yaklaşımı bir araya getirmek amacıyla, yerel mirası modern stratejilerle harmanlayan "Kamusal Ekososyal Avlu" adında hibrit bir kentsel tipoloji önermektedir. Önerilen bu model, geleneksel avlunun mikro-iklimsel konfor sağlayan yapısını kamusal kullanıma açarak, savaş boşluklarını hem yağmur suyu yönetimi sağlayan ekolojik bir altyapıya hem de toplumsal etkileşim alanına dönüştürmeyi hedeflemektedir. Sonuç olarak bu yaklaşım, Şam'ın kültürel köklerinden güç alarak ekosistem hizmetlerini onaran ve toplumsal dayanışmayı güçlendiren bütüncül bir çözüm sunmaktadır.

**Anahtar Kelimeler:** Şam, Mavi-Yeşil Altyapı, Kentsel Boşluk, Savaş Sonrası Yeniden Yapılanma, Hafıza Mekânları, Sosyal Dirençlilik.

# A STUDY ON REPURPOSING POST-WAR VOIDS IN DAMASCUS AS BLUE-GREEN INFRASTRUCTURE AND SOCIAL PUBLIC SPACES

## ABSTRACT

The physical and ecological destruction emerging in post-war cities signifies not only the loss of architectural building stock but also the collapse of social life, collective memory, and ecological infrastructures. In Damascus, the capital of Syria, the "urban voids" formed after conflicts stand out as vacant spaces representing both the failure of physical infrastructure and the severing of social ties. In this context, the repurposing of these devastated areas has become a critical necessity for sustainable urban development and social recovery.

This study analyzes successful international models while developing intervention strategies for the voids in question in Damascus. Within this scope, Berlin's remediation strategies that heal urban voids through "social memory spaces" and "community gardens," and Rotterdam's innovative " Blue-Green Infrastructure" models that ensure climate adaptation, have been examined. The article addresses how these modern and "public" forms of intervention can be integrated with Damascus's heritage of the "courtyard" and "bahra" as a fundamental design problematic.

To synthesize these two distinct spatial approaches, the study proposes a hybrid urban typology named the "Public Eco-social Courtyard," which blends local heritage with modern strategies. By opening the traditional courtyard's structure to public use, this proposed model aims to transform war voids into both an ecological infrastructure that provides rainwater management and a space for social interaction. Consequently, this approach offers a holistic solution that restores ecosystem services and strengthens social solidarity by drawing strength from Damascus's cultural roots.

**Keywords:** Damascus, Blue-Green Infrastructure, Urban Void, Post-War Reconstruction, Memory Spaces, Social Resilience.

## 1. GİRİŞ

Savaşlar, kentlerin fiziksel, sosyal ve ekolojik dokularında derin ve kalıcı izler bırakır (Charlesworth, 2006). Yıkım, altyapı çöküşü ve göçler, kent mekânında "boşluklar" yaratır; bu alanlar sadece fiziksel bir atıllığı değil, zayıflayan toplumsal bağları ve travmatik hafızayı da temsil eder (Bašić, 2018). Bu bağlamda, savaş sonrası yeniden inşa, teknik bir onarımdan ziyade, toplumsal barışı, kolektif kimliği ve ekolojik sağlığı yeniden tesis eden bütüncül bir eylem alanıdır (UN-Habitat, 2021). Literatür, bu süreçte kamusal mekânların toplumsal uzlaşma için kritik bir platform sunduğunu vurgulamaktadır (Ilija, 2021).

Yirmi birinci yüzyılda, bu sosyal onarım zorunluluğu, iklim değişikliğinin getirdiği ek baskılarla kesişmektedir (Matthews vd., 2015). Bu noktada, "yeşil ve mavi altyapı", doğa temelli çözümlerle (Ahern, 2011) hem ekolojik dirençliliği artıran hem de yüksek kaliteli kamusal mekânlar yaratarak (Meerow & Newell, 2017) toplumsal refahı destekleyen bütünleşmiş bir çözüm sunar. Bu durum, kriz sonrası kentler için "ekososyal" bir yaklaşımı, yani ekolojik ve sosyal onarımı eş zamanlı ele alan bir stratejiyi gündeme getirir.

Bu "ekososyal" zorunluluk, özellikle son yirmi yılda yoğun çatışmalara sahne olan ve iklimsel açıdan kırılgan olan Orta Doğu coğrafyası için kritik bir önem taşımaktadır. Irak, Yemen ve Suriye'deki kentler, tarihsel dokularının büyük yara aldığı ve ekolojik baskıların (kuraklık, su kıtlığı) yoğunlaştığı karmaşık yeniden yapılanma sorunlarıyla karşı karşıyadır (Alnsour & Meaton, 2020). Bu bölgedeki yeniden yapılanma çabaları, sadece fiziksel restorasyonu değil, aynı zamanda iklime duyarlı ve toplumsal bağları güçlendirici stratejileri de içermek zorundadır.

İşte Suriye'nin başkenti Şam, bu bölgesel krizin ve "ekososyal" zorunluluğun kesişim noktasında duran karmaşık bir örnektir. Savaş, kentin dokusunda ciddi fiziksel ve sosyal boşluklar yaratmıştır (Gharib, 2020). Ancak bu boşluklar, Şam'ın kendine özgü geleneksel kentsel modelinden (içe dönük avlular, su öğeleri, mahalle odaklı ortak alanlar) ilham almak için bir potansiyel sunar. Bu geleneksel model, tarihsel olarak hem sosyal dayanışmayı güçlendiren hem de kurak iklimde mikro-iklimsel konfor sağlayan bir yapıya sahiptir (Al-Houdi, 2017).

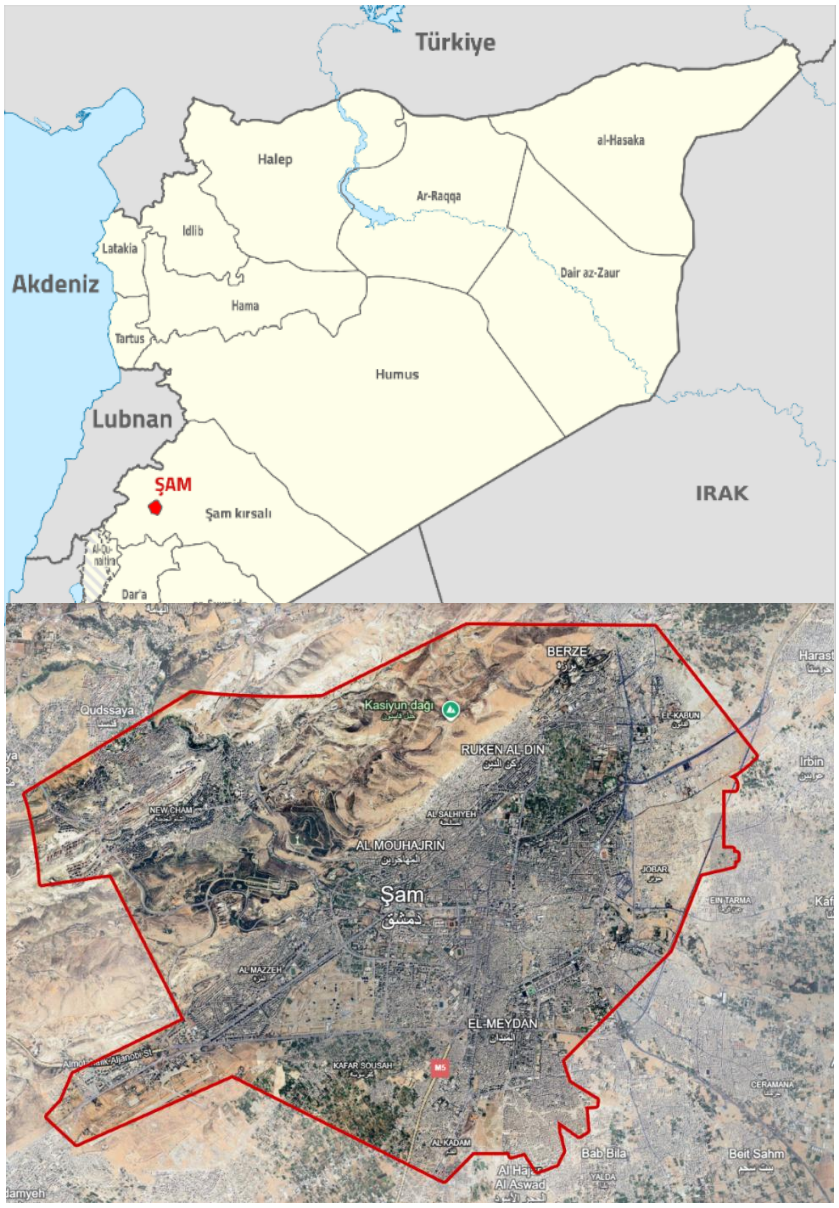
Bu çalışmada, literatürdeki bir boşluğa yanıt aranarak şu temel soru sorulmaktadır: Şam'da savaş sonrası boşluklar, kentin geleneksel avlu ve su mimarisinden ilham alarak, nasıl hem ekolojik sistemleri onaracak hem de toplumsal dayanışmayı ve hafızayı güçlendirecek şekilde dönüştürülebilir? Makale, Berlin ve Rotterdam gibi trend kentlerdeki uygulamalardan dersler çıkararak, Şam'ın özgün kültürel ve ekolojik bağlamına uygun "ekososyal" bir yeniden işlevlendirme modelini tartışmayı ve uygulamacılara bir model sunmayı amaçlamaktadır.

## 2. ARAŞTIRMA VE BULGULAR

### 2.1. Kentsel Miras Bağlamında Çalışma Alanının Tanımlanması

Dünyanın en eski sürekli yerleşim yerlerinden biri olarak kabul edilen Şam (Damascus), insanlık tarihinin en kadim kentsel merkezlerinden biridir. Arkeolojik bulgular, kentin yerleşim geçmişinin M.Ö. 8. binyıla kadar uzandığını göstermektedir (Burns, 2005). Tarih boyunca Aramiler, Romalılar, Bizanslılar ve Emeviler gibi farklı uygarlıklara ev sahipliği yapmış olan Şam, bu katmanlı geçmişin izlerini günümüze kadar taşımaktadır. Özellikle Emevi Dönemi (7.–8. yüzyıl), kentin İslam dünyasının önemli kültürel ve idari merkezlerinden biri haline geldiği

bir dönem olarak öne çıkar. Şekil 1 ve Şekil 2'de çalışma alanının konumu görülmektedir. Emevî döneminin ardından Şam, özellikle Eyyûbîler (12.–13. yüzyıl) sürecinde Haçlı Seferleri bağlamında stratejik bir merkez olarak yeniden önem kazanmış; medrese, zaviye ve vakıf yapıları üzerinden kentsel-kamusal ağını güçlendiren bir dönüşüm yaşamıştır. Daha sonraki Memlûk döneminde anıtsal dini-sivil mimari üretim ve vakıf sistemi kentsel dokuya güçlü biçimde yansımış; çarşı omurgası ve mahalle örgütlenmesi pekişmiştir (Burns, 2005; Lapidus, 2014). Osmanlı hâkimiyeti (1516–1918) ile Şam hem bölgesel idare merkezi hem de Hac yolu güzergâhının ana duraklarından biri olarak işlev görmüş; bu konum, hanlar, imaretler ve su yapıları gibi altyapı yatırımlarıyla kentsel sürekliliği desteklemiştir (Rafeq, 2006).




**Şekil 2** Şam haritası (URL-2)

### 2.2. Geleneksel Şam Konut Tipolojisi

Kentin geleneksel dokusunun temelini, kurak iklim koşullarına ve mahremiyet odaklı sosyal yaşama yanıt veren "avlu" sistemi oluşturur. Geleneksel Şam evlerinde yaşam, dışa kapalı cephelerin ardında, merkezi bir avlu etrafında organize olur. Bu avlular, "Bahre" adı verilen merkezi su havuzları ve bitki örtüsü sayesinde, sadece bir sosyal toplanma mekânı değil, aynı zamanda pasif iklimlendirme sağlayan birer ekolojik araç olarak işlev görmüştür. Bu yapı, kentin yerel "ekososyal" modelinin temelini oluşturur.



**Şekil 3** Geleneksel Şam Evlerin Avlusu ve Su Öğesi (Bahre) (URL-1)

### 2.3. Savaş Sonrası Kentsel Boşlukların Oluşumu ve Çok Boyutlu Etkileri

Yakın dönemde, 2011 sonrası savaş süreci Şam'ın kentsel yapısında derin tahribatlar yaratmıştır. Özellikle Doğu Guta ve benzeri çeper alanlarda yoğun bombardımanlar sonucu konut dokusu, altyapı ve kamusal alanlar büyük ölçüde yok olmuştur (Gharib, 2020). Ortaya çıkan bu "kentsel boşluklar", yalnızca fiziksel yıkımın değil; aynı zamanda çöken su ve kanalizasyon altyapısının (UN-Habitat, 2021) ve yerinden edilen nüfusun yarattığı sosyal kopuklukların da göstergesidir. Bu alanlar, savaş sonrası dönemde hem çevresel risklerin hem de toplumsal iyileşme gereksinimlerinin yoğunlaştığı bölgeler haline gelmiştir. Dolayısıyla, Şam'daki bu boşlukların yeniden işlevlendirilmesi, sadece fiziksel onarım değil; ekolojik, sosyal ve altyapısal bütünlük açısından da kritik bir fırsat alanı olarak değerlendirilebilir.



**Şekil 4** Savaş öncesi Jobar ilçesi, Şam 2023 (URL-2)

**Şekil 5** Savaş sonrası Jobar ilçesi, Şam 2023 (URL-2)



**Şekil 6** Savaş sonrası Al-Qabun ilçesi, Şam 2025 (URL-3)

### 2.4. Emsal Analizi: Uluslararası ve Yerel Precedent İncelemesi

İkincil Materyal kapsamında Şam'daki bu "ekososyal" boşluklara yönelik strateji geliştirmek amacıyla iki uluslararası ve bir yerel emsal (precedent) analiz edilmiştir:

- Berlin (Almanya): Savaş ve bölünme sonrası ortaya çıkan kentsel boşlukların, hafıza mekânları ve "topluluk bahçeleri" aracılığıyla sosyal onarımı.
- Rotterdam (Hollanda): İklim adaptasyonu hedefiyle yeşil-mavi altyapının ve yenilikçi su yönetiminin kentsel mekâna entegrasyonu.

**2.5. METOT:** Şam'daki Ekososyal Boşlukların Literatür Temelli Karşılaştırmalı İncelemesi

Bu çalışmanın metodu, ilgili literatürün taranmasına ve analizine dayanmaktadır. Bu kapsamda, birincil vaka alanı olan Şam'daki "ekososyal" boşlukların mevcut durumu ve tarihsel modeli, ikincil emsaller olan Berlin (sosyal hafıza) ve Rotterdam (ekolojik YMA) vakalarıyla literatür üzerinden karşılaştırılmıştır. Araştırmanın amacı, bu karşılaştırmalı sentezden yola çıkarak Şam'a özgü "ekososyal" bir yeniden işlevlendirme modeli önermektir.

**2.6. Sosyal Emsal Örneği: Berlin (Hafıza Mekânları ve Toplukluk Bahçeleri)**

Berlin, II. Dünya Savaşı'ndaki yıkımın ve ardından gelen fiziksel bölünmenin (Berlin Duvarı) kent dokusunda yarattığı derin "boşluklar" ile başa çıkma stratejileri konusunda adeta bir kentsel laboratuvar işlevi görmüştür. Berlin'in deneyimi, travmatik boşlukların sadece fiziksel olarak doldurulması gereken alanlar olmadığını, aynı zamanda kentin sosyal ve kolektif hafızası için kritik bir rol oynadığını göstermektedir.

Berlin'in en radikal ve başarılı stratejilerinden biri, bazı travmatik boşlukları kasıtlı olarak "inşa-etmemek" (non-building) olmuştur. Bunun en somut örneği, eski Gestapo karargahının bulunduğu alanda geliştirilen "Topography of Terror" (Terörün Topoğrafyası) anıtıdır. Bu projede, mevcut boşluk doldurulmamış, aksine, geçmişin kanıtlarını (eski hücre kalıntıları) ortaya çıkarmak için kazılmıştır (Brenner, 2021). Boşluk, kentsel bir "yara" olarak korunmuş ve açık hava müzesine dönüştürülmüştür. Bu yaklaşım, boşluğun kendisini bir "anlatı aracı" olarak kullanarak toplumsal yüzleşmeyi ve iyileşmeyi sağlar; fiziksel boşluk, sosyal ve tarihsel bir "doluluğa" kavuşur (Kramer, 2019).



**Şekil 7** Topography of Terror, Berlin (URL-4)

Berlin Duvarı'nın yıkılması, kentin merkezinde devasa, sahipsiz ve tanımsız boşluklar yaratmıştır. Bu alanlar, devletin "yukarıdan-aşağıya" (top-down) planları gecikirken, sivil toplum ve sanatçılar tarafından "aşağıdan-yukarıya" (bottom-up) bir anlayışla "geçici kullanımlara" (Temporary Use) açılmıştır (Schmidt, 2019). Bu geçici kullanımlar âtıl alanlara hızla yeni bir kimlik ve sosyal enerji kazandırmıştır. En başarılı ve kalıcı hale gelen geçici kullanım biçimi ise "topluluk bahçeleri olmuştur. Örneğin, Kreuzberg'de âtıl bir alana kurulan "Prinzessinnengarten" (Prenseslerin Bahçesi), bir parktan öte, mobil (taşınabilir) kasalarda tarım yapılan, katılımcı ve üretken bir sosyal alandır (Müller, 2022). Bu tür projeler, âtıl alanları sosyal merkezlere dönüştürerek topluluk bağlarını yeniden kurmuştur.




**Şekil 8** Prinzessinnengarten, Berlin (URL-5)

**2.7. Ekolojik Emsal örneği: Rotterdam (Su Yönetimi ve Yeşil-Mavi Altyapı)**

Rotterdam'ın kentsel mücadelesi savaşla değil, doğayla ilgilidir. Deniz seviyesinin altında yer alan bir delta kenti olarak, iklim değişikliğinin getirdiği yoğun yağışlar ve taşkın riskleriyle karşı karşıyadır. Kentin bu soruna yanıtı, "ekolojik" altyapıyı "sosyal" altyapıyla birleştiren yenilikçi Yeşil-Mavi Altyapı uygulamaları olmuştur. Rotterdam, "suyu dışarıda tutan" geleneksel savunmacı altyapıdan, "suyu kentin içinde yöneten" proaktif bir modele geçmiştir. Bu modelin sloganı "Su ile Yaşamak"tır (Living with Water) (De Graaf, 2020). Amaç, suyu bir "sorun" olarak görüp yeraltına gömmek değil, onu kentsel tasarımın görünür, estetik ve işlevsel bir "öğesi" haline getirmektir (Waggonner & Meyer, 2021).

Bu yeni paradigmanın en ünlü örneği, "Waterplein Benthemplein" (Benthemplein Su Meydanı)'dır. Bu proje, "altyapısal" ihtiyacı "sosyal" bir işleve dönüştürmüştür. Meydan, kurak zamanlarda üç farklı kotta tasarlanmış bir toplanma, spor (basketbol sahası) ve rekreasyon alanı olarak çalışır. Yoğun yağış sırasında ise bu üç kot sırayla dolarak, 1.7 milyon litre yağmur suyunu geçici olarak depolar. Su, kanalizasyon sistemine yüklenmek yerine burada tutulur ve yavaşça sisteme veya yeraltına salınır (van Es, 2022). Bu sayede, maliyeti yüksek olan iklim

altyapısı, yılın geri kalanında âtıl kalmak yerine, mahalle için aktif bir sosyal donatıya dönüşür (Jacobs, 2023).



**Şekil 9** Waterplein Benthemplein, Rotterdam, Kurak halde (URL-6)



**Şekil 10** Waterplein Benthemplein, Rotterdam, Yağışlı halde (URL-6)

### 2.8. Geleneksel Emsal örneği: Geleneksel Şam Modeli (Avlu ve Bahre)

Analizin üçüncü bileşeni, Şam'ın kendi yerel mirasına dayanan geleneksel konut ve mahalle örgütlenmesidir. Geleneksel Şam dokusunda sosyal ilişkiler, çoğunlukla bir çıkmaz sokak çevresinde kümelenen ve "Hāra" (mahalle) olarak tanımlanan yerleşim birimleri üzerinden kurulur; bu örgütlenme, gündelik komşuluk etkileşimlerini ve kolektif yaşam pratiklerini destekleyen bir ara-ölçek üretir (Jabi, 2018). Bununla birlikte modelin "ekososyal" çekirdeğini, konutun merkezinde yer alan avlu ve avlu içindeki "Bahre" (su havuzu) bileşeni oluşturur. Avlu, mahremiyet odaklı yaşam kurgusu içinde ailenin özel sosyal mekânı olarak işlev görürken, Bahre'nin bitki örtüsüyle birlikte çalışması buharlaşma yoluyla serinletme etkisi yaratarak pasif iklimlendirme performansını artırır (Hâkim, 2021).

Ayrıca, yüksek termal kütleye sahip taş duvarlar ve gölgelenme koşulları, avlu içinde daha dengeli bir mikroiklim üretir; bu durum dış sokak ortamına kıyasla daha konforlu bir iç-dış ara mekân oluşmasına katkı sağlar (Al-Houdi, 2017). Bu yerel model, savaş sonrası ortaya çıkan kentsel boşlukların yeniden işlevlendirilmesinde, mavi-yeşil altyapı bileşenlerinin sosyal-kamusal programlarla birlikte kurgulanmasına yönelik, bağlamsal ve kültürel olarak uyarlanabilir bir referans çerçevesi sunmaktadır (Jabi, 2018; Hâkim, 2021).



**Şekil 11** Geleneksel Şam evi (URL-1)

## 4. SONUÇ VE ÖNERİLER

Suriye'nin başkenti Şam'da savaşın yarattığı kentsel boşluklar (voids), sadece fiziksel bir yıkımı değil, aynı zamanda derin sosyal ve ekolojik kırılmaları da temsil etmektedir. Bu atıl alanlar, kentin sosyal dokusunu zayıflatmakta ve çöken altyapı (UNICEF, 2017) nedeniyle iklimsel riskleri artırmaktadır. Bu çalışma, bu "ekososyal" boşluklara müdahale etmek için Berlin (sosyal emsal) ve Rotterdam (ekolojik emsal) vakalarını, Şam'ın geleneksel "avlu" mimarisi (Al-Houdi, 2017) ile karşılaştırmalı olarak analiz etmiştir. Temel bulgu, modern, "kamusal" ve "dışa dönük" emsaller (Müller, 2022; Jacobs, 2023) ile Şam'ın "özel" ve "içe dönük" yerel mirası arasında güçlü bir sentez potansiyeli olduğudur. Bu potansiyeli tasarımsal ve yönetsel araçlarla görünür kılmak, kentin kimliğini koruyarak iyileşmesi için kritik önem taşımaktadır. Şam il merkezindeki bu âtıl savaş boşluklarının yeniden işlevlendirilmesinde, "ekososyal" bir yaklaşımdan ve yerel mirasın (avlu/bahre) yeniden yorumlanmasından yola çıkılarak aşağıdaki iyileştirmeler öneri olarak sunulabilir:

- Savaş boşlukları, Berlin örneğindeki gibi (Müller, 2022), "topluluk bahçelerine" dönüştürülerek sosyal aktivasyon merkezi olarak kullanılabilir ve yerel halkın katılımı güçlendirebilir.
- Geleneksel "Bahre" (su havuzu) fikri, Rotterdam'daki "Waterplein" (Jacobs, 2023) gibi çok işlevli, "kamusal" bir Yeşil-Mavi Altyapı havzasına dönüştürülebilir. Bu havzalar, yağmur suyunu toplamalı (ekolojik) ve kurak zamanda sosyal alan olarak hizmet edebilir (sosyal).

- Bazı stratejik boşluklar, "hafıza avlusu" (memory courtyard) olarak tasarlanmalı ve Berlin'deki "Topography of Terror" (Kramer, 2019) örneğinden ilhamla toplumsal yüzleşme ve iyileşme sürecine katkı sunabilir.
- Tüm bu müdahaleler, Şam'ın yerel "avlu" mimarisinin pasif iklimlendirme (serinletme) (Hâkim, 2021) ve sosyal toplanma prensiplerini (Jabi, 2018) kamusal alana taşıyabilir.

Sonuç olarak, Şam'da yer alan bu kentsel boşluklar, birer 'sorun' alanı olmaktan çok, kentin 'ekososyal' direncini artırmak için birer 'fırsat' alanı olarak değerlendirilebilir. Bu "Kamusal Ekososyal Avlu" modelinin uygulanması, gelecek kuşaklara aktarılacak kültürel mirasın (avlu) sürdürülebilirliği için kritik bir adımdır ve aynı zamanda kentin hem toplumsal (social) hem de ekolojik (ecological) olarak iyileşmesine katkı sağlayabilir.

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# OSMANLI TAŞRASINDA MİMARİ PROJE UYGULAMALARININ 1898 BALIKESİR ÖRNEKLERİ ÜZERİNDEN BİR OKUMASI

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## ÖZET

Bu çalışma, 29 Ocak 1898 tarihinde meydana gelen ve Balıkesir'de büyük yıkıma yol açan deprem sonrasında Osmanlı taşrasında yürütülen mimari proje uygulamalarını incelemektedir. Depremden hemen sonra başlatılan yeniden inşa faaliyetleri kapsamında, Hüdâvendigâr Vilayeti Nâfi'a Mühendisi Ahmed Fevzi Bey tarafından hazırlanan Zağanos Mehmed Paşa Türbesi, Zağanos Mehmed Paşa Mektebi ve Hacı Kaya Camii projeleri değerlendirilmiştir. 23 Mart 1898 tarihli bu projeler, Osmanlı taşrasında afet sonrası mimari müdahalelerin teknik, idari ve estetik yönlerini belgeleyen özgün örneklerdir. Çalışma, söz konusu projelerin çizim dili, ölçek kullanımı, anlatım teknikleri ve kimlik unsurları üzerinden dönemin mühendislik ve temsil anlayışını irdelemektedir. Bulgular, geç Osmanlı döneminde taşra düzeyinde mimari üretimin belirli bir standartlaşma sürecine girdiğini, mühendislik temelli proje üretiminin kurumsal bir kimlik kazandığını göstermektedir. Ayrıca projeler, taşra ölçeğinde modern mimari temsilin yaygınlaşması ve afet sonrası imar faaliyetlerinde merkezi idarenin teknik rolünün güçlenmesi bakımından da önemli veriler sunmaktadır.

**Anahtar Kelimeler:** Osmanlı taşrası, mimari proje, Balıkesir depremi, Ahmed Fevzi Bey, 19. yüzyıl sonu mimarlığı

## 1. GİRİŞ

Türkiye, jeolojik yapısı itibarıyla dünyanın en etkin deprem kuşaklarından biri üzerinde yer almakta olup, tarih boyunca birçok yıkıcı sarsıntıya maruz kalmıştır. Depremler, yalnızca can ve mal kayıplarına yol açmakla kalmamış, aynı zamanda ülkemizin tarihî ve kültürel mirasında da derin izler bırakmıştır. Özellikle taşra kentlerinde yer alan geleneksel sivil mimarlık örnekleri, dini yapılar ve kamu binaları, depremlerin ardından ağır hasar görmüş; kimi zaman yeniden inşa edilmek, kimi zaman da onarımlarla ayakta tutulmak durumunda kalmıştır. Bu tür afetlerin ardından yürütülen imar ve onarım faaliyetleri, dönemin teknik, idari ve estetik yaklaşımlarını belgelemeleri açısından da büyük önem taşımaktadır.

Balıkesir ve çevresinde meydana gelen en yıkıcı depremlerden birisi, 29 Ocak 1898 tarihinde gerçekleşmiştir. Ramazan ayının ilk haftasına rastlayan ve yerel halk arasında "Koca Zelzele" olarak anılan bu deprem sonrasında, Osmanlı arşiv kayıtlarına göre, Balıkesir'de sağlam kalan yapı sayısı yalnızca 51'dir. Deprem saat 17.00 civarında meydana gelmekle beraber, öncesinde hissedilen öncü depremler nedeniyle halkın büyük kısmının dışarıda bulunması, depremin

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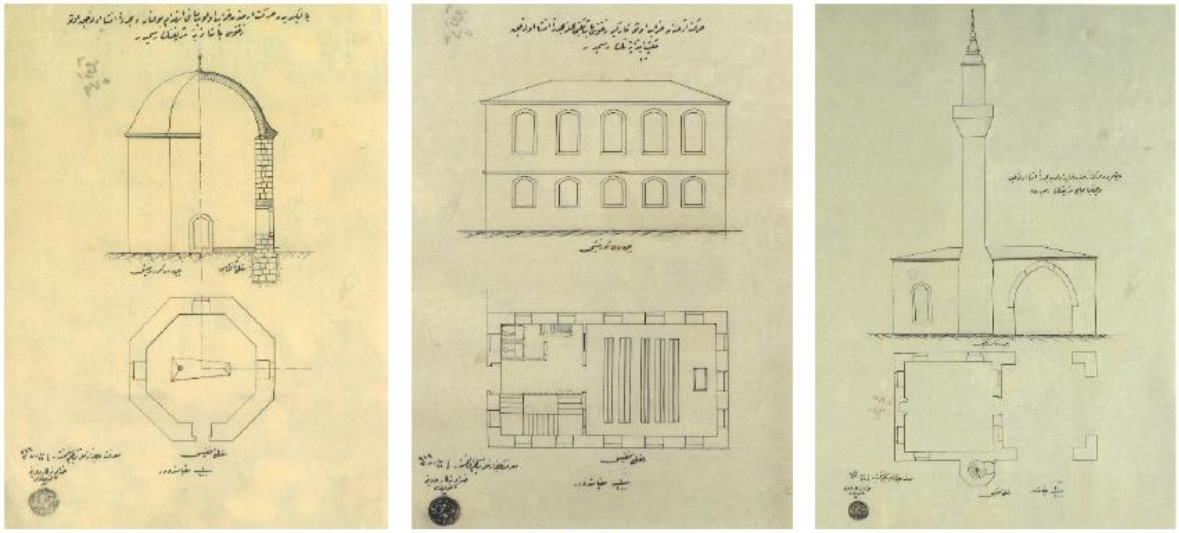
şiddetine kıyasla can kaybının görece düşük olmasını sağlamıştır. Can kaybının yaklaşık 500 olarak kaydedildiği depremin büyüklüğünün 7,0 olduğu tahmin edilmektedir (Şenyurt, 2023, s. 38).

Çobanoğlu (2028) tarafından hazırlanan ve Çevre ve Şehircilik Bakanlığı tarafından yayınlanan Osmanlı Mimarisinde Plan ve Projeler isimli çalışmada yer alan Balıkesir'de bulunan ve Ahmed Fevzi Bey tarafından hazırlanan üç farklı yapıya ait üç adet proje, 23 Mart 1898 tarihinde yapılmıştır. Bu tarihten, depremin üzerinden henüz iki ay bile geçmemişken, bu büyük yıkımın yaralarını sarma faaliyetinin başlatılmış olduğu anlaşılmaktadır.

Bu çalışmada Balıkesir'de büyük depremde çok büyük zarar gördüğü için yeniden inşa edilmeleri maksadıyla Ahmed Fevzi Bey tarafından hazırlanan, türbe, mektep ve cami olmak üzere üç farklı yapı grubuna ait proje çalışmaları incelenecektir. Bunlar, Zağanos Mehmed Paşa Türbesi, Zağanos Mehmed Paşa Mektebi ve Hacı Kaya Camii projeleridir (Görsel 1). Projelerin tamamının üzerinde hazırlanma tarihi olarak R. 11 Mart (1)314 (M. 23 Mart 1898) bilgisi bulunmaktadır.



Zağonos Mehmed Paşa Türbesi | Zağonos Mehmed Paşa Mektebi | Hacı Kaya Camii

**Görsel 1. 1898 Balıkesir Depreminden sonra Ahmed Fevzi Bey tarafından hazırlanan projeler (Çobanoğlu, 2018, s. 340-343).**

Bildiri kapsamında incelenen projelerde müellif bilgisi olarak "Ahmed Fevzi" ismi karşımıza çıkmaktadır. Ahmed Fevzi Bey, hazırladığı projelerde unvan olarak "Hüdâvendigâr Vilayeti Nâfi'a Mühendisi" unvanını kullanmaktadır. Buradan Ahmed Fevzi Bey'in Bursa merkezli Hüdâvendigâr Vilayeti'nin bayındırlık işlerinden sorumlu mühendisi olduğu anlaşılmaktadır. Projelerinde kullandığı kazıma tekniği ile yapılmış olan mühründe "Ahmed Fevzi 1310" (احمد فوزی ۱۳۱۰) ifadesi bulunmaktadır (Görsel 2).

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**Görsel 2. Ahmed Fevzi Bey'in mührü (Çobanoğlu, 2018, s. 343).**

Mühürde bulunan bu bilgiye göre Ahmed Fevzi Bey Hüdâvendigâr Vilayeti Nâfi'a Mühendisliği görevine R. 1310 senesinde (M. 1894-95) getirilmiştir.

## 2. ZAĞANOS MEHMED PAŞA TÜRBESİ PROJESİ

Türbe; cami, hamam, imaret, muvakkithane, muallimhane ve bedestenden oluşan Zağanos Paşa Külliyesi'nin elemanlarından birisidir. Külliye, Balıkesir'in en büyük ve mimari yönden en mükemmel külliyesidir. Günümüzde türbenin yanına ayrı olarak dikilmiş vaziyette bulunan kitabesinde Zağanos Paşa'nın ölüm yılı olan H. 865 (M. 1461) ve türbenin yeniden inşa tarihi olan H. 1329 (M. 1911) tarihleri yer almaktadır (Sözlü, 2014, s. 25, 35). Özgün durumu bilinmeyen türbe, günümüze ulaşan biçimiyle Mutasarrıf Ömer Ali Bey tarafından yaptırılmıştır (Eren, 1994, s. 39).

Ahmed Fevzi Bey tarafından hazırlanan Zağanos Mehmed Paşa Türbesi'nin elimizde bulunan proje çalışması tek paftadan meydana gelmektedir. Paftada planın yanı sıra plan üzerinde gösterilmiş hattan çizilen kısmi kesit ve cephe çizimi bulunmaktadır. Çalışma, ölçekli bir çalışma olduğu halde (1:100), planda ve cephe/kesitte herhangi bir uzunluk ya da yükseklik bilgisi bulunmadığından, orijinal pafta büyüklüğü ile ilgili net olarak bilgi vermek mümkün değildir. Paftanın farklı kısımlarında Osmanlı Türkçesi ile yazılmış bilgilendirmeler mevcuttur. Paftanın üst kısmında iki satır halinde ve paftaya ortalanmış olarak iri puntolarla yazılan ifadenin metni ve transkripsiyonu şöyledir[1] (Görsel 3):

**Metni**

باليكسريده حركت ارضدن خراب اولوب مائل انهدام بولنان و مجددا انشا اولنه جق اولان
زغنوس پاشا تربه شريفنك رسميدر

**Transkripsiyonu**

*Balıkesir'de hareket-i arzdan harâb olup mâil-i inhidam bulunan ve müceddeden inşâ olunacak olan Zağanos Paşa Türbe-i şerifinin resmidir*

Pafta üzerinde plan alt kısma, kesit/cephe ise aynı eksende bulunmak üzere üst kısma yerleştirilmiştir. Kesit/cephe çalışmasının plandan taşınarak vurgulanan ekseninin sağ tarafında kesit, sol tarafında ise cephe çizimi yapılmıştır. Kesit çiziminin altına "*Makta'-ı şakulîsi*" (مقطع شاقوليسي) ifadesi; cephe çiziminin altına da *"Cebheden görüntüsü"* (جبهه دن گورونيشي) ifadeleri yazılmak suretiyle çizimler hakkında bilgilendirme yapılmıştır. Günümüzde modern proje çalışmalarında "kısmi kesit" olarak ifade edilen ve arkeolojik seramik buluntularda daha sık

[1] Proje üzerindeki özgün metinlerin transkripsiyonlarını yapan ve Osmanlı Türkçesi ile yazımını gerçekleştiren Fatma El Casim ve Rama Rai'ye; kontrol eden Doç. Dr. Bahar Sultan Qurraie'ye teşekkür ederim.

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olmak üzere mimari çalışmalarda da zaman zaman kullanılan bu teknik, dönemine göre gayet modern bir mimari anlatım tekniği olarak yorumlanabilir.

Paftanın alt kısmında türbenin planı bulunmaktadır. Planın altında iki satırlık bir bilgilendirme notu yer almaktadır. Bunlardan üstteki "*Makta'-ı ufkîsi"* (مقطع افقيسي) ifadesi olup, çizimin plan çalışması olduğunun bilgisini vermektedir. Bunun hemen altında yer alan ikinci satırda ise *"1/100 mikyasındadır"* (مقياسنده در $\frac{1}{100}$) ifadesiyle paftanın çizim ölçeği belirtilmiştir.

Paftanın sol alt kısmında proje müellifi ile ilgili bilgilendirmeler, Ahmed Fevzi Bey'in kendi ifadeleri ile yapılmıştır. 4 satır halinde yapılan açıklamanın metni ve transkripsiyonu şöyledir:

| **Metni** | **Transkripsiyonu** |
|---|---|
| معرفت عجيزم له تنظيم قلنمشترا في ١١ مارت سنه ٣١٤ | *Ma'rifet-i âcizânemle tanzim kılınmıştır \| Fî 11 Mart sene 314* |
| خداوندگار ولايتي | *Hüdâvendigâr Vilâyeti* |
| نافعه مهندسي | *Nâfia Mühendisi* |
| بنده | *Bende* |

Bu bölümde bilgilendirme olarak verilen tarihte Rumi takvim tarihlendirmesi kullanılmıştır. Burada verilen *"Fî 11 Mart sene (1)314"* tarihi, miladi takvime göre 23.03.1898 tarihini vermektedir. Bu bölümdeki bilgilendirmelerin altında da Ahmed Fevzi Bey'in mührü bulunmaktadır (Görsel 3).

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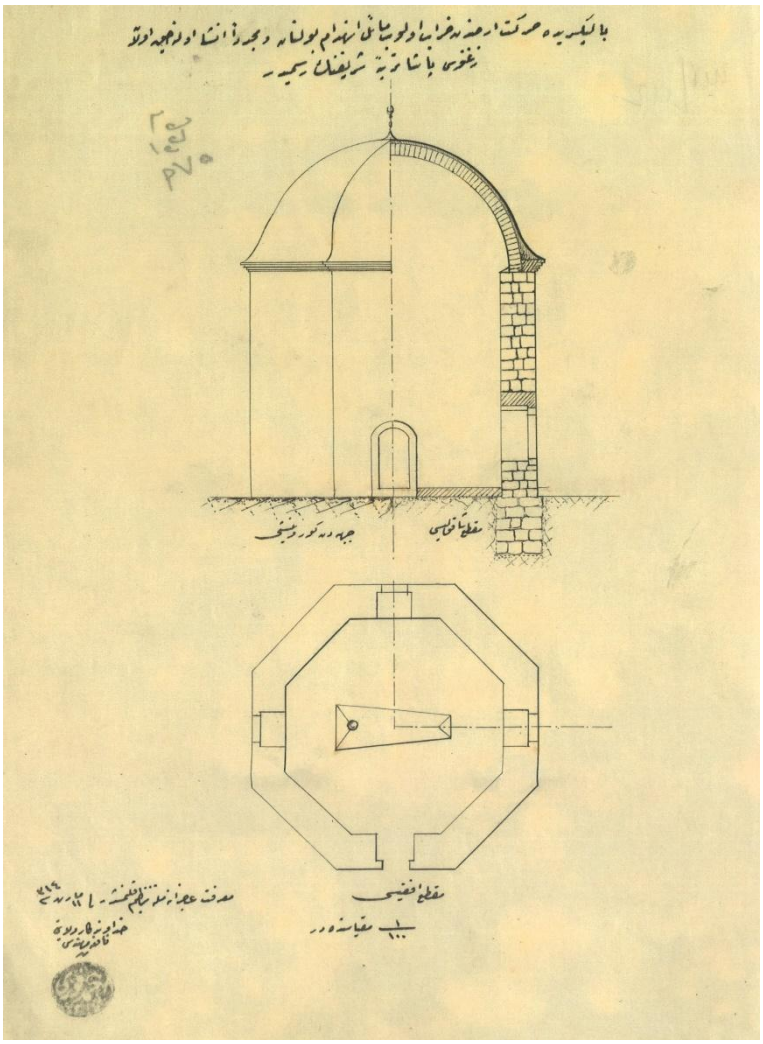

**Görsel 3. Zağanos Mehmed Paşa Türbesi projesi (Çobanoğlu, 2018, s. 340).**

Proje hazırlanırken, özellikle plan çiziminde oldukça sade bir dil kullanılmıştır. Tamamında aynı kalınlıktaki kalemin kullanıldığı çalışmada kapı ve pencere boşlukları net olarak ifade edilmiştir. Ayrıca kesitin alındığı yatay hat plan merkezine kadar kesit işaret çizgisiyle gösterilmiş, ortada son bulan bu hattın merkezde (orta aksta) sona erdiği bilgisi de kesit çizgisi düşey yönde devam ettirilmek suretiyle ifade edilmiştir. Türbenin içinde bulunan mezarın sandukası da baş ve ayak tarafı tereddütsüz belli olacak şekilde detaylı biçimde çizilerek gösterilmiştir (Görsel 3). Planda yön bilgisi bulunmamaktadır.

Kesit/cephe çiziminin kesit kısmında duvar ve kubbenin kesit dokusu çalışma üzerinde taranarak ifade edilmiştir. Buna göre yapının inşasında temel ve duvarlarda taş malzemenin, örtü sistemini meydana getiren kubbede ise tuğla malzemenin kullanılacağı çizim üzerinde net olarak okunabilmektedir. Kesitin sağ tarafında kesilen pencere, lentosu da dahil olmak üzere kesit üzerine işlenmiştir. Türbenin temel duvarlarının yapının duvarlarından daha kalın olduğu da kesit çiziminde gösterilmiştir. Su basman kotunun toprak kotundan bir miktar yukarıda olduğu çizimle ifade edilmişken, su basman kotunun değeri verilmemiştir. Kubbe ile örtülü üst bölümde kubbenin inşa malzemesi haricinde bir kaplama ile kaplanacağı çizilerek ifade edilmiştir. Sekizgen formlu yapının kesit çalışmasında, görünüşe giren karşı duvarla açılı duvarın birleştiği düşey çizgi gösterilmemiştir. Ayrıca giriş kapısı aksında bulunan arka

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cephedeki pencere de mimari anlatım tekniklerinin gereği olarak çizimin kesit kısmında görünüş olarak ifade edilmesi gerekirken bu detay dikkate alınmamıştır (Görsel 3).

Kesit/cephe çiziminin cephe kısmında fazla detaya girilmemiştir. Giriş kısmında yarım olarak gösterilmesi gereken giriş kapısının tamamı görünüş olarak çizilmiştir. Kesitte de vurgulanan saçak kornişleri, cephe duvarı ile örtünün birleştiği hatta olması gerektiği gibi aktarılmıştır. Ancak cepheye yansıyan kubbe ifadesinde kubbenin parçalı olarak gösterilmesi, aynı durumun kesitteki anlatımla örtüşmemesi çalışmada yapılan anlatım tekniği hatası olarak dikkati çekmektedir (Görsel 3). Kesit/cephe çalışmasında herhangi bir yükseklik ya da genişlik bilgisi bulunmamaktadır.

Ahmed Fevzi Bey türbenin iç kısmını tek sandukalı olarak çizmişken, günümüzde bu türbede ikinci bir sanduka bulunmaktadır. Bu sandukanın, Zaganos Paşa'nın hanımı ve Oruç Gazi Bey'in kızı olan Sitti Nefise Hatun'a ait olduğu tahmin edilmektedir (Mutaf, 1996, s. 20). Ancak Ahmed Fevzi Bey tarafından dönemde yapılan projede tek sandukalı bir mezarın bulunması, buraya daha sonra başka bir defin yapılmış olma ihtimalini de akla getirmektedir.

Zağanos Paşa Türbesi'nin mimarisi, günümüzde Ahmed Fevzi Bey'in günümüze ulaşan çizimlerinden oldukça farklıdır. Burada paftada başlık olarak kullanılan "müceddeden" ifadesini irdelemekte fayda vardır. "Ceddede" (جدد) kelimesi Arapça'da, "yenilendi", "restore edildi" anlamına gelmektedir (Tüfekçioğlu, 2002, s. 114). Müceddeden (مجددا) terimi ise yapıların asli plan şemalarında değişikliğe gidildiği durumlarda kullanılmaktadır (Dündar, 2001, s. 277). "Ceddede" terimi sanat tarihi açısından değerlendirildiğinde, mutlak surette, yapı ya da yapı elemanlarının onarımını ve bazen de bütünüyle yenilenmesini belirtmek için kullanılmaktadır (Özkurt, 2006, s. 80). Ahmed Fevzi Bey'in çalışması bu bilgiler dahilinde değerlendirildiğinde yenilenen yapıda bilerek ya da bilmeyerek bazı değişikliklerin olması ihtimal dahilindedir. Türbe, Ahmed Fevzi Bey'in planlarında da gününüzdeki gibi sekizgen formludur. Ancak Ahmes Fevzi Bey'in çalışmasında plan duvarlardan meydana gelirken, günümüzdeki yapı baldeken özellik göstermekte olup, örtü, sütunlar tarafından taşınmaktadır. Örtü ise ahşap bağdadi kubbe şeklindedir. Türbe camekânlarla kapatılmıştır (Sözlü, 2014, s. 36).

Balıkesir depreminden bir süre sonra Karesi Evkâf Muhasebecisi Halid Bey ve arkadaşları tarafından yapıldığı ifade edilen bir şikâyet sonucunda Balıkesir'de Gazi Zağanos Mehmed Paşa'nın kâgir türbesinin yıkıldığı, arsasının bir kısmı yola katıldıktan sonra bir kısmına ahşaptan dar bir türbe inşa edildiği ifade edilmektedir (Şenyurt, 2023, s. 241). Bu yazışmalarla beraber dosyaya eklenerek arşiv kayıtlarına geçen bir fotoğraf, türbenin depremden sonraki durumunu göstermesi açısından önemlidir (Görsel 4). Buna göre türbenin depremden sonraki mimari yapısı ile bugünkü yapısı birbirine uyumludur. Ancak deprem öncesi durumuyla ilgili net bilgi bulunmamaktadır.

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Türbenin 20 yy. başındaki durumu
(Şenyurt, 2023, s. 242)



Türbenin günümüzdeki durumu
(Url-1)

**Görsel 4. Zağanos Paşa Türbesi'nin günümüzdeki durumu**

## 3. ZAĞANOS MEHMED PAŞA MEKTEBİ PROJESİ

Ahmed Fevzi Bey tarafından 1898 Balıkesir depreminden sonra hazırlanan Zağanos Mehmed Paşa Mektebi'nin elimizde bulunan proje çalışması tek paftadan meydana gelmektedir. Pafta, planın yanı sıra paftanın üst kısmına çizilmiş cephe çiziminden meydana gelmektedir. Çalışma, ölçekli bir çalışma olduğu halde (1:100), planda ve cephede herhangi bir uzunluk ya da yükseklik bilgisi bulunmamaktadır. Bu sebeple orijinal pafta büyüklüğü ile ilgili net olarak bilgi vermek mümkün değildir. Paftanın farklı kısımlarında Osmanlı Türkçesi ile yazılmış bilgilendirmeler mevcuttur. Paftanın üst kısmında iki satır halinde ve paftaya ortalanmış olarak iri puntolarla pafta hakkında bilgi veren başlık kısmı bulunmaktadır. Bu başlığın metni ve transkripsiyonu şöyledir (Görsel 5).

**Metni**

حركت ارضدن خراب اولان كارگر زغنوس پاشا مكتبي محلنه مجددا انشا اولنه جق
مكتب ابتدائيه نك رسميدر

**Transkripsiyonu**

*Hareket-i arzdan harâb olan kârgir Zağanos Paşa Mektebi mahalline müceddeden inşâ olunacak mekteb-i ibtidâiyyenin resmidir*

Pafta üzerinde üst kısımda cephe, altında ise plan bulunmaktadır. Cephe çiziminin altına *"Cebheden görünüşü"* (جبهه دن گورونشي) ifadesi yazılmak suretiyle çizim hakkında bilgilendirme yapılmıştır. Paftanın alt kısmında mektebin planı bulunmaktadır. Planın altında iki satırlık bir bilgilendirme yer almaktadır. Bunlardan üstteki "*Makta'-ı ufkîsi"* (مقطع افقيسي) ifadesi olup, çizimin plan çalışması olduğunun bilgisini vermektedir. Bunun hemen altında yer alan ikinci satırda ise *"1/100 mikyasındadır"* (مقياسنده در $\frac{1}{100}$) ifadesiyle paftanın çalışma ölçeği belirtilmiştir.

Paftanın sol alt kısmında proje müellifi ile ilgili bilgilendirmeler bulunmaktadır. Bu bölümde yapılan bilgilendirmeler, Türbe planındaki bilgilendirmelerle aynıdır. Son satırdan sonra

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Ahmed Fevzi Bey'in mührünün bulunduğu bilgilendirmenin metni ve transkripsiyonu şöyledir (Görsel 5).

| Metni | Transkripsiyonu |
|---|---|
| معرفت عجيزم له تنظيم قلنمشتر | في ١١ مارت سنه ٣١٤ | *Ma'rifet-i âcizânemle tanzim kılınmıştır | Fî 11 Mart sene 314* |
| خداوندگار ولايتي | *Hüdâvendigâr Vilâyeti* |
| نافعه مهندسي | *Nâfia Mühendisi* |
| بنده | *Bende* |

Proje hazırlanırken, oldukça sade bir dil kullanılmıştır. Aynı kalınlıktaki kalemle yapılan çalışmada ıslak hacimlerinin ifade edildiği kısımda kesik çizgi kullanılmıştır (Görsel 5).

Yapı, cephe çiziminden anlaşıldığı üzere iki kattan meydana gelmektedir. Alt kat yüksekliğinin üst kata göre daha az olması, yapının esas kullanım katının birinci kat olduğunu göstermektedir. Bununla beraber planda herhangi bir ölçü ve cephede de herhangi bir kot bilgisi bulunmadığı için kat yüksekliklerinin ne kadar olduğu net olarak belli değildir. Ancak yapının 18 rıhttan meydana gelen bir merdivene sahip olması, günümüz merdiven standartlarıyla kıyaslandığında zemin kat yüksekliğinin yaklaşık 3 metre olma ihtimalini güçlendirmektedir.

Dikdörtgen planlı yapıya dar kenarın ekseninde açılmış genişçe bir kapı ile girilmektedir. Girişin hemen sağına konumlandırılmış üç kollu köşede sahanlıklı merdivenin bir bölümünün giriş kısmının korkulukla kapatılmış olarak ifade edilmiş olması, planın üst kat planı olduğunu doğrularken, bu durum, planda gösterilen giriş kapısının üst katta bulunamayacağı hususuyla birlikte değerlendirildiğinde, her iki kat planının da aynı plan üzerinde gösterilmiş olması ihtimaliyle açıklanabilir.

Merdivenin karşısında, girişin solunda bulunan boş alanda ıslak hacimler noktalı çizgilerle belirtilmiştir. Bu durum muhtemelen ıslak hacimlerin alt katta bulunduğunu ve üst katta bu kısmın fuaye olarak düşünüldüğünü göstermektedir. Sınıf ile bu alanı ayıran bölme duvarında yer alan pencere de bu ihtimali güçlü hale getirmektedir (Görsel 5).

Islak hacim olarak düşünülen kısımda iki adet kabin yer almaktadır. Kabinlerin içinde bulunan alaturka hela taşları da tefriş olarak planda gösterilmiştir. Kabinlerin açıldığı alanda bulunan lavabo da tefriş olarak anlatımda ifade bulmuştur. Islak hacimlerin dışında bulunan geniş lavabo ise, bu kısmın tuvalet ihtiyacı olmadan yalnızca el yıkama ya da abdest alma ihtiyacı olanlara yönelik düşünülmüş olabileceğini göstermektedir. Kesik çizgilerle ifade edilen ve alt katta olduğunu tahmin ettiğimiz bu birimlerin dışında planda alt katın yapı ve mekân özellikleriyle ilgili başka bir bilgi okunamamaktadır (Görsel 5).

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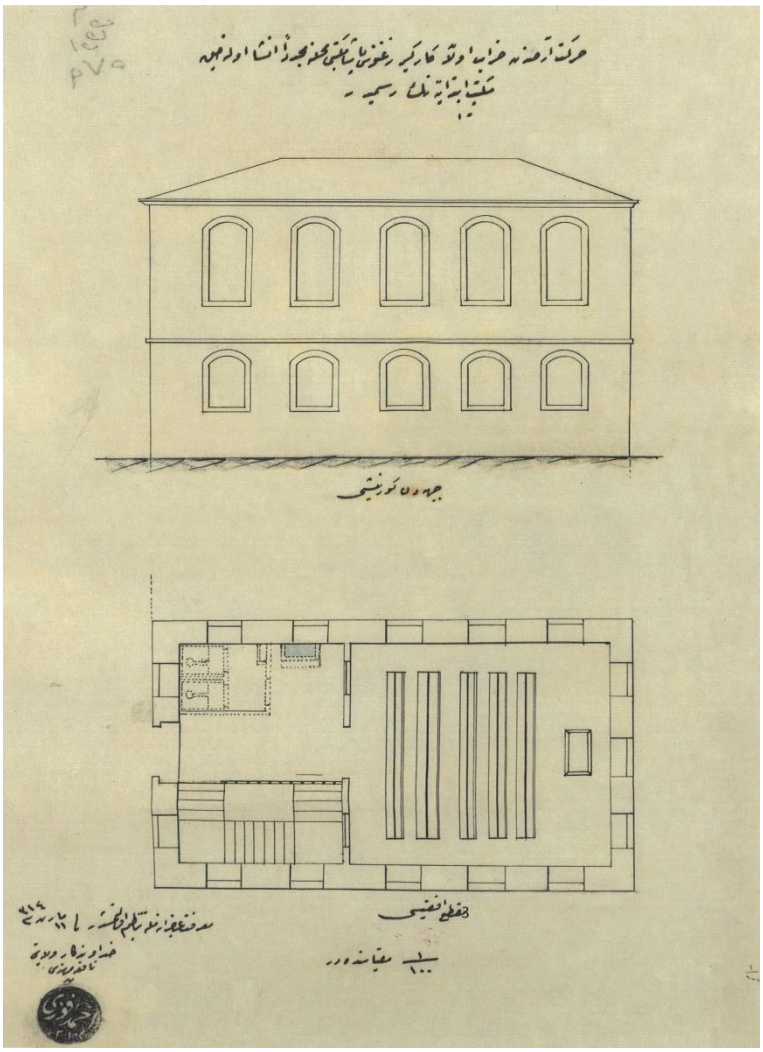

**Görsel 5. Zağanos Mehmed Paşa Mektebi projesi (Çobanoğlu, 2018, s. 341)**

Mektebin üç yönden üçer pencere ile aydınlatılan sınıf kısmında oturma düzeni ve hocanın kullandığı kürsü, tefriş olarak plana işlenmiştir.

Cephe çiziminde katlar arası ve saçak altı yatay silmelerle vurgulanmıştır. Katlar arasındaki silme düz olmasına karşın, saçak silmesinin geometrik profilli olduğu anlaşılmaktadır. Örtü kırma çatı olarak çizilmiş olup, ölçekli cephe çizimi üzerinde yapılan hesaplamada çatı eğiminin yaklaşık %30 olarak alındığı anlaşılmaktadır. Söveli ve basık kemerli pencerelerin kullanıldığı cephelerde, üst kattaki pencereler, kat yüksekliğine bağlı olarak alt kattaki pencerelere nazaran daha yüksek tutulmuştur. Cephenin oturduğu zemini ifade eden toprak çizgisi de alt kısmı taranmak suretiyle kesit çalışmalarına toprağın gösterimine benzer şekilde ifade edilmiştir (Görsel 5).

Yaptığımız kaynak taramalarında, depremde hasar gördüğü için Ahmed Fevzi Bey tarafından yeniden yapılmak üzere projesi hazırlanan Zağanos Mehmed Paşa Mektebi'nin banisinin Zağanos Paşa'nın oğlu Mehmed Bey olduğu ve yapının caminin avlusunda bulunduğu, ancak mektebin 1898 depreminde yıkıldığı bilgisine ulaşılmıştır (Şenyurt, 2023, s. 249). Bununla beraber, eser hakkında yapılan çalışmaların sadece proje çalışması olarak mı kaldığı ve daha sonra yeniden inşa edilip edilmediği ile ilgili bir bilgiye ulaşılamamıştır.

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## 4. HACI KAYA CAMİİ PROJESİ

Ahmed Fevzi Bey tarafından hazırlanan Hacı Kaya Camii'nin proje çalışması tek pafta olup, pafta, planın yanı sıra paftanın üst kısmına çizilmiş cepheden çiziminden meydana gelmektedir. Çalışma, ölçekli bir çalışma olduğu halde (1:100), planda ve cephede herhangi bir uzunluk ya da yükseklik bilgisi bulunmadığı için orijinal pafta büyüklüğü ile ilgili net olarak bilgi vermek mümkün değildir. Paftanın farklı kısımlarında Osmanlı Türkçesi ile yazılmış bilgilendirmeler mevcuttur. Paftanın üst kısmında iki satır halinde ve paftaya ortalanmış olarak iri puntolarla yazılmış pafta başlığı bulunmaktadır. Başlık metninin yazılışı ve transkripsiyonu şöyledir (Görsel 6):

**Metni**

باليكسريده حركت ارضدن خراب اولوب مجددا انشا اولنه جق
حاجي قيا جامع شريفنك رسميدر

**Transkripsiyonu**

*Balıkesir'de hareket-i arzdan harâb olup müceddeden inşâ olunacak*
*Hacı Kaya Cami-i Şerifinin resmidir*

Pafta düzenlemesinin, üst kısımda cephe, altında ise plan bulunmaktadır. Cephe çiziminin altına *"Cebheden görünüşü"* (جبهه دن گورونشي) ifadesi yazılmak suretiyle çizim hakkında bilgilendirme yapılmıştır. Paftanın alt kısmında caminin plan çizimi bulunmaktadır. Planın alt kısmında tek satır halinde ve iki kısımdan oluşan bir bilgilendirme yer almaktadır. Bunlardan çizime ortalı olarak yazılan soldaki "*Makta'-ı ufkîsi"* (مقطع افقيسي) ifadesi olup, çizimin plan çalışması olduğunun bilgisini vermektedir. Bunun hemen sağında yer alan diğer bilgilendirmede ise üstte küçük puntolarla "mikyas", (مقياس) altında ise *"1/100 mikyasıdır"* (مقياسنده در $\frac{١}{١٠٠}$) ifadesiyle paftanın çalışma ölçeği belirtilmiştir (Görsel 5).

Paftanın sol alt kısmında Ahmed Fevzi Bey'in diğer projelerinde de olduğu gibi aynı bilgilendirmeler bulunmaktadır. Bilgilendirmelerin altında da yine aynı şekilde mühür yer almaktadır (Görsel 5).

| Metni | Transkripsiyonu |
|---|---|
| معرفت عجيزم له تنظيم قلنمشترا في ١١ مارت سنه ٣١٤ | *Ma'rifet-i âcizânemle tanzim kılınmıştır \| Fî 11 Mart sene 314* |
| خداوندگار ولايتي | *Hüdâvendigâr Vilâyeti* |
| نافعه مهندسي | *Nâfia Mühendisi* |
| بنده | *Bende* |

Ahmed Fevzi Bey, Hacı Kaya Camii'nin projesinin hazırlanırken de diğer proje çalışmalarında olduğu gibi sade bir çizim dili kullanılmıştır. Aynı kalınlıkta kalem kullanılarak yapılan standart pafta bilgilendirmeleri dışında çizimlerin üzerinde herhangi bir uzunluk ya da yükseklik bilgisine yer verilmemiştir.

Ahmed Fevzi Bey tarafından depremden hemen sonra hazırlanan Hacı Kaya Camii'nin planı iki bölümden meydana gelmektedir. Son cemaat yeri olarak değerlendirilen arka kısmın dışarıya üç taraftan büyük sivri kemerlerle geçilen geniş açıklıklarla bağlandığı görülmektedir. Cephe çiziminde bu bölümün zemin kotunun bir miktar yukarıda olduğu ifade edilmekle beraber bu kot farkı plan çiziminde gösterilmemiştir. Kareye yakın planlamaya sahip harim kısmı, minarenin bulunduğu doğu kısmı hariç üçer pencereyle aydınlatılmıştır.

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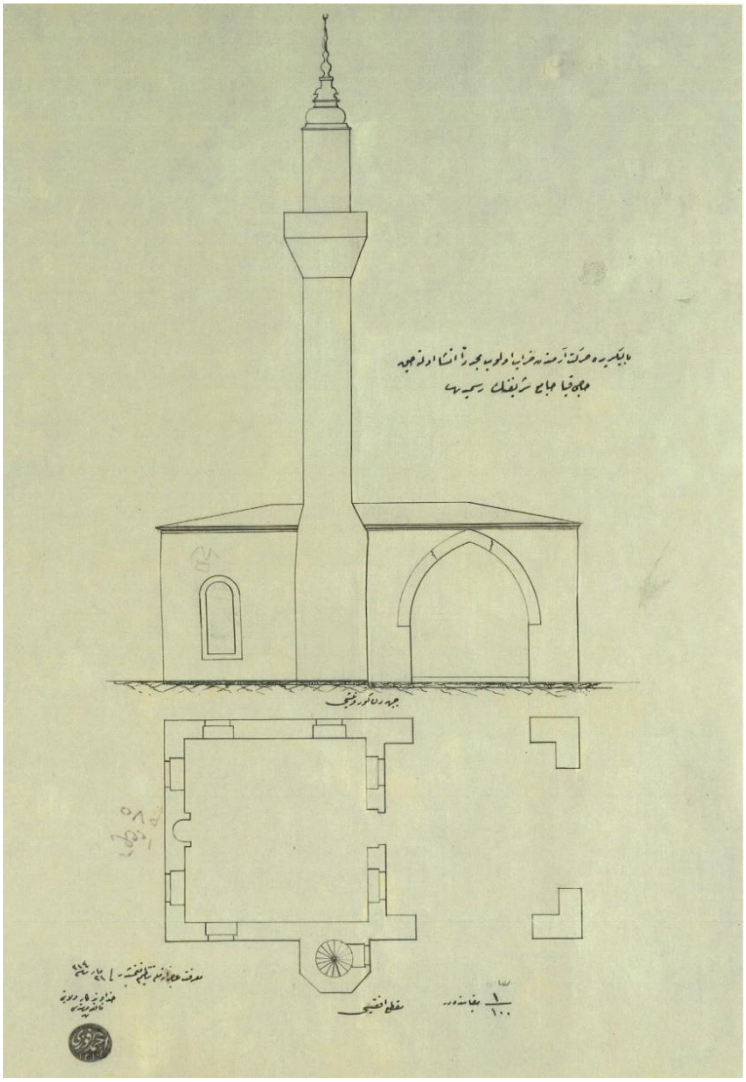
Paftada bulunan diğer çizim ise, minarenin de bulunduğu doğu cephesidir. Duvarın üst tarafının örtü ile birleştiği hatta saçak yerine profilli bir silme dikkat çekmektedir. Kırma çatı örtülü yapının ölçekli cephe çalışmasında yapılan hesaplamalarda çatı eğiminin yaklaşık %20 olarak alındığı hesaplanmıştır. Harim mekânının bu cepheden görülen penceresinin tam kemerli formda ve söveli olarak düşünüldüğü, yüksekliğinin de fazla tutulduğu görülmektedir. Yine bu cepheden son cemaat mahalline geçişi sağlayan sivri kemerle geçilen açıklıkta kemer taşlarının vurgulu hale getirildiği gözlenmektedir (Görsel 6).



**Görsel 6. Hacı Kaya Camii projesi (Çobanoğlu, 2018, s. 342)**

Minare bu cephede bulunduğu için, minarenin tamamıyla ilgili özelliklerin çizime aktarılması sağlanmıştır. Minarenin kürsü kısmı saçak silmesine kadar uzamakta ve bu kotta başlayan pabuç bölümü ile gövde kısmına geçiş sağlanmaktadır. Pabuç bölümünün simetrik çizilmemesi bir yana, çizim de mimari anlatım teknikleri bakımından olmazsa olmaz kurallar göz ardı edilmiştir. Paftanın genelinde sade bir çizim anlayışı hakimken, cephe çiziminde minarenin alem kısmı iyi bir çizim işçiliğiyle ve paftanın diğer kısımlarına kıyasla dikkat çeken bir özenle çizilmiştir (Görsel 6).

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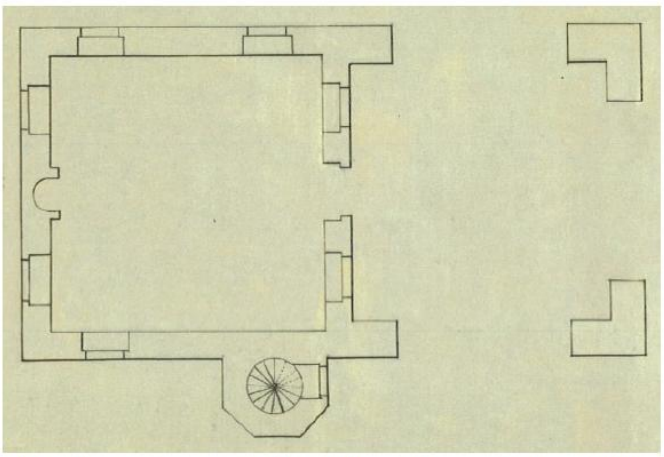
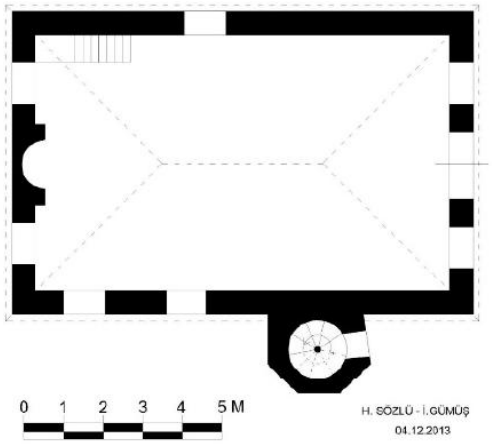
Hacı Kaya Camii'nin ilk inşa tarihi olarak 1863-73 yılları arasıdır (Mutaf, 1996, s. 48). 1898 yılında projelerinin hazırlanması, inşa edildiği tarihin üzerinden çok fazla zaman geçmeden yaşanan büyük depremde çok ciddi anlamda hasar aldığını ve belki de yıkıldığını göstermektedir. Daha sonra yenilenen cami, günümüzde Karesi mahallesinde halen ayakta olup kullanılmaktadır. Ancak caminin günümüzdeki planı ile Ahmed Fevzi Bey tarafından hazırlanan projeleri arasında ciddi farklar bulunmaktadır (Görsel 7). Yapı günümüze gelen haliyle harim ve minareden oluşmaktadır. Bununla beraber, 1898 yılında hazırlanan projelerinde görüldüğü gibi sadece harim değil, son cemaat yeri de olmak üzere iki bölümden meydana gelmektedir. Bu durum, caminin yeniden inşasında Ahmed Fevzi Bey tarafından hazırlanan projelere uyulmadığı ya da sonraki dönemde yapılan köklü onarımlarda bazı değişikliklere gidildiği şeklinde yorumlanabilir.



Hacı Kaya Camii'nin Ahmed Fevzi Bey tarafından 1898 yılında çizilen planı (Çobanoğlu, 2018, s. 342)




Hacı Kaya Camii'nin günümüzdeki (2013 yılı) planı (H. Sözlü arşivi)

**Görsel 7. Hacı Kaya Camii'nin planları**

## 5. SONUÇ

1898 Balıkesir depremi, yalnızca bir doğal afet olarak değil, aynı zamanda Osmanlı taşrasındaki mimari üretim, proje hazırlama ve uygulama süreçlerinin anlaşılmasına imkân tanıyan önemli bir kırılma noktası olarak değerlendirilmelidir. Depremin hemen sonrasında başlatılan yeniden inşa faaliyetleri, Osmanlı Devleti'nin taşra teşkilatlarında mühendislik hizmetlerinin kurumsallaşma düzeyini, teknik müdahale kapasitesini ve idari reflekslerini ortaya koymaktadır. Depremden henüz iki ay sonra, Hüdâvendigâr Vilayeti Nâfi'a Mühendisi Ahmed Fevzi Bey tarafından türbe, mektep ve cami gibi farklı işlevlerdeki yapı gruplarına ait projelerin hazırlanmış olması, merkezden taşraya yayılan bir planlı müdahale sürecine işaret etmektedir.

Ahmed Fevzi Bey'in hazırladığı projeler, dönemin taşra ölçekli mimari üretim anlayışını temsil eden nadir belgelerden olup, teknik ve estetik açıdan önemli ipuçları sunmaktadır. Bu projelerde, sade bir çizim dili kullanılması, ölçek ve açıklama sistematiğinde birlik bulunması ve mühür, unvan, tarih gibi kimlik unsurlarının düzenli biçimde yer alması, geç Osmanlı döneminde mimari projelendirme pratiğinin belirli bir standartlaşma sürecine girdiğini göstermektedir. Ayrıca projelerde kullanılan kısmi kesit anlatımı ve yapı malzemelerinin çizim

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üzerinde açık biçimde belirtilmesi, dönemsel olarak gelişmiş bir teknik temsil yetkinliğine işaret eder.

Bildiride incelenen Zağanos Mehmed Paşa Türbesi, Zağanos Mehmed Paşa Mektebi ve Hacı Kaya Camii projeleri, Balıkesir'in deprem sonrası yeniden imarında tipolojik çeşitliliğin korunduğunu; dinsel, eğitimsel ve anıtsal yapıların eşzamanlı olarak ele alındığını göstermektedir. Bununla birlikte, projelerin bir kısmının inşa edilip edilmediğine dair belirsizlikler, Osmanlı taşrasındaki uygulama sürecinin her zaman projelerle birebir örtüşmediğini de ortaya koymaktadır. Özellikle Hacı Kaya Camii örneğinde günümüzdeki plan ile proje arasındaki farklar, bu tür projelerin bazen yalnızca onarım rehberi veya öneri taslak olarak değerlendirildiğini düşündürmektedir.

Sonuç olarak, 1898 Balıkesir örnekleri, Osmanlı taşrasındaki mimari proje üretiminin kurumsal örgütlenmesini, mühendislik temelli teknik temsil anlayışını ve afet sonrası imar uygulamalarını birlikte belgeleyen özgün örneklerdir. Bu projeler, imparatorluğun son döneminde taşrada mimari üretimin yalnızca usta-çırak geleneğine dayalı bir pratik olmaktan çıkıp, mühendislik bilgisiyle desteklenen bir planlama disiplinine evrildiğini göstermektedir. Ahmed Fevzi Bey'in çalışmaları, geç Osmanlı döneminde merkezî teknik teşkilatın taşra kentlerine kadar uzanan etkisini ve modern proje anlayışının yerel ölçekli yansımalarını belgeleyen önemli birer arşiv niteliğindedir.

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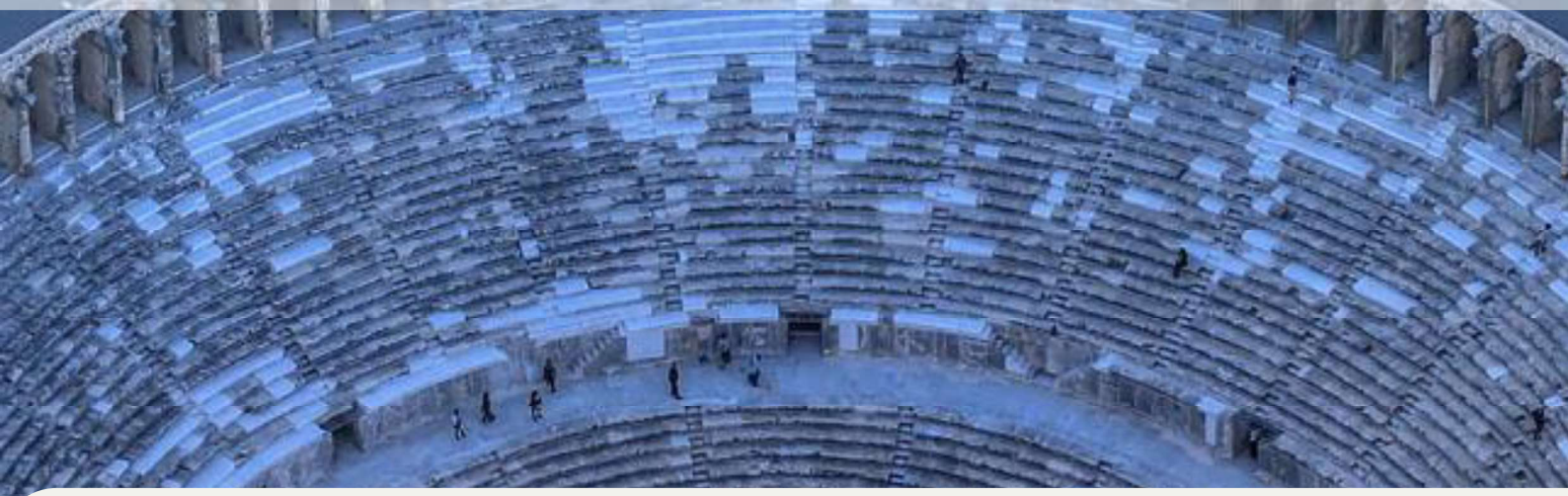


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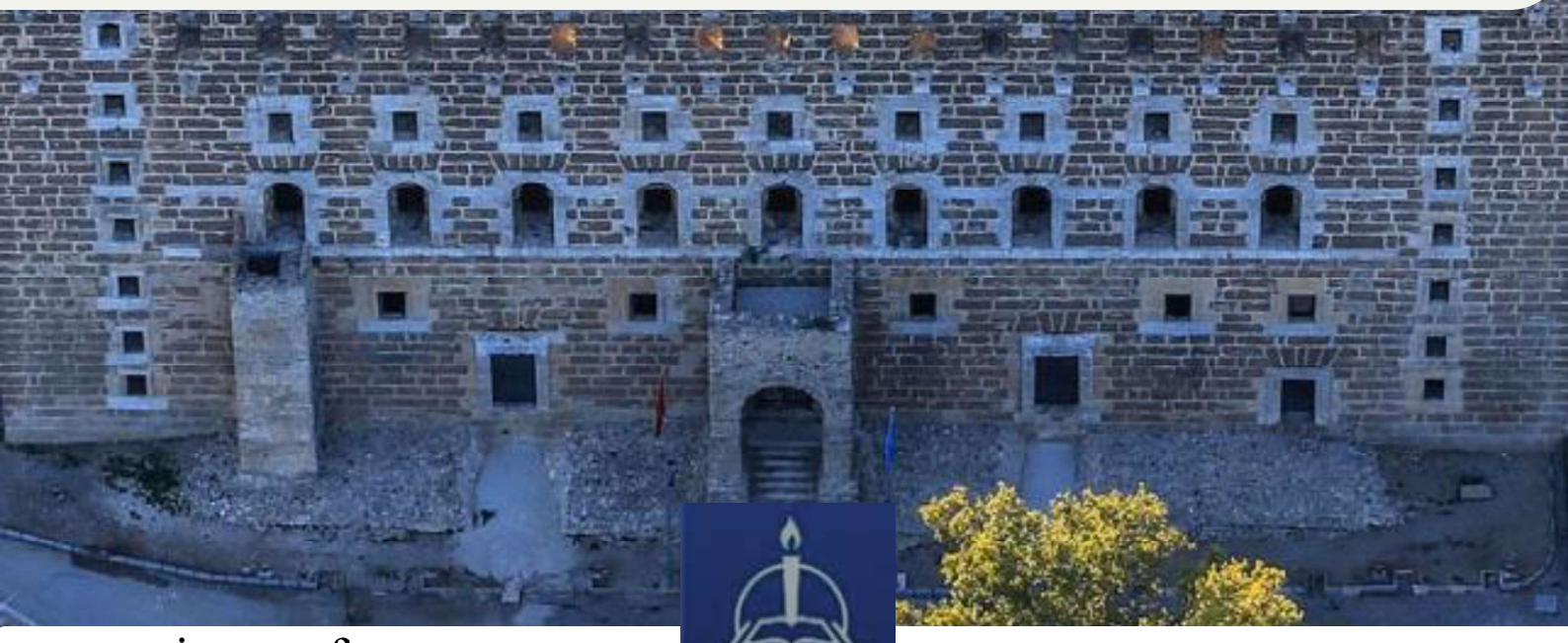


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# SANAYİ KENTİNDEN ÜNİVERSİTE KENTİNE DÖNÜŞÜM: KARABÜK, ÜNİVERSİTE MAHALLESİ

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## ÖZET

Erken Cumhuriyet Dönemi'nin planlı sanayileşme hamlesiyle kurulan Karabük, kentleşme tarihi boyunca farklı konut üretim dinamiklerine sahne olmuştur. Kentin mekânsal gelişiminde üç büyük kırılma noktası bulunmaktadır. Bunlardan üçüncü büyük kırılma noktası, 2007 yılında Karabük Üniversitesi'nin kurulmasıyla ivme kazanan ve kampüs etrafında yer alan bölgenin dönüşümdür. Bu çalışma; Karabük'ün sanayi kenti kimliğinden üniversite kenti kimliğine geçiş sürecinde ortaya çıkan bu yeni yerleşim bölgesini tarihsel gelişim, planlama kararları, mekânsal karakter ve kullanıcı memnuniyeti ekseninde incelemeyi amaçlamaktadır. Araştırma kapsamında bugünkü yoğun konut dokusuna evrildiği tarihsel süreç irdelenmiş, ayrıca bölgedeki kullanıcı deneyimini ölçmek amacıyla "Yaşam Kalitesi (QoL)" ölçeği temel alınarak hazırlanan anket çalışması uygulanmıştır. Üniversite mahallesinden katılımcıların yer aldığı bu çalışmada; aidiyet, güvenlik, konfor ve erişilebilirlik parametreleri analiz edilmiştir. Bölgenin öğrenci ağırlıklı ve geçici nüfus yapısı nedeniyle aidiyet duygusunun ve komşuluk ilişkilerinin zayıf olduğu, özellikle geç saatlerde güvenlik algısının düştüğü belirlenmiştir. Üniversite odaklı gelişen bu bölgenin kente yeni bir merkezilik kazandırmasına rağmen, mekânsal ve sosyal sürdürülebilirlik açısından parçalı ve kimliksiz bir yapı sergilediği görülmüştür. Çalışma, gelecekteki planlamalarda geçici nüfusun ihtiyaçlarına yönelik esnek tasarım ilkelerinin ve sosyal entegrasyonu artıracak kamusal mekân stratejilerinin geliştirilmesini önermektedir.

**Anahtar kelimeler:** Karabük, üniversite, konut, kullanıcı memnuniyeti.

# TRANSFORMATION FROM INDUSTRIAL CITY TO UNIVERSITY CITY: KARABÜK, ÜNİVERSİTE NEIGHBORHOOD

## ABSTRACT

Karabük, founded as part of the planned industrialization drive of the early Republican period, has witnessed diverse housing production dynamics throughout its urbanization history. There are three major turning points in the city's spatial development. The third major turning point was the transformation of the area surrounding the campus, which gained momentum with the establishment of Karabük University in 2007. This study aims to examine this new residential area, which emerged during Karabük's transition from an industrial city to a university city,

through the lens of historical development, planning decisions, spatial character, and user satisfaction. The research examines the historical process through which it evolved into its current dense residential structure. A survey based on the "Quality of Life (QoL)" scale was also conducted to measure user experience in the area. This study, which included participants from the university neighborhood, analyzed the parameters of belonging, security, comfort, and accessibility. It was determined that due to the area's predominantly student and transient population, the sense of belonging and neighborly relations are weak, and the perception of security decreases, especially in late hours. Although this university-focused district has brought a new centrality to the city, it has been observed to exhibit a fragmented and identity-less structure in terms of spatial and social sustainability. The study recommends that future planning incorporate flexible design principles to address the needs of the transient population and develop public space strategies that will enhance social integration.

**Keywords:** Karabük, university, housing, user satisfaction.

## 1. GİRİŞ

Karabük, Erken Cumhuriyet döneminin planlı sanayileşme politikaları çerçevesinde inşa edilmiştir. 1937 yılında Demir Çelik Fabrikası'nın (bugünkü adıyla KARDEMİR) temellerinin atılmasıyla, 13 haneli küçük bir köyden bir sanayi kentine dönüşmüştür. "Cumhuriyet Kenti Karabük" olarak adlandırılan şehir, sadece sanayi üretimi ile değil, modern şehircilik anlayışının Anadolu'da uygulanması açısından da büyük önem taşımaktadır. Şehir, tarım toplumundan sanayi toplumuna geçiş sürecinin somut mekânsal karşılıklarını barındırmaktadır. Fabrikanın kurulmasıyla başlayan iç göç ve nüfus artışı, şehrin idari yapısını da değiştirmiş; 1938'de belediye, 1953'te ilçe ve 1995'te il statüsüne yükselmiştir.

Karabük, konut üretim süreçlerinde sosyo-mekânsal bağlamda çok katmanlı bir gelişim göstermiştir. Cumhuriyet dönemiyle birlikte konut tarihi araştırılırken, dönemdeki etkiler ve kavramın içeriği bağlamında bir de kentleşme kavramı dikkate alınmalıdır. Kentleşme kavramı; "Bir yerleşmede, ya da, bir ülkenin yerleşmelerinde tarımsal olmayan üretim oranının artması ve tüm üretimin denetim ve koordinasyonunun yoğunlaşması sonucu, büyüklük, yoğunluk, heterojenlik, bütünleşme derecelerinin artması olayıdır (Mimarlar Odası, 1971).", "Sanayileşmeye ve toplumsal gelişmeye paralel olarak kent sayısının artması ve var olan kentlerin büyümesi sonucunu doğuran, toplum yapısında artan oranda örgütleşme, işbölümü ve uzmanlaşma yaratan, insan davranış ve ilişkilerinde kentlere özgü değişikliklere yol açan bir nüfus birikim süreci (Hasol, 2017)." ve "Şehirleşme işi, özellikle sanayinin gelişmesi sonucu nüfusun şehirlerde toplanması ve şehir alanlarının genişlemesi süreci (Türk Dil Kurumu, 2025)." gibi açıklamalarla tanımlanmıştır.

Cumhuriyet döneminde konut politikalarını izleyebilmek için bu konuda çeşitli araştırmacılar tarafından yapılan çalışmalara bakmak gerekmektedir:

1. Keleş (1989), başkentin Ankara'ya taşınmasıyla birlikte kamu görevlilerinin barınma sorununa odaklanılan 1923-1945 yılları, kentleşmenin hızlandığı ve gecekonduların ortaya çıktığı 1945-1960 yılları, darbe sonrası yoksul ve dar gelirliye yönelik halk konutlarının yaygınlaştığı 1960- 1980 yılları, toplu konutun yaygınlaştığı 1980 ve sonrası olarak dört başlıkta gruplandırmıştır.
2. Tekeli (2012): Kentleşme hızının yavaş olduğu, konuta modernist yaklaşımın olduğu 1923-1950 yılları, kentleşme hızının yükseldiği, konuta popülist yaklaşımın olduğu 1950-1965 yılları, yap-satçı üretimin ve gecekondulaşmanın arttığı, yüksek yoğunluklu konut üretimiyle çevre sorunlarına neden olan 1965-1980 yılları, kooperatif ve toplu konutun hakim olduğu, konut arzındaki artışın hızlandığı 1980-1990 yılları olarak bu dönemleri dört başlıkta ele alarak tariflemiştir.
3. Çoban (2012) ise her dönemin ortak noktasının konut edindirmeye yönelik olduğu vurgusunu yaparak, ulus devletin kuruluşunu içeren 1923-1950 yılları, köyden kente göçün yaşandığı 1950-1980 yılları ve sermayenin kentte kaldığı 1980 ve sonrası olarak konut politikalarını üç başlıkta değerlendirmiştir.
4. Ödekan (2014, 2018), I. ve II. Ulusal Mimarlık üsluplarının örneklerinin verildiği, yabancı mimarların etkisinde başkentin kurulduğu 1923-1950 yılları, uluslararası ilişkilere bağlı, dışa açık liberal kapitalist eğilimin olduğu 1950-1960 yılları, tasarım, teknoloji, malzeme, yapım teknikleri ve estetiğin ön planda olduğu devingen ve üretken olan 1960-1980 yılları, prefabrike yapım, tünel kalıp ve hazır beton kullanımı ile yeni malzemelerin ve dijital teknolojinin ortaya çıktığı 1980-2000 yılları, gökdelenler ve rezidansların görüldüğü 2000 ve sonrası olarak dönemleri beş başlıkta sınırlamıştır.

Kentleşmenin yönüne göre alınan konut politikaları kararları nedeniyle Cumhuriyet Dönemi'ni çeşitli araştırmacılar kendi bulgularına göre farklı dönemlere işaret etseler de ortak bir aralık yakalanabilmektedir. Bu çalışmada dönemler şu şekilde ele alınacaktır:

1. **1923-1950:** Devletin kuruluşunu içeren, devletçi politikaların görüldüğü dönem.
2. **1950-1980:** İşgücü hareketliliğinin yaşandığı, köyden kente göçün olduğu, serbest piyasa ve kooperatiflerin başladığı dönem.
3. **1980-2000:** Kentlerde sermaye birikiminin olduğu, liberal politikaların görüldüğü, kent çeperlerinde büyük ölçekli toplu konut projelerinin başladığı dönem.
4. **2000 ve sonrası:** Globalleşmenin yaşandığı, kentsel dönüşüm projelerinin hızlandığı, lüks konut ve dikey yapılaşmanın ön plana çıktığı dönem.

## 2. KARABÜK'TE KONUT ÜRETİM SÜREÇLERİ

Türkiye'deki kentleşmeyle ilgili konut politikalarını inceledikten sonra, Karabük'teki konut üretim süreçlerine ve şehrin gelişiminin kırılma noktalarına baktığımızda üç ana dönem ve bölgeden bahsetmek mümkündür:

1. **Yenişehir Bölgesi:** 1938'den itibaren sanayiye bağlı konut üretimi kapsamında oluşturulmuştur. Fabrika çalışanları için bahçeli ev düzeninde, sosyal donatıları (sinema, kulüp, spor alanları vb.) içeren modern bir yaşam alanı olarak tasarlanmıştır. Bu bölge, Cumhuriyet modernizminin mekânsal yansımasıdır.
2. **5000 Evler Bölgesi:** Kooperatifçiliğin ve toplu konut üretiminin görüldüğü bölge 1969'da inşa edilmeye başlanmıştır. Artan nüfus ve gecekondulaşma tehdidine karşı geliştirilen, Türkiye'nin en kapsamlı toplu konut projelerinden biridir. Mülkiyetin tabana yayılmasına katkı sağlamış ve lineer bir gelişim göstermiştir.
3. **100. Yıl Bölgesi:** Üniversite odaklı ve bireysel sermayeyle konut üretimi, Karabük Üniversitesi'nin kurulmasıyla öğrenci nüfusuna yönelik gerçekleşmiştir. Yoğun parsel kullanımıyla öne çıkmıştır.

Bu üç kırılma noktası kentleşmenin şekil değiştirdiği ve şehrin büyüme yönüne etki etmiş faktörlerdir. Bu bağlamda bakıldığında Karabük ilinin Merkez ilçesi Cumhuriyet'in konut politikalarının örnekleriyle irdelenebileceği açık bir laboratuvar ortamı gibidir.

## 3. ÜNİVERSİTE MAHALLESİ

Çalışma kapsamında kırılma noktalarından birinin çeperindeki Üniversite Mahallesi, konumu ve yapısı itibariyle incelenmiştir. Karabük'ün şehirlerarası yolu olan Şehir Ateşe Reşat Moralı Bulvarı üzerinde yer alan mahalle, Karabük Üniversitesi ve 100. Yıl Mahallesi'nden de bu bulvar ile ayrılmaktadır. Güneyde bulvar, kuzeyde 5000 Evler Mezarlığı'yla sınırlanmaktadır. Batı ve doğu yönlerindeyse tepelerle çevrilidir. Karabük Üniversitesi'nin 2007 yılında kurulmasıyla bu bölge de hızla yoğun bir konut ve yurt bölgesine dönüşmüştür.

Karabük ili Merkez ilçesine bağlı 28 mahalleden biri olan Üniversite Mahallesi'nde yapılaşma, dikey büyüme ve yüksek apartman blokları ile karakterizedir. Genel itibariyle site formunda yapı grupları bulunmaktadır. Kamusal açık alanlar ve yaya erişimi açısından eksiklikler bulunmaktadır. 2024 yılı TÜİK raporlarına göre 3.676 kişilik nüfusa sahiptir. İlçenin toplam mahalle nüfusu 121.846 kişidir; Üniversite Mahallesi bu nüfusun yaklaşık %3'ünü oluşturarak, nüfus yoğunluk sıralamasında 11. sıradadır. Aynı bölgede yer alan 100. Yıl Mahallesi ise 14.786 kişilik nüfusuyla en yoğun mahalledir ve ilçe mahalle nüfusunun %12'sini barındırmaktadır. Üniversite Mahallesi'nin nüfusunda 3.343 kişi 18 yaş ve üzeridir. Bu veri de

mahallenin nüfus yapısını anlamak için çok çarpıcıdır. Mahallenin daha çok üniversite odaklı bir yerleşke olarak kullanıldığını ispatlar niteliktedir.

Üniversite Mahallesi'nde yaşayan insanların yaşadıkları konutla ilgili bilgi, deneyim ve memnuniyetlerini ölçerek, katılımcı bir konut bölgesi planlama çalışması için anket yapılması düşünülmüştür. Anket sorularının hazırlanmasında QoL (Quality of Life) ölçeğinden yararlanılmıştır (Cella, 1994). QoL, öznel ve çok boyutlu bir kavram olup kapsayıcı bir özelliğe sahiptir. Fiziksel, sosyal, duygusal ve işlevsel olarak kişinin memnuniyetini birden fazla bakış açısıyla değerlendirerek bir skor oluşturmaktadır. QoL, insanların yalnızca mutlulukları veya gelirleri ile değil; aynı zamanda ihtiyaçlarının karşılanması, sosyal katılımı, aidiyet hisleri, güven, toplumsal ilişkileri ve eşitlik algıları ile bütünsel olarak belirlenen bir yaşam kalitesidir (Philips, 2006).

Ankete mahalleden 41 kişi katılmıştır (Etik Kurul Kararı, 2024). Bunlardan 22'si kadın, 19'u erkektir. Yapılan anketlerdeki katılımcılarla ilgili diğer veriler aşağıda sunulmuştur (Çizelge 1):

**Çizelge 1.** Katılımcı bilgileri.

| MEDENİ DURUM | | YAŞ | | EĞİTİM DURUMU | |
|---|---|---|---|---|---|
| Evli | 27 kişi | 18-25 | 7 kişi | İlkokul | 4 kişi |
| | | 26-35 | 13 kişi | Ortaokul | 6 kişi |
| Bekar | 14 kişi | 36-50 | 15 kişi | Lise | 14 kişi |
| | | 50+ | 6 kişi | Üniversite | 17 kişi |

Katılımcılara toplam 8 adet boşluktan oluşan; yaşadıkları ilde, ilçede, mahallede ve konutta en çok beğendikleri ve hiç beğenmedikleri yanlar sorulmuştur (Çizelge 2):

**Çizelge 2.** Katılımcılara sorulan sorular.

| YAŞADIĞINIZ YERE DAİR GÖRÜŞLERİNİZLE İLGİLİ SORULAR | | | |
|---|---|---|---|
| | | EN ÇOK BEĞENDİĞİM YANI | HİÇ BEĞENMEDİĞİM YANI |
| 1. | Yaşadığım ilin; | | |
| 2. | Yaşadığım ilçenin; | | |
| 3. | Yaşadığım mahallenin; | | |
| 4. | Yaşadığım konutun; | | |

Verilen cevaplar QoL ölçeği kriterlerine göre (güvenlik, aidiyet, erişilebilirlik ve konfor) değerlendirilmeye alınmıştır. Dönüşlerden bu kavramlarla ilgili olan içerikler kategorize edilmiş ve o kritere dair verilen cevap sayıları tespit edilmiştir (Çizelge 3):

**Çizelge 3.** Anket cevaplarının içeriklerinin kategorize edilmesi.

| | | EN ÇOK BEĞENDİĞİM YANI | | | | HİÇ BEĞENMEDİĞİM YANI | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | Yaşadığım ilin; | G | A | E | K | G | A | E | K |
| | | 4 | 4 | 15 | 7 | 3 | 9 | 9 | 13 |
| 2. | Yaşadığım ilçenin; | G | A | E | K | G | A | E | K |
| | | 1 | 5 | 7 | 19 | 2 | 5 | 12 | 8 |
| 3. | Yaşadığım mahallenin; | G | A | E | K | G | A | E | K |
| | | 1 | 9 | 7 | 9 | 8 | 3 | 9 | 3 |
| 4. | Yaşadığım konutun; | G | A | E | K | G | A | E | K |
| | | 5 | 5 | 6 | 17 | 1 | 2 | 3 | 24 |

Tabloya bakıldığında yalnızca yaşanılan konutla ilgili verilen cevaplarda 41 kişinin tamamı konfor hakkında yorum yapmıştır. 17 kişi pozitif, 24 kişi negatif olarak değerlendirmiştir. Kişilere sorular verildiğinde yönlendirme yapılmadığından diğer seçeneklerde bu oran yakalanamamıştır. Yapılan değerlendirmelerde il için pozitif yorum yapan 30 kişi, negatif yorum yapan 38 kişi; ilçe için pozitif yorum yapan 32 kişi, negatif yorum yapan 27 kişi, mahalle için pozitif yorum yapan 26 kişi, negatif yorum yapan 23 kişi; konut için pozitif yorum yapan 33 kişi, negatif yorum yapan 30 kişi tespit edilmiştir.

Üniversite Mahallesi için, bu çalışma kapsamındaki belirlenen kavramlar bağlamında elde edilen sonuçlar şu şekilde özetlenebilmektedir:

1. **Güvenlik:** Güvenlik algısı oldukça düşüktür. Güvensiz hissetme durumunu katılımcıların tamamı kalabalık kaynaklı sebeplere bağlamışlardır. Sosyal güvensizlik de etken olmuştur.
2. **Aidiyet:** Kullanıcı profili çoğunlukla kendini geçici görmekte olduğu için aidiyet hissi düşük bölgedir. Bu nedenle komşuluk ilişkileri de zayıf kalmaktadır.
3. **Erişilebilirlik:** Üniversiteye yürüme mesafesinde olması, merkezi konumda olması erişilebilirlik açısından olumlu bulunmuştur. Ancak kent merkezine ulaşım ve sosyal hizmetlere erişimde yetersizlikler belirtilmiştir.
4. **Konfor:** Katılımcıların cevapları değişkenlik göstermektedir. Binaların yeni olması bir avantaj olsa da yeşil alan, otopark ve sosyal donatı eksikliği konfor düzeyini düşürmektedir. Özellikle konuttaki olumsuzluklar yalıtım sorunu (ısı, ses) kaynaklıdır.

## 4. SONUÇ

Bu çalışma, Erken Cumhuriyet Dönemi'nin planlı sanayileşme hamlesiyle kurulan Karabük'ün, sanayi kenti kimliğinden üniversite kenti kimliğine geçiş sürecini incelemeyi amaçlamaktadır. Karabük'ün mekânsal gelişimindeki üç büyük kırılma noktasından üçüncüsü, 2007 yılında Karabük Üniversitesi'nin kurulmasıyla ivme kazanmış ve kampüs çevresindeki bölgenin dönüşümüne yol açmıştır.

Araştırma, bu yeni yerleşim bölgesini (Üniversite Mahallesi) tarihsel gelişim, planlama kararları, mekânsal karakter ve kullanıcı memnuniyeti eksenlerinde değerlendirmektedir. Bu amaçla, bölgenin mevcut yoğun konut dokusuna evrildiği süreç irdelenmiş ve kullanıcı deneyimini ölçmek için "Yaşam Kalitesi (QoL)" ölçeği temelli bir anket çalışması uygulanmıştır. Üniversite mahallesinden katılımcıların yer aldığı bu çalışmada; aidiyet, güvenlik, konfor ve erişilebilirlik parametreleri analiz edilmiştir.

Çalışmanın temel bulgularına göre, bölgenin ağırlıklı olarak öğrencilerden oluşan ve geçici nüfus yapısı nedeniyle aidiyet duygusunun ve komşuluk ilişkilerinin zayıf olduğu belirlenmiştir. Güvenlik algısı düşüktür ve katılımcılar bu durumu özellikle geç saatlerde kalabalıktan kaynaklanan sebeplere bağlamışlardır. Üniversiteye yakın ve merkezi konumda olması erişilebilirlik açısından olumlu bulunsa da kent merkezine ulaşım ve sosyal hizmetlere erişimde yetersizlikler mevcuttur. Üniversite odaklı gelişen bu bölge, kente yeni bir merkezilik kazandırmasına rağmen, mekânsal ve sosyal sürdürülebilirlik açısından parçalı ve kimliksiz bir yapı sergilemiştir. Binaların yeni olmasına rağmen, yeşil alan, otopark ve sosyal donatı eksikliği ile konutlardaki yalıtım sorunları (ısı, ses) konfor düzeyini düşüren ana etkenlerdir.

Karabük'ün sanayi kenti kimliğinden üniversite kenti kimliğine evrilme süreci, Üniversite Mahallesi örneğinde görüldüğü üzere, hızlı ve yoğun bir yapılaşmayı beraberinde getirmiştir. Ancak bu fiziksel büyüme, sosyal sürdürülebilirlik ve kullanıcı memnuniyeti ile tam anlamıyla desteklenememiştir. Bölgenin kimliksiz ve parçalı yapısı, planlama süreçlerinde sadece barınma ihtiyacının değil, sosyal entegrasyonun da gözetilmesi gerektiğini ortaya koymaktadır. Gelecekteki planlama stratejilerinde; geçici nüfusun ihtiyaçlarına duyarlı esnek tasarım ilkelerinin benimsenmesi, sosyal etkileşimi artıracak kamusal mekanların oluşturulması ve üniversite çevresinin kent merkeziyle ulaşım ağları üzerinden daha güçlü bir şekilde bütünleştirilmesi önerilmektedir.

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# GLOBAL SUSTAINABILITY AND DEVELOPMENT CONGRESS

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# THE IMPACT OF THE EU's DIGITAL PRODUCT PASSPORT ON CONSTRUCTION MATERIALS: TRANSPARENCY, TRACEABILITY, AND COMPETITIVE ADVANTAGES

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## ABSTRACT

The Digital Product Passport (DPP), which will become mandatory by 2026-2030 under European Union regulations, emerges not only as an environmental transformation tool in the construction materials sector but also as a strategic instrument that defines competitive strength. For materials with a high carbon footprint—such as cement, ceramics, insulation products, and window systems—the DPP requires the transparent and traceable recording of all lifecycle data, from raw materials to recycling. This will enhance transparency in material selection and supply chain management, facilitate compliance with green building certifications, and strengthen the position of exporting companies in the EU market. From Turkey's perspective, the adaptation process to the DPP involves challenges such as data management, digital infrastructure, and the preparedness level of SMEs. However, producers who adapt in a timely manner will improve their sustainability performance and gain a competitive edge in the international market.

**Keywords:** Digital Product Passport (DPP), Construction Materials, Traceability, Competitive Advantage

## Introduction

Rising environmental pressures, climate change, the scarcity of natural resources, and the continuous increase in energy consumption on a global scale necessitate the redefinition of production and consumption models. In this context, sustainability has become not merely an environmental concern but a strategic imperative for economic growth, commercial competitiveness, and societal welfare (European Commission, 2020).

The construction industry occupies a central position in sustainability debates due to both its energy-intensive material production processes and its extensive supply chains. Building materials—particularly cement, ceramics, glass, and insulation products—stand out for their high carbon emissions and energy consumption during production. Indeed, the cement sector alone accounts for approximately 7% of global $CO_2$ emissions (Andrew, 2019).

In response to these challenges, the European Union (EU) has developed radical policy instruments within the framework of the **European Green Deal**. Among the most significant of these is the **Ecodesign for Sustainable Products Regulation (ESPR)**, announced in 2022, and its complementary initiative, the **Digital Product Passport (DPP)**. The DPP aims to digitally record and transparently share environmental, chemical, and performance data across a product's entire life cycle—from raw material extraction to recycling (European Commission, 2022).

One of the most critical features of the DPP is its capacity to enhance transparency and traceability. For a building material, the passport will contain comprehensive information such as raw material sources, the type of energy used during production, carbon footprint, percentage of recycled content, and post-use recyclability potential. Thus, beyond mere environmental reporting, the DPP will strengthen trust and transparency across the supply chain. Particularly in the context of **green public procurement** and exports to the EU market, the availability of such transparent data is becoming a fundamental determinant of competitiveness.

From Turkey's perspective, the EU's mandatory implementation of the DPP will have a direct impact on building material exports. The EU constitutes Turkey's largest export market; therefore, manufacturers failing to comply with DPP requirements risk significant market losses. Conversely, firms that successfully adapt will not only gain export advantages but also enhance their brand credibility in terms of sustainability performance, thereby achieving a competitive edge in the domestic market as well.

In conclusion, the **Digital Product Passport** should be regarded not merely as an environmental regulatory tool but as a strategic instrument for **commercial competitiveness, transparency, and traceability** within the building materials sector. This paper discusses the implications of the DPP for the construction materials industry in terms of transparency, traceability, and competitive advantage, while also evaluating the potential opportunities and challenges Turkey may encounter during its adaptation process.

## Digital Product Passport and Supply Chain Transparency

The Digital Product Passport (DPP) represents one of the most innovative instruments within the European Union's circular economy and sustainable production policies. In the building materials sector, one of the DPP's primary functions is to enhance transparency and traceability across the supply chain. The supply chain encompasses multiple actors—from raw material extraction to the delivery of the final product to end-users and its eventual recycling at the end of its life cycle. This multi-layered structure often leads to data fragmentation and a lack of transparency. The DPP seeks to overcome this challenge by consolidating all life-cycle information of a product under a single digital identity (European Commission, 2022).

For a construction material, the DPP will include detailed information such as raw material sources, the percentage of recycled content, energy and water consumption during production, carbon footprint, chemical additives, service life, maintenance instructions, and recycling pathways. Recording this information transparently enables all actors in the supply chain to make more informed decisions. For instance, a contractor could compare the carbon footprints of different cement products and select the one with lower emissions. Similarly, in a public procurement process, DPP data could serve as a direct evaluation criterion for insulation materials.

Beyond tracking environmental metrics, the DPP also contributes to strengthening supply chain reliability. The building materials industry frequently faces issues such as counterfeit documentation, inaccurate product declarations, and non-compliance with standards. Through its digital identity, the DPP enables the verification of product conformity certificates (e.g., EPD, CE marking) and thus helps prevent fraud.

Furthermore, the digital infrastructure of the DPP is supported by technologies such as GS1 identifiers, QR codes, and RFID systems, allowing for real-time tracking of product movements throughout the supply chain. Traceability extends beyond environmental data to include logistics information, manufacturing facility details, and batch/serial numbers.

Supply chain transparency also plays a critical role in international competitiveness. From 2026-2030 onwards, the European Union will restrict market access to products compliant with DPP requirements. Consequently, the DPP will become a mandatory condition for Turkish building materials exporters aiming to access the EU market. Companies that complete the compliance process in a timely manner will not only meet technical regulatory obligations but will also position themselves as trustworthy and verifiable actors within global supply chains.

In conclusion, the Digital Product Passport enhances supply chain transparency and establishes a new trust-, verifiability-, and sustainability-based business model within the building materials sector. This model is expected to generate competitive advantages both environmentally and commercially.

## Competitive Advantage and Market Access

The Digital Product Passport (DPP) is not merely an environmental regulation within the building materials sector; it has emerged as a central instrument in shaping competitive strategy. With the European Union's plan to make DPP compliance mandatory by 2026-2030, the passport will become a prerequisite for access to the EU market for Turkish building materials manufacturers.

The European Union holds a significant share in Turkey's building materials exports. Products such as cement, ceramics, and insulation materials are directly exported to EU member states, where they constitute a major market segment. However, manufacturers that fail to achieve DPP compliance will face market access barriers within the EU. This challenge should not be interpreted solely as an environmental compliance issue but rather as a broader question of commercial sustainability.

DPP compliance provides companies with multiple dimensions of competitive advantage.

✧ First, it enhances customer trust. Transparent and verifiable product data directly influence procurement decisions, particularly in international construction projects.

✧ Second, since the environmental data required for green building certifications (e.g., LEED, BREEAM, EDGE) can be supplied through the DPP, compliant products are more likely to be preferred in sustainable construction markets.

✧ Third, public procurement processes are increasingly integrating sustainability criteria, and DPP compliance is becoming a precondition for participation in such tenders.

In addition, the DPP functions as a certification of a company's corporate sustainability performance, which holds particular significance for investors and financial institutions. Green finance mechanisms and sustainable investment funds are expected to regard firms with verified DPP data as more reliable, thereby granting them access to advantageous financing opportunities.

Another dimension of competitive advantage lies in innovation and differentiation. Firms leveraging DPP data to develop low-carbon products will distinguish themselves within the market. For instance, cements with reduced clinker content or insulation materials with higher recycled content will gain increased marketing value (Habert et al., 2020).

In conclusion, the DPP should be regarded not as a mere technical compliance requirement, but as a strategic investment that drives commercial growth, brand value, and market access for building materials manufacturers. Therefore, it is crucial for Turkish producers to perceive the DPP process not as a cost burden but as an opportunity to establish long-term competitive advantage in both domestic and international markets.

**Turkey's Adaptation Process and Challenges**

Turkey's strong trade integration with the European Union amplifies the direct impact of the Digital Product Passport (DPP). The EU constitutes the largest market share in Turkey's building-materials exports. Therefore, aligning with the DPP framework is a strategic necessity, both environmentally and economically. However, the adaptation process entails several structural and operational challenges.

✧ First, the issue of data management is particularly critical. Many Turkish building-materials manufacturers lack the capacity to systematically collect product-specific information such as carbon footprints, raw-material ratios, and recycled-content levels. Consequently, the detailed datasets required under the DPP framework may be incomplete or inconsistent.

✧ Second, digital-infrastructure deficiencies represent a major barrier. Most small and medium-sized enterprises (SMEs) lack ERP systems, life-cycle-assessment (LCA) software, or integrated digital databases. The digital-infrastructure investments necessary for DPP compliance can be costly for these firms (UNEP, 2020).

✧ Third, the issue of financial burden stands out. Achieving DPP compliance may generate significant costs associated with software investments, expert recruitment, consultancy services, and certification processes. For smaller producers in particular, covering these expenses poses a considerable challenge.

✧ Fourth, supply-chain alignment represents another critical obstacle. A large portion of the raw materials used in building-materials manufacturing is sourced from multiple suppliers. Ensuring transparency throughout the supply chain requires not only manufacturers but also suppliers to provide DPP-compliant data. Yet many suppliers remain unprepared for this transformation.

Nevertheless, Turkey also possesses notable advantages in its adaptation process. The Green Deal Action Plan, announced in 2021, provides a strategic roadmap for sustainability and digital transformation in industry. Moreover, support mechanisms offered by TÜBİTAK, KOSGEB, and regional development agencies facilitate SMEs' investments in green transition and digitalization.

In conclusion, although Turkey's DPP adaptation process involves short-term challenges, it also presents significant long-term opportunities. Companies that achieve compliance will gain competitive advantages in the EU market, while those that fail to do so risk substantial market losses. Therefore, it is essential for Turkey to act swiftly and in a coordinated manner to ensure an effective transition toward DPP alignment.

**Policy Recommendations**

Compliance with the Digital Product Passport (DPP) is a critical prerequisite for maintaining the competitiveness of Turkey's building materials sector. However, this process encompasses not only risks but also significant opportunities. The following recommendations summarize potential strategies for ensuring a successful transition:

*Accelerating legislative alignment:* Turkey should develop national legislation aligned with the European Union's Ecodesign for Sustainable Products Regulation (ESPR) and the Digital Product Passport (DPP) framework. In this regard, the Ministry of Environment, Urbanization and Climate Change, the Ministry of Industry and Technology, and the Turkish Standards Institution (TSE) should collaborate to prepare official DPP guidelines and disseminate them across the sector.

*Supporting digital infrastructure investments:* Access to ERP systems, Life Cycle Assessment (LCA) software, and product data management systems should be facilitated for SMEs through targeted incentives. Development agencies and KOSGEB (Small and Medium Enterprises Development Organization) could restructure their digital transformation grants to specifically support DPP compliance.

*Enhancing supply chain integration:* Building-materials manufacturers should require standardized data formats from their suppliers and organize training programs to support this transition. Furthermore, sectoral associations could establish shared data platforms to enable efficient and transparent information exchange within the supply chain.

*Introducing green financing mechanisms:* Public banks and private financial institutions should develop specialized credit and insurance schemes for DPP-compliant investments. In addition, EU funds and carbon-market mechanisms could serve as vital sources of financing for Turkish manufacturers in their green-transition efforts.

*Promoting education and awareness:* The DPP represents not only a technical adaptation but also a cultural transformation for all stakeholders in the construction sector. Universities, professional chambers, and industry organizations should collaborate to establish training programs and certification systems to build institutional and technical capacity.

*Fostering public–private collaboration:* Pilot projects and demonstration initiatives should be launched to illustrate the practical implementation of DPP requirements. Public institutions can assume a leadership role by mandating the use of DPP-compliant materials in their own projects, thereby setting an example for the private sector.

In conclusion, Turkey's success in the DPP adaptation process depends on a holistic approach that simultaneously addresses regulatory alignment, digital infrastructure, financial mechanisms, and education. Such an integrated strategy will not only preserve the competitiveness of the building materials industry but also advance national sustainability and green-transition objectives.

**Conclusion and Evaluation**

The Digital Product Passport (DPP) represents the onset of a profound transformation within the building materials sector. With its mandatory implementation by the European Union in 2026-2030, the DPP will not only reinforce environmental sustainability but also emerge as one of the core determinants of commercial competitiveness.

For Turkey, this transition encompasses both risks and opportunities. The primary risk lies in the potential market-access barriers that non-compliant firms will face in the EU. Conversely, firms that complete the adaptation process in a timely manner will have the opportunity to increase their market share, enhance brand value, and gain access to favorable financing mechanisms.

One of the most significant contributions of the DPP to the sector is the promotion of transparency and traceability. By recording all data—from raw material sourcing to end-of-life recycling—on a digital platform, the DPP will strengthen trust across the supply chain. In addition, integration with green-building certification systems, prioritization in public procurement, and access to green-finance instruments will provide further strategic advantages.

To ensure an effective transition, Turkey must accelerate regulatory harmonization, support digital-infrastructure investments, foster supplier integration, and enhance education and awareness initiatives. Addressing the financial needs of SMEs and facilitating the process through pilot projects will also be essential for practical implementation.

In conclusion, the Digital Product Passport constitutes a strategic instrument that delivers transparency, traceability, and competitive advantage within the building materials industry. Turkey's rapid and effective alignment with the DPP framework will enhance its competitiveness not only in the EU market but also globally. When properly implemented, the DPP has the potential to establish a powerful bridge between environmental sustainability and economic growth, advancing both national and international sustainability objectives.

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# YAŞLANAN TOPLUMLAR İÇİN EVRENSEL TASARIM YAKLAŞIMLARI: TÜRKİYE PERSPEKTİFİNDEN BİR İRDELEME

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## ÖZET

Son yıllarda ortalama yaşam süresinin artması ve doğurganlık oranlarının düşmesi, nüfus yapısında önemli bir dönüşüme yol açmış ve yaşlı bireylerin oranı hızla yükselmiştir. Bu demografik değişim, bağımsız yaşam, hareketlilik ve mekânsal kullanım açısından yeni gereksinimler doğurmuştur. Bu noktada şehirlerin, konutların ve kamusal alanların erişilebilir, güvenli ve kapsayıcı biçimde planlanması kritik önem taşımaktadır. Evrensel tasarım ilkeleri, farklı yaş ve yetkinlik gruplarının mekânları eşit koşullarda kullanabilmesini sağlayarak yaşlanan toplumların karşılaştığı mimari engellere çözüm sunmaktadır. Bu çalışmanın amacı, Türkiye'de yaşlanan nüfusun kentsel ve yapılı çevrede karşılaştığı erişim sorunlarını evrensel tasarım yaklaşımları çerçevesinde incelemek ve uluslararası örneklerle karşılaştırarak geleceğe yönelik öneriler geliştirmektir. Türkiye'de kamusal alanlar, toplu taşıma yapıları, konutlar ve sağlık tesislerinde erişilebilirliği sınırlayan sorunlar devam etmektedir. Bu durum, mimari mekânların kullanıcı çeşitliliğini yeterince karşılayamadığını ortaya koymaktadır. Uluslararası deneyimler, mimari mekânlarda evrensel tasarım uygulamalarının yalnızca erişilebilirlik sağlamakla kalmadığını, aynı zamanda kullanıcıların bağımsızlığını ve mekânların sürdürülebilirliğini desteklediğini göstermektedir. Özellikle gelişmiş ülkelerde yaş dostu kent politikaları ile bütüncül mekânsal çözümler geliştirildiği, bunun da yapı ölçeğinden kentsel ölçeğe kadar erişilebilirliği güçlendirdiği görülmektedir. Çalışmada elde edilen bulgular evrensel tasarımın yalnızca fiziksel engelleri kaldırmak değil, aynı zamanda mimari mekânların bütün kullanıcılar için kapsayıcı biçimde tasarlanmasını gerekli kıldığını göstermektedir. Ulusal stratejilerde bu yaklaşımın önceliklendirilmesi, tasarım süreçlerinde disiplinler arası iş birliğinin artırılması ve kullanıcı katılımının sağlanması, yaşlanan toplum için erişilebilir ve sürdürülebilir bir yapılı çevre oluşturulmasının temel koşulu olduğu görülmüştür.

**Anahtar Kelimeler:** Evrensel Tasarım, Erişilebilirlik, Yaşlılık, Aktif Yaşlanma

# UNIVERSAL DESIGN APPROACHES FOR AGING SOCIETIES: AN EXAMINATION FROM THE PERSPECTIVE OF TURKEY

## ABSTRACT

In recent years, the increase in average life expectancy coupled with declining fertility rates has led to a significant transformation in demographic structure, resulting in a rapid rise in the proportion of elderly individuals. This demographic shift has engendered new requirements regarding independent living, mobility, and spatial utilization. In this context, the planning of cities, residential areas, and public spaces in an accessible, safe, and inclusive manner is of critical importance. Universal design principles offer solutions to the architectural barriers faced by aging societies by ensuring that diverse age and ability groups can utilize spaces under equal conditions. The aim of this study is to examine the accessibility challenges encountered by the aging population in Turkey within the urban and built environments through the lens of universal design approaches, and to develop future-oriented recommendations by comparing

these with international precedents. Issues limiting accessibility persist in public spaces, public transportation facilities, residential buildings, and healthcare facilities in Turkey. This situation reveals that architectural spaces fail to adequately accommodate user diversity. International experiences demonstrate that universal design applications in architectural spaces not only provide accessibility but also support user independence and the sustainability of the spaces. It is observed, particularly in developed countries, that holistic spatial solutions are developed through age-friendly city policies, thereby enhancing accessibility from the building scale to the urban scale. The findings obtained in this study indicate that universal design necessitates not merely the removal of physical barriers, but also the inclusive design of architectural spaces for all users. Prioritizing this approach in national strategies, enhancing interdisciplinary collaboration during design processes, and ensuring user participation have been identified as fundamental prerequisites for creating an accessible and sustainable built environment for an aging society.
**Keywords:** Universal Design, Accessibility, Aging, Design for Everybody, Active Aging

# 1. GİRİŞ

## 1.1. Yaşlılık, Aktif Yaşlanma ve Yaşlı Nüfus

Yaşlanma tabiattaki her canlı varlığın yaşam sürecindeki doğumdan ölüme kadar süren değişim sürecini ifade etmektedir (Kalınkara, 2014). Yaşlılık kavramı biyolojik, kronolojik, sosyolojik, psikolojik ve toplumsal yaşlanma olarak ele alınabilse de genel kullanımda en fazla kronolojik yaşlanma üzerinden tanım yapılmaktadır (Settersten ve Mayer, 1997). Kronolojik yaşlanma takvim yaşı üzerinden yapılan yaşlanma ölçütü tanımıdır (Şentürk,2020). Yaşlanma ile birlikte fiziksel engellerin artmasından dolayı bireyler sosyal hayattan kopmaktadır (Lök ve Lök,2016). Bu nedenle yaşlı bireylerin toplumsal yaşamdan kopmalarını önlemek için aktif yaşlanma anlayışının benimsenmesi önem taşımaktadır. Aktif yaşlanma, bireylerin sağlık, güvenlik ve toplumsal katılım fırsatlarını sürdürerek yaşam kalitelerini artırmayı hedeflemektedir (Caner vd.,2013).

Toplumların yaşlanması olgusu, temel olarak doğurganlık oranlarının azalması ve doğuşta beklenen yaşam süresinin uzamasıyla açıklanmaktadır (Çuhadar ve Lordoğlu,2016). Tıp alanındaki gelişmeler, bulaşıcı hastalıkların kontrol altına alınması, beslenme ve yaşam standartlarının yükselmesi, sağlık hizmetlerine erişimin artması ve yaşam koşullarının iyileşmesi, bireylerin daha uzun süre yaşamasına olanak sağlamıştır (Bayrak,2025). Bununla birlikte, modernleşme ve kentleşme süreçleri doğurganlık oranlarının düşmesine, dolayısıyla genç nüfusun azalmasına yol açmıştır (Chani vd.,2011). Ortaya çıkan bu demografik dönüşüm, toplumların nüfus piramitlerinin yapısını köklü biçimde değiştirmekte, genç nüfusun oranı azalırken yaşlı nüfusun oranı giderek artmaktadır.

DSÖ'ne göre yaşlılık kronolojik sınıflandırmaya göre;
0-18 yaş arası: ergen, 18-65 yaş arası: genç, 65-74 yaş arası: genç-yaşlı, 74-84 yaş arası: yaşlı, 85 yaş ve üzeri: çok yaşlı kabul edilmektedir (Erik vd.,2019).

Dünya genelindeki veriler, yaşlanma olgusunun giderek hızlandığını göstermektedir. 1974'te küresel ölçekte 65 yaş üzeri bireylerin nüfus içindeki oranı %5,5 iken, bu oran 2024 yılında yaklaşık iki kat artış göstererek %10,3'e ulaşmıştır. Birleşmiş Milletler 'in öngörülerine göre, 2024–2074 arasında söz konusu oran tekrar iki katına çıkarak %20,7 seviyesine erişecektir. Aynı dönemde 80 yaş ve üzerindeki nüfusun ise üç katından fazla büyüme göstermesi beklenmektedir (WHO,2025).

Türkiye'de yaşlı nüfusun toplam nüfus içindeki payı yıllar içinde istikrarlı biçimde artmıştır. 2000 yılında 65 yaş ve üzeri bireylerin oranı %5,7 iken, 2023'te bu oran %10'un üzerine çıkmıştır (Şekil 1). Aynı dönemde çocuk nüfusun payı %29,8'den %21,4'e gerilemiş, hatta 1935'ten 2023'e kadar neredeyse yarı yarıya azalmıştır. Günümüzde 15 yaş altı bireyler toplam nüfusun yalnızca beşte birinden biraz fazlasını oluştururken, 15–64 yaş grubundaki çalışma çağındaki nüfus %68,3 ile en geniş kesimi meydana getirmektedir. Bu veriler, Türkiye'nin demografik yapısında yaşlanma eğiliminin belirginleştiğini göstermektedir (Ergöçmen,2025).




Şekil 1. Türkiye'nin Yaş Gruplarına Göre Dağılımı (TUİK,2024)

Yaşlı nüfusun artışı, yalnızca demografik bir olgu değil, aynı zamanda ekonomik, sosyal ve mekânsal boyutları olan bir dönüşümdür (Özgür ve Yakar,2021). Bireylerin yaşlılık döneminde fiziksel ve bilişsel kapasitelerinde azalmalar, bağımsız yaşam becerilerinde sınırlanmalar ve sosyal hayata katılımda kısıtlılıklar ortaya çıkabilmektedir (Tajvar vd.,2008). Özellikle hareket kabiliyeti sınırlı bireyler, toplumsal, kültürel ve ekonomik yaşama daha düşük düzeyde katılabilmekte, bu durum mekânsal düzenlemelerin önemini artırmaktadır (Erten ve Aktel,2020). Bu nedenle, yaşlılığın bireysel bir süreç olmasının ötesinde toplumsal yaşama ve mekânsal kullanıma doğrudan etki eden bir olgu olarak ortaya çıkmaktadır.
Bu bağlamda yaşlılık kavramı bireysel özellikleri ve toplumsal dinamikleriyle çok boyutlu bir süreç olarak değerlendirilmelidir. Dünya genelinde ve Türkiye'de yaşlı nüfusun hızla artması, kentlerin, konutların ve kamusal alanların yeniden düşünülmesini zorunlu kılmaktadır (Lawton & Simon, 1968). Bu noktada evrensel tasarım ilkeleri, yaşlı bireylerin bağımsızlığını, hareketliliğini ve toplumsal katılımını destekleyerek yaşlanmanın getirdiği mekânsal engelleri aşmada kritik bir araç olarak öne çıkmaktadır (Beard ve Petitot,2010). Çalışmanın devamında yaşlı bireylerin mekânsal gereksinimlerinin incelenmesi, Türkiye'deki mevcut durumun değerlendirilmesi ve uluslararası örneklerle karşılaştırılması bu çerçevede ele alınacaktır.

## 2. YÖNTEM

Bu çalışmada ilk olarak literatür taraması ile yaşlılık ve yaşlanan toplum kavramları hakkında genel bilgiler derlenmiştir. Yaşlanan bireylerin mekânsal gereksinimleri irdelenerek evrensel tasarım prensipleri kapsamında çözüm önerileri geliştirilmiştir. Ardından dünyadaki yaşlı dostu kentler arasında mekânsal çözümlerinde başarılı kabul edilen Japonya'nın Akita ve Fransa'nın Dijon kentlerinde yaşlanan nüfusundaki bireylere yönelik yaklaşımları incelenmiştir. Elde edilen veriler incelenerek Türkiye'nin yaşlanan nüfusuna yönelik ihtiyaçlarına çözüm önerileri sunulmuştur.

## 3. BULGULAR

Gelişmiş ülkelerde artan kentleşme ve nüfusun yaşlanması birbiri ile bağlantılı olarak ilerlemektedir. Gelişmiş ülkelerin nüfusunun %80'i kent alanlarında yaşamaktadır (Beard ve Petitot,2010). Bu durum kentlerin demografik yapısını doğrudan belirlemekte ve erişilebilir kent ve çevre ihtiyacını doğurmaktadır (Gillian ve Windlea,2006). Nitekim kent yaşamında yaşlı bireylerin karşılaştığı en belirgin sorunlardan biri erişilebilirlik alanında kendini göstermektedir (Danış,2009). Kent içeresindeki kaldırımların standart dışı yüksekliklerde olması, rampa eksiklikleri, düzensiz parke taşları ve yetersiz yaya geçitleri yaşlı bireyler için günlük yaşamı doğrudan zorlaştırmaktadır (Cervero,2005). Buna karşılık, bazı kentlerde bu konuda dikkate değer gelişmeler yaşanmaktadır. Yaşlı dostu topluluklar, yaşlı bireylerin bağımsız olarak topluma katılabildiği ve temel ihtiyaçlarını karşılayabildiği bir oluşumdur (Lehning vd.,2007). Yaşlı dostu kentler ve topluluklar kavramının oluşmasındaki önemli adımlardan biri Dünya Sağlık Örgütü (DSÖ)'nün Yaşlı Dostu Kent modelidir. Bu model ülkelerin mevcut durumlarının analiz edilerek çözüm önerileri sunan bir kılavuz niteliğindedir. Bu kapsamda yaşlıların kentlerde karışılacağı zorluklar ve ihtiyaç duyacağı eylemler sekiz alanda derlenmiştir (WHO,2007).
Bu alanlar aşağıdaki şekilde gösterilmektedir.




Şekil 2. Yaşlı Dostu Kent Modeli (WHO,2007)

Dış mekanlar ve binalar, yaşlı bireylerin bağımsız olarak hareket edebilmesi ve yaşam kalitelerini arttırabilmesi için mimari düzenlemeleri kapsamaktadır. Bu alanda düzenli rekreasyon alanları, planlanmış yürüyüş ve bisiklet güzergahları, aralıklı dinlenme noktaları, erişilebilir kamu yapıları, uygun standartlarda yaya kaldırımı, merdiven ve rampaların tasarlanması gibi öneriler sunmaktadır (WHO,2007).



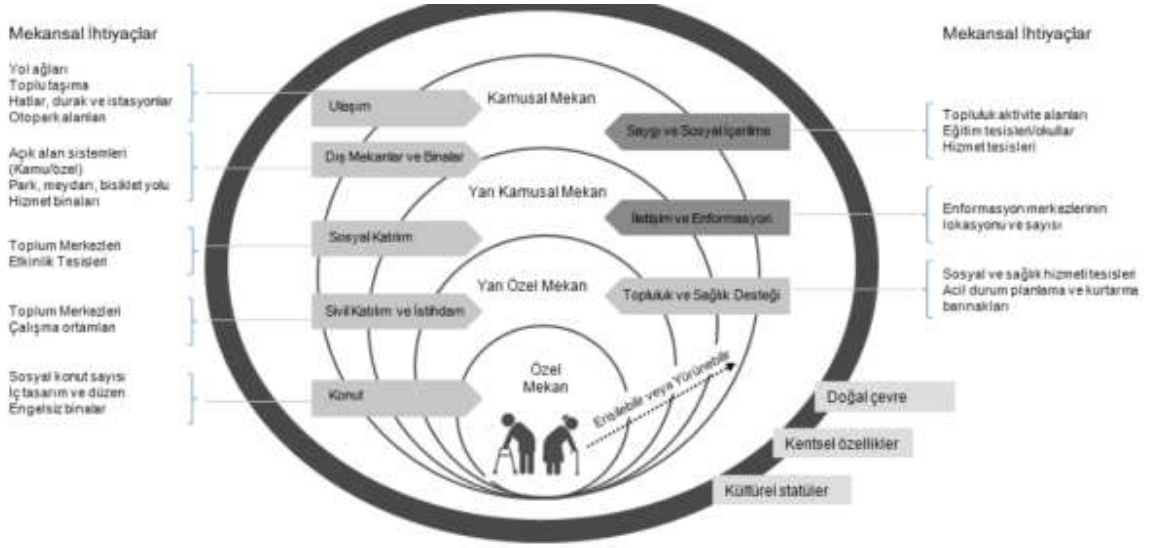
Şekil 3. Peyzaj tasarımcısı Arja Paula'nın Yaşlı Parkı Tasarımı (URL-1)

Yaşlı Dostu Kent Modeli, mekânsal kamusallık perspektifinden incelendiğinde, özel, yarı özel ve kamusal alanlarda yaşlı bireylerin farklı ihtiyaçlarını ortaya koymaktadır. Özel alanlarda konutların iç düzeni, engelsiz erişim ve sosyal konut sayısı, yaşlıların yaşam kalitesi ve güvenliği açısından temel önceliklerdir.



Şekil 4. Yaşlı Dostu Mutfak Tasarımı (URL-2)

Yarı özel mekânlarda ise sivil katılım, istihdam ve toplumsal ile sağlık desteklerinin mekânsal karşılıkları önem kazanmaktadır; bu bağlamda toplum merkezleri, etkinlik ve çalışma alanları ile sağlık hizmeti sunan tesisler öne çıkmaktadır. Ayrıca, yarı-kamusal alanlarda enformasyon merkezleri ve nitelikli iletişim araçları, yaşlıların doğru ve hızlı bilgiye ulaşmasını sağlayarak sosyal iletişimi desteklemektedir. Kamusal mekânlarda ise güçlü kamusallık, ulaşım altyapısı, dış mekânlar ve binalar ile toplumsal kapsayıcılık gereksinimlerini belirginleştirmektedir; yol ağları, toplu taşıma hatları, duraklar, parklar, meydanlar, bisiklet yolları ve hizmet binaları erişilebilirliği artırırken, okul ve etkinlik alanları sosyal içerilmeyi desteklemektedir. Örneğin, çeşitli etkinliklerin gerçekleştirildiği engelsiz ve erişilebilir tesisler ile dış mekânlar, yaşlıların toplumsal etkileşimini güçlendirmekte ve modelin sekiz alanı boyunca bütüncül bir mekânsal yaklaşım gerektirmektedir.




Şekil 3. İyi yaşlanma kentsel planlama modeli (Chao,2018)

Kullanıcı çeşitliliğini merkeze alan tasarım yaklaşımlarından biri evrensel tasarımdır. Bu yaklaşım, yaş, yetenek ve durum farklılıklarına rağmen kullanıcıların çevrelerini ve ürünleri en erişilebilir şekilde kullanabilmesini hedeflemektedir (Hatırnaz,2019). Evrensel tasarım temelde engelli bireyler için ortaya çıkan bir yaklaşım olsa da önerileri ile herkes için tasarım fikrini benimsetmiştir (Mishchenko,2014). Evrensel tasarımın temelleri Ronald L. Mace tarafından 1989'da atılmıştır. Bu yaklaşım, 1996'da North Carolina State Üniversitesi bünyesinde Evrensel Tasarım Merkezi'nin kurulmasıyla kurumsal bir kimlik kazanmıştır. Merkez, 1997'de kavramı daha anlaşılır kılmak ve herkes için tasarıma rehberlik etmek amacıyla yedi temel ilke geliştirmiştir (Story,2001).

| | |
|---|---|
| Eşit Kullanım | Tasarımlar, farklı yeteneklere sahip bireylerin kullanımına uygun olmalı ve erişim imkânı bulunmalıdır. |
| Kullanımda Esneklik | Tasarımlar, farklı kullanıcı tercihlerini karşılayacak şekilde esneklik sunmalı ve çeşitli kullanım seçenekleri sağlamalıdır. |
| Basit ve Anlaşılır Kullanım | Tasarım, değişken okuma seviyeleri ve dil yeterliliklerine sahip kullanıcılar tarafından kolayca anlaşılabilir olmalıdır. |
| Algılanabilir Bilgilendirme | Tasarım, çevresel faktörlerden veya kullanıcıların duyusal farklılıklarından etkilenmeden gerekli bilgiyi iletebilmelidir. |
| Hata Toleransı | Tasarım, kazara veya istem dışı yapılan eylemlerden kaynaklanabilecek riskleri ve olumsuz sonuçları en aza indirmelidir. |
| Düşük Fiziksel Çaba | Tasarım, kullanıcıdan minimum güç harcamasını talep etmeli ve fiziksel çabayı azaltacak şekilde tasarlanmalıdır. |
| Uygun Boyut ve Mekân | Tasarım, kullanıcıların erişim ve kullanımını engellemeyecek yeterli alan sağlayacak biçimde düzenlenmelidir. |

Tablo 1. Evrensel Tasarım İlkeleri
(The Center For Unıversal Desıgn, NC State University, 1997)

Türkiye'de yaşlı nüfusun 2019–2024 arasında %20,7 artarak 9,1 milyona ve toplam nüfusun %10,6'sına ulaştığı görülmektedir (TÜİK, 2024). Bu artış, konut, kamusal alan ve ulaşım altyapısında erişilebilirlik gereksinimini artırmıştır. Evrensel tasarım, yaş ve yetenek farkı gözetmeksizin herkesin çevreyi kullanabilmesini amaçlayan bir yaklaşımdır (Dostoğlu, Şahin & Taneli, 2009). Türkiye'de 5378 sayılı Engelliler Hakkında Kanun ve Erişilebilirlik İzleme ve Denetleme Yönetmeliği erişilebilir çevreyi yasal zorunluluk haline getirmiştir (Şahin ve Çiftyıldız,2024). Ayrıca TS 9111 ile özürlüler ve hareket kısıtlılığı bulunan bireyler için binalarda ulaşılabilirlik gerekleri ve TS 12576 kaldırım ve yaya geçitlerinde ulaşılabilirlik için yapısal önlemler ve işaretlemelerin tasarım standartları, binalar ve şehir içi yollar için erişilebilir tasarım ölçütlerini tanımlamıştır (Arslantaş ve Güngör,2014). Ancak uygulamada standartların yetersiz uygulanması, bakım eksiklikleri ve mevcut yapı stokunun uyarlanmasında yetersizlikler sürmektedir (Tutal, 2016). Buna rağmen 2020 yılının "Erişilebilirlik Yılı" olarak belirlenmesi gibi yaklaşımlar, belediyeler arası ödül programları ve atölyeler farkındalığı artırmıştır (Aile ve Sosyal Hizmetler Bakanlığı, 2020). Son yıllarda yapılan çalışmalar, yaşlı bireylerin yerinde yaşlanmasını destekleyen evrensel tasarımın hem fiziksel hem dijital alanlarda yaygınlaştırılması gerektiğini vurgulamaktadır.

### 3.1. Dünyadan Yaşlı Dostu Kent Örnekleri

#### 3.1.1. Akita, Japonya

Japonya demografik verilere göre günümüzün en hızlı yaşlanan toplumlarındandır (Cantürk,2021). Ülkede 65 yaş ve üzeri nüfus oranı BM verilerine göre 2022 yılı itibarıyla %29,9 seviyesine ulaşmıştır. Bu oran ile Monako'dan sonra dünyanın en yaşlı ikinci ülkesi konumundadır (Bulut,2024). Japonya küresel ölçekte "süper yaşlı toplum" kategorisinde değerlendirilmektedir (Cabinet Office,2018). Artan yaşam süresi, düşük doğurganlık oranı ve kırsal bölgelerden büyük şehirlere göç eğilimleri, yalnızca sosyal politikaları değil, aynı zamanda şehircilik ve mimarlık yaklaşımlarını da yeniden şekillendirmiştir (Inoue ve Inoue,2024). Bu bağlamda ülke genelinde engelsiz yaşam ve evrensel tasarım ilkeleri yasal mevzuat ve uygulama rehberleri aracılığıyla kentsel planlama süreçlerine dâhil edilmiştir.

Bu dönüşümün en dikkat çekici örneklerinden biri, Tohoku bölgesinde yer alan Akita kentidir. Doğal çevresi, tarımsal üretim kültürü ve dağlık topografyasıyla bilinen kent, aynı zamanda Japonya'nın en yüksek yaşlı nüfus oranına sahip bölgelerinden biridir. 2023 yılı itibarıyla Akita ilinde 65 yaş ve üzeri nüfus oranı %36'ya ulaşmıştır (Akita Prefectural Government, 2023). Genç nüfusun büyük kentlere göç etmesiyle birlikte Akita, yaşlı bireylerin yoğunlukta olduğu bir demografik yapıya evrilmiştir. Bu gelişme karşısında yerel yönetimi "yaşlı dostu şehir" politikalarını yalnızca sosyal refah bağlamında değil, mekânsal sürdürülebilirlik çerçevesinde ele almaya yöneltmiştir (Kadoya,2013).

Akita yönetimi, Japonya'nın ulusal düzeyde yürüttüğü "Yaşlı Dostu Şehirler ve Topluluklar Girişimi" (WHO, 2007) programı ile uyumlu biçimde 2003 yılında "Akita Yaşlı Dostu Şehir Eylem Planı" uygulamaya koyulmuştur. Kent Japonya'nın hızla yaşlanan nüfusuna uyum sağlamak için geliştirdiği politikalarla, ülkenin yaşlı dostu şehircilik yaklaşımının öncü örneklerinden biri olarak öne çıkmaktadır. Eylem planına göre, 2045'e kadar kentin nüfusunun 226 bine düşmesi, buna karşın 65 yaş ve üzeri nüfus oranının %46,8'e ulaşması beklenmektedir. Bu demografik eğilim, kentsel planlamada erişilebilirlik, güvenlik ve sosyal katılım ilkelerinin bütüncül biçimde ele alınmasını zorunlu kılmıştır (Akita City Government, 2022).

Akita'nın eylem planı, kamu yönetimi, özel sektör ve yerel topluluklar arasında kurulan üçlü iş birliği modeli üzerine inşa edilmiştir. Bu model, kentsel mekânın yalnızca fiziksel erişilebilirliğini değil, aynı zamanda yaşlı bireylerin toplumsal aidiyetini güçlendirmeyi amaçlamaktadır. Kentin planlama belgelerinde, kamusal alanlardan konut tasarımlarına kadar her ölçekte erişilebilirlik temel alınmıştır (Akita City Government, 2022; Doran et al., 2025).

Fiziksel erişimin sağlanabilmesi için güvenli kaldırım, engelsiz yol ve iklim koşullarına uyumlu çevre tasarımının önemini plandaki aksiyonlarda bulunmaktadır (Yamada et al., 2023).

Soğuk iklim koşullarına sahip Akita'da, ısıtmalı kaldırımlar, kaymaz yüzey kaplamaları ve kar tutmayan rampalar gibi mimari çözümler standart hâle gelmiştir (Firestone, 2018). Konut tasarımlarında ise eşiksiz girişler, geniş dönüş alanları ve ergonomik tutamak sistemleri bulunmaktadır (Eyong Christian, 2013).

2016'da tamamlanan çok kuşaklı belediye binası, hem idari merkez hem de toplumsal etkileşim alanı olarak kullanılmaktadır. Afet toplanma alanı işlevinin yanı sıra, vatandaşların sosyalleşebileceği erişilebilir bir kamusal mekân olarak planlanmıştır. Yapı, danışma hizmeti, tekerlekli sandalye noktaları ve yürüme destekleri ile donatılmış olup, baston tutucusu olan oturma düzenleri gibi ayrıntılar ile evrensel tasarım prensiplerini yansıtmaktadır (Firestone,2018)



Akita Belediye Binasındaki Tasarımlar (URL-3)

### 3.1.2. Dijon, Fransa

Fransa'nın Bourgogne-Franche-Comté bölgesinin orta büyüklükteki kenti Dijon, yaşlı nüfusun hızla arttığı gelişmiş kentlerden biridir. Ulusal İstatistik ve Ekonomik Araştırmalar Enstitüsü'ne göre 2022 yılında nüfusun %22,9'i 60 yaş ve üzerindedir (INSEE,2022). Yaşam süresinin uzaması, doğurganlık oranlarının düşmesi ve kırsal kesimlerden kente göç, kentteki demografik yapıyı değiştirmiştir. Bu değişim, kentin sosyal politikalarını ve kentsel planlamasını yeniden şekillendirmiştir.

Dijon Belediyesi, 2010 yılında Dünya Sağlık Örgütü'nün "Yaşlı Dostu Şehirler ve Topluluklar" programına katılmıştır (WHO, 2010). Bu adım, yaşlı bireylerin yaşam kalitesini artırmaya yönelik bütüncül bir sürecin başlangıcı olmuştur. Belediye, erişilebilirlik, hareketlilik ve sosyal katılım konularını öncelikli politika alanları olarak belirlemiştir (Ville de Dijon, 2025).

Dünya Sağlık Örgütü'nün yayımladığı raporlarda Dijon'un uyguladığı pratik düzenlemeler örnek olarak gösterilmektedir. Şehir, yaşlı bireylerin merkez bölgelere daha kolay ulaşması için bazı alanları yayalaştırmıştır. Tramvay platformları yeniden düzenlenmiş, bank ve oturma alanları artırılmıştır. Kaldırımlar alçaltılmış ve daha fazla kamusal tuvalet yapılmıştır Bu değişiklikler, şehir merkezinin yaşlılar için daha erişilebilir hale gelmesini sağlamıştır. Ayrıca, yaya dolaşımını kolaylaştırmış ve kamusal alan kullanımını artırmıştır (World Health Organization, 2021).



Dijon Kentsel Yayalaştırma Projesi (URL-4)

Dijon'daki yaşlı dostu planlama politikaları, belediye, özel sektör ve sivil toplum kuruluşları arasında kurulan iş birliği modeliyle yürütülmektedir. Bu model, sadece fiziksel erişimi değil, yaşlı bireylerin toplumsal katılımını da güçlendirmeyi amaçlamaktadır. Konut projeleri ve kamusal alan düzenlemeleri için planlamalar bu modele göre tasarlanmaktadır (Ville de Dijon, 2020)(URL-4)

2018 yılında l'Observatoire de l'Âge tarafından ikinci kez düzenlenen yaşlı bireylerin kent içinde aktif ve bağımsız biçimde hareket etmelerini teşvik etmek amacıyla "Hareketlilik Günü" etkinliği düzenlenmiştir. Etkinlikte katılımcılara, yaş ve fiziksel kapasitelerine uygun bisiklet, üç tekerlekli bisiklet, elektrikli bisiklet veya scooter gibi araçları deneme fırsatı sunarak yaş dostu kentsel hareketlilik anlayışının yaygınlaştırılması hedeflenmiştir (URL-4)




Dijon Hareketlilik Günü Etkinliği (URL-5)

## 4. SONUÇ VE ÖNERİLER

Küresel ölçekte yaşlanan nüfus, demografik yapıyı değiştirmesinin ötesinde, toplumsal, ekonomik ve mekânsal sistemlerin yeniden kurgulanmasını zorunlu kılan bir durum haline gelmiştir. Türkiye özelinde incelendiğinde, artan yaşam süresi ve azalan doğurganlık oranları nüfus piramidinde yaşlı nüfusun ağırlığını belirgin biçimde artırmaktadır. Bu durum, kamusal mekânların, konut yapılarının ve kentsel altyapının erişilebilirlik ve kapsayıcılık ilkeleri doğrultusunda yeniden ele alınmasını gerektirmektedir. Bu çalışma, yaşlanan toplumlarda evrensel tasarım yaklaşımlarını irdeleyerek, Türkiye için mekânsal sürdürülebilirlik ve toplumsal kapsayıcılık açısından çözüm önerileri sunmaktadır.

Elde edilen bulgular, evrensel tasarımın fiziksel engellerin ortadan kaldırmasının yanı sıra toplumsal eşitlik ve adil kent kullanımını sağladığını ortaya koymuştur. Japonya'nın Akita kenti ile Fransa'nın Dijon kentinde uygulanan politikalar bütüncül planlama anlayışı, katılımcı yaklaşım ve disiplinler arası iş birliğinin sağlandığı modeller olarak öne çıkmaktadır. Bu örnekler, mekânsal erişilebilirliğin sosyal katılım, güvenlik ve aidiyet duygusuyla bütünleştiği

bir yaşanabilirlik anlayışını temsil etmektedir. Türkiye'de ise erişilebilirlik konusundaki yasal düzenlemelere rağmen, uygulama süreçlerinde standartların yetersiz uygulanması, denetim eksiklikleri ve mevcut yapı stokunun uyarlanmasındaki sınırlılıklar, evrensel tasarımın mekânsal yaşama bütüncül biçimde entegre edilmesini engellemektedir. Bu durum, erişilebilirliğin bir mimari standart olmanın ötesine geçerek tasarım kültürünün bir bileşeni haline getirilmesi gerekliliğini ortaya koymaktadır.

Türkiye açısından öncelikli gereklilik, evrensel tasarım ilkelerinin ulusal mekânsal stratejilere bütüncül biçimde dâhil edilmesidir. Kentsel planlama, konut üretimi, ulaşım altyapısı ve kamusal alan düzenlemelerinde yaş dostu yaklaşımlar, engellilik bağlamından çıkarılarak yaşam döngüsünün tüm evrelerini kapsayacak biçimde genelleştirilmelidir. Tasarım süreçlerinde disiplinler arası iş birliği mekanizmalarının geliştirilmesi, kullanıcı temelli veri toplama yöntemlerinin kullanılması ve yerinde yaşlanma ilkesine dayalı mekânsal modellerin yaygınlaştırılması önem arz etmektedir. Ayrıca, dijital teknolojilerin ve akıllı kent bileşenlerinin erişilebilirlik amaçlı entegrasyonu, yaşlı bireylerin bağımsız yaşam becerilerini güçlendirecek yenilikçi bir yönelim olarak değerlendirilmelidir.

Sonuç olarak, yaşlanan toplumlar için evrensel tasarım yaklaşımları, yalnızca erişilebilir çevrelerin değil, aynı zamanda adil, kapsayıcı ve sürdürülebilir kentlerin inşası için temel bir stratejik çerçeve sunmaktadır. Türkiye'de yaşlanan nüfus yapısı, şehir planlama politikalarının, mimari uygulamaların ve toplumsal farkındalık süreçlerinin yeniden değerlendirilmesini gerektirmektedir. Bu kapsamda, evrensel tasarım anlayışı; yaşlanmanın neden olduğu mekânsal ve sosyal sınırlamaları ortadan kaldırarak, yaşlı bireylerin toplumun aktif ve bütünleşik bir parçası olmasını sağlamada anahtar rol üstlenmektedir.

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# OSMANLI ARMASININ GELİŞİMİ VE SAFRANBOLU MİMARİSİNDEKİ TEMSİLİ

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**Özet**

Osmanlı İmparatorluğu, altı asırlık hâkimiyeti boyunca kültürel, sanatsal ve mimari alanlarda derin izler bırakmış, kendine özgü kimliğiyle dünya tarihine yön veren bir medeniyet olmuştur. Bu mirasın önemli sembollerinden biri, özellikle imparatorluğun son dönemlerinde olgun biçimine ulaşan Osmanlı armasıdır. Orta Çağ'dan itibaren soyluluk ve egemenliğin simgesi olarak ortaya çıkan armalar, zamanla devletlerin kimliklerini temsil eden kurumsal göstergelere dönüşmüştür. Osmanlı bağlamında arma, yalnızca resmî belgelerde veya saray dekorasyonlarında değil; askeri birliklerin işaretlerinde, kamusal yapılarda ve gündelik yaşamın çeşitli unsurlarında da yer alarak hem siyasi hem de kültürel bir sembol niteliği taşımıştır. Osmanlı şehir mirası içinde özgünlüğünü ve bütünlüğünü büyük ölçüde koruyarak günümüze ulaşan Safranbolu, bu sembolün mimarideki temsiline dair dikkate değer örnekler sunmaktadır. Safranbolu evleri ve yapıları, Osmanlı sosyal düzeni ve yaşam kültürünü yansıtan işlevsel ve estetik özellikleriyle öne çıkarken, bazı yapılarda görülen Osmanlı arması kullanımı, kentin mimari kimliğine farklı bir boyut kazandırmaktadır. Yapılan incelemelerde, Safranbolu'da Osmanlı armasının üç farklı yapı üzerinde bulunduğu tespit edilmiştir: Çarşı bölgesinde yer alan Hükümet Konağı ve Kileci Çeşmesi ile Bağlar bölgesindeki Bağlar Kız Teknik Lisesi. Bu örnekler, farklı yapı tiplerinde Osmanlı armasının görsel ve sembolik değerini ortaya koymaktadır. Sonuç olarak, Safranbolu'daki Osmanlı arması örnekleri, yalnızca dekoratif bir unsur olmanın ötesinde, imparatorluğun siyasal otoritesini ve kültürel sürekliliğini yansıtan birer tarihsel temsil niteliği taşımaktadır.

**Anahtar kelimeler:** Osmanlı arması, Safranbolu mimarisi, Mimaride arma

# THE DEVELOPMENT OF THE OTTOMAN COAT OF ARMS AND ITS REPRESENTATION IN SAFRANBOLU ARCHITECTURE


## Abstract

The Ottoman Empire, throughout its six centuries of rule, left profound marks in cultural, artistic, and architectural domains, shaping world history with its distinctive identity. One of the significant symbols of this legacy is the Ottoman coat of arms, which reached its mature form particularly in the late period of the empire. Heraldic emblems, emerging in the Middle Ages as symbols of nobility and sovereignty, gradually evolved into institutional markers representing the identities of states. In the Ottoman context, the coat of arms was not limited to official documents or palace decorations; it also appeared in military insignia, public buildings, and various elements of daily life, serving as both a political and cultural emblem. Among the Ottoman urban heritage sites, Safranbolu stands out as one of the most well-preserved and authentic settlements, offering remarkable examples of the representation of this symbol in architecture. Safranbolu's houses and public structures reflect the social order and cultural life of the Ottoman period through their functional and aesthetic qualities, while the use of the Ottoman coat of arms on certain buildings adds a distinctive dimension to the city's architectural identity. Research has identified three examples of the coat of arms in Safranbolu: the Government House and Kileci Fountain in the Çarşı district, and the Bağlar Girls' Technical High School in the Bağlar district. These cases demonstrate the visual and symbolic significance of the Ottoman coat of arms across different building types. In conclusion, the representations of the Ottoman coat of arms in Safranbolu should be regarded not merely as decorative elements, but as historical symbols reflecting the political authority and cultural continuity of the empire.



**Keywords**: Ottoman Coat of Arms, Safranbolu Architecture, Heraldry in Architecture

## 1. GİRİŞ

Bir aileyi ya da tüzel kişiyi simgeleyen, kalkan biçiminde bir kontur içerisinde üsluplaştırılmış nesnelerle oluşturulan kompozisyonlara "arma" denilmektedir (Sözen ve Tanyeli, 2017: 33). Çoğunlukla resim ya da kabartma biçiminde tasarlanan armalar, başta silahlar olmak üzere çeşitli nesneleri içermektedir (Arseven, 1983: 103). Tarih boyunca farklı kültürlerde, toplumlarda ve dönemlerde armalar; kimlik, egemenlik ve soyluluğun görsel bir simgesi olarak işlev görmüştür. Özellikle Orta Çağ Avrupa'sında savaş alanlarında ayırt edici bir unsur olarak ortaya çıkan armalar, zamanla soyluların ve devletlerin kimliklerini temsil eden önemli semboller hâline gelmiştir. Kalkan, zırh veya diğer silahların üzerinde yer alan bu figürlerin her biri, belirli bir anlam taşımakta; sosyal statü, köken ve aidiyetin ifadesine aracılık etmektedir. Bu uygulama, Avrupa'da heraldik geleneğin doğmasına zemin hazırlamış, söz konusu gelenek armaların incelenmesi ve tasarımına dair bir disiplin olarak günümüze kadar varlığını sürdürmüştür.

Armaların kullanımı yalnızca Avrupa ile sınırlı kalmamış; Çin, Mısır, Pers ve Türkler başta olmak üzere pek çok medeniyet tarafından da benimsenmiştir. Türk kültüründe, özellikle Orta Asya'dan itibaren toplumsal kimliğin ifadesinde armaya benzer semboller öne çıkmıştır. Eski Türkler, savaşçı toplum yapılarının da etkisiyle, hayvan figürlerini ve mitolojik öğeleri "ongun" adıyla tanımlamış (Mülayim, 1991, s. 382; Akay, 2012, s. 7); bu figürleri bayrak ve sancaklarında kullanmışlardır. Göktürklerden Osmanlılara uzanan süreçte ongunlar hem bireysel hem de toplumsal kimliğin önemli bir göstergesi olmuştur.

Osmanlı İmparatorluğu ise altı yüzyıllık tarihinde hem devletin gücünü hem de kültürel zenginliğini yansıtan arma ve sembollerle kendi kimliğini pekiştirmiştir. Başlangıçta Batı'daki anlamıyla figürlü armalar kullanmayan Osmanlılar, zamanla artan Batı etkisiyle birlikte, geleneksel sembolizmini de içine alan özgün ve zengin bir arma anlayışı geliştirmiştir. Padişah tuğrası, hilâl, yıldız, silahlar ve çeşitli sembollerden oluşan bu kompozisyonlar, estetik bir düzenlemenin yanı sıra, Osmanlı toplumunun siyasal yapısını, egemenlik anlayışını ve kültürel değerlerini yansıtan işlevsel göstergeler olarak önem kazanmıştır.

Sonuç olarak gerek dünyada gerekse Osmanlı'da arma, yalnızca bir süsleme unsuru değil; tarihsel, kültürel ve siyasal kimliğin görünür kılınmasında kritik bir rol oynayan, köken, soyluluk, güç ve değerlerin sembolik bir ifadesi olarak tarih sahnesinde yerini almıştır.

## 2. OSMANLI ARMASININ BİÇİMSEL GELİŞİMİ

Osmanlılarda arma kullanımından çok önce, tuğra geleneği gelişmiş ve devlet teşkilatı içerisinde yerleşmiştir. Tuğra, hükümdarın kimliğini, otoritesini ve hükümranlığını temsil eden bir nişane olarak resmî belgelerde kullanılan sembolik bir unsur niteliği taşımaktadır. Kökeni, Türk-İslam kültüründe hükümdar adlarının bir tür mühür veya damga olarak yazılmasına dayanan bu gelenek, özellikle Selçuklu sultanları tarafından kullanılan nişan ve mühürlerle Osmanlı tuğrasının gelişiminde önemli bir öncül oluşturmuştur.

Osmanlı tuğrasının bilinen ilk örneği Orhan Gazi dönemine aittir. "Orhan bin Osman" ifadesiyle oluşturulan bu tuğra, ilerleyen süreçte dua ve niyaz cümlelerinin eklenmesiyle zenginleşmiştir. Zamanla estetik açıdan gelişim gösteren tuğra, II. Murad ve özellikle Fatih Sultan Mehmed dönemlerinde klasik formuna ulaşarak Osmanlı sanatında kurumsallaşmış bir devlet geleneği hâline gelmiştir. Tuğralar; fermanlardan vakfiyelere, sikke basımlarından mimari kitabelere kadar geniş bir kullanım alanına sahip olmuştur.

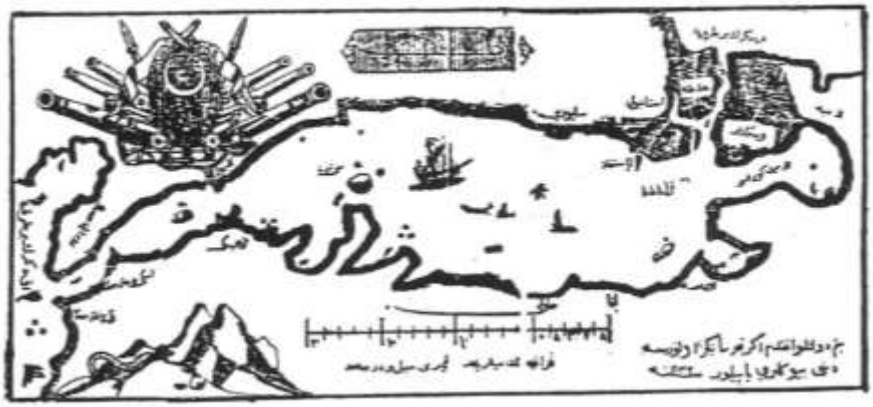
Tuğra ile arma arasında hem sembolik hem de estetik açıdan bir paralellik bulunmaktadır. Batı dünyasında hanedanlıkların kullandığı arma sistemiyle benzer şekilde Osmanlı tuğrası da hükümdarın şahsi mührü ve devlet otoritesinin temsili olarak işlev görmüştür. Arma, Avrupa'da aile ve hanedanlık bağlarını ifade ederken; Osmanlı tuğrası, hükümdarın şahsi imzası olmasının ötesinde devletin sürekliliğini ve İslami hükümranlık anlayışını sembolize etmiştir. Bu yönüyle tuğra, bir bakıma "Osmanlı arması" işlevi kazanmıştır.

Osmanlı'nın Batı ile diplomatik ilişkilerinde de tuğra, hükümdarın kimliğini ve gücünü temsil eden bir araç olarak görülmüş; devletin prestiji ve nişanı niteliğiyle Batı armalarına karşılık gelen bir unsur olarak kullanılmıştır. Ancak Batı etkisiyle Osmanlı'da arma kullanımı, asıl olarak 19. yüzyılın ikinci yarısında Sultan Abdülmecid döneminde ortaya çıkan Osmanlı armasıyla kurumsallaşmıştır. Bu arma, Osmanlı tuğrasını da içerecek şekilde tasarlanmış, tuğra yeni düzenlemenin merkezinde yer alarak geleneksel otoritenin modernleşen dünyadaki bir yansıması olmuştur.

Öte yandan, Osmanlı'ya matbaayı kazandıran İbrahim Müteferrika, 1720 yılında hazırladığı Marmara Denizi haritasını Sadrazam İbrahim Paşa'ya sunmuştur. Bu baskı üzerinde yer alan görsel, Batılı üslupta hazırlanmış ilk Osmanlı arması denemesi olarak değerlendirilmektedir (Özdemir, 1997: 72-73) (Şekil 1).

Osmanlı padişahlarının "Mühr-i Hümayun" denilen mühürleri vardı. Sultan III. Selim için 1213 (1798-1799) tarihinde bir İngiliz hakkak tarafından hazırlanan Mühr-i Hümayun, üzerinde bulundurduğu bitkisel motifler, taç, hilâl ve altı köşeli yıldız, III. Selim'in tuğrası tuğ, sancak, teber, mızrak, ok ve yay, sadak, zurna (boru)

trampet (davul) gibi sembol ve silahlarla Osmanlı armasına giden arma serüveninin bazı ipuçlarını bulmak mümkündür (Şekil 1).



İbrahim Müteferrika tarafından 1720 yılında yapılan Marmara Denizi haritası (Özdemir, 1997: 73).



Sultan III. Selim'in Mühr-i Hümayun'u (URL 1).

Şekil 1. İbrahim Müteferrika'nın Marmara Denizi haritası ve III. Selim'in Mühr-i Hümayun'u

II. Mahmud'un padişahlık döneminde, askeri belgeler üzerinde ay yıldızın yer aldığı armaya benzeyen (Şekil 2) görseller kullanılmıştır (Özdemir, 1997: 83).

Sultan II. Mahmud'dan sonra 1839'da yerine geçen oğlu Sultan I. Abdülmecit döneminde kullanılan armalarda dikkate değer yenilik görülmez. Bu dönemde Sultan II. Mahmud zamanında oluşturulan armaların kullanılmasına devam edilmiştir (Özdemir, 1997: 83).

Madalya kelimesi, Türkçe'ye İtalyanca "medaglia" kelimesinden geçmiştir. Genellikle, unutulmaya değer bir başarının anısını yaşatmak amacıyla altın, gümüş, bakır veya nikel gibi metallerden yapılan ve bir kez verilen bir ödül ve onur nişanesidir. 1267 (1851) yılında Brüksel'de Hart isimli bir sanatkâr tarafından yapılan Tanzîmât-ı Hayriyye Madalyası Sultan Abdülmecid'e takdim edilmiştir (Artuk, 2003: 301). Madalyanın ön yüzünde, en üstte güneş ışınları arasında Abdülmecid'in tuğrası, altta, ortada üzeri on iki yıldızlı altı şualı kalkan ve kalkan üzerinde bir serpuş, kalkanın sağında batı tarzı bir zırh, top ve top gülleleri, tuğ, sancak, mızraklar, kılıç, balta, tüfek ve ok bulunmaktadır. Sol yanda bereket boynuzu ve boynuzdan çıkan meyve, çiçek ve başaklar, onun üst tarafında bir asa, Hellen mitolojisinin haberci tanrısı Hermes'e ait bir işaret olan Kadüse, terazi, tanzimat fermanı yer almaktadır (Şekil 2). Tanzimat Madalyası'nı Osmanlı Armasının en etkili görsel

kaynaklarından biri olarak kabul etmek gerekmektedir. Bereket boynuzu ve terazi sembolleri bir Osmanlı armasında ilk defa yer almaktadır (Özdemir, 1997: 87-88).



Sultan II. Mahmud döneminden armalı berat (URL 2)



Ön yüz



Arka yüz

Tanzîmât-ı Hayriyye Madalyası (Özdemir, 1997: 87)

Şekil 2. Armalı Berat (II. Mahmud dönemi) ve Tanzîmat-ı Hayriye madalyası

Osmanlı Armasına standart bir görünüm verilmesi Abdülhamid'in 17 Nisan 1882 tarihli emirleri ile gerçekleşmiştir. Bu tarihe kadar armada olan gelişmeler dikkate alınmak suretiyle yeni bir arma oluşturulmuştur (Özdemir, 1997: 96).

## 3. OSMANLI ARMASINI MEYDANA GETİREN NESNELER

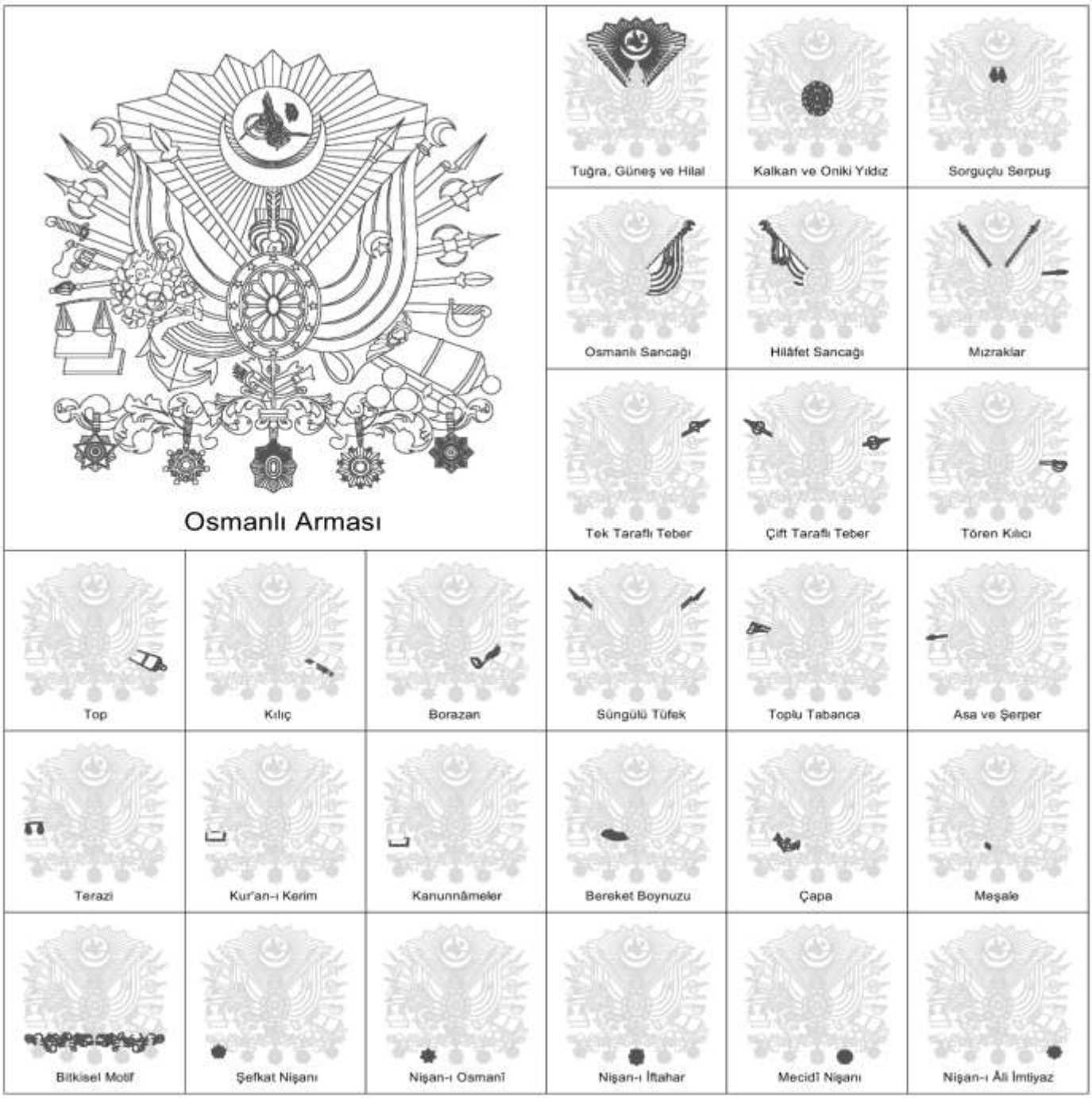
Osmanlı armasında kırka yakın sembol, şekil ve obje yer almaktadır. Bu unsurların önemli bir bölümü, yüzyıllar boyunca toplumun belleğinde yer edinmiş, günlük yaşamda da karşılığı bulunan simgelerdir. Dolayısıyla Osmanlı kimliğinin, mümkün olan en kapsamlı biçimde armaya yansıtıldığı söylenebilir.

Armanın son biçimini Sultan II. Abdülhamid döneminde aldığı bilinmektedir. Ancak bu kararın yalnızca padişahın şahsi tercihiyle şekillenmediği açıktır. Büyük olasılıkla saray ve darphane bünyesinde görev yapan sanatkârlardan yeni bir arma hazırlanması istenmiş, ortaya çıkan tasarımlar arasından en uygun görülen forma onay verilmiştir. Bu süreçte armanın hangi sembol ve şekilleri içermesi gerektiği padişah tarafından sanatçılara iletilmiş; sanatçıların da kendi sanatsal yorumları ve önerileriyle tasarımın son hâline katkıda bulundukları anlaşılmaktadır. Osmanlı armasını meydana getiren nesneler ve bu nesnelerin armada yer alma sebepleriyle ilgili kısa bir değerlendirme yapmak gerekirse şunlar söylenebilir:

Armada yer alan en önemli unsurların başında tuğra gelmektedir. Osmanlı armasının merkezinde, Sultan II. Abdülhamid'in "el-Gazi" unvanını taşıyan tuğrası yer almaktadır (Şekil 3). Simetrik bir düzen içerisinde konumlanan tuğra, armanın kolayca benimsenmesini ve saygı görmesini sağlayan en önemli unsur olarak kabul edilmektedir. Zira Osmanlı Sultanı, devletin varlık sebebi ve otoritenin kaynağı olarak armada da en üst konumda yer almıştır. Tuğra olmaksızın bir armanın anlamını yitireceği açıktır. Bu nedenle tuğra hem devletin hem de hükümdarın temsilini üstlenen asli sembol niteliğindedir. Osmanlı armasının en önemli bölümlerinden birisi olan tuğra, güneşi sembolize eden bir zemin üzerinde kendine yer bulmaktadır. Osmanlı armasında tuğra, güneşin merkezinde yer almakta ve imparatorluğun tüm topraklarını aydınlatan bir unsur olarak yorumlanmaktadır (Şekil 3). Güneş; aydınlığın, hayatın ve düzenin simgesi olup karanlığın karşıtı olarak yaşam kaynağını temsil etmektedir. İnsanlık tarihi boyunca kutsal bir sembol olarak görülen güneş, Türklerin Orta Asya'daki Şamanist inançlarında da önemli bir yere sahipti. Hunlar, geceleri aya, sabahları ise güneşe yönelerek saygı göstermekteydi. Bu inanç unsuru, Orta Asya'dan Anadolu'ya taşınmış; Anadolu'nun yerli kültürlerinde de güneş kutsallık atfedilen bir simge olmuştur.

Osmanlı armasında hilâl, İslamiyet'in en güçlü sembollerinden biri olarak yer almaktadır (Şekil 3). İslam dünyasında vahdeti, ilahî rehberliği ve Müslüman kimliğini temsil eden hilâl, Osmanlı için aynı zamanda devletin dinî meşruiyetinin ifadesidir. Bayrak ve sancaklarda da kullanılan bu sembol, armada imparatorluğun İslam dünyasındaki liderlik iddiasını vurgulayan bir unsur niteliği taşımaktadır. Osmanlı Armasında Batı etkisini yansıtan en önemli unsur kalkandır. Avrupa'daki armaların merkezinde yer alan kalkan, Osmanlı armasında da kompozisyonun odak noktasıdır; ancak biçim olarak Türk kalkanlarından farklıdır (Şekil 3). Osmanlı örneğinde kalkan, görece küçük boyutlu olup çevresinde çok sayıda sembol yer almaktadır. Kalkan, devletin koruyuculuğunu simgelemekte; üzerine yerleştirilen yazı ve şekillerle Osmanlı kimliğini kazanmıştır. II. Abdülhamid döneminde kalkanda *"El müstenid-ü bi'tevfikatir rabbaniye Abdülhamid Han melükküd*

*Devlet'il Osmaniye"* ibaresinin bulunması hem İslami meşruiyeti hem de sultanın otoritesini vurgulayan bir unsur olarak dikkat çekmektedir.




Şekil 3. Osmanlı Arması ve armada bulunan nesneler (Yazar arşivi)

Osmanlı armasında kalkanın kenarlarına yerleştirilen 12 yıldız, farklı anlamlarla yorumlanmıştır (Şekil 3). Bunlardan ilki, Bektaşilikte önemli bir yere sahip olan 12 imama gönderme olabileceğidir; ancak Yeniçeriliğin 1826'da kaldırılması ve Bektaşiliğin zayıflaması bu yorumu güçsüz kılar. İkinci ve daha güçlü ihtimal ise yıldızların Zodyak'ın 12 burcunu simgelemesidir. Bu durumda Osmanlı'nın, yıldızlarla çevrelenmiş bir şekilde kâinatın merkezi olarak tasvir edildiği düşünülür. Zamanla yıldızların ayyıldız biçimine dönüştürülmesi, onların aynı zamanda Osmanlı'ya bağlı eyaletleri temsil edebileceğini de düşündürür. Farklı armalarda yıldız sayısının sekiz veya daha fazla olarak değiştiği görülse de 12 yıldızın esasen Tanzimat Madalyası'ndan arma tasarımına geçmiş olması dikkat çekicidir. Ayyıldızın Türkler tarafından çok eskilerden beri çok sevildiği, günümüze kadar uzanan süreçte de sevilerek kullanıldığı kesindir (Çetin, 2022, s. 83). Bu sebeple armada farklı yerlerde gerek esas ve gerekse tamamlayıcı süsleme unsuru olarak çok sayıda kullanım yeri görmek mümkündür.

Kalkanın üst kısmında yer alan sorguçlu serpuş ise (Şekil 3), Osmanlı Devleti'nin kurucusu Osman Gazi'ye atıf yapmaktadır. Osmanlı kültüründe başlık, yalnızca bir giyim unsuru değil, aynı zamanda taşıyan kişinin kimliğini ve statüsünü yansıtan önemli bir semboldür (Mahmud Şevket, 1983, s. 20). Arma üzerindeki bu unsur, Batı'daki kraliyet taçlarının Osmanlı'daki karşılığı olarak yorumlanabilir. Tuğra sultanı temsil ederken, sorguçlu serpuş ise Osmanlı tahtının simgesi olarak kabul edilmektedir. Armanın sağ tarafında, kırmızı zemin üzerine beyaz ay ve yıldızdan oluşan Osmanlı sancağı görülmektedir (Şekil 3). Beş köşeli yıldız, 1844 yılından itibaren önce Osmanlı paralarında, ardından da bayraklarda kullanılmaya başlanmıştır. Sancak renginin kırmızı olarak belirlenmesi ise 1793'te Kaptanıderya Küçük Hüseyin Paşa'nın takririyle karara bağlanmış ve uygulamaya geçirilmiştir. Arma üzerinde Osmanlı sancağı, devletin bağımsızlığını simgeleyen bir unsur olarak yer almaktadır. Kalkanın solundaki yeşil zeminli sancak (Şekil 3), hilafet sancağı izlenimi verse de aslında hilafetin rengi siyahtır; yalnızca kılıfı yeşildir. Yeşil, Osmanlı denizcilerinin ve hacca giden gemilerin bayrağında da kullanılmış, İslam dünyasında hayatı ve suyu simgelediği için kutsal kabul edilmiştir. Arma üzerindeki bu sancak, gerçekte yanlış bir algıya dayansa da II. Abdülhamid döneminin İslamcılık politikasını yansıtan bir unsur olarak değerlendirilir.

Osmanlı armasındaki mızrak (Şekil 3), Orta Asya'dan beri Türklerin geleneksel silahlarından biri olup geçmişin akıncılarını ve ordunun süvari sınıflarını simgelemektedir. Ateşli silahların yaygınlaşmasıyla önemini yitirse de 19. yüzyılda süvari alaylarında yeniden kullanılmaya başlanmıştır. Bazı armalarda mızrağa asılı görülen nal aslında kılıcın kayışından kaynaklanmakta, ancak yanlış yorumlanmıştır. Nal ise uğur ve atla ilişkilendirilen bir semboldür. Mızrak, hilafet sancağının üzerinde yer almakta; bu konum, eski örneklerdeki tuğların yerini

almıştır. Oysa tuğ, bağımsızlık alameti ve Türk-Osmanlı geleneğinin önemli bir simgesi olarak armada eksik bırakılmıştır. Osmanlı armasında yer alan tek taraflı teber tören silahı olarak kullanılmıştır. Çift taraflı teber ise (Şekil 3), Osmanlı armasındaki iki taraflı balta, kökeni antik çağa dayanan ve "Labrys" adıyla bilinen bir silahtır. Tarihte kutsal törenlerde kurban aracı olarak kullanılan bu balta, Osmanlı'da daha çok üst düzey görevlilerin bir üstünlük sembolü olmuştur. Saray korumasıyla görevli Baltacı ocaklarının en seçkin bölüğü Zülüflü Baltacılar'dı. Yeniçeri Ocağı'nın kaldırılmasıyla Teberderan-ı Hassa Ocağı da sona ermiş, 18. yüzyıldan itibaren balta uzun saplı bir tören silahı haline gelmiştir. Ayrıca tarikat dervişlerinin simgesel silahları arasında da yer almış, armasında ise törensel niteliği ve tarihî kutsallığı nedeniyle kullanılmıştır.

Osmanlı armasında bulunan unsurlardan birisi de Tören Kılıcı'dır. İlk kılıç, geleneksel ordunun kılıçlarından farklıdır ve 19. yüzyılda subaylar tarafından kullanılan tören kılıçlarını andırır. Bazı el siperlikli kılıçların siperliklerinde ise arma motifine de yer verilmiştir. Armada bulunan top ise Sultan II. Murad'dan itibaren kullanılan ateşli silahları ve Topçu Ocakları'nı temsil eder; ayrıca İstanbul'un fethiyle sembolik bir bağlantı taşır. Osmanlı armasındaki ikinci tip kılıç, geleneksel Türk kılıçlarına daha çok benzemekte ve ordunun gerçek silahını temsil etmektedir. Adalet, doğruluk, güç, savaşçılık ve hükümranlığın sembolü olarak, armada bu değerleri simgelemek amacıyla yer almıştır.

Osmanlı armasında bulunan enstrümanlar da dikkati çekmektedir. Mehterhanede vurmalı çalgılardan sonra en önemli enstrüman zurnadır. Modern mızıka takımlarının ortaya çıkmasıyla zurna yerini borazana bırakmış ve borazan, haber verme ve duyurma eyleminin sembolü olmuştur.

Osmanlı Ordusu'nda 19. yüzyılda yabancı menşeli tüfeklerin yoğun olarak kullanılan tüfekler, armaya, ordunun ana silahı olarak girmiştir. Osmanlı armasındaki tabanca ise, 1840'tan itibaren subaylar ve süvari çavuşları tarafından kullanılan silahları temsil ederek ordunun modernleşmesini simgelemektedir. Armadaki şeşper benzeri unsur, biçiminden dolayı aslında bir asayı andırmaktadır. Tanzimat Madalyası'nda da görülen asa, Hz. Musa'nın mucizevi bastonu olarak bilinir ve mucizelerin gerçekleşmesine aracılık eder. Taç ile birlikte kullanımı hükümranlığı, tasavvufta ise yol önderliğini simgeler; bilgi ve yönetimin, ayrıca toplumsal hiyerarşinin evrensel sembolü olarak kabul edilmektedir. Armadaki terazi ise, şeşper veya asaya asılı şekilde yer almakta olup, tüm uluslarda adaletin sembolü olarak kabul edilen eski bir göstergedir ve Osmanlı armasında devletin ve sultanın adaletini simgelemektedir.

Armada bulunan önemli unsurlardan birisi de Kur'an-ı Kerim'dir. Osmanlı ülkesinde halkın büyük çoğunluğu Müslüman olduğundan ve sultan İslam'ın halifesi konumunda bulunduğundan, Kur'an-ı Kerim'in armada yer alması doğaldır. Terazinin üzerine konulması, Osmanlı adalet sisteminin kaynağının Kur'an'a dayandığını gösterir. Kur'an-ı Kerim'in "Oku" ile başlaması, aynı zamanda eğitimi de simgeler ve armasında Osmanlı İmparatorluğu'nun bir İslam devleti olduğunu vurgular.

Osmanlı armasının üzerinde kanunnamelere de gönderme bulunmaktadır. Osmanlı, İslam temelli şeriat hukukuna dayanırken, hükümdarın iradesiyle şeriat kapsamı dışındaki alanlarda konulan kanunlarla (Siyaset-i Sultani) düzenlenmiş bir hukuk sistemi geliştirmiştir. Önemli kanunnameler arasında Fatih, I. Selim ve Süleyman Kanunnameleri ile Tanzimat dönemi yasaları yer alır. Armadaki bu ikinci kitap, muhtemelen 1876'da ilan edilen Kanun-ı Esasi'yi simgeliyor olabilir. Böylece armadaki iki kitap, din, adalet, hukuk ve eğitimi sembolize etmektedir.

Osmanlı armasındaki Bereket Boynuzu, antik Hellen mitolojisinden gelen bir semboldür ve armada bereketi, üretkenliği ve Osmanlı topraklarının zenginliğini temsil eder. İlk çağlardan süsleme öğesi olarak kullanılan bu sembol, Tanzimat Madalyası'ndan alınmış olabilir ve armada Türk ve İslam geleneklerinden bağımsız tek öge olarak dikkat çeker. Armadaki çapa ise, gemiciliğin evrensel sembolü olup, 16. yüzyıldan itibaren Osmanlı donanmasını ve denizciliği temsil etmektedir.

Armadaki meşale, aydınlatan ve yol gösteren bir sembol olarak eğitimi ve ordudaki eğitim sınıfını temsil eder. Ateş, Türklerde kutsal sayılmış, yaşam, bereket ve koruma ile ilişkilendirilmiş; tasavvufta ise tanrı sevgisinin insan içine düşmesini simgelemiştir. Armada, meşale geleceği aydınlatan ideali ve parlak günlerin habercisi olarak kullanılmıştır.

Osmanlı armasının altında yer alan klasik bitkisel motifler, kıvrık dallar ve palmetlerden oluşmakta ve beş Osmanlı nişanıyla tamamlanmaktadır. Bu Batı tarzı motifin kaynağı, muhtemelen Tanzimat Madalyası'nda görülen benzer süslemelerdir; madalyadan armaya Bereket Boynuzu ve asa gibi ögeler de taşınmıştır. Ancak madalyadaki anlam taşımayan damla mücevherler, armada Osmanlı nişanlarıyla değiştirilmiştir.

Osmanlı armasında yer alan nişanlar, Şefkat Nişanı, Nişan-ı Osmanî, Nişan-ı İftihar, Mecidî Nişanı ve Nişan-ı Âli İmtiyaz gibi çeşitli nişanları kapsar. Nişanların armadaki yerleri, kullanıldığı bağlama, çizen kişinin tarzına ve olası hatalarına göre değişiklik gösterir; para ve madalyalarda stilize edilmiş biçimde, karakteristik özelliklerinden uzak görünürler. Tespitleri için en güvenilir kaynak, Devlet Salnamelerindeki gerçek

çizimlerdir. Armadaki nişanlar, imparatorluğun asker ve sivil bürokrasisini temsil etmek amacıyla yerleştirilmiştir. Osmanlı armasında yer alan ok, yay ve tirkeş (okluk) bir grup olarak değerlendirilmelidir. Ok ve yay, Türklerin milli silahları olup Osmanlı'da kemankeşler tarafından kullanılmış, 16. yüzyıldan sonra savaşta önemini kaybederek sportif bir araç hâline gelmiştir. Arma, bu nedenle ok ve yayı geleneksel ata silahı olarak simgelemektedir (Özdemir, 1997: 99-140).

Özetle, Osmanlı armasının, Osmanlı Devleti'nin kara ve deniz kuvvetlerinin, eski ile yeni silahlarıyla sancağını ve şer'î ve nizamî hukuk ilkelerini toplayan kitaplarla adalet terazisini ve samimiyeti temsil eden çiçek demetini ve devletin şanlı nişanlarını içerdiği görülmektedir (Eldem, 2009, s. 7; Can, 2014, s. 174-175).

## 4. SAFRANBOLU YAPILARINDA OSMANLI ARMALARI

Safranbolu'da bulunan mimari eserlerin üç tanesinde Osmanlı Arması tespit edilmiştir. Tamamı 20. yüzyılın başında inşa edilen bu örnekler üç ayrı yapı grubunda bulunmaktadır. Bunlar, inşa sırasına göre Kileci Çeşme'si, Safranbolu Hükümet Konağı ve Bağlar Kız Teknik Lisesi yapılarıdır.

### 4.1. Kileci Çeşmesi'nde Bulunan Osmanlı Arması

Safranbolu'nun Musalla Mahallesi, Manifaturacılar Sokağı üzerinde yer almaktadır. Yapının üzerinde bulunan tarih kitabesine göre çeşme, H. 1321 (M. 1903) yılında inşa edilmiştir. Hazneli çeşmeler grubuna dahil olan yapının aynalığında altı adet lüle olmasına karşın, günümüzde bu lülelerin bir kısmı işlevini yitirmiş durumdadır. Üç bölümlü cephe düzenine sahip olan çeşmenin üst bölümünde, mermerden işlenmiş bir Osmanlı arması yer almaktadır (Şekil 4 ve 5).

Arma, yapının cephe düzeninde merkezi bir konuma sahiptir ve profilli silmelerle çerçeveye alınmış, basık kemerli bir tepelik ile tamamlanmıştır. Kompozisyon alanında armadan başka herhangi bir öğe bulunmamaktadır. Bu düzenleme, armanın yapıya hâkim bir estetik ve simgesel değer katmasını sağlamaktadır.

Kileci Çeşmesi'ndeki Osmanlı Arması, klasik armalarda görülen pek çok sembolü içermektedir: güneş, ayyıldız, kalkan ve on iki yıldız, Osmanlı ve hilafet sancakları, mızraklar, borazan ve zurna, çapa, bereket boynuzu, tirkeş ve sadak ile bitkisel motifler. Bununla birlikte, çoğu örnekte alt kısımda yer alan nişanlar ve bazı askeri silahlar (süngülü tüfek, tek ve çift taraflı teberler, tabanca, asa veya şeşper, tören kılıcı, top, Kur'an-ı Kerim ve kanunnameler) Kileci Çeşmesi'ndeki armada yer almamaktadır.



Genel görünüm



Alınlık bölümü

Şekil 4. Kileci Çeşmesi'nin cephe görünümleri (Karaca, vd., 2013, s. 265, 267)

Armanın odak noktası, üst orta bölümde dairesel bir madalyon içine alınmış ayyıldız ve güneş motifi ile vurgulanmıştır. Bu madalyon, her iki tarafta bulunan sancakların üzerinde simetrik olarak yerleştirilmiş mızrakları da kapsamaktadır. Osmanlı armalarının vazgeçilmez öğelerinden biri olan Osmanlı sancağı, sağ tarafta; hilafet sancağı ise sol tarafta konumlandırılmıştır. Her iki sancakta da ayyıldız motifi yer almakta ve sancak direklerinin üst kısımlarında hilal şeklinde alemler görülmektedir.

Sancakların orta kısmında yer alan elips formlu kalkan, çevresinde yaygın olarak kullanılan on iki yıldız düzenlemesiyle desteklenmiştir. Kalkanın sol tarafında bereket boynuzu bulunmakta olup, boynuzun uç kısmında gül demeti şeklinde bir bitkisel süsleme yer almaktadır. Sağ taraftaki Osmanlı sancağının altında, kısmen sancağın arkasında kalan bir borazan tasvir edilmiştir. Sol taraftaki hilafet sancağının alt kısmında ise çapa yer almaktadır.

Kalkan ve on iki yıldız düzeninin alt bölümünde bir başka müzik aleti olan zurna yer almakta olup, zurnanın her iki yanına sadak ve tirkeşler konumlandırılmıştır. Armanın alt kısmı, simetrik bir bitkisel motifle tamamlanarak kompozisyon bütünlüğü sağlanmıştır.



Şekil 5. Kileci Çeşmesi'nde Osmanlı Arması (Karaca, vd., 2013, s. 269)

Yaklaşık 120 yılı aşkın süre boyunca çeşitli doğal etkenlere maruz kalan mermer arma, zamanla ciddi ölçüde aşınmıştır. Bu nedenle, arma üzerindeki bazı küçük öğelerin orantısı ve detayları günümüzde tam olarak okunamamaktadır. Ancak, Kileci Çeşmesi'ndeki Osmanlı Arması, dönemin görsel ve kültürel temsil unsurlarını yansıtan özgün bir örnek olarak işlevini korumakta ve taşıdığı tarihsel değeri günümüzde de yansıtmaya devam etmektedir.

### 4.2. Safranbolu Hükümet Konağı'nda Bulunan Osmanlı Arması

Çeşme Mahallesi'nde yer alan yapı, kitabesinin son satırında ebcet hesabıyla verilen tarihe göre H. 1322 (M. 1904-1905) yılında inşa edilmiştir (Mutlu, 2024a, s. 777). Bu tarih, yapının kuzey cephesinde bulunan Osmanlı armasının altında yer alan tarih kayıtlarıyla da doğrulanmaktadır. Cephenin üst kısmındaki yuvarlak tepelikli alınlığın merkezine yerleştirilen Osmanlı arması, Safranbolu'daki örnekler arasında en ayrıntılı kompozisyonu sunmaktadır. Armanın alt bölümünde Arabi rakamlarla hicrî 1322 ve rûmî 1320 tarihleri yer almaktadır (Şekil 6).

Arma, alınlığın mimari formu dışında herhangi bir çerçeve ile sınırlandırılmamış olup, düzenlemede armadan başka yalnızca tarih bilgileri dikkati çekmektedir. Safranbolu Hükümet Konağı'nda yer alan bu arma, klasik

Osmanlı armasının birçok unsurunu yansıtmaktadır. Yapının 1976 yılındaki yangından sonra kapsamlı bir restorasyon geçirmiş olması, armanın günümüze sağlam biçimde ulaşmasında belirleyici olmuştur. Kompozisyonda güneş, hilal, tuğra, kalkan, Osmanlı ve hilafet sancakları, mızraklar, çapa, bereket boynuzu, tirkeş ve sadak, bitkisel motifler, nişanlar, teberler, terazi, asa, şeşper, tören kılıcı, top, ateşli silahlar, Kur'an-ı Kerim ve kanunnameler gibi çok sayıda unsur yer almaktadır (Şekil 7).



Şekil 6. Safranbolu Hükümet Konağı'nda bulunan armanın genel ve detay görünümleri

Armanın üst bölümünde, diğer tüm örneklerde olduğu gibi güneş motifi bulunmaktadır. Hilalin iç kısmında dairesel bir madalyon oluşturulmuş, merkezine kazıma tekniği ile Sultan II. Abdülhamid'in tuğrası işlenmiştir. Tuğrada "*Abdülhamid Han bin Abdülmecid el-muzaffer dâima"*; sağ üst bölümde bulunan mahlas kısmında ise "*el-Gâzî"* yazmaktadır (Mutlu, 2024b, s. 291). Güneş motifinin altında simetrik biçimde iki mızrak yerleştirilmiştir. Orta bölümde Osmanlı armasının tipik unsurları olan sancaklar görülmektedir (Şekil 7).

Sağdaki sancakta ayyıldız, soldakinde ise üç hilal motifi işlenmiştir. Hilal biçimli alemlerle sonlanan sancak direklerine bağlı püsküllü ipler her iki tarafta ikişer adet olarak tasvir edilmiştir. Sancakların merkezinde yer alan kalkanın etrafına klasik örneklerde on iki yıldız yerleştirilirken, bu yapıda kazıma tekniğiyle işlenmiş on adet geometrik süsleme kullanılmıştır. Klasik Osmanlı armalarında hilal ile kalkan arasında çoğu örnekte sorguçlu serpuş betimlenirken, burada dairesel bir bitkisel süsleme görülmektedir (Şekil 7). Kalkanın sol tarafında bereket boynuzu, uç kısmında ise gül buketi formunda bitkisel süsleme yer almaktadır.



Şekil 7. Safranbolu Hükümet Konağı'nda Osmanlı Arması (Karaca, vd., 2013, s. 126)

Sancakların dış kısımları yoğun biçimde arma unsurlarıyla donatılmıştır. Sağdaki sancakta yukarıdan aşağıya sırasıyla teberler, mızrak, tören kılıcı, top ve normal kılıç; soldaki sancakta ise iki teber, ateşli silah, terazi, Kur'an-ı Kerim, kanunname ve bereket boynuzunun altında bir çapa bulunmaktadır. Alt bölümde bitkisel motif, onun altında beş nişan ve nişan ile bitkisel motifi bağlayan, iki yanda karşılıklı yerleştirilmiş dört ayyıldız ile kompozisyon tamamlanmaktadır. Ortadaki nişan ile bitkisel süsleme arasındaki bağlantı ise küçük bir geometrik motifle sağlanmıştır (Şekil 7).

Hükümet Konağı'nın 1976'daki yangından sonra 2000-2006 yılları arasında gerçekleştirilen restorasyonunda armanın yenilendiği anlaşılmaktadır. Yangın öncesi durumuna ilişkin bilgi bulunmamakla birlikte, günümüzdeki yıpranma düzeyi dikkate alındığında arma büyük ölçüde yeniden yapılmıştır. Genel olarak iyi korunmuş olmasına karşın, bazı bölümlerindeki yıpranmadan ziyade imalattan yani yenileme sırasında ortaya çıkan işçilik sorunlarıyla açıklanabilir.

### 4.3. Bağlar Kız Teknik Lisesi'nde Bulunan Osmanlı Arması

Yapı, Safranbolu'nun "Köyiçi" olarak isimlendirilen mevkide, Kurtuluş Caddesi ile Hacıbey Sokak'ın birleşiminde bulunmaktadır. Günümüzde Köyiçi meydanına bakan bahçe duvarı üzerinde bulunan armalı kitabesine göre eser, H. 1333 (M. 1914-15) yılında inşa edilmiştir (Şekil 8). Eserin inşa tarihi, kitabede rakamla

verilmesinin yanı sıra, son satırında noktalı harflerle tarihlendirme tekniği kullanılarak ebcetle de verilmiştir (Mutlu, 2024a, s. 781). İlk olarak idadi (lise) olarak inşa edilen bina, daha sonra Pratik Kız Sanat Okulu, Kız Sanat Okulu ve Kız Meslek Lisesi olarak kullanılmıştır.

Bağlar Kız Teknik Lisesi'nin kitabesi mermer malzemeden yapılmıştır. Üst bölümünde dairesel tepelikli bir form alan kitabede, tepelik kısmına Osmanlı arması işlenmiştir. Kitabe ve arma genelinde nitelikli bir işçilik dikkat çekmektedir. Bununla birlikte, armada klasik örneklerde görülen bazı unsurların, özellikle de güneş motifinin bulunmadığı anlaşılmaktadır. Arma; hilal, tuğra, sancak, mızrak, ateşli silah, tek ve çift taraflı teber, terazi, tören kılıcı, normal kılıç, top, kalkan, borazan, tirkeş, sadak, bitkisel süslemeler ve nişanlardan oluşmaktadır (Şekil 9).

Osmanlı armalarında genellikle tuğra ve hilalin, güneşi sembolize eden bir zemin üzerinde yer aldığı bilinmektedir. Ancak Bağlar Kız Teknik Lisesi örneğinde güneş motifi yer almaz; hilal ve tuğra sade bir zemin üzerine işlenmiştir.



Şekil 8. Bağlar Kız Teknik Lisesi'nin kitabesinin genel ve detay görünümleri

Hilalin sınırları kabartma tekniğiyle belirginleştirilmiş olup, iç kısmına *"Rabbani yardımlara dayanan Yüce Osmanlı Devleti Meliki"* anlamına gelen *"el-Müstenid bi-tevfîkâti'r-Rabbâniyye Melikü'd-Devleti Osmâniyye"* ibaresi yazılmıştır. Bu yazının ortasında Sultan Mehmed Reşad'a (V. Mehmed) ait küçük ölçekli bir tuğra yer almaktadır. Tuğrada *"Mehmed Han bin Abdülmecid el-muzaffer daima"* ifadesi bulunurken, mahlas kısmında padişahın kullandığı *"Reşad"* ibaresi yer almaktadır (Şekil 9) (Mutlu, 2024b, s. 293).

Hilalin altında, Osmanlı armalarında sıklıkla görüldüğü üzere, iki mızrak, simetrik şekilde yerleştirilmiştir. Hilal ile kalkan arasındaki bölümde ise klasik örneklerde rastlanan sorguçlu serpuş yerine, yıldız biçimini andıran geometrik bir süsleme kullanılmıştır. Kalkanın tasarımında da özgün ayrıntılar dikkat çekmektedir. Üst kısmında, ortadaki yıldızla simetri oluşturan iki hilal bulunmakta; merkezde yer alan süslemenin çevresi ise yedi adet yıldızla çevrelenmektedir (Şekil 9).

Armanın orta bölümünde, sol taraftaki sancağın altında bereket boynuzu, onun hemen altında ise çapa kompozisyonu öne çıkmaktadır. Kalkanın alt kısmında klasik Osmanlı armalarında da görülen şekilde bir borazan; borazanın yanlarında ise tirkeş ve sadak yer almaktadır. Alt bölümdeki bitkisel süslemeden sarkar biçimde gösterilen nişanlar kompozisyonu tamamlamakta; en dıştaki iki nişan ise bitkisel süslemeye içe dönük ayyıldızlı ara motiflerle bağlanmaktadır (Şekil 9).



Şekil 9. Bağlar Kız Teknik Lisesi'nin kitabesinde bulunan Osmanlı arması

Kalkanın sağında ve solunda Osmanlı ve hilafet sancaklarını temsil eden sancaklar yer almakta, sancakların üzerinde dışa dönük ayyıldızlar görülmektedir. Direklerin alem kısımları ise hilal figürleriyle sonlanmaktadır.

Klasik Osmanlı armalarında olduğu gibi sancakların dış bölümlerinde diğer tamamlayıcı ögeler düzenlenmiştir. Sol tarafta yukarıdan aşağıya doğru süngülü tüfek, tek taraflı teber, ayrıntılı biçimde işlenmiş bir ateşli silah, onun altında asa; bunların devamında terazi ve en altta Kur'an-ı Kerim yer almaktadır. Sağ tarafta ise en üstte

tek taraflı, altında çift taraflı teber; daha aşağıda mızrak, onun altında tören kılıcı; en altta top ve son olarak normal kılıç sıralanarak kompozisyon tamamlanmıştır (Şekil 9).

## 5. DEĞERLENDİRME VE SONUÇ

Osmanlı arması, imparatorluğun çok yönlü siyasi, askerî ve kültürel yapısını görsel bir dil aracılığıyla ifade eden en önemli sembollerden biridir. İçerisinde yer alan tuğra, sancak, kalkan, silahlar, güneş, hilâl ve çeşitli nişanlar, yalnızca dekoratif unsurlar olmayıp Osmanlı'nın temsil ettiği değerlerin, otoritenin ve devlet geleneğinin farklı boyutlarını yansıtmaktadır. Arma, bir yönüyle İslamî kimliği ve hilâfet otoritesini vurgularken, diğer yönüyle devletin askerî gücünü, adalet anlayışını ve hâkimiyet iddiasını ön plana çıkarmaktadır. Tanzimat'tan sonraki süreçte bereket boynuzu, terazi ve asa gibi unsurların araya katılması ise Osmanlı modernleşme hareketlerinin sembolik düzeydeki yansımaları olarak değerlendirilebilir. Böylelikle Osmanlı arması, geleneksel semboller ile Batı etkisi taşıyan unsurların bir araya geldiği hibrit bir görsel kompozisyon özelliği kazanmıştır.

Armanın Safranbolu'daki uygulamaları, sembolün yalnızca merkezde değil, taşrada da güçlü bir temsil aracına dönüştüğünü göstermektedir. Bu bağlamda arma, devletin otoritesini ve kimliğini yalnızca büyük şehirlerde değil, Anadolu'nun önemli ticaret ve kültür merkezlerinden biri olan Safranbolu'da da görünür kılmıştır. Özellikle Kileci Çeşmesi'nde yer alan örnek, sıradan bir su yapısının devlet ideolojisi ile bütünleştirilmesine imkân tanımaktadır. Çeşme gibi gündelik yaşamla doğrudan ilişkili bir yapı üzerinde armanın kullanılması, sembolün halka yakınlaştırıldığını, devlet kimliğinin ise mekân üzerinden sürekli hatırlatıldığını ortaya koymaktadır. Bu durum, arma kullanımının yalnızca resmi yapılarda değil, kamusal ve sosyal hayata hizmet eden yapılarda da yaygınlaştırıldığını göstermektedir.

Safranbolu Hükümet Konağı'nda görülen arma ise doğrudan devlet otoritesinin temsili açısından dikkat çekicidir. Konağın işlevi gereği halk ile devletin buluşma noktası olması, armayı burada anlam bakımından daha da merkezi bir konuma taşımıştır. Eğitim yapısındaki uygulama ise farklı bir boyuta işaret etmektedir: Arma, genç nesillere Osmanlı kimliğinin ve devlet ideolojisinin görsel bir aktarım aracı olarak sunulmuştur. Böylece arma, yalnızca kamusal otoritenin değil, aynı zamanda kültürel sürekliliğin ve aidiyetin sembolü olarak işlev görmüştür.

Safranbolu'daki bu örnekler, Osmanlı armasının taşra ölçeğinde de bir tür "görsel politika" aracı olarak kullanıldığını ortaya koymaktadır. Arma, bulunduğu yapılara sadece estetik değer katmakla kalmamış; aynı

zamanda Osmanlı devlet düzenini, hilâfetin temsilini ve modernleşme sürecinin izlerini bir bütün olarak yansıtmıştır. Çeşme, hükümet konağı ve eğitim yapısı gibi farklı işlevlere sahip yapılarda aynı sembolün kullanılması, armanın çok yönlü temsil gücünü ve Osmanlı toplumunun farklı kesimlerine hitap eden kapsayıcı rolünü gözler önüne sermektedir.

Sonuç olarak, Osmanlı arması yalnızca bir süsleme unsuru değil, çok katmanlı bir anlam dünyasının taşıyıcısıdır. Safranbolu'daki uygulamalar, devletin kimlik, otorite ve ideolojisini mimari üzerinden taşraya aktarmanın somut örneklerini sunmaktadır. Bu bağlamda arma, imparatorluğun kültürel çeşitliliğini, siyasal sürekliliğini ve toplumsal belleğini görünür kılan bir sembol olarak ele alınmalıdır. Safranbolu'daki örneklerin ayrıntılı biçimde incelenmesi, Osmanlı armasının yalnızca merkezde değil, taşrada da gündelik yaşamın ve mimarinin ayrılmaz bir parçası haline geldiğini göstermektedir. Dolayısıyla Osmanlı arması, estetik bir unsur olmanın ötesinde, imparatorluğun siyasi söylemini ve kimlik inşasını destekleyen güçlü bir görsel iletişim aracıdır.

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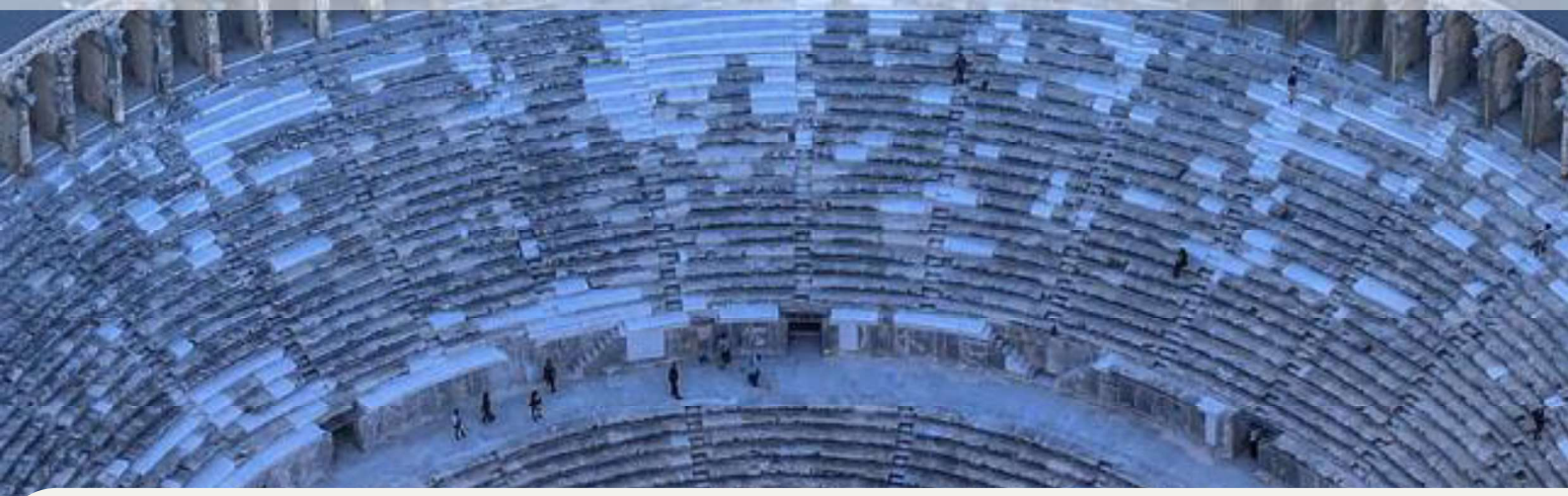


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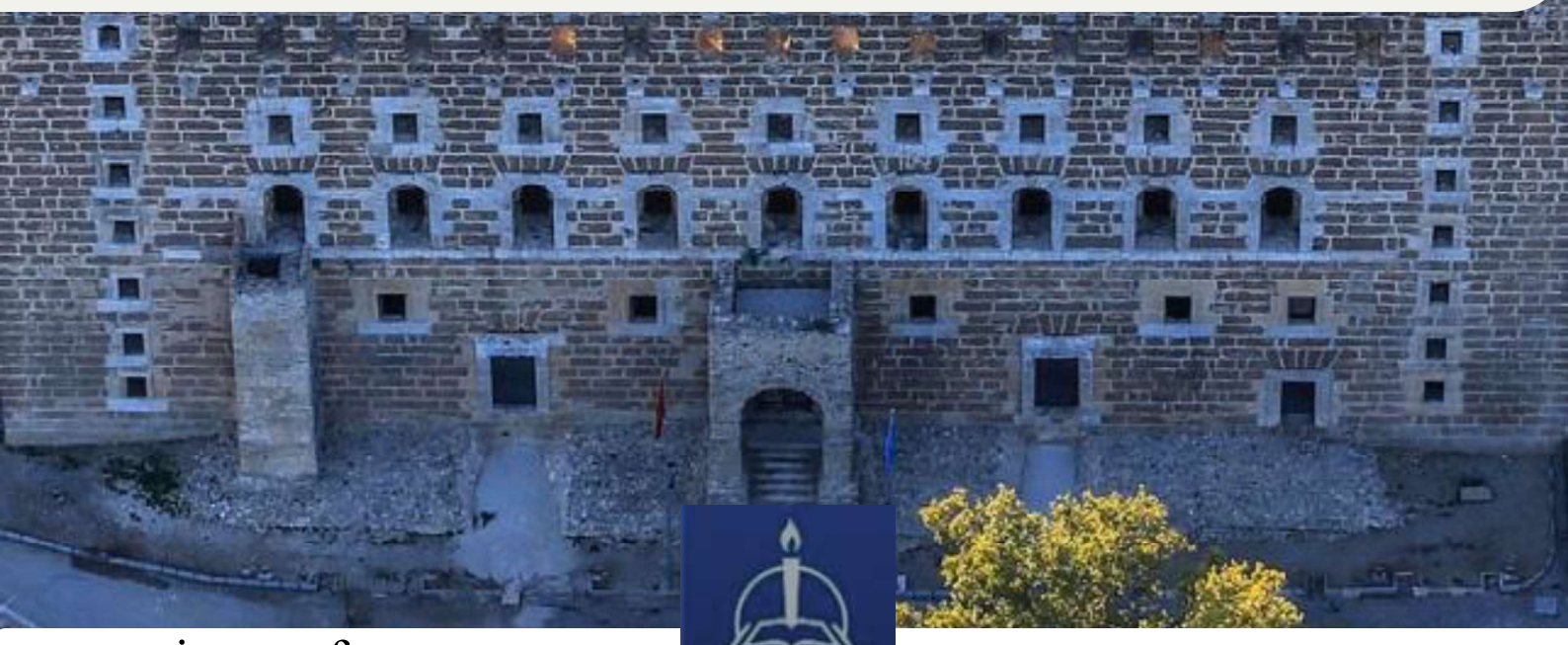


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# KARABÜK'TE SANAYİ VE MİMARİ İLİŞKİSİNDE TASARIMLAR: FERFORJE

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## ÖZET

Türkiye Cumhuriyeti'nin erken dönem sanayileşme vizyonunun ürünlerinden biri olan Karabük'ün, kentsel gelişimi ve kimliği doğrudan Demir-Çelik Fabrikası'nın (KDÇF) varlığı etrafında şekillenmiştir. Fabrikanın kuruluşunu takiben, çalışanlar için kurgulanan ve bugün Yenişehir olarak tanımlanan modern yerleşke, kentin çekirdek dokusunu oluşturmuştur. Yenişehir'de uygulanan modern planlama ve mimari anlayış, zamanla yerleşkenin çeperlerinde gelişen bireysel konut üretimlerini de etkisi altına almıştır. İster kurumsal (lojman) ister bireysel (sivil) girişimle üretilmiş olsun, dönemin konut stokunda benzer tasarım refleksleri ve modernleşme arayışları gözlemlenmektedir. Bu mimari dilin en belirgin ortak paydası, sanayi üretiminin sağladığı erişilebilirlik sayesinde yapı detaylarında yoğunlaşan demir kullanımıdır. Bu bağlamda demir, Karabük için salt bir endüstriyel çıktı değil, kentin ontolojik varoluşunun kurucu temelidir. Balkon korkuluklarından bina girişlerine, bahçe duvarlarından kentsel donatılara kadar uzanan bitkisel ve geometrik motifli ferforje uygulamaları, cephelere şeffaflık ve ritim kazandırmaktadır. Bu çalışma, sanayinin gölgesinde büyüyen bir kentin, estetik dilini metal üzerinden nasıl kurguladığını; bu 'demir estetiğinin' toplumsal bellek ve aidiyet üzerindeki etkilerini incelemektedir. Çalışma, bölgedeki özgün niteliğini koruyan yapıların cephe analizlerine dayanan bu araştırma, sanayi ve mimari arasındaki organik ilişkiyi ferforje kullanımı özelinde irdelemeyi amaçlamaktadır.

**Anahtar Kelimeler:** Karabük, endüstriyel miras, konut, sivil mimari, ferforje.

# DESIGNS IN THE RELATIONSHIP BETWEEN INDUSTRY AND ARCHITECTURE IN KARABÜK: WROUGHT IRON

## ABSTRACT

Karabük, one of the products of the Republic of Turkey's early industrialization vision, directly shaped its urban development and identity around the presence of the Iron and Steel Factory (KDÇF). Following the factory's establishment, the modern campus built for the workers, now known as Yenişehir, formed the city's core fabric. The modern planning and architectural approach implemented in Yenişehir gradually influenced the individual housing production that

developed on the campus's peripheries. Whether produced through institutional (lodging) or individual (civil) initiatives, similar design reflexes and modernization quests are observed in the housing stock of the period. The most obvious common denominator of this architectural language is the use of iron, which became more prevalent in structural details thanks to the accessibility provided by industrial production. In this context, iron is not merely an industrial output for Karabük, but the founding foundation of the city's ontological existence. From balcony railings to building entrances, garden walls to urban fixtures, wrought iron applications featuring plant and geometric motifs bring transparency and rhythm to facades. This study examines how a city growing in the shadow of industry constructs its aesthetic language through metal, and the effects of this "iron aesthetic" on social memory and belonging. Based on façade analyses of buildings that retain their original character in the region, this research aims to explore the organic relationship between industry and architecture, specifically through the use of wrought iron.

**Keywords:** Karabük, industrial heritage, housing, civil architecture, wrought iron.

## 1. GİRİŞ

Dövme demir, yüzyıllardır mimari tasarımda önemli bir rol oynamış, sağlamlığı, şekillendirilebilirliği ve dekoratif potansiyeli nedeniyle değer görmüştür. Balkon korkuluklarında, bahçe duvarlarında ve bina girişlerinde kullanımı hem işlevsel hem de estetik nitelikleri bir araya getirerek hem tarihi hem de modern mimaride vazgeçilmez bir unsur haline gelmiştir. Fransızca "fer forgé" (dövme demir) kelimesinden dilimize geçen, “Kapılara, pencerelere veya evlerin iç bölümlerine süsleme amacıyla yapılıp takılan dövme demir” (URL-1) veya “demir, düşük karbon içeriğine sahip, sert ve şekillendirilebilir bir metaldir; bu nedenle dövülebilir ve kaynaklanabilir” (URL-2) olarak tanımlanan ferforjeler; süslü, natüralist motiflerden daha sade, çizgisel tasarımlara kadar değişen zevklere uyarlanabilmesiyle, mimaride orta çağdan beri kullanılmaktadır. Kalıpların kullanımı ve yeni dövme teknikleri gibi teknolojik gelişmeler, dekoratif unsurların seri üretimini mümkün kılarak ferforjeyi daha geniş bir mimari uygulama yelpazesi için erişilebilir hale getirmiştir (Vidovszky, 2023).

İnsanlığın demiri işlemeyi keşfedip, şekillendirmesinin ardından, demirin mimaride estetik bir unsur olarak kullanılmasıyla, mimarlık tarihi için ferforjeler de bir sanat formu olarak kabul edilmişlerdir. Orta çağda güvenlik amaçlı yapılan tasarımların, malzemenin yalnızca işlevsel olarak değerlendirilmesi nedeniyle kaba ama sağlam oldukları söylenebilmektedir. 17. Yüzyıldan sonra demir artık bir statü göstergesi haline gelmiştir. Barok ve rokoko dönemlerinde ferforjeler giriş kapıları, balkon korkulukları, merdiven tırabzanları gibi mimari elemanlarda

kıvrımlı hatlar ve bitkisel motiflerle yapılarda uygulanmaya başlamışlardır. Art Nouveau akımıyla birlikte ferforjenin altın çağı yaşanmıştır. 19. yüzyıl sonrasında ise endüstri devrimiyle birlikte ferforjeler yeniden yorumlanmış ve modern sanayi ekipmanlarıyla yeniden tasarlanmışlardır (Norton, 2021).

Ferforje duyusal olarak soğuk bir malzeme olmasına rağmen, doğru tekniklerle tasarlanıp uygulandığında, estetik görünümüyle yapıya prestij sağlamaktadır. Bunun yanı yapısal olarak sağlam olması nedeniyle hem sürdürülebilir oluşundan hem de güç sembolü haline gelmesinden de bahsedilebilmektedir. Bu iki özellik bir arada düşünüldüğünde ferforjenin mimari için önemi bir kez daha vurgulanmış olmaktadır. Sağlamlık sayesinde güvenlik sağlarken, estetik tasarımlarla da şeffaflık elde edilerek görüş engellenmemiş olmaktadır.

## 2. FERFORJENİN MİMARİDEKİ YERİ

Osmanlı mimarisinde demirin mimari bir eleman ve ferforje olarak kullanımı farklı bir gelişim çizgisinde ilerlemiştir. Strüktürel ve fonksiyonel bir malzeme olarak tercih edilen malzeme, 19. yüzyıla gelindiğinde Avrupa etkisiyle süslü bir sanata dönüşmüş ve yapının tasarım dilini tamamlayan elemanlara dönüşmüşlerdir (Şekil 1). Klasik dönemde (15.-18. yy) geometrik, sade, dikey ve hatlar; geç dönemde (19. yy) kıvrımlı ve bitkisel motiflerin ana üslup olarak kullanıldığı görülmektedir. Yine Klasik dönemde malzemenin kullanımında güvenlik ve sağlamlık amaçlanırken; Geç dönemde gösteriş, prestij ve dekorasyon algısı fark edilmektedir.



**Şekil 1.** Osmanlı'nın çeşitli dönemlerine ait demir malzemenin kullanımı. Solda: Yeşil Camii, İznik/Bursa. Ortada: 3. Ahmet Çeşmesi, Fatih/İstanbul. Sağda: Pertevniyal Valide Camii, Fatih/İstanbul.

Erken Cumhuriyet Dönemi mimarisinde ferforje kullanımı, ülkenin bu dönemdeki sanayileşme ve modernleşme ideolojisiyle yakından ilişkilidir. Bu dönem mimarisi, süsten uzak, sade ve yalın cepheleri benimseyen modern akımın özelliklerini taşımıştır. Osmanlı'nın son dönemlerinde başlayan batılılaşma hareketleriyle Avrupa'daki demir kullanım ve üretim

teknolojisi de Osmanlı mimarisine eklemlenmiştir. Bu dönemde ampir, barok, neo-klasik ve art nouveau gibi üsluplar demirciliği şekillendirmiştir. Erken Cumhuriyet dönemi yapılarıysa, modernleşme arayışları doğrultusunda, bu üsluplardan etkilenen ancak aslen modern mimarinin sadeleşme prensibini benimseyen tasarımları barındırmıştır (Kurugöl ve Küçük, 2015).

Erken Cumhuriyet döneminde mimari yapılarda, yeni kurulan devletin ideolojisini yansıtan modern, geometrik ve rasyonel bir kimlik belirlenmiştir. Bu dönemde yeni yapı teknikleri ve betonarme, çelik, cam gibi malzemelerin kullanımı öne çıkarken, ferforje gibi dekoratif metal işçiliği de modern mimarinin estetik unsurları arasında yer almıştır. Ferforje, sanayileşme arzusu ile zanaatkarlığın kesişiminde bir yapı elemanı olarak gelişmiştir.

## 3. KARABÜK'TE DEMİR ESTETİĞİ: SANAYİ, MİMARİ VE FERFORJE

Türkiye Cumhuriyeti'nin erken dönem sanayileşme politikalarını anlamak için, 1923 yılında toplanılan İzmir İktisat Kongresi'ni ve 1934-1938 yıllarını kapsayan Birinci Beş Yıllık Sanayi Planı'nı incelemek gerekmektedir. İzmir İktisat Kongresi'nde ülkenin sanayi ekonomisinin teşviğine yönelik kararlar alınmış ve bu kararların hayata geçirilebilmesi için de 1933 yılında Sümerbank kurulmuştur. Türkiye'nin ilk Kamu İktisadi Teşekkülü olarak olan Sümerbank, bizzat Mustafa Kemal Atatürk tarafından kurulmuş ve devletin kalkınmasında bir mihenk taşı işlevi görmüştür. Başta dokuma olmak üzere kimya, maden, selüloz ve seramik alanında çok sayıda fabrika inşa etmiştir.

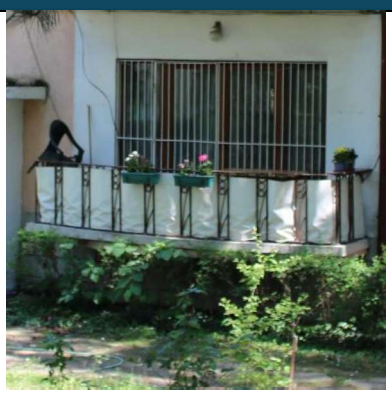
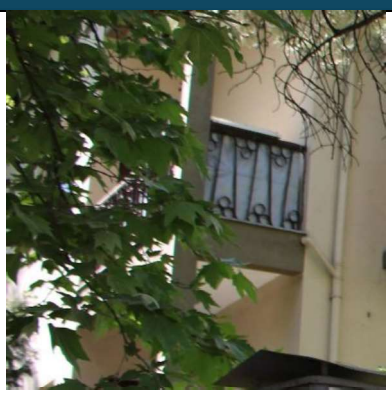
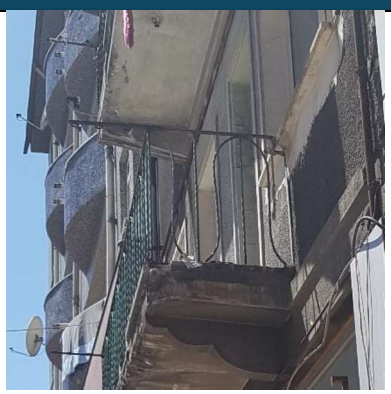
Karabük, Demir-Çelik Fabrikası'nın kurulmasıyla şekillenmiş bir şehirdir. 1935 yılında Öğlebeli köyüne bağlı bir mahalle iken, 1995 yılında Türkiye'nin 78. ili olmuştur. Fabrikanın kurulması ve buna bağlı hızla artan nüfusa çözüm için şehirleşme faaliyetleri geliştirilmiştir (Kolektif, 1985). Fabrikanın kurulmasının ardından, çalışanlar için inşa edilen ve modern bir yerleşke olan Yenişehir, kentin çekirdek dokusunu oluşturmuştur.

Dönemin konut anlayışında, cumhuriyetin her alanda modernleşme pratikleri görülmekte, ev kavramı modern bir anlayışla ele alınmaktadır. Konut tasarımlarında mekanlar tek aile için tasarlanmakta, konutun içinde ailenin ihtiyaçlarını karşılaması için çözümler getirilmeye başlamıştır. Geleneksel Türk evinin etkileri hala konut planlarında hissedilmektedir. Sofadan dönüşen salonlar, yatak odalarının gece holüne bağlanması, banyodan ayrı bir tuvalet olması bu etkenler arasında sayılabilmektedir. Sosyolojik anlamda Türkiye'de net olarak sınıfsal farklılıklar, sınıfların mücadelesi ya da sınıfların varlığı olmasa da Erken Cumhuriyet döneminde, sanayileşmeyle kırda yaşayan ve kentte yaşayan arasındaki farkın azaltılması hedefi bulunmaktadır (Bozdoğan, 2012).

Dönemin konut stoğunda modernleşme arayışı ve tasarım anlayışı geliştirirken, ortak bir dil oluşmasını sağlamak için kullanılan ögelerden biri de ferforjelerdir. Karabük örneği, Türkiye mimarlık tarihinde ferforjenin kullanımı açısından mekan ve malzeme ilişkisinin en organik biçimde kurulduğu nadir örneklerden biridir. Sanayi üretiminin sağladığı erişilebilirlik, demirin sadece sanayi yapılarında değil, sivil mimaride ve konutlarda da yoğun bir şekilde kullanılmasının ana nedenidir. Fabrika sayesinde demir, mimari detaylarda kolayca ulaşılabilir ve işlenebilir bir malzeme haline gelmiştir. Şehirde ferforje, sıradan bir yapı malzemesi olmanın ötesine geçerek, bir kentin varoluş nedeni olan fabrikayla şekillenen toplumsal kimliğin mimariye yansımasıdır.

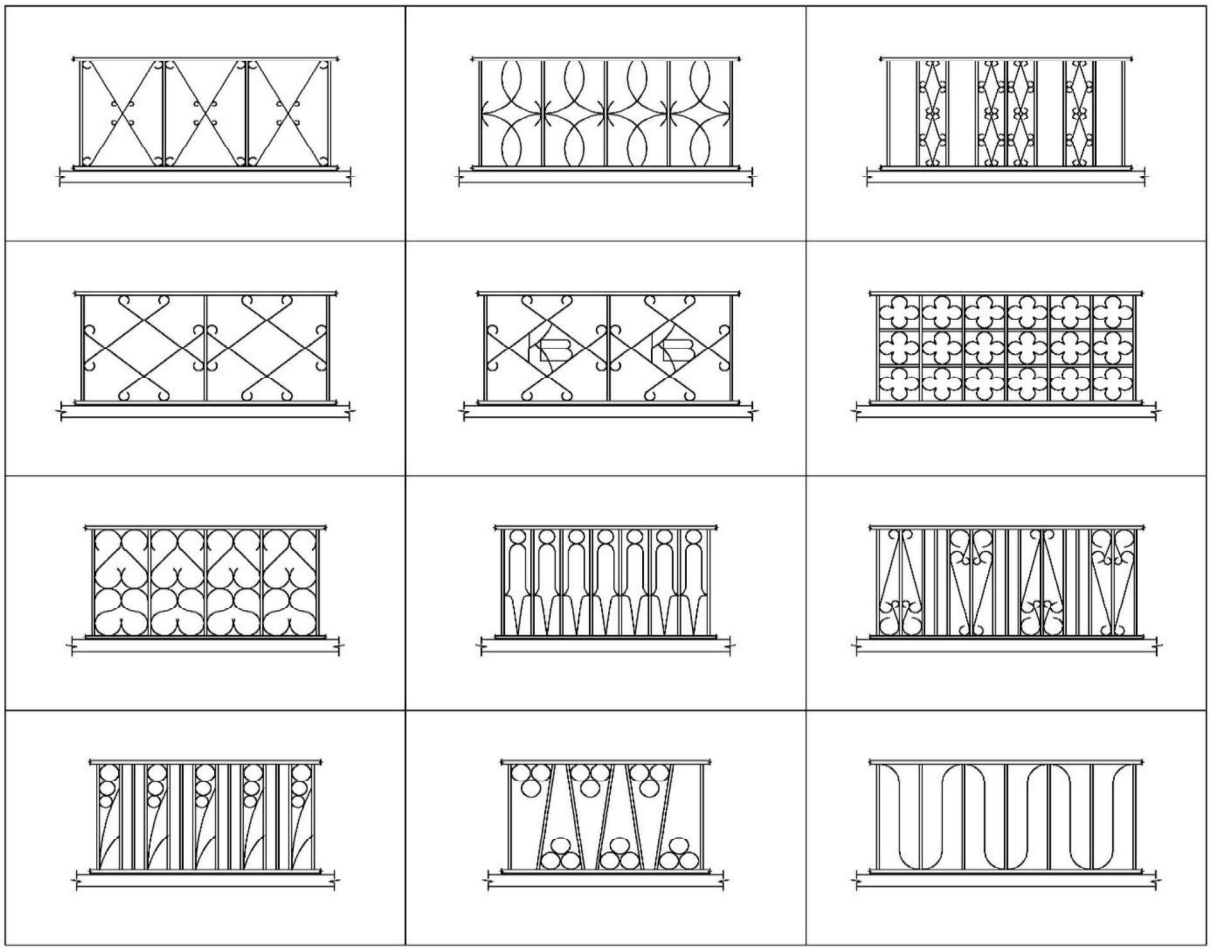
**Çizelge 1.** Çalışma alanında tespit edilen ferforje balkon korkulukları (Saraçoğlu Gezer).



| | | |
|---|---|---|
|  |  |  |

Balkon korkuluklarında görülen ferforjeler, cephede ağır kütle etkisini kırarak, şeffaf bir sınır oluşturmaktadır. Seri üretim ürünlerin aksine, gerçek ferforje el işçiliğidir. Bu da mimarlara ve yapı sahiplerine sınırsız tasarım özgürlüğü sunmaktadır. Kullanıcının talebine uygun özel tasarımları üretmek mümkündür. Çalışma kapsamında tespit edilen ferforjeler, neredeyse hiç tekrara uğramayan, tekrarı varsa da aynı yapı grubunda kullanılmış desenlerdir. Hem yalın tasarımlar hem de detaylandırılmış işçiliğe sahip örnekler mevcuttur (Çizelge 1).

**Çizelge 2.** Tespit edilen ferforje balkon korkuluklarının çizimleri (Saraçoğlu Gezer).



Demir, Karabük ili için hem taşıyıcı bir girdi hem de kimlik kurucu bir tasarım ögesi olmuştur. Çalışma alanı olan Karabük ili Merkez ilçesindeki balkon korkuluklarında düz çizgiyle beraber eğrisel çizgilerin tercih edildiği görülmüştür. Eğrisel çizgiler çemberin ya da çemberin bir kısmından türetilen kıvrımlar olarak tercih edilmişlerdir. Hem geometrik hem de bitkisel motifler tasarlanmıştır (Çizelge 2). Erken Cumhuriyet dönemi ferforjeleri; süsü amaç değil araç olarak gören, fonksiyonu estetikle birleştiren, Türkiye'nin modernleşme hikayesini demir üzerine kazıyan tanıklardır. Bugün kentsel dönüşüm riski altındaki pek çok yapıda bu detaylar maalesef kaybolmaktadır. Merkez ilçedeki Yenişehir bölgesi, 1996 yılında Anıtlar Yüksek Kurulu tarafından üçüncü derece doğal sit alanı olmasının yanında kentsel sit alanı da ilan edilerek koruma altına alınmıştır (Koruma kurulu, 1996).

**4. SONUÇ**

Bu çalışma, Türkiye Cumhuriyeti'nin erken dönem sanayileşme hamlesinin simge kenti Karabük'te, endüstriyel üretimin sivil mimariyi ve kentsel estetiği nasıl şekillendirdiğini ferforje tasarımları üzerinden ortaya koymuştur. Elde edilen bulgular, Karabük'te demirin yalnızca fabrikada işlenen endüstriyel bir çıktı olmadığını, aynı zamanda kentin ontolojik varoluşunun kurucu bir temeli olduğunu göstermektedir. Demir-Çelik Fabrikası'nın (KDÇF) sağladığı malzeme erişilebilirliği, Yenişehir yerleşkesinden başlayarak kentin çeperlerine yayılan konut üretimlerinde demirin yoğun ve etkin bir biçimde kullanılmasına olanak tanımıştır.

Yapılan cephe analizleri ve çizimler neticesinde, Karabük konutlarında kullanılan ferforje uygulamalarının, Erken Cumhuriyet döneminin modernleşme ideolojisiyle paralellik gösterdiği tespit edilmiştir. Süsü bir amaç değil araç olarak gören bu anlayış; balkon korkuluklarında, işlevselliği estetikle birleştirerek yapılara şeffaflık ve ritim kazandırmıştır. İncelenen örneklerdeki bitkisel ve özellikle geometrik motifler, dönemin rasyonel kimliğini yansıtırken, seri üretimin aksine zanaatkarlığa dayalı bir tasarım özgürlüğü sunmuştur.

Sanayi ve mimari arasındaki organik ilişkinin somut birer belgesi olan bu ferforje tasarımlar, kentsel dönüşüm süreçlerinde kaybolma riski altındadır. Bu çalışmada belgelenen demir estetiğinin sivil mimarideki diğer özgün örneklerinin de korunması, toplumsal bellek ve aidiyetin sürdürülebilirliği açısından büyük önem arz etmektedir.

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# GLOBAL SUSTAINABILITY AND DEVELOPMENT CONGRESS

**OCTOBER 15-16, 2025 / KAYSERI, TÜRKİYE**




# FULL TEXT BOOK


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# POLICY APPROACHES IN CITIES AND THE CONSTRUCTION SECTOR WITHIN THE FRAMEWORK OF CIRCULARITY INDICATORS: LESSONS FROM THE EU FOR TURKEY

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## ABSTRACT

The European Union's report titled "New Indicators for Monitoring the Transition to a Circular Economy" introduces a comprehensive set of policy tools and measurement indicators designed to accelerate the adoption of circular economy principles, particularly within urban areas and the construction sector. These sectors are recognized as pivotal in the transition due to their substantial impact on resource consumption, energy use, and waste generation. Buildings, throughout their life cycle—from design and construction to demolition—account for significant material flows and carbon emissions. At the same time, cities act as focal points for circular transformation, offering the governance structures, spatial planning tools, and innovation ecosystems necessary for large-scale change.

Drawing from the EU report, this paper analyzes the key circularity indicators proposed for both the building environment and urban systems. These include metrics related to material reuse rates, construction and demolition waste recovery, energy efficiency improvements, and the integration of secondary raw materials into new developments. In addition, the study examines how local and national public policies can support this transition through strategic planning, regulation, and fiscal incentives. The role of municipalities and regional authorities is highlighted, particularly in embedding circularity principles into public procurement processes and infrastructure investments.

The paper further explores how Turkey can benefit from the EU's experience, identifying gaps and opportunities within Turkey's current legislative framework and strategic documents. Emphasis is placed on potential harmonization paths, institutional capacity-building, and stakeholder engagement strategies to ensure a smoother and more effective alignment with European circular economy standards.

**Keywords:** Circular Economy, Cities and Buildings, Policy and Governance, EU-Turkey Alignment

## Introduction

Circular economy has been recognized as one of the most critical transformation tools to address the growing global challenges of resource pressure, climate change, and waste management (Geissdoerfer et al., 2017). In particular, the construction sector and urban areas are focal points for circular strategies due to their high levels of resource consumption and carbon emissions. Globally, the construction industry consumes approximately 50% of all extracted natural resources and generates about 35% of total solid waste (European Environment Agency [EEA], 2020). At the same time, cities—home to more than 55% of the world's population—have become the primary centers of energy and material demand (United Nations, 2019).

Within this context, the European Union (EU) has developed comprehensive strategies under the European Green Deal and the New Circular Economy Action Plan (2020) to enhance resource efficiency, achieve carbon-neutral targets, and transform industrial policies (European Commission, 2020). One of these strategies involves the development of new indicators to monitor the transition toward circularity. The EU's report "New Indicators for Measuring the Transition to Circularity" (EU Report, 2025) proposes applicable metrics particularly for cities and the built environment, offering a guiding framework for policymakers in these fields.

In the construction sector, the proposed indicators highlight the renovation rate of building stock, the share of recycled content in construction materials, the post-demolition material recovery rate, and the potential for carbon emission reduction (OECD, 2022). For cities, indicators include waste management performance, circular practices in public spaces, the integration of environmental criteria in public procurement, and the

alignment of local governments with climate targets (Williams, 2019). These indicators assess circularity not only from an environmental standpoint but also by integrating economic and social dimensions, thereby providing a holistic framework for evaluating the transition.

From Turkey's perspective, urban areas and the construction sector hold strategic importance in circular economy policies. The construction industry represents a significant share of Turkey's GDP and remains a major consumer of natural resources (TÜİK, 2022). However, compared with the EU, practices related to waste management, material efficiency, and green public procurement remain limited. Although Turkey's Green Deal Action Plan (2021) includes circular economy measures, the monitoring and reporting of indicators at the building and city scales are still in their early stages.

As emphasized in the literature, the active role of local governments and the effective integration of policy instruments are key determinants of success in transitioning toward a circular economy (Fratini et al., 2019). Best practices in the EU provide valuable insights for Turkey—particularly regarding green public procurement, building passports, energy efficiency criteria, and waste management indicators, all of which could be adapted to Turkey's policy framework.

In conclusion, circularity indicators serve not only as monitoring tools but also as strategic compasses for policymakers in cities and the construction sector. This paper discusses the EU's indicator frameworks and policy approaches, exploring how Turkey can benefit from and adapt these experiences within its own national and local contexts.

**Circularity Indicators and Policy Approaches in the Construction Sector**

The construction sector is one of the most critical domains in the transition toward a circular economy, as construction activities exert direct environmental pressures through high material demand, energy intensity, and waste generation. According to the European Environment Agency (EEA, 2020), construction and demolition activities account for approximately 35% of total waste generated in Europe. Moreover, the sector consumes more than 50% of globally extracted raw materials, underscoring the need to develop circularity indicators not only for waste management but also for resource efficiency, carbon emission reduction, and long-term economic sustainability.

In the EU's report "New Indicators for Measuring the Transition to Circularity" (EU Report, 2025), one of the most prominent indicators for the construction sector is the renovation rate of the building stock. Renovating or retrofitting old and energy-inefficient buildings to meet higher energy performance standards contributes significantly to both energy savings and emission reductions (European Commission, 2020). In this context, the "Renovation Wave" strategy has emerged as a key policy aligned with the EU's carbon-neutral objectives.

Another crucial indicator is the share of recycled content in construction materials. Increasing the proportion of recycled inputs in cement, steel, aluminum, and glass enhances material efficiency while reducing dependence on virgin raw materials. In particular, reducing clinker ratios in cement and incorporating industrial by-products such as fly ash and slag are among the most effective circularity measures in the sector (Habert et al., 2020).

The post-demolition material recovery rate is also emphasized among the proposed indicators. In some European countries, more than 70% of demolition waste is recovered, while this rate remains considerably lower in Turkey (OECD, 2022). Tools such as material passports, digital product passports (DPPs), and Environmental Product Declarations (EPDs) contribute to transparency and traceability in recovery processes (Shields & Pizzol, 2021).

On the policy front, green public procurement plays a pivotal role in the EU's circular economy strategies for the construction sector. Public authorities' preference for materials with high recycled content and low-carbon construction products directly influences market transformation (Fratini et al., 2019). Moreover, building passports and mandatory energy performance certificates function as regulatory tools that support the sector's systemic transition.

For Turkey, these indicators and policy tools carry significant importance. According to Turkish Statistical Institute (TÜİK, 2022) data, the construction sector remains one of the main drivers of national economic growth; however, it lags behind the EU average in terms of material efficiency and waste management performance. While the Turkish Green Deal Action Plan (2021) and the National Waste Management Plan set targets for construction waste recycling, the monitoring of indicators and the strengthening of regulatory

frameworks are still required. Integrating recovery criteria into urban transformation projects would enhance the practical implementation of circularity indicators.

In conclusion, circularity indicators in the construction sector serve not merely as technical monitoring tools but as strategic mechanisms that guide policy decisions. The EU experience offers adaptable lessons for Turkey, particularly in the areas of material efficiency, building renovation rates, waste recovery, and green public procurement.

## Cities and Circularity Indicators: Governance and Policy Instruments

Cities play a critical role in the transition to a circular economy—not only as spatial entities but also as governance hubs. Given that more than half of the world's population now lives in urban areas (United Nations, 2019), it is evident that the majority of energy consumption, material demand, waste generation, and carbon emissions occur within cities. Consequently, cities inevitably occupy a leading position in the implementation of circularity indicators and the operationalization of policy instruments.

Among the new indicators developed by the European Union, several key areas aim to measure the circular performance of cities. The first is urban waste management performance, which includes indicators such as per capita waste generation, recycling rate, composting capacity, and landfilling rate, all of which directly affect a city's circular performance (EEA, 2020). A second major area concerns the integration of circular criteria into public procurement. By prioritizing the use of recycled materials in municipal infrastructure, transport, and housing projects, local authorities exert a strong market-shaping influence (OECD, 2022).

Another critical indicator is the integration of circular approaches into urban planning processes. For instance, the "15-minute city" model contributes to resource efficiency by reducing material and energy consumption (Moreno et al., 2021). Furthermore, the development of local plans aligned with energy efficiency and carbon reduction targets has become increasingly common in EU cities.

From a governance perspective, the capacity of local administrations is a key determinant of success. As highlighted in the literature, effective circular economy policies depend on multi-actor governance models that foster collaboration among municipalities, the private sector, academia, and civil society (Fratini et al., 2019). Experimental platforms such as "circular city labs" have been instrumental in advancing policy innovation across Europe.

In the context of Turkey, circular economy indicators for cities have not yet been systematically monitored. Nevertheless, local governments have assumed an increasingly active role, particularly through waste management, urban regeneration, and energy efficiency projects. The Zero Waste Project, for example, mirrors EU best practices by aiming to increase municipal recycling rates. However, the integration of circular economy criteria into urban planning and public procurement remains at an early stage of development.

In conclusion, circularity indicators for cities serve not only as monitoring tools but also as strategic mechanisms that guide policymaking processes. European best practices provide valuable insights for Turkey—especially in developing waste management performance indicators, institutionalizing green public procurement, and mainstreaming circular approaches in urban planning.

## Turkey's Adaptation Process: Current Status and Gaps

Due to its strong economic integration with the European Union (EU), Turkey is directly influenced by the EU's circular economy policies. In the context of the construction sector and cities, the indicators developed by the EU represent both a compliance requirement and a transformation opportunity for Turkey. However, the current situation reveals several structural gaps in implementation.

One of the most significant steps toward advancing the circular economy in Turkey has been the Green Deal Action Plan (2021), which provides a roadmap for waste management, resource efficiency, and industrial transformation. Additionally, the Zero Waste Project has enhanced municipalities' capacity for waste collection and recycling. Nevertheless, a systematic monitoring framework—comparable in scope to the detailed indicators proposed in EU reports—has not yet been established.

In the construction sector, recycling rates for construction and demolition waste remain considerably low. According to TÜİK (2022) data, the construction industry accounts for the largest share of total waste

generation, yet recovery processes are still limited. Tools such as material passports, digital product passports (DPPs), and Environmental Product Declarations (EPDs) are not widely implemented, creating a competitive disadvantage for Turkey in relation to the EU market.

From the perspective of urban governance, circular economy initiatives by Turkish municipalities largely focus on waste management. In contrast, EU cities have made progress in integrating circular criteria into public procurement, embedding energy efficiency targets in urban planning, and establishing multi-stakeholder collaboration platforms (Williams, 2019). For Turkey, strengthening the technical capacity, financial resources, and institutional coordination mechanisms of local governments is essential to enable this transition.

From a regulatory standpoint, Turkey has existing frameworks concerning energy efficiency, insulation standards, and environmental impact assessment for the construction sector; however, circularity criteria are not yet explicitly defined. For instance, neither the use of recycled materials in urban regeneration projects nor the inclusion of circular criteria in public tenders is currently mandatory—constituting a major gap in the EU alignment process.

In conclusion, the key priorities for Turkey's alignment with EU circular economy policies include:

- ✧ Systematic monitoring of circularity indicators,
- ✧ Integration of circularity criteria into legislation,
- ✧ Capacity-building for local governments, and
- ✧ Strengthening recycling infrastructure in the construction sector.

These steps are essential for Turkey to maintain competitiveness with the EU and advance toward its sustainable development objectives.

**Policy Recommendations and Implementation Pathways**

For Turkey to align with circular economy indicators in its urban and construction sectors, a comprehensive policy approach is required. The experiences of the European Union (EU) provide a valuable roadmap that should be adapted to Turkey's national and local contexts.

First, regulatory alignment must be accelerated. The EU's Circularity Indicators and Ecodesign Regulations should be integrated into Turkey's legislative frameworks at both the building and city scales. In particular, making circular criteria mandatory in public procurement would serve as a transformative market mechanism.

Second, institutional capacity should be established for the systematic monitoring of indicators. Data-sharing infrastructure must be developed among the Turkish Statistical Institute (TÜİK), the Ministry of Environment, Urbanization and Climate Change, and local governments. Key indicators such as the building stock renovation rate, waste recovery rate, and share of green public procurement should be regularly reported and publicly accessible.

Third, the capacity of local governments needs to be strengthened. Municipalities should be provided with technical guidelines, training programs, and financial support mechanisms incorporating circular economy principles. Establishing experimental platforms similar to Europe's "circular city labs" would facilitate the implementation and testing of innovative local practices.

Fourth, green financing instruments should be mobilized. Projects meeting circularity criteria should be supported through dedicated credit lines, grants, and incentive schemes, with a particular focus on assisting small and medium-sized enterprises (SMEs) in their adaptation processes. Collaboration with international financial institutions, such as the European Investment Bank, could further enhance funding opportunities.

Fifth, innovation and digitalization must be encouraged. The use of material passports, digital product passports (DPPs), and life-cycle assessment (LCA) tools would improve transparency and traceability in the construction sector. To promote the widespread adoption of these digital tools, R&D investments and university–industry collaborations should be supported.

Finally, awareness-raising campaigns are essential. Educating both citizens and private-sector actors about the principles and benefits of the circular economy will increase social acceptance and stakeholder engagement in the transition process. These policy recommendations would enable Turkey not only to align with EU standards

but also to advance sustainable development within its own cities and construction sector, fostering a resilient and resource-efficient national economy.

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# EVRENSEL TASARIM İLKELERİ DOĞRULTUSUNDA KENT PARKLARININ ERİŞİLEBİLİRLİK ÜZERİNDEN İRDELENMESİ

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## ÖZET

Engellilik, bireyin doğum öncesinde, doğum sırasında veya sonrasında ortaya çıkan organ yetmezliği ya da uzuv kaybı nedeniyle fiziksel veya zihinsel fonksiyonlarını tam olarak yerine getirememe durumudur. Engelli bireyler, eğitimden sağlığa, ulaşımdan istihdama kadar hayatın her alanında var olmakta ancak pek çok fiziksel engelle karşılaşmaktadır. Dünya Sağlık Örgütü'nün 2019 yılı verilerine göre dünya nüfusunun yaklaşık %15'i, yani 1 milyar insan, farklı derecelerde engellilik durumuna sahiptir. Türkiye'de ise Ulusal Engelli Veri Tabanı'na göre resmi olarak 1.559.22 engelli birey kayıtlıdır. Ancak, resmi olmayan tahminler nüfusun %13'üne denk gelen yaklaşık 9 milyon engelli bireyin bulunduğunu göstermektedir.

Bireylerin fiziksel, zihinsel ve sosyal gelişimi için sosyal etkileşim büyük önem taşımaktadır. Kamusal alanlar, bireylerin sosyalleşme, dinlenme ve kültürel etkinliklere katılma gibi ihtiyaçlarını karşılamak için tasarlanmaktadır. Bu alanların en önemlilerinden biri olan parklar, herkes için erişilebilir ve kullanılabilir olmalıdır. Engelli bireylerin sosyal hayata katılımını desteklemek amacıyla, parkların tasarımında erişilebilirlik ve evrensel tasarım ilkelerine uyulmalıdır. Bu kapsamda, fiziksel engellerin kaldırılması, ulaşım kolaylığı sağlanması, uygun zemin kaplamalarının tercih edilmesi ve engelli bireylerin kullanımına uygun donatıların yerleştirilmesi gerekmektedir.

Bu araştırmada, engelsiz park tasarımında dikkat edilmesi gereken kriterler detaylı bir şekilde ele alınmış, literatür taraması ve Karabük ilinde gerçekleştirilen saha gözlemleri ile analiz edilmiştir. Çalışma sonucunda, engelli bireylerin kamusal alanlarda, özellikle parklarda, karşılaştıkları fiziksel engellerin ortadan kaldırılmasına yönelik tasarım önerileri geliştirilmiştir. Önerilen tasarım yaklaşımlarının hayata geçirilmesi, engelli bireylerin yaşam kalitesini artırarak toplumsal hayata daha aktif katılım sağlamalarına yardımcı olacaktır.

**Anahtar kelimeler:** Engelsiz park, ergonomik tasarım, evrensel tasarım, Karabük.

## AN EXAMINATION OF URBAN PARKS IN TERMS OF ACCESSIBILITY WITH IN THE FRAMEWORK OF UNIVERSAL DESIGN PRINCIPLES


### ABSTRACT

Disability refers to a condition in which an individual is unable to fully perform physical, mental, or sensory functions due to organ failure, limb loss, or functional impairment that occurs before, during, or after birth. Persons with disabilities participate in many areas of life—such as education, health, transportation, and employment—but encounter numerous physical and environmental barriers. According to the World Health Organization (WHO) data from 2019, approximately 15% of the world's population, that is, around 1 billion people, live with some form of disability. In Turkey, according to the National Disability Database, there are 1,559,222 officially registered individuals with disabilities. However, unofficial estimates suggest that there are nearly 9 million people with disabilities, corresponding to about 13% of the population.

Social interaction plays a crucial role in the physical, mental, and social development of individuals. Public spaces are designed to meet people's needs for socializing, resting, and participating in cultural activities. Among these, parks are one of the most important spaces and should be accessible, inclusive, and usable for everyone. In order to support the participation of individuals with disabilities in social life, the design of parks should adhere to the principles of accessibility and universal design. In this context, it is essential to eliminate physical barriers, ensure ease of access, select appropriate ground surfaces, and incorporate equipment suitable for the use of individuals with disabilities.

In this study, the criteria that should be considered in barrier-free park design are examined in detail through a literature review and field observations conducted in the province of Karabük. As a result of the study, design recommendations were developed to eliminate the physical barriers encountered by individuals with disabilities in public spaces, particularly in parks. The implementation of the proposed design approaches is expected to improve the quality of life of individuals with disabilities and enhance their active participation in social life.



**Keywords**: Barrier-Free Park, Ergonomic Design, Universal Design, Karabük.


### GİRİŞ

Engelli kavramı, Birleşmiş Milletler Genel Kurulu'nun (BM'nin) kabul etmiş olduğu Sakat Kişilerin Hakları Bildirgesi'nde "Normal bir kişinin kişisel ya da sosyal yaşantısında kendi kendine yapması gereken işleri, bedensel veya ruhsal yeteneklerindeki kalıtımsal ya da sonradan olma herhangi bir noksanlık sonucu yapamayanlar" olarak tanımlanmıştır(Koca,2010). Engellilik; görme, işitme, konuşma, zihinsel, ortopedik ve süreğen

engelli olarak altı gruba ayrılmaktadır(Çelik ve Ender, 2015). Her insanın gün içerisinde yaşayabildiği yorgunluk, uykusuzluk, dikkat eksikliği gibi nedenler dahil olmak üzere her sağlıklı insan hayatının belli bir döneminde geçici engellilik durumu yaşayabilmektedir(Kalaycı, Kutay ve Kesim, 2006).

Türkiye İstatistik Kurumu'nun 2011 yılında yapmış olduğu nüfus ve konut araştırmalarının verilerine göre 0-4 yaş aralığının % 1.2'si, 5-9 yaş aralığının % 2.1'i, 10-14 yaş aralığının % 2.1'i ve 15-19 yaş aralığının %2.3'ü en az bir engele sahiptir. Bu oran neticesinde de 0-19 yaş aralığındaki her 5 bireyden 1 bireyin engelli olduğu sonucuna ulaşılmaktadır(TUİK, 2015).Türkiye'deki engelli bireylerin sayısının tespitine yönelik çeşitli araştırmalar yapılsa da güncel engelli sayısı bilinememektedir(Çetin,2022). Ancak bu araştırmalar sonucunda, veriler eksik ve yetersiz olsa da Türkiye nüfusunun %10'undan fazla bir oranda en az 8,5 milyon engelli birey yaşadığı söylenebilmektedir(Engelliler Federasyonu, 2020)

Eşit kabiliyete ve fiziksel/zihinsel yetiye sahip olamayan engelli bireyler kentsel yaşamda da birçok zorluk ve engelle karşı karşıya kalmaktadır(Meşhur, 2018). Bu olumsuzluklara sebep olan durumlardan biri söz konusu bireylerin toplumsal hayattaki görünürlüğünün kısıtlı olmasıdır(Erdoğan,2014). Görünmezliğin sonucu olarak da toplum; tanımadığı, nadiren karşılaştığı engelli bireylere karşı olumsuz önyargılar üretmektedirler. Engelli bireylerin topluma dahil edilmemesi durumunda toplumun bu tutumu devam edecek ve engelli bireylerin toplumdan dışlanmaları, kamusal alanda yok sayılmaları, engelli bireylere karşı saldırganlık, alay etme, psikolojik ve fiziksel şiddet gibi olaylarla karşı karşıya kalmasına sebep olacaktır.

Toplum içerisinde sosyal dışlanmaya maruz kalan engelli bireylerin, kentsel yaşamda her bir bireyle ihtiyaç duydukları fiziksel ve çevresel mekanlarda eşit şartlarda yararlanmaları en doğal hakkıdır. Engelli bireylerin kentsel mekanlardan kimseye bağımlı olmadan yararlanabilmeleri için, mekanların engellilere yönelik özgür ve bireysel kullanım olanağı sağlanacak şekilde tasarlanması gerekmektedir(Meşhur, 2018). Her bireyin kesintisiz olarak bütün kentsel mekanlara ve olanaklara ulaşabilmesi, kamusal yaşam içerisinde bulunabilmesi ve kamusal hizmetleri alabilmesi erişilebilirlik olarak değerlendirilmektedir(Kavak,2010). Engelli bireylerin kamusal mekanlara erişimlerini sağlamak ve engel olan durumları ortadan kaldırmak, kentsel ölçekte belediyelerin görevidir. Belediyeler, engelli bireylerin herhangi bir kaza yaşama korkusu duymadan kaldırımdan yürüyebilmesi, karşıdan karşıya geçebilmesi, bir parkta dinlenebilmesi, toplu taşımayı kullanabilmesi ve herhangi bir binaya giriş yapabilmesi gibi fiziksel aktiviteleri güvenli bir şekilde gerçekleştirebilmesi için çok katmanlı bir planlama ve uygulama sunması gerekmektedir.(Şat ve Göver, 2017).

## BULGULAR

### EVRENSEL TASARIM

İnsanların dinlenme, eğlenme ve sosyalleşme gibi gereksinimlerini karşılayan açık bir kamusal mekan olan parklarda da, engelli bireyleri topluma kazandırmak, sosyalleşebilmelerini sağlamak ve yaşam kalitelerini artırmak için engelsiz tasarım anlayışı büyük önem taşımaktadır. Evrensel tasarım kavramı 1985 yılında Amerikalı Mimar Ronald L. tarafından "ürünlerin ve çevrenin, her yaştan ve her yeterlilik seviyesinden mümkün olan en fazla insan tarafından kullanılabilir olacak şekilde tasarlanmasıdır" şeklinde tanımlanmıştır(D'souza,2004; Kuter ve Çakmak, 2017).

Evrensel tasarım anlayışında benimsenen; eşitlik, basit ve anlamlı kullanım, esneklik, koruma ve güvenlik, basit ve anlaşılır bilgi, erişilebilir ve minimum fiziksel efor ilkeleri ile konuyla ilgili standartlar oluşturulmuştur(Tuğluer ve Ekren, 2022). 6 kıtada 65 ülkeden, Dünya Engelliler Vakfına(World Disability Foundation- WDU) üye 120 ilgili e yetkin kuruluş tarafından 3 yıllık bir süreç sonucunda, engelli ve yaşlıların topluma etkin ve eşit katılımını sağlamak amacıyla bir kılavuz hazırlanmıştır(DEV,2022; Tuğluer ve Ekren, 2022). Hazırlanan kılavuzda açık yeşil alanlarda ve yapılarda erişilebilirliğe yönelik nitelik ve nicelik açısından standartlar bulunmaktadır(Tuğluer ve Ekren, 2022).

Kentsel park alanlarında engelli ve engelli olmayan bireylerin gereksinimleri tasarım açısından benzer olmakla birlikte, erişilebilir ve biçim açısından yeterli donanıma sahip olması gerekir. Ancak engelli bireyler; standartlara uygun olmayan ölçülerdeki (genişlik ve eğim) gezinti yolları, rampalar ve merdivenler, sert zemin kaplamalarında kullanılan parlak ve kaygan malzeme, engelli bireylerin kullanımına uygun olmayan kent mobilyaları gibi çeşitli sorunlarla karşılaşmaktadır(Çelik, Ender ve Akdeniz, 2015). Bu sorunların oluşmaması adına; Anayasa, Engelliler Yasası, İmar Hukuku, Büyükşehir Belediyeleri Kanunu, İl Özel İdareleri Kanunu gibi yasal dayanaklar çerçevesinde Dünya Engelliler Birliği (DEB) ve Dünya Engelliler Vakfı (DEV) çalışmaları doğrultusunda engelli park tasarımı ile ilgili çeşitli detay özellikleri belirlenmiştir.

| **Engelsiz Park Tasarım Detayları** | **TASARIM İLKELERİ** | | |
|---|---|---|---|
| | **ÖLÇÜ** | **MATERYAL** | **GÜVENLİK** |
| **Park içi yürüyüş yolları** | -Yürüyüş yolları min 200 cm tercihen 300 cm olmalıdır. | | -Min 3 cm yükseklikte bordürler kullanılarak görme engelli bireylerin bordür takibi yapılabilmesi sağlanmalıdır. |
| | -Rampa eğimi tekerlekli sandalye kullanan bireylerin rahatlıkla inip | | -Rampa ile aşılan yükseklik 15 cm'den fazla olduğunda rampanın her iki tarafına |

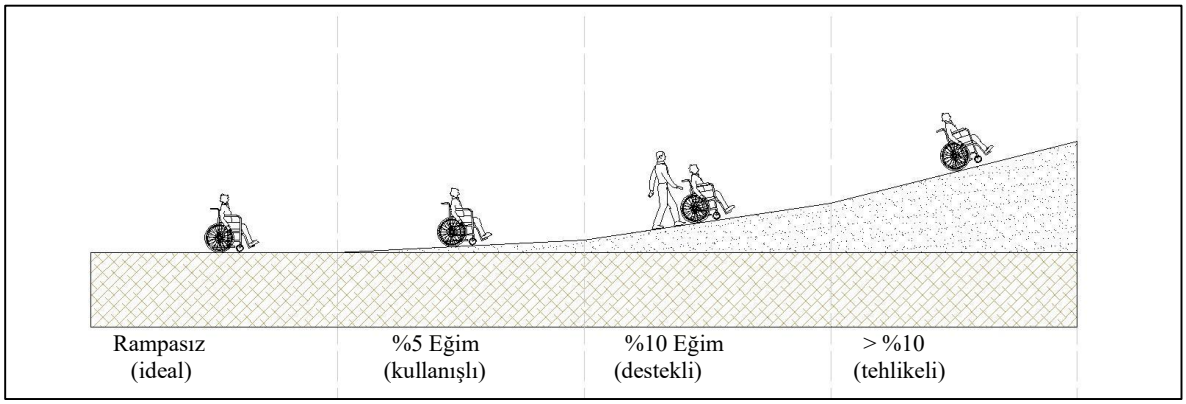
**Tablo 1.** Engelsiz Park Tasarım Standartları ve Detayları (Çakar, 2021 ve Çelik, Ender, Seyidoğlu Akdeniz, 2015)

| | | | |
|---|---|---|---|
| **Rampalar** | çıkabileceği şekilde max %5 eğimde olmalıdır.<br>-Rampaların net genişliği üzerinde bulunan koruma bordürü ve tırabzan hariç min 100 cm olmalıdır.<br>Başında ve sonunda 150 cm x 150 cm hareket alanı olmalıdır. | -Zemin kaplamaları sabit, dayanıklı ve ıslak-kuru halde kaymaya karşı dirençli olmalıdır.<br>-Dokulu ve ses çıkaran nitelikte olmalıdır. | tırabzan (korkuluk) yapılmalıdır. |
| **Merdiven** | -Gerekmedikçe merdiven kullanımından kaçınılmalıdır.<br>-Merdivenlerde basamak derinliği min 30 cm, basamak yüksekliği max 15 cm olmalıdır.<br>-Merdiven genişliği min 180 cm olmalıdır.<br>-Max 12 basamakta bir sahanlık yapılmalıdır. | | -Merdiven başlangıcında ve bitiminde hissedilebilir yürüme yüzeyi işareti bulunmalıdır.<br>-Basamakların uçları çıkıntısız(damlalıksız) olmalıdır. Basamak uçlarında zemin ile zıt renkte 2.5 cm eninde kaymaz şerit uygulanmalıdır. |
| **Otopark** | -Tüm tesisteki araç park yeri sayısının %5'i kadar engelli park yeri bulunmalıdır.<br>-Engelli park yeri 490 cm x 360 cm(min) olmalıdır. | -Çevre koşullarına, aşınmaya dayanıklı olmalıdır.<br>-Su yalıtımı olmalıdır.<br>-Kaymaz ve hissedilebilir olmalıdır. | -Tekerlekli sandalye geçişleri için iki park yeri arasında 1,2 metre genişliğinde bir erişim koridoru önerilmektedir. |
| **Dinlenme Cepleri** | -Her 100 metrede bir dinlenme cepleri bulunmalıdır. | -Çevre koşullarına ve aşınmaya dayanıklı, pürüzlü ve kaymaz nitelikte olmalıdır. | |
| **Spor ve Oyun Alanları** | -Spor ve çocuk oyun alanları yürüyüş yolu ile erişilebilen ve düzayak erişim sağlanabilen güzergahta olmalıdır.<br>-Engelli bireyler dahil tüm bireylerin bir arada kullanabileceği çeşitlilikte olmalıdır. | -Çevre koşullarına dayanıklı ve tehlike yaratmayacak nitelikte olmalıdır.<br>-Yumuşak, doğal ve statik elektriklenmenin olmadığı malzemeler kullanılmalıdır. | -Oyun elemanlarında bulunan rampa ve merdiven kenarlarında korkuluklar bulunmalıdır. |
| **Çöp Kutusu** | -Çöp kutuları, bordür taşına min 40 cm uzaklıkta olacak şekilde yayaların hareketlerini kısıtlamayacak şekilde konumlandırılmalıdır.<br>-Yüksekliği 90-120 cm aralığında olmalıdır. | -Çöp kutuları kullanılan mekana zıt renkli ve kolay fark edilebilir olmalıdır.<br>-Yaralanmalara sebep olmayacak malzemeden olmalıdır. | -Tek elle kullanılabilecek kapaklı olmalıdır. |
| | -Her 30 metrede bir oturma elemanı bulunmalıdır. | -Çevre ve hava şartlarında zarar görmeyecek ve tehlike | -Keskin ve çıkıntılı kenarlardan arındırılmış olmalıdır. |

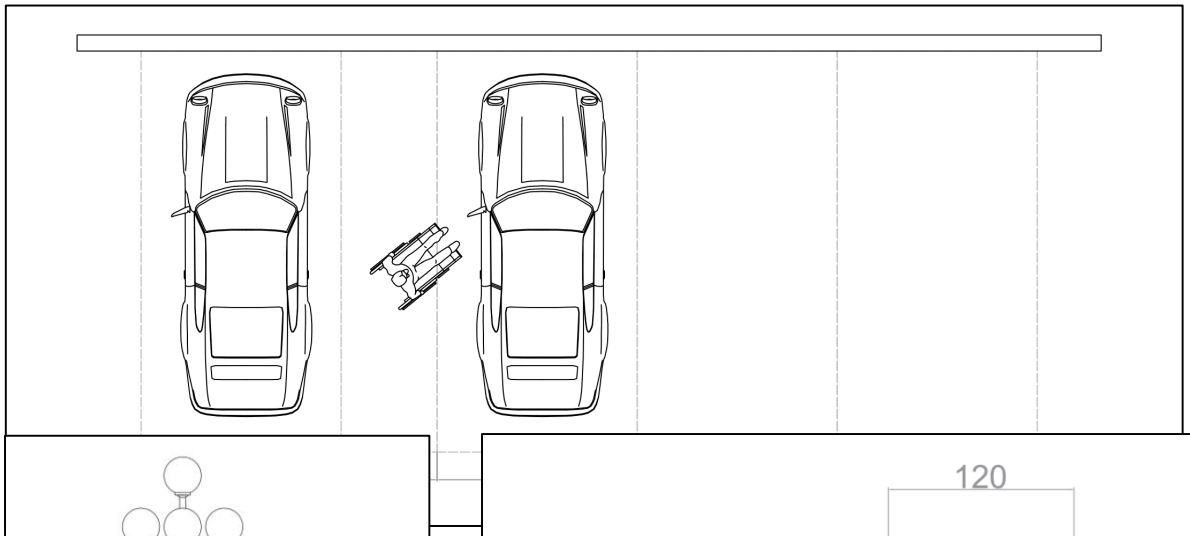
| | | | |
|---|---|---|---|
| **Kent Mobilyaları** | -Tekerlekli sandalye kullanıcıları için bankların yanında 120 cm genişliğinde ve 120 cm derinliğinde alan bırakılmalıdır.<br>-Oturma birimlerinin yerden yüksekliği 40-48 cm, derinliği ise 30-45 cm olmalıdır. | yaratmayacak nitelikte olmalıdır. | |
| **Aydınlatma Elemanları** | -Aydınlatma elemanları, yaya yoluna uzanıyorsa ya da yol üzerinde bulunuyorsa yerden min 220 cm yükseklikte olmalıdır. | -Işık şiddeti, az gören kişilerin mekanları daha rahat algılayabilmesi için önemlidir. | -Aydınlatma elemanları yolların genişlik ve hareket alanını daraltmamalı, geçişi engellemeyecek konumlara yerleştirilmelidir.<br>-Engelli bireylerin güvenliği açısından potansiyel tehlike taşıyan rampa ve merdiven girişleri gibi alanlarda aydınlık düzeyine dikkat edilmesi gerekmektedir. |
| **Bitkiler** | -Yol üzerinde bulunan bitki dallarının yüksekliği min 220 cm olmalıdır.<br>-200 cm'den daha dar kaldırımlara ağaçlandırma yapılmamalıdır. | -Görme duyusu için; çabuk algılanan kırmızı, turuncu, sarı ve iri çiçekli bitkiler tercih edilmelidir.<br>-Duyma için; rüzgar ile ses çıkaran(çim, bambu vb.)bitkiler kullanılmalıdır.<br>-Dokunma için; dokulu yaprak ve gövde özelliklerine sahip bitkiler kullanılmalıdır.<br>-Koklama duyusu için; aromatik yapıdaki kokulu bitkilere(yasemin, lavanta) kullanılmalıdır. | -Yürüyüş yollarında dikenli bitkiler, kaygan bir yüzey oluşturabilecek tohum ve meyve dökücü ağaç kullanılmamalıdır. |
| **Su Yüzeyleri** | -Çeşmelerin farklı yükseklikte iki ağzının olması gereklidir.<br>-Çeşmelerdeki ağız yüksekliği tekerlekli sandalye kullanıcıları için 85 cm, diğer kullanıcılar için 95 cm olmalıdır. | -Engelli bireyler için yön bulmada kolaylık sağlanabilmesi için peyzaj tasarımında havuz ve dere gibi ses çıkaran tasarım elemanları kullanılmalıdır. | -Tehlikelere karşı uyarıcı ve koruyucu güvenlik önlemleri alınmalıdır. |

**Tablo 1 (devam).** Engelsiz Park Tasarım Standartları ve Detayları (Çakar, 2021 ve Çelik, Ender, Seyidoğlu Akdeniz, 2015)

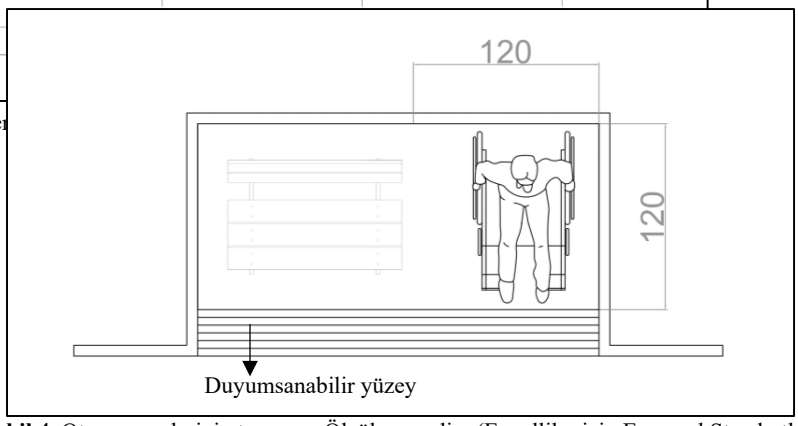
**Tablo 1 (devam).** Engelsiz Park Tasarım Standartları ve Detayları (Çakar, 2021 ve Çelik, Ender, Seyidoğlu Akdeniz, 2015)




**Şekil 1.** Rampa Eğim Standartları (Engelliler için Evrensel Standartlar Kılavuzu, 2012)




**Şekil 3.** Yaya yolunda baş kurtarma yüksekliği 220 cm'den fazla olmalıdır (Engelliler için Evrensel Standartlar Kılavuzu, 2012)




**Şekil 4.** Oturma ceplerinin tasarımı. Ölçüler cm.dir. (Engelliler için Evrensel Standartlar Kılavuzu, 2012)

## DÜNYADAN EVRENSEL ÇOCUK PARKI VE KAMUSAL PARK ÖRNEKLERİNİN İNCELENMESİ

### 1. Magical Bridge Oyun Alanı- Palo Alto

Magical Bridge Park Oyun Alanı, Amerika Birleşik Devletleri'nde, her yaş, boyut ve yetenekteki bireylerin rahatlıkla ulaşıp kullanabileceği; farklı yetenek seviyelerine ve ihtiyaçlarına göre destek sunan yapı ve aktiviteler içeren; çocuk psikomotor ve bilişsel becerilerin gelişimine teşvik eden; toplumun çeşitli kesitlerinden insanların bir araya gelip etkileşimde bulunabildiği ve sosyalleşebildiği alanlar sunan bir oyun alanıdır(Ofiesh& Poller, 2018).



**Şekil 5.** Magical Brigde Oyun Alanı Genel Görünüş (Url 1)

Ofiesh ve Poller Magical Bridge Oyun Alanları tasarımının 7 prensibe dayandığını belirtmişlerdir. Bu prensipler:

1. Eşit kullanım
2. Esnek kullanım
3. Basit ve kolay kullanım
4. Anlaşılabilirlik
5. Hata toleransı
6. Düşük fiziksel efor
7. Ölçek

Benimsenen prensiplere göre park alanında; salıncak bölgesi, kayma ve tırmanma alanı, müzik alanı, dönme bölgesi, oyun evi, strüktürel oyun elemanları ve iyilik köşesi gibi alanlar tasarlanmıştır.



**Şekil 8. ve 9.** Magical Brigde Oyun Alanı Kayma ve Tırmanma Alanı (Url 3)



**Şekil 10. ve 11.** Magical Brigde Oyun Evi ve Köprüler (Url 3)

## 2. Coded Scape

Çin'in Zhejiang Eyaleti'nin başkenti olan Hangzhou'da bulunan Coded Scape, Hangzhou Future City Experience Center'i çevreleyen 10.000 $m^2$'lik bir kamusal alandır. Akıllı teknolojilerin sergi salonu olarak hizmet verecek olan The Future City Experience Center'ı tamamlamak ve teknoloji karakterini kazandırmak için siyah-beyaz , dolu-boş biçimindeki ikili kod konsepti peyzaj, kaldırım ve yeşilliklere uygulanması düşünülmüştür(Url 5).



**Şekil 12.** Hangzhou Future City Experience ve Coded Scape (Url 4)




**Şekil 13.** Coded Scape diyagram (Url 5)

Peyzaj alanı içerisinde bulunan; dinlenme alanları, toplanma noktaları, eğitim ve eğlence alanları stratejik bir biçimde yerleştirilerek sadece alan kullanıcıları için değil The Future Experience Center ziyaretçilerinin binaya ulaşırken ya da binayı kullanırken hem eğlenebilecekleri hem de dinlenebilecekleri deneyimler yaşamasına olanak tanımaktadır(Url 4)

Projede aynı zamanda çocukların güvenli bir şekilde eğlenebilmesi için Bots Oyun Alanı bulunmaktadır(Şekil 14).



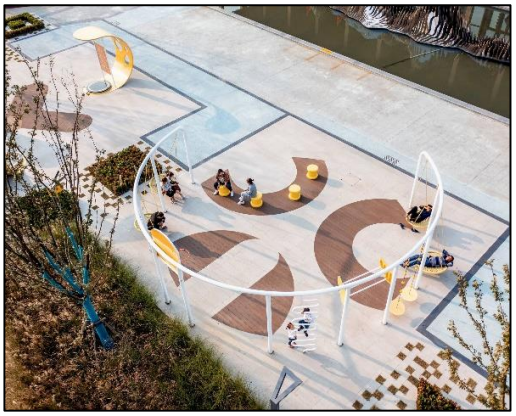
**Şekil 14.** Bots Oyun Alanı (Url 5)

Proje tasarlanırken engelli bireylerin kullanımı da düşünülmüş olup engelli erişimi sağlamasına yönelik bazı özellikler bulundurmaktadır. Bu özellikler:

1. Erişilebilir yollar ve rampalar: Tekerlekli sandalye kullanan engelli bireylerin rahatça kullanabileceği eğimde, genişlikte, materyalde rampalar ve yollar bulunmaktadır.
2. Erişilebilir dinlenme ve eğlence alanları: Engelli bireylerin erişip kullanabilecekleri ergonomik alanlar bulunmaktadır(Şekil 15,16).



**Şekil 15.** Ergonomik Dinlenme Alanları (Url 4)



**Şekil 16.** Oturma ve Salıncak Alanı (Url 4)

3. Engelli tuvaleti: Engelli bireyler için özel olarak tasarlanmış tuvaletler bulunur.
4. İşaret ve Bilgilendirme: Görme engelli ziyaretçiler için yüksek kontrastlı ve Braille alfabesi ile yazılmış işaretler bulunmaktadır.

5. Teknoloji: Parkta bulunan dijital enstalasyonlar ve interaktif oyunlar, engelli bireylerin kolayca kullanabileceği şekilde tasarlanmıştır(Şekil 17,18).



**Şekil 17.,18.** Dijital ve İnteraktif Oyun Alanları (Url 4)

6. Güvenlik: Kullanılan aydınlatma gece saatlerinde engelli bireylerin güvenli bir şekilde hareket etmelerine uygundur. Ayrıca park içinde engelli bireyler için yönlendirme ve bilgilendirme levhaları bulunmaktadır.



**Şekil 19.,20.** Aydınlatma Elemanları (Url 4)

## KARABÜK İLİNDE BULUNAN MAHALLE PARKLARININ ENGELLİ KULLANIMI AÇISINDAN İNCELENMESİ

Karabük'ün 5000 Evler 75.yıl Mahallesi'nde bulunan 75.Yıl Parkı ve Pazar Alanı Parkı engelli bireylerin kullanımı için gözlemler sonucunda;



**Şekil 21.** Karabük 5000 Evler 75. Yıl Mahallesi Harita Görüntüsü (Gözlemlenen parklar haritada işaretlenmiştir)



**Şekil 22. ,23. Ve 24.** 75.Yıl Parkı giriş rampası ve merdiveni- otoparkı- basketbol sahaları (Aydoğmuş,2024)

-Parka yaya girişi merdiven ve rampadan sağlanmaktadır. Tekerlekli sandalye kullanan engelli bireyler ve bebek arabası için rampa eğimi ve genişliği idealdir. Merdivende görme engelli bireyler için hissedilebilir engelli takip yüzeyi bulunmamaktadır(Şekil 22.)

-Parkta bulunan otoparkta araç yeri işaretlemesi bulunmamaktadır. Bu sebeple engelli bireyler araçlarını park ederken sorun yaşayabilirler(Şekil 23.).

-Basketbol sahalarına girişte herhangi bir kot farkı bulunmadığından engelli bireyler sahaya kolaylıkla erişim sağlayabilirler(Şekil 24.).



**Şekil 25. ,26. Ve 27.** 75.Yıl Parkı park içi yürüyüş yolları (Aydoğmuş, 2024)

-Park içinde bulunan yürüyüş yolları birbirleriyle merdivensiz ve ideal eğimlerle bağlantı kurmaktadır. Ancak bazı bölümlerde bitkiler yolun tam ortasında bulunduğundan görme engelliler ve tekerlekli sandalye kullanan engelli bireyler bu rotayı tercih ettiğinde bir kaza yaşayabilirler.



**Şekil 28. ,29. Ve 30.** 75.Yıl Parkı dinlenme alanları- çocuk parkı- spor aletleri (Aydoğmuş, 2024)

-Parkta bulunan üstü kapalı dinlenme alanlarına erişim park içi yürüyüş yollarıyla rahatlıkta sağlanabilmektedir ancak oturma elemanları çoğunlukla başka yerlere taşınmış, eksik ya da zarar görmüş haldedir(Şekil 28.).

-Çocuk parkında kaydıraklara erişim rampa ile sağlanmıştır. Bu sayede engelli çocukların kullanımına uygun hale gelmiştir. Salıncakta güvenlik tedbirleri yeterlidir(Şekil 29.).

-Spor aletleri engelli kullanıcılar düşünülmeden seçilmiştir(Şekil 30.).

75. Yıl Parkı, çeşitli eklemeler ve düzeltmeler yapıldığı takdirde engelli kullanıcılar için uygun bir park olabileceğine gözlemler sonucunda ulaşılmıştır.



**Şekil 31. ,32. Ve 33.** Pazar Alanı Parkı giriş merdiveni- paten alanına giriş rampası (Aydoğmuş, 2024)

-Pazar Alanı parkına girişte bulunan kot farkı ve merdivenler engelli bireyler için tehlike oluşturmaktadır.

-Paten alanına giriş rampası çevresel faktörlerden dolayı tahribata uğradığından dolayı çeşitli yaralanmalara yol açabilir.



**Şekil 34. ,35. Ve 36.** Çocuk Parkları- Futbol sahasına giriş (Aydoğmuş, 2024)

-Çocuk parkları yükseklilerinden dolayı çocuklar için tehlike oluşturabilir. Engelli çocuklar için rampa bulunmamaktadır.

-Futbol sahasına girişteki kot farklılıklarında rampa kullanılmadığı için engelli bireyler, birinin desteği olmadan kullanamamaktadır.

**SONUÇ VE DEĞERLENDİRME**

Engellilik durumu hayatın büyük bir gerçeği olup, engelli bireylerin yaşantılarını güvenli bir şekilde sürdürebilmeleri için günlük yaşamda kullanılan alanların (yürüyüş yolları, kaldırım, binaya giriş-çıkış, bina içinde güvenli yol takibi, fonksiyonların kullanılabilirliği, kamusal park alanları gibi sosyal aktivite mekanları vs.) tasarımı çok önemlidir. Bu alanlar, engelli bireylerin topluma katılımını, sosyal yaşantılarını ve psikolojik durumlarını desteklemektedirler. Çalışma kapsamında engelli bireylerin erişim kolaylığı ve güvenliği için sosyal bir kamusal alan olan parklardaki belirlenen engelli standartları ve engelli kullanımına uygun evrensel tasarım anlayışına uygun olan Magical Bridge Oyun Alanı(çocuk parkı) ve Coded Space(kamusal park) incelenmiştir. Elde edilen bulgulara göre Karabük ilindeki 2 mahalle parkı erişilebilirlik, donatı güvenliği ve güvenlik açısından değerlendirilmiştir. Değerlendirmeler sonucunda parkların giriş ve çıkışlarındaki rampa-merdiven kullanımı, spor aletleri, çocuk oyun alanları çoğunlukla standartlara uyulmadan engelli birey kullanımına uygun olarak düşünülmeden tasarlanmıştır.

Bu bulgular ışığında, engelli bireylerin parklarda daha aktif ve güvenli zaman geçirebilmeleri için giriş-çıkış ve park içindeki kot farklılıkları güvenli bir eğime sahip rampalarla aşılması, merdivenlerin yanına alternatif erişim yollarının yapılması, spor aletleri ve oyun alanlarının engelli bireylerin kullanımına uygun hale getirilmesi, engelli çocuklar ve sağlıklı çocukların bir arada güvenli bir biçimde zaman geçirebilecekleri oyun alanlarının tasarlanması ve parklardaki donatıların güvenlik standartlarına uygun hale getirilmesi ve düzenli olarak bakımının yapılması gerekmektedir.

Engelli bireylerin sosyal hayata daha fazla katılımını sağlamak amacıyla, parklardaki fiziksel engellerin kaldırılması ve erişilebilirliğin artırılması gerekmektedir. Ayrıca, park tasarımlarında evrensel tasarım prensiplerinin uygulanması, tüm kullanıcılar için daha kapsayıcı ve erişilebilir alanlar yaratılmasını sağlayacaktır. Bu sayede, engelli bireyler toplumun bir parçası olarak daha aktif ve bağımsız bir yaşam sürdürebilecektir.

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# II. Uluslararası Kıbrıs Bilimsel Araştırmalar ve İnovasyon Kongresi

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# MİMAR ALİ TALAT BEY VE ESERLERİ[1]

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**Özet**

Mimar Ali Talat Bey (1869-1922), Osmanlı İmparatorluğu'nun son dönemi ile Cumhuriyet'in ilk yıllarında mimarlık alanında hem uygulamacı hem de akademik düzeyde önemli katkılar sunmuş bir isimdir. İstanbul doğumlu olan Ali Talat Bey, erken yaşta aldığı dini ve askeri eğitim sonrasında Sanayii Nefise Mektebi'nde resim öğrenimi görmüş ve 1895 yılında Hendese-i Mülkiye Mektebi'nden birincilikle mezun olmuştur. Mezuniyetinin ardından Mühendis Mektebi'nde çeşitli inşaat derslerini okutmuş, öğrencileri ve dönemin diğer mimarları tarafından takdir edilmiştir. Ali Talat Bey'in mesleki üretimi, uygulama projeleri ve teknik eserleri ile dikkat çekmektedir. "Ahşap İnşaat", "Kargir İnşaat" ve "Fenni Mimari" gibi kitapları, yapı malzemeleri, mühendislik hesapları ve yerel uygulamalar konusunda dönemin eğitim ve uygulama anlayışına ışık tutmaktadır. Mimari üretimleri ise kamu yapıları, eğitim binaları, sağlık tesisleri, iskeleler ve camileri kapsamaktadır; bazı projeler hayata geçirilmiş, bazıları yalnızca tasarım aşamasında kalmıştır. Bu eserlerde, Birinci Ulusal Mimarlık Akımı'nın teknik ve estetik yaklaşımı ile klasik Türk mimarisi geleneklerinin sentezi gözlenmektedir. Çalışmada Ali Talat Bey'in eserleri iki ana başlık altında incelenmiştir: teknik ve eğitim kitapları ile mimari projeler ve uygulamalar. Bulgular, onun hem teorik hem de uygulamalı yönleriyle dönemin mimarlık pratiğine ve eğitimine yaptığı katkıları ortaya koymaktadır. Bu bağlamda Ali Talat Bey, Mimar Kemaleddin ve Vedat Tek gibi dönemin önde gelen mimarları arasında daha görünür bir konuma sahip olmayı hak eden bir isim olarak değerlendirilmiştir.

**Anahtar kelimeler:** Mimar Ali Talat Bey, Osmanlı mimarlığı, Birinci Ulusal Mimarlık Akımı

[1] Bu bildiri, 2. yazarın danışmanlığında 1. yazar tarafından hazırlanan "Birinci Ulusal Mimarlık Akımı ve Mimar Ali Talat Bey" başlıklı yüksek lisans tezinden üretilmiştir.

# ARCHITECT ALİ TALAT BEY AND HIS WORKS[1]


**Abstract**

Architect Ali Talat Bey (1869–1922) made significant contributions to architecture both as a practitioner and as an academic during the late Ottoman period and the early years of the Republic. Born in Istanbul, Ali Talat Bey received early religious and military education before studying painting at the Sanayii Nefise Mektebi, and graduated first in his class from Hendese-i Mülkiye Mektebi in 1895. Following his graduation, he taught various construction courses at the Mühendis Mektebi, earning recognition from his students and contemporaneous architects. His professional output is notable for both his practical projects and technical publications. Works such as "Ahşap İnşaat", "Kargir İnşaat", and "Fenni Mimari" provide insights into building materials, engineering calculations, and local construction practices, reflecting the educational and practical approaches of the period. His architectural productions include public buildings, educational institutions, healthcare facilities, piers, and mosques; while some projects were realized, others remained at the design stage. These works reveal a synthesis of the First National Architectural Movement's technical and aesthetic approaches with classical Turkish architectural traditions. In this study, Ali Talat Bey's contributions are examined under two main categories: technical and educational publications, and architectural projects and applications. The findings demonstrate his impact on both the theoretical and practical dimensions of architecture and education of his time. Accordingly, Ali Talat Bey is recognized as a figure deserving greater visibility alongside leading contemporaries such as Mimar Kemaleddin and Vedat Tek.



**Keywords**: Architect Ali Talat Bey, Ottoman Architecture, First National Architectural Movement


[1] This paper is based on the master's thesis entitled *"The First National Architectural Movement and Architect Ali Talat Bey"*, written by Saliha Kafalı under the supervision of Mehmet Mutlu.

## 1. GİRİŞ

Mimar Ali Talat Bey (1869-1922), Osmanlı İmparatorluğu'nun son dönemleri ile Cumhuriyet'in ilk yıllarında mimarlık alanında hem uygulayıcı hem de akademik düzeyde önemli katkılar sunmuş bir isim olarak öne çıkmaktadır. İstanbul doğumlu olan Ali Talat Bey, erken yaşta aldığı dini eğitim ve Eyüp Sultan İptida-i Mektebi ile Kocamustafapaşa Askeri Rüştiyesi eğitiminin ardından Sanayii Nefise Mektebi'nde resim öğrenimi görmüş; 1888'de girdiği Hendese-i Mülkiye Mektebi'nden 1895 yılında birincilikle mezun olmuştur (Yücel, 1980: 467–469; Neftçi, 2013: 151). Mezuniyetinin ardından eğitim hayatına akademik bir kariyer ekleyen Ali Talat Bey, Mühendis Mektebi'nde çeşitli inşaat derslerini okutmuş ve öğrencileri ile dönemin diğer mimarları tarafından takdir edilmiştir.

Ali Talat Bey'in mesleki üretimi, yalnızca uygulama projeleriyle sınırlı kalmamış, aynı zamanda çok sayıda teknik ve eğitimsel kitapla da zenginleşmiştir. "Ahşap İnşaat", "Kargir İnşaat", "Fenni Mimari" ve "Vahit Kıyas Fiyatı" gibi eserler, yapım tekniklerini, mühendislik hesaplarını ve yerel uygulamaları detaylı bir biçimde aktarmakta hem Mühendis Mektebi'ndeki ders notları hem de Ali Talat Bey'in kendi yorum ve çizimlerini içermesi açısından, dönemin eğitim ve uygulama anlayışını anlamak için önemli kaynaklar oluşturmaktadır (Yücedal, 2023; Acar, Çakar, Han, & Şengün, 2022: 15–17; Neftçi, 2013: 154). Bu eserlerde, klasik Türk mimarisi ile modern teknikler arasında kurduğu sentez, Birinci Ulusal Mimarlık Akımı'nın estetik ve işlev anlayışı ile paralellik göstermektedir.

Mimari üretim açısından Ali Talat Bey'in çalışmaları, kamu yapıları, eğitim binaları, iskeleler, camiler ve sağlık kuruluşları gibi farklı işlevlerde eserleri kapsamaktadır. Projelerin bir kısmı hayata geçirilmiş, bazıları ise yalnızca tasarım aşamasında kalmıştır. İstanbul Teknik Üniversitesi ve çeşitli Evkaf yapılarındaki projelerde yer alan çizimler, onun dönemin önde gelen mimarlarından Mimar Kemaleddin Bey ile eşgüdümlü çalıştığını göstermektedir. Ayrıca bazı türbelerin restorasyon çalışmalarını üstlenmiş olması, onun klasik Türk mimarisi konusundaki bilgi birikimini uygulamaya aktarma kapasitesini ortaya koymaktadır (Neftçi, 2013: 152).

Bu bildiri, Mimar Ali Talat Bey'in hem uygulamacı hem de akademik kimliğini, kitap ve proje üretimlerini sistematik bir şekilde incelemeyi amaçlamaktadır. Çalışmada eserler iki ana başlık altında ele alınmakta; birinci bölümde teknik ve eğitim kitapları, ikinci bölümde ise mimari projeler ve uygulamalar değerlendirilmektedir. Böylece, Ali Talat Bey'in Osmanlı ve erken Cumhuriyet dönemi mimarlık pratiğine yaptığı katkılar, Birinci Ulusal Mimarlık Akımı'nın etkileriyle birlikte bütüncül bir perspektifle ortaya konulmaktadır.

## 2. MİMAR ALİ TALAT BEY

Mimar Ali Talat Bey (Şekil 1), 1869 yılında İstanbul'da dünyaya gelmiştir. Bazı kaynaklarda doğum yeri olarak memleketi Tokat gösterilse de bu bilginin doğruluğunu kesin olarak kanıtlayan belgeler bulunmamaktadır. Babası Abdullah Şefik Bey, İstanbul Şehremaneti Kordon Kalemi'nde görev yapan bir memurdur. Ali Talat Bey, eğitim hayatına sıbyan mektebinde başlamış, ardından Eyüp Sultan İptida-i Mektebi ve Kocamustafapaşa Askeri Rüştiyesi'ni tamamlamıştır (Yücel, 1980: 467-469). Sanayi-i Nefise Mektebi'nde resim eğitimi aldıktan sonra 1888 yılında Hendese-i Mülkiye Mektebi'ne kaydolmuş ve 1895 yılında birincilikle mezun olmuştur. İki diplomaya sahip olan Ali Talat Bey, okur-yazar seviyesinde Fransızca bilmekteydi (Neftçi, 2013: 151).

Mezuniyetinin ardından 1895'te Hendese-i Mülkiye Mektebi'nde Fenn-i Mihanik Muallim Muavini olarak göreve başlamış ve aynı yıl kendisine Rütbe-i Rabia verilmiştir. 1889 yılında İftihar ve Sanayi Madalyası ile ödüllendirilmiştir. 1909'da Şehremaneti Hey'eti Fenniye Mimarlığı ve Evkaf-ı Hümayun İnşaat ve Tamirat İdaresi Müdür Muavinliği görevlerini üstlenmiş, 1910'da Mühendis Mektebi'nde "Kargir Usul-u İnşaat" derslerinin hocası olmuştur (BOA Sicilli Umumi). Öğrencilik dönemindeki çalışkanlığı ve bilgisi ile dikkat çeken Ali Talat Bey, öğretmenlerinin tavsiyesi ile köprücülük, kargir ve ahşap inşaat derslerini de vermeye başlamıştır (Yücel, 1980: 467-469).



Şekil 1. Ali Talat Bey (Göncüoğlu ve Türksever, 2008: 12).

Zamanın ders nazırının 1914'te Nafia Nezareti'ne yazdığı bir yazı, Mimar Kemaleddin Bey ile Ali Talat Bey'in ders saatlerinin arttığını ve bu dersleri verecek başka bir öğretmenin bulunmadığını vurgulamaktadır. Bu durum,

her iki hocanın dönemin eğitim sistemi ve mimarlık pratiği açısından ne denli önemli olduğunu göstermektedir (Neftçi, 2013: 152).

Ali Talat Bey, öğretmenlik görevinin yanı sıra çeşitli devlet kurumlarında da çalışmıştır. Şehremaneti Heyeti Fenniye Mimarlığı ve Evkaf Nezareti Hey'eti Fenniye Müdür Muavinliği görevlerinde bulunmuş, Meclisi Maliye İstinaf Muhammimliği'nde görev almıştır (Yücel, 1980: 467-469). Klasik Türk yapı sanatını araştırmak amacıyla Evkaf Nezaretine girmiş, burada Hey'eti Fenniye Müdür Yardımcılığı görevini üstlenmiş ve 1919'da Hey'eti Fenniye Reisliğine atanmıştır (Konyalı, 1948: 125).

Evkaf Nezaretinde Mimar Kemalettin Bey ile birlikte çalışarak, Türk yapı sanatının Batı etkisinden nasıl arındırılarak kendi öz mimarisine dönüştürülebileceğini araştırmıştır (Yücel, 1980: 467-469). 19 Kasım 1922'de vefat eden Ali Talat Bey, klasik Türk mimarisine olan bağlılığını bilenler tarafından, Süleymaniye Camii haziresinde Mimar Sinan'ın türbesinin yanına defnedilmiştir.

## 3. MİMAR ALİ TALAT BEY'İN ESERLERİ

Ali Talat Bey'in eserleri, yalnızca uygulamacı bir mimar olarak değil, aynı zamanda akademik bir kimliğe sahip eğitimci ve bilimsel teknik kitaplar kaleme alan bir uzman olarak da değerlendirilmesi açısından iki ayrı alt başlık altında incelenebilir.

### 3.1. Yazılı Eserleri

Ali Talat Bey, yalnızca mimari tasarımlarıyla değil, aynı zamanda mesleki bilgi ve deneyimlerini yazılı eserler aracılığıyla aktarmasıyla da dikkat çekmektedir. Bu eserlerin bir kısmı, görev yaptığı eğitim kurumlarında verdiği derslerin notlarını içermektedir.

#### 3.1.1. Ahşap İnşaat ve Ahşap İnşaat Eşkali

Ali Talat Bey'in 1327'de yayımlanan iki ciltlik "Ahşap İnşaat" ve "Ahşap İnşaat Eşkali" (Şekil 2) eserlerinden ikinci cilt, şekilleri içeren ek kitap niteliğindedir ve 1341'de yeniden basılmıştır (Yücedal, 2023). Kitap, binalarda kullanılan ağaç türlerinden kesim şekillerine, ahşap aksamların birleşim ve bağlantılarından mukavemetine, başlık, döşeme, bölme, çatı ve merdiven detaylarına kadar kapsamlı mühendislik bilgilerini içermektedir. Yapılan hesaplar ve alınan yük değerleri günümüzde de geçerliliğini korumaktadır; ayrıca restorasyon ve malzeme bakımına dair çizimlerle desteklenmiş bilgiler sunulmaktadır.

Eserin bazı bölümleri yabancı kaynaklardan çevrilmiş olup, özellikle Jules Denfer'in 1892 tarihli *Architecture et Constructions Civiles-Charpente* adlı eserinden yararlanıldığı görülmektedir. İlk bölümlerde bire bir çeviri yapılırken, ilerleyen kısımlarda özet alıntılar kullanılmış, bazı bölümler ve şekiller ise Ali Talat Bey'in kendi yorum ve çizimlerini yansıtmaktadır. Kitap, Mühendis Mektebi'nde ders kitabı olarak da kullanılmıştır (Yücedal, 2023: 20-21).

### 3.1.2. Fenni Mimari ve Fenni Mimari Şekilleri

Mimar Ali Talat Bey ve Mimar Kemaleddin Bey'in Mühendis Mektebi'nde okutulmak üzere kaleme aldıkları Fenni Mimari (Şekil 2) ve Fenni Mimari Şekilleri kitapları, 1909 yılında Mühendis Mekteb-i Matbaası tarafından basılmıştır. Fenni Mimari Şekilleri, Fenni Mimari kitabındaki çizimleri içermektedir. Eserin girişinde, mimarlık mesleği üç temel ilke çerçevesinde tanımlanır: metanet (dayanıklılık), faide (işlevsellik) ve hüsn-ü manzaraça letâfet (estetik güzellik). Metanet ve faide unsurları mimarlığın teknik ve bilimsel boyutunu, estetik güzellik ise sanatsal yönünü ifade etmektedir; bu ayrım, mimarlığın hem teknik bir disiplin hem de güzel sanat olarak ele alındığını göstermektedir. Kitap, arkadlar, parmaklıklar, alınlıklar, kapılar ve süslemeleri, pencereler, balkonlar ve çatı pencereleri gibi temel mimari öğeleri kapsamaktadır (Url-1).



Ahşap İnşaat Eşkali kitabı kapağı

(İTÜ arşivi)



Fenni Mimari kitabı kapağı

(İTÜ arşivi)

Şekil 2. Ali Talat Bey'in Ahşap İnşaat Eşkali ve Fenni Mimari kitaplarının kapakları

### 3.1.3. İnşaat ve İmalatta Vahit Kıyas Fiyatı Yahut İşçilik

Vahit Kıyas Fiyatı (Mukayese Edilen Birim Fiyat), bir inşaat veya imalat işinde kullanılan birim fiyatın, başka bir projedeki benzer iş kalemleriyle karşılaştırılarak belirlenmesidir. Osmanlı Devleti'nde dönemin inşaat uygulamaları ve imalatlarına dair birim fiyat bilgilerini içeren bu eser, 1922 yılında yayımlanmış olup dört ciltten oluşmaktadır (Şekil 3). Kitapların içerik detaylarına ilişkin bilgiler günümüzde erişilebilir değildir (Neftçi, 2013: 154).

### 3.1.4. Kargir İnşaat ve Kargir İnşaat Eşkali

Ali Talat Bey'in 1911'de kaleme aldığı eser, iki ciltten oluşmaktadır: "Kargir İnşaat" ve çizimlerin yer aldığı "Kargir İnşaat Eşkali" (Şekil 3). Yazarın 1922'deki vefatından sonra, 1925'te Ali Ziya Bey tarafından "noksanları ikmal edilerek" derlenmiş ve Mühendis Mektebi'nde yeniden basılmıştır (BOA, İTÜ.MÜM. 71/48).

Koruma Akademisi, 2022 yılında Osmanlı Dönemi Mimarlık ve Mühendislik Ders Kitapları Yayın Dizisi'nin ilk eseri olarak eserin transkripsiyonunu yayımlamıştır (Acar, Çakar, Han, & Şengün, 2022:11). Yayın, 1911 baskısını temel almış ve 1925 baskısındaki değişiklikleri belirtmiş, çizimleri de içermektedir (Şekil 3).

Mühendis Mektebi, 1910 başlarında eğitim programını yenileyerek ders kitapları basmıştır; bu dönemde birçok eser Fransızcadan çevrilmiştir. Transkripsiyon çalışmaları, Ali Talat Bey'in "Kargir İnşaat" ve "Eşkali" kitaplarının bazı bölümlerinin Jules Denfer'in 1891 tarihli "Architecture & Constructions Civiles, Maçonnerie" adlı iki ciltlik eseriyle birebir veya özet olarak örtüştüğünü göstermiştir. Ayrıca Germano Wanderlay (1883) ve J. Dubosque (1881) eserlerinden de yararlanıldığı anlaşılmaktadır. Kitap, kendi yazdığı bölümlerin yanı sıra yerel malzeme ve uygulamalara dair bilgiler de içermektedir (Acar, Çakar, Han, & Şengün, 2022: 15-17).



İşçilik kitabı kapağı (İTÜ arşivi)



Kargir İnşaat kitabı kapağı (İTÜ arşivi)

Şekil 3. Ali Talat Bey'in Kârgir inşaat kitaplarının kapakları

### 3.1.5. Sanayi-i İnşaiyye ve Mimariyeden Doğramacılık, Marangozculuk ve Silicilik İmalatına Ait Mebâhis

Ali Talat Bey'in ölümünden sonra yayımlanan eser, Mühendishane-i Berri Hümayun ve Hendese-i Mülkiye'de verdiği derslerin notlarını içermektedir. İlk olarak 1923'te Mühendishane Matbaası'nda Osmanlıca basılan eser, geleneksel Türk ahşap mimarisinin yapım tekniklerini ayrıntılı biçimde aktaran önemli bir kaynaktır.

2008 yılında eser, İstanbul Büyükşehir Belediyesi tarafından Latinceye çevrilerek yeniden yayımlanmıştır (Şekil 4). Kitapta kapılar, pencere doğramaları, kafesler, panjurlar, jaluzi sistemleri, mağaza ve dükkân camekanları ile kepenkler, lambri uygulamaları, binaların inşaat ve imalatında silicilik ve İslam mimarisi esas alınarak yapılan doğramalar ele alınmıştır. Eser, ders notu olarak öğrenciler için sunulmasının yanı sıra, uygulamacılar için de önemli bir kaynak niteliği taşımaktadır.



Doğramacılık, Marangoz ve Silicilik kitabı kapağı

(İTÜ arşivi)




Doğramacılık, Marangoz ve Silicilik kitabı kapağı

(Göncüoğlu ve Türksever, 2008).

Şekil 3. Ali Talat Bey'in Doğramacılık, Marangoz ve Silicilik kitabının özgün ve sonradan baskısının kapakları

### 3.2. Mimari Uygulamaları

Ali Talat Bey, kendisini akademik alanda geliştirmesinin yanı sıra aynı zamanda çok sayıda mimari proje de üretmiştir. İsmi dönemin ünlü mimarları Mimar Kemaleddin Bey ve Vedat Tek Bey kadar sık geçmese de hakkında yapılan araştırmalarla ulaşılan bilgiler Ali Talat Bey'in de döneminin Türk mimarisinde öncülük eden isimlerinden biri olduğunu göstermektedir (Yücel, 1980: 467–469).

Beşiktaş İskelesi, Kuzguncuk İskelesi ve Üsküdar İskelesi Ali Talat Bey'in bilinen eserleridir. Bu yapılardan Beşiktaş ve Kuzguncuk İskeleleri günümüzde halen kullanılmaktayken, Üsküdar İskelesi ise yıkılarak ve yerine bugün kullanılan iskele yapılmıştır (Url-5).

Beşiktaş İskelesi ilk olarak 1851'de Şirket-i Hayriye tarafından yapılmış, 1884, 1898 ve 1900 yıllarında onarım ve genişletme çalışmaları geçirmiştir. 1913'te ise eski yapı yıkılarak, Mimar Ali Talat Bey'in tasarladığı bugünkü iki katlı yığma bina inşa edilmiştir. Giriş kapısındaki çini süslemeler üzerinde "1267" (1850-51), "Beşiktaş" ve "1329" (1913) kitabeleri yer almaktadır (Şekil 4). Hava koşullarının olumsuz etkileri sebebiyle iskelenin bazı bölümleri zaman içinde yenilenmiş; zemin kattaki sivri kemerli revak ile üst katın bir bölümü cam panellerle kapatılmıştır. Sonraki restorasyonlarda ise vapur yanaşma alanı genişletilmiş, kulelerin özgün kubbeleri kaldırılarak kırma çatıyla değiştirilmiştir (Url-2).

Kuzguncuk İskele Binası ilk olarak 1831 yılında inşa edilmiştir (DBİA, 1994). Ancak geçirdiği yangınlar ve artan ihtiyaçlar nedeniyle yeni bir yapıya gereksinim duyulduğu için, günümüzde kullanılan iki katlı kâgir iskele tasarlanmıştır. Yapının zemin katında yolcu girişi, görevli odaları, bekleme salonu ve Vapur Kafe yer almakta, işletme, üst katında bulunan oturma ve çalışma alanlarıyla hizmet vermeye devam etmektedir (Url-3) (Şekil 4).



Beşiktaş İskelesi'nin yan cephesi



Kuzguncuk İskelesi'nin deniz cephesi

Şekil 4. Beşiktaş ve Kuzguncuk iskelelerinin günümüzdeki durumu (Saliha Kafalı arşivi)

Eski Üsküdar İskelesi, Şirket-i Hayriye tarafından yaptırılmış, ancak 1906 yılında yıkılarak yerine Ali Talat Bey'in projesi olan yeni iskele inşa edilmiştir (Url-4). Ancak bu yapı daha sonra gerekçesini bilmediğimiz bir sebeple Denizcilik Bankası tarafından yıkılarak günümüzdeki iskele inşa edilmiştir (Url-5). Ali Talat Bey'in

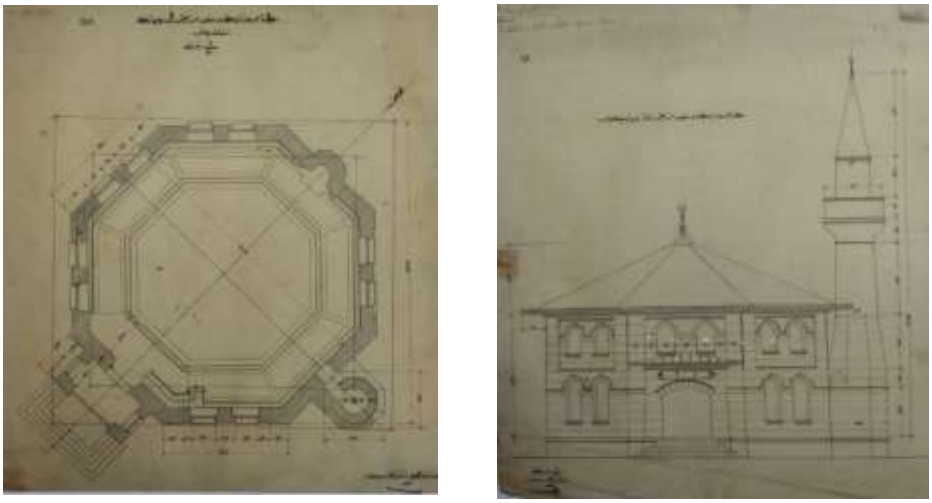
müellifi olduğu eserin geniş saçakları, simetrik cephe düzeni ve bezemeleriyle Birinci Ulusal Mimarlık Akımı'nın karakteristik özelliklerini yansıttığı anlaşılmaktadır (Şekil 5).

Mimar Ali Talat Bey'in bazı çalışmalarına da arşiv belgelerinden ulaşılmaktadır. Vakıflar Genel Müdürlüğü arşivinde yapılan incelemelerde, mimari açıdan önemli birçok belge ortaya çıkarılmıştır. Prof. Dr. Yıldırım Yavuz'un öncülüğünde Kemal Elker ve Erdem Yücel'in de yer aldığı bir ekip tarafından belgeler tasnif edilmeye başlanmış, bu süreçte Mimar Kemaleddin Bey ve Ali Talat Bey'e ait imzalı eskiz projeler bulunmuştur. Ali Talat Bey'in dönemin mimarisine katkıları bilinse de adı Kemaleddin Bey ve Vedat Tek kadar öne çıkmamış, bu nedenle etkisinin boyutu yeterince değerlendirilememiştir. Ancak arşiv belgelerindeki imzalar ve tarihler, onun da Türk mimarisine yön veren önemli bir mimar olduğunu ortaya koymaktadır. Prof. Dr. Afife Batur ve Gül Cephanecigil'in katkılarıyla hazırlanan *Mimar Kemaleddin Proje Kataloğu* (2009), Kemaleddin Bey'in projeleriyle aynı dönemde yapılmış diğer eserleri kapsamaktadır. Bu bölümde ise Kemaleddin'den ayrı olarak, Ali Talat Bey imzası taşıyan çizimler ve eserler ele alınacaktır.



Şekil 5. Ali Talat Bey'in projesi olan Üsküdar İskelesi (Url-6).

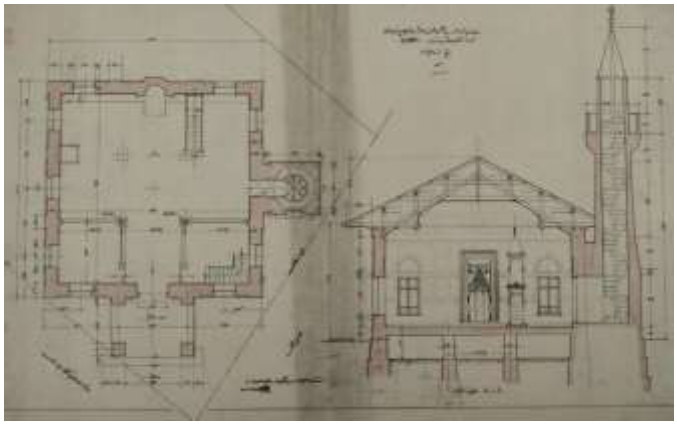
Ali Talat Bey'in arşivde rastlanan eserlerinden birisi Ahmediye Camii'dir. İstanbul İskenderpaşa semtindeki cami, kuzey kapısındaki kitabede verilen bilgiye göre 1331 (1912-1913) yılında inşa edilmiştir. Kaynaklarda Câmi-i Miyâne, Etmeydanı Camii ve Orta Camii gibi adlarla anılan yapının bulunduğu yerdeki ilk cami 1527 yılında Sadrazam İbrâhim Paşa tarafından yaptırılmıştır (Dişören, 1994: 140–141). *Mimar Kemaleddin Proje Kataloğu*'nda camiye dair çizimler, "Sultan Ahmed-i Evvel Hazretleri Vakfı'ndan Ortaçeşme'de Kâin Cami-i Şerifi" başlığı altında yer almakta olup, 1911-1912 tarihli bu belgelerde "İnşaat ve Tamirat Müdürü ve Sermimar Muavini Ali Talat Bey" imzası bulunmaktadır. Söz konusu belgeler arasında plan, cephe çizimleri, mihrap ve çatı detayları ile kısmi çatı planı yer almaktadır (Şekil 6).



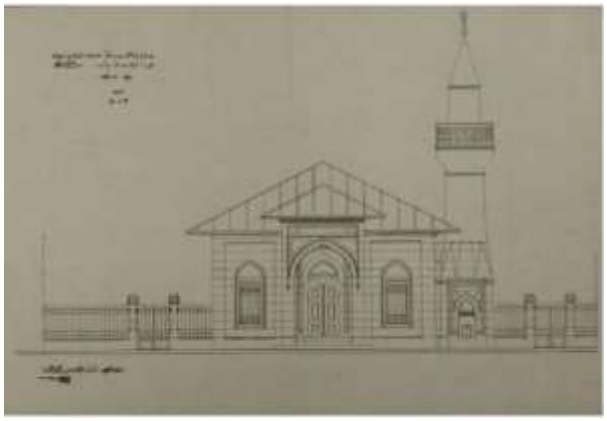
Plan Giriş cephesi

Şekil 6. Ahmediye Camii plan ve cephesi (Batur, 2008: 239-242).

Talat Bey'in Arşivden ulaşılan bir başka eseri de Soğanağa Camii'dir (Şekil 6). Alçep ve Karaman'ın (2017) belirttiğine göre, Beyazıt'taki Soğanağa Camii Sultan II. Bayezid döneminde Soğanbaşısı Sinan Ağa tarafından 16. yüzyılda inşa ettirilmiştir. Ahşap çatılı ve kârgir olan cami, kapı kitabesine göre 1329 (1911) yılında yanmış, ardından yeniden inşa edilmiştir. Zamanla harap hâle gelen yapı, 1997'de yenilenmiş; bu süreçte minaresi özgün yapıya göre daha yüksek olarak yapılmıştır (Yüksel, 1983: 291). Caminin mihrabı ve orta kotuna kadar olan pencere duvarları çini kaplamalıdır. *Mimar Kemaleddin Proje Kataloğu*'nda yer alan belgeler, "Midhat Paşa Mahallesi'nde Kâin Muhterik Soğanağa Cami-i Şerifinin Müceddeden İnşasına Dair Proje" başlığıyla kayıtlıdır. "İnşaat ve Tamirat Müdüriyeti Umumiyesi Sermimar Muavini Ali Talat" imzalı ve 1914-1915 tarihli çizimler arasında plan, kesit, cephe çizimleri, abdest mahalli, müezzin odası planları ve vaziyet planı yer almaktadır (Şekil 7).



Plan ve Kesit

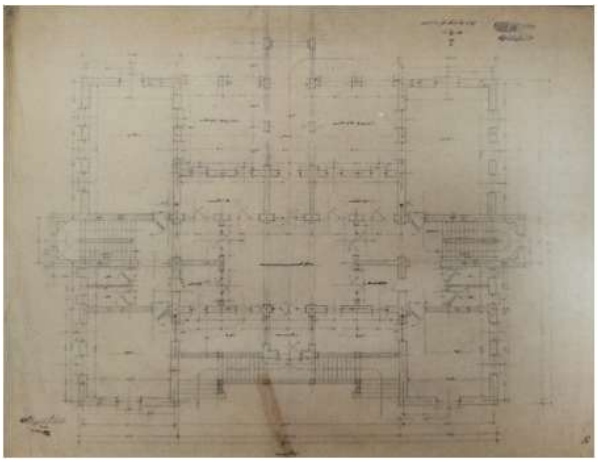


Ön cephe

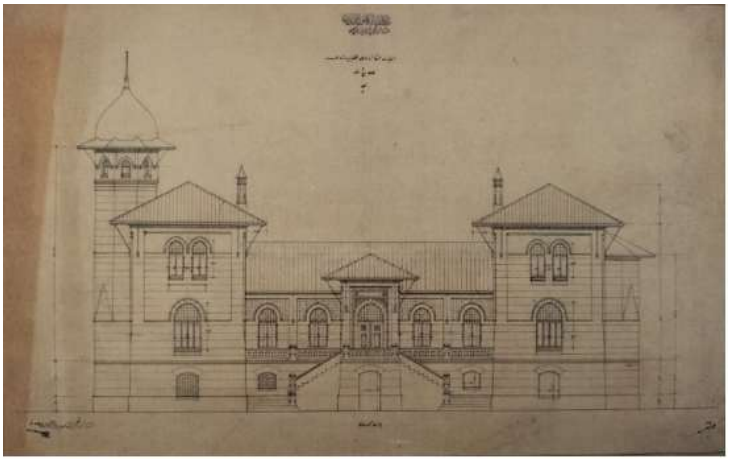
Şekil 7. Soğanağa Camii plan, kesit ve cephesi (Batur, 2008: 245-247).

Ali Talat Bey'in *Mimar Kemaleddin Proje Kataloğu*'nda yer alan projelerinden bir diğeri, "İstinye'de İnşa Olunacak Mektep Projesi" başlığıyla sunulmuştur. Tarih belirtilmeyen çizimler, "İnşaat ve Tamirat Müdüriyeti Umumiyesi Sermimar Muavini Ali Talat" imzasını taşımaktadır. Proje kapsamında zemin, bodrum ve birinci kat planları; kesit, iki cephe görünüşü, vaziyet planı ve detay kesitler bulunmaktadır (Şekil 8). Ancak bu okulun gerçekten inşa edilip edilmediğine dair kaynaklarda herhangi bir bilgiye ulaşılamamıştır.

Mimar Kemaleddin Proje Kataloğu'nda bulunan üç farklı mektep projesi birbirinden dershane sayıları ile ayrılarak, dört dershaneli, beş dershaneli ve altı dershaneli mektep isimleri ile adlandırılmıştır. "Dört Dershane Üzerine Tertib Olunmuş Mekteb-i İptidai Projesi" başlığıyla sunulan çizimler, Mimar Ali Talat imzasını taşımaktadır (Şekil 9). Projede cephe, kesit ve plan çizimleri yer almaktadır. Mimar Kemaleddin Proje Kataloğu'nda "Beş Dershane Üzerine Tertib Olunmuş Mekteb-i İptidai Projesi" başlığıyla sunulan çizimler, Mimar Ali Talat imzasını taşımakta olup, iki cephe çizimi ve 1913-1914 tarihli zemin kat planını içermektedir (Şekil 9).



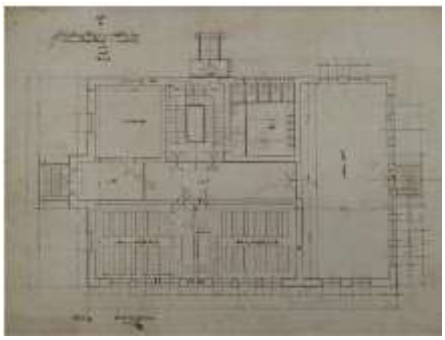
Zemin kat planı



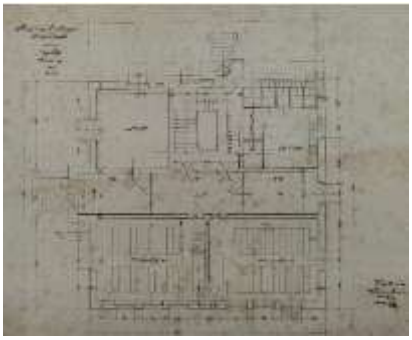
Giriş cephesi

Şekil 8. "İstinye'de inşa olunacak mektep" isimli projenin zemin kat planı ve cephesi (Batur, 2008: 259-262).

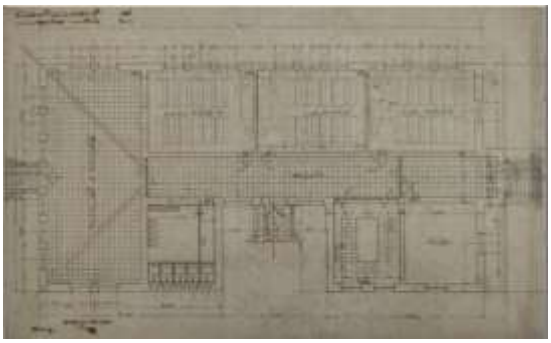
Katalogda yer alan sonuncu mektep projesi ise "Altı Dershane Üzerine Tertib Olunmuş Mekteb-i İptidai Projesi" başlığı altında sunulmaktadır. Çizimlerde tarih belirtilmemiştir. Belgeler, "İstanbul Evkaf Müdüriyeti Sermimar Vekili Mimar Ali Talat" imzasını taşımaktadır. Projeye ilişkin çizimler arasında; zemin kat planı, birinci kat planı, kesit ve üç farklı cephe görünüşü yer almaktadır (Şekil 9). Bu üç mektep projesinin de gerçekleştirilip gerçekleştirilmediğine dair kaynaklarda herhangi bir bilgi bulunmamaktadır.



Dört dershaneli mektep



Beş dershaneli mektep

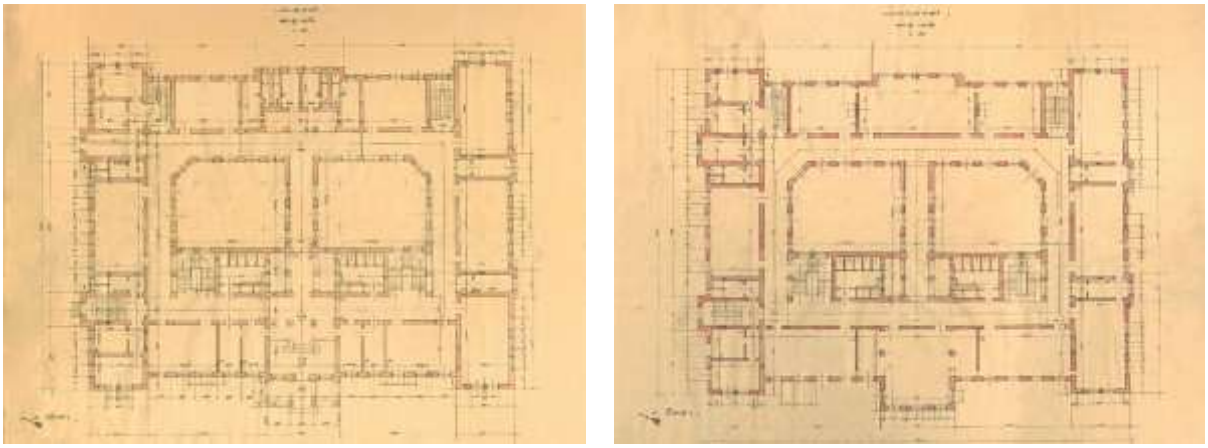


Altı dershaneli mektep

Şekil 9. Ali Talat Bey'in mektep projelerinin zemin kat planları (Batur, 2008: 269, 275, 277).

Mimar Ali Talat Bey'in çalışması olarak arşivde bulunan, ancak uygulanmayan çalışmalarından birisi de Tevkifhane (Cezaevi) projesidir (Şekil 11). 1916 yılında hazırlanan tevkifhane projesi, Sultanahmet'te planlanan

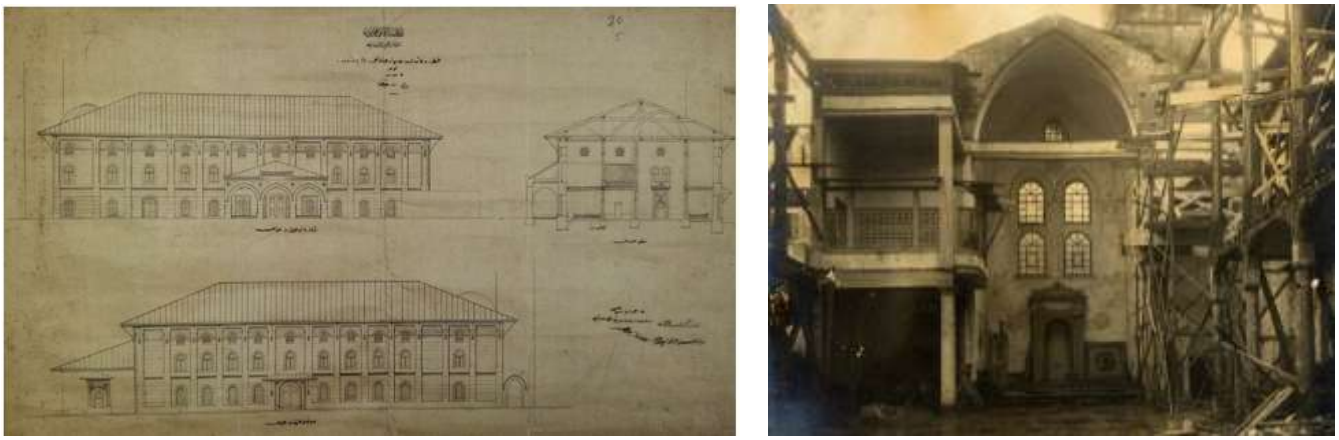
iki katlı bir hapishane yapısına aittir. Merkez ve yan cephelerde çıkmalar, sivri kemerli pencere ve kapı alınlıkları ile simetrik plan şeması, dönemin mimari üslubunu yansıtmaktadır (Çobanoğlu, 2018: 72).



Zemin kat planı Birinci kat planı

Şekil 11. Tevkifhane projesinin zemin ve birinci katları (Çobanoğlu, 2018: 73, 74).

Ali Talat Bey'in Mimar Kemalettin ile birlikte yaptıkları çalışmaları da bulunmaktadır. İstanbul'un fethinden sonra kiliseden camiye çevrilen Arap Camii bu ortak çalışmalarından birisidir (Şekil 12). Eser, 1913 yılında kapsamlı bir restorasyondan geçirilmiştir (Eyice, 1991: 326–327). Mimar Kemaleddin Proje Kataloğunda yer alan 1913 tarihli cami çizimleri; son cemaat mahalli planı, kesit ve cepheler, avlu kapısı ve detayları, şadırvan ve sokak cepheleri, iç galeri görünüşü, mihrap cephesi kesiti ile vaziyet planını kapsamaktadır. Şadırvan ve sokak cephesi görünüşleri ile kesit çizimlerinde Ali Talat Bey'in imzası bulunmaktadır. Mimar Kemaleddin Bey ise İnşaat ve Tamirat Müdürü ve Sermimar olarak projeye Ali Talat Bey'le birlikte imza atmıştır.

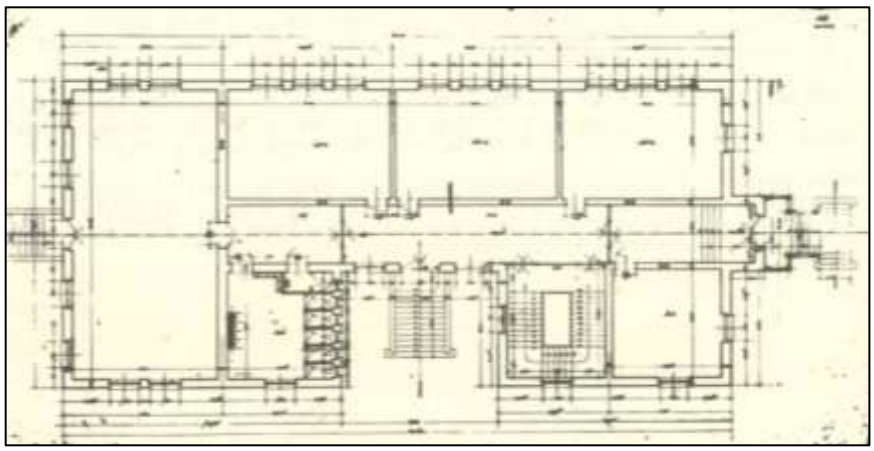


Kesit ve cepheler (Batur, 2008: 9) 1913-19 restorasyonu sırasında iç mekân (İAM Arşivi).

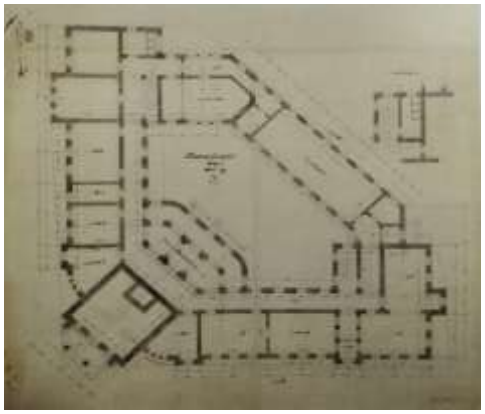
Şekil 12. Arap Camii'nin cepheleri ve kesiti ile 20. yy. başındaki restorasyonda iç mekân görünüşü

1915-1924 yılları arasında Evkaf Nezareti tarafından inşa ettirilen Göztepe Mekteb-i İptidaisi (Göztepe İlkokulu) Mimar Kemaleddin Proje Kataloğunda, "Göztepe'de Müceddeden (yeni) İnşa Kılınacak Mekteb-i İbtidai" başlığı ile yer almaktadır. Bodrum katıyla birlikte üç katlı olan yapı, dikdörtgen planlıdır (Turan, 2010: 43). Proje paftaları arasında zemin kat planı (Şekil 13), bodrum kat planı, birinci kat planı, üç yönden cephe görünüşü ve iki yönden kesit yer almakla beraber, yalnızca zemin kat planında Mimar Kemaleddin Bey'in imzası vardır. Diğer çizimlerde, ismi belirlenemeyen bir mimarın ve İnşaat ve Tamirat Müdürü ve Sermimar Muavini Ali Talat'ın imzaları bulunmaktadır.

Hendese-i Mülkiye Mektebi, 1883 yılında Hasköy'de Mühendishane-i Berr-i Hümayun bünyesinde eğitim vermeye başlamış, 1884'te yeni binasına taşınmıştır. 1909'da "Mühendis Mektebi" adını alarak Nafia Nezareti'ne bağlanmış; Mimar Kemaleddin Bey'in proje önerisi doğrultusunda Gedikpaşa Tiyatrosu'nun bulunduğu alanda yeni bir yapı inşa edilmeye başlanmış, ancak savaş koşulları nedeniyle yalnızca kısmen tamamlanabilmiştir. Kurum, 1922'de Gümüşsuyu Kışlası'na taşınmış ve 1928'de "Yüksek Mühendis Mektebi" adını alarak zamanla İstanbul Teknik Üniversitesi'ne dönüşmüştür (Unat, 1964: 79; Ergin, 1941: 955; Arslan Çinko, 2020: 56). Mimar Kemaleddin Proje Kataloğunda okul çizimleri, "Gedikpaşa'da Müceddeden İnşa Olunacak Mühendis Mekteb-i Âlisi" başlığı altında sunulmuş; zemin, bodrum ve ikinci kat planları, kesitler, mobilya ve kapı detayları yer almaktadır. Zemin ve bodrum kat planlarında Mimar Kemaleddin Bey ve Ali Talat Bey'in imzaları görülmekte olup, zemin kat planı 1911'de çizildikten sonra 1912'de revize edilmiştir (Şekil 13).



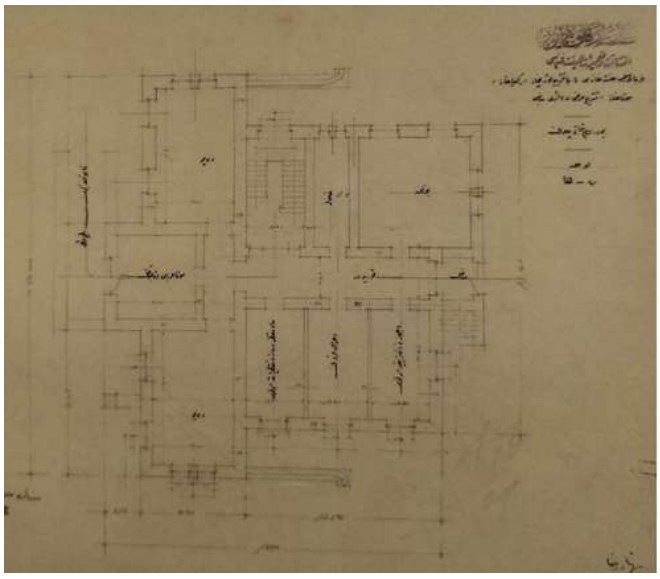
Göztepe İptidaisi
(Yavuz, 1981: 218)



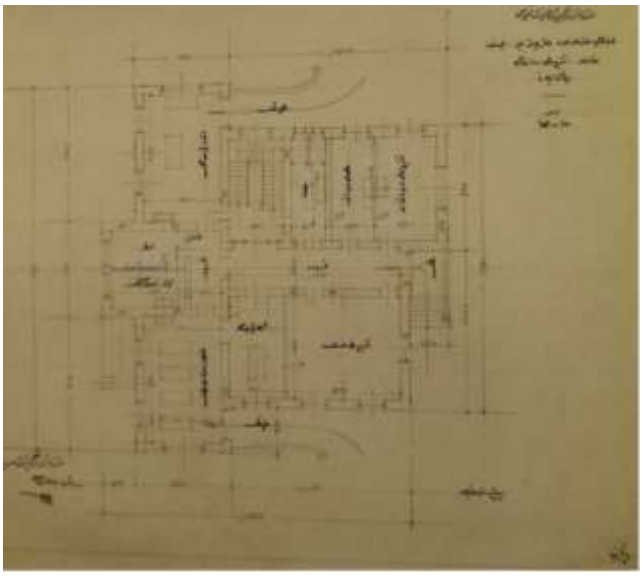
Gedikpaşa Mühendis Mekteb-i âlisi
(Batur, 2008: 95)

Şekil 13. Göztepe İptidaisi ve Gedikpaşa Mühendis Mekteb-i Âlisi zemin kat planları

Ali Talat Bey'in Mimar Kemalettin Bey ile ortak çalıştıkları projelerden birisi de Gureba Hastanesi projesidir. Osmanlı döneminin son sağlık kuruluşlarından biri olan hastane, 1843'te açılmıştır. Mevcut yapıların onarımı yerine tamamen yeni bir bina yapılması kararlaştırılmış ve tasarım Mimar Kemaleddin Bey tarafından, Almanya'daki Berlin Neue Köln Hastanesi incelenerek gerçekleştirilmiştir (Bolak, 1950: 57). Yerleşkede yönetim merkezi ve poliklinik binasında Osmanlı mimarisine özgü öğeler; geniş saçaklar, kubbeli kuleler ve sivri kemerli pencereler yer alırken, hasta pavyonları daha yalın ve işlevsel tasarlanmıştır (Cantay, 2013: 118). Dönemin koşulları nedeniyle önerilen ek binalar hayata geçirilememiştir (Batur, 2011: 118-122). Mimar Kemaleddin Proje Kataloğunda, 1916 tarihli çizimler, gerçekleştirilemeyen projeleri belgelemektedir. Müdavat-ı Muhtelife ve Hamam Dairesi, İdarehane, Ameliyat-ı Cerrahiye Binası, hasta pavyonları, mutfak ve çamaşırhane, tedbirhane, bakteriyolojihane, kimyahane, mevtahane ve teşrih morgu, röntgen, verem koğuşu ve klinik binası olmak üzere sekiz farklı yapı için çizimler hazırlanmıştır. Bakteriyolojihane, Kimyahane, Mevtahane ve Teşrih Morgu Binası çizimlerinde, Ali Talat Bey "İnşaat ve Tamirat Müdürü ve Sermimar" unvanıyla imza atmıştır. Yapının kat planları ile kesit çizimleri mevcuttur (Şekil 14).



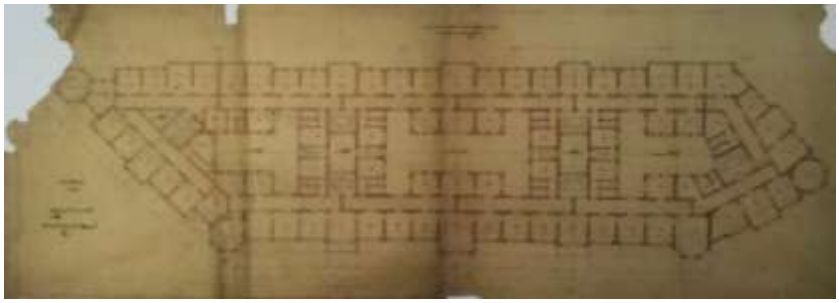
Bodrum kat planı



Zemin kat planı

Şekil 14. Gureba-i Müslimin Hastanesi, Bakteriyolojihane, Kimyahane, Mevtahane, Teşrih Morgu binası bodrum kat planı (Batur, 2008: 167-168).

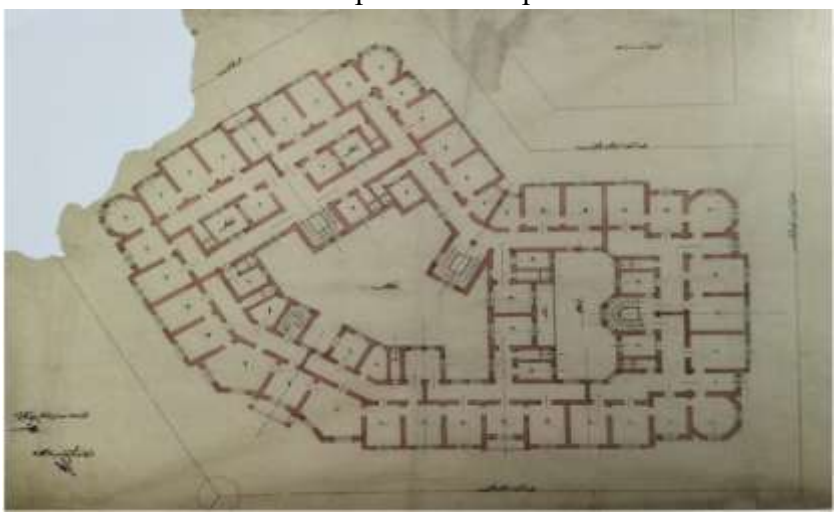
Mimar Kemaleddin Proje Kataloğunda, “Beyoğlu’nda Apartman” başlığı altında üç farklı apartmana ait plan çizimleri yer almaktadır (Şekil 15). Çizimlerde, dönemin Evkaf Nezareti İnşaat ve Tamirat Müdürü ve Sermimarı Kemaleddin Bey ile Sermimar Muavini Ali Talat Bey’in imzaları bulunmaktadır.



Birinci apartmana ait plan



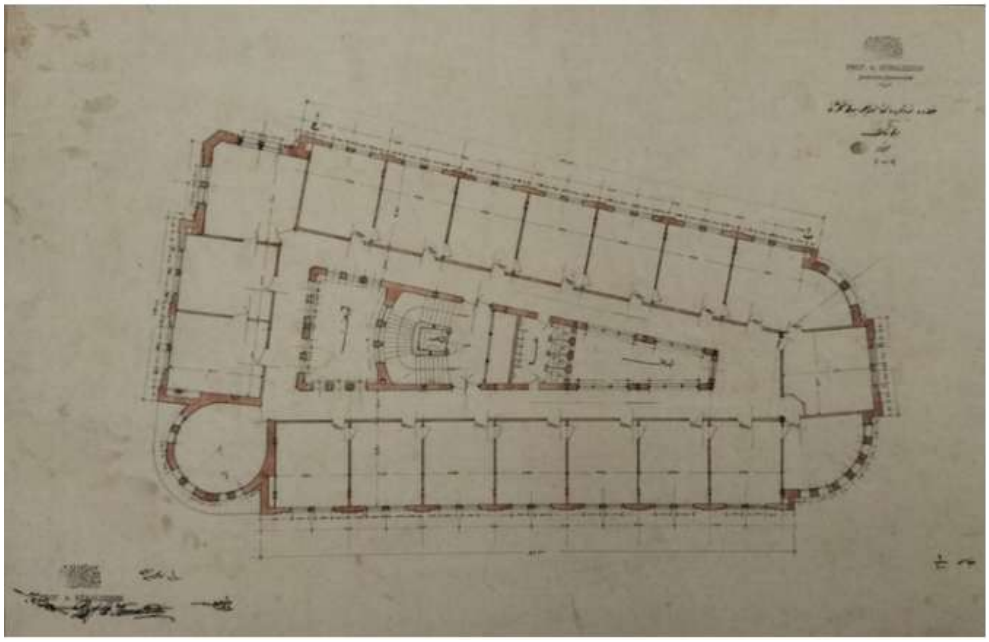
İkinci apartmana ait plan



Üçüncü apartmana ait plan

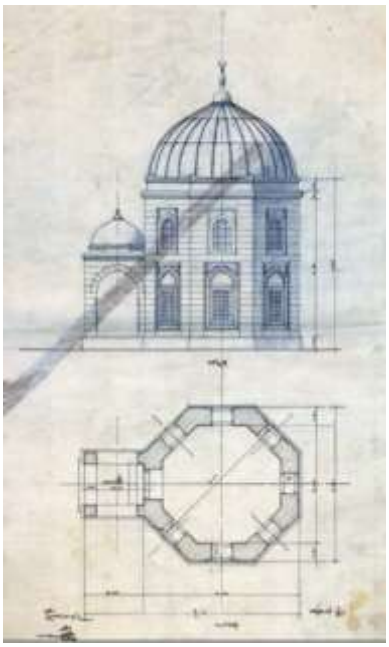
Şekil 15. Beyoğlu’nda inşa edilen apartmanlara ait planlar (Batur, 2008: 188-190).

Mimar Kemaleddin Proje Kataloğunda yer alan 1914 tarihli çizimlerde, "Galata'da Karaköy'de İnşa Olunacak Birinci Şehir Hanı" başlığı altında bir han yapısı da bulunmaktadır. Yapının inşa edilip edilmediğine dair kaynaklarda bilgi bulunmamaktadır ve günümüzde bu plana uygun bir han mevcut değildir. Çizimler, zemin (Şekil 16), birinci ve dördüncü kat planları ile üç farklı cephe detayını içermekte olup, Kemaleddin Bey ve Ali Talat Bey'in imzalarını taşımaktadır.



Şehir Hanı 1. Kat planı

(Batur, 2008: 203)



Barboros Hayrettin Paşa Türbesi cephe ve planı
(VGM arşivi)

Şekil 16. I. Şehir Hanı ve Barboros Hayrettin Paşa Türbesi'nin projelerinden görünümler

Mimar Ali Talat Bey'in, yeni yapılar tasarlamanın yanı sıra türbelerin restorasyonunda da görev aldığı anlaşılmaktadır. Restorasyonunda görev aldığı net olarak bilinen yapı, Barbaros Hayreddin Paşa Türbesi'dir (Neftçi, 2013: 152). Diğer restorasyon çalışmaları hakkında ise bilgi mevcut değildir. Vakıflar Arşivi'nden alınmış türbeye ait plan ve cephe çiziminin sol altında Ali Talat Bey'e ait imza bulunmaktadır (Şekil 16).

## 3. DEĞERLENDİRME VE SONUÇ

Mimar Ali Talat Bey'in yaşamı ve üretimleri incelendiğinde, onun yalnızca bir uygulamacı mimar olarak değil, aynı zamanda bir eğitimci, akademik yazar ve dönemin mimarlık pratiğine yön veren entelektüel bir figür

olarak da önemli katkılar sunduğu görülmektedir. Ali Talat Bey'in eserleri, özellikle "Ahşap İnşaat", "Kargir İnşaat" ve "Fenni Mimari" gibi kitapları hem teorik hem de uygulamalı boyutlarıyla dönemin mühendislik ve mimarlık eğitimine ışık tutmaktadır. Bu kitaplar, teknik hesaplar, yerel malzeme kullanımı, yapı sistemleri ve uygulama yöntemleri açısından güncel değer taşıyan bilgiler sunmakta; öğrencilere ders notları olarak işlev görürken, uygulayıcı mimarlar için de rehber niteliğinde kaynaklar sunmaktadır. Ayrıca bu eserler, Ali Talat Bey'in Batı kaynaklarından yaptığı çevirilerle kendi yorumlarını ve yerel uygulamaları harmanlayarak, klasik Türk mimarisi ile modern teknikler arasında kurduğu sentezi ortaya koyması bakımından ayrı bir önem taşımaktadır.

Ali Talat Bey'in projeleri, farklı işlevlerdeki yapıları kapsamakta ve dönemin teknik ve estetik gerekliliklerini bütüncül bir şekilde yansıtmaktadır. Kamu binaları, eğitim yapıları, sağlık tesisleri, iskeleler ve camiler üzerindeki çalışmaları, onun hem işlevsel hem de estetik boyutları dikkate alan bir tasarım yaklaşımına sahip olduğunu göstermektedir. Projelerdeki aks sistemleri, simetrik cephe düzenlemeleri, sivri kemer kullanımı ve geniş saçaklar, dönemin Birinci Ulusal Mimarlık Akımı'nın karakteristik özellikleriyle uyumlu bir estetik yaklaşımı ortaya koymaktadır. Bununla birlikte, bazı projelerin yalnızca tasarım aşamasında kalması ve uygulanmamış olması, dönemin sosyo-ekonomik ve idari koşullarının mimarlık pratiği üzerindeki etkilerini de göstermektedir.

Sonuç olarak, Ali Talat Bey'in hem yazılı eserleri hem de mimari projeleri, Osmanlı'nın son dönemi ve erken Cumhuriyet dönemi mimarlık pratiğini ve eğitim anlayışını anlamak için değerli belgeler niteliğindedir. Çalışmada ortaya konan belgeler, onun klasik Türk mimarisi ile modern teknikler arasında kurduğu sentez arayışını, Birinci Ulusal Mimarlık Akımı'nın etkisi altındaki özgün mimari üslubunu ve eğitim alanındaki katkılarını kapsamlı bir biçimde göstermektedir. Bu bağlamda, Ali Talat Bey'in adı, dönemin önde gelen mimarları olan Mimar Kemaleddin ve Vedat Tek ile birlikte daha görünür hâle getirilmelidir. Yapılan inceleme, onun teorik bilgi birikimi ve uygulamalı projeleri üzerinden Türk mimarlık tarihine yaptığı katkıları bütüncül bir perspektifle değerlendirme imkânı sunmaktadır. Ayrıca bu çalışma, Birinci Ulusal Mimarlık Akımı bağlamında, dönem mimarlarının estetik, işlev ve teknik bütünlüğü nasıl sağladığını anlamak açısından da önemli bir referans teşkil etmektedir.

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# *Artificial Intelligence and Virtual Reality in Cultural Heritage Sites: A Study on Nature-Based Experiences*

# *Kültürel Miras Alanlarında Yapay Zekâ ve Sanal Gerçeklik: Doğa-Temelli Deneyimler Üzerine Bir Çalışma*

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## Abstract

Cultural heritage sites, which embody historical, architectural and social values, are multilayered spaces that reflect the identity and collective memory of societies. The 1972 World Heritage Convention and the 2003 Convention for the Safeguarding of the Intangible Cultural Heritage of UNESCO emphasize the importance of preserving cultural heritage and transmitting it to future generations. Today, digital technologies, particularly artificial intelligence (AI) and virtual reality (VR), stand out as effective tools in the conservation, documentation and enhancement of visitor experience in cultural heritage contexts. Studies on virtual reality show that virtual environments make significant contributions to the reconstruction of lost or damaged structures, to the enhancement of visitor interaction, to the establishment of emotional bonds with historical contexts, to the transmission of cultural landscapes to the future and to the strengthening of individuals' connection with the landscape. These aspects of AI/VR generate experience-based learning opportunities in cultural landscapes, where contact with nature is facilitated, that support well-being and contribute to health literacy.

On the other hand, AI applications are used in damage assessment, material analysis and preventive conservation of architectural structures; deep learning algorithms have been shown to contribute to academia. This paper examines the role of AI and VR technologies in the processes of conserving, documenting and experiencing cultural heritage. In line with the definitions of UNESCO and ICCROM, it emphasizes the importance of implementing

technological interventions in an ethical, context-sensitive and sustainable manner. The findings reveal that digital technologies are not only technical innovations but also strategic tools for transmitting cultural heritage to future generations, increasing public participation and improving conservation strategies. In conclusion, AI and VR applications in cultural heritage sites can strengthen health-related outcomes such as visitor well-being, accessibility and safety through nature-based experiences. AI- and VR-based approaches enhance interdisciplinary collaboration in heritage conservation, enrich visitor experience and contribute to sustainable conservation strategies. The ethical and contextually sensitive implementation of these technologies will play a critical role in safeguarding the authentic values of cultural heritage and transmitting them to future generations.

**Keywords:** Cultural heritage, artificial intelligence, virtual reality, nature, conservation

## 1.INTRODUCTION

Cultural heritage is not limited to physical structures or artefacts transmitted from the past to the present; it is also the totality of values that represent the identity, memory and continuity of societies. As stated in UNESCO's 1972 Convention Concerning the Protection of the World Cultural and Natural Heritage, cultural heritage "includes monuments, architectural works, sites and cultural landscapes of outstanding universal value" (UNESCO, 1972). Cultural landscapes and open-green spaces, which constitute an important component of cultural heritage, are places where contact with nature is easily established. Nature-based solutions in the conservation and management of cultural heritage help to overcome the challenges of preservation. The concept of nature-based solutions emerged in conservation and nature enhancement sectors following the recognition of both positive and negative relationships between people and nature (Cohen-Shacham et al., 2016).

In recent years, green infrastructure concepts have started to occupy an important place in planning practice in urban design, in the conservation of heritage sites and in the provision of high-level visitor experiences (Tzoulas et al., 2007). Green infrastructure is a significant urban network system that encompasses natural, semi-natural and artificial networks composed of multifunctional ecological systems at all spatial scales within and around urban areas. All networks that are part of this green infrastructure system, or that connect heritage sites to each other and to other spaces, have important effects on individuals' well-being.

If green infrastructure is proactively planned, developed and maintained, it can guide urban development by providing a framework for economic growth and nature conservation (Walmsley, 2006). Such a planned approach can offer many opportunities for integrating urban development, nature conservation and public health promotion. One way to strengthen the conservation of cultural and natural elements in cities is to focus on what connects them. All heritage consists of natural and cultural elements and, although the balance between them may vary greatly, there can be opportunities for mutual benefit.

In cultural heritage sites, VR-supported narratives and AI-based decision support tools make it possible to design accessible and inclusive experiences that support visitor well-being, reduce stress and enhance learning motivation. In addition, UNESCO's 2003 Convention for the Safeguarding of the Intangible Cultural Heritage defines cultural heritage as a multilayered phenomenon extending from oral traditions to social practices, from rituals to craftsmanship (UNESCO, 2003). This approach frames cultural heritage conservation not only as the restoration of physical assets but also as a process that requires the sustainability of knowledge, skills and social meanings.

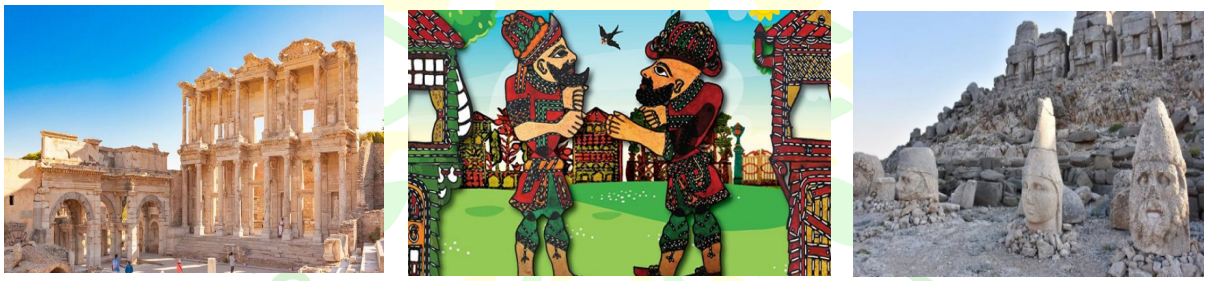

*Figure 1. Examples of Tangible and Intangible Cultural Heritage*

Cultural heritage conservation and transmission are strongly supported by ICCROM (International Centre for the Study of the Preservation and Restoration of Cultural Property), one of the most important institutions in this field, which emphasizes the effective use of technological developments. According to ICCROM (2020), tools such as digitization, artificial intelligence and virtual/augmented reality provide contemporary methods for "documentation of cultural heritage, risk assessment, development of conservation strategies and engagement with communities."

In recent years, academic studies at the intersection of digital technologies and cultural heritage have gained considerable importance. The study titled *A Systematic Review of Virtual 3D Reconstructions of Cultural Heritage in Immersive Virtual Reality* notes that VR-based three-

dimensional reconstructions have become a common tool in the reconstruction of lost or damaged cultural assets (Garcia et al., 2024). Similarly, *Virtual Reality with 360-Video Storytelling in Cultural Heritage* shows that VR technology enriches user experience in cultural spaces and facilitates the establishment of emotional bonds with historical contexts (Skola et al., 2020).

The inclusion of AI in conservation practices provides critical contributions in terms of restoration, damage detection and preventive conservation. In the study *Cross-Material Damage Detection and Analysis for Architectural Heritage Images* (Xu et al., 2025), AI-based object recognition algorithms were developed to detect damage in architectural structures and achieved high accuracy rates, especially in complex deterioration types. Moreover, in the research titled *Towards AI-Assisted Preventive Conservation in Libraries*, deep learning methods were used to enable early detection of biological deterioration caused by fungi and insects in old manuscripts (Schirrmeister et al., 2025).

On the other hand, VR and digital storytelling offer important opportunities in the interaction between cultural heritage and visitors. The study *Digital Storytelling in Cultural Heritage: Audience Engagement in the Interactive Documentary New Life* enabled audiences to establish an active relationship with historical narratives (Nisi et al., 2021); *Digital Storytelling and Audience Engagement in Cultural Heritage Management: A Collaborative Model* demonstrated that it is possible to increase cultural participation through digital city applications (Economou & Meintani, 2011).

All these studies show that AI- and VR-based applications are not only technical innovations for the conservation, reconstruction and experiencing of cultural heritage but also strategic tools in terms of sustainability, public participation and the safeguarding of cultural authenticity. As UNESCO also emphasizes, the ethical, inclusive and contextually sensitive use of digital technologies will be decisive in the transmission of cultural heritage to future generations (UNESCO, 2021).

## 2.MATERIALS and METHOD

### 2.1 Aim

The aim of this study is to present, from the perspective of existing academic research, the opportunities and challenges related to artificial intelligence and virtual reality applications in cultural heritage sites. The objectives of the research can be listed under four headings:

1. To reveal the conceptual foundations of artificial intelligence and virtual reality technologies in the context of cultural heritage conservation.
2. To evaluate the compatibility of these technologies with UNESCO and other international heritage principles.
3. To examine application models through selected examples from the literature (e.g., Design and Evaluation of a Real-World Virtual Environment for Architecture and Urban Planning, Digital Storytelling and Narratives in Cultural Heritage Sites, A Survey of Augmented, Virtual, and Mixed Reality for Cultural Heritage).
4. To discuss advantages, limitations and recommendations derived from the applications and to contribute to future directions.

### 2.2 Method

This research offers a perspective on studies conducted to ensure the sustainability of cultural heritage sites through virtual reality and artificial intelligence applications. It employs a qualitative literature review to examine academic studies on the challenges and potential of cultural heritage, artificial intelligence and virtual reality applications. The following steps were followed in the research method:

1. Academic databases (Scopus, Web of Science, Google Scholar) were searched using the predefined keywords “cultural heritage + virtual reality”, “augmented reality + cultural heritage”, “digital storytelling heritage”, “heritage + artificial intelligence”.
2. Influential studies in the literature, such as Design and Evaluation of a Real-World Virtual Environment for Architecture and Urban Planning (Drettakis et al., 2007) **and** *Digital Storytelling and Narratives in Cultural Heritage Sites*, were taken as a basis, and key references cited in these papers were identified and examined.
3. The obtained articles were selected based on scientific quality, contribution to the field and application dimension, and were subjected to systematic reading.

4. The texts were analyzed thematically, and common concepts, example applications, advantages and constraints were classified.
5. Finally, the findings were synthesized and a conclusion and recommendations section was developed.

## 3. CONCEPTUAL FOUNDATIONS and TECHNOLOGICAL APPROACHES

### 3.1 Artificial Intelligence (AI) and Cultural Heritage

Artificial intelligence includes approaches such as machine learning, deep learning, computer vision and natural language processing (NLP). In the field of cultural heritage, AI can be used for the following purposes:

- Automatic recognition of structures/cubic elements and material classification through image processing.
- Detection of damage or deterioration: analysis of data such as cracks, moisture effects and surface degradation.
- Suggestions for virtual restoration: predictive completion of missing parts of lost decorative motifs.
- Analysis of user behaviour: developing personalized experiences through the analysis of interaction data from museums/visitors.

Although AI applications in the field of cultural heritage are currently limited, they have increased in recent years, particularly in the areas of image processing and modelling. In this context, providing information layers such as shade, resting areas, access to water and barrier-free routes via AI in open-air museums and cultural landscape routes is a low-cost approach that strengthens both accessibility and visitor health. Especially in cultural landscapes, VR is well suited to producing scenarios that support health-related experiences such as relaxation and attention restoration through the multisensory presentation of green spaces and water elements.

### 3.2 Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR)

VR (Virtual Reality): A technology that transports the user into a fully computer-generated environment. In cultural heritage sites, it is used for virtual tours, reconstructions and simulations.



*Figure 2. A View from a VR (Virtual Reality) Application*

AR (Augmented Reality): A technology that enriches the real world by overlaying computer-generated layers. For example, projecting graphics of an historic façade's former appearance onto its current image.

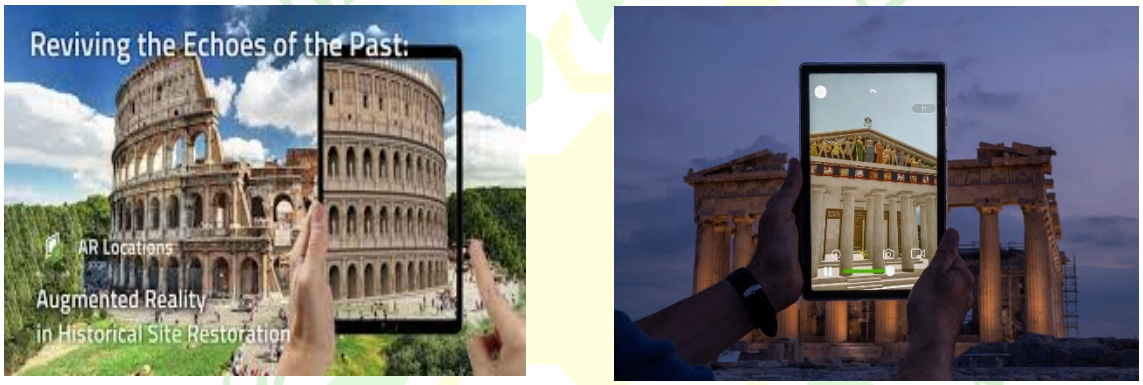


*Figure 3. A View from an AR (Augmented Reality) Application*

MR (Mixed Reality): Environments in which VR and AR components are combined and in which both virtual objects and the real environment interact.



*Figure 4. A View from an MR (Mixed Reality) Application*

In the study by Boboc and colleagues, an overview is provided of AR applications in the field of cultural heritage over the last decade, and modes of intervention and dimensions of user experience are examined (Boboc et al., 2022). For instance, AR technology offers enriched information to users by superimposing an information layer onto the real environment. Particularly when producing nature-based scenarios, VR content can balance multisensory elements such as vegetation, the sound of water and wind.



*Figure 5. Example of a Mobile AR Application Designed to Enhance Tourist Experience, by Boboc et al. (2022)*

### 3.3 Digital Storytelling and Interaction

Digital storytelling is a method of presenting historical narratives in digital environments using text, visuals, sound and animation tools. In cultural heritage sites, it aims to provide storytelling to visitors and to convey the history of the place experientially. Interactive digital storytelling allows the user to influence the course of the story through their choices, thereby positioning the visitor as a more active and meaningful participant. The "Narralive" project by Vrettakis et al. offered visitors the opportunity to create and experience stories in a mobile environment (Vrettakis et al., 2019).

## 4. FİNDİNGS

### 4.1 Virtual Environment Design – Findings from the Study "Design and Evaluation of a Real-World Virtual Environment for Architecture and Urban Planning" by Drettakis et al.

The study titled *Design and Evaluation of a Real-World Virtual Environment for Architecture and Urban Planning* presents a methodology for the design and evaluation of VR environments in the context of architecture and urban planning. Based on a user-centred design approach, the

study emphasizes the integration of feedback from architects, engineers and decision-makers at early stages. Narratives enriched with natural elements can be prepared to strengthen visitors' awareness of emotional attachment by linking them to biophilic design principles.

Some of the main findings identified in the study are as follows:

- The audiovisual realism of the environment (e.g., shadows, plant details, three-dimensional sound) significantly enhances users' sense of space and perception of scale.
- The involvement of users in the design process from the beginning enables the VR environment to be tailored to user expectations.
- Experimental evaluations were conducted both in laboratory settings and real usage environments, and both settings were reported to yield complementary results.

This study shows that VR in architectural projects has potential not only as a visualization tool but also as a decision-support and design communication tool.

**4.2 AR/VR Applications in Cultural Heritage**

Boboc et al. (2022) reviewed AR applications in the context of cultural heritage and identified both the aspects of AR that enhance visitor interaction and those that can assist conservation processes. For example, digital information overlays, reconstruction layers and user-interactive guidance become possible with AR.

In the study conducted by Ariya and colleagues, the impact of VR, VR360 and MR technologies on visitor experience was examined; panoramic video and VR-based historic city tour applications were found to strengthen visitors' perception of the city's history (Ariya et al., 2025).

The article *Virtual Reality Simulation in Urban Design Processes* by Ali et al. (2025) addressed the impact of VR simulations on decision-making processes in the context of urban design and highlighted the advantages of VR in terms of spatial understanding, interactive visualization and stakeholder participation. The positive effects of VR technology on decision-making processes and the flexibility it provides in urban design workflows are among the findings of the study (Ali et al., 2025).

In addition, interactive digital storytelling approaches for integrating narrative methods with VR environments in cultural heritage have attracted attention. For example, the study *Interactive Digital Storytelling in Cultural Heritage* proposes systems in which visitors can

determine the flow of the story through their choices, and discusses the effect of user agency on experience (Katifori et al.).

Furthermore, in the work *A Reference Architecture for Gamified Cultural Heritage Applications Leveraging Generative AI and Augmented Reality* by Martusciello and colleagues, the integration of generative AI with gamification approaches and AR is proposed, emphasizing the importance of making user interaction with content adaptive and personalized (Martusciello et al., 2025).

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## 5. RESULTS and DISCUSSION

Recent research demonstrates that virtual reality (VR) and artificial intelligence (AI) applications enhance user interaction and support the sustainable memorability of cultural heritage. This paper has addressed the use of AI and VR technologies in cultural heritage sites from both theoretical and applied perspectives. According to the findings obtained:

Kültürel Miras Alanlarında Yapa…

- VR/AR technologies offer multiple benefits for the documentation and simulation of cultural heritage, visitor interaction and restoration support systems. In particular, the realism of VR environments and user participation deepen spatial perception.
- Artificial intelligence can provide automatic analytical and recommendation systems through image processing and generative models. This offers contributions such as reducing restoration costs and optimizing conservation strategies.
- Digital storytelling and interactive narratives tend to transform the visitor from a passive viewer into an active participant; this approach increases both educational and experiential value.
- However, high costs, challenges in data acquisition, hardware requirements and copyright/ethical issues emerge as significant constraints in the implementation of these technologies.
- Considering UNESCO's cultural heritage principles, it is important that these technologies be structured in line with the principles of "priority of conservation", "transparency of intervention" and "sustainable access".

## 6.CONCLUSION

- A phased implementation model (pilot scale → upscaling) should be adopted in projects, with tests initially carried out in small areas.
- High-resolution cameras/drones and LIDAR technologies should be used in data collection processes, and accuracy should be ensured with ground control points (GCP).
- A user-centred design approach (cultural heritage experts + users + community participation) should be adopted from the beginning of the process.
- AI models should be carefully selected in terms of "transparency" and "interpretability", and black-box models should be avoided.
- Copyrights, data use permissions and digital ethics should be planned from the outset; open-source alternatives should be preferred over platforms such as Google Earth wherever possible.
- Collaboration should be established with UNESCO and relevant heritage institutions, and strategies compatible with conservation principles should be developed before technological interventions.

In conclusion, artificial intelligence and virtual reality technologies offer strong opportunities in the field of cultural heritage; however, their successful implementation requires multidisciplinary approaches, careful planning and close attention to ethical responsibilities.

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8. ULUSLARARASI

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**“COMPLIANCE WITH PUBLICATION ETHICS IS THE SOLE RESPONSIBILITY OF THE AUTHORS; ACCORDINGLY, THEY BEAR BOTH ETHICAL AND LEGAL ACCOUNTABILITY”**

# SURİYE'DE OSMANLI DÖNEMİ'NE AİT GELENEKSEL AVLULU KONUTLAR
§§§§§§§§§§§§§§§§§§§§§§§§§§§§

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## ÖZET
Suriye toprakları, binlerce yıllık yerleşim tarihi boyunca sayısız medeniyete ev sahipliği yapmış, kentsel dokusunun ve sivil mimarisinin belirgin karakterlerinden birini de Osmanlı İmparatorluğu'nun dört asır süren hakimiyeti (1516-1918) altında kazanmıştır. Geleneksel Suriye evinin tasarımındaki temel belirleyici etken içe dönüklük ilkesidir. Bu ilke hem İslam inancındaki mahremiyet kavramına hem de bölgenin sert, kurak iklim koşullarına bir cevap olarak gelişmiştir. Ev, dış dünyaya karşı sağır, yüksek duvarlarla kendini kapatırken, tüm yaşamı iç avluya odaklamaktadır. Arapça'da "evin toprağı" anlamına gelen *Ard al-Diyar* (avlu), evin mimari, sosyal ve iklimsel kalbidir. Gökyüzüne açık bu alan, evin diğer tüm birimlerinin (odalar, eyvan, mutfak) kendisine yönlendiği bir dağılım mekanıdır. Suriye geleneksel evi, mimari bir kabuk olmanın ötesinde, içinde yaşanılan zengin bir kültürün ve sosyal yaşamın göstergesidir. Osmanlı Suriye'sinde konut mimarisi tek tip değildir. Şam'da ve Halep'te, coğrafi yakınlıklarına rağmen, birbirinden ayrılan iki farklı mimari tipoloji gelişmiştir. Yerel, İslami ve Osmanlı etkilerinin yanı sıra zaman zaman Avrupa dokunuşlarının da birleşmesi, Suriye kültürel kimliğinin merkezinde yer alan eşsiz bir mimari miras bırakılmıştır. Bu çalışmada, bu mimari mirasın, sadece bir barınma kültürü değil, aynı zamanda iklimle uyumlu, sürdürülebilir tasarım yaklaşımları ile üretilmiş; yerel malzeme, süsleme anlayışı ve mekânsal organizasyon bakımından da özgün biçimlerde yorumlanarak ortaya konmuş olan, tarihsel bir model sunduğu vurgulanmaktadır.
**Anahtar Sözcükler:** Osmanlı mimarisi, Suriye, geleneksel konut, avlulu ev.

# TRADITIONAL COURTYARD HOUSES FROM THE OTTOMAN PERIOD IN SYRIA

## ABSTRACT
Syrian lands, throughout their millennia-long history of settlement, have been home to countless civilizations, and one of the distinctive characteristics of their urban fabric and civil architecture was acquired under the four-century rule of the Ottoman Empire (1516-1918). The fundamental determining factor in the design of the traditional Syrian house is the principle of introversion. This principle developed as a response both to the concept of privacy in Islamic belief and to the harsh, arid climate of the region. While the house is closed off from the outside world with high walls, it focuses all life on the inner courtyard. Ard al-Diyar (courtyard), meaning "the land of the house" in Arabic, is the architectural, social, and climatic heart of the house. This open-to-the-sky area is a distribution space towards which all other units of the house (rooms,

§§§§§§§§§§§§§§§§§§§§§§§§§§§§ Bu çalışma Karabük Üniversitesi, Safranbolu Başak Cengiz Mimarlık Fakültesi, Mimarlık Bölümü'nde gerçekleştirilmiş uluslararası öğrenciler için ülkelerindeki geleneksel konutların tanıtıldığı bir çalışmadan üretilmiştir. Katkıları için öğrencimiz Zaher Alhasan ve kardeşi Tamam Alhasan'a teşekkür ederiz.

veranda, kitchen) are oriented. The traditional Syrian house is more than an architectural shell; it is an indicator of the rich culture and social life lived within it. Residential architecture in Ottoman Syria was not uniform. In Damascus and Aleppo, despite their geographical proximity, two distinct architectural typologies developed. The blend of local, Islamic, and Ottoman influences, along with occasional European touches, has left a unique architectural heritage at the heart of Syria's cultural identity. This study emphasizes that this architectural heritage presents a historical model that is not merely a culture of shelter, but also one produced with climate-adapted, sustainable design approaches; interpreted in original ways in terms of local materials, ornamentation, and spatial organization.
**Keywords:** Ottoman architecture, Syria, traditional housing, courtyard house

## 1. GİRİŞ

Geleneksel avlulu konutlar, mimarlık tarihinde önemli bir yere sahip olup, insanların yaşam tarzlarının, inançlarının ve sosyal yapılarının bir yansıması olarak şekillenmiştir. Bu yapılar tarih boyunca farklı iklim ve kültürel ihtiyaçlara göre biçimlenmiş ve sosyal etkileşim ve kültürel amaçlar için kullanılmıştır.

Suriye'de geleneksel konut mimarisi, Osmanlı İmparatorluğu döneminde gelişim göstermiştir. Şam ve Halep gibi kentlerdeki eyvanlı-avlulu ev örnekleri, Eyyubiler ve Memluk dönemlerinden kalma örneklerin yanı sıra, en belirgin mimari özelliklerini Osmanlı döneminde sergilemiştir. Eski Şam'da, geleneksel avlulu evler 16. yüzyılın sonlarından 19. yüzyıla kadar inşa edilmiş olup, bu evler Arap, Osmanlı ve Akdeniz unsurlarının zengin bir karışımını yansıtarak Suriye'nin kültürel mirasının çeşitliliğini temsil etmektedir (Bwidani ve Yıldız, 2025).

Suriye'deki konut mimarisi, bulunduğu coğrafi bölgeye, iklim koşullarına ve kültürel etkilenmelere bağlı olarak çeşitlilik göstermektedir. Ülkenin güney ve doğu bölgelerinde sıcak ve kurak iklim koşulları nedeniyle üst örtü düz damlı tercih edilirken; yoğun yağış yaşanan kuzey bölgelerde ve dağlık alanlarda eğimli çatılar uygulanmaktadır. Benzer şekilde bölgesel olarak malzeme türlerinde de farklılıklar bulunmaktadır. Şam ve Halep gibi kentlerde taş ve kireç esaslı yapı malzemeleri öne çıkmakta, Fırat havzası ve çevresinde ise kerpiç ve ahşap destekli duvar sistemleri kullanılmaktadır.

Malzeme ve biçim farklılıklarına rağmen, Osmanlı İmparatorluğu dönemi boyunca Suriye evleri benzer mekânsal bir düzeni ve kültürel yaklaşımı paylaşmıştır. Özellikle avlulu ev tipolojisi hem iklimsel hem de toplumsal ihtiyaçlara cevap veren ortak bir plan anlayışını yansıtmaktadır. Bu evlerin çekirdeğini oluşturan iç avlu, mahremiyet, iklimsel konfor ve sosyal etkileşim açısından temel bir bileşen olmuştur. Bu geleneksel konutlar, genellikle bir veya daha fazla avlu etrafında organize edilen konak türü yapılardır. Avlulu evlerin mimarisi, mahremiyete verilen önemden dolayı içe dönük bir mekânsal organizasyona sahiptir. Sokaktan bakıldığında sade ve sağır görünen dış cephelerinin aksine, iç avluları yoğun bir şekilde dekore edilmiştir (Eraslan, 2020).

Osmanlı döneminde Suriye'nin farklı bölgelerinde özellikle Şam, Halep, Hama ve Humus gibi kentlerde geleneksel evler hem yerel geleneklerin hem de imparatorluk mimarisinin etkisiyle biçimsel olarak gelişmiş ve farklı sosyo-kültürel gereksinimlere uyum sağlamıştır. Her ne kadar avlulu ev planı Mezopotamya ve Arap coğrafyasında benzer örneklerle karşılaşılsa da Osmanlı dönemi Suriye konutları özgün bir tipoloji ortaya koymuş, yerel malzeme, iklim ve kültürle birleşerek kendine has bir kimlik kazanmıştır.

Bu çalışma, geleneksel Suriye evlerinin temel özelliklerini, mekânsal bileşenlerinin tarihsel süreç içerisindeki gelişimini ve farklı örnekler üzerinden geçirdiği dönüşümü irdelemektedir. Suriye'de Osmanlı dönemi mimari özelliklerini taşıyan geleneksel avlulu konutların mimari kimliği ve yapısal özellikleri, kültürel miras ve sosyal süreklilik bağlamında ele alınması amaçlanmıştır.

## 2. AVLULU EVLERİN MİMARİSİ: SURİYE

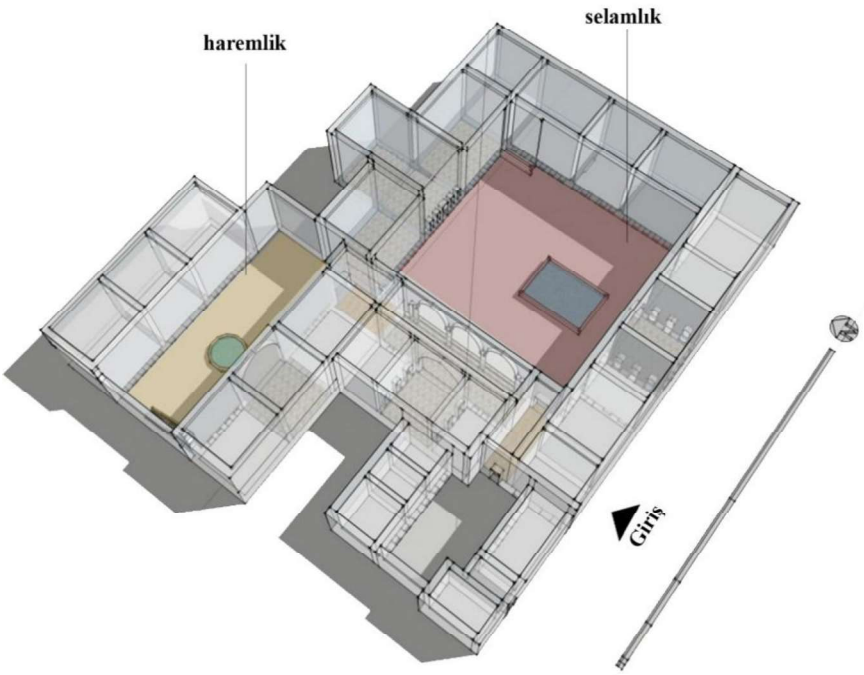
Avlulu evlerin merkezinde yer alan avluların belirli bir standart biçimi olmamakla birlikte, farklı mimari ve kültürel ihtiyaçlara göre çeşitlenen şekillere sahip olduğu görülmektedir. Suriye'de geleneksel konut mimarisinin en belirgin özelliği olan avlu hem iklimsel hem de kültürel ihtiyaçlara cevap veren merkezi bir mekân olmuştur. Suriye'deki geleneksel avlulu evler üç ana başlık olan, sosyal ve kültürel değerler, mimari ve mekânsal unsurlar, iklimsel uyum ve sürdürülebilirlik kapsamında incelendiğinde, dönemin konut mimarisi üzerinden bölgenin kültürel mirasını yansıtan değerlerini ortaya koyabilmektedir.

Avlulu evlerin insanların sosyal yapılarının ve inançlarının bir yansıması olarak şekillenmektedir. Bu da yaşam tarzı hakkında fikir vermekte, içe dönük mekânsal organizasyon mahremiyete verilen önemi de ortaya koymaktadır. Suriye'deki avlulu ev tipolojisinde ortak mekan olan avlunun bir sosyal alan olarak çalıştığı, evlerin dış cephelerinin sokağa karşı sağır olup, açıklıkların avluya açıldığı görülmektedir. Geniş ailelerin ikamet ettiği konut grubu olarak düşünüldüğünde, ailenin fertleri bağımsız birimlerde barınırken, avlu aile bağlarını güçlü tutacak şekilde şekillenen bir mekan olmaktadır. Bu bölgedeki geleneksel evlerde de Türk Evi'nde karşılaştığımız harem-selamlık ayrımı da görülmektedir. Benzer şekilde selamlık için zemin kat, ailenin özel yaşam alanlarını içeren harem üst katta değerlendirilmiştir (Bwidani ve Yıldız, 2025).

Avlu, evin merkezi öğesi ve omurgası olarak işlevlendirilmiştir. Kare ya da dikdörtgen şeklinde olup, mekanlar arası bağlantı sağlayan bir mekandır. Suriye'deki geleneksel avlulu evlerde eyvan bu ev tipolojisinin ayırt edici özelliklerinden biridir. Genellikle avlu seviyesinde olup, üç tarafı kapalı ve bir tarafı avluya açılan bir yaz odası şeklindedir. Sıcak yaz günlerinde gölgelik alan sağlaması için kuzeye yönlendirilmiştir. Avlunun merkezinde "bürke" adı verilen fıskiyeli bir havuz veya kuyu bulunmaktadır. Avlu peyzajında ise yasemin, gül, portakal ve limon gibi narenciye ağaçları yer almaktadır. Avlu cephelerinde geometrik motifli süslemeler görülmektedir (Acam, 2019).

Avlulu evler, iklimin etkisiyle şekillenmişlerdir. Sıcak ve kurak iklimlerde termal konfor için pratik çözümler sunmaktadır. Avlular, mikro iklimsel verimlilik sağlamak için önemlidir ve sıcak mevsimlerde serinlik sağlayacakları şekilde tasarlanmışlardır (Barut ve Özcan, 2022). Avlulu evler, iklim dostu tasarımları sayesinde enerji verimliliğini artırır ve sürdürülebilir yaşam alanları sağlamaktadır.

Mekânsal ayrışma yalnızca işlevsel değil, aynı zamanda iklimsel ve estetik bir düzen yaratmıştır. Geniş avlular, yüksek duvarlarla çevrili korunaklı alanlar ve su öğeleri hem hava sirkülasyonu hem de görsel sakinlik sağlamıştır. Beit Farhi'nin (Farhi Sarayı) üç boyutlu modelinde (Şekil 1) bu mekânsal hiyerarşi açıkça görülmektedir: avlu etrafında dizilmiş odalar, dışarıdan görünmeyecek şekilde konumlanmış; selamlık kısmı girişe yakın, harem ise daha derinde yer almıştır (Macaulay-Lewis, 2018).

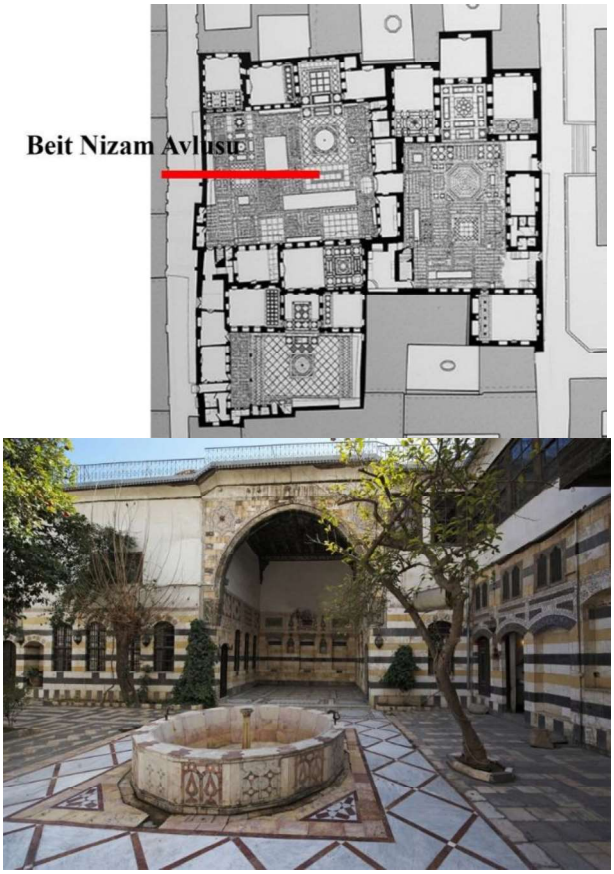



**Şekil 1.** Beit Farhi'nin üç boyutlu modellemesi.

## 3. SURİYE'DEKİ AVLULU EV ÖRNEKLERİ

Beit Nizam (Nizam Evi): Avlulu konut kurgusunun erken örneklerinden biri, Şam'daki (Beit Nizam) Nizam Evi'dir. Evin planı, çevresinde odaların sıralandığı geniş bir iç avlu düzenine sahiptir (Şekil 2). Avlu, sıcak iklim koşullarında yaşamın odak noktası hâline gelmiş; yemek hazırlama, misafir ağırlama ve günlük aile etkinliklerinin gerçekleştiği yarı açık bir mekân işlevi görmüştür. Aynı zamanda yüksek duvarlarla çevrili bu alan, kadınların ve çocukların dış bakışlardan korunarak günlük yaşamlarını sürdürebilmelerine olanak tanımıştır. Böylece mahremiyet, mimarinin biçimsel bir ilkesi hâline gelmiştir (URL-1).

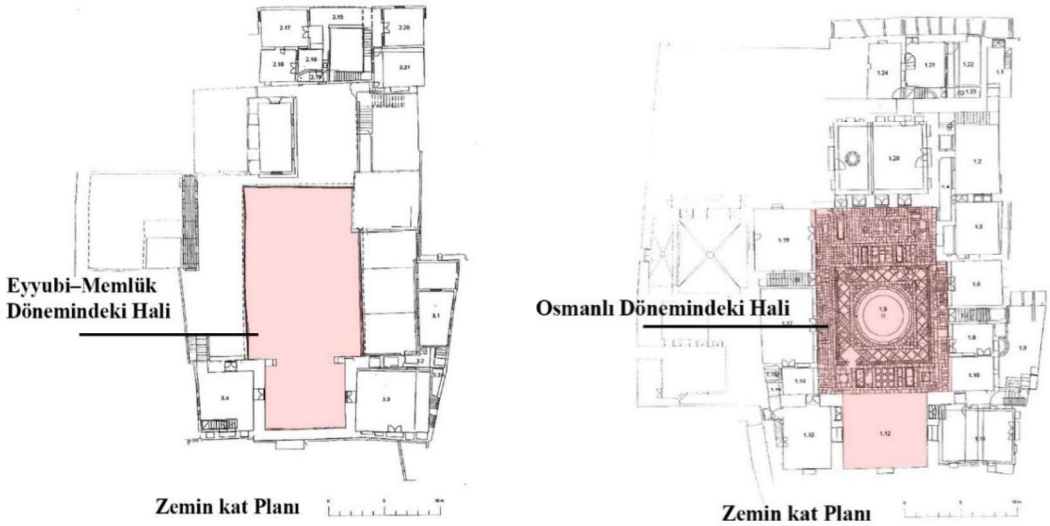
Beit Nizam avlusunun iç mekânında kullanılan fıskiye, eyvan ve revak düzeni, iklimsel konfor ile estetik uyumu bir arada sunmaktadır (Şekil 2). Merkezdeki su öğesi hem serinlik sağlamayı amaçlamakta hem de sembolik olarak huzur ve arınmayı temsil etmektedir. Revaklı cephelerde kullanılan taş işçiliği ve renkli taş sıraları ise Osmanlı öncesi dönemden miras kalan bir süsleme geleneğini sürdürmektedir. Bu düzen, erken dönem Suriye konutlarında mahremiyetin, iklimin ve sosyal yaşamın mimariyle nasıl bütünleştiğini açık biçimde ortaya koymaktadır (Labeyrie, 1991).




**Şekil 2.** Nizam Evi (Beit Nizam).

Beit Nizam Evi, geleneksel Suriye avlulu konut tipolojisinin mahremiyeti ve iklimsel adaptasyonu merkeze alan erken dönem bir örneği olarak, mimari düzeni ve süsleme özellikleriyle öne çıkmaktadır.

Beit al-Aqqad (Al-Aqqad Evi): Osmanlı hâkimiyetinden önce de Suriye'de konut mimarisi, avlulu plan anlayışı hem iklimsel gereksinimlere hem de toplumsal yaşam biçimlerine uyum sağlayacak biçimde gelişmiştir. Şam'daki Beit al-Aqqad Evi, bu dönüşümün en karakteristik örneklerinden biridir. Yapının erken planında avlu sade ve geniş bir açık alan olarak tasarlanmış, çevresinde temel yaşam birimleri konumlanmıştır. Bu düzen, mahremiyet ve iklim kontrolü arasında dengeli bir ilişki kurmuştur. Zamanla, Osmanlı döneminin başlamasıyla birlikte, aynı yapının mekânsal organizasyonu daha kompleks bir hal almıştır (Şekil 3). Avlunun ortasına yerleştirilen havuz ve süsleme unsurlarıyla mekân yalnızca iklimsel bir işlev değil, aynı zamanda estetik ve temsili bir anlam da kazanmıştır. Revaklı cepheler, süslemeli taş döşemeler ve geometrik kompozisyonlar, Osmanlı etkisinin yerel mimariyle birleştiği dönemi yansıtmaktadır (Koenigs, 2008).




**Şekil 3.** Beit al-Aqqad'ın farklı dönemlerdeki zemin kat planları.

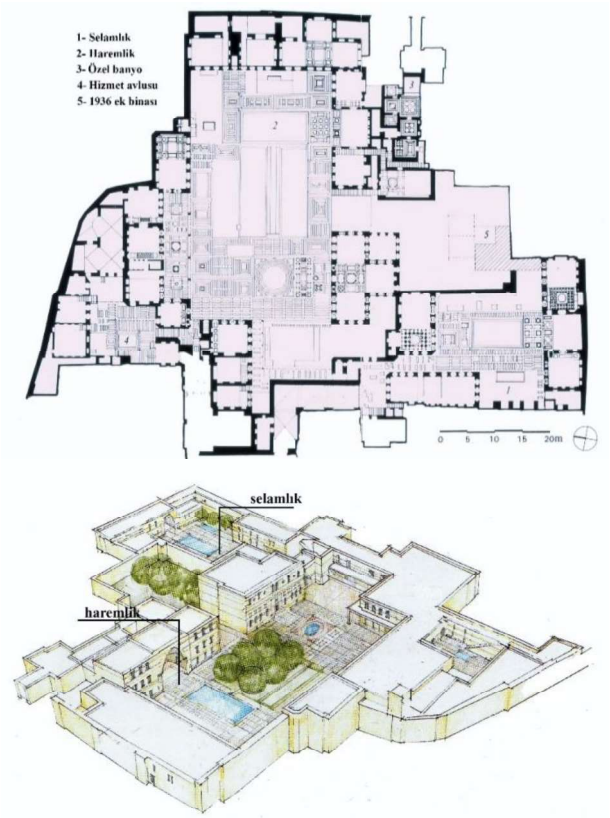
Beit al-Aqqad örneği, Osmanlı öncesi Suriye konutlarının nasıl aşamalı biçimde dönüştüğünü göstermektedir. Bu ev tipinin evrimi, avlunun salt bir açık alan olmaktan çıkıp, toplumsal statü ve estetik değerlerin ifade aracı haline geldiğini ortaya koymaktadır.

Beit al-Azm (al-Azm Evi): Şam'daki Beit al-Azm (As'ad Paşa al-Azm Sarayı), Osmanlı döneminde konut mimarisinin en gelişmiş örneklerinden biridir. Yapı, harem ve selamlık olmak üzere iki ana avlu etrafında örgütlenmiştir. Geniş revaklarla çevrili bu avlular hem mahremiyeti hem de sosyal etkileşimi dengelemektedir. Avlunun zemininde geometrik biçimlerde taş döşemeler kullanılmıştır. Malzeme seçimiyle mekanda ışığın yansıması ve derinlik hissinin güçlenmesi sağlanmıştır. Bu döşeme düzeni, Şam evlerinin zarif ve süslemeci karakterini vurgularken aynı zamanda mekâna görsel bir ritim kazandırmaktadır (Şekil 4).



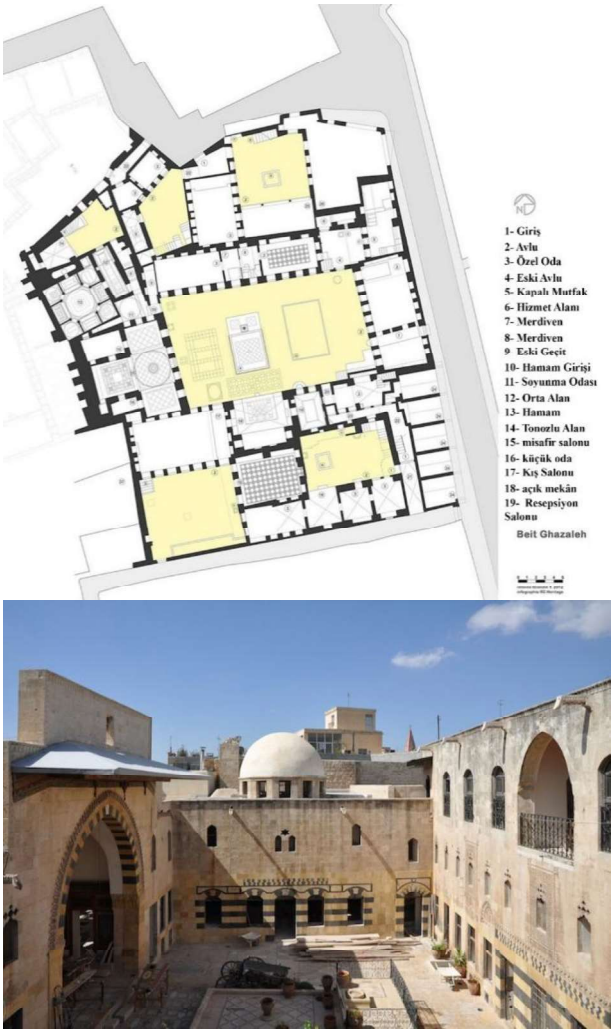
**Şekil 4.** Beit al-Azm avlusu cephe ve döşeme düzeni.

Harem ve selamlık avluları arasında net bir geçiş bulunmaktadır (Şekil 5). Avlu cephesinde 'ablaq' adı verilen siyah-beyaz taş örgüsü görülmektedir. Bu örgü biçimi Osmanlı döneminde Şam'a özgü en belirgin cephe kimlik özelliklerindendir. Revak kemerleri ve taş işçiliğindeki simetri anlayışı İslam sanatının geometrik düzenini ve Osmanlı zarafetini birleştirmektedir. Beit al-Azm, dönemin estetik gücünü yansıtan mimari bir simge olarak var olmaktadır (Brzezicki vd., 2019).




**Şekil 5.** Beit al-Azm avlu düzeni.

Beit Ghazaleh (Gazale Evi): Halep'te yer alan Beit Ghazaleh'te merkezi bir avlu çevresinde hamam, kışlık salon ve misafir odaları yer almaktadır. Şam'daki süslemeci tavırdan ziyade taşın doğal dokusu ve duvar kalınlığıyla oluşturulan güçlü bir mekânsal etki ön plandadır. Duvar yüzeylerinde 'ablaq' duvar örgülerine rastlanmaktadır. Bu ablaq düzeni, Şam'daki ince taş işçiliğine göre sade ve masif bir dokuya sahiptir. Ayrıca, Beit Ghazaleh'in iç mekânında görülen taş mozaik zemin detayı (Şekil 13) Halep ustalığının küçük ölçekli bir yansımasıdır. Burada kullanılan çok renkli taş parçaları, geometrik motiflerle birleştirilerek bir kompozisyon oluşturmaktadır. Bu detaylar, Halep evlerinde estetik kaygının sadelikle birleştiğini ve yapının dayanıklılık, işlevsellik ve taş işçiliği üzerine kurulu olduğunu gösterir (Alafandi, 2016).




**Şekil 6.** Beit Ghazaleh evi planı ve avlu görünümü.

## 4. SONUÇ

Suriye'deki Osmanlı dönemi geleneksel avlulu konutları, yüzyılların birikimiyle şekillenmiş; toplumsal yapıyı, kültürel kimliği ve estetik anlayışı bir bütün olarak yansıtan mimari sistemlerdir. Bu yapılar, insanların yaşam tarzlarının, inançlarının ve sosyal dokularının mekâna doğrudan bir yansıması olarak gelişim göstermiştir. Osmanlı döneminde mahremiyet kavramı, konut mimarisinin en temel belirleyicisi haline gelmiştir. Bu doğrultuda, aile yaşamı ile misafir ağırlama işlevlerini birbirinden ayıran harem-selamlık düzeni yaygınlaşmıştır. Evler dış dünyaya karşı yüksek duvarlarla sağır ve kapalı bir karakter sergilerken, tüm yaşamı iç avluya odaklamıştır.

Avlulu evler tipolojisi, bölgenin sıcak ve kurak iklim koşullarına uygun bir uyum sergilemektedir. Doğal havalandırma ve mikro iklimsel serinlik sağlayarak pasif bir iklimlendirme sistemi görevi görmektedir. Yerel malzeme kullanımı ve enerji verimli tasarımları, bu yapıları günümüzde dahi sürdürülebilir mimari için birer model haline getirmektedir. Aynı kültürel kökten beslenmelerine rağmen, farklı kentlerde özgün mekânsal kimlikler oluşmuştur. Osmanlı öncesi dönemden itibaren aşamalı bir dönüşüm geçirerek toplumsal statü ve estetik değerlerin ifade aracı haline gelmiştir.

Günümüzde bu miras, Suriye'de 14 yılı aşkın süredir devam eden iç savaş nedeniyle ağır hasar görmüş ve ciddi bir yok olma tehdidiyle karşı karşıya kalmıştır (Şekil 7). Özellikle UNESCO

Dünya Mirası Listesi'nde yer alan Halep ve Şam'ın eski şehir bölgelerindeki tarihi konut dokusu, çatışmaların merkezinde yer alarak fiziksel ve kültürel açıdan büyük kayıplar yaşamıştır.



**Şekil 7.** Beit Ghazaleh.

Suriye'deki Osmanlı dönemi avlulu konutları üzerine yapılan araştırmalar ve bu mirasın korunmasına yönelik öneriler, sadece mimari birer teknik çalışma değil, aynı zamanda kültürel belleğin ve sürdürülebilir yaşamın geleceğe taşınması adına kritik bir öneme sahiptir. Ağır hasarlı yapılar için acil teknik analizler yapılmalı ve taş mozaik, mukarnas gibi kaybolan süsleme öğeleri arşiv kayıtları üzerinden yeniden üretilmelidir. Bu yapıların sadece geçmişin kalıntıları değil; iklimsel çözümleme, sosyal hiyerarşi ve estetik zarafet açısından geleceğin mimarlığına ışık tutan "yaşayan birer laboratuvar" niteliğinde olduğu unutulmamalıdır.

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8. INTERNATIONAL

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## ÖZET

Kamusal alanların erişilebilirliği, erişim kısıtı olan bireylerin toplumsal yaşama eşit ve tam katılımı için temel bir gerekliliktir. ISO 21542 standardı, bu ihtiyaca yönelik yapılı çevrede erişilebilirliğin sağlanması için uluslararası kabul görmüş teknik bir çerçeve sunmaktadır. Bu standart, kamusal mekanların erişim kısıtı yaşayan bireyler tarafından bağımsız ve güvenli bir şekilde kullanılabilmesi için dolaşım yolları, rampalar, ıslak hacimler, bilgilendirme ve yönlendirme sistemleri gibi kritik yapısal elemanlara yönelik ayrıntılı tasarım kriterleri ve performans gereklilikleri belirlemektedir. Bu çalışmada, ISO 21542'nin teknik çözümlerini kamusal mekanlara erişim bağlamındaki yeri ve genel uygulanabilirliği bağlamında irdelenmektedir. Kavramsal çerçeve erişilebilirlik ve evrensel tasarım kavramları etrafında şekillenmiş ve erişilebilir kamusal alanların mekânsal kullanım kalitesi ve bağımsız hareket üzerindeki doğrudan etkisi vurgulanmıştır. Çalışmada, literatür taraması ve ISO 21542 standardının teknik gerekliliklerini irdeleyen bir doküman analizine dayanmaktadır. Elde edilen bulgular, standardın teknik açıdan son derece yeterli ve kapsamlı olduğunu göstermiştir. ISO 21542, rampa eğimleri, ıslak hacim ölçüleri ve bilginin en az iki duyu aracılığıyla iletilmesi gibi net kriterler sunmaktadır. Çalışmada, standardın en önemli katkısının, erişilebilirlik çözümlerini tasarımcının bireysel yorumuna bırakmayarak, ölçülebilir, tutarlı ve objektif bir kritere bağlaması olduğu tespit edilmiştir. Kamusal mekanlarda evrensel tasarım ilkelerinin tam anlamıyla hayata geçirilebilmesi için, ISO 21542'nin sunduğu bu kapsamlı teknik çerçevenin etkin bir şekilde uygulanması ve denetlenmesinin temel gereklilik olduğu sonucuna varılmıştır. Bu bağlamda, ilgili kamu kurumları ve yerel yönetimlerin denetim sorumluluklarını artırması ve başta mimar ve mühendisler olmak üzere tüm uygulayıcılara yönelik teknik eğitimlerin yaygınlaştırılması çalışmanın temel önerilerini oluşturmaktadır.

**Anahtar Kelimeler:** Kamusal Mekân, ISO21542, Erişilebilirlik, Herkes İçin Tasarım

# AN EXAMINATION OF ISO 21542 IN THE CONTEXT OF PUBLIC SPACE ACCESSIBILITY

## ABSTRACT

Accessibility of public spaces is a fundamental requirement for the equal and full participation of individuals with restricted access in social life. The ISO 21542 standard presents an internationally recognized technical framework for ensuring accessibility in the built environment to address this need. This standard specifies detailed design criteria and performance requirements for critical structural elements—such as circulation routes, ramps, sanitary facilities, and information and wayfinding systems—to ensure public spaces can be used independently and safely by individuals with restricted access. This study examines the role and general applicability of ISO 21542's technical solutions within the context of access to public spaces. The conceptual framework is shaped around the concepts of accessibility and universal design, emphasizing the direct impact of accessible public spaces on the spatial

quality of use and independent movement. The study is based on a literature review and a document analysis examining the technical requirements of the ISO 21542 standard. The findings indicate that the standard is technically highly sufficient and comprehensive. ISO 21542 presents clear criteria, such as ramp gradients, dimensions for sanitary facilities, and the communication of information via at least two sensory modalities. It was determined that the standard's most significant contribution is that it binds accessibility solutions to measurable, consistent, and objective criteria, rather than leaving them to the designer's individual interpretation. It is concluded that for the full implementation of universal design principles in public spaces, the effective implementation and enforcement of this comprehensive technical framework provided by ISO 21542 is an essential requirement. In this context, the main recommendations of the study include the enhancement of inspection responsibilities by relevant public institutions and local authorities, and the widespread provision of technical training for all practitioners, particularly architects and engineers.
**Keywords:** Public Space, ISO 21542, Accessibility, Universal Desing

## 1. GİRİŞ

Kentler, binalar, altyapı sistemleri ve açık alanların birleşiminden oluşmaktadır (Lynch,1960). Bu sistem içinde kamusal mekanlar, kentsel dolaşımın ve ortak faaliyetlerin gerçekleştiği fiziksel alanları tanımlamaktadır (Erdönmez ve Çelik,2016). Bu mekanlara meydanlar, parklar, kütüphaneler, caddeler, kaldırımlar ve toplu taşıma terminalleri gibi alanlar örnek gösterilebilir (Güzel ve Sönmez,2020). Bu alanların temel işlevi, kent sakinlerinin rekreasyon, dinlenme ve bir yerden bir yere bağımsız hareket etme gibi eylemlerini gerçekleştirmelerine olanak tanımaktır. Kamusal mekanların tasarım kalitesi, bu işlevlerin ne ölçüde yerine getirilebildiği ile doğrudan ilişkilidir (Gehl,2001).

Temelde bir mekânın kamusal veya halka açık olarak tanımlanması, onun pratikte herkes tarafından kullanılabilir olduğu anlamına gelmemektedir. Yapılı çevrenin fiziksel tasarımı, kentsel donatılar ve bilgilendirme sistemleri, toplumun belirli kesimleri için fiziksel engeller oluşturabilmektedir (Madanipour,1999). Merdivenler, dar geçişler, yetersiz aydınlatma, karmaşık yönlendirme veya dokunsal yüzey eksikliği gibi tasarım eksiklikleri, bazı bireylerin bu mekanları kullanmasını zorlaştırmaktadır. Bu durum, kamusal mekânın temel işlevselliğini kısıtlamaktadır. Bu sorunu çözmek için yapılı çevrenin tasarımında erişilebilirlik kavramı merkezi bir rol üstlenmektedir (Aygün vd,2018).

Erişilebilirlik kavramı, bir mekânın, ürünün veya hizmetin, erişim kısıtı olan bireyler de dahil olmak üzere, herkes tarafından bağımsız, güvenli ve konforlu bir şekilde kullanılabilmesini tanımlamaktadır (WHO,2007). Erişim kısıtlamaları, yalnızca kalıcı fiziksel engeli olan bireyleri kapsamamaktadır. Bunun dışında pusetli ebeveynler, hamileler, geçici yaralanması olanlar, yaşlı bireyler, görme veya işitme gibi duyusal farklılıklara sahip olanlar ya da bilişsel zorluk yaşayanlar gibi geniş bir kullanıcı yelpazesini kapsamaktadır (Steinfeld ve Maisel,2012). Bu yaklaşım, erişilebilirliği belirli bir kullanıcı grubuna yönelik bir gereklilikten çıkarıp, genel nüfusun değişken ihtiyaçlarını karşılayan bir tasarım problemi haline getirmektedir.

Bu probleme yönelik olarak, 1980'lerden itibaren Evrensel Tasarım yaklaşımı, mimarlık ve tasarım disiplinlerinde teknik bir temele oturtulmuştur (Iwarsson ve Ståhl,2003). Evrensel tasarım prensipleri mekanları "engelliler ve diğerleri" olarak ayıran özel çözüm anlayışını benimsememektedir. Bunun yerine geniş bir kullanıcı yelpazesi için işlevsel ve sürdürülebilir olan tek bir tasarım çözümü üretmeyi hedeflemektedir (Story,1998). Kamusal mekanlar, kullanıcı çeşitliliğinin en fazla olduğu alanlardan biri olduğundan dolayı Evrensel Tasarım ilkelerinin uygulanmasını gerektiren başlıca alanlardandır.

Herkes için tasarım yaklaşımının mimari uygulamalarda somut ve tutarlı olması gerekmektedir. Tasarımcının veya uygulayıcının bireysel yorumuna bırakılan erişilebilirlik çözümleri, genellikle yetersiz, standart dışı veya sonradan ekleme uygulamalar ile

sonuçlanmaktadır (Watchorn vd.,2023). Kamusal alanda rampanın eğimi, asansör kapısının açık kalma süresi veya yönlendirici bir yüzeyin konumu gibi ögeler bireysel yoruma bırakılmamalıdır (Çiftçi ve Kayhan Tunalı,2021). Teknik detaylarda tutarlılığı ve işlevselliği sağlamak için objektif bir standart gerekmektedir. Bu ihtiyaca yönelik olarak, asgari gereklilikleri belirlemek ve denetim için bir temel oluşturmak amacıyla uluslararası standartlar geliştirilmiştir.

Bu ihtiyaca yanıt veren en kapsamlı ve küresel ölçekte kabul görmüş teknik rehberlerden biri "ISO 21542: Yapılı çevrenin erişilebilirliği ve kullanılabilirliği" standardıdır. ISO 21542'nin gelişimi, tek bir standardın küresel gerekliliğini ortaya koyan uzun bir sürecin ürünüdür (Kose,2021). 20. yüzyılın sonlarında, başta ABD (ADA- Americans with Disabilities Act) ve Birleşik Krallık (DDA- Disability Discrimination Act) olmak üzere birçok gelişmiş ülke, kendi ulusal erişilebilirlik standartlarını ve yasal çerçevelerini oluşturmuştu (Cheausuwantavee ve Cheausuwantavee,2012). Ancak, uluslararası hareketliliğin ve ticaretin artması, standartların da ortak çatıda buluşma ihtiyacını doğurmuştur (Algan,2020). Uluslararası Standartlar Örgütü (ISO), bu farklı ulusal yaklaşımları ve en iyi uygulamaları sentezleyerek ortak bir teknik dil oluşturmayı hedeflemiştir. İlk olarak 2011 yılında yayınlanan ve daha sonra 2021'da kapsamlı bir revizyondan geçerek yeniden yayınlanan ISO 21542, bu ortak dili oluşturmayı hedeflemektedir (ISO,2021)

## 2. YÖNTEM

Bu çalışmada ilk olarak literatür taraması ile kamusal mekân ve erişilebilirlik standartlarının gelişimi hakkında genel bilgiler derlenmiştir. ISO 21542 standartları incelenerek kamusal alanlardaki rolü irdelenmiştir. Elde edilen bilgiler derlenerek kamusal alanlarda ISO21542 standartının erişilebilirliğe katkılarına vurgu yapılmıştır.

## 3. BULGULAR

ISO 21542, bir binanın veya kamusal alanın planlama aşamasından inşaatın tamamlanmasına kadar erişilebilirliğini sağlamak için mimari tasarımın birçok aşamasını kapsayan teknik bir dokümandır (Word Bank,2022). Yapılı çevrenin erişilebilirliği ve kullanılabilirliği üzerine temel bir referans olan ISO 21542 standardı spesifik teknik ölçülendirmelerin yanı sıra erişilebilirliği bütüncül bir yaklaşımla ele alan kavramsal bir çerçeve sunmaktadır. Yapılı çevreyi çeşitli bileşenleriyle ele almakta ve aşağıdaki bölümler için ölçülebilir kriterler sunmaktadır.

**Yapıya Adil Yaklaşım:** Bu ilke, kullanıcıların yapı ve çevresine erişimini kapsamaktadır. Örneğin belirlenmiş özel park alanlarının sağlanması, araç ve bisiklet yollarından ayrılmış yaya rotaları, güzergahta basamak veya engellerin bulunmaması, otopark ve toplu taşıma duraklarının kısa mesafelerde olması ve tüm bu lokasyonlara yönlendirmeler bulunması, yeterli aydınlatma ve görsel kontrastla desteklenmesini içermektedir (ISO21542).

**Kamusal Girişler Yoluyla Adil Giriş:** Yapıya girişte ayrımcılığın önlenmesini hedeflemektedir. Bu durum ana girişlerin kolayca bulunabilmesi, girişte basamak ve engellerin olmaması, geniş kapı açıklıkları, kapının önünde yeterli manevra alanı bırakılması, kapıları çalıştırmak için fazla güç gerektirmemesi ve giriş bölgesinin iyi yönlendirme, aydınlatma ve görsel kontrast ile donatılması anlamına gelmektedir (ISO21542).

**Yapının Yatay Dolaşımında Yolların Adil Kullanımı:** Yapı içindeki koridor ve geçişlerin herkes tarafından kullanımını tanımlamaktadır. Yatay sirkülasyonda basamak veya engellerin olmaması, yeterli manevra alanı (örn. tekerlekli sandalye dönüşleri için) olması, geniş kapı açıklıkları ve kolay açılıp kapanan kapıların bulunması, uzun sirkülasyon alanlarında dinlenme noktaları tasarlanması, net ve anlaşılır bir mekânsal düzen ve iyi yönlendirme, aydınlatma ve görsel kontrast bulunması ilkenin temel bileşenleridir (ISO21542).

**Yapıların Dikey Dolaşımında Adil Erişim:** Katlar arası geçişte tüm kullanıcıların aynı yolları kullanabilmesini içermektedir. Bu kriter merdivenlerde rıhtların ve basamakların uygun ölçülerde tasarlanasını ve geniş girişli seviye farkı olmayan asansörler gerektirmektedir (ISO21542).

**Mekanların Adil Kullanımı:** Mekanların temel işlevinden herkesin faydalanabilmesini hedeflemektedir. Mekânda geniş dolaşım alanı ve çeşitli oturma olanakları sunulmalıdır. Fiziksel erişimin yanı sıra, iyi akustik koşullar, işitme destek sistemleri, yeterli aydınlatma ve görsel kontrast sağlanması da bu kapsama girmektedir (ISO21542).

**Ekipman ve Tesislerin Adil Kullanımı:** Bina içindeki donatıların (banko, otomat, panel vb.) kullanımını kapsamaktadır. Yapı içindeki ekipmanların anlaşılmasının ve çalıştırılmasının kolay olması, çevresinde yeterli manevra alanı bulunması, uygun bir kullanım yüksekliğinde olması ve bilginin en az iki duyu aracılığıyla (örn. hem görsel hem işitsel) alınabilmesini gerektirmektedir (ISO21542).

**Tuvalet ve Islak Hacimlerin Adil Kullanımı:** Bu ilke erişilebilir ıslak hacimlerin tasarımını detaylandırmaktadır. Islak hacimler yönlendirme ile kolayca bulunabilmelidir. İçerde yeterli manevra alanı olmalıdır. Ayrıca tekerlekli sandalyeden klozete geçişte destek tutamakları bulunmalıdır. Uygun yükseklikte ve mekanizmada yerleştirilmiş lavabo, ayna, sabunluk bulunmalıdır. Kolay kullanılan armatürler ile kesintisiz aydınlatma sağlanmalıdır (ISO21542).

**Adil Çıkış ve Tahliye Yolları ile Net Acil Durum Planlaması:** Acil durumlarda herkesin güvenliğini sağlamayı hedeflemektedir. Tahliye rotalarında basamak veya engel olmaması, yangına karşı korumalı liftler ve asansörler bulunması, aydınlatmalı yönlendirme levhaları ile kaçış rotasının aydınlatmasının sağlanması ile erişilebilir tahliye sağlanmalıdır (ISO21542).

**Önemli Bilgilerin İki veya Daha Fazla Duyu Aracılığıyla İletilmesi:** Bilginin (uyarı, yönlendirme, bilgilendirme) farklı duyusal yeteneklere sahip kişilere ulaştırılmasını zorunlu kılmaktadır. Bu ilke bilginin görsel, işitsel ve dokunsal kanallar aracılığıyla sunulması anlamına gelmektedir (ISO21542).

Bu kriterler, ISO 21542'nin kamusal alanların herkes tarafından eşit şekilde kullanılması ön planda tutularak oluşturulmuştur. Standardın asıl önemi; bir kent meydanı, park veya ulaşım terminali gibi karmaşık, çoklu fonksiyona sahip ve kullanıcı çeşitliliğinin en yüksek olduğu alanlara bütüncül bir tasarım mantığı getirmesidir. Kamusal mekanların işlevselliğini artırmayı hedefleyen bu yaklaşımlar, farklı yapısal ihtiyaçlara eşit erişim imkânları sunmaya yöneliktir.

Standardın yalnızca fiziksel değil, duyusal ve bilişsel gereksinimleri de kapsaması, kamusal alanların değişken kullanıcı profiline yanıt verebilmesi için kritik bir katkıdır. Bu standart sayesinde kamusal alan tasarımı, tasarımcının bireysel yorumuna veya sonradan eklenen çözümlere bırakılmak yerine, Evrensel Tasarım ilkelerini temel alan, ölçülebilir, tutarlı ve denetlenebilir objektif bir zemine oturtulmaktadır. Bu bulgular, standardın teknik açıdan yeterli bir rehber olduğunu ve erişilebilirlik yönünde küresel bir standart olarak kullanılabileceğini göstermektedir.

## 4. SONUÇ VE ÖNERİLER

Bu çalışmada, kamusal mekanların erişim kısıtı olan bireyler de dahil olmak üzere herkes tarafından eşit, bağımsız ve güvenli kullanımını hedefleyen ISO 21542 standardının teknik çerçevesi ve uygulanabilirliği irdelenmiştir. Yapılan ISO21542 doküman analizi ve literatür taraması sonucunda, standardın teknik açıdan kapsamlı ve evrensel tasarım ilkeleriyle uyumlu olduğu tespit edilmiştir. ISO 21542, rampa eğimlerinden yönlendirici yüzeylere, ıslak hacim ölçülerinden acil durum tahliyesine kadar yapılı çevrenin tüm kritik bileşenlerini ele almaktadır. Standardın önemi, erişilebilirliği "bireysel yoruma" veya "sonradan eklenen" çözümlere bırakmadan, ölçülebilir, tutarlı ve objektif bir zemine oturtmasıdır. Özellikle, yalnızca fiziksel erişimi değil, aynı zamanda bilginin en az iki duyu aracılığıyla iletilmesi gibi kriterlerle duyusal ve bilişsel gereksinimleri de kapsaması, onun kamusal alanların değişken kullanıcı profiline

yanıt verebildiğini göstermektedir. Bu bağlamda, kamusal mekanlarda gerçek bir erişilebilirliğin sağlanması için ISO 21542'nin sunduğu teknik kriterlerin denetlenebilir ve etkin bir şekilde uygulanması temel gerekliliktir. Bu hedefe ulaşmak için öncelikli öneri, yerel yönetimlerin ve ilgili kamu kurumlarının tasarım ve uygulama süreçlerindeki denetim sorumluluklarını artırmasıdır. ISO 21542 kriterleri, projelerin ihale, uygulama ve geçici kabul aşamalarında uyulması zorunlu, yaptırıma tabi bağlayıcı maddeler olarak şartnamelerde ve ilgili yönetmeliklerde net bir şekilde yer almalıdır. Buna ek olarak, standardın teknik detaylarının doğru anlaşılması ve uygulanması için mimar, peyzaj mimarı, plancı ve mühendisler başta olmak üzere tüm uygulayıcılara yönelik meslek içi teknik eğitimlerin sürekli hale getirilmesi ve yaygınlaştırılması gerekmektedir. Bu eğitimler, ilgili meslek odaları ve üniversitelerin mimarlık ve mühendislik fakültelerinin müfredatlarına entegre edilerek, farkındalığın ötesinde teknik bir yetkinlik kazandırılmalıdır.

Çalışmada ISO2154'nin erişilebilirliğe geniş çerçeveden bakan yaklaşımı vurgulanarak gelecek çalışmalarda, mevcut kamusal mekanların ISO 21542 kriterlerine ne düzeyde uyduğunu analiz eden saha çalışmaları ve karşılaştırmalı vaka analizleri yapılması önerilmektedir. Böylece, uygulamada karşılaşılan denetim eksikliklerinin altındaki yatan nedenleri anlamak amacıyla uygulayıcılar ve denetçiler ile yapılacak nitel araştırmalar, alana önemli teorik ve pratik katkılar sunacaktır.

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# CUMHURİYET DÖNEMİ ANKARA EĞİTİM YAPILARININ PULLAR ÜZERİNDEKİ TEMSİLİ: PTT PUL MÜZESİ KOLEKSİYONU

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## ÖZET

Cumhuriyet'in ilanıyla birlikte Ankara'nın yeni başkent olarak planlanması ve yapılandırılması gündeme gelmiştir. Bu kapsamda kurumsal kimliğin inşası olarak da ele alabileceğimiz çok sayıda kamu binasının inşası gerçekleşmiştir. Bunlar arasında Cumhuriyet başkenti Ankara için eğitim yapıları hiç kuşkusuz büyük önem taşımaktadır. Ortaokul ve lise binalarının yanında mesleki eğitim veren okullar ve üniversitelerin kendi binalarında eğitim faaliyetlerini sürdürmeleri için binalar inşa edilmiştir. Diğer yandan basılı bir belge olarak tarihsel sürece kaynaklık eden pullar, başkent kimliğinin oluşumunda belirleyici rol oynayan binaların

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inşasında önemli bir belge niteliği de taşımaktadır. Ülke ve başkent Ankara için övünç kaynağı olan pek çok yapı pullar üzerine basılarak ulusal kimlik söylemini taşıyan güçlü görsel belgeler olmuştur.

Ankara PTT Pul Müzesi tematik olarak çok geniş koleksiyona sahip olmakla birlikte çalışma kapsamında, Ankara'daki eğitim yapıları içinde Gazi Eğitim Enstitüsü, Ankara Üniversitesi Ziraat Fakültesi, Ankara Üniversitesi Siyasal Bilgiler Fakültesi, Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi ve Orta Doğu Teknik Üniversitesi Mimarlık Fakültesi binalarının basılı olduğu pullar farklı yıllarda basılarak çeşitli koleksiyonlar içinde yer almıştır. Pul ve posta tarihi ile ilgilenen çalışma alanı olarak tanımlanan filateli; mimarlık tarihi, kültürel bellek ve ulus inşası kavramlarını bir araya getirmekte ve bu çalışmayla filateli ile mimarlık tarihi arasında disiplinler arası bağ kurularak literatüre özgün bir katkı sağlamak amaçlanmaktadır.

**Anahtar Kelimeler:** Ankara, Eğitim Yapıları, Posta Pulu, Filateli

## REPRESENTATION OF ANKARA EDUCATIONAL BUILDINGS DURING THE REPUBLICAN PERIOD ON STAMPS: THE PTT STAMP MUSEUM COLLECTION

**ABSTRACT:**

With the proclamation of the Republic, the planning and structuring of Ankara as the new capital came to the forefront. In this context, the construction of numerous public buildings, which can also be considered as the building of institutional identity, took place. Among these, educational buildings undoubtedly hold great importance for Ankara, the capital of the Republic. In addition to middle and high school buildings, vocational schools and universities were built to enable them to conduct their educational activities in their own buildings. On the other hand, stamps, which serve as a source of historical information as printed documents, also constitute an important document in the construction of buildings that played a decisive role in the formation of the capital's identity. Many structures that are a source of pride for the country and the capital Ankara have been printed on stamps, becoming powerful visual documents carrying the discourse of national identity.

While the Ankara PTT Stamp Museum has a very extensive thematic collection, within the scope of this study, stamps featuring the buildings of Gazi Education Institute, Ankara University Faculty of Agriculture, Ankara University Faculty of Political Science, Ankara University Faculty of Language, History, and Geography and Middle East Technical University Faculty of Architecture, printed in different years and included in various collections, are examined. Philately, defined as the field of study concerned with stamp and postal history; This study brings together the concepts of architectural history, cultural memory, and nation-building, and aims to make a unique contribution to the literature by establishing an interdisciplinary link between philately and architectural history.

**Keywords:** Ankara, Educational Buildings, Postage Stamp, Philately

## 1. GİRİŞ

Cumhuriyet'in ilanıyla Ankara, ulusal kimliğin yeniden inşa edildiği bir başkent olmuş ve mimarlık aracılığıyla Cumhuriyet düşüncesini ideolojik olarak da ortaya koymuştur. Bu süreçte inşa edilen meclis ve bakanlık binaları gibi yönetim yapıları, kültür, sağlık ve eğitim yapıları vb. gibi kamu yapıları devletin siyasi ve toplumsal hedeflerinin gerçekleştirilmesinde önemli olmuştur. Bu yapılanma içinde eğitim yapılarının önemi, yeni başkentin yeni rejiminde ayrıca bir önem taşımaktadır. Her kademede planlanan ve inşa edilen eğitim yapılarıyla ülkenin gençlerinin eğitim alması, okuma yazma oranının arttırılması, mesleki eğitimin yaygın hale getirilmesi için çalışmalar yapılmıştır. Bu süreçte ortaokul ve lise binaları ve üniversite binalarının yanında meslek liseleri ile halkın çeşitli konularda bilgi ve yeterlilik sahibi olmasını amaçlayan akşam sanat okulları ve halkevlerinin inşası ve yapılandırılmasından söz edilebilir. Bu eserlerin büyük çoğunluğunun Ankara PTT Pul Müzesi'nde çeşitli koleksiyonlar içerisinde anı ya da yıldönümü pulu olarak basıldığı tespit edilmiştir. Bu şekilde binaların önemi vurgulanmıştır.

"Pul" mektup üzerindeki, göndericiden peşin alınan ücret karşılığında verilen makbuz, alındı[180] ya da faturadır (Düzenli ve Kavuran, 2004, 189). Ön yüzüne çeşitli şekil, motif ya da resim basılmış, arkasına zamk sürülmüş, dikdörtgen, kare, üçgen, asimetrik ve simetrik vb. şekillerde hazırlanmış değerli kağıttır. Pulların ön tarafında ait olduğu ülkenin adı ve değeri yazılıdır (Güven Bezaz, 2006, 293). *Türk Dil Kurumu Sözlüğü*'nde ise posta parası karşılığı kartpostal, damga resmi ve mektup zarfına karşılık kağıtlara yapıştırılan, basılı kâğıt parçası olarak tanımlanmaktadır.[181] Pul, posta işlemlerinde bir hizmet bedeli olarak ortaya çıkmış ve daha sonra farklı temalarla zenginleşen görsel bir iletişim aracı haline gelmiştir (Tarlakazan, 2018, 712).

Pul sadece mektubun gönderilmesi amacıyla yapılan bir ödeme değil aynı zamanda basıldığı ülkenin de bir sembolü olmuştur. Yapıldığı ülkenin kültürünü, sosyal yaşamını ve sanat anlayışını yansıtan grafik tasarım ürünüdür (Düzenli ve Kavuran, 2004, 189). İlk başlarda sadece yazı unsurları ve simgesel görsellerin yer aldığı pul tasarımları zaman içinde mimari yapıların da bulunduğu tasarımlarla çeşitlilik kazanmıştır (Pektaş, 2023, 13). Tarihsel süreç içinde pullar; bir ülkenin müzik, edebiyat ve spor gibi çeşitli kültürel ögelerinin sergilendiği genel tanıtım amaçlı, posta ücretlerinin ödenmesi amaçlı, hobi amaçlı ve propaganda amaçlı kullanılmıştır (Yazıcı, 2010, 324-325).

Dünyada bilinen ilk posta pulu İngiltere'de kullanılmıştır. Dönemin İngiltere posta bakanı Rowland Hill, İngiltere'nin kasabalarının birinde postacının bir kıza mektup getirdiğini görmüş, kız ücretin bir shilling olduğunu öğrenince parası olmadığını söyleyerek mektubu postacıya geri iade etmiştir. Bu olaya şahit olan Hill, kızın haline üzülerek bir shilling ücreti ödemiş ve mektubu alıp kıza vermiştir. Bu olay üzerine mektup ücretini gönderici ödemesi düşüncesiyle pul fikri ortaya çıkmış ve gönderme ücretinin faturası olarak posta hizmetinde yerini almıştır (Düzenli ve Kavuran, 2004, 191).

[180] *Türk Dil Kurumu Sözlüğü*'nde "alındı" para vb. şeylerin teslim alındığını gösteren bir belge, makbuz anlamlarına gelmektedir. https://sozluk.tdk.gov.tr (Erişim tarihi: 09.12.2025)
[181] https://sozluk.tdk.gov.tr (Erişim tarihi: 09.12.2025)

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İlk posta pulu 6 Mayıs 1840 tarihinde çıkartılmıştır. 1 penilik değere denk gelmesi ve siyah renkli olmasından dolayı "The Penny Black" olarak adlandırılan pulun üzerinde Kraliçe Victoria'nın portresi yer almaktadır (**Görsel 1**). Bu puldan kısa bir süre sonra "Two Pence Blue" olarak adlandırılan 2 peni değerinde ikinci pul ortaya çıkmıştır. Rengi mavi olup yine aynı şekilde Kraliçe Victoria'nın profilden portresini içermektedir (Güven Bezaz, 2006, 291; (Tarlakazan, 2018, 713). (**Görsel 2**)







**Görsel 1.** The Penny Black, **Görsel 2.** Two Pence Blue
(https://harringtonstamps.co.uk/search/penny-black-two-pence-blue-pair, Erişim tarihi: 08.12.2025)

İlk pulların tasarımında genellikle hükümdar ve devlet büyüklerinin portreleri, pulun değeri gösteren rakam ve ülkeleri temsil eden figürler yer almıştır. Genellikle tek rengin tonları kullanılmış, arkası zamklı olmayan bu ilk pullar makasla kesilerek birbirlerinden ayrılmıştır (Düzenli ve Kavuran, 2004, 191).

Osmanlı Devleti döneminde ilk posta pulu ise 19. yüzyılda ortaya çıkmıştır. 13 Ocak 1863 tarihinde Darphane-i Âmire'de beyaz kâğıt üzerine siyah taş baskı yöntemiyle basılan bu pulun üzerine Sultan Abdülaziz'in tuğrası işlenmiştir. Tuğranın altında yer alan hilalin içinde "Devlet-i Aliye-i Osmaniye" yazmaktadır (Ayaydın, 2020, 55). (**Görsel 3**)



**Görsel 3.** Osmanlı Devleti'ne ait ilk posta pulu
(https://medium.com/t%C3%BCrkiye/d%C3%BCnyan%C4%B1n-i%CC%87lk-posta-pulu-the-penny-black-23d958d27094, Erişim tarihi: 08.12.2025)

1863-1920 yılları arasındaki Osmanlı pulları İstanbul (Darphane-i Âmire, Düyûn-ı Umûmiye, Maliye Nezâreti, Sanâyi-i Nefîse Matbaası vb.), Paris, Londra, Cenova ve Viyana'da basılmıştır. Basılan pullarda Osmanlıca, bazen de İngilizce ve Osmanlıca birlikte kullanılmıştır. 1863-1913 yılları arasında basılan pullarda genellikle hilal, yıldız, tuğra, silah ve Arap alfabesine yer verilmiştir. Bu yıllarda savaşların yaşanması ve ülke ekonomisinin kötü olmasından dolayı "sürşarj[182]"lı pullar kullanılmıştır. 1913 yılı itibariyle pullarda resimler yer almaya başlamıştır. 1914 yılında Osmanlı Devleti'nin yıkılmasına sebep olan I. Dünya

[182] Pul gibi kağıtların değerini değiştirerek ya da değiştirmeden farklı bir olayı anmak ya da pulun basılma amacını değiştirmek için üzerine yeni rakam, yazı ve motiflerin basılma işlemine sürşarj denir (Ayaydın, 2020, 57).

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Savaşı'nın başlaması ile pullara hükümdar portreleri basılmış (**Görsel 4)**, 1917 yılında Çanakkale Savaşı'na atıfta bulunulmuş (**Görsel 5)**, 1918 yılında ise Osmanlı askerleri pullarda yerini almıştır (**Görsel 6)**. İttihat ve Terakki Partisi'nin iktidarda olduğu 1918 yılında, Enver Paşa da pullarda resmedilmiştir (Yazıcı, 2014, 181-182). (**Görsel 7)**



**Görsel 4.** Sultan V. Mehmet pulu (https://bigblue1840-1940.blogspot.com/2016/08/ClassicalStampsofTurkey.html, Erişim tarihi: 08.12.2025)



**Görsel 5.** Çanakkale haritası pulu (https://mapsonstampsdb.com/issuing/Turkey#stamps-db-2, Erişim tarihi: 08.12.2025)



**Görsel 6.** Mısır'da Sina Çölü'nde Osmanlı askerleri pulu (Yazıcı, 2014)



**Görsel 7.** Enver Paşa ve Alman İmparatoru II. Wilhelm pulu (https://www.lastdodo.com/en/items/2311349-enver-pasha-and-emperor-wilhelm-ii, Erişim tarihi: 08.12.2025)

TBMM hükümeti tarafından 1920-1922 yılları arasında çıkarılan sürşarjlı pulların üzerinde "Osmanlı Postaları" yazarken, 1922 yılından itibaren "Türkiye Postaları" ibaresi pulların üzerinde yerini almıştır. Bu dönemin pulları Ankara, Konya, Adana ve Cenova'da basılmıştır (Yazıcı, 2014, 185).

## 2. POSTA PULLARINDA BAŞKENT ANKARA'DA EĞİTİM YAPILARI

Cumhuriyet'in ilanıyla birlikte pullarda işlenen konular Osmanlı dönemine göre belirgin bir biçimde değişmiş ve yeni devletin ideolojisini, kimliğini ve modernleşme amacını yansıtan temalar ön plana çıkmıştır. Modernleşme, sanayileşme, kalkınma ve ulusal kimlik temaları pullarda yerini almış ve bu kapsamda başkent kimliğinin oluşumunda belirleyici rol oynayan yapıların pullar üzerinde temsili, yeni rejimin mekânsal programının görselleştirilmesinde önemli bir işlev üstlenmiştir.

Başkent Ankara, Türkiye'de posta pullarına konu alınan şehirlerin başında gelmektedir. Ankara çeşitli özellikleriyle emisyona çıkarılan pullarda çok fazla konu olmuş; tarihi, sosyal ve kültürel hayatı, mimari yapıları ve doğal varlıkları pullar üzerinde yerini almıştır. Ankara'nın pullar üzerinde bulunması, yeni dönemin başlangıcını ifade etmesi açısından önemli bir yer tutmaktadır (Anameriç ve Rukancı, 2010, 21).

Özgünde Emlâk ve Eytam Bankası olarak inşa edilen yapı, 2013 yılında Ankara PTT Pul Müzesi olarak yeni işlevi ile düzenlenmiştir. Tematik sergilemenin yapıldığı çok geniş bir koleksiyona sahip müzede Ankara'da bulunan eğitim yapıları farklı yıllardaki koleksiyonlar içerisinde yer almaktadır. Gazi Eğitim Enstitüsü, Ankara Üniversitesi Siyasal Bilgiler Fakültesi ile Dil ve Tarih-Coğrafya Fakültesi ve Orta Doğu Teknik Üniversitesi Mimarlık Fakültesi binaları pullar üzerine basılmıştır. Ayrıca Ankara Üniversitesi Ziraat Fakültesi ile Siyasal Bilgiler Fakültesi ve Orta Doğu Teknik Üniversitesi'ne ait logoların üzerinde bulunduğu pullar da dolaşıma çıkarılmıştır.

### 2.1. Gazi Eğitim Enstitüsü

Mimar Kemalettin Bey (1870-1927)'in vefatından bir müddet önce tasarladığı ve I. Ulusal Mimarlık akımının son örneklerinden olan Gazi Eğitim Enstitüsü'nün yapımına 1927 yılında başlanmış ve 1930 yılında bitirilerek aynı yıl içinde eğitime geçilmiştir (Yavuz, 1981, 72).

Osmanlı döneminde farklı yerlere dağılan öğretmen okulları Cumhuriyet'in ilanından sonra belirli yerlere toplanarak yeni binalar inşa edilmiştir. Bu okullardan biri olan Gazi Terbiye Enstitüsü 1926 yılında Konya'da "Orta Muallim Mektebi" adıyla açılmış, 1927 yılında inşaatına başlanan merkez tamamlandıktan sonra 1930 yılında Ankara'da "Gazi İlk ve Orta Muallim Mektebi" adıyla yeni yerleşkesinde eğitimine devam etmiştir. 1940'lı yıllarda okulun ismi "Gazi Eğitim Enstitüsü" olarak değiştirilmiş, günümüzde ise Gazi Üniversitesi Rektörlük Binası olarak kullanılmaktadır.[183]

Bodrum üzerine üç katlı inşa edilen yapının orta bölümü beş katlı olup, girişin üzerine gelen ve gözlemevi olarak kullanılması düşünülen kubbeyle örtülü altıncı katı vardır. Simetrik kurgulanan zemin kat planında derslikler ve yemekhane, yan bloklarda laboratuvarlar, ikinci katın ön tarafında öğretmen odaları, arka tarafında atölyeler, diğer iki katta ise yatakhaneler yer almaktadır. Giriş cephesi simetrik düzenlemeye sahip yapının orta bölümü dışarı taşırılmıştır. Beş açıklıklı giriş revakının iki yanında kule şeklinde dışa taşkın bölümler yer almaktadır. Birinci katta sivri kemerli, diğer katlarda dikdörtgen pencere düzeni kullanılmıştır (Cengizkan, 2009, 251). (**Görsel 8**)



**Görsel 8.** Gazi Eğitim Enstitüsü
(https://i.pinimg.com/736x/17/fb/73/17fb73d6b4766fdd380907402870d2af.jpg, Erişim tarihi: 08.12.2025)

[183] https://gazi.edu.tr/view/page/219/binamizin-tarihi (Erişim tarihi: 18.12.2025)

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PTT Pul Müzesi'nde 1963 yılında *Konulu Sürekli Posta Pulları-Ankara* başlığı ile oluşturulan seriye ait dokuz posta pulundan oluşan grubun (Julyanus Sütunu, Etnoğrafya Müzesi, Ankara Kalesi, Gazi Eğitim Enstitüsü, Cumhurbaşkanlığı Köşkü, Çankaya Atatürk Köşkü, Anıtkabir, I. TBMM Binası) beşinci pulunda Gazi Eğitim Enstitüsü yer almaktadır. Siyah beyaz hazırlanan pul 30 kuruş değerinde basılmıştır. Pulun dış çerçevesi beyaz renkle yapılmış, kenar kısmı ise dantel detayı ile sonlandırılmıştır (**Görsel 9**).




**Görsel 9.** Gazi Eğitim Enstitüsü pulu (https://www.pulhane.com/PulSayfalari/p196312.html, Erişim tarihi: 08.12.2025)

### 2.2. Ankara Üniversitesi Ziraat Fakültesi

1933 yılında Ankara Üniversitesi Ziraat Fakültesi, Yüksek Ziraat Enstitüsü adıyla Ankara'da kurulmuştur. Köklü bir geçmişe sahip Fakültenin tarihi, 1891 yılında faaliyete başlayan Halkalı Yüksek Ziraat Okulu'na dayanmaktadır. 1930 yılında Yüksek Ziraat Okulu kurulmuş, 1933 yılında ise Yüksek Ziraat Enstitüsü'ne dönüştürülmüştür. 1948 yılında Yüksek Ziraat Enstitüsü, Ankara Üniversitesi bünyesine dahil edilmiştir. Fakülte kuruluşundan itibaren ülkede tarımın gelişmesine önemli katkılarda bulunmuş, ziraat mühendislerinin ve bilim adamlarının yetiştirilmesinde öncü bir rol üstlenmiştir.[184]

ANKARA ÜNİVERSİTESİ ZİRAAT FAKÜLTESİ
"Tarım, Çevre ve Yaşam Bilimlerinde Öncü"

**Görsel 10.** Ankara Üniversitesi Ziraat Fakültesi logosu (https://www.agri.ankara.edu.tr/, Erişim tarihi: 21.12.2025)

1959 yılında *Ankara Üniversitesi Ziraat Fakültesi'nin 25. Tedris (Öğrenim) Yılı* anısına emisyona çıkarılan tek puldan oluşan bu seride Ankara Üniversitesi Ziraat Fakültesi'nin logosu bulunmaktadır. Logonun üstünde "Türkiye", altında "Ankara Üniversitesi Ziraat Fakültesi" yazısı yer almaktadır. Dikey olarak tasarlanan lacivert renkli pulun dış çerçevesi beyaz renkle yapılmış ve kenarları ise dantellidir (**Görsel 11**).

184 https://www.agri.ankara.edu.tr/wp-content/uploads/sites/10/2020/05/ZiraatFakultesi.pdf (Erişim tarihi: 18.12.2025)

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Logoda altın renkli başak figürü, Anadolu'nun birçok uygarlığın merkezi olmasında rol oynayan toprakların tahıl zenginliğini, buğday ve tarımı simgelemektedir. Güneş ürünlerin yetiştirilmesi için gerekli kaynağı, lacivert zemin ise tarım için gerekli hava ve suyu temsil etmektedir (Anameriç ve Rukancı, 2010, 50).




**Görsel 11.** Ankara Üniversitesi Ziraat Fakültesi pulu
(https://www.pulhane.com/PulSayfalari/p195901.html, Erişim tarihi: 08.12.2025)

### 2.3. Ankara Üniversitesi Siyasal Bilgiler Fakültesi (Mülkiye)

"Mekteb-i Mülkiye", Osmanlı ve Cumhuriyet döneminde çeşitli kademelerde görev alacak personelleri yetiştirmek amacıyla eğitim veren bir okuldur. 1858 yılında açılan okul, 1915 yılında kapatılmıştır. 1918 yılında ise Dahiliye Nezâreti himayesinde tekrar açılmış, 1920 yılında Maârif Nezâreti'ne bağlanmıştır. 1935 yılında dönemin Milli Eğitim Bakanı'nın İstanbul'da yaptığı görüşmeler sonucunda okulun Ankara'ya taşınmasına karar verilmiştir. Ernst Arnold Egli tarafından tasarlanan yeni Mülkiye Mektebi binasının inşaatına 1935 yılında başlanmış ve aynı yıl ismi "Siyasal Bilgiler Okulu" olarak değiştirilmiştir. 1936 yılında tamamlanan bina eğitim ve öğretimine başlamıştır (Yabacı vd., 2019, 75-76). 1950 yılında da "Ankara Üniversitesi Siyasal Bilgiler Fakültesi" ismiyle Ankara Üniversitesi'ne katılmıştır.[185]

Betonarme inşa edilen Mülkiye Mektebi binası caddeye paralel bir blok ve ona dik konumlanan dört paralel bloktan oluşur. Caddeye paralel blok üç katlı, dik bloklar iki katlıdır. Paralel blokta ofisler ve sınıflar, dik bloklarda ise konferans salonu, yemekhane ve yatakhane yer alır (Yabacı vd., 2019, 78). (**Görsel 12**)



[185] https://www.politics.ankara.edu.tr/kurumsal/dekanin-mesaji/ (Erişim tarihi: 18.12.2025)

**Görsel 12.** Ankara Üniversitesi Siyasal Bilgiler Fakültesi (https://kulturenvanteri.com/yer/ankara-universitesi-siyasal-bilgiler-fakultesi/#17.1/39.929081/32.873238, Erişim tarihi: 08.12.2025)

1959 yılında *Siyasal Bilgiler Fakültesi'nin 100. Yılı* anısına emisyona çıkarılan üç puldan oluşan bu seride Ankara Üniversitesi Siyasal Bilgiler Fakültesi (Mülkiye) bulunmaktadır. Kırmızı (**Görsel 13**) ve yeşil (**Görsel 14**) renkte 40 kuruş değerinde basılan pullarda binanın görseli sağ tarafa yerleştirilmiştir. Sol kısımda dikey bant üzerinde 40 kuruş ibaresi ve altında Siyasal Bilgiler Fakültesi'nin kısaltılması olan "SBF" ile bir Türkiye haritasının bulunduğu logo basılmıştır. Ayrıca bu seride altında Siyasal Bilgiler Fakültesi'nin logosunun yer aldığı üçüncü bir pul dikey olarak tasarlanmış ve 1 Türk lirası değerinde basılmıştır (**Görsel 15**). Pullarda en dış çerçeve beyaz renkle yapılmış ve kenarları ise dantellidir.




**Görsel 13-14-15.** Ankara Üniversitesi Siyasal Bilgiler Fakültesi pulu (https://www.pulhane.com/PulSayfalari/p195920.html, Erişim tarihi: 08.12.2025)

2009 yılında *Siyasal Bilgiler Fakültesi'nin 150. Yılı* anısına emisyona çıkarılan iki puldan oluşan bu seride Ankara Üniversitesi Siyasal Bilgiler Fakültesi (Mülkiye) bulunmaktadır.

75 kuruş değerinde mavi tonlarda basılan birinci pulda binanın görseli sol tarafa yerleştirilmiş, üstte "Türkiye Cumhuriyeti" yazısı yer almaktadır. Sağ alt köşede ise fakültenin logosu ve "150. Yıl" yazısı bir kompozisyon içinde bulunmaktadır. Pulun kenarları ise dantellidir (**Görsel 16**).

Lacivert tonlarda basılan ikinci pulda ise fakültenin logosu ve "150. Yıl" yazısı bir kompozisyon içinde ortada bulunmaktadır. Yine aynı şekilde üstte "Türkiye Cumhuriyeti" yazısı yer almakta olup, pulun kenarları dantellidir (**Görsel 17**).

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**Görsel 16-17.** Ankara Üniversitesi Siyasal Bilgiler Fakültesi pulu
(https://www.pulhane.com/KatalogSayfalari/k200923.html, Erişim tarihi: 08.12.2025)

### 2.4. Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi

Dil ve Tarih- Coğrafya Fakültesi, Türk kültürünün zenginliğini görünür kılmak ve ulusal tarihin bütün gerçekliğiyle araştırılmasını sağlamak için kurulmuştur (Erdoğan vd., 2007, 132).

1935 yılında Ankara Üniversitesi'ne bağlı olarak kurulan Dil ve Tarih- Coğrafya Fakültesi, Mimar Kemalettin Bey tarafından yapılan Evkaf Apartmanı'nda eğitim ve öğretime başlamıştır (Aslanoğlu, 2001, 184). Günümüzde kullanılan fakülte binası ise 1938-1940 yılları arasında Bruno Taut'un başında olduğu Güzel Sanatlar Akademisi Mimarlık Bölümü tarafından tasarlanmıştır. Bodrum üzerine yüksek bir zemin kat ve dört katlı kütlelerin birleşmesinden oluşur (Erdoğan vd., 2007, 132). Ön cephede zemin ve bodrum kat rustik taş, orta bölüm kesme taş, yan kanatlar taş-tuğla örgü ile kaplanmıştır, yan ve arka cepheler sıvalıdır (Hasol, 2017, 81). Yapının giriş cephesinin orta kısmı dışa taşkın olarak tasarlanmış ve bu üstteki alınlık kısmında "Hayatta En Hakiki Mürşit İlimdir" yazısı yazılmıştır (**Görsel 18**).



**Görsel 18.** Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi
(https://upload.wikimedia.org/wikipedia/commons/3/37/Dil_ve_Tarih_Co%C4%9Frafya_Fak%C3%BCltesi_Binas%C4%B1%2C_Ankara.jpg, Erişim tarihi: 08.12.2025)

1943 yılında *Cumhuriyet'in 20. Yıldönümü* anısına basılan altı anı pulundan oluşan seriye ait dördüncü pul üzerinde Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi yer almaktadır. Kuzeybatı cephesinden fakülte ve çevresi, 10 kuruş değerinde siyah beyaz basılmıştır. Pulun

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üstünde "Türkiye Postaları" altında "Cumhuriyetin 20. Yıldönümü Hatırası" yazısı bulunmaktadır. Pulun en dış çerçevesi beyaz renkle yapılmış ve kenarı dantellidir (**Görsel 19**).




**Görsel 19.** Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi pulu (https://www.pulhane.com/PulSayfalari/p194304.html, Erişim tarihi: 08.12.2025)

1952 yılında ise *Birleşmiş Milletler Akdeniz Yetiştirme Merkezi (FAO)* anısına emisyona çıkarılan dört puldan oluşan seride, dördüncü pul üzerinde Dil ve Tarih-Coğrafya Fakültesi binası güneybatı yönünden 60 kuruş değerinde kırmızı renkli basılmıştır. Pulun en dış çerçevesi beyaz renkle yapılmış ve kenarı dantellidir (**Görsel 20**).




**Görsel 20.** Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi pulu (https://www.pulhane.com/PulSayfalari/p195201.html, Erişim tarihi: 08.12.2025)

1953 yılında ise iki puldan oluşan *Milletlerarası Halk Kredisi 5. Kongresi* anısına emisyona çıkarılan serideki ikinci pul üzerinde Dil ve Tarih-Coğrafya Fakültesi yer almaktadır. Siyah beyaz basılan pulun üzerinde sol üst köşede madalyon içerisinde Türkiye Cumhuriyeti'nin üçüncü Cumhurbaşkanı Celal Bayar'ın portresi, sağ alt köşede ise madalyon içerisinde Mithat Paşa portresi yer almaktadır. Ziraat Bankasının kurucusu da olan Mithat Paşa'nın kooperatifçilik ile ilgili yaptığı çalışmalar nedeniyle pul üzerine portresinin konulduğu düşünülmektedir. Siyah beyaz basılan pulun en dış çerçevesi beyaz renkle yapılmış ve kenarı dantellidir (**Görsel 21**).

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**Görsel 21.** Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi pulu (https://www.pulhane.com/PulSayfalari/p195307.html, Erişim tarihi: 08.12.2025)

1961 yılında *Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi'nin Kuruluşunun 25. Yılı* anısına, üç puldan oluşan seri emisyona çıkarılmıştır. 30 kuruşluk ilk pulda fakülte binası, 40 kuruşluk ikinci pulda Türkiye haritası, güneş kursu ve çivi yazılı kompozisyon, 60 kuruşluk üçüncü pulda ise Atatürk heykeli yer almaktadır.

30 kuruş değerinde siyah beyaz basılan birinci pul Dil ve Tarih-Coğrafya Fakülte binasını cepheden göstermektedir. En üst kısmında 25. yıl Romen rakamları "XXV" şeklinde yazılmış, tarih aralığı ise "1936-1961" şeklinde verilmiştir. Sağ tarafta siyah renk üzerine fakültenin ismi yazılmıştır. Dış çerçevesi beyaz çerçevelenmiş ve dantellidir (**Görsel 22**).

İkinci pulun ortasında Hitit Uygarlığı'nın sembolü olan güneş kursu, arkasında Türkiye haritası ve üzerinde *E-GAL A-NI-TA RU-BA-IM* (Kral Anita'nın Sarayı) yazısı bulunur.[186] Hatti Uygarlığı'na ait olan güneş kursu sembolü, Hititler tarafından da benimsenmiş ve bir kült eşyası olarak törenlerin bir parçası olmuştur (**Görsel 23**).

Fakültenin de tıpkı Hitit Güneşi gibi Türkiye'yi aydınlattığına ve başkent Ankara'nın sadece siyasi değil, kültür ve bilim alanlarında da bir merkeze dönüştüğüne işaret etmektedir (Anameriç ve Rukancı, 2010, 52-53).

60 kuruş değerinde siyah beyaz basılan üçüncü pul üzerinde ise Atatürk'ün heykel olarak portresi yer almaktadır. Üst kısımda 25. yıl Romen rakamları ile "XXV" şeklinde tekrarlanmış, tarih aralığı ise yine "1936-1961" şeklinde yazılmıştır. Atatürk portresinin altında Dil ve Tarih-Coğrafya Fakülte binasının cephesinde bulunan "Hayatta En Hakiki Mürşit İlimdir" yazısı yer almaktadır. Fakülte ismi sağ tarafta dikey olarak bulunmaktadır. Dış çerçevesi beyaz çerçevelenmiş ve dantellidir (**Görsel 24**).

[186] https://www.pulhane.com/KatalogSayfalari/k196101.html (Erişim tarihi: 18.12.2025)

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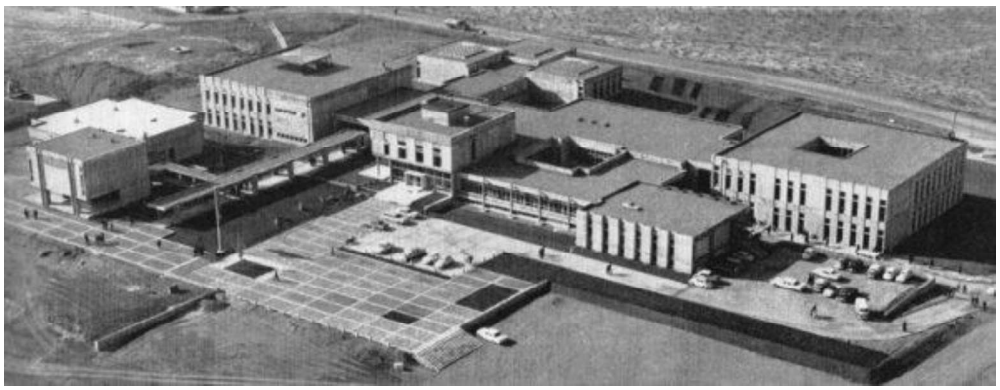
**Görsel 22-23-24.** Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi pulu (https://www.pulhane.com/PulSayfalari/p196101.html, Erişim tarihi: 08.12.2025)

### 2.5. Orta Doğu Teknik Üniversitesi Mimarlık Fakültesi

Orta Doğu Teknik Üniversitesi, Türkiye ile Orta Doğu ülkelerinin kalkınmasına katkıda bulunmak, fen ve sosyal bilimler alanında eleman yetiştirmek amacıyla 1956 yılında "Orta Doğu Yüksek Teknoloji Enstitüsü" adıyla eğitime başlamıştır. Üniversitenin yerleşkesinin planı 1961 yılında uluslararası proje yarışmasıyla elde edilmiştir. Yarışmayı kazanan Behruz Çinici ve Altuğ Çinici'nin projeleri doğrultusunda, 1961 yılında Mimarlık Fakültesi binası ile yerleşkenin inşasına başlanmış ve yerleşkenin inşası 1970'lerin sonuna kadar devam etmiştir (ODTÜ, 2016, 3). (**Görsel 25**)



**Görsel 25.** Orta Doğu Teknik Üniversitesi Mimarlık Fakültesi (https://www.arkitektuel.com/odtu-mimarlik-fakultesi/, Erişim tarihi: 08.12.2025)

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1966 yılında *Orta Doğu Teknik Üniversitesi'nin 10. Yılı* anısına üç puldan oluşan seri emisyona çıkarılmıştır. 50 kuruşluk ilk pulda fakülte binası, 100 kuruşluk ikinci ve 130 kuruşluk üçüncü pulda ise üniversitenin logosunun yer aldığı kompozisyon yer almaktadır.

Birinci pulda fakülte binası 50 kuruş değerinde ve renkli basılmıştır. En üste "Orta Doğu Teknik Üniversitesi 10. Yılı" yazısı ve altında sol köşede üniversitenin logosu bulunmaktadır. En dış kısmı beyazla çerçevelenmiş olup dantellidir (**Görsel 26**).

100 kuruş değerindeki ikinci pul ise yine renkli basılmış, en üst kısımda "Orta Doğu Teknik Üniversitesi 10. Yılı" yazısı ve altında bilimi temsil eden "element simgesi" merkezinde üniversite logosuyla resmedilmiştir. Kenarı beyaz çerçeveli ve dantellidir (**Görsel 27**).

130 kuruş değerinde kahverengi tonlarının baskın olduğu renkli basılan diğer pulda ise yine aynı "10. Yıl" yazısı ile üniversitenin mühendislik alanlarını sembolize eden dişli ve çarkların soyutlandığı bir kompozisyon yer almaktadır. Sağ kısımda ise üniversitenin logosu bulunmaktadır (**Görsel 28**).




**Görsel 26-27-28.** Orta Doğu Teknik Üniversitesi pulu
(https://www.pulhane.com/PulSayfalari/p196615.html, Erişim tarihi: 08.12.2025)

## 3. SONUÇ

Erken Cumhuriyet döneminden başlayarak ülkedeki yeni mimari yapılanmanın görünürlüğü açısından posta pulları bir araç olarak kullanılmıştır. Üzerinde çeşitli yapılar, devletin çeşitli kurumlarına ait binalar ile tematik olarak pek çok konu işlenmiştir. Pullar aynı zamanda mimari olarak bu yapıların geniş kitlelere aktarıldığı güçlü görsel bir araçtır. Küçük boyutlarına rağmen ulusal kimlik ve devlet ideolojisinin görsel aktarımında stratejik rol üstlenmişlerdir.

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Basılı bir belge olarak tarihsel sürece kaynaklık eden pullar, başkent kimliğinin oluşumunda belirleyici rol oynayan binaların inşasına ilişkin önemli bir belge niteliği taşımaktadır. PTT Pul Müzesi koleksiyonunda yer alan Cumhuriyet dönemi Ankara eğitim yapılarının yer aldığı pullar aynı zamanda Cumhuriyet ideolojisinin mimarlık ve görsel kültür üzerinden nasıl kurgulandığını göstermektedir. Diğer yandan pulların dolaşımda olması başkent Ankara'nın kurumsal kimliği ile Ankara yapılarının mimari özelliklerinin Türkiye'de ve dünyada tanıtılmasını sağlamıştır.

Başkentte inşa edilen yapılar ulus-devlet ideolojisinin göstergeleri olmuş ve pullar aracılığıyla simgesel yapılara dönüşmüştür. Pullar kent hafızasını güçlendirilmesinde önemli bir yer tutmakla beraber kuşaklar arası bilgi aktarımına da katkıda bulunan önemli ve kalıcı bir tanıtım aracıdır.

Pullar üzerine basılı olan fakülteler genç Türkiye Cumhuriyeti'nin çeşitli kademelerinde çalışacak bilim insanlarını yetiştirmek için öncülük etmiş eğitim kurumlarıdır. Bu okullardan mezun olan öğrenciler ülke kalkınmasında önemli rol oynamış ayrıca sosyal ve kültürel alanda da önemli araştırmalarda bulunmuştur. Pullar üzerinde eğitim yapılarının basılı olması Türkiye Cumhuriyeti'nin eğitime verdiği önemi de göstermektedir.

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# KİTAPLAR

**Karabük Üniversitesi**
Safranbolu Başak Cengiz Mimarlık Fakültesi

**KİTAPLAR**

Doç. Dr. Mehmet MUTLU

Konya'nın Demiryolu Mirası Tarihi Gar ve İstasyon Binaları. İstanbul/Türkiye: Eğitim Yayınevi.
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Y. Mimar Büşra ARSLAN & Doç. Dr. Mehmet MUTLU

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Eda AKSAÇ & Prof. Dr. Yasin DÖNMEZ

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Betül BEDİR & Doç. Dr. Çiğdem BOGENÇ

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