

Sustainable Approaches In Architecture And Urban Design

Editor
Gökhan UŞMA



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PREFACE

In recent years, global environmental challenges have made the adoption of sustainable approaches in architecture and urban design a necessity. Issues such as climate change, the depletion of natural resources, and the disruption of ecological balance compel us to rethink our living environments and develop environmentally conscious solutions. In this context, sustainable architecture and urban design are not only obligations of environmental responsibility but also keys to creating a more livable world for future generations.

This book brings together original studies that address sustainable approaches in architecture and urban design from diverse perspectives. By sharing theoretical, practical, and innovative solutions developed within the framework of sustainability, this work aims to contribute to academic and professional fields alike, fostering new dialogues among researchers and practitioners. Each chapter reflects the knowledge and expertise of its authors, offering readers a valuable resource. I firmly believe that this book will provide new perspectives for sustainability-focused projects by bringing together researchers from different disciplines

I would like to express my heartfelt gratitude to all the authors who contributed to this book and to the reviewers who provided their valuable insights during the evaluation process. I also extend my sincere thanks to the publishing house and my colleagues, whose support was instrumental in bringing this work to fruition.

I hope this book will inspire academic research and serve as a guide for practice-oriented efforts. May it illuminate the path toward creating more livable, eco-friendly, and sustainable cities.

Assoc. Prof. Dr. Gökhan UŞMA
Editor

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CHAPTER I

EVALUATING ADANA ATATÜRK PARK THROUGH THE LENS OF SUSTAINABLE SITE DESIGN: A SITES RATING SYSTEM APPROACH

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1. Introduction

The concept of sustainability, widely applied across various fields today, has become a significant aspect of our lives since the 1980s. The term “sustainability,” derived from the Latin word “sustinere,” has been defined in dictionaries with multiple meanings, primarily including sustaining, providing, continuing, supporting, and existing (Şermet, 2017, p. 9). In the 1987 report “Our Common Future,” presented by Gro Harlem Brundtland, Chair of the World Commission on Environment and Development, sustainability is described as “the ability of humanity to meet its present needs without compromising the ability of future generations to meet their own needs.” In other words, sustainability involves ensuring that social, environmental, political, economic, and cultural resources are passed on to future generations with minimal harm. As a concept applied in numerous

fields, sustainability fosters a new social perspective focused on preserving and maintaining the protection of all societal, cultural, natural, and human resources. Moreover, the concept of sustainability has introduced the idea of sustainable development.

1.1. Definition and Components of Sustainable Development

The concept of Sustainable Development (SD) entered global discourse in 1987 with the publication of the report “Our Common Future” by the World Commission on Environment and Development, also known as the Brundtland Commission. Today, SD is widely recognized as the core principle of environmental protection policies on both national and international levels, and it is often associated with the concept of environmental conservation (WCED, 1987; Turgut, 1996; Uşma, 2023).

According to the World Commission on Environment and Development, sustainable development necessitates the simultaneous integration of environmental, economic, and social justice principles. Development is deemed sustainable if it does not diminish the overall quality of life. Additional objectives of sustainable development include enhancing social solidarity, boosting economic welfare, and fostering ecological responsibility. The evolving concept of sustainability encompasses economic, social, and environmental dimensions. Economic Dimension concerns the use of limited resources. An economically sustainable system is one that can prevent excessive sectoral imbalances that negatively impact agricultural and industrial production, maintain domestic and public debt at manageable levels, and continuously produce goods and services. Social Dimension is people-oriented. A socially sustainable system is one that can achieve adequate social services such as education and healthcare, ensure distributional equity, promote gender equality, and support political accountability and participation. Environmental Dimension focuses on balancing biological and physical systems. It emphasizes the conservation of natural resources, maintaining ecosystem health, and reducing negative impacts on the environment. This dimension aims to minimize the effects of human activities on the natural environment and to uphold the long-term health of ecosystems (WCED, 1987 Sarıkaya & Kara, 2007; Şermet, 2017, p. 14-15)

This research aims to analyze Adana Atatürk Park, an urban park located in the Seyhan district of Adana, Turkey, in terms of sustainability. The objective is to conduct a detailed assessment of how environmental, social, and economic

sustainability criteria are addressed within this park. Particular emphasis will be placed on the park's material choices, plant species, energy use, and community interactions. This analysis seeks to reveal the extent to which Adana Atatürk Park adheres to sustainability principles and to identify areas requiring improvement.

In this context, the concept of sustainability and the criteria outlined in the SITES (Sustainable Sites Initiative) evaluation system will be examined in detail. The sustainability status of Adana Atatürk Park will be assessed within this framework.

2. Sustainable Site, Urban Park Terms

Challenges such as shifts in lifestyle and culture, overpopulation, environmental issues, and inadequate protection of natural resources have brought the concept of a “sustainable environment” to the forefront and heightened its importance. In this context, sustainable landscape and environmental protection policies have gained significant attention. The concept of sustainability plays a crucial role in the design and planning processes of landscape projects. It is vital across a broad spectrum, from gardens to urban scales. Given that the majority of the world's population resides in cities today and considering the impact of urban areas on other regions, cities are arguably where the components of sustainability—human, environmental, and economic—are most intensely and effectively integrated (Atıl et al., 2005). The sustainability of cities, and thereby the sustainability of landscapes, facilitates the resolution of environmental problems, the creation of healthy and livable spaces, the enhancement of current population welfare, and the provision of favorable conditions for future generations. Thus, urban sustainability can also be defined as the sustainability of society.

They are green spaces integrated into urban areas that are designed and managed entirely according to sustainability principles and meet environmental, economic, and social sustainability criteria. These parks play significant social, environmental, and economic roles in urban life. Cranz and Boland (2004) assert that parks should incorporate features such as natural vegetation, river restoration, wildlife habitats, suitable infrastructure and technology integration, recycling, and sustainable construction and maintenance practices to enhance their ecological performance. In this regard, self-sufficiency in material use and design practices that minimize resource consumption and maintenance have become crucial for sustainable parks (Özdemir Şahin and Eşbah Tuncay, 2023: p.146).

The phenomenon of urban sustainability represents one of the most pressing challenges facing humanity today and necessitates effective solutions. Urban parks play a crucial role in achieving urban Sustainability.

3. SITES (Sustainable Sites Initiative) Rating System

SITES is a comprehensive rating system created by the Green Business Certification Inc. (GBCI) to promote sustainable landscape development (USGBS, 2024). The SITES Certification evaluates sustainability aspects in urban green spaces. This program addresses key issues for improvement in these areas, such as mitigating flooding, adapting to climate change, and creating carbon sinks. The sustainable landscape criteria of the SITES Certification encompass components including soil, water, vegetation, materials, and human health. As the only global certification system for green spaces, SITES represents a significant specialization area involving urban planners, architects, landscape architects, and related engineering disciplines. Environmental practices, particularly those implemented by local governments in urban green areas, will contribute to the city's adaptation to climate change, reduction of greenhouse gas emissions, protection of urban biodiversity, and enhancement of the city's resilience to disasters.

SITES-certified green spaces and recreational areas contribute to reducing water demand, filtering and mitigating stormwater runoff, protecting and enhancing wildlife habitats, decreasing energy consumption, improving air quality, promoting human health, and increasing recreational opportunities in urban open spaces. The SITES Certification is based on a scoring system, where the number of points a project earns determines its level of certification. This process allows for the comparison of projects against established performance criteria. The certification process is facilitated through SITES Online, a streamlined tool designed for project registration. SITES Online offers tables and worksheets to support project documentation and monitor progress from initiation to completion. All certification activities are conducted online. The SITES Certificate grades and scores are detailed in Table 1.

Table 1. SITES Rating System Scoring Table
(The Sustainable SITES Initiative, n.d.)

Certification Level	Score Range
Certified	70-84
Silver	85-99
Gold	100-134
Platinum	135 and over

SITES Certification can be applied to a diverse range of project types globally, whether or not they involve buildings, including:

- Green spaces, parks, recreational areas, botanical gardens, and arboretums
- Roadside green spaces and squares, as well as commercial or institutional campuses
- Residential green areas
- Public and private campuses, including university and educational institutions, museums, and hospital campuses.

Table 2 presents the criteria of the rating system through examples of SITES-certified projects from various countries and provides explanations for these criteria.

Table 2. SITES V1 Certification Criteria Explained Through Examples of Certified Projects from Various Countries (Created by author)

Criteria	Example Project	Description	Project Visual
Hydrology			
Rainwater collection and reuse systems	Grand Green Osaka, Osaka, Japan.	The Grand Green Osaka project efficiently manages water through rainwater collection and reuse systems. (SITES Precertified Gold 2024)	 (Umekita, n.d.)
Water-efficient plant selection and irrigation techniques	MARAÉY, Maricá, Brazil.	The project optimizes water use through water-efficient plant selection and irrigation techniques. (SITES Precertified Gold 2020)	 (Maraey, n.d.)
Soil			
Erosion control methods	Glendale Regional Park, Salt Lake City, Utah, USA.	Glendale Regional Park minimizes soil erosion through green roof applications and erosion control methods. (SITES Precertified Gold 2023)	 (ArcGIS StoryMaps, n.d.)
Vegetation			
Use of native plant species and preservation of natural habitats	The 10th China Flower Expo Park Shanghai, China	The 10th China Flower Expo Park preserves natural habitats and supports environmental sustainability by utilizing native plant species. (SITES Precertified Gold 2019)	 (ArchDaily, n.d.-a)

Material Selection			
Use of locally sourced and sustainable materials	Midtown Park Houston, TX United States	Midtown Park Houston minimizes its environmental impact by using locally sourced and sustainable materials.	 <p>(Design Workshop, n.d.)</p>
Human Health and Well-being			
Consideration of community needs and expectations	Yangpu Public Space Integrated Environment Project, Shanghai, China.	The Yangpu Public Space and Integrated Environment Project encourages community participation in the project process and supports social sustainability. (SITES Precertified Gold 2022)	 <p>(ArchDaily, n.d.-b)</p>

4. Method

This study was organized into four stages: literature review, field study and findings, results, and recommendations (Table 3). The objective of the literature review was to define the problem and access relevant data sources. First, the basic principles of the V1 version of the SITES (Sustainable SITES Initiative) certification system, which is used to establish sustainable landscape criteria, will be discussed. Then, examples of projects that meet these criteria will be reviewed. Finally, findings from the field trip conducted to evaluate Adana Atatürk Park will be presented, followed by recommendations.

Adana Atatürk Park is strategically situated between two main axes in the central part of the city. As one of the largest urban parks in Adana, this park has the potential to contribute significantly to Adana's sustainable energy and climate plan. The interventions in this area will have a considerable impact on the city as a whole. For these reasons, Adana Atatürk Park was selected as the research area.

Table 3. Flowchart (Created by the author)

Stage	Content
Literature Review	A literature review was conducted to define the problem and access data sources. The fundamental principles of the SITES (Sustainable SITES Initiative) certification system were examined Example projects adhering to SITES criteria were reviewed.
Findings	A site visit was conducted to evaluate Adana Atatürk Park. Various sections of the park were observed, and notes were taken. The current state of the park was analyzed according to SITES criteria.
Results	Data obtained from the literature review and fieldwork were analyzed The current condition of Adana Atatürk Park was evaluated based on SITES criteria, identifying its strengths and weaknesses.
Recom- mendations	Recommendations were developed to enhance the sustainability of Adana Atatürk Park. Suggestions were made for transforming the park into a more sustainable urban park.

According to the SITES V1 certification system, sustainable landscape criteria are categorized under five main headings: Hydrology, Soil, Vegetation, Material Selection, and Human Health and Wel-Being (Sustainable Sites Initiative, n.d.; Gürbüz & Arıdağ, 2013, pp. 80-84; Özyılmaz Küçükyağcı, 2020).

Hydrology

– Protecting and renoving hydrological functions: Development and degradation should be avoided in areas near rivers, wetlands, and flood-prone zones. Native or climate-appropriate plant species should be planted, soils should be reshaped where necessary, and adaptive soft engineering techniques should be employed to enhance and restore riparian habitats and buffer zone functions.

– Treatment and management of used water: Settlements should be designed to capture, slow, and divert stormwater runoff by reducing impervious surfaces. These designs should incorporate systems to collect rainwater, divert excess water not absorbed by the soil, and integrate vegetation-based water

management techniques such as rain gardens, wetlands, and green roofs, allowing water to infiltrate the soil and replenish groundwater .

– Stormwater management and design: Multipurpose stormwater management tools should be integrated into the settlement design to enhance both water quality and aesthetics. These tools should provide tranquil landscapes, recreational open spaces, and opportunities for water interaction and play.

– Ensure minimum water use: Utilize local or regional vegetation suited to the site's conditions, context, and climate. Irrigation efficiency should be optimized by grouping plants with similar water needs. Climate-based irrigation control systems should be implemented to minimize water consumption

Soil

– Protection and management of healthy soils: Prior to site design, soil health and areas impacted by previous land uses should be mapped. During construction, the topsoil layer must be preserved, erosion and sedimentation controlled, and soil compaction and disturbance minimized. The displacement and destruction of vegetation should be avoided.

– Use of compost: Maintenance waste can be reduced by repurposing field residues as fertilizer and straw. Natural fertilizers (e.g., garden waste) release essential nutrients gradually, decreasing the reliance on chemical fertilizers. Additionally, compost retains more rainwater, reduces unabsorbed rainfall on the soil surface, and enhances soil moisture and filtration capacity .

– Improving the health of degraded soils: Restoring soil function is vital for supporting healthy plant and biological communities while enhancing water retention and filtration. Soil compaction, organic matter levels, and the balance of microorganisms should be assessed. Appropriate soil density for optimal plant growth should be ensured.

Vegetation

– Conservation and utilization of existing vegetation: For endangered species, developments should favor areas without native species. Settlements should prioritize the conservation of local biodiversity.

– Minimal disruption to wildlife: Trees designated as important by local, regional, or government agencies should be preserved. Mature trees are valuable cultural, historical, and aesthetic assets within a community. Strict control measures should be implemented to minimize damage to vegetation during construction.

- Use of native species: Native and non-native, yet climate-adapted plants should be incorporated based on site conditions and climate. Designs should foster biodiversity, reduce pesticide usage, and promote water conservation. Non-invasive, legally sourced nursery plants should be utilized within and around settlements.

- Planting to reduce energy consumption: Vegetation or herbaceous structures should be strategically planted around buildings to lower energy consumption and costs associated with indoor energy demands. Trees, green roofs, and herbaceous structures can also be employed to mitigate the urban heat island effect

- Plan to mitigate potential fire damage: Control and remove invasive species to limit harm to the regional ecosystem. Collaborate with local fire departments on plant spacing, fire-resistant species, and fuel management practices tailored to the area to minimize the risk of fire damage

Material Selection

- Use of existing materials: Survey for usable on-site or scrap materials before acquiring new ones to reduce consumption and waste generation.

- Buying local and sustainable materials: Prioritize local, recyclable, and sustainably sourced materials from companies with eco-friendly practices to reduce emissions.

- Consider the life cycle of materials: Assess the environmental and health impacts across a material's life cycle, with emphasis on recycled over single-use products.

- Strive for zero-waste: Focus on using recyclable or reusable materials during construction and establish collection points to minimize waste.

- Strive for zero-waste: Prioritize recyclable or reusable materials during construction and demolition. Set up collection points to reduce waste throughout the space's use.

- Reducing the urban heat island effect: Use vegetation, reflective materials, and shaded areas to minimize heat islands. Replace concrete surfaces like roofs and sidewalks with green spaces.

- Reduce air pollution: Choose low-VOC materials (e.g., paints, adhesives) to limit air pollution and reduce smog formation.

Human Health and Wel-Being

- User-friendly residential areas: Ensure accessibility, safety, and visibility with protective signage and people-oriented design to make users feel safer.

- Focus on natural landscapes: Position windows and seating areas to overlook natural views, blocking distractions to enhance the healing effects of nature.
- Maintain cultural and historical connections: Incorporate educational and interactive elements to promote sustainable practices and encourage environmentally responsible behavior.
- Promote social interaction and physical activity: Create comfortable environments with wind corridors, shade, lighting, and flexible furniture. Design spaces that encourage physical activity with features like play areas, art installations, and Wi-Fi zones.

5. Findings

5.1. Adana Atatürk Park

This research on urban parks and the concept of sustainability will focus on Atatürk Park, located in the Seyhan district of Adana province, Turkey. Atatürk Park, designed in 1935 as part of the Jansen Zoning Plan for Adana (Figure 1), spans an area of 47,000 m². The original design included features such as a city hotel, a casino, a concert garden, a parade ground, a children's playground, a swimming pool, a bathhouse, a solar bath, six tennis courts, wooded areas, and a rose garden.

In the early years, the park housed the Municipality Hotel, designed by Muhittin Güreli, who implemented the Jansen Plan. However, part of the hotel was demolished during landscaping works in the 1990s, leaving only the 75th Year Art Gallery, which has also since been demolished. The reconstruction of the gallery has been approved by the Adana Regional Board for the Protection of Cultural Assets (Kalfa, 2019, p.43).

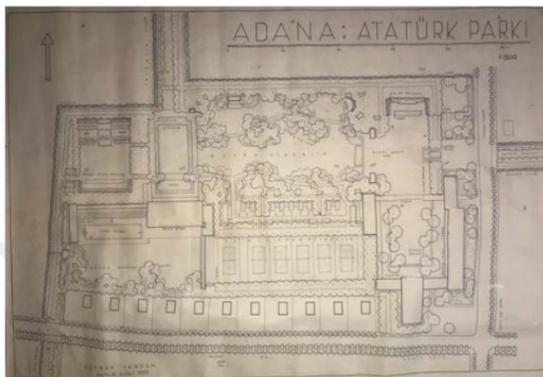


Figure 1. The plan of Atatürk Park drawn by Jansen (Jansen, 1935)

Atatürk Park is located within the boundaries of the Seyhan district in Adana and is under the ownership of the Metropolitan Municipality. It lies between Atatürk Street and Ziyapasa Boulevard, one of the most frequently used areas in the city. In its current form, the park includes features such as a monument and ceremony area, the 75th Year Art Gallery, recreation zones, a cafeteria, children's activity and sports areas, seating groups, and various other facilities (Figure 2) (Kalfa, 2019, p. 43)



Figure 2. Aerial photographs of Atatürk Park and its surroundings (Yandexmap, 2018)

Irrigation Systems

The park's irrigation systems are primarily based on traditional methods. Most of the water used for irrigation is supplied from the municipal network, and sustainable water management practices such as rainwater harvesting and the use of graywater are not yet implemented.

Water Consumption

The water consumption of the park is significantly high, particularly during the summer months due to Adana's climate. This situation complicates the sustainable use of water resources. There is a need for more effective and efficient irrigation system

Amount of Green Space

Adana Atatürk Park encompasses an area of approximately 47,000 m², with around 70% of this area designated as green space.

Plant Species

Observations conducted in the park have identified various plant species, including both native and exotic species. Notable tree species include sycamore, oak, and palm trees, as well as Mediterranean laurel and star bush among the shrub species. Flowering species exhibit seasonal variations (Figure 3).



Figure 3. Some plant species found in Adana Atatürk Park (Photographed by the author)

Ecological Functions

The plant diversity within the park contributes to biodiversity conservation and serves to create a microclimate. Additionally, plants possess the ability to enhance air quality and sequester carbon (Özdemir Şahin & Eşbah Tunçay, 2023).

Material Selection

Parquet concrete stone was used throughout the walkways of the park. In the square featuring the reinforcement element inscribed with “Adana,” ceramic tiles were employed as the floor covering (Figure 4). In the sports area, rubber tile flooring has been installed, though it has been observed that some sections are worn out.



Figure 4. Floor Coverings in Adana Atatürk Park (Photographed by the author)

In the park, materials such as wood and stone were utilized for seating elements of various sizes and shapes (Figure 5). The seating area of the amphitheater has sustained damage, with the wooden components being broken and dislocated.



Figure 5. Seating Elements in Adana Atatürk Park
(Photographed by the author)

Human Health and Wellbeing

The aim is to prioritize environmental and human health. In this context, beneficial insects have been released as part of a biological control program (Figure 6).



Figure 6. Announcement board of the Adana Metropolitan Municipality Parks and Gardens Department regarding the release of beneficial insects as part of biological control (Photographed by the author)

Community Events

Events organized in the park enhance local community participation and strengthen social ties. In particular, cultural and national holiday celebrations, as well as carnival events held in the area, attract a diverse range of participants.

Transportation

The park is easily accessible via public transportation. City bus lines operate near the park, facilitating convenient access. Bicycles and pedestrians can also navigate the park effectively.

6. Evaluation of Adana Atatürk Park According to the SITES Certification System and Recommendation

Evaluating Adana Atatürk Park within the framework of SITES sustainable certification criteria will enhance its ability to fulfill its ecological and social functions more effectively. The areas identified for improvement in the park based on the SITES V1 criteria include hydrology, soil, vegetation, materials, and human health and well-being. In addition to these categories, the assessment also considered transportation and energy use, both of which are critical for sustainability.

Hydrology

An analysis of the park's hydrological structure reveals that water resources are not managed effectively. Collecting and utilizing rainwater is vital for the sustainability of water resources. This practice is crucial for reducing water consumption and minimizing the environmental footprint. The current situation indicates that all water used in the park is supplied from the municipal network, highlighting the absence of a sustainable water management strategy.

Soil

The soil structure of the park is critical for plant health and water management. There is a need to improve the fertility of the existing soil. Preventing erosion and supporting soil biodiversity are essential for sustainable landscape management. Regular monitoring of soil fertility and chemical components will contribute to maintaining healthy vegetation.

Vegetation

An evaluation of the park's vegetation structure in terms of ecological health and sustainability shows that local plant species are not sufficiently utilized. The incorporation of local plant species will enhance biodiversity, while controlling exotic species will help maintain ecosystem balance.

Materials

The building and landscaping materials used in the park should be environmentally friendly and recyclable. Currently, the majority of the materials in use are traditional building materials, some of which are worn out in certain areas. Incorporating local and recyclable materials during the repair phase will reduce energy consumption and the environmental impacts associated with transportation. Additionally, the use of natural materials will enhance both the aesthetic and ecological value of the park.

Human Health and Wellbeing

The park should provide an accessible, safe, and stimulating environment for all users. Currently, it is noted that the park lacks adequate walking paths and specific equipment for individuals with disabilities. Furthermore, the physical activity areas are worn out and do not offer sufficient opportunities for physical exercise for park users. The absence of spaces that encourage social interaction also hinders the park from fully achieving its social function.

Table 4. Renewable/Non-Renewable Energy Sources and Usage Areas in Adana Atatürk Park (Created by the author)

Area	Energy Source	Usage Area	Visual
Beside the Atatürk Statue	Solar Panels	For users to charge their phones	
Bicycle Station	Solar Panels	Energy needs of the station (monitored by cameras)	
Atatürk Children's Park	Solar Panels	Energy needs of the local municipal unit	
Entire Park	Local electricity network	General energy needs	

7. Results and Recommendations

When evaluated within the framework of the SITES certification system, the strengths and weaknesses of Adana Atatürk Park in terms of sustainability became apparent, leading to specific recommendations. The field study provided detailed insights into the current state of the park, and the findings were compared with examples of sustainable parks found in the literature. It was noted that significant steps have been taken to protect and enhance the existing green areas of Adana Atatürk Park. The current tree cover of the park is valuable for biodiversity conservation and the sustainability of ecosystem services. However, improvements are needed in water management and energy

efficient. Specifically, the absence of rainwater harvesting, and reuse systems adversely affects the park's sustainability performance.

Adana Atatürk Park has considerable potential for community engagement and social sustainability. The park serves as a gathering place for individuals of various ages and social groups, thereby fostering social cohesion. Nonetheless, it does not fully adhere to accessibility and universal design principles, which limits its usability for people with disabilities and the elderly. The compliance of Adana Atatürk Park with sustainable landscape criteria is presented in Table 5.

Table 5. Compliance of Adana Atatürk Park with Sustainable Sites Criteria (Created by the author)

CRITERIA	ASSESSMENT	STATUS
Hydrology	There are no rainwater collection and reuse strategies for effective water management. All water needs are met through the city's water supply.	Not Suitable
Soil	Soil fertility needs to be improved, and erosion should be prevented. Biodiversity should be supported, and soil chemical components should be regularly monitored.	Not Suitable
Transportation	Motor vehicle use is prohibited within the park, but bicycle use is encouraged. The bike rental system is a positive step.	Suitable
Vegetation	The use of native plant species is insufficient, an control over exotic species is lacking. Native plant diversity should be increased, and the ecosystem balance should be preserved.	Not Suitable
Material Selection	The use of environmentally friendly and recyclable materials should be encouraged, and local materials should be preferred during renovation.	Not Suitable
Human Health and Wellbeing	The park should provide an accessible, safe, and encouraging environment for all users. Areas for disabled access should be created, physical activity spaces should be renovated, and areas that promote social interaction should be established.	Not Suitable
Energy Use	Renewable energy is provided by solar panels, but a more comprehensive and efficient renewable energy strategy should be developed. The distribution and usage areas of the panels should be more balanced.	Partially Suitable

In light of the criteria for sustainable sites, various recommendations for the park examined in this study are outlined below:

Rainwater Collection Systems

Rainwater collection systems should be installed in the park, and this water should be utilized for irrigation and other park needs.

Permeable Surfaces

The surface materials used in the park should be permeable to allow water to penetrate the soil. Rainwater collection systems should be strategically placed throughout the park. Rainwater harvested from roofs, walkways, and other hard surfaces can be collected in storage tanks for irrigation purposes. These systems will meet the irrigation water needs of the park and ensure the efficient use of water resources. Permeable concrete slabs, porous concrete, and porous asphalt can be implemented on the main axis. For the 1-meter-wide curving secondary axes, gravel or a thick layer of mulch can be used. Encouraging the infiltration of rainwater into the soil is essential, as it nourishes groundwater resources and reduces surface runoff, thereby helping to prevent flooding.

Natural Water Areas

Biological ponds and wetlands should be created in the park instead of artificial ponds. Such natural water features facilitate the collection and purification of rainwater through natural filtration processes. They also enhance the ecological value of the park by promoting biodiversity.

Renewable Energy Use

Meeting the park's energy needs with solar panels will foster a more sustainable energy environment. Photovoltaic (PV) solar LED lighting should be installed throughout the park. The 75th Year Art Gallery, currently demolished, should be rebuilt according to sustainable architectural design criteria, incorporating solar panels on its roof to supply part of the energy requirements for both the gallery and the park.

Use of Organic Fertilizer

Organic fertilizers should be employed to enhance soil fertility, while chemical fertilizers should be avoided.

Soil Tests

Regular soil tests should be conducted to monitor the nutrient content and pH levels of the soil.

Use of Local Plant Species

The incorporation of local plant species should be increased. Native plants require less maintenance, as they are better adapted to the region's climate and soil conditions, thereby preserving the natural structure of the soil.

Regular Maintenance and Monitoring

The vegetation structure of the park should be regularly monitored, and maintenance activities should be carried out. This includes regular watering, pruning, and fertilization to support the health and development of the plants.

Recyclable Materials

Cast rubber has been used as flooring in all playgrounds of Atatürk Park. Given its health hazards, natural materials (such as bark, compressed sawdust, sand, and soil) should be utilized in playgrounds instead of synthetic materials. A sandbox has been designed in one area of the park, and the ground materials of other playgrounds should also consist of natural materials (Türkan & Önder, 2011; Taştepe et al., 2016).

Accessibility Improvements

All areas of the park should be accessible. Currently, the park lacks walking paths and specific equipment for individuals with disabilities. Walking paths should be established for visually impaired individuals, allowing them to navigate using canes.

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CHAPTER II

A COMPARATIVE STUDY OF THE EFFECTS OF MODERN URBAN SETTLEMENTS ON CLIMATE CHANGE THROUGH TRADITIONAL URBAN SETTLEMENTS

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1. Introduction

The Industrial Revolution is shown as the beginning of the increase in greenhouse gases in the atmosphere. In the early periods of the Industrial Revolution, there were significant increases in food production with new inventions in agricultural machinery such as seed drills and scientific and technological developments such as the discovery of crop rotation. As large masses of people began to live in cities, cities created their own economies and more production activities were carried out in the fields of energy, industry, agriculture and animal husbandry to support urban life. This increase in production and prosperity experienced with the Industrial Revolution brought about the expansion of cities and, in parallel, more energy consumption in cities. As a result of widespread industrialization and urbanization, forests were destroyed in order to meet the increasing demand for iron and steel for bridges, railways and high-rise buildings, and coal began to be extracted and consumed much more intensively from mines with the support of steam engines.

While the population in cities where industrialization took place in the 19th and 20th centuries continued to expand at unprecedented rates, the pressures on

¹ This study is an expanded and developed version of the paper presented under the title of Energy Efficient Design at the Settlement and Building Scale Against Global Warming at the Climate Change Symposium held on 23-24 March 2022.

natural resources, ecosystems and climate also increased at the same rate. As a result of all these developments, the world population, which was around 1 billion at the beginning of the 19th century, exceeded 7.9 billion at the beginning of 2022 (Figure 1).

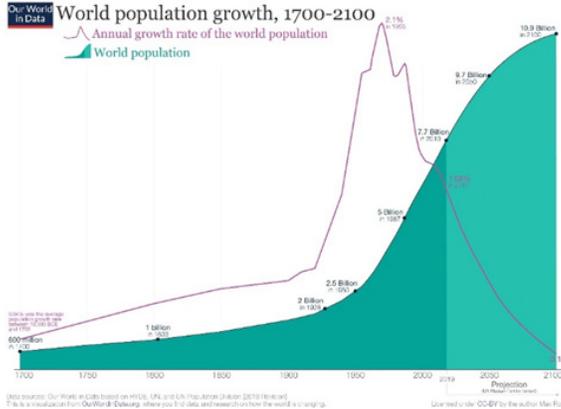


Figure 1. World population and fertility rate 1700-2100 (Roser and Ritchi, 2023)

More recently, the total world population living in cities increased from 750 million in 1950 to 4.2 billion in 2018, just 68 years later. While only 3% of the world population lived in urban areas in 1800, this rate increased to 54% by 2022. According to projections, the rate of urbanization will continue to increase and it is expected that 68% of the world population will live in cities in 2050 (Uncu, 2011). Today, intensive and uncontrolled urbanization, especially caused by rural-urban migration in underdeveloped or developing countries, creates high energy demand with more consumption. This, in turn, causes more greenhouse gas emissions into the atmosphere.

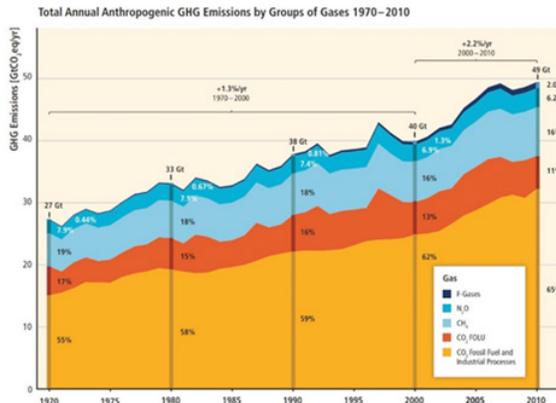


Figure 2. Greenhouse gas emission rates between 1970-2010 (IPCC, 2021).

When the weights of the gases contributing to greenhouse gas emissions are examined, it is seen that the CO₂ rate, which was 55 percent in 1970, increased to 65 percent in 2010 (Figure 2). According to the research, the amount of carbon dioxide gas in the atmosphere today is the most concentrated amount in 650,000 years (Giddens, 2011).

2. Relationship Between Climate Change and Cities

It is stated that the root cause of problems such as global temperature increase, melting of glaciers and increasing forest fires is related to human-induced greenhouse gas emissions and land use changes in cities (Figure 3)



Figure 3. View of the Pedersen Glaciers in Alaska in the summers of 1917 and 2005 (Anonymous, 2021).

Approximately 72% of the increase in greenhouse gas emissions, which are considered the main cause of climate change, is due to activities such as heating, transportation, and industrial production (World Resources Institute, 2021). During the lockdown period in China during the Covid-19 pandemic, a significant improvement in emissions was observed with the reduction of human activities and air pollution associated with the transportation and industrial sectors. In China, where energy supply is largely based on coal, air pollution has decreased significantly as seen in satellite images as the manufacturing sector has stopped its activities (Figure 4). The Covid pandemic has been an experiment that both air pollution and emissions causing climate change will decrease when the energy used in industrial and daily life activities in cities is obtained from renewable sources (Şahin and Erensu, 2020).

The reasons for the increase in global temperature, melting glaciers and increasing forest fires are linked to land use changes in cities and the resulting greenhouse gas emissions caused by humans. According to the 2016 United Nations HABITAT World Cities Report, cities are responsible for 70% of global

greenhouse gas emissions that cause climate change. The same report also states that cities cause land use changes and deforestation.

According to the report titled “World Population Prospects” prepared by the United Nations, the world population, which is approximately 7.7 billion as of 2019, is expected to increase to 9.7 billion in 2050 and 11 billion in 2100. Increasing welfare and developments in health are extending the average human lifespan worldwide. This data shows us that 42 percent of the current world cities will need new settlements. If such a need is met by expanding existing cities, the most optimistic scenario of keeping the increase in earth temperature within the 1.5°C limit by 2050 will not be realized. In pessimistic scenarios, desertification will accelerate with global warming, extraordinary climate events will become more frequent, and as a result, problems with access to food and clean water are expected.

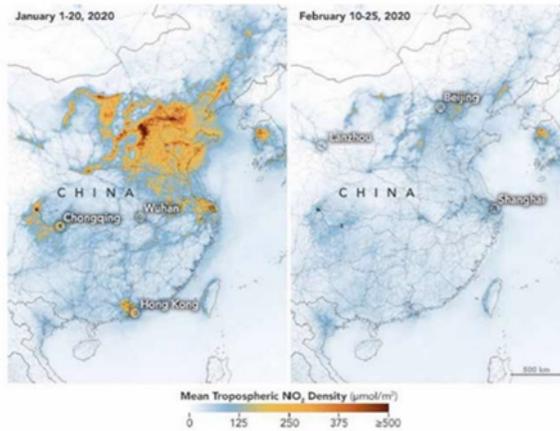


Figure 4. The amount of NO₂ in the air in China before Covid-19 and during the lockdown (Şahin and Erensu, 2020).

2.1. Urban Heat Island Effect in Modern Settlements

One of the important human-induced causes of global warming is the density of urban tissue. Today, urban planning, which is based on the principle of producing multi-story buildings with closer building intervals, which reduces infrastructure, land and construction costs, causes such density. While small parcels within city centers, which are created with a grid layout (and only enough to fit one building) in the remaining sections of the road system determined primarily for motor vehicle traffic create a microclimate in the area where they are built, they also cause significant vegetation loss

These types of urban settlements reflect the heat they receive from the sun directly to the atmosphere with roofs, roads, parking lots and other urban spaces with impermeable surfaces that do not retain heat. On the other hand, they store heat by reaching incredible surface areas such as the folds of a stomach or the chambers of a perforated brick with the lateral areas of the buildings within the settlement and release it to the atmosphere with a delay at night. The heat stored in these chambers between the buildings is added to the heat of the buildings themselves and the heat released from the vehicles, thus increasing the general temperature of the city (Figure 5).

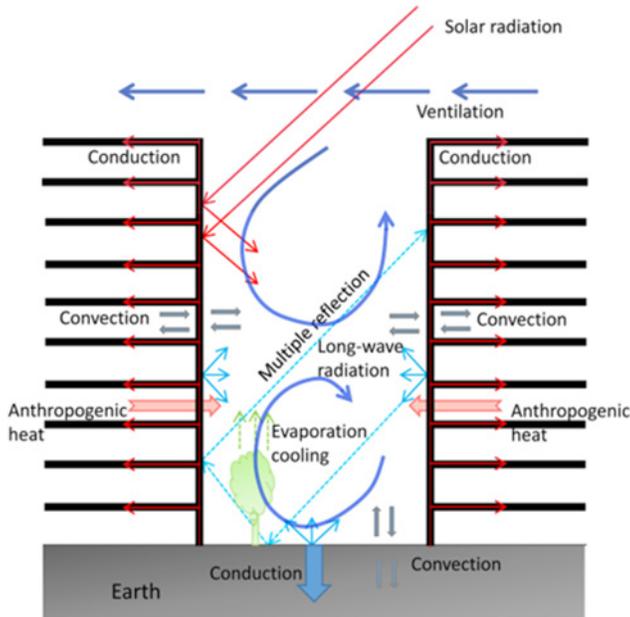


Figure 5. Heat accumulation in building gaps in the Modern Urban Texture (Gou et al., 2017).

The negative effects of climate change, which is accepted to have occurred as a result of the increase in greenhouse gas emissions, on urban life are:

- excessive energy consumption with heat waves
- productivity losses in the workforce
- changes in weather and climate conditions
- breathing polluted air
- rising sea levels

- irregular rainfall
- uncontrolled fire
- changes in the ecosystem and effects on other living thing
- water scarcity (Kusum, 2018).

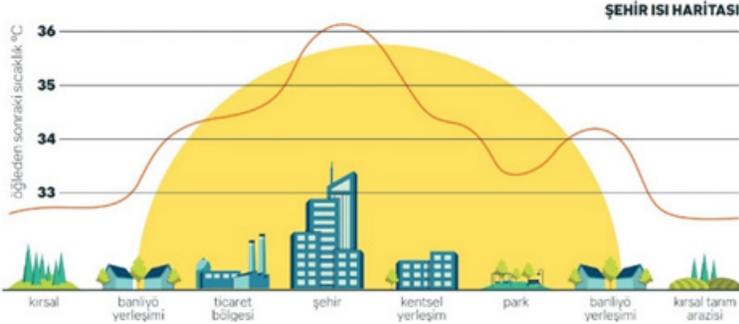


Figure 6. City Heat Map (Uncu, 2019)

The urban heat island effect is most felt in metropolitan-style urban settlements with high-rise buildings and narrow building spaces (Figure 6). The greenhouse gas emissions of 13,000 cities were calculated for the most comprehensive study on carbon footprints to date. The study, which evaluated the city's population and the income levels of the city's residents as data, observed that carbon emissions increased in parallel with the increase in income levels. The study analyzed the country's total emissions and the greenhouse gases emitted by individual cities, and determined that a significant portion of the total emissions determined for the country were concentrated in metropolitan cities (Miller, 2018).

The reasons for urban heat island formation can be summarized as follows:

- Industrial facilities located within the city
- Anthropogenic (human-induced) heat sources
- Decrease in evaporation on urban surfaces
- Urban population density
- Contiguous and high-rise construction that blocks air flow
- Urban lifestyle and high energy consumption
- High energy consumption in crowded cities with individual vehicle use and congested traffic
 - Reinforced concrete buildings with high heat mass and impermeable building materials and built environment (Kusum, 2018).

3. The Effect Of Modern Urban Settlements On Greenhouse Gas Emissions

Approximately 39% of global greenhouse gas emissions related to energy are caused by the construction, use and production of construction materials of buildings. However, it is possible to reduce the carbon footprint of cities mostly during the use of buildings, that is, during the operation phase. The energy used during the construction of a building has a very low rate compared to the operation phase. It has been determined that the most energy is used during the use of buildings for heating and cooling purposes. While the use of devices that consume less energy is a method to reduce the energy used in a building, evaluating the climate as a design criterion in the urban design and project planning stages of buildings will provide maximum benefit from natural resources in energy consumption. It was recorded that in the USA in 2002, 80 million buildings consumed around 36% of the country's energy (approximately 1 quadrillion BTU) and that 31% of this energy was used in lighting, 22% in heating and 18% in cooling. In the USA, energy consumption by buildings was responsible for 35% of carbon dioxide emissions in 2002 (Kantaroglu, 2011).

It is stated that in order to keep the increase in the earth's temperature within the most optimistic estimate of 1.5°C by 2050,

- Greenhouse gas emissions from buildings should be reduced by 80-90% below today's total level
- Energy use in transportation should be reduced by at least 30%
- At least 75-80% of total electricity production should be obtained from renewable sources (Kantaroglu, 2011).

Although solar energy is considered unlimited and theoretically accessible from anywhere in the world, it is not possible to effectively utilize solar energy in the current urban fabric outside of rooftops (Figure 7). The roof surface area of multi-storey and high-rise buildings (with current PV panel technology) can provide electricity for a very small part of the building and for a limited time. On the other hand, while it is planned that the majority of vehicles used in the transportation sector in the near future will use electricity, it does not seem possible to overcome this with solar energy produced within the city and independently of the central grid.

In the event of a natural or man-made disaster, access to energy immediately is of great importance today, when life is dependent on electricity at every

moment. In today's urban life, where all public and banking transactions are conducted online, electricity is needed even to operate heating systems, which is the most basic need. However, if urban planning and zoning regulations defining building construction are arranged in a way that ensures that every building in the texture benefits from the sun passively and can generate electricity with PV panels, it may be possible to greatly reduce dependency on the central electricity grid.



Figure 7. PV panel usage limitations due to insufficient surface area in metropolitan areas (Darling, 2020)

In addition to the inadequate urban green areas, today's modern urban fabrics indicate significant potential problems due to the limitations of the building spaces in terms of passive utilization of the sun. In the event of an energy supply crisis, as experienced in the city of Isparta in February 2022, or if natural gas cannot be supplied due to wars, production facilities in all sectors may not work for weeks or months, and access to some basic needs such as food may not be possible.

However, the biggest disadvantage is that there is not enough building surface area to install PV solar panels to solve the problem of access to energy during a disaster. In normal operation, the fact that buildings block each other increases the energy consumption of the building for heating and cooling purposes, especially artificial lighting, and this puts pressure on energy efficiency.

4. Natural Resource Use Possibilities In Modern And Traditional Urban Settlements

As we see in traditional settlements, there are many benefits to being positioned on the south-facing slope of a hill and using the slope of the land. In such a settlement, each house can benefit from natural resources such as sun and wind equally without any obstacles.



Figure 8. Setting of houses on the slope, Kayaköy, Fethiye (Anonymous, 2021)

In Fethiye-Kayaköy settlement, which is thought to date back to the 18th century and is located on a sloped area, the view and access to natural resources were decisive (Figures 8 and 9). Neither a settlement plan nor professional support was needed during the construction of the houses, which were positioned in accordance with the topography and without blocking each other's sun and view.



Figure 9. Topographic distribution of residences, Kayaköy, Fethiye (Anonymous, 2021).

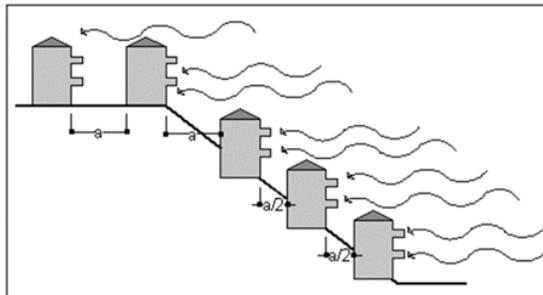


Figure 10. Access to natural resources with narrow building spaces on a sloping land (Karagülle, 2009)

Another benefit of settling on a slope in the south, which allows every house in the texture to access the sun, is that the house is protected against unwanted winds coming from the north in the winter (Figure 10). In the summer, while the relaxing night breezes reach all houses on the sloping land, on the flat lands chosen by many of the modern cities in our country as settlements, the breeze is not felt because the buildings screen each other. Moreover, choosing a slope in the south as a settlement will provide the direction and slope angle where the highest efficiency can be obtained from today's PV solar panels.

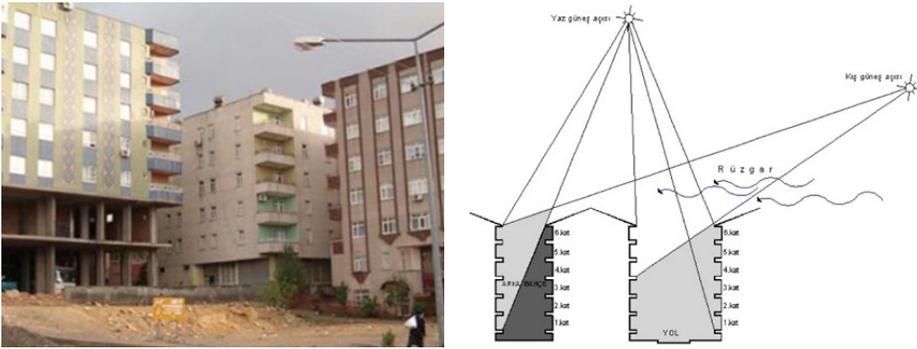


Figure 11. Building Spacing in Modern Housing and Access to Natural Resources, Yenişehir-Mardin (Karagülle, 2009)

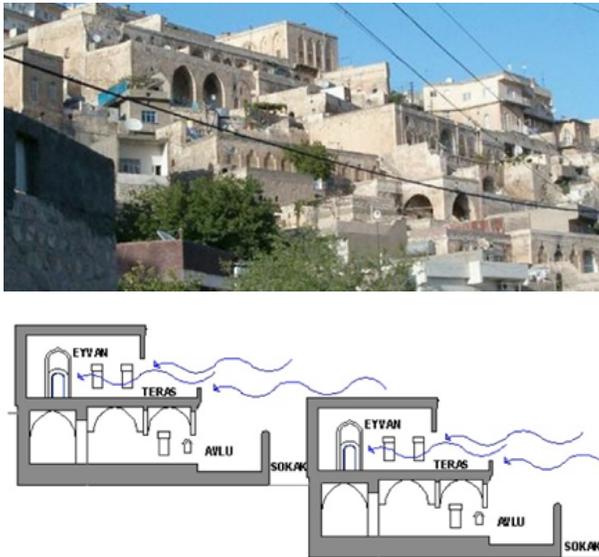


Figure 12. Building distances and access to natural resources in Mardin Old City (Karagülle, 2009).

Traditional Mardin houses are structured on organic plots surrounded by flat, sloping or staired streets (Figures 12 and 13). Mardin, as the hot-dry climate region it is located in, requires a dense and dense settlement pattern horizontally, and is a good example in terms of benefiting from natural resources such as landscape, sun and wind as a result of the correct use of topography (Karagülle, 2009). However, the modern Mardin urban settlement, which has the same climate conditions and is a few km away, has been shaped by the same zoning plan and regulations applied everywhere in the country, and access to natural resources such as sun and wind is quite limited (Figure 11).

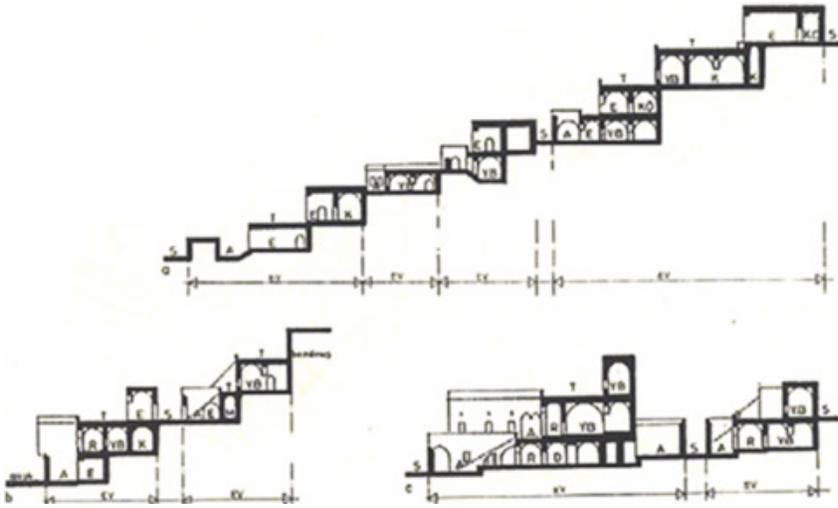


Figure 13. Mardin Houses (Karagülle, 2009).

In addition to the effect of climate on the selection of settlement, it has become an important data used in urban design with its effect on spatial organization, material selection, construction system and the formation of the house. When traditional housing textures are examined, the harmonious existence of settlement texture and climate is observed. As in other traditional settlements in the world, climate has been the most effective design data in the formation process of houses in our country. Houses in traditional settlements with different climate zones prevailing in Turkey have been shaped according to the following principles:

- In traditional settlements where hot-dry climate prevails, it is observed that compact geometry, light colored wall surface and few small window openings are preferred with the principle of taking as little heat as possible to

the interior due to the high temperature in the summer months in outdoor areas. In this climate region, it has been necessary to support the temperature in the interior especially during seasonal transitions due to the decrease in temperature at night. For this purpose, thick masonry walls (such as stone and adobe) that do not let in high heat during the day give the heat they collect to the interior space with a delay at night. Semi-open spaces such as iwans and porticos were included in the housing design so that the outdoor areas exposed to high heat during the day can be used comfortably. The humidity lacking in the environment was tried to be eliminated using water elements such as ornamental pools in semi-open spaces. The dense settlement of houses in small plots in this climate region and the narrow streets formed because of this create a micro-climate effect in the entire urban texture. The dense and dense settlement texture protects from high heat in the summer season and prevents cold harsh winds from entering the settlement in the winter season.

- In hot-humid climate zones, especially in the summer months, excessive humidity accompanying high temperatures causes an increase in perceived temperature. In this climate zone, traditional houses and settlements are organized with the principle of reducing heat gain and radiation, increasing moisture loss and ventilation and removing moisture from the environment. In the texture of traditional dwelling, it is observed that the buildings are placed on the plot in a long-thin form and separately are settled by shifting to benefit from more wind effect and shade each other without blocking the wind. In the facade surfaces of buildings and streets in this climate zone, thin walls that are less absorbent against solar radiation and do not store heat, are used in light colors with high reflectivity .

- In traditional settlements where cold climate prevails, especially in winter, arrangements are made with the principle of not taking the very low heat in the exterior into the interior. In the residences of this region, as in the hot-dry climate region, a compact geometry with reduced building surface area, thick masonry walls and few and small windows are preferred, while the wall surface colors are dark to absorb heat. Traditional settlements in this region are preferred close to the valley floor of slopes facing south or southeast to benefit from the heating effect of solar radiation and to be less affected by the cold prevailing wind effect

- Traditional settlements where climatic factors are the determining factors in single building and settlement design are examples where physical comfort conditions are provided with minimum energy without using technology

(Figure 14). In these settlements, wind is sometimes a desired and sometimes an undesirable and avoided factor in designs depending on the climatic structure of the region. The effect of air movements accelerating evaporation is positive in hot and humid regions and negative in cold and dry regions. Considering the difference in summer and winter use, it is expected to design spaces that respond to both different needs for effective use

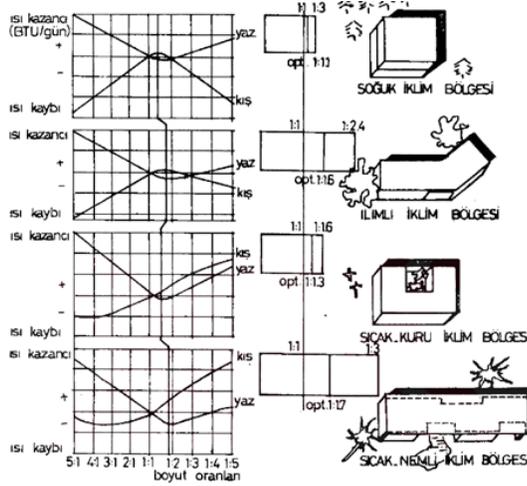


Figure 14. Suitable building forms for different climatic zones (Olgay, 1967)



Şekil 15. Yezd City Texture (base archive, 2006).

When we examine traditional settlements with their streets as urban fabric, we see that they are shaped in a way that adapts to the climate zone they are in. For example, in a dry hot climate region that is dominant in North Africa and the Middle East, in addition to narrow streets, solutions have been developed to reduce the surface area of the houses in order not to receive the high heat that exists outside inside the building. In a dense and dense settlement formed by using common walls, wind towers have been used in traditional settlements to remove the polluted air in the interior and to benefit from the breeze inside the space.

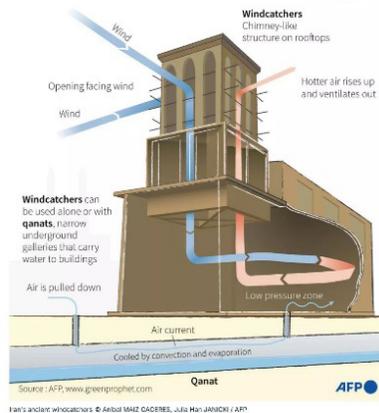


Figure 16. Badgir-Wind Towers in Yazd City (Anonymous, 2022-a).
On the right, the working principle of the wind tower (Anonymous, 2023-a)

Wind towers, which have become the symbol of the traditional Yazd urban fabric in Iran, can be given as an example. Wind towers help cool the room without using energy by creating a current with the air captured from above (Figure 16).

The construction order in modern city centers which creates a dense and high-rise texture reduces the speed of the wind. In such settlements, local increases in wind speed are seen due to turbulence occurring at ground level near high-rise blocks. In order to reduce the negative wind effect of high-rise buildings in urban space, some measures can be taken by evaluating the building form and facades. Norman Foster's 179.8-meter-high 'Swiss Re Headquarters' building in London can be shown as an example of this subject. The wind factor is also taken into consideration in the design of the building, which is described as London's first environmental skyscraper (Figure 17).

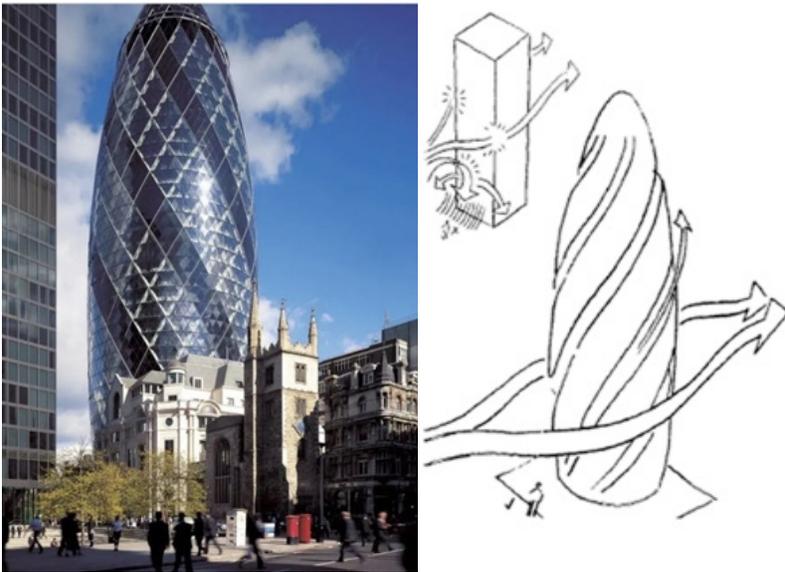


Figure 17. Swiss Re Headquarters Building-London (Çil, 2011).

Climatic elements such as solar radiation, air temperature, air movement and humidity have different effects on buildings depending on the landform. These differences, in interaction with macroclimatic data in different regions, have created the traditional house. The relationship between heat losses and temperature differences depending on the location of the house on the land is shown schematically in Figure 18. As in the example settlement shown here, it is sometimes seen that in modern urban settlements, the highest density is given to the peaks with the highest heat loss due to the landscape data (Figure 18).

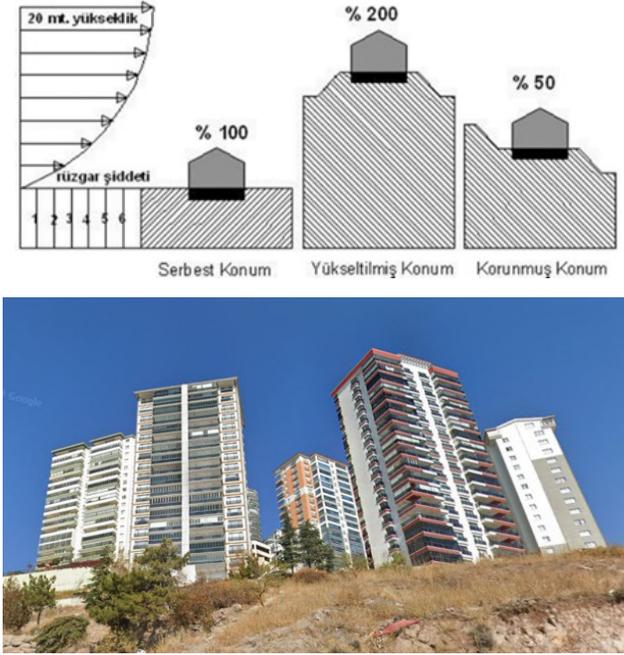


Figure 18. Heat losses depending on the location of the buildings (Transferred and reproduced by Can Karagülle from Dörter) (Dörter, 1994). (Right) High-rise residences in Ankara Y.Mahalle-Yeşil Evler district

The slope of the land is also a very important design data in urban settlements due to the angle of the sun's arrival on the land. Buldurur draws attention to this very important design data in terms of urban design by stating that latitude and topographic order affect both the intensity of solar radiation and the length of the shadow created by objects on the settlement (Buldurur, 1983).

The effect of the sun and wind on the building depends on the distance, height and location of the surrounding buildings and other environmental obstacles from the building. In the winter months, approximately 90% of the solar energy is provided between 09.00-15.00 and during this time period, the sun's rays should be received by the building without encountering any obstacles. Therefore, when dimensioning the building intervals, the slope, direction and settlement density of the land should be taken into consideration. In order to benefit from solar energy at the maximum level, the minimum building interval should be equal to or greater than the depth of the longest shadow length created by neighboring buildings (Figure 19).

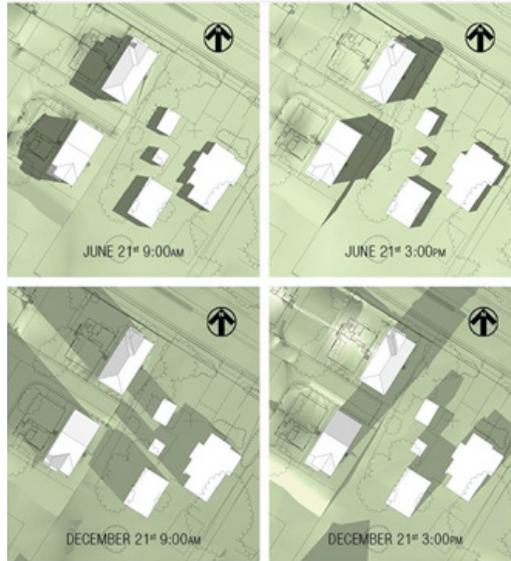


Figure 19. Shadow lengths in different seasons and hours (Malisos, 2018)

While residential buildings in traditional settlements are built in a way that does not block the sun and view of each other, shadow length is not a mandatory design criterion in the zoning plans and regulations that form modern settlements in our country. For this reason, even if the dwelling in most housing projects are oriented in appropriate directions on the plan plane, all apartments in that block can be deprived of the sun because they are screened by tall neighboring buildings (Figure 20).



Figure 20. High-rise housing complex built by TOKİ in Bursa Doğanbey (Anonymous, 2022-b)

5. Design Suggestions on A Settlement Scale Against Global Warming

Conducting legislative work to protect urban biodiversity and increase urban green areas on a settlement scale against global warming, developing land use policies with the participation of local and central authorities, civil society organizations and the public in this direction will enable existing cities to produce less greenhouse gases. As a result of such a study, more natural reserves, parks and green areas can be provided in newly planned areas (Figure 21).

The presence of vegetation and urban greening works in cities can significantly increase the resistance of cities to climate change, while indirectly playing an important role in mitigating the effects of climate change by reducing energy consumption for cooling and heating. Urban green areas have numerous benefits on urban microclimate

- Since urban green areas are cooler than surrounding areas, they reduce the urban heat island effect
 - The vegetation on urban green areas is a natural carbon sink.
 - It contributes to the reduction of air pollution with its filter function and photosynthesis abilities.
- Since excessive rainfall does not affect the sewage load, they do not cause floods
 - Rainwater taken into the soil and vegetation increases the humidity in the atmosphere through transpiration-evaporation and provides coolness.
 - It reduces the need for heating by preventing cold wind from reaching the building in the winter months (Uncu, 2019).



Figure 21. Urban Green Areas-Manisa (Mahalli Gündem, 2020)

Other design suggestions that can be taken at the settlement scale against global warming are summarized below:

- Requiring the use of light-colored roofs and walls that do not retain heat in buildings in urban fabric according to climatic zones
- Intensive planting and afforestation in urban area
- Architectural designs that will encourage roof farming and urban agriculture
- Including more space in green (underground) parking lots
- Implementing heat reduction strategies during urban planning
- Urban planning according to bicycle use and public transportation use
- Including more pedestrian paths, large green areas and parks in urban areas
- Avoiding impermeable hard surface landscaping
- Expanding green roof applications with the help of zoning regulations (Kusum, 2018).

Table 1. Energy gains obtained according to directions (Karagülle, 2009)

Direction	Energy gain
South facade	256 kWh/m ² .yıl
West facade	89 kWh/m ² .yıl
East facade	43 kWh/m ² .yıl

The direction that the surface piece selected as a settlement and the blocks on it face plays an important role in the energy consumption of the buildings within the texture for air conditioning and lighting purposes throughout the year (Table 1). For this reason;

- When urban planning is carried out on a sloping topography, the geographical direction must definitely be taken as a mandatory design criterion for areas that are mainly used during the day, such as residences, office and schools. For example, if the areas belonging to these uses are decided on in the north-facing part of a hill, the buildings in that region will consume much more energy for air conditioning throughout their lives (Figure 22). Since the angle of the sun's rays falling on the ground is greater in the south direction of a hill, the duration of sunshine and temperature are higher.

▪ Due to the effect of access to natural resources and shadow length, building distances should not be determined independently of the “place” and topography with a standard formula for every location and every density parcel. In other words, when defining the construction conditions within an island or parcel, construction boundaries and number of floors should be decided in a way that will not prevent the access of buildings in neighboring parcels to natural resources such as sun and wind.

▪ When deciding on the number of floors of the blocks within the texture, the shadow lengths of the buildings should be analyzed, taking into account the hours when the sun is effective in that climate region

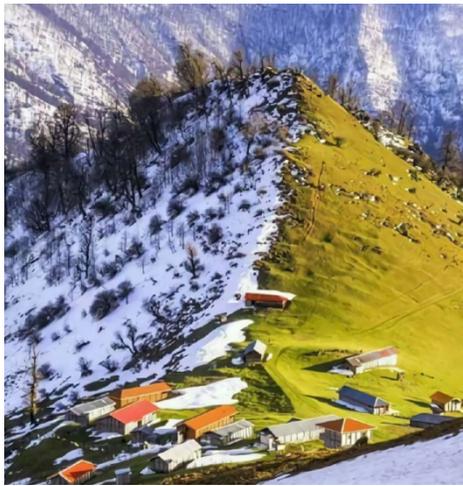


Figure 22. Difference in heat gain in the north and south directions of an elevation (Anonymous, 2023-b).

6. Conclusion And Recommendations

As a result of the comparison made with the article, while traditional settlements exhibit a self-sufficient behavior in terms of using resources in harmony with the climate and “place”, in modern urban settlements, which have an important role in global warming and climate change, there is generally no sensitivity observed at the settlement scale in terms of using natural resources. There have been significant developments in obtaining energy by using natural resources such as sun, wind and waves, which have become more economical with the developing technology and increasing prices of fossil-based energy sources in the recent period. However, no significant precautions and policy

changes are being followed in the construction sector, which is responsible for approximately 50 percent of the energy consumed in the European continent, in terms of reducing energy consumption, except for the insulation of buildings.

In Turkey, where 93 percent of the population now lives in urban centers due to migration to city and district centers, there is a lack of legal regulations in the fields of planning and architecture that will implement design decisions that prioritize the use of renewable energy sources instead of energy obtained from fossil sources and have the power to enforce them. The zoning laws and regulations, which significantly guide both urban planning and building design, need to be restructured in a way that can benefit from renewable energy sources such as solar and wind with passive and active methods. With the guidance of such legislation, it is possible to reduce the negative pressure that our cities put on the carrying capacity of the natural environment. On the other hand, this will be very limited to achieve with existing urban settlements that do not take local conditions into account and contribute to global warming with the urban heat island effect

In order to spread the culture of sustainability to the whole society, the priority should be to educate the candidates who will enter the profession like architects and urban planners. In architecture and planning education, the subject of sustainability should be addressed in project courses in universities as practice and should be brought to the agenda with many theoretical compulsory and elective courses. According to the projections, it is estimated that global warming and drought will affect wider regions on Earth. As a result, it is expected that significant restrictions on access to fresh water and food will be on the agenda in the world where the world population growth, which has exceeded 8 billion, continues at the same pace, as well as migrations and wars. Instead of establishing settlements in fertile agricultural areas or expanding urban settlements in this direction (as in the example of settling on a south-facing slope), implementing the sustainable design criteria of traditional settlements in newly planned settlements will be a very important step to stop global warming.

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CHAPTER III

TOWARDS A SUSTAINABLE RECOVERY EXPLORING LOW-TECH SOLUTIONS IN ALEPPO'S URBAN AND ARCHITECTURAL CONTEXT*

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1. Introduction

Aleppo, one of the oldest continuously inhabited cities in the world, is renowned for its architectural legacy, which reflects centuries of adaptation to its hot, arid climate (See Figure 1). The city's traditional houses, deeply rooted in vernacular wisdom, embody sustainable design principles that address environmental challenges with remarkable simplicity. These homes integrate low-tech strategies, such as central courtyards, thick stone walls, and narrow streets, to optimize thermal comfort, natural ventilation, and shading, reducing reliance on external energy sources.

The sustainable design characteristics of Aleppo's traditional houses go beyond their climatic responsiveness; they also reflect a harmonious relationship between human needs, cultural values, and environmental conditions. Features such as courtyards serve as multifunctional spaces for social and climatic

* This study has been derived from Master Thesis of Mariam Altaema at Ankara Yildirim Beyazit University.

purposes, while the spatial organization of homes ensures privacy, functionality, and efficient resource use. These principles, developed centuries ago, offer valuable lessons for addressing contemporary challenges in sustainable architecture and urban design. This study explores the design characteristics of traditional Aleppo houses, emphasizing their low-tech energy-efficient strategies. By analyzing spatial configurations, material use, and passive cooling techniques, the research aims to uncover how these historic structures provide sustainable solutions that are still relevant today. The findings seek to inspire modern architectural practices in similar climatic regions, blending traditional knowledge with contemporary needs for energy efficiency and environmental sustainability.

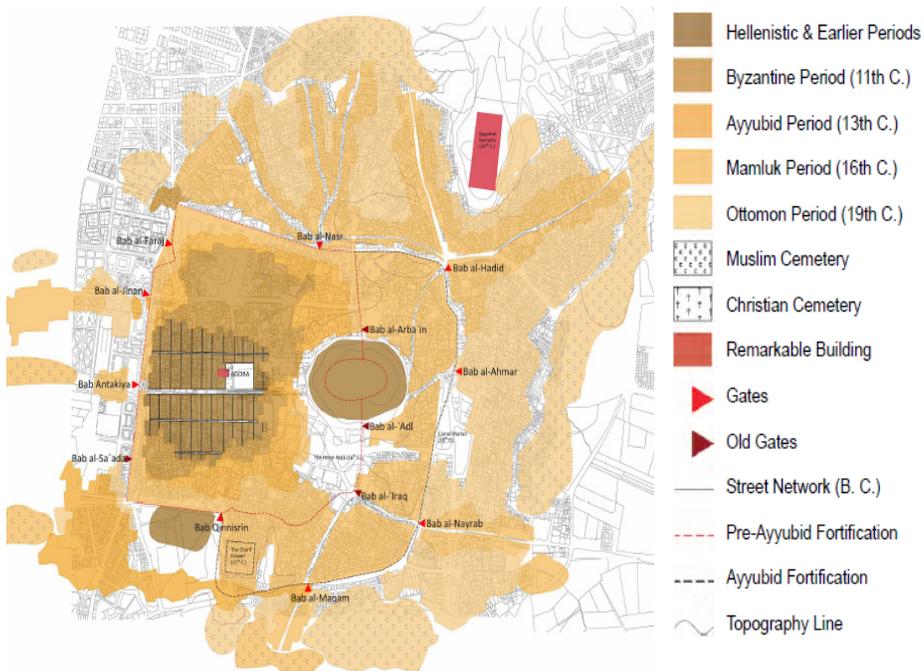


Figure 1 Map shows the Hellenistic city foundation, Ayyubid city and Mamluk city (TERAO, 1995). (TERAO, 1995).

2. Urban Planning and Directing are the Main Axes.

Architectural adaptation in regions with hot, dry climates evolved organically, shaped by functionality, environmental conditions, and cultural practices rather than pre-defined architectural concepts. This spontaneous approach to urban planning prioritized climatic protection, often orienting

cities along a north-south axis. Such orientation positioned buildings to the east and west, reducing exposure to intense morning and evening sunlight. Urban layouts in these regions featured pedestrian pathways shielded from harsh solar radiation, with narrow, winding streets strategically designed to ensure shade throughout most seasons. This organic street network, characterized by a branched and gradient distribution, emerged as a direct result of building configurations (Cas & Edarb, 2018; Abdulac, 1979). Furthermore, streets were often aligned perpendicular to prevailing winds to minimize the infiltration of heat-carrying dust and sand. For visual representation, see Figures 2 and 3.



Figure 2 Traditional texture of the city of Tunisia with a network of sub-alleys
Source: Hasan Fethi, natural energies, and traditional architecture 1986
(Abdulac, 1982)



Figure 3 Narrow streets in the traditional texture of the city of Tripoli
(Cas & Edarb, 2018; Abdulac, 1979).

3. Architectural and Design Strategies for Adapting to Hot and Dry Climates

The architectural and design parameters for adapting to hot and dry climates play a pivotal role in ensuring the sustainability and comfort of built environments in regions characterized by arid conditions. In such areas, where the impact of high temperatures is significant, traditional architectural wisdom has offered valuable insights. This discussion sheds light on how architectural choices can mitigate the negative effects of hot and dry climates, fostering sustainable development and enhancing the overall livability of the built environment.

3.1. Building Design

Inhabitants of hot and dry regions have traditionally devised strategies to adapt their households to the environment, mitigating its adverse effects. One notable example is the traditional Berber architecture of Morocco and North Africa (see Figure 4). This architectural style is distinguished by its careful definition of outdoor spaces, which reflects a deep understanding of local environmental challenges.

In such regions, high ground-level temperatures have led to the design of homes that are closed off externally while opening inward to internal courtyards, known as ‘sahn’ or “patio,” where the sky remains visible. This design effectively reduces nighttime temperatures by 10 to 20 degrees Celsius through passive cooling (Fathy, 1986). Interior courtyard housing, a hallmark of this adaptation, provides privacy and shields occupants from solar radiation. The shape, size, and placement of courtyards vary across regions, with larger courtyards found in cooler climates such as Aleppo and Damascus, and medium-sized courtyards common in hotter regions like the Casbah, Tunis, and Marrakesh (Mohsen, 1979). These courtyards serve as multifunctional spaces that integrate climatic, social, and functional needs, showcasing the ingenuity of traditional architecture in harsh environments.



Figure 4 Traditional architecture in hot and dry climates. (Bozsaky, 2015)

3.2. Façade Processing

As one moves closer to the equator, the ratio of window area to wall area decreases, reflecting an intentional effort to minimize exposure to direct sunlight and heat. In hot and dry regions, this reduction in both the size and number of windows is particularly pronounced (Fathy, 1986). Consequently, a carefully considered design strategy is essential to achieve a balance between thermal comfort and adequate natural lighting within households (Warren, 1989). The architecture of hot and arid climates is distinguished by its compactness, a feature that minimizes the number of exposed facades. Such buildings are often characterized by large external enclosures, with interiors designed to be open and inward-facing. Openings, when present, are typically small or medium in size and strategically oriented towards the north or the sky to reduce heat gain (Izard, 1973). See Figure 5.



Figure 5 Ait Ibn Hiddo Borzazat Palace where it shows the area of the openings is too small in ratio to the area exposed to sunlight (Izard, 1973).

3.3. *Al Mashrabiya*s

The Mashrabiya is a distinctive architectural feature that projects outward from rooms located on the first floor or higher, extending either beyond the building facade or into the courtyard. Typically constructed from intricately carved, decorated, and painted wooden beams, the Mashrabiya often incorporates colored glass on the interior. Its name is derived from the Arabic word for “to drink,” referencing its original function as a latticed structure where a small water jar was placed to cool by evaporation, facilitated by air movement through the opening (Fathy, 1986). (see Figure 6)

Widely used in traditional architecture across hot Arabic regions, the Mashrabiya serves as a practical response to challenging climatic conditions, particularly high temperatures. Beyond its functional role, it embodies cultural and aesthetic significance. Hasan Fathy (1986) identified five primary climatic functions of the Mashrabiya, which are as follows:

- Light control: It is preferable to have the nearby shading elements be close to the human eye level so that they can block direct sunlight and reduce eye strain by contrasting different elements of the Mashrabiya
- Air flow adjustment: The upper part is made up of a wide clip that allows air to flow into the space
- Decreasing air temperature: Direct sunlight is the main cause of increased temperature in indoor areas, and to avoid this, The Mashrabiya is used to reduce the entry of sunlight into architectural spaces.
- Increasing air flow humidity: Placing a pottery jar with a wide filtered surface area in the Mashrabiya, as the flow of air over this jar causes the evaporation of water on its surface and thus cools the air flow, this method is called evaporative cooling.

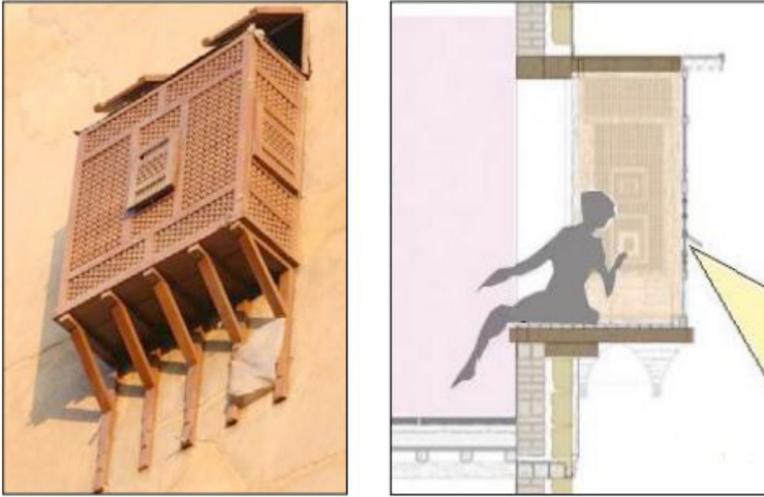


Figure 6 Illustrative drawing and an outside Figure of an old Mashrabiyya (Ravereau, 1997)

3.4. *Almalkaf*

It is an elevated structure above the building with an opening opposite the direction of the prevailing wind to capture the cool air above the building and push it inside. In this way, the Almalkaf eliminates the need to use ordinary windows for ventilation and air movement. (see Figure 7). Almalkaf also helps in reducing dust and sand carried by the winds blowing over hot and dry areas. It is important to study the direction of the prevailing winds in the surrounding area before installing the Almalkaf in the building and adjusting its opening direction accordingly (Fathy, 1986)

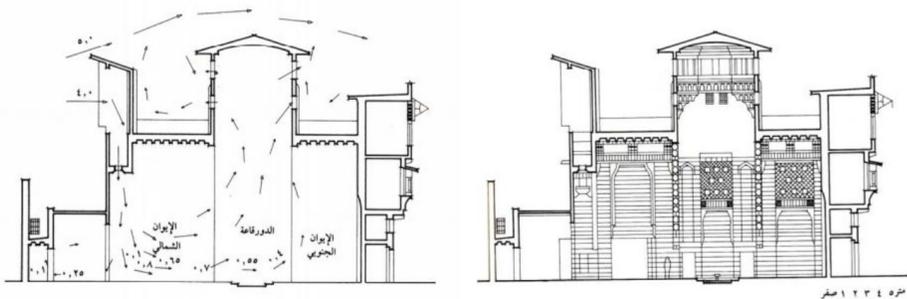


Figure 7 a section showing how the malkaf and wind exit work on forming inner air flows (Fath , 1986)

The size of Almalkaf depends on outdoor air temperature, with large horizontal sections for low temperatures and small sections for unsuitable conditions. A high-porosity pottery jar can humidify and cool the air (Fathy, 1986).

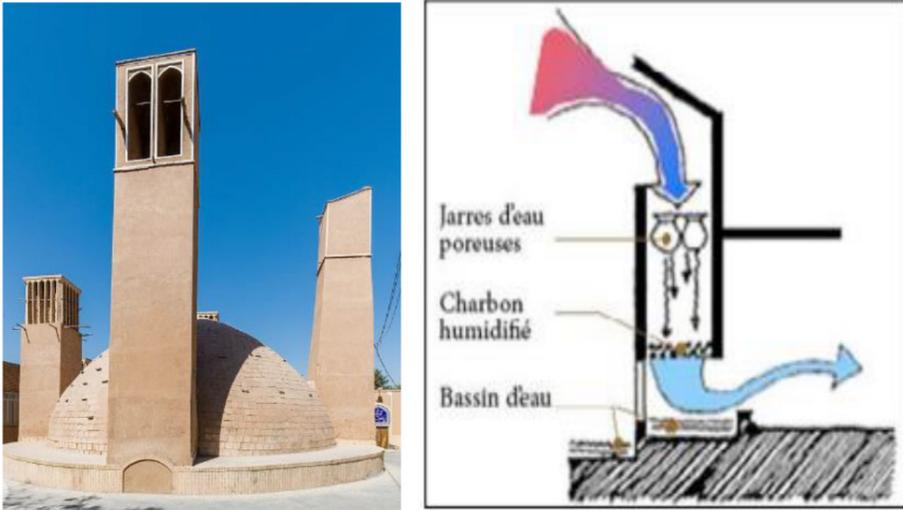


Figure 8 An illustrative section showing the method of cooling the air entering almalkaf using water jars. (Haj, H.M 2009)

3.5. Building Envelope

The materials used in traditional architecture in hot and dry regions play a vital role in mitigating heat and enhancing thermal comfort. Mud, one of the most commonly used materials, is favored for its low cost, ease of shaping, and availability near construction sites, making it highly practical in such climates (Fathy, 1986). In addition to mud, locally sourced materials such as stone, plaster, wood, and other resources have been widely utilized, reflecting the region's resourcefulness and adaptation to environmental conditions.

Construction techniques and the number of floors in traditional buildings vary depending on geographical location and the materials available. For instance, most traditional buildings in cities such as Syria, Iraq, and North Africa typically consist of two floors. However, in regions like Yemen and the Hijaz, the number of floors often exceeds this, demonstrating regional adaptations to climate, social needs, and material availability (Ntefeh, 1995; Cas & Edarb, 2018).

3.6. Internal Courtyard Patterns

The shape, size, and location of the courtyard vary in different hot regions, depending on the degree of heat and harshness of the climate. It is more widespread in the Mediterranean hot and arid regions in general. The courtyard can be located at the center of the household or at its center, where the remaining spaces are distributed around it. Usually, the centrality of the internal courtyard is not considered a priority or a technical aspect, but rather a symbolic or functional aspect. From this perspective, Abdulac classifies internal courtyard patterns into five types based on their location inside the household and the number of connections to the outside, which are determined by the following letter shapes: O, L, H, I, U. As shown in the Figure 9 (Abdulac, 1982).

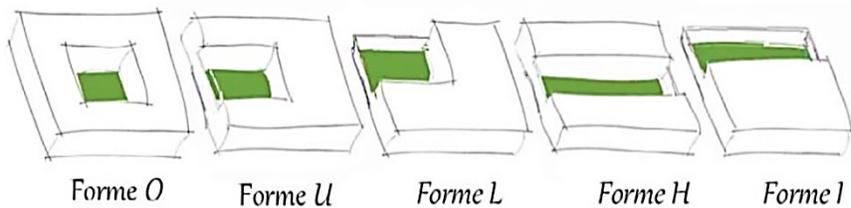


Figure 9 an illustrative drawing showing the courtyard patterns (Abdulac, 1982)

Among the five shapes, there is one shape that has three connections with the outside, which is the I shape, while the two shapes H and L have two connections with the outside. Type U has only one connection, while Type O has no connection with the outside (Altaema & Kalfaoglu Hatipoglu, 2021). Through this classification, Abdulac found that the last two types are characterized by axial geometric symmetry and that they are the most widespread in areas where hot and dry climates prevail. This means that the open inner courtyard is linked to the type of climate .)(Abdulac, 1982

4. Courtyard Location, Configuration, and Their Role in Thermal Comfort

The courtyard is characterized by its functional and climatic importance, which aroused the interest of many researchers and scholars of ancient local architecture, such as (Abdulac, Dunhaam, Al-Azzwi, Mohsen, Ain Muhaisen) and others (Abdulac, 1982), (Mohsen, 1979)., in terms of the extent of its adaptation to the hot and dry climate, it is considered one of the best examples

in which we can find climatic changes for the various urban patterns that have merged with the climate since its design.

The courtyard is an open part of the household that most of the internal opening's face and is the most used area for activities such as relaxation, dining, and other daily life activities. Traditional architecture is characterized by its closeness, with internal openings facing the courtyard, which acts as the lungs of the household (Rapoport, 1972).

The size and location of the patio can be affected by external climatic factors, depending on the intensity of the climate and its type. It also affects, in turn, the internal thermal exchange within the household through its dimensions, controlling thermal comfort by maximizing heat exchange between the interior and exterior and achieving a thermal balance between the gains and losses. As shown in the Figure 10.

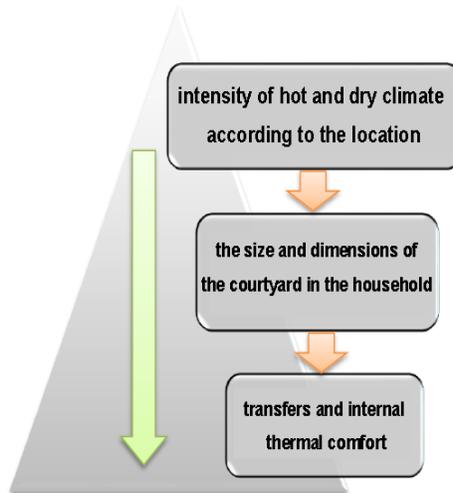


Figure 10 shows the relationship between climate, the courtyard, and thermal comfort (Abdulac, 1982)

4.1. Climate Influence on the Size and Dimensions of Courtyards

Reynolds 2002 classifies the courtyard into four forms based on the descriptive classification of the courtyards found across the various regions within the hot and dry climate in which the inner court households are found in Figure 11. This classification depends on the dimensions of the patio, which are wide, deep, and shallow (Reynolds, 2002).

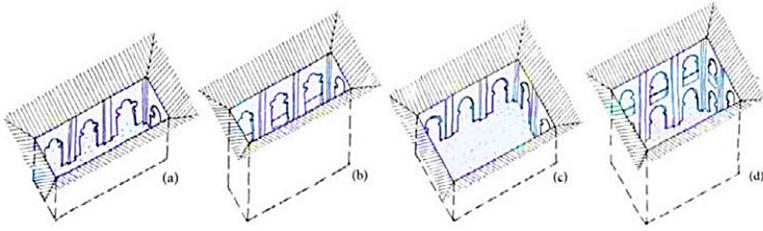


Figure 11 Reynolds's classification of the courtyard (Reynolds, 2002)

In a study conducted by Abdulac and Pinon (1973), numerous courtyard houses were classified into four categories based on climatic influences, particularly the courtyard's size, which ranged from spacious and open to compact with horizontal openings. Mohsen (1979) affirms these findings, emphasizing that courtyard dimensions are primarily shaped by climate, especially solar radiation. The more expensive the courtyard, the narrower and deeper it tends to be, as these proportions help optimize thermal performance.

Houses located in identical climatic conditions often exhibit comparable courtyard dimensions. For example, large courtyards in Damascus and Diyarbakir, Turkey, reflect many architectural designs found in the hot Mediterranean climate. These courtyards are typically open to the sky, with most apertures oriented upwards. External openings, when present, are usually minimal. A distinctive feature of such courtyards is the integration of verdant vegetation and water elements, which contribute to cooling and enhance the overall microclimate. These characteristics are frequently observed in traditional Syrian and Turkish homes (Abdulac and Pinon, 1973). See Figures 12 and 13.

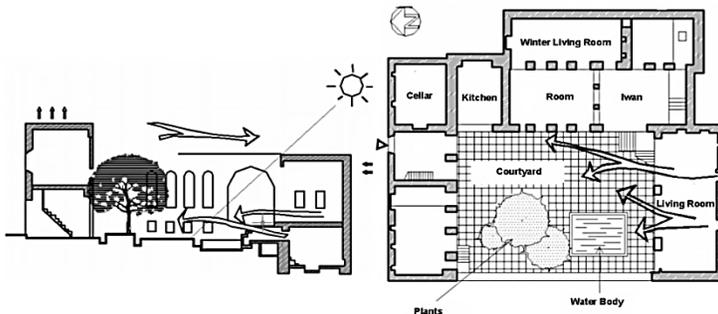


Figure 12 layout and section view of a house with a large courtyard and high walls, a water body, and plants to refine the air and shading in Diyarbakir Turkey (Abdulac, 2011)

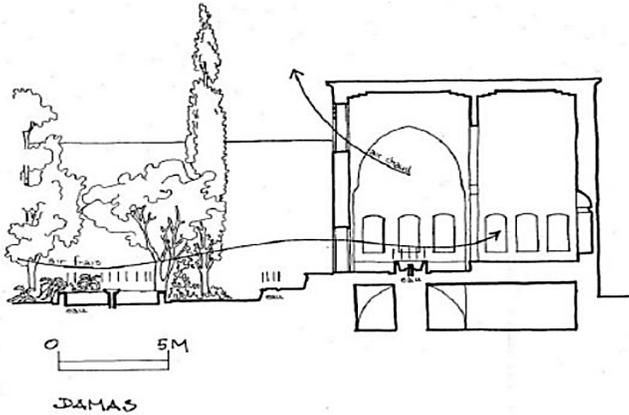


Figure 13 section view of a household with a large courtyard in Damascus (Abdulac, 2011)

Traditional houses in North Africa, particularly those near the Mediterranean Sea, are designed to adapt to the region's moderate climate, characterized by relatively low sun exposure. Temperatures typically range from 10°C in winter to 28°C in summer. These houses often feature spacious interiors and resemble those found in Tunisia and Algeria, which are commonly one or two stories high. Corridors are frequently incorporated into the design to facilitate movement while protecting the interiors from excessive sunlight and rain (Kessab, 1998).

Unlike traditional homes in arid regions, these houses often lack water features in their courtyards. This is primarily due to the high levels of air humidity in coastal cities, where humidity can reach up to 90% during certain seasons. The inclusion of water elements in such environments can further increase humidity, making the atmosphere less comfortable for occupants (see Figure 14).

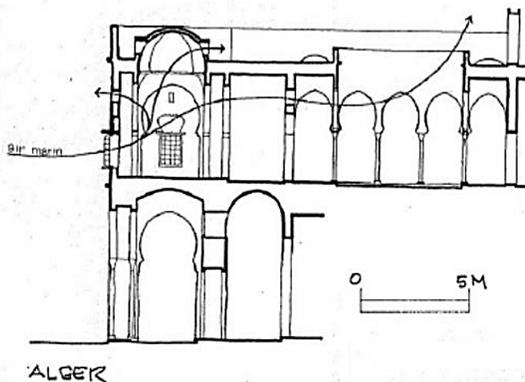


Figure 14 section view of an interior courtyard in Al-Qassabah (Abdulac, 2011)

In regions with higher temperatures, courtyard houses are often designed with narrow and deep courtyards, and typically consist of two or three floors. This architectural strategy facilitates internal movement and helps maintain thermal comfort for occupants (Brown, 1985). The multiple floors also reduce the amount of solar radiation entering the courtyard, while ensuring that the house maintains a suitable proportion between its height and width (Mohsen, 1979).

The assessment of courtyard dimensions in this context relies on two key values, R1 and R2. R1, the depth of the courtyard, is calculated by dividing its perimeter by its height, while R2 represents the courtyard's extension, calculated by dividing its length by its width (Hadj, 2012). These parameters were utilized by Mohsen (1979) in a comparative study examining the relationship between courtyard dimensions and solar radiation distribution across four different climates. The study's results demonstrated that the amount of solar radiation entering a courtyard increases during summer and decreases in winter when the courtyard has small and square dimensions (Mohsen, 1979). For further visualization, see Figure 15.

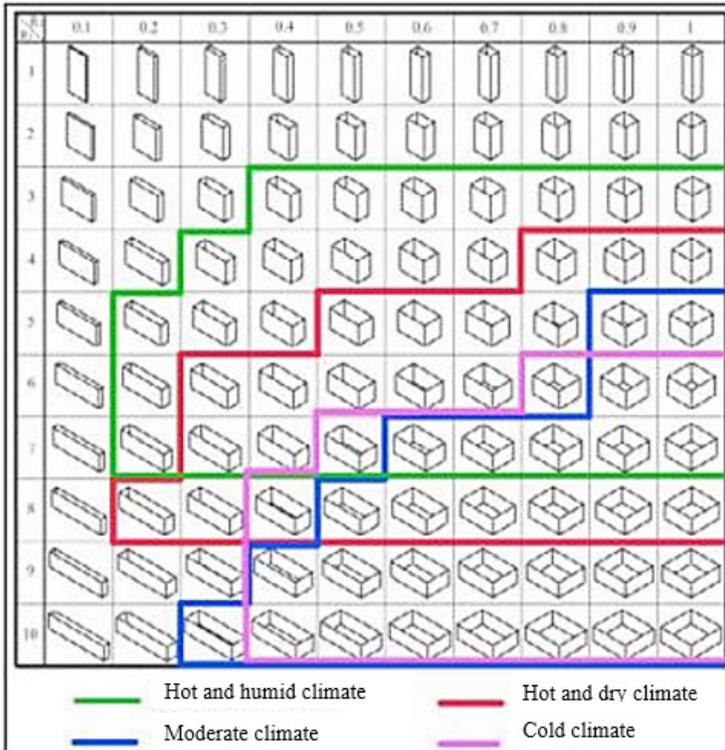


Figure 15 The Impact of Climate on The Dimensions of The Courtyard (Mohsen, 1979).

4.2. The Impact of Courtyard Dimensions on Indoor Thermal Comfort

A study was conducted on three models of open courtyards with varying heights (Reynolds, 2002). based on their relationship with indoor temperature. It was found that the deeper the courtyard, the lower the indoor temperature, and vice versa, as the dimensions of the courtyard directly affect the heat exchanges within the home environment. In a comparative study of the courtyards of some homes in Cairo (Waziri 2004), the measurements showed that the air temperature inside was lower than the outdoor temperature in the summer. The study also found a relationship between the increase in the containment degree of the courtyard and its effectiveness as cool air storage. The temperature inside the courtyard was lower than above the household's surface by 8 degrees Celsius. According to Alzubaidi and Shahin (2008), the thermal performance of the courtyards is based on the role of a thermal regulator that benefits from the large difference in temperature between night and day, The pressure points are differently located between narrow streets, shady areas, and open central courtyards. At the beginning of the day, the central courtyard still retains the cool air acquired overnight (Abdulac, 2011). (See Figure 16)

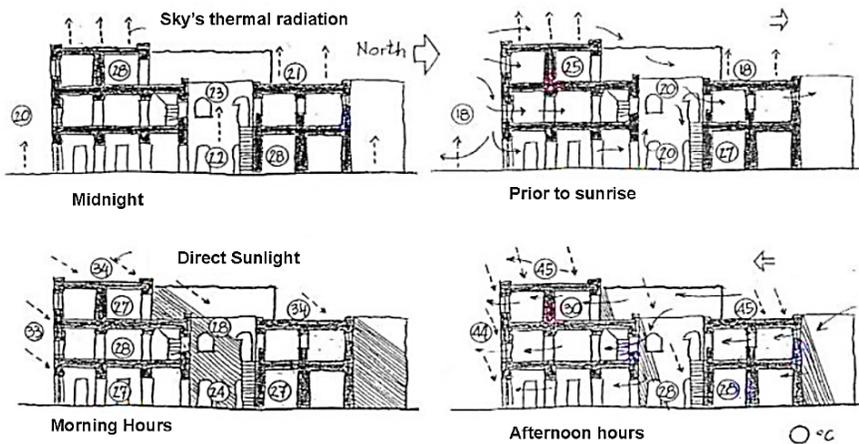


Figure 16 Thermal performance of the courtyard in a traditional household (Alzubaidi and Shahin 2008).

The decrease in night temperature during summer months leads to the surface losing heat to space through radiation, which contributes to the decrease in atmospheric pressure in contact with the surface. This decrease in turn allows relatively heavy cold air to descend into the central courtyard and displace the hot, light air (Abdul-Rahman, 2011). This process ensures the continuation of

ventilation, as the cold air interacts with the exterior surfaces of the walls facing the courtyard, accelerating the cooling process of the room temperature and soothing the indoor air (Ouahrani, 1993). (Figure 17)

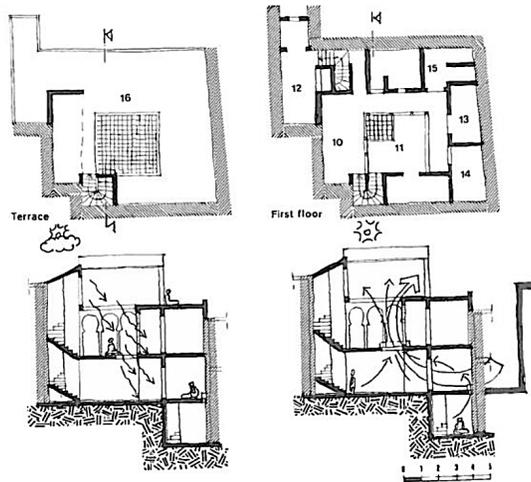


Figure 17 ventilating the household naturally using the window during the summer, which begins after sunset, hence, cooling the spaces that gained heat being exposed to sunlight (Ouahrani, 1993).

As far as natural ventilation goes, (Brown, 2001 and Conia, 1980) believe that the longer the patio is in the same direction as the cold winds, the faster the airflow flows in the interior.(Figure 18)

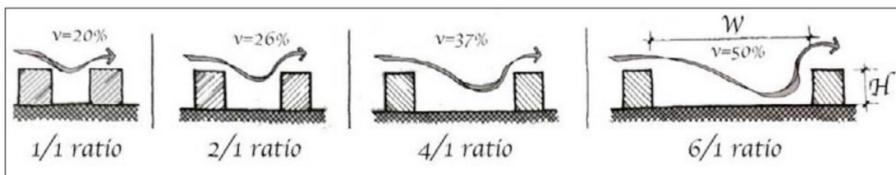


Figure 18 The effect of the width of the inner courtyard on the medium wind speeds (Brown, 2001 and Conia, 1980).

Water distributed across the heated ground and plants leads to the evaporation of moisture, which contributes to a reduction in the indoor temperature of the household. This process helps to cool the surrounding environment, enhancing thermal comfort. Additionally, the tall walls with wide ratios in this architectural design block a significant portion of the sun's rays during the day, further cooling the **Iwan** and parts of the courtyard (Mohsen, 1979).

5. Bioclimatic Design Strategies for Energy-Efficient Residential Buildings in Aleppo

The courtyard, a defining feature in the traditional typology of residential buildings in Aleppo, serves as a critical morphological, functional, and environmental element. It facilitates natural lighting and ventilation, while also adapting to the region's hot and arid climate. Studies by Fathy (1986) and Bahadori (1978) highlight the introverted design of courtyards, enabling them to fulfill multiple roles, including recreation, cooling, and protection from dust and solar radiation. Additionally, Bahadori (1978) observed that courtyards could function as thermal pockets, capturing solar heat in colder climates to enhance indoor warmth. The efficiency of courtyards as both sun protectors and collectors is closely linked to their proportions, as noted by Tulu Toros (2009) and Al-Sallal (2016). These studies underscore the courtyard's role as a multifunctional architectural solution, balancing environmental and functional needs in traditional residential design.

The design of traditional Aleppo houses prioritizes comfort by employing passive cooling techniques that adapt to the region's hot and arid climate. Central to these strategies are courtyards, such as the "Qa'a" and "Iwan," which facilitate evaporative cooling while serving as sheltered outdoor spaces that enhance thermal regulation. Additionally, the careful selection of building materials and the thermal properties of envelope systems, including walls and roofs, play a crucial role in maintaining comfortable indoor environments.

5.1. Characteristics of the Traditional Settlement of Aleppo

Aleppo's city center, known as the "medine," served as a vital economic, commercial, cultural, and religious hub. Its origins date back to the Roman era, with significant expansion occurring during the Ottoman period, when the construction of mosques reinforced its religious significance. Residential areas were organized into distinct districts, while commercial centers featured a regular street network, contrasting with the irregular layout of residential neighborhoods. Suburbs developed based on ethnicity, religion, and activity patterns, with the primary suburbs located in the north and northeast. These suburbs expanded significantly from 91 hectares in the 16th century to 200.5 hectares by the 19th century (Miroğlu, 2005):

- main roads that radiated from the city center to individual city gates, some of which led to long-distance trade or pilgrimage routes.
- neighborhood streets (Darb) that connected the main roads.

- dead-end roads (Zugak) that were narrow and opened to the entrance doors of individual houses (Marrawi, 2018).

The city's design was influenced by its climate, with densely constructed buildings and narrow streets providing shading and airflow. Courtyards were used for living spaces, reducing noise levels. Basalt stone, a traditional building material, reduced noise levels. Buildings were constructed on a north-south axis to reduce exposure to the sun and maximize cross-ventilation (Abdulmawla, 2019). Traditional residential settlements in Aleppo province use solar control and natural ventilation principles, focusing on courtyards for balanced temperature and humidity. Housing units are primarily courtyard homes, with smaller units for privacy (Taleghani et al., 2004) (Figure 19)

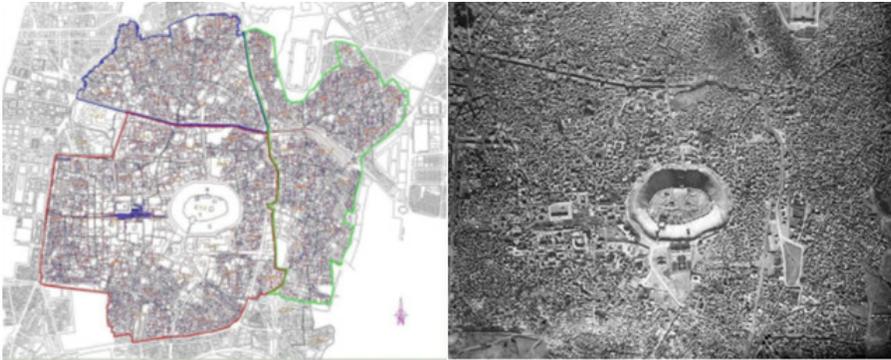


Figure 19 Top view of the settlement (Marrawi, 2018)

Houses in Aleppo, shaped by the wealth and religious beliefs of their owners, display distinctive yet common features, despite variations in size and layout:

- Emphasis on external access: Entry points are prioritized to ensure accessibility.
- Multifunctional spaces: Interior spaces are designed to serve multiple purposes.
- Central open courtyard: Often intricately designed, the courtyard serves as a focal point of the house.

Rooms, arranged on one to four sides of the courtyard depending on the house's size, open directly to it without interconnections. These spaces are flexible, adapting their function according to the time of day and season. In larger homes, the Iwan serves as the main family area, characterized by a prominent high hall, arched and elevated 50–60 cm above the courtyard.

The primary living spaces and guest rooms, also accessible from the courtyard, are typically aligned along the house’s central axis. This design ensures optimal light and air circulation, facilitated by the strategic placement of doors, windows, and decorative wall elements. The courtyard’s vertical axis plays a crucial role in maintaining ventilation and daylight distribution throughout the house (Alabidin, 2010; Zin Alabadin, 2019). For further details, refer to Table 1.

Table 1 Parts of a typical traditional house in the Aleppo old town settlement (by authors)

Part	Image
<p>Site plan</p> <p>Multi-functional spaces, and an open central courtyard</p>	
<p>Iwan</p> <p>The Iwan is the central area for families</p>	
<p>Building block</p> <p>The main sections in a traditional home in Aleppo</p>	
<p>Courtyards are designed to be introverted</p>	
<p>Privacy</p> <p>A balanced distribution of private, semi-private, and public spaces</p>	

5.2. Bioclimatic Design of “Al Liwan”

In traditional residential buildings in Aleppo, “Al Liwan” serves as a pivotal bioclimatic feature, enhancing both functionality and environmental responsiveness. This semi-outdoor space, enclosed on three sides and characterized by three large arches, opens to the south side of the building. Strategically designed, it was typically positioned on the north side to harness cooler summer winds and oriented toward the south during winter to optimize solar gain (Alamuddin, 1996).

Full sliding walls often connect the peristyle to the central hall, which functions as a focal point for family gatherings. This design maximizes the climatic benefits of the peristyle, enabling it to provide shade during the summer while allowing direct sunlight to warm the space in winter. The peristyle also facilitates cross ventilation and natural lighting, creating a comfortable indoor-outdoor transition.

In addition to its functional advantages, the Al Liwan contributes to the aesthetic and cultural identity of Aleppo’s traditional homes. With three substantial arcades on each level, it offers panoramic views of the surroundings while ensuring privacy. This semi-open design fosters a sense of place, balancing the preservation of local cultural heritage with practical climate adaptation (Edwards et al., 2006). (see Figure 20).

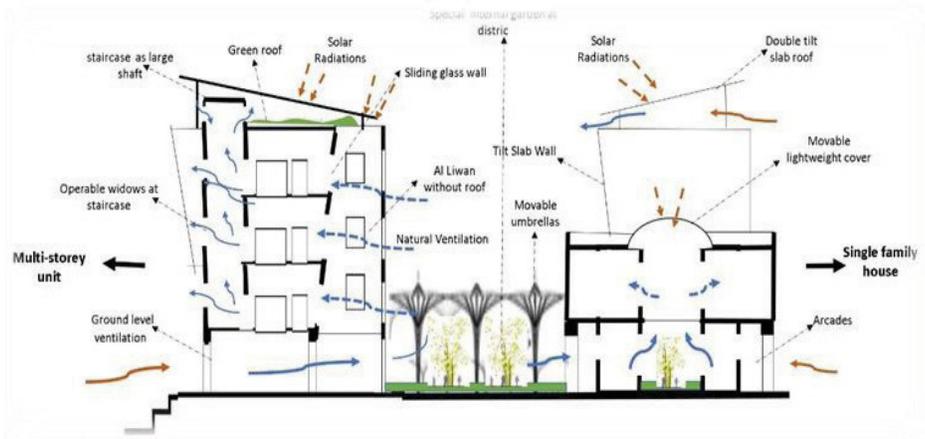


Figure 20 The section shows the new inspire Ventilation Systems for the new residential building at the old city of Aleppo (Salkini et al., 2017).

5.3. Exterior Wall Design

The exterior appearance of a building plays a crucial role in preserving the cultural heritage of a city. Elevations serve multiple purposes, such as reducing heat transfer through the walls and reflecting sunlight to regulate indoor temperatures. Traditional buildings in Aleppo are known for their heavy construction with limited exterior openings, utilizing thick walls made of stone to slow down heat flow into the interior. These stones possess a high heat storage capacity, absorbing energy during the day and releasing it at night, shown in Table 2. However, modern research has indicated that adding insulation to the exterior envelope can prevent heat retention in the thermal mass and swiftly conduct it to the outside. Furthermore, planting climbing plants on the walls can improve the microclimate (Sunaga et al., 2012).

5.4. Innovative Shading Systems for Sustainable Buildings Design

Windows play a critical role in regulating air circulation, natural lighting, and thermal comfort in traditional architecture. Careful consideration was given to their placement and size to optimize airflow, control sunlight entry, and ensure privacy (Pour, 2015). High-level openings on external walls and low-level openings on internal walls were designed to enhance cross ventilation and expel hot air effectively. Research highlights efficient glazing ratios for windows in traditional designs, with 30% on south-facing surfaces, 15% on west-east facades, and 20% on north-facing walls, optimizing thermal and lighting performance (Salkini et al., 2017). Additionally, the incorporation of green roofs has been shown to significantly enhance a building's thermal performance. By utilizing vegetation, these roofs reduce direct solar exposure, improve energy efficiency, and add functional and aesthetic value to the building. This practice, often referred to as rooftop gardening, has emerged as a sustainable alternative to traditional flat roofs, addressing both environmental and spatial needs (see Table 2).

Table 2 Exterior wall and Shading Systems in Aleppo houses (by authors)

Part	Image
<p>Qa'a” and “Iwan”, are central to these passive cooling techniques</p>	
<p>A fountain and a small garden contribute to cooling and shading technology</p>	
<p>Winter wings are in the north of the courtyard with openings facing south</p>	
<p>Season's part</p>	

6. Conclusion

The traditional houses of Aleppo stand as enduring examples of sustainable architecture, demonstrating how design can meet social and cultural needs while adapting to environmental conditions. Adapted over centuries to the hot, dry climate, these houses incorporate low-tech strategies that prioritise thermal comfort, natural ventilation and energy efficiency. Courtyards, thick stone walls, narrow streets and carefully orientated spaces are not only architectural features, but also evidence of a deep understanding of local climate conditions and resource constraints.

This study highlights the potential of these traditional design elements to inspire modern sustainable architecture. In the face of global challenges such as energy efficiency and environmental degradation, the lessons contained in Aleppo's traditional architecture offer practical, low-tech solutions that bridge the gap between tradition and innovation. Contemporary architecture can integrate passive design principles that reduce reliance on energy-intensive systems, strengthen resilience to climate change and preserve the connection to cultural heritage by revisiting these practices.

The findings emphasise the need to re-appreciate traditional wisdom in designing sustainable urban environments (Kalfaoglu, 2021). While global architectural practices are increasingly focussed on sustainability, the low-tech and energy-efficient principles observed in Aleppo's traditional houses offer a compelling model for integrating timeless design strategies into modern contexts. These insights are particularly relevant for regions with similar climatic conditions and offer ways to create buildings and cities that are not only environmentally conscious, but also culturally rooted and socially inclusive.

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CHAPTER IV

A REVIEW ON ARCHITECTURAL PROJECT COMPETITIONS AND SUSTAINABILITY IN TURKEY¹

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1. Introduction

When we look at the contribution of various human activities to global warming, we see that the share of energy use is approximately 50 percent. It is stated that fossil-based resources such as oil, coal and natural gas, which cause carbon emissions, have the largest share in our world's energy use with 64 percent (Sev, 2009). When looked at the impact of buildings on environmental problems according to different sources, we see that the share related to energy consumption has very important rates such as 50%, loss of land suitable for agriculture 80%, and usage water 50% (Ayaz, 2002).

Different countries around the world have many certification systems such as LEED and Bream, which measure factors such as energy and water efficiency, waste management and environmental impacts of buildings, and indoor quality,

¹ This article is a reconsideration and development of the paper titled "Türkiye'deki Mimari Yarışmalar ve Sürdürülebilirlik" presented at the Smart and Green Buildings Congress and Exhibition in 2013.

and the number of buildings planned and constructed according to these systems is increasing rapidly in the world and in our country.

On the other hand, to what extent do sustainability and ecological architectural design come to the agenda in the design of buildings that contribute so much to global warming, climate change and environmental problems and are obtained especially through competition? In order to find an answer to this question, the article first conducts a preliminary examination of the competition legislation and process in our country. It is known that architectural works are shaped by the influence of art movements that existed in different periods on the earth and that the spaces they host are designed with concerns about sustainability in addition to the lifestyle required by the socio-economic relations prevailing in that period, the available construction technology and material possibilities. In architectural project competitions held in our country since the 1930s, the expectation and perception is observed to be choosing the most original and creative project in line with the trends of the period. As in the municipal buildings that have been held the most in competition recently, the structures subject to competition are generally planned in the most central part of the city and are seen as exemplary structures for that city. The issue of why sustainability has not yet come to the forefront as a design criterion in the acquisition of public buildings that have significant contributions to the formation of the building culture of that city through competition has required the consideration of method and process.

2. Methods Of Obtaining Architectural Projects In Türkiye

In our country, public and private sector organizations having building projects using two basic methods. The first and much more common of these is the tender method. In this method, the employer institution obtains the architectural project for the least amount of money based on the conditions determined by the institution in terms of program, quality and size. In this method, where the employer's intervention in the architectural project is quite high and the initial construction cost is prominent, it is observed that creativity and environmental values are achieved to a much lesser extent in the absence of competition.

The second method, architectural project competitions, is applied to very few in our country, unlike developed countries. From the first architectural project competition held in Turkey until 2007 (including urban design, zoning plan and monumental tomb competitions), 83 percent of the 672 competitions were organized by the Ministry of Environment and Urbanization (formerly the

Ministry of Public Works), local governments, state economic enterprises and the Bank of Provinces, while 17 percent were organized by the Chamber of Architects and banks (Başbuğ, 2007).

While a total of 542 architectural project competitions were held in our country in the 77-year period between 1930-2007, an average of 400 competitions are held in Germany in just one year². It is observed that the subjects of these competitions are 204 management, 95 health, 78 education, and the rest transportation, culture, typical projects, housing and sports. Due to the predominance of public buildings, the most competitions were held in Ankara as of 2007 with 172. This is followed by Istanbul with 111 and Izmir with 48 (Başbuğ, 2007).

As can be seen from these figures, competitions are a method rarely used to obtain an architectural work in Turkey. However, competitions can create the architectural agenda and contribute positively in many ways and determine the agenda. The potential to obtain contemporary and permanent works, to create a discussion environment in the field of architecture, to support original and creative ideas, to give newly graduated young architects a chance to show themselves, to renew themselves with up-to-date information for participants, and therefore to receive professional training in a sense are among the benefits of architectural project competitions.

2.1. Architectural Project Competition Method

Architectural project competitions, which are mostly initiated by the public sector in our country, are held within the framework of the “Regulation on Architecture, Landscape Architecture, Engineering, Urban Design Projects, Urban and Regional Planning and Fine Arts Competitions” issued by the Public Procurement Agency in accordance with the Public Procurement Law No. 4743 and entered into force on January 1, 2003³. The objectives of the competition in this Regulation are;

a) To provide a suitable environment for the development of culture, art, science and environmental values through competition, to select the most

² The country that uses architectural competitions the most as a method of obtaining projects is Germany. For example, while 97 competitions were held in Turkey between 1980 and 1991, 4057 competitions were held in Germany in the same years (Uzun, 1999).

³ As of 01.01.2003, the provisions of the “Regulation on Engineering and Architecture Project Competitions” dated 19/8/1970 have been repealed in design competitions to be held by administrations within the scope of the Public Procurement Law No. 4734.

economical, most functional and innovative solutions from a large number of options, to identify their authors and to encourage fine arts

b) To provide a suitable environment for the development of professions within the scope of this Regulation, to establish ethical values and to gain international competitive power (URL-1)

According to this regulation, competitions are held in three ways: international, national and regional. National competitions are held as free or pre-selection (invited) and single-stage or two-stage. While all participants can participate in free national competitions provided that they meet the conditions stipulated in this regulation and competition specifications, competitions with pre-selection are held in subjects that require very special expertise or experience and are competitions in which the winners can participate after the evaluation to be made according to the pre-selection criteria. Regional Competitions are competitions in which only members operating within a branch region of the relevant professional chamber can participate and the project area is limited to a maximum of 5000 m² (URL-1).

With this management, architecture, engineering, urban and regional planning, landscape architecture and fine art competitions can be held. It is possible to hold project studies for the competition, as well as to organize advanced meetings for problem solving, to encourage new research, planning and design approaches, to present ideas, concepts and developments that will form the basis of the next project, and to determine basic data and programs (URL-1).

After the administration determines the form, type and subject of the competition, the jury selection is on the agenda. The jury is composed of main, reserve and advisory members and rapporteurs.

According to this regulation, at least one of the main jury members in five-person juries, at least two in seven-person juries, and at least one of the reserve jury members are selected and appointed by the administrations from a list of candidates twice as long as the relevant professional chamber of the Union of Chambers of Turkish Engineers and Architects. In architectural project competitions, it is requested that there be one civil engineer among the main and reserve jury members (URL-1).

The main jury members are selected from people who have been involved in the implementation or approval phase of a similar design subject for at least

ten years in their profession. In addition to this condition, they must also meet one of the following three conditions.

- a. Having received an award, honorable mention or having a project purchased in architectural project competitions
- b. Being the author of an original and exemplary design
- c. Having prepared all the projects, implementation projects and details of a design and having them approved by the competent authorities
- d. Having conducted an academic study in the relevant field, having them approved by the competent authorities and having published a research on that subject (URL-1)

The advisor, main and reserve jury members prepare the competition specifications by consulting with the administration. The specifications include the purpose, type and form of the competition, subject and location, participation conditions, information and documents to be provided to the competitors in the annex of this specification, what will be requested from the competitors (such as drawings, reports and models), scales, quantities and presentation formats, principles that the competitors are required to comply with, and the competition calendar. Information and documents such as the requirements program, zoning plan, zoning status, zoning information, plan drawing, ground and infrastructure report, and photographs are provided to the competitors in the annex of the architectural project competition specifications (URL-1)

The primary jury members examine the draft competition specifications and requirements program given to them by the administration and finalize them. The primary jury members answer the questions of the competitors in the question-answer phase clearly and distinctly. The duties of the primary jury members are defined in the regulation as “selecting the works that best comply with the program conditions in terms of art, economy, technique, safety and operation among the works entered in the competition and determining the awards (ranks and honourable mentions) among these works and deciding on the purchase of the projects deemed worthy of purchase.” (URL-1).

On the other hand, it is stated in the Regulation that the evaluation jury is not authorized to make changes to the specifications and program during the evaluation process and to leave the specifications and program during the selection (URL-1).

Among the advisory jury members, one person from the administration representing the organization that opened the competition and one person with expertise in the competition representing the investor organization serve as advisory jury members. Advisory members who do not have the right to vote in the decision-making process are responsible for informing the jury about problems related to the competition subject in their own fields of expertise (URL-1).

After the conclusion of each competition, a colloquium is organized where the results of that competition will be discussed and no restrictions can be imposed. The participation of all jury members (advisor, main, substitute) and rapporteurs in the colloquium is mandatory. Questions are asked orally or in writing at the colloquium. Questions can be directed to the entire jury or to each individual jury member (URL-1).

3. Architectural Project Competitions and Sustainability

There are positive views that Architectural Project Competitions⁴ will create an environment for the emergence of contemporary buildings, that different and diverse ideas will support creativity in a competitive environment, and that the competition and colloquium process is quite useful in creating an educational discussion environment.

There are views that the administration, which can be effective in the creation of competition specifications, can be restrictive in the emergence of original and innovative products. Özbay states that almost every organization that opens the competition expects the best solution that considers its own needs rather than serving the country's architecture. He argues that contributions to the country's architecture in competitions can only be produced through juries (Özbay, 1993).

However, when a public institution wants to obtain a service building project through competition, the institution uses specific tions as a means of expressing the conditions it determines. However, if the institutions that open competitions are looking for sustainable architecture in their buildings, they state this in the specifications with different statement

⁴ In the Regulation on Architecture, Landscape Architecture, Engineering, Urban Design Projects, Urban and Regional Planning and Fine Art Competitions, architectural project competitions are defined as design competitions that combine the aesthetic and functional requirements of interior and exterior spaces of buildings or building groups necessary to facilitate people's lives and to sustain their various activities with technical and administrative necessities, and that develop scientific, environmental, cultural and artistic values and include the most economical solutions.

According to the TMMOB Competition Regulation⁵, the primary jury members determine the necessary evaluation criteria after conducting the initial examination studies on the projects and the jury president is responsible for ensuring that the project selections are made in accordance with this regulation. It is stated here that the evaluation criteria depend on the subjective comments of the jury members.

In the symposiums organized by the Chamber of Architects in 2007 and 2009 regarding national architecture competitions and where all the actors in the form of jury members, competitors and chambers in the competitions gave their opinions, it was discussed which criteria the appointed jury members should have, and the most controversial subject regarding competitions, the qualifications of the jury members and the selection criteria, came to the fore (Topal, 2010).

The list of jury candidates, which has been criticized for not being up-to-date, is announced according to the relevant chamber regulation. In the regulation, without objectively stating what criteria the members appointed as jury should have, there are subjective criteria such as the jury to be proposed should “have a respected place in the architectural environment” and “be familiar with the subject of the competition” (Topal, 2010). However, whether the jury, which will examine the proposed projects in terms of their long-term effects on the environment, has a scientific formation does not constitute a criterion in jury selection. On the other hand, since there is no mechanism to evaluate the performances of the jury members according to current realities, it is possible that similar selection committees that look at architecture from a certain perspective will select works in a vicious circle (Özdemir, 2013; Omacan, 2013).

Whether the architectural competition juries in our country are knowledgeable about sustainability or ecological design is not a criterion in jury selection. Many of the competition juries were in the architectural environment as competitors in the past (when sustainability was not on the agenda). At that time, sustainability was not on the agenda either in architectural education⁶ or in architectural circles, and it was generally known that Modernism could

⁵ The “Architecture, Engineering, Urban Planning and Urban Design Project Competitions Regulation” was put into effect in 1988. Private institutions, organizations that are not subject to the Public Procurement Law, such as the Pharmacists’ Union and the Notaries Union, can participate in competitions according to the TMMOB Regulation.

⁶ Sustainability or ecological design is still a compulsory course in the undergraduate curriculum of only a few architecture schools in our country.

provide physical comfort in interior spaces by using technology, disregarding environmental data.

Similarly, there is no specific criterion in terms of qualifications for the appointment of members appointed by the institution opening the competition. When we look at the issue from the perspective of sustainability, it is thought-provoking that the members of the jury, who are the sole determinants in the selection of works that will be exemplary in the national architecture world (Tuna, 2010), do not question whether they have sufficient scientific knowledge for a structure that will serve for at least 30-40 years.

The fact that only 7 percent of the competitions opened between 1997-2007 were built shows that there were disagreements in terms of expectations between the competition process and specifications, and between the competition institution and the employer institution. It is stated that since the competition specifications cannot go beyond a template framework and the administration's thoughts regarding the area where the competition is opened cannot be adequately reflected, the projects obtained in the competitions do not satisfy both the administration and the competitors. As a result, a significant inconsistency in terms of expectations emerges between the structure that the administration dreams of and the first project selected by the jury (Yılmaztürk, 2020; Topal, 2010).

From the perspective of the participants in the competition, the jury structure created for that competition and the specifications that the jury was effective in the preparation work provide clues about how the final product should be. Kahvecioğlu expresses this situation as follows: The competitors in the 2000s “had to choose between producing the architecture they wanted and discovering the scheme that would win; while the schemes and approaches did not change much, what changed was the transformation of the familiar approaches into contemporary representations and presentations.”(Özdemir, 2013; Eray, 2013; Kahvecioğlu, 2010).

3.1. Specifications for Architectural Project Competitions Where Sustainability is a Criterion

The specifications sent to the competitors to comply with often include more detailed explanations on the functional relationships required by the competition subject (such as which floors the spaces will be located on or their relationships with each other), and sometimes there are also explanations that can guide the design such as the structure being economical, being suitable for

the era, being innovative, and recently sustainability or sensitivity to ecological values. However, the extent to which all these expectations are taken into consideration or not by the jury during the project evaluation is a matter of debate due to the subjectivity of the selection.

However, two competitions opened recently have attracted attention with the importance they give to sustainable architectural design in their specifications

- “Green Local Administration and Cultural Center Building and Arrangement of Its Immediate Surroundings” National Architectural Project Competitions opened by Çanakkale Municipality.
- İzmir Sustainability Center Building Architectural Project Competition opened by İzmir Metropolitan Municipality

3.1.1. Çanakkale Green Local Government and Culture Center Building Architectural Project Competition

The architectural project competition “Çanakkale Green Local Administration and Cultural Centre Building and its Surroundings” has broken new ground in many aspects such as sustainability concerns and the competition process. The Mayor’s message in the specifications stated that “the institution’s environmental sensitivity is expected to be reflected in an exemplary nature-friendly building in every aspect, from the selection of materials to be used in the construction of the building to alternative energy use and air conditioning.” For the first time in our country, a local administrator has emphasized such awareness and consciousness and requested a sustainable architectural design for his own service building. This request has not only remained as a request in the specifications, but steps have been taken regarding the mechanism required to achieve this. First of all, instead of the jury list of the chamber of architects, which has become rigid in terms of defending its own truths, a jury⁷ consisting of academic architects with academic formation in this field, with the aim of obtaining a sustainable architectural product, has been formed (URL-2).

The specific tion, after providing enlightening information about sustainability and its importance in the explanation section, explains the basic

7 Çanakkale Yeşil Yerel Yönetim ve Kültür Merkezi Binası İle Yakın Çevresinin Düzenlenmesi mimari proje yarışması seçici kurul asıl üyeleri:

Ülkü ALTINOLUK	Mimar , Prof. Dr. (Jüri Başkanı)
Emre AYSU	Mimar , Prof. Dr.
Harun BATIRBAYGİL	Mimar , Prof. Dr.
H.Orhun KÖKSAL	İnşaat Müh. , Prof. Dr.
İsmail ERTEN	Mimar

principles of sustainable design and the role of architects in the design phase using LEED (Leadership in Energy and Environmental Design) criteria as a basis.

It is understood that a green building expert (LEED AP) among the competition consultant members made a significant contribution to the preparation process of the specification

An 18-page section in the competition specification is dedicated to the “Green Self-Assessment Guide” created to achieve a green building. This guide, along with the information and documents to be given to the competitors, includes the green building criteria and report for the first time in a competition. In addition to the project, report, detail and model requested from the competitors in each competition, there is also a green building self-assessment chart. (Figure 1)

Çanakkale Municipality states that the aim is to carry the existing potential and experiences of its architects within the framework of the “green” theme to the competition platform, while on the other hand, it shares educational information on sustainability and green building design with the explanations in the specification (URL-2)

It is observed that the objective criteria required to obtain a green building are intended to be brought with an algorithmic structure intended to be established with the Specification. It is stated that the Self-Assessment Form will be delivered with the projects as an annex to the report, and it is stated that the explanations and scoring approaches regarding the criteria included herein will be taken into consideration by the jury during the award and honorable mention evaluations, along with other criteria. Thus, it is aimed to guarantee a sustainable architectural design without leaving it to the preference of the competitors (URL-2).

In order to comply with the algorithmic structure in question, LEED criteria adapted to an architectural competition framework with some articles removed or transformed were used. While doing this, a path to the “gold” level certification of the ideas and suggestions developed in the projects was aimed (URL-2).

The five comprehensive categories of the LEED evaluation system selected for this project are as follows:

- Sustainable Appropriate Project Area Selection,
- Efficient Water Use,
- Efficient Energy Use,

- Material Selection,
- Indoor Air Quality (URL-2).

Çanakkale Belediyesi Yerel Yönetim ve Kültür Merkezi Yeşil Bina Öz Değerlendirme Formu (ODF)		
Değerlendirme		Max. Puan
1. SÜRDÜRÜLEBİLİR YERLEŞME SEÇİMİ		
	1.1 Yerleşme Yoğunluğu ve Erişilebilirliği (SS-C1.2. Development Density & Accessibility)	5
	1.2 Ulaşım Alternatifleri, Bisiklet Parkı+ Duş Olanakları (SS-C4.2. Alternative Transportation)	1
	1.3 Ulaşım Alternatifleri, Düşük Emisyonlu Araçlara Park Ayrışığı (SS-C4.3. Alternative Transportation)	3
	1.4 Arsa Kullanımı, Açık Alan Maksimizasyonu (SS-C5.2. Site Development)	1
	1.5 Sel & Yağmur Suyunun Denetim Altına Alınması, Miktar Kontrolü (SS-C6.1. Storm Water Design)	1
	1.6 Sel & Yağmur Suyunun Denetim Altına Alınması, Nitelik (SS-C6.2. Storm Water Design)	1
	1.7 İsu Adası Etkisi- Açık Alanda (SS-C7.1. Heat Island Effect)	1
	1.8 İsu Adası Etkisi, Üzeri Örtülü Alan (SS-C7.2. Heat Island Effect)	1
0		14
2. SU VERİMLİLİĞİ (WE-WATER EFFICIENCY)		
	2.1 Su Etkin Peyzajlandırma (WE-C1.Water Efficient Landscaping)	4
	2.2 Atık Suyun Yenilikçi Tekniklerle Değerlendirilmesi (WE-C6.1. Wastewater Treatment)	2
0		6
3. ENERJİ & ATMOSFERE KATKI (EA-ENERGY & ATMOSPHERE)		
	3.1 Enerji Performansının Optimizasyonu (EA-C1. Optimize Energy Performance)	19
	3.2 Yerde Yenilenebilir Enerji Temini (EA-C2. On-Site Renewable Energy)	7
0		26
4. MALZEME & KAYNAK DEĞERLENDİRME (MR-MATERIAL & RESOURCE)		
	4.1 Dönüştürülmüş Malzemelerin Toplanması ve Depolanması (MR-C6.1. Collection of Recyclable)	0
	4.2 Yerel Malzeme Kullanımı (MR-C5. Regional Materials)	2
0		2
5. İÇ ORTAM KALİTESİ (IEQ-INDOOR ENVIRONMENTAL QUALITY)		
	5.1 İç Ortam İkliminin Minimum Değerde Korunması (IEQ-ER. Minimum IEQ Satisfaction)	0
	5.2 İç Ortamda Kimyasal Etki & Zehirli Maddeler Denetimi (IEQ-CS. Indoor Chemical & Biological Source Control)	1
	5.3 Gün Işığı & Görüş Açıklığı Sağlanması, Gün Işığı (IEQ-CS.1. Daylight & Views)	1
0		2
6. TASARIMDA YENİLİK (ID-INNOVATION IN DESIGN)		
	6.1 (Yeşil) Tasarımda Yenilik (ID-C1.1-4. Innovation in Design)	3
0		3

Figure 1. Green building assessment form (URL-2).

The project, which won first place in the National Architectural Project Competition for the Green Local Government and Cultural Center Building and Its Immediate Surroundings, organized by Çanakkale Municipality in 2012, was completed in 2023.

3.1.2. Izmir Sustainability Centre Building (S-Hub) Architectural Project Competition

Izmir Metropolitan Municipality has announced a two-stage national architectural project competition in 2023 to establish Turkey's first sustainability centre. This competition differs from other competitions in that the subject of the competition is a sustainability centre building (URL-6).

Another difference of this competition from others is the creation of a 21-page Sustainable Building Criteria Guide given in addition to the project specifications. In the guide, Sustainable Building Performance Criteria are defined under the titles of Integrated Design Process, Settlement and

Transportation Issues, Sustainable Land Use, Water Efficiency Applications, Energy Efficiency and Carbon Emission Reduction Applications, Material and Resource Use, Indoor Environmental Air Quality, Innovative Applications, Climate and Disaster Resistance Planning and Izmir City Regional Priorities Assessment (URL-7).

Similar sensitivity is also evident in the jury selection. 3 of the 7 jury members have conducted academic studies on environmental design, sustainability and energy efficiency in their career

3.2. An Example from Architectural Project Competitions Where Sustainability Is Not Sought

The jury in the Uşak Municipality Service Building Architectural Project Competition, one of the architectural project competitions held in Türkiye in 2013, adopted the following evaluation criteria that do not include sustainability:

- Urban outdoor space continuity on a large scale
- Context, Relationship with the Nearby Environment, Belonging to the Place
- Architectural Tectonics, spatial organization in accordance with the main idea
 - Leading attitude, representative quality
 - Compliance with the requirement program included in the specification (URL-2).

When the awarded projects are examined, it is observed that the projects with 1st, 2nd and 3rd awards and 1st and 3rd Honourable Mentions are oriented towards the northeast with their living units (a long thin rectangular mass where they are built) having the municipality service function, which has the main function and is only used during the day. On the other hand, it is seen that spaces such as multi-purpose halls, which do not need daylight due to their function, are oriented towards the south in almost all of them. As it is known, Uşak is in a climate region with continental climate conditions in our country and it is expected that the buildings to be built here will be oriented towards the south, which receives the most sunlight during the day. When we look at the specifications of a competition held in our country, where several times more energy is consumed for air conditioning purposes than in cold Northern European countries and where it was decided to use nuclear technology to provide

energy, unfortunately, no provisions were written regarding sustainability, and sustainability was not included as a criterion (although there are provisions on these issues in the regulation issued on energy efficiency



Figure 2. 1st PRIZE (URL-3).



Figure 3. 2nd PRIZE (URL-3).



Figure 4. 3rd PRIZE (URL-3).

4. Impact of Other Organizations on The Process of Obtaining A Sustainable Building

4.1. Project Competitions for Completed or Ongoing Buildings

4.1.1. National Architecture Exhibition and Awards

The National Architecture Exhibition and Awards Program is known as the first institutional initiative established with the aim of developing the profession and culture of architecture in Turkey. The first awards were given by the Chamber of Architects in 1988, on the 400th anniversary of Mimar Sinan's death. The program, which is held every two years, has so far had 2605 works submitted in 18 periods, and 157 works and 60 individuals or organizations were awarded in various branches. The organization:

- Mimar Sinan Grand Prize
 - Achievement Awards
 - Construction Branch
 - Structure
 - Construction-Conservation
 - Construction-Environment (Public Space Design)
 - Architectural Project Branch
 - Project
 - Project-Conservation
 - Project-Environment (Public Space Design)
 - Idea Presentation Branch
 - Contribution to Architecture Branch
- gives awards in the branches.

The organization describes the criteria it bases its awards on as the labour behind the architectural design, awareness of world standards, care for implementation, environmental sensitivity, attention to historical continuity, resistance to populist tendencies and significant creative effort (URL-4

4.1.2. Archisections Green & Blue International Project Competition

The Archisections Green & Blue International Project Competition, which aims to raise awareness about sustainability and ecological approaches in architecture and urban scale, was organized by the World Architecture Community in 2018. The aim of the Project Competition is explained as raising awareness about sustainability and ecological approaches in architecture

and urban scale with the participation of projects that have combined design excellence with sustainability principles. The competition is aimed to be a platform where projects built or under construction in Turkey or abroad compete and are awarded.

4.1.3. Best Sustainable Practices Competition

In 2019, Ankara University, Gazi University, Texas Tech University, Texas A&M Commerce University consortium, American Institute of Architects (AIA Dallas) and US Green Building Council (USGBC) organized the 4th International Sustainable Buildings Symposium in collaboration. The Best Sustainable Practices Competition was participated in the area of Sustainable Building - Housing Sustainable Building - Office Building - Shopping Mall, Building - Healthcare Facility, Building - Educational Facility, Building Materials, Facility Management, Real Estate Development, Energy, Urban Design, Urban Transformation, City Technologies, City, Environment, Future, Social Responsibility, Agriculture, Landscape projects, which was completed or under construction only within the borders of Turkey participated.

4.2. Sustainability Themed Architectural Project Idea Competitions for Students

4.2.1. Design the Sustainable Future Competition

Organized by **Rönesans Holding**, the Design the Sustainable Future Competition, which directs students studying architecture and engineering to think about the concept of ‘sustainability’ and develop projects, awards are given in the fields o

- Architectural Project Idea Competition
- Social Sustainability

The competition, which has been announced with a different theme every year since 2014, aims to bring different disciplines together by directing students to develop projects on the concept of sustainability.

4.2.2. ÇEDBİK Sustainability Idea Competition

The architectural project competition organized by the Environmentally Friendly Green Buildings Association since 2020 in order to encourage sustainable, innovative ideas and solutions can be participated by undergraduate

and graduate students studying at the Faculties of Architecture, Engineering, Design and Art in Turkey and abroad.

The competition, which is announced every year with the themes such as ecological village settlement, innovative steps in sustainability, designing transformation, sustainable living space design, is evaluated according to criteria such as compliance with sustainability principles, taking into account energy conservation and efficiency, sufficient use of natural resources, utilization of sustainable materials and techniques, etc.

4.2.3 Energy Efficient Building Design Competition

In 2016, the Energy Efficient Building Design Competition was organized by the Ministry of Environment and Urbanization and is open to the participation of undergraduate and/or graduate students of Turkish Republic or foreign nationals studying Architecture, Civil Engineering, Mechanical Engineering, Electrical Engineering, Electrical-Electronic Engineering at Turkish Universities. The competition was organized within the scope of the “**Increasing Energy Efficiency in Buildings in Turkey**” technical assistance project financed by the European Union and the Republic of Turkey. It is stated that the project competition aims to increase the awareness of university students about energy efficiency.

4.2.4 Rüzgarev Architectural Design Project Competition

Borusan EnBW Energy Investment and Production Inc. Rüzgarev Architectural Design Project Competition aimed to design control buildings, which are structures where the facility production/consumption in wind power plants (RES) is managed, and it was requested that they be prepared based on the relevant specifications of the Turkish Electricity Transmission Inc. (TEİAŞ). It was stated that there was limited participation in the competition and that students from the Faculty of Architecture of Istanbul Technical University were included. According to the specifications, Control Buildings

- Implementing world-class architectural solutions using innovative and environmentally friendly architectural techniques and trends,
- Being compatible with the natural environment,
- Offering solutions that will reduce the carbon footprint
- Making maximum use of solar energy and daylight,

- Offering solutions for water supply and grey water treatment
- Changing solid waste management solutions,
- Using materials and production techniques to reduce initial investment costs,
- Providing ease of construction and shortening construction time by using new construction methods,
- Reducing health, safety, environment (HSE) risks,
- Offering an optimum design solution that will increase employee turnover rates.

4.3. Architectural Project Idea Competitions Organized by Public Institutions

Recently, there have been very few architectural project competitions that have remained at the level of ideas by various public institutions working on energy and building construction.

- The Energy Information and Technology Management Center (EBITEM) within the General Directorate of Electrical Power Resources Surveying Administration campus, which was opened in 2011 and later canceled, and
- The Public Building Design Idea Competition organized by the Bank of Provinces in 2018

4.3.1. Energy Information and Technology Management Centre Architectural Project Competition

In the EBITEM project competition specifications, it is emphasized that the purpose of the EBITEM building should be perceived as a research environment for energy and environmental sensitivities, a process open to testing new technologies and values, an environment where the culture of “sustainability” in every area of life is represented and a model for new generation institutional structures, in addition to its own functional expectations. It is stated that the EBITEM building is expected to meet the program expectations, as well as being a structure that targets the efficient use of energy and energy resources, uses renewable energy resources, has contemporary technological opportunities, is in compliance with sustainable and integrated design principles, and in this sense, provides multidimensional feedback to its users, the architecture and engineering environment (URL-5). However, the competition was canceled as a result of the new regulation made by the Ministry of Energy.

4.3.2. Public Building Design Idea Competition

The purpose of the competition is to obtain designs that are based on sustainability in public buildings, **environmentally sensitive, prioritize energy efficiency, comply with the local architectural approach, encourage the use of local materials, associated with the immediate environment, accessible, economical and innovative**. The competition specifications state that the main elements of sustainable architecture are **environmental sensitivity, energy efficiency, consideration of all natural conditions specific to the location, compliance with social and cultural structure, architectural identity, use of local materials, economical solutions and permanence**. Participants are expected to develop original and innovative architectural proposals during the design phase for public buildings planned to be built in 12 cities selected from different geographical regions in line with the main elements of sustainable architecture.

5. Conclusion

According to the research conducted within the scope of the article, only 4 of the 39 architectural project competitions⁸ organized between 2014 and 2024

- 8 Antalya Muratpaşa Belediyesi Çok Amaçlı Gösteri Merkezi Atölye ve Sahnesi 2015
- Bodrum Ticaret Odası Yeni Hizmet Binası Bölgesel Mimari Proje Yarışması 2015
- Tekirdağ Su ve Kanalizasyon İdaresi Genel Müdürlüğü (TESKİ) Hizmet Binası 2015
- TESKİ hizmet binasının tasarlanması için açılan yarışma 2015
- Özel Alman Lisesi Ek Yapıları Mimari Proje Yarışması 2015
- Beylikdüzü Belediyesi Cemevi, Kültür Merkezi ve Çevresi Ulusal Mimari Proje Yarışması 2015
- Beylikdüzü Belediyesi Yaşam Vadisi, Köprü ve Bağlantıları Yarışması 2015
- Antalya Kepez Belediyesi Odak Yapı Mimari ve Çevre Düzenleme Fikir Projesi Yarışması 2015
- Bornova Belediye Binası ve Çevresi Mimari Proje Yarışması 2015
- Büyükkada Çarşı Camii Mimari Fikir Projesi Yarışması 2015
- İzmir Konak Belediyesi Hizmet Binası ve Yakın Çevresinin Düzenlenmesi 2015
- Lüleburgaz Belediyesi Lüleburgaz Yıldızları Kadın Akademisi 2015
- Tekirdağ Büyükşehir Belediye Hizmet Binası, Meydan ve Çevresinin Düzenlenmesi 2015
- Efeler Belediyesi Hizmet Binası Mimari Proje Yarışması 2016
- İnegöl Belediyesi Hizmet Binası Mimari Proje Yarışması 2016
- Van İpekyolu Belediye Merkezi Mimari Proje Yarışması 2016
- Merzifon Belediyesi İş ve Yaşam Merkezi Mimari Proje Yarışması 2017
- Süleymanpaşa Belediye Hizmet Binası Ulusal Mimari Proje Yarışması 2017
- Tekirdağ Büyükşehir Belediye Hizmet Binası 2015
- Elazığ Belediyesi Kent Meydanı Kentsel Tasarım ve Mimari Proje Yarışması 2017
- Enerji Verimli Bina Tasarım Yarışması, Çevre ve Şehircilik Bakanlığı 2017
- Bursa Osmangazi Belediyesi Çekirge Meydanı Mimari, Kentsel Tasarım ve Peyzaj Tasarımı Proje Yarışması 2017
- Çanakkale Belediyesi Çarşı, Yaşam Merkezi ve Otopark ile Yakın Çevresi Ulusal Mimari Proje Yarışması 2018

were based on the theme of sustainability. One of the 4 competitions organized by public institutions at the idea level was cancelled.

In our country, where the culture of building with architectural projects by public institutions has not been established much except for the projects of municipal service buildings, the Green Local Government and Cultural Centre Building and Its Immediate Surroundings opened by Çanakkale Municipality and the İzmir Sustainability Center Building Architectural Project Competition opened by İzmir Metropolitan Municipality are the only examples in our Republic's history where sustainability has been taken as a basis.

In addition, the sustainability-themed competitions organized by Rönesans Holding and ÇEDBİK every year for architecture students are promising for the future.

Architectural project competitions opened in Turkey should be created with mandatory criteria that will bring awareness about sustainability or ecological design, and this should be internalized as a building culture by all actors of the construction sector, as required by the country's interests and the ecological balance in our world.

For this purpose, the institution organizing the competition should be highlighted the awareness and willingness of the jury and the competitors with a mechanism based on objective criteria

With the arrangements to be made in the competition regulations, as in the example of jury selection, the production of sustainable buildings should be guaranteed for our future generations. Because while vital effects such as the sharp increase in carbon emissions caused by buildings in decades and the increase in global temperatures by a few degrees compared to the beginning of

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- Archisections Yeşil & Mavi Uluslararası Proje Yarışması 2018
 - Kamu Binaları Tasarımı Fikir Yarışması, İller Bankası 2018
 - İTÜ İşletme Fakültesi Mimari Proje Yarışması 2019
 - En İyi Sürdürülebilir Uygulamalar Yarışması 2019
 - Bursa Atatürk Spor Salonu Mimari Proje Yarışması 2020
 - Yöresel Mimariye Uygun Konut Projesi Yarışması nisan 2021
 - Ulus Modern Kültür ve Sanat Merkezi Ulusal Mimarlık Yarışması 2021
 - Baykar IHA Araştırma ve Geliştirme Merkezi Mimari Proje Yarışması 2021
 - Sosyal Merkezler Mimari Proje Yarışması 2021
 - Gebze Hükümet Konağı Ön Seçimli Ulusal Mimari Proje Yarışması 2022
 - Konya Alaeddin Tepesi II. Kılıçarslan Köşkü ve Kazı Alanı Mimari Fikir Proje Yarışması 2022
 - İzmir Ekonomi Üniversitesi Güzelbahçe Yerleşkesi Mimari Proje Yarışması 2022
 - Tarsus Şelalesi Turizm Tesisleri Mimari Proje Yarışması 2022
 - SİNPAŞ 50. Yıl Mimari Fikir Projesi Yarışması "Geleceğin için Tasarla" 2022
 - İzmir Sürdürülebilirlik Merkezi (S-Hub) Mimari Proje Yarışması 2023
 - Bodrum Sağlık Vakfı Fizyoterapi ve Hidroterapi Merkezi Ulusal Mimari Proje Yarışması 2024

the century are known with objective data, it is a great contradiction in the name of science and humanity that architectural designs that will require more fossil fuel consumption are still declared as generally correct in competitions.

Kahvecioğlu suggests that an alternative housing competition be organized for TOKİ (the institution most criticized for not using local data, especially climatic data, in Turkey) and that traditional thematic competitions be held every year with an application similar to the National Architecture Exhibition and Awards (Kahvecioğlu, 2010).

The jury members responsible for project competitions decide, in a sense, which structures will be the signatures of that period with the choices they make in our country's architectural world. To ensure that ecological concerns are included in the evaluations of architectural project jury members with objective-measurable criteria, there must be an expert in the field of sustainable architectural design in the jury.

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CHAPTER V

AN INVESTIGATION ON THE RELATIONSHIP BETWEEN SMART DISASTER MANAGEMENT, SMART CITIES AND SUSTAINABILITY

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1. Introduction

Disasters, either natural or human-induced, pose significant threats to communities, economies, and ecosystems worldwide. From hurricanes and earthquakes to wildfires and industrial accidents, the frequency and intensity of these events have been exacerbated by climate change, rapid urbanization, and global interconnectivity. Managing such crises demands robust, scalable, and adaptive solutions that can minimize loss of life and property while ensuring effective resource allocation and decision-making. As urbanization accelerates and cities become the primary hubs for economic, social, and cultural activities, the challenges of disaster management have grown increasingly complex. With the majority of the global population now residing in urban areas, disasters, whether natural or anthropogenic, pose heightened risks to densely populated regions, critical infrastructure, and interconnected supply chains. Traditional disaster management frameworks often rely on reactive measures, are increasingly inadequate in addressing the complex and dynamic challenges of modern disasters and no longer sufficient to address the multifaceted vulnerabilities of modern cities.

In this context, the concept of smart cities has emerged as a transformative framework for urban planning and governance. Smart cities, with their focus on technology integration and sustainability, present a promising framework for

addressing the challenges. Smart cities leverage advanced technologies such as Internet of Things (IoT), artificial intelligence (AI), big data analytics, and digital communication networks to enhance operational efficiency, improve quality of life, and promote sustainability. These same technologies can play a pivotal role in advancing disaster management systems, enabling cities to anticipate, respond to, and recover from disasters more effectively. In recent years, advancements in digital technologies have paved the way for the emergence of smart disaster management, a paradigm that integrates real-time data analytics, artificial intelligence (AI), Internet of Things (IoT), and advanced communication networks. These technologies enable proactive, predictive, and collaborative approaches to disaster preparedness, response, recovery, and mitigation. By leveraging the power of smart systems, stakeholders can achieve enhanced situational awareness, optimized resource distribution, and faster response times, ultimately improving resilience at individual, organizational, and societal levels.

A key aspect of integrating smart disaster management into smart cities is its alignment with sustainable approaches. By focusing on resilience and adaptability, smart cities aim to minimize the environmental footprint of disaster response while maximizing resource efficiency and community engagement. Strategies such as using renewable energy for emergency power, deploying sensor networks for real-time monitoring, and incorporating green infrastructure for natural hazard mitigation exemplify how smart and sustainable principles intersect.

This study explores the peculiar nature of smart disaster management, focusing on its key aspects, challenges, and potential impacts; while examining the relationship between smart cities and disaster management and emphasizing the importance and effect of sustainability in designing future-ready urban systems. It also investigates the concept of smart disaster management within the context of smart cities, examining how advanced technologies and sustainable approaches can enhance urban resilience and disaster preparedness, by highlighting case studies that demonstrate the effectiveness of smart systems in real-world disaster scenarios. By synthesizing current research and identifying future directions, this study aims to contribute to the growing discourse on harnessing technology for sustainable and inclusive disaster resilience.

2. Understanding Smart Cities

The increasing pace of urbanization, with 66% of the global population projected to live in urban areas by 2050 (United Nations, 2015), has escalated the

operate at the intersection of energy, transport, and ICT—areas that have received the majority of EU funding under the Horizon 2020 program for smart cities and communities. The goal is to foster smart economy, mobility, environment, people, living, and governance (IEEE, 2014). The smart city concept builds on past efforts to measure environmentally friendly and liveable cities by incorporating sustainability and quality of life principles, with the crucial addition of advanced technological and informational components (Ahvenniemi et al., 2017). Key characteristics of smart cities are illustrated in Figure 2.

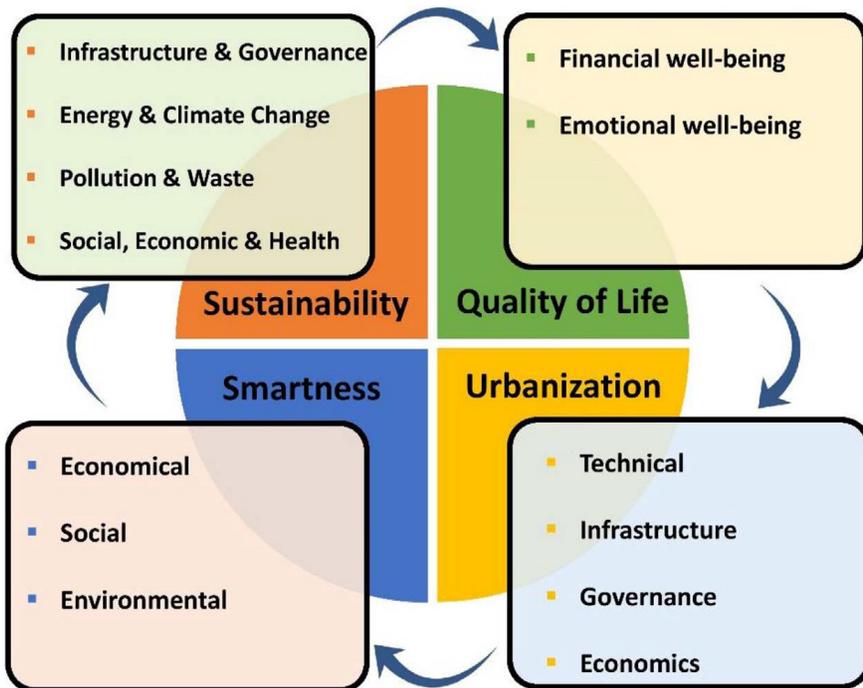


Figure 2: Fundamental characteristics of a smart city

Reference: Silva et al., 2018

The literature which highlights the use of information and communication technologies (ICT) and modern technologies as a key to a smart city is extensive (Ahvenniemi et al., 2017). A smart city employs ICT to improve urban operations, enhance citizen well-being, and foster sustainability. Key components include smart governance, smart mobility, smart energy, and smart living (Harrison & Donnelly, 2011). While technology-driven approaches dominate the discussion, people-oriented strategies emphasizing inclusion, equity, and quality of life are equally vital (Lombardi et al., 2011).

The practical implementation of smart cities faces significant challenges at every stage—design, implementation, and operation. Key obstacles include high design and operational costs, device heterogeneity, massive data collection and analysis requirements, concerns about information security, and ensuring sustainability. Smart cities aim to achieve sustainability by integrating environmental, social, and economic dimensions. However, the assessment of smart cities often focuses more on social and economic indicators, with environmental considerations receiving comparatively less attention (Ahvenniemi et al., 2017).

3. Sustainability Challenges in Smart Cities

There is a growing need to better understand the relationship between the concepts of smart and sustainable cities. While earlier discussions focused on the sustainability of cities, recent years have seen increased interest in how sustainability goals can be achieved through the use of smart technologies, leading to the rising popularity of the smart city concept (Ahvenniemi et al., 2017). The concept of sustainability is foundational to the success of smart cities, yet significant challenges remain in achieving it. Sustainability in smart cities encompasses environmental, social, and economic dimensions, but balancing these elements is often a complex task to accomplish (Silva et al., 2018).

(1) **Environmental Sustainability:** Smart cities face difficulties in reducing their ecological footprints. High energy consumption, waste production, and greenhouse gas emissions remain major concerns. While technologies like renewable energy systems and efficient waste management infrastructures help mitigate these issues, the integration of such solutions often lags due to high costs and limited implementation capacities.

(2) **Social Sustainability:** Ensuring inclusivity and equity is another critical challenge. Smart cities often prioritize technological advancements over social inclusivity, leading to digital divides and unequal access to resources. Bridging this gap requires deliberate policies and community engagement strategies that prioritize marginalized groups.

(3) **Economic Sustainability:** Financial constraints pose a significant barrier to sustainable development. The initial costs of implementing smart technologies are high, and maintaining these systems demands continuous

investment. Furthermore, economic sustainability also entails creating employment opportunities and fostering local economies, which necessitates tailored approaches for different urban contexts

4. The Necessity of Disaster Management

Key low-carbon concepts for smart cities include clean energy-powered public transportation, solar-powered streetlights, and green buildings. However, for a city to truly qualify as “smart,” it must also address disaster impacts. Without a comprehensive disaster strategy, a smart city would fall short of its purpose. Safety is a prerequisite for smartness (URL-1). Disaster risk reduction is a critical component of urban management. A smart city must prioritize safety by incorporating robust systems for disaster response, sensing, prevention, information, and management (URL-2).

A disaster is typically defined as a disruption in the normal functioning of a community that significantly impacts people, their livelihoods, and the environment, exceeding the community’s capacity to respond using its own resources (United Nations, 1992). Disasters can result from natural events or human activities, with urban areas being particularly vulnerable due to their density and complexity. Natural disasters such as floods, earthquakes, and cyclones pose significant risks to cities. According to the United Nations, approximately 60% of the global population lives in cities at risk of experiencing at least one major natural disaster, and nearly three out of five cities worldwide face high disaster risk (URL-3; URL-4). The intricate and interconnected urban systems—transportation, water supply, sanitation, and housing—make cities especially susceptible to the devastating effects of such events.

Disasters not only have devastating impacts on socio-economic factors, the built environment, and infrastructure, but also create challenging, variable, uncertain, complex, and ambiguous processes to manage. Developing an appropriate disaster management strategy is a critical need for governments. Disasters place an excessive burden on the logistical and organizational factors of the affected country. Therefore, traditional management methods may not be effective all the time. For this reason, it is crucial for disaster management practitioners to adopt contemporary, rapid, precise, and more effective methods to establish successful humanitarian aid and disaster relief processes. Consequently, disaster management is a cornerstone of a safe, sustainable and smart city.

Disaster management encompasses four key phases as (Chandraprakaikul, 2010):

- (1) Preparedness: Developing plans to save lives, minimize damage, and enhance response capabilities.
- (2) Mitigation: Implementing measures to prevent or reduce the impact of disasters.
- (3) Response: Addressing immediate needs during and after disasters.
- (4) Recovery: Restoring affected communities and rebuilding infrastructure.

The preparation phase requires proactive approaches, while others necessitate reactive approaches. In the pre-disaster phase, prevention and preparation efforts should be addressed within the scope of strategic planning. During the disaster phase, agile principles should be considered as response activities are carried out, because short-term project management, flexibility, and regularity are the most critical aspects in this process. In the post-disaster phase, recovery and (if necessary) resettlement activities take precedence as the primary actions, replacing their predecessors.

5. Smart Disaster Management

Smart disaster management refers to the use of innovative technologies such as artificial intelligence (AI), Internet of Things (IoT), big data, and real-time communication networks to enhance the four phases of disaster management: mitigation, preparedness, response, and recovery. It focuses on leveraging data-driven insights to make proactive decisions and optimize resource allocation during crises. As seen in Figure 3, a proper disaster management system should have some fundamental services.



Figure 3: Fundamental service requirements of disaster management systems

Reference: Arepalli et al., 2019

Management of the information plays a crucial part on disaster management and ICT is essential for disaster management, as accurate and timely information is critical during the various phases of the disaster lifecycle, given the unpredictable nature of disasters. The information enables authorities, leaders, and expert stakeholders to evaluate the situation, make informed decisions, and provide directives to operational teams. In the field of emergency response, information exchange is inherently diverse and complex. Furthermore, stakeholders are often required to make life-or-death decisions based on information that may be incomplete, imprecise, or constantly changing (Asimakopoulou and Bessis, 2011). The relationship of information and disaster management can be seen on Figure 4.

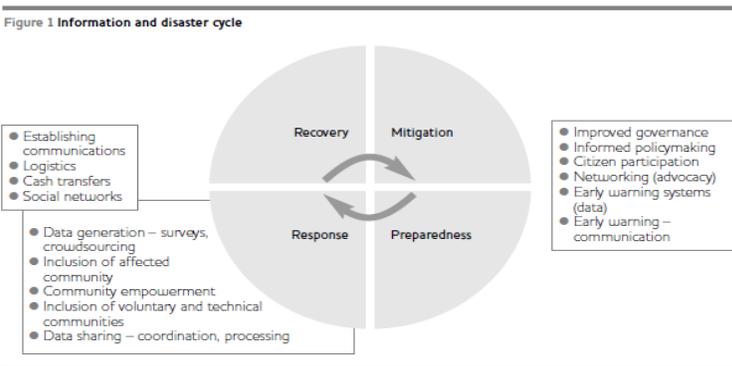


Figure 4: Information and disasters

Reference: Scott and Batchelor, 2013

Smart cities integrate technological systems into urban infrastructure to improve efficiency and resilience. Features such as sensor networks for environmental monitoring, automated emergency alerts, and predictive modelling allow for better disaster management (Cheng et al, 2020). Moreover, smart city initiatives often emphasize sustainability, ensuring that disaster management strategies align with long-term environmental goals. Some of the key technologies in smart disaster management are:

(1) Internet of Things (IoT): IoT devices, such as sensors and connected cameras, play a critical role in monitoring environmental conditions and detecting early signs of disasters. For example, seismic sensors can detect tremors and send real-time alerts to emergency response teams.

(2) Artificial Intelligence and Machine Learning: AI and machine learning algorithms analyse large datasets to predict disaster patterns and optimize response strategies. For instance, AI-driven models can forecast the trajectory of hurricanes or assess the structural integrity of buildings after an earthquake.

(3) Big Data Analytics: Big data enables the analysis of diverse datasets, such as weather forecasts, social media feeds, and historical disaster records, to inform decision-making processes. This approach supports real-time situational awareness and adaptive planning.

(4) Geographic Information Systems (GIS): GIS tools are instrumental in mapping disaster-prone areas, visualizing evacuation routes, and managing logistics during emergencies. GIS-based platforms also facilitate community engagement by providing accessible risk information.

6. Integration of Disaster Management and Smart Cities

While it may not be possible to completely prevent a disaster, taking proactive measures to establish an efficient framework for data dissemination and organization can significantly mitigate the impact. Smart city databases can play a key role in facilitating effective communication between various stakeholders during emergencies. When disaster management must be integrated into an existing city, preparedness activities may have a more limited scope. Consequently, response efforts become the top priority in such scenarios. Conversely, in the case of a newly planned city, the most advanced disaster management techniques can be incorporated from the initial planning phase. This allows for the development of a fully integrated Smart disaster management system right from its inception. (Arepalli et al., 2019). Smart cities provide an integrated platform for sustainable disaster management. Technologies like

AI, IoT, and block-chain enable real-time monitoring, predictive analytics, and transparent resource allocation as: (1) IoT Sensors: Used for early detection of seismic activities or flooding, providing critical time for evacuation, (2) AI Algorithms: Analyse large datasets to predict disaster hotspots, optimize resource distribution, and improve emergency response, and (3) Block-chain: Ensures accountability in disaster relief by securely tracking aid distribution. Integrating disaster management into smart city frameworks is critical to ensuring resilience, safety, and sustainability. Some of the major aspects on this integration issue are:

(1) Leveraging ICT for disaster resilience: ICT plays a pivotal role in disaster management within smart cities. Advanced technologies such as big data, artificial intelligence, and IoT enable real-time data collection, analysis, and dissemination (Silva et al., 2018). These capabilities enhance situational awareness, decision-making, and coordination among stakeholders. For instance, systems like Japan's J-Alert utilize seismometers and predictive algorithms to provide early warnings for earthquakes, enabling timely evacuation and mitigation measures (Harrison & Williams, 2016). Similarly, platforms like Ushahidi crowdsource disaster-related data to inform response efforts effectively.

(2) Smart sensors and predictive analytics: Smart sensors integrated into urban infrastructure can monitor environmental conditions and detect anomalies. These sensors can alert authorities to potential hazards, such as blocked storm drains causing flash floods. Predictive analytics further aid in prioritizing resources by identifying high-risk areas and populations (Lim et al., 2018).

(3) Enhanced communication systems: Effective communication is crucial during disasters. Smart cities employ mobile networks, social media platforms, and emergency alert systems to disseminate information rapidly. For example, the Cell Broadcast Service in Japan ensures that critical messages reach all mobile phone users in real time (Harrison & Williams, 2016).

In disaster management, the top priority is to ensure that city residents receive timely information about the disaster and clear guidance on actions to safeguard their safety. Early alerts and organized evacuation instructions can help to reduce panic, ultimately protecting more lives and property. During disasters, people seek timely updates, a desire to assist, and ways to stay connected with others. Technology plays a pivotal role in saving lives by enabling faster, more efficient and comprehensive communication and collaboration (URL-5).

Integrating vast amounts of data is essential for quickly and effectively acquiring the key knowledge needed for decision-making in emergency situations. Transportation and ICT are already crucial in responding to crises and reducing disruptions, as well as minimizing human and socioeconomic impacts. In the face of a natural disaster, smart cities can leverage advanced ICT infrastructure and analytical tools to improve and streamline communication among various public agencies, including transportation authorities, emergency services, energy providers, and citizens. With the support of mobile networks, a city can quickly reach the majority of its residents with urgent information (URL-6). Despite its potential, integrating disaster management into smart cities faces several challenges (Silva et al., 2018):

(1) High costs and infrastructure inequalities: Designing and deploying smart infrastructure requires significant financial investment, which may exacerbate disparities between urban and rural areas. Equitable access to technology is essential for inclusive disaster resilience.

(2) Data heterogeneity: Managing diverse datasets from various sources poses technical and logistical challenges.

(3) Cybersecurity risks, data privacy and security: The extensive use of IoT devices and data-sharing platforms raises concerns about data privacy and cybersecurity. Protecting sensitive information from cyber threats is paramount and crucial to maintaining public trust in smart disaster management systems.

(4) Stakeholder coordination: Integrating smart disaster management into urban planning requires collaboration among technologists, policymakers, and community stakeholders. Ensuring seamless collaboration among governments, private entities, and communities and fostering interdisciplinary approaches to address the challenges are essential.

(5) Sustainability concerns: Balancing technological advancements with environmental sustainability remains a persistent issue.

7. Integrating Sustainability into Smart Disaster Management

Smart cities, with their focus on technology-driven governance and efficiency, offer a robust framework to implement advanced disaster management strategies. When sustainability is incorporated into these frameworks, cities can balance immediate disaster responses with long-term environmental, social, and economic resilience. Sustainability ensures that disaster responses are environmentally sound, economically viable, and socially inclusive. For

instance, green infrastructure solutions, such as flood-absorbing parks and permeable pavements, mitigates hazards such as flooding while contributing to urban biodiversity and can simultaneously address disaster risks and environmental concerns (Kabisch et al., 2017). Disaster management strategies in smart cities must incorporate sustainability principles to ensure long-term resilience. Additionally, fostering public-private partnerships can alleviate financial constraints by distributing the costs and benefits of sustainability initiatives. Some important aspects of sustainable approaches to smart disaster management are (Kabisch et al., 2016; Jacobson et al., 2018; Hansson et al., 2020):

(1) Green infrastructure and nature-based solutions: Green infrastructure, such as wetlands and urban forests, acts as a buffer against natural hazards like floods and heatwaves. These nature-based solutions not only mitigate disaster risks but also contribute to urban sustainability. It involves using ecosystems to address disaster risks. Examples include restoring wetlands to absorb floodwaters and planting mangroves to protect coastal cities from storm surges. These solutions provide dual benefits of risk mitigation and ecological restoration

(2) Renewable energy for resilient power supply: Smart disaster management systems rely heavily on energy-intensive technologies. Incorporating renewable energy, such as solar panels, wind turbines, and battery storage systems not only provide reliable energy supply during disasters but also aligns with global carbon reduction goals. Integrating renewable energy into smart cities ensures continuity of critical services.

(3) Inclusive urban planning: Smart disaster management frameworks emphasize community participation to enhance local resilience. Crowdsourcing platforms and citizen science initiatives enable residents to report hazards and contribute to data collection, fostering a sense of collective responsibility. Disaster management plans must also address the needs of vulnerable populations, such as low-income residents and individuals with disabilities. Community-driven approaches, supported by participatory technologies, enhance the equity of disaster responses.

(4) Enhancing policy frameworks: Governments must enact policies that incentivize sustainable disaster management practices. Policies promoting resilient building codes, green technologies, and sustainable reconstruction practices are crucial for aligning disaster management with sustainability goals.

Integrating sustainability into smart disaster management bridges the gap between immediate disaster mitigation and long-term urban resilience. By embedding sustainability into the smart city paradigm, urban areas can enhance their capacity to respond to disasters while fostering ecological, social, and economic health. The relationship between smart disaster management, smart cities, and sustainability offers a transformative pathway for creating resilient and inclusive urban environments.

8. Case Studies

8.1. Earthquake Response in Japan

Japan's disaster resilience system exemplifies effective integration of technology in disaster management. By leveraging real-time data from seismometers, the system provides early warnings, enabling proactive measures such as halting trains, evacuating subways, and redirecting flights. This coordinated approach minimizes casualties and infrastructure damage (Harrison & Williams, 2016). Japan has implemented smart technologies such as AI-powered earthquake detection systems and automated tsunami warning networks. These innovations have enhanced the country's ability to respond rapidly to seismic events.

Japan's disaster resilience system integrates observation systems, data collection, analysis tools, decision-making aids, and an intelligent warning mechanism into an interoperable framework. The system utilizes seismometers to detect initial shockwaves (P-Waves) from earthquakes. These waves are analysed by computers to predict the intensity of the subsequent shockwaves (S-Waves). If the estimated magnitude exceeds a threshold of five, a warning is issued.

During the March 2011 earthquake, Japan's Ocean Bottom Observation Systems and building seismometers detected P-waves at precisely 14:46:48, while S-Waves followed at 14:47:17, providing a critical 29-second warning window. The Japan Meteorological Agency coordinated response actions within this brief timeframe. Japan's major mobile network operators used the Cell Broadcast Service System to send earthquake warnings in five languages to mobile phone users. As required by a 2007 law, all 3G phones were compatible with this service. The Japanese Broadcasting Corporation issued alerts through television broadcasts, displaying the epicentre and highlighting high-risk areas, while radio stations shared similar warnings. In Tokyo, actions aligned with

the Tokyo Metropolitan Government's plan included halting Shinkansen bullet trains, evacuating subways, suspending surgical operations, disconnecting gas, and shutting down nuclear reactors. Runways at Haneda and Narita airports were closed, and flights were redirected. Tokyo Electric Power Company prepared for power outages, prioritizing electricity supply to hospitals, power plants, traffic control centres, and key government agencies. Factories paused operations, cranes lowered materials, vehicles stopped, and emergency services heightened readiness. This coordinated emergency response system prevented derailments, protected elevated bridges, and ensured safe landings for all flights heading to Tokyo's airports.

8.2. Crowd-sourced Crisis Mapping

Platforms like Ushahidi demonstrate the power of citizen participation in disaster response. By combining crowd-sourced data with authoritative information, these platforms provide actionable insights for responders, as seen during the 2015 Nepal earthquake (Open Data Soft, 2015). Ushahidi adopts a unique approach by offering an open-source platform that enables users to crowdsource crisis information via mobile phones. This crowd-generated data is combined with open data to create maps that aid response teams. Originally developed to monitor reports of violence during Kenya's 2008 post-election crisis, the Ushahidi platform was later utilized by 4,000 volunteers to map damaged roads in Kathmandu following the Nepal earthquake in April 2015.

8.3. AI-Driven Risk Assessment by One Concern, Inc.

One Concern, Inc., employs artificial intelligence and open data to predict areas and buildings that are most likely to be affected during disasters. Their algorithm considers factors such as building structures, soil data, and population density, enabling efficient resource allocation during emergencies (Open Data Soft, 2015). This system helps save valuable time that would otherwise be spent prioritizing resources based on a surge of incoming 911 calls. The algorithm analyses how buildings have behaved in previous earthquakes and combines this with data on soil conditions, nearby water bodies, building age, recent improvements, and more. This results in a heat map highlighting buildings that are more likely to suffer damage. The program also considers the time of day and population density to help prioritize resource allocation.

8.4. Disaster Response Dashboards by Appallicious

Appallicious developed the Disaster Assessment and Assistance Dashboard (DAAD) to facilitate information and resource sharing among communities, businesses, and governments during crises. This open-data platform proved to be effective in organizing disaster response efforts in urban settings (Open Data Soft, 2015).

8.5. Flash Flooding - Smart Flood Prevention System

Creating truly resilient cities requires better-connected infrastructure designed to deliver actionable insights. For example, flash flooding often occurs when trash and debris block storm drains and sewers. If maintenance crews had access to smart sensors providing real-time alerts about such blockages, much of the water damage could be avoided. Additionally, these sensors could detect high toxin levels, preventing irreversible harm and potentially saving thousands of lives, as seen in the Flint, Michigan crisis. Therefore, the city facing frequent flooding issues has adopted smart sensor technologies to monitor and address drainage blockages. These sensors alert maintenance crews in real time, preventing urban flooding and minimizing property damage (Medium, 2015)

8.6. Smart Disaster Management in Singapore

Singapore has implemented a robust Smart Disaster Management System as part of its Smart Nation initiative. Leveraging advanced technology and data-driven solutions, the city enhances its ability to monitor, respond to, and mitigate disasters. For an example, Singapore's smart city initiatives include an advanced flood monitoring system that uses IoT sensors and predictive analytics to manage urban drainage systems effectively. The system has significantly reduced flood risks in low-lying areas

8.7. A Geographic Approach to Identify Information on Flood Events

Albuquerque et al. (2015) proposed a method to enhance the identification of relevant social media messages by analysing the relationships between georeferenced social media data and geographic characteristics of flood events. This method integrates authoritative data, including sensor data, hydrological information, and digital elevation models. The approach was applied to analyse Twitter messages during the River Elbe Flood in Germany in June 2013. Statistical analysis revealed spatial patterns in flood-related tweets, showing that

tweets originating from areas within 10 km of severely flooded zones were more likely to reference the flood. This geographic method provides a reliable means of assessing the relevance of social media messages, offering valuable insights for disaster management in both emergency response and proactive monitoring.

8.8. An Emergency Management Platform for Smart Public Safety

Bartoli et al. (2015) introduced an efficient smart public safety platform designed to involve both professional operators and citizens, aligning with the smart city paradigm. The platform focuses on monitoring, forecasting, and managing emergencies related to environmental disasters. It incorporates multiple elements, such as smart data collection and analysis systems, advanced communication tools, wireless sensor networks, and social networks. These components collaborate autonomously to enhance system efficiency and minimize human intervention.

9. Conclusion and Recommendations

This study gave an insight into the concept of smart disaster management in various aspects. Not only investigated its relationship between smart cities in a sustainability concern, but also presented some case studies that demonstrate the effectiveness of smart systems in real-world disaster scenarios. According to the investigation; disaster management is a critical component of smart city development, ensuring urban safety and resilience. By leveraging ICT, predictive analytics, and community engagement, smart cities can mitigate the impacts of disasters and enhance quality of life. While challenges persist, collaborative efforts and innovative approaches, which integrate these strategies within smart cities, highlights the transformative potential in creating safer and more sustainable urban environments

Smart disaster management concept represents a paradigm shift in addressing urban vulnerabilities to disasters. By combining advanced technologies with sustainable practices, cities can enhance resilience while promoting environmental benefits. Based on the examinations, recommendations for future implementation on this topic are: (1) integrating disaster management in urban planning and incorporating disaster resilience strategies into the design of new smart cities and retrofitting of existing ones, (2) investing in technology and prioritizing funding for innovative technologies such as AI, IoT, and big data analytics tailored for disaster management, (3) enhancing public awareness by educating citizens on disaster preparedness and fostering community

engagement, (4) fostering global collaboration by sharing best practices, technologies, and expertise across cities worldwide to improve disaster management capabilities, and (5) developing robust policies and establishing clear guidelines and frameworks for integrating disaster management into smart city ecosystems.

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CHAPTER VI

BIOPHILIC URBANISM APPROACH: ANY DEBATE FOR APPLICABILITY ON TURKISH CITIES

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1. Introduction

This review research study on applications within the framework of the Biophilic Urbanism approach analyzes examples that have been implemented as well as studies that remain at the project stage. The study also provides suggestions on how to apply it to developing enclosed gated communities in the city of Kayseri, with a focus on its applicability in Turkish cities. In this context, the study is related to Sustainable Development Goal 11, which focuses on Sustainable Cities and Communities and aims to create quality living environments through Biophilic Urbanism and design, ensuring that people feel good physically, mentally and emotionally.

1.1. Importance of the Topic and Its Original Value

The research topic of biophilic design and urbanism aims to develop the network of relationships that should exist between humans and other living beings by integrating natural elements into the built environment with minimal intervention. A review of the literature reveals that examples of this approach are primarily found in areas where natural habitats are preserved and urban service areas, such as educational and healthcare facilities, are established and utilized. Essentially, one of the fundamental planning principles is that such examples are located in regions where the functional and density-based sustainability of natural green areas spanning the entire city is ensured and utilized. Thus,

a planning system is structured from the macro to the micro scale, ensuring a balance between the built and natural environments in response to the pressures exerted by the urban population. Most importantly, investment decisions driven by economic priorities should not exceed the city's carrying capacity. Additionally, protecting natural areas within cities has become essential for enhancing the city's resilience to natural disasters.

The study will be conducted on housing and communities that meet the human need for shelter. It will be evaluated not only at the level of individual structures but also within the context of housing communities, drawing on the experience gained from the gated communities that have become dominant worldwide since the 1980s, as well as the new dimensions of spatial organization that have emerged with the adoption of this design approach. In a context where environmental sustainability has gained prominence alongside economic development and growth processes, the traditional planning approach in Turkish cities should be replaced by the implementation of the biophilic urbanism approach. Therefore, Kayseri has been chosen as the metropolitan city for this study due to its rapid economic growth and increasing population in recent years. It has been observed that a significant number of gated communities have developed rapidly in the city since the early 2000s, driven by key criteria such as "privilege, prestige and security," similar to global examples. Accordingly, the application of the biophilic design approach and method in the designated areas of Kayseri from a holistic perspective is expected to offer definitive and applicable solutions for new typologies of housing and living environments.

Modern metropolises around the world are grappling with various economic, social and environmental issues, including unemployment, migration and refugee-related crises and poverty. In response, international organizations, governments and civil society groups are working together to develop and implement innovative solutions for these multifaceted challenges. The United Nations Millennium Development Goals represent a notable example of such collaborative efforts, aiming to address global poverty, hunger, disease, illiteracy, environmental degradation and discrimination.

However, human-centered and unlimited economic growth has had a detrimental impact on urban environments. As economic development accelerates, natural, historical and cultural heritage sites are increasingly threatened and unsustainable planning practices have become more widespread. This is particularly evident in developing countries, where planning regulations are often inadequate or absent, resulting in rapid and uncontrolled urbanization.

To address these issues, a biocentric approach that prioritizes the well-being of all living beings is gaining traction. This approach emphasizes the interconnectedness of humans and nature and advocates for a more holistic and sustainable approach to urban planning.

The fundamental goal of urban planning is to proactively identify and address problems, develop viable solutions and engage the public in decision-making processes. Although the concept of sustainability emerged in the 1970s, its importance has grown significantly in recent decades. Nevertheless, balancing economic growth with environmental protection and social equity continues to pose a significant challenge

Since the 1980s, with globalization, cities have become increasingly important and competition between cities has intensified. This has led to the emergence of concepts such as branded cities, green cities and biophilic cities. However, as the focus on human-centric conservation and utilization has strained the Earth's carrying capacity, the need for a biophilic design approach has become essential. Recent global events, such as pandemics, ecological crises and climate change, manifested through natural disasters such as earthquakes, floods and wildfires, have underscored the crucial importance of nature. Consequently, there is an increasing demand for a paradigm shift from traditional planning approaches to proactive and preventive planning centered around nature. This has also necessitated a focus on disaster risk reduction.

The Anthropocene era has rekindled interest in nature and prompted the search for new ways of living. Biophilic design, which aims to create spaces that connect people with nature, has emerged as a key approach at both the architectural and urban scales. The Biophilic Cities Network, largely based in the United States, has facilitated collaboration among cities dedicated to integrating biophilic principles into their urban planning. By exchanging experiences and best practices, these cities are working towards improving quality of life and achieving their sustainability goals (URL1).

1.2. Objectives and Goals, Application Examples

The study aims to create livable, sustainable and high-quality living spaces by implementing biophilic urbanism and design principles as an alternative to current planning and architectural practices that often lead to substandard built environments. Prioritizing the quality and preservation of green spaces, irrespective of a city's size or population, is essential. Using natural elements as the primary design metaphor and creating healthy, integrated living environments

are core principles. This approach minimizes urban degradation, enhances human health and eliminates pathogens and toxic substances.

Inspired by successful examples of biophilic urbanism from around the world, the study will incorporate green strategies at the urban level, such as green belts, green corridors and green wedges, integrated with new transportation and accessibility modes, such as cycling and walking. Additionally, revitalizing neighborhoods through the creation of community spaces within residential areas will be a central focus.

Since the 1990s, the New Urbanism movement in the United States has emphasized the creation and regeneration of public spaces, along with the harmonious coexistence with nature. These participatory approaches to projects have proven successful.

Cities in the 21st century must be green and nature-integrated, incorporating natural elements at multiple scales. Failure to do so could result in urban crises and a lack of resilience. Urban green infrastructure, such as green roofs and green walls, can transform two-dimensional urban landscapes into three-dimensional, ecologically rich environments. Green infrastructure can evolve into a comprehensive urban landscape system, offering a variety of ecosystem services.

Although large-scale urban planning initiatives are important, biophilic design principles can also be applied to individual buildings, such as educational institutions and hospitals, as demonstrated in Istanbul. Additionally, residential complexes can integrate biophilic elements to foster more sustainable and healthy living environments. It is crucial to analyze the extent to which large-scale residential projects, particularly those housing homogeneous social groups, have incorporated biophilic design principles at both the site and building levels.

Rotterdam, Netherlands, offers an exemplary model of a city that prioritizes green spaces and integrates them into its urban fabric. The key steps to achieving this vision are:

1. Analyzing existing green spaces and urban areas.
2. Mapping existing green roofs on buildings.
3. Identifying potential green areas within building blocks.
4. Assessing the city's opportunities and constraints.
5. Developing a comprehensive green vision for the city.
6. Reconnecting green spaces.
7. Creating an action plan.

By following these steps, cities can foster more sustainable, resilient and livable environments for future generations (Willemsen & Tillie, 2018, p. 1131).

Rotterdam's achievements in biophilic urbanism can serve as an inspiration for other cities. The city has adapted to living with water, integrated green infrastructure into the core of its urban planning and developed sustainable transportation systems. Rotterdam's experiences provide valuable lessons in combating climate change and creating sustainable cities.



Figure: 1 Green Densified Inne -City Plan (Tillie, 2018)

Bio Istanbul Example:

This concept, which is relatively new in Turkey, is being implemented for the first time as a project in Istanbul. BIO ISTANBUL, envisioned by Bio City Development (BCDCO), is part of the 'New City' project to be developed in the rapidly growing northern region of Istanbul. The project aims to be realized in collaboration with the Turkish Ministry of Environment and Urbanization, the Housing Development Administration of Turkey (TOKİ), its Subsidiary Real Estate Marketing, Construction Project Management and Trade Inc. and Bio City Development Company.

BIO-ISTANBUL aims to pioneer a new understanding of sustainable urbanism in Turkey. Targeting the highest achievable standards in sustainable

real estate projects, such as LEED Gold and BREEAM Excellent certifications, BIO-ISTANBUL also serves as a pilot project for the BREEAM Communities certification. Planned for implementation in Başakşehir under the coordination of the Ministry of Environment and Urbanization, the smart city BIO-ISTANBUL is planned to feature Turkey's most advanced children's hospital, a state-of-the-art biomedical research and development park and work and social spaces.

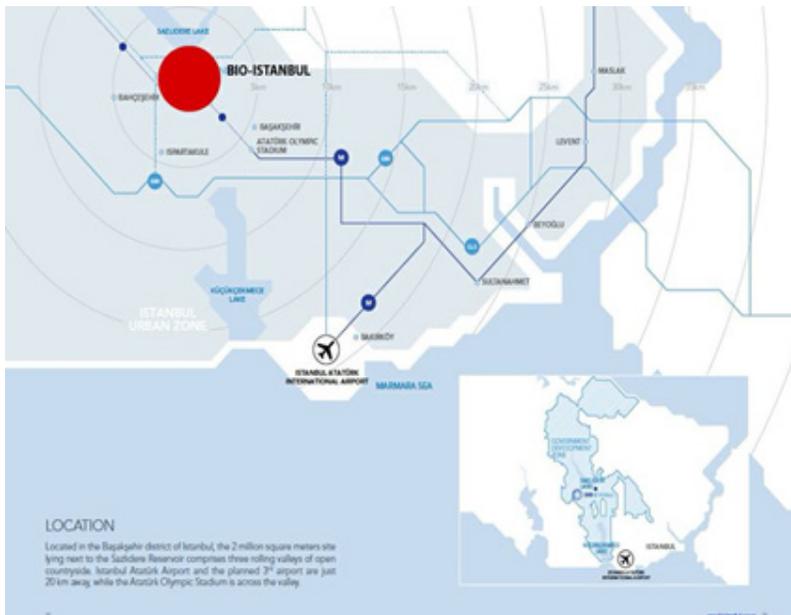


Figure 2: Bio İstanbul's Location, URL 3.

BIO-ISTANBUL, a joint venture between TOKİ subsidiary Emlak Pazarlama Proje Yönetimi (EPP) and Bio Development Company, is a \$2.2 billion investment project slated for completion within three years. It will accommodate 10,000 residents. Spanning two million square meters, divided into three valleys, BIO-ISTANBUL will allocate one million square meters as green space. BIO-ISTANBUL aims to meet the energy needs of hospitals, research centers, residences and office through solar, wind and natural gas energy, while also utilizing recycled rainwater.

Lake Homes, a residential zone within BIO-ISTANBUL, will comprise 600 units. The first phase, scheduled for completion by September 2015, will feature 150 independent units grouped around seven courtyards. The planned metro lines will offer direct access to BIO-IS ANBUL.

On the other hand, new spatial organizations are emerging that prioritize prestige, status and security, where residences are increasingly isolated from

their external environment and equipped with self-sufficient amenities and user-specific functions. These private residential enclaves, designed with specific concepts and layouts, often overlook public spaces. It is evident that even in these exclusive residential areas, biophilic design principles are being incorporated.



Figure 3: The Model Of Project, URL 3.



Figure 4: Bio-Istanbul Innovation Centre, URL 3.



Figure 5: The Neighborhood Unit And Square In The Project Content URL3.

As these examples illustrate, such approaches give rise to numerous problems. Moreover, these practices emphasize architectural design, prioritizing individual projects over comprehensive urban planning. This approach perpetuates the construction industry, maintaining its ongoing dynamism and benefiting associated sectors

However, cities are not mere physical structures; they are living entities that evolve through the actions of their inhabitants. Transforming the fabric of a city into something entirely different constitutes a significant disservice. Can transforming cities into gated communities be considered a viable solution? It is essential to question whether these settlements, detached from planning processes, can establish a sustainable architectural model that fosters social, economic and spatial change and transformation.

While these exclusive residential areas emphasize prestige, security and economic gain, they also seek to offer high-quality living standards through architectural design, technology and amenities. This approach often serves as a tool for generating additional economic value. In this context, prestige can be viewed as a socio-psychological construct.

Security, while addressing the safety concerns related to being isolated from the outside world, should not overlook the fact that this issue extends beyond the site's boundaries. The rising economic rent should be considered in tandem with the high quality of life. This way, both the space and its surroundings primarily benefit the residents while simultaneously increasing in value. The combination of land rent and special zoning rights presents a unique opportunity for real

estate investment in that area. Consequently, closed communities have emerged as a major investment vehicle, contributing to uncontrolled growth in countries such as Turkey.

In this context, planning is often reactive rather than proactive. Developments frequently outpace planning efforts. Ideally, planning should precede project development, offering a framework for rational decision-making at the spatial level. However, in practice, planning decisions often form the basis for project development, resulting in legal constraints that limit flexibility.

Avend Beytepe Project

The Avend Beytepe project in Ankara serves as a prime example of a closed residential development. This project, awarded by the World Architecture Design Organization, is distinguished by its vibrant response to the city's grayness through the integration of greenery. It is designed to offer a peaceful and serene environment, providing an escape from the hustle and bustle of urban life. The project aims to elevate the quality of life for residents, their families and guests.

The landscape design, seamlessly integrated with the existing topography, incorporates relaxation and gathering areas, children's playgrounds, green spaces and water features, providing opportunities for waterfront recreation. The project is designed to offer both active and passive recreational spaces for all age groups. Water features and relaxation zones, designed to evoke the calming effect of water for residents, are complemented by playgrounds with traditional play equipment for children, along with various social gathering spaces for young people.

Another key aspect of the landscape design is the efficient organization of vehicle circulation, ensuring easy access for residents within the complex. Open parking areas for visitors are located at the entrances to the residences. Avend Beytepe provides its residents with a lush green environment, rich in plant diversity, allowing them to experience the uninterrupted seasonal cycle.

These examples emphasize the importance of creating suitable environments and spatial solutions to promote urban health and hygiene. At the building scale, designing natural environments that foster comfort and well-being for users is crucial for both residential and commercial spaces.

The WELL Building Standard, first introduced in 2014, is a certification system that emphasizes human health and well-being throughout the design, construction and operation stages. WELL certification focuses on enhancing the mental and physical health of building occupants. While green building

certifications emphasize energy efficiency, WELL certification prioritizes human well-being and focuses on aspects related to quality of life. The Avend Beytepe project serves as a successful example of implementing biophilic design principles in both outdoor and indoor spaces (URL4).



Figure 6: Avend Beytepe Project layout plan, URL4.

In urban centers, residential forms are often dominated by high-rise buildings, especially in the city center, while lower-rise structures, such as apartment blocks, villas and single-family homes, become more common as one moves away from the city center. A common feature of these residential forms is the inclusion of recreational areas and social facilities within the complex, regardless of the land size. These spaces are designed to be luxurious and controlled, catering to a particular social group.

Kayseri Case: The Villa Community Project As A Gated Community

In Kayseri, the preference for luxury residential complexes is driven by factors such as security, a combination of rural and urban lifestyles, the ability to enjoy a luxurious lifestyle without security concerns, shared social experiences with similar social groups and the sense of exclusivity that such a lifestyle offers. Initially, features such as security, well-maintained gardens, swimming pools and sports facilities were exclusive to the wealthy. However, over time, the middle and upper-middle classes have started to demand these amenities as well, contributing to the increasing popularity of luxury residential complexes in Kayseri.

Sociological factors also play a significant role in the emergence of gated communities. The choice of location within the urban landscape is influenced by factors such as income, social class and educational background. Sociologically, certain areas of the city are preferred by specific social groups according to their income and lifestyle. This preference, combined with the accumulation of capital from the growing industrial and commercial sectors, has led to increased investment in real estate in certain areas.

Capitalist classes typically develop and build residences in the most prestigious neighborhoods of the city. Landowners, who have traditionally relied on land-based wealth, are now actively involved in housing construction projects, benefiting from rising land values. In the early stages of urban growth, areas that are not immediately converted into residential zones often remain unaffected by urban development pressures. However, as the population grows and demand for urban space increases, these areas inevitably undergo urban transformation. Although this transformation is physical, the underlying social structure often remains unchanged.

Çay Bağları, located in Kayseri, is a notable residential area renowned for its historical bağ evleri (traditional houses) and modern luxury villas. The popularity of Çay Bağları can be attributed to the following factors:

- **Preservation of Historical Character:** The presence of traditional bağ evleri enhances the area's charm, offering a unique living experience for those seeking a connection to the past.

- **Modern Luxury Living:** The development of luxury villas offers a blend of modern amenities and natural beauty.

- **Nature-Oriented Lifestyle:** The region's abundant greenery and expansive gardens provide residents with a peaceful and serene environment.

- **Proximity to the City Center:** Çay Bağları's close proximity to the city center allows residents to enjoy both urban conveniences and a peaceful suburban lifestyle.

The future of Çay Bağları looks promising. As Kayseri continues to grow, this district is set to become even more prestigious. However, preserving its historical and natural character is essential. To ensure the sustainable development of Çay Bağları, the following considerations are important:

- **Preservation of Historical Buildings:** Efforts must be made to preserve and restore the historical bağ evleri.

- **Protection of the Natural Environment:** The region's natural beauty must be preserved and new developments should be designed to minimize environmental impact.

- **Improved Infrastructure:** Enhancing transportation infrastructure, including roads and public transportation, will improve accessibility.

- **Social Amenities:** Increasing social amenities, such as parks, sports facilities and community centers, will enhance residents' quality of life.

By carefully considering these factors, Çay Bağları can remain a desirable and sustainable residential area for years to come.



Figure 7: Different villa community Project in Çaybağları, Erenköy district

Core Themes and Arguments

The provided text explores the characteristics and implications of gated communities in Turkey, with a particular focus on Kayseri and the Çay Bağları region. Key themes discussed include:

- **Status Symbol:** Gated communities are seen as a symbol of wealth and prestige, often replacing traditional bağ evleri (vineyard houses).

- **Security and Protection:** Residents seek these communities for a sense of security, shielding them from perceived urban dangers.

- **Economic Investment:** Gated communities are viewed as valuable investments, with property values expected to appreciate over time.

- **Homogeneity:** These communities tend to attract residents with similar socioeconomic backgrounds.

- **Social Isolation:** Despite offering various amenities, gated communities can lead to social isolation and the erosion of traditional neighborhood bonds.

- **Urban Planning and Design:** The text advocates for a more integrated approach to urban planning, suggesting that gated communities should be designed to be more inclusive and environmentally sustainable.

Key Arguments

- Gated communities are driven by a complex interplay of social, economic and psychological factors.

- These communities contribute to both social cohesion and segregation.
- Urban planning needs to address the challenges posed by gated communities, such as social inequality and environmental impact.
- Biophilic design principles can be applied to improve the quality of life within gated communities and integrate them more seamlessly into the urban fabric.

The text suggests that while gated communities offer certain advantages, they also raise significant concerns. To address these issues, the following recommendations are implied:

- Promote diversity within gated communities: Encourage a mix of income levels and social groups to create more inclusive communities, avoiding homogeneity and fostering social integration.
- Prioritize community engagement: Foster a sense of community within gated communities by encouraging residents to interact with one another and engage with the surrounding neighborhoods, combating isolation.
- Integrate gated communities into the urban fabric: Design these communities to be more pedestrian-friendly and well-connected to public transportation networks, reducing their sense of seclusion and improving accessibility.
- Apply biophilic design principles: Incorporate nature-based design elements, such as green spaces, natural materials and sustainable building practices, to enhance residents' well-being and create a healthier and more sustainable living environment.
- Re-evaluate urban planning policies: Develop urban planning policies that promote social equity, environmental sustainability and inclusivity, ensuring that gated communities do not exacerbate urban inequalities or environmental degradation.

1.3. Methodology

Throughout history, there has been a continuous interplay between rural and urban areas. While rural areas have traditionally served as centers of production, urban areas have primarily functioned as centers of consumption. However, with increasing urbanization and migration, urban areas have increasingly encroached upon potential development zones adjacent to rural areas.

Therefore, agricultural lands, forests and water basins must continue to serve as vital protection zones. It is essential to sustain the rural areas by preserving their unique characteristics, including local populations and traditional agricultural and livestock practices. Additionally, buffer zones between urban and rural areas should be safeguarded to prevent urban sprawl and maintain a balance between the built environment and natural landscapes.

While natural habitats must be strictly protected, there is often pressure to convert more land for urban development to meet the demands of economic growth. This trend, prevalent in many countries, conflicts with urban planning principles and biophilic design concepts.

To address these challenges, it is essential to promote sustainable agricultural practices, expand protected areas and integrate biophilic design principles into urban planning. By doing so, we can create more sustainable and resilient cities that coexist harmoniously with the natural environment.

In this context, it is crucial to consider the impact of biophilic urbanism and design principles on human, societal and urban health, as reflected in architectural approaches at the building scale. While biophilic design practices are still relatively new in our country, their implementation at the urban scale remains limited.

To address this, a methodology involving the application of SWOT analysis and impact assessment techniques to identify suitable locations and assess their economic, social and spatial parameters, in conjunction with general bio-urbanism principles, would be a rational approach. Additionally, regional and urban planning should prioritize the preservation and enhancement of natural features, transforming them into new built environments.

Educational spaces and programs should be designed to foster a deep connection with nature, enabling individuals to learn through direct experience and ecological understanding. Urban gardens and farms, ranging from large-scale green spaces to smaller community gardens, can serve as gathering places that promote social interaction.

Ultimately, creating habitats that allow humans to coexist with other living beings is crucial. Biophilic design principles are a key tool in achieving this goal. By collecting and analyzing data, conducting field studies and applying biophilic design criteria, it is possible to identify the most suitable locations for biophilic residential developments and develop models for such projects.

While biophilic urbanism is still a relatively new concept, it is gaining increasing attention. By studying successful examples from around the world

and adapting them to local contexts, we can develop a strategic approach to urban planning and design that prioritizes human well-being and environmental sustainability.

The current focus on economic growth often overlooks ecological and environmental concerns. A more holistic approach is needed—one that integrates ecological and environmental considerations into urban development. This approach encompasses not only interior design and architectural form but also the preservation and restoration of ecosystems, integrating them into the built environment.

Kayseri, despite being a metropolitan city, retains its rural character and landscape. By analyzing the region's potential and integrating urban functions with natural elements, it is possible to create self-sufficient neighborhoods that combine the best of both worlds.

By applying biophilic design principles and sustainable urban planning practices, we can create more livable, resilient and environmentally friendly cities.

2. Theoretical and Conceptual Framework of the Study

The “biophilia” approach is a concept that emphasizes the importance of connecting people with natural environments and elements. Biophilic urbanization, inspired by Wilson's 1986 idea of “biophilia,” suggests that humans have an innate affinity for nature and that increasing the presence of nature in urban spaces can lead to positive outcomes. Recent studies on biophilic urbanism, which results from the application of biophilic design principles to human and urban health, have demonstrated that biophilic urbanism can reduce stress, depression and anxiety, increase productivity, promote faster recovery from illness and enhance physiological immunity (Russo & Cirella, 2017).

The positive contributions of integrating natural systems into cities and the increasing need for nature today are more evident than ever. Meanwhile, the lack of nature-based solutions in our cities is the root of many urban challenges. This study focuses on the application of green infrastructure and biophilic city approaches in urban areas as potential solutions to these issues. One of the prime examples of this is Singapore, a city-state located in a tropical region. The development of “biophilic city” characteristics in Singapore, which includes green infrastructure and a biophilic approach, stands as a rare example of how architecture, urban planning, design and landscape architecture can contribute

to solving urban problems. In this context, the concepts of green infrastructure, biophilic urbanism and biophilic landscape design are discussed.

The biophilic city is not just a city that incorporates biodiversity; it is also a collection of spaces that adapt to natural systems, internalize natural forms and images and where designs and plans are created in harmony with nature. It both preserves natural elements and draws inspiration from them, while repairing and restoring values that have been lost or damaged through urbanization. T. Beatley, an expert on the subject, believes that biophilic design should not be limited to buildings alone and poses the following questions: “How do we create biophilic cities? How can biophilic urbanization conditions be established?” According to Beatley, green initiatives in cities primarily focus on aspects like public transportation, renewable energy production and energy-efficient buildings, while completely excluding nature from this process. He argues that while these elements improve the city’s image, they are insufficient. People need to connect with the natural world. He emphasizes that “for a sustainable urban future, we need to focus on nature and appreciate natural life forms” (Beatley, 2010).

According to the evaluations, the main functions of biophilic cities are as follows:

- They incorporate abundant nature in areas accessible to many residents.
- Biophilic cities protect and actively restore biodiversity, ensuring the system is constantly renewed and protected.
- A quality of life emerges in these cities, characterized by green, growing spaces and organic, nature-filled living environments
- Residents are deeply attracted to the local flora and fauna, as well as the climate, topography and other unique features, because habitat areas that host humans and other living beings are highly valuable and offer unique opportunities to all life forms.
- The attractiveness of these places increases as they offer abundant opportunities to enjoy nature through outdoor activities such as hiking, walking, cycling and leisurely strolls.
- They are highly diverse, as they include rich, multi-sensory environments where the sounds of nature (and other sensory experiences) are appreciated as much as visual stimuli.
- Emphasizing education about nature and biodiversity and offering numerous opportunities to learn about and experience nature directly, provides exceptional opportunities, particularly for children and young people, to engage with nature.

- These cities will play a significant role globally by investing in social and physical infrastructure that brings residents closer to nature and fosters a deeper understanding of it through natural history museums, wildlife centers, school-based nature initiatives, parks and recreation programs.

- Biophilic cities are also recognized as globally responsible cities that acknowledge the importance of actions aimed at limiting the impact of resource use on nature and biodiversity, extending beyond their urban boundaries (ibid, 2010).

In line with these principles, Singapore, which has developed and emerged as a leader in biophilic urbanism, plays a prominent role, particularly due to its status as an island state with green spaces spread over a wide area (Russo & Cirella, 2018). Additionally, cities such as Portland, Chicago, Toronto and Berlin, along with Singapore, are considered some of the five leading cities in the world in terms of biophilic urbanism (Xue et al., 2019). The topic of biophilic urbanism is of critical importance in addressing two major contemporary challenges: the increasing risks and effects of climate change and the threats posed by growing population pressure. Indeed, the ecological climate crisis is a reality that negatively impacts all living beings worldwide. Research indicates that sustainable and smart biophilic cities not only achieve and maintain a higher standard of living compared to others but also predict higher living standards as their operational periods extend. It is clear that biophilic design practices have positive effects on urban ecology, in addition to their benefits for human well-being. Biophilic urbanism can provide a wide range of ecosystem services, including improvements in air quality, CO₂ reduction, microclimate benefits, flood control, water quality, food production and economic advantages (Russo & Cirella, 2017). From this perspective, adopting biophilic urbanism approaches in increasingly crowded and nature-deprived urban areas is of significant importance (Acar & Acar, 2020, p. 35).

Biophilic design, green design and ecological design all focus on human interaction with natural processes, often with a physical and material emphasis. However, biophilic design specifically highlights the emotional aspect of the human need to connect with natural elements. E.O. Wilson (1984), a biologist and evolution theorist, defines the concept of biophilia - on which this approach is based - as “the innate tendency towards life and life-like processes.” The key idea emphasized by the founders of biophilic design is that human survival and reproductive success in the evolutionary process are closely tied to the bond humans establish with life itself. This bond, or sense of closeness, is considered

a universal feeling shared by all human beings. Orr (2002) argues that humans adapt better to environments where nature is abundant. He notes that the biophilic design approach is grounded in the fact that we feel better in environments with sunlight, where we are in contact with animals and where trees, flowers, flowing water, birds and natural processes are present (Bayraktaroğlu, 2013, p. 35).

Therefore, there is an inseparable and close relationship between humankind and nature. Throughout this relationship, the perception of nature by humans and the actions taken towards nature are mediated through design and the widespread use of natural elements forms the core of this concept. Kellert and Mador (2008) identify two primary orientations within the concept of biophilic design: organic design and regional design. Organic or biologically inspired design draws from forms or processes found in nature, including spatial characteristics such as water, trees, plants, views and concepts like color and light, which are related to perception quality. In the regional design concept, an interaction occurs through the interpretation of culture, history and ecology. These two orientations offer two major benefits. The first is their positive and encouraging impact on people's productivity, emotional states, learning and recovery.

The second benefit is the sense of appreciation for nature, which is often overlooked by the design industry but is of great importance. As discussed here, when an individual fails to recognize that their spiritual deficiency stems from a lack of natural experience, they cannot fully complete their development, leading to an unreasonable pessimism. This situation transforms into a process of separation from nature—and thus from the true self of humanity—which is sought to be fulfilled through concepts of power and authority, but which continues to grow. The rationale for explaining the concept of biophilia within the context of an architectural approach emphasizes that humans will find the peace and security they truly need in nature itself. (Ibid: 36-37)

In terms of the spatial structure that incorporates both the natural and built environments, it is essential to understand the framework that defines biophilic design within space. These frameworks utilize spatial relationships to enhance well-being, particularly the experience of space. In this context, Kellert identifies four main elements that are crucial:

Expectation and Refuge: Refuge refers to the ability of buildings to offer comfortable and nourishing interior spaces (such as recesses or dim lighting), while expectation emphasizes horizons, movement and potential sources of

danger. Examples of design elements include balconies, recesses, changes in lighting and variations in the width of spaces, often reminiscent of savanna-like environments.

Organized Complexity: This principle aims to replicate the need for controlled variability, which is achieved through repetition, modification and elaboration in the architectural design.

Integration of Parts: When different components come together to form a cohesive whole, it enhances user satisfaction. Design elements that demonstrate this include interior spaces that employ clear boundaries or feature a central focal point.

Transitional Spaces: This element facilitates the connection between interior and exterior spaces or offers comfort by providing access from one space to another. Design features such as porches, decks, courtyards, doors, bridges, windows and foyers embody this principle. Additionally, mobility—the ability for people to move freely between spaces, even complex ones—provides a sense of security for building occupants. This can be accomplished by creating clear entry and exit points.

Cultural and Ecological Attachment to Place: Creating a cultural sense of place within the built environment fosters human connection and identity. This is achieved by integrating the geography and history of the area into the design. Ecological identity is cultivated through the establishment of ecosystems that encourage the use of local flora and fauna. Since there is no one-size-fits-all approach for building types, each of these elements should be considered individually when applying biophilic principles in projects. Architects and project owners should collaborate to incorporate the biophilic principles that are most suitable for their specific context, ensuring they effectively reach building occupants (URL 5).

On the other hand, in terms of the social dimension of biophilic design, seven key features that enhance the sense of community can be summarized as “space diversity,” “space identity,” “soft edges,” “encounter areas,” “green areas,” “sensory areas,” and “focus areas.” With the development of ergonomics in urban design during the 1990s, people-centered designs began to enter our lives more frequently, becoming more accessible and contributing to an overall improvement in the quality of life. All components that shape our living spaces have become more adaptable and flexible, following ergonomic standards. Ergonomic lighting, air conditioning, flooring, furniture and many other elements can be considered within this scope.

After providing the necessary level of comfort in living spaces, it is equally important to address the spiritual and physical needs of individuals. People shape their lives consciously or, in the case of well-designed spaces, are encouraged to thrive both physically and spiritually. This is closely linked to the availability of environments that promote well-being. Particularly in the context of the global Covid-19 pandemic, people's physical, mental and spiritual health are under significant threat. Studies highlight the critical importance of having a sufficient amount of green space per person in urban areas, as well as low- and medium-density buildings, close contact with nature, the use of energy-efficient and non-polluting transportation and the development and implementation of green infrastructure systems. (URL6)

The spaces in gated communities are private yet possess elements of publicness within the private realm. In this context, these spaces serve significant purposes, such as ensuring security and enhancing prestige. Furthermore, the desire for social groups of the same class to live together and share common experiences is on the rise. As a result, highly isolated living communities are emerging for residents. In Turkey, such communities are often characterized by membership in religious groups, economic wealth and belonging to culturally elitist circles. Gated residential communities are housing developments where private car use and vehicle ownership are particularly prevalent. Consequently, these settlements are typically located in areas not served by public transportation routes or axes. Gated communities, found both in city centers and on the outskirts, distinguish themselves through their architectural features, which range from low-rise to medium-rise and multi-story structures. These formations contribute significantly to the city's housing history. The street, once a crucial element of the neighborhood, has been removed from the pedestrian scale and is now dominated by automobiles. No area remains untouched by car access.

The security aspect has led to the proliferation of private security forces alongside state security organizations, depending on the crime rates within the city and these areas have been secured by these organizations. However, studies indicate that judicial incidents still occur in many gated communities. Security can be ensured through architectural solutions, with smart homes serving as the ideal examples. The integration of technology into housing and building design can significantly minimize security concerns. Ensuring security is one of the fundamental rights of urban dwellers. The trend of creating residential areas for prestige purposes is emerging not only in major cities such as Istanbul and Ankara but also in other cities across Anatolia. Residents often view their

housing and its surroundings as indicators of social status, with the place of residence and its environment serving as a spatial expression or reference point. Social inequalities that arise in the space of a capitalist city are reflected in the urban landscape, leading to the formation of differentiated, socially and spatially closed settlement communities within the city.

It can be concluded that all kinds of facilities and amenities are provided within these communities, making any additional amenities, especially green spaces that serve the needs of the entire city, unnecessary. As a result, the concept of the “common property of the entire city” is effectively eliminated by transforming public spaces into private areas, a process that is facilitated by architectural solutions within each gated community. This shift leads to the realization of zoning rents, which benefit certain privileged classes in specific areas.

On the other hand, when considering the social, economic and environmental sustainability of Kayseri, gated communities emerge as one of the potential application areas for biophilic design. Beyond the mere economic gains from capital investments in these areas, there is a need for biophilic applications that preserve and enhance natural and environmental features. It is observed that the education and cultural levels, as well as the economic infrastructure of the social classes residing in these regions, are adequate to support such initiatives. In this respect, this study will lay the groundwork for future applications in these areas and will outline the guiding principles. The study also evaluates the applicability and potential of biophilic urbanism in this context. In this case, we can conclude that Biophilic Design Principles Specific to Kayseri

The following principles may emerge as key considerations in biophilic design for closed residential settlements in Kayseri, contributing to Biophilic Urbanism.

Adaptation to Local Climate Conditions: Considering Kayseri’s climatic characteristics, such as hot, dry summers and cold winters, strategies like natural ventilation, shading and passive heating can be utilized.

Water Management: Efficient use of water resources can be achieved through practices like rainwater harvesting systems and gray water recycling.

Green Areas: Creating green spaces between residences can enhance biodiversity, improve air quality and provide visual appeal.

Energy Efficiency Energy consumption can be reduced by incorporating solar energy systems, insulation materials and energy-efficient device

Local Materials: Utilizing locally sourced natural materials helps minimize environmental impact and supports the local economy.

Recycling Management: Waste reduction through practices like separation, recycling and composting helps prevent environmental pollution.

Application Examples should focus on the following items:

Green Roofs: Vegetation-covered building roofs help retain rainwater, enhance thermal insulation and provide an aesthetic appeal.

Permaculture Applications: Implementing permaculture strategies that mimic natural systems in areas such as food production, water management and waste management is essential for promoting a sustainable lifestyle.

Local Architecture: By integrating Kayseri's traditional architectural elements with modern designs, both the historical fabric is preserved and contemporary needs are met.

Smart Home Systems: Smart home technologies that autonomously manage energy consumption and enhance comfort are crucial components of biophilic design.

Therefore, transforming Kayseri in accordance with the principles of biophilic urbanism will bring substantial benefits in terms of both environmental sustainability and quality of life. This transformation will position Kayseri as one of the most livable cities of the future.

3. Conclusion

The Biophilic Urbanism approach, which is the focus of this research, has gained significant traction, particularly with the introduction of the Biophilic concept and the establishment of the Biophilic Cities network. These studies, which involve the direct application of principles developed with a focus on Biophilic design in various urban areas, aim to preserve and enhance natural elements within cities. They seek to establish a balance between the natural and built environments, thereby promoting sustainability through the life cycle approach. Since sustainability is a concept that emphasizes the protection-use balance and safeguards the rights of future generations, the Biophilic concept can be applied to ensure the well-being and health of communities in both outdoor and indoor spaces. This, in turn, is closely tied to the overall quality of life. However, when examining Turkish cities, the number of projects based on this approach is extremely limited and very few examples are accessible.

In this context, a new urban growth model, the "concentrated city form-compact form," should be developed by promoting mixed land use on a macro scale. To achieve this, the principles of Biophilic Urbanism should be applied

and integrated with biophilic design at the urban design scale. Efforts should focus on enhancing the protection of water, air, soil and natural green spaces, while establishing a balance and hierarchy between passive and active green areas both within and between urban zones. Green spaces and water should dominate the city's system, ensuring that the emerging urban ecosystem is preserved. Threshold capacity values should be defined and the level and structure of urbanization should be carefully planned. Appropriate measures should be taken in advance to safeguard the environment and ensure sustainable development.

In this context, it is evident that closed housing settlements hold significant potential for implementing these applications. However, in most of the projects undertaken so far, new living environments have been designed without adhering to these fundamental principles. Therefore, it is essential to improve and reorganize both occupied and vacant spaces through urban renewal initiatives.

In recent years, Kayseri has been undergoing a significant structural transformation, particularly in its role as a capital city, where capital accumulation is being transferred to the built environment. Luxurious, prestigious and secure residential areas are being developed rapidly and made available to residents. However, it is evident that these projects are not designed according to the principles required by biophilic design. To address this, it is crucial to begin with these areas and extend the biophilic design method to other land uses. This will enhance the applicability of the biophilic urbanism approach.

On the other hand, it is essential to identify and protect vital resources such as water, soil and greenery, enhance them and expand their distribution. Strong green connections and networks should be established. As a result, accessibility and daily mobility will improve, reliance on cars will decrease and public transportation, cycling and walking will become more prevalent. Additionally, energy systems should be transformed to prioritize renewable energy sources, replacing those that contribute to carbon footprints. Most importantly, in cities where the principles of biophilic urbanism and design are applied, residents will be better prepared for life, both physically and mentally. This will foster greater joy in life, a more hopeful outlook and increased productivity.

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CHAPTER VII

EVALUATION OF RESIDENTS' SATISFACTION LEVELS IN A GATED COMMUNITY: A CASE STUDY IN MARDİN, TÜRKİYE*

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1. Introduction

A house is a private living area for its residents that cannot be isolated from its environment, which is another physical and behavioral space (Gür & Bekleyen, 2003). Therefore, it should be handled as a whole with its environment (Adriaanse, 2007), including its neighborhood and neighborhood relations (Amerigo & Aragonés, 1997; Bekleyen & Aras Baylan, 2018). In a more general sense, the residential area forms a whole consisting of the house, the neighborhood, and the neighbors. The residents' satisfaction with the residential area is related to the extent to which it meets their expectations in terms of the social and physical characteristics of both the

* This study is derived from the master's thesis of Res. Asist. Sevcan Aslan Kılıç, conducted under the supervision of Prof. Dr. Ayhan Bekleyen at the Institute of Natural and Applied Sciences, Dicle University.

house and its surroundings (Lu, 1999). Therefore, the quality of a residential area is directly evaluated by satisfaction levels, which are an extension of the residents' subjective evaluations. Satisfaction levels for the residential area are also related to the harmony between the current environment perceived by the residents and the desired environment (Etminani-Ghasrodashti et al., 2017; Galster, 1987; Galster & Hesser, 1981; Ibem & Aduwo, 2013; Lu, 1999). A high level of satisfaction indicates congruence between the current and the desired levels, while a low level of satisfaction indicates incongruence. In a residential area where satisfaction levels are low, there is pressure on residents to move out of the house or the residential area as a larger area (Bekleyen & Korkmaz, 2013; Morris et al., 1976). There are many studies showing that this pressure is effective in moving decisions (Acar & Bekleyen, 2008; Diaz-Serrano, 2006; Kearns & Parkes, 2003; Özbudak & Bekleyen, 2006).

The neighborhood, a common area shared by neighbors, provides a sense of belonging which plays a major role in individuals' attachment to the residential area (Fleury-Bahi et al., 2008). Encompassing the activity areas (social, play, and sportive) of both adults and children (Ozan & Ekinci, 2006), this common zone affects the behaviors and attitudes of its residents and is an indicator of welfare level (Kellekçi & Berköz, 2006; Lawrence, 1987; Sultana et al., 2022). This area, which is at the center of neighborhood relations, can be considered as the micro-level social network of the society.

The neighborhood has to be a safe area that supports common sharing for both children and adults (Selçuk Kirazoglu & Akpınar, 2015) and the presence of strong social relationships contributes to a safer neighborhood (McDonell, 2006). Thus, neighborhood relations are a strong determinant of residential area satisfaction (Amerigo & Aragones, 1997; Andersen, 2008; Parkes et al., 2002). Positive relationships with neighbors also strengthen individuals' sense of place attachment to the residential area (Kim, 2010) since the existence of this feeling increases the residents' instinct to protect the built environment against crime and criminals (Bekleyen & Aras Baylan, 2018; Comstock et al., 2010). Over time, this orientation has contributed to the emergence and further development of a different type of housing provision: gated communities

1.1. Gated Communities

Gated communities (GCs), which are widely produced all over the world, are residential areas with limited access (Low, 2003). Blakely and Snyder (1997) identified three types of GC: lifestyle, prestige, and security zone communities.

In lifestyle communities, residents usually focus on leisure activities (such as golf and tennis) whereas the second one responds to residents' desire to live in a prestigious and exclusive neighborhood. The third is a community that creates the perception of a safe area where more stringent measures are taken. In all of these communities, security control starts at the entrance gate. GCs are also surrounded by "security devices such as walls, fences, gates, barriers, alarms, guards, and closed-circuit television cameras" (Roitman, 2005: p. 304). Due to these features, GCs are mostly preferred by upper-income groups (Roitman, 2005).

Recently, GCs have been symbolic images of social and economic status (Akpınar and Paker, 2007). Labels such as prestigious, elite, and secure, which are frequently repeated in the commercials, are chosen carefully to encourage living in these settlement types (Blandy, 2006; Şahin & Şener, 2018). Similarly, some studies reflect that the physical aspects of these settlements are considered indicators of prestige and beauty (Pow, 2011; Wu, 2005, 2010), which provide residents with the opportunity to live in a safe and respectable neighborhood that has become an expensive commodity over time (Almatarneh & Mansour, 2013).

Having a relatively homogeneous user profile, GCs are indicators of a presentation type that aims at addressing residents' security concerns (Asiedu & Arku, 2009; Polanska, 2010). Security gate guards have an important role in the sense of security. Nonetheless, when patrols are added to this structure, security is maximized. Hence, guards and patrons are more prominent than gates in these communities regarding both property value and security (Allen & Fraser, 2022).

The widespread and prolific production of GCs in the world (Grant & Mittelsteadt, 2004; Vesselinov & Le Goix, 2012; Wei et al., 2016) has attracted the attention of many scientists. Consequently, a large number of studies have been conducted on the characteristics and privileged aspects of these habitats. Some of these studies argue that these communities trigger social segregation between insiders and outsiders (Low, 2003; Roitman, 2005; Alkan-Gökler, 2017; Atkinson & Flint, 2004; Manzi & Smith-Bowers, 2005; Roitman, 2013). Some other studies, which argue that segregation negatively affects interaction and solidarity, reveal that segregation is not only physical but also social (Blakely & Synder, 1997; Atkinson, 2008; Caldeira, 2000; Sennett, 2007; Wissink, 2013). This uncontrolled segregation is referred to as urban segregation (Le Goix & Webster, 2008; Miao, 2003; Sanchez et al., 2005). In these areas, the public

spaces are privatized (Blakely & Snyder, 1997; Dear and Flusty, 1998) as a reflection of the pursuit of the upper-income groups for a privatized life (Bartu Candan & Kolluoğlu, 2008; Geniş, 2007; Tanulku, 2012).

A desire for a better lifestyle and more prestige plays an important role in the emergence of these communities as well as security (Blakely & Snyder, 1997; Roitman, 2005; Lang & Danielsen, 1997; Roitman, 2010). Security in particular drives residents to live in such communities (Low, 2003). The findings of research on the area confirm the priority of security in resident preferences with high satisfaction levels (Bekleyen & Aras Baylan, 2018; Aslan, 2022; Aras Baylan & Bekleyen, 2018). In addition, these communities are among the settlements preferred by residents in terms of property value, sense of community, and quality of life (Elsayed, 2016; Salah & Ayad, 2018). It seems that the number of these communities will continue to increase all over the world (Bekleyen & Yılmaz-Ay, 2016).

GCs have been built in Türkiye especially since 1980s and they have become the rapidly increasing new residential areas all over the country (Bekleyen & Yılmaz-Ay, 2016; Akalın, 2016; Akyol Altun, 2008; Berköz, 2008; Fridin Özgür, 2006; Tümer & Dostoğlu, 2008; Yılmaz-Ay, 2013). After the 2000s, GCs were produced in cities in the southeastern region of Türkiye, including the city of Mardin. Within the scope of this study, Altınşehir GC, the largest gated community in the city of Mardin built in 2013, has been analyzed to determine resident satisfaction levels. To the best of the authors' knowledge, there is no prior study conducted on GCs in this area. It is aimed that the findings obtained from this study will contribute to the design of GCs to be produced in this city in the future.

Aligned with its aim, the study addresses two primary research inquiries:

1. To what extent are residents of Altınşehir GC, Mardin's largest residential development, satisfied with their residential area encompassing their houses, neighborhood, and neighborhood relations?

2. What are the prominent features that emerge from user evaluations regarding satisfaction levels within the residential area? What are the features that contribute to negative satisfaction levels?

2. Materials and Method

The description of the study area and the methodology for collecting and evaluating the information obtained from the residents are described under the following headings.

2.1. Study Area

Located to the north of the historic city and the east of the new city, Altınşehir GC in Mardin was built between 2013-2018. GC consists of 5 blocks with 387 apartments in 13 different plan types (Figures 1-4). At the time of the survey, 350 of these apartments were in use.

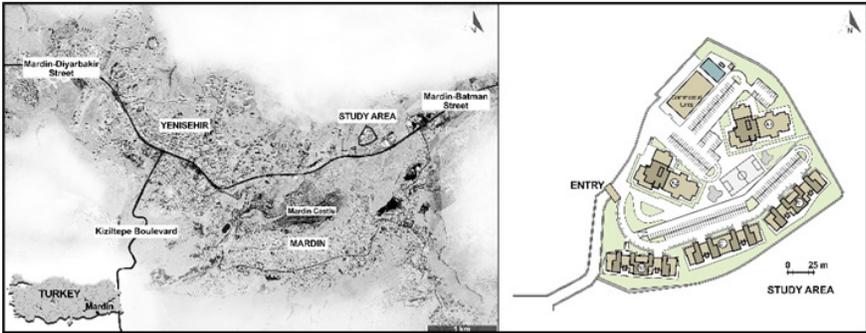


Figure 1: Location of the Study Area in Mardin (Left) and Layout Plan of Altınşehir GC (Right)

The garden wall is placed as a barrier against the outside world, and it forms the outer boundary of the GC along with the iron railings on it. Access to the residential area is provided through a single entrance gate with security control. The GC has commercial units including a bakery and market, accompanied by social areas such as children's playgrounds, sports fields, and a swimming pool.



Figure 2: Floor Plans and Views of Blocks A1 and A2



Figure 3: Floor Plans and Views of Blocks B1 and B2

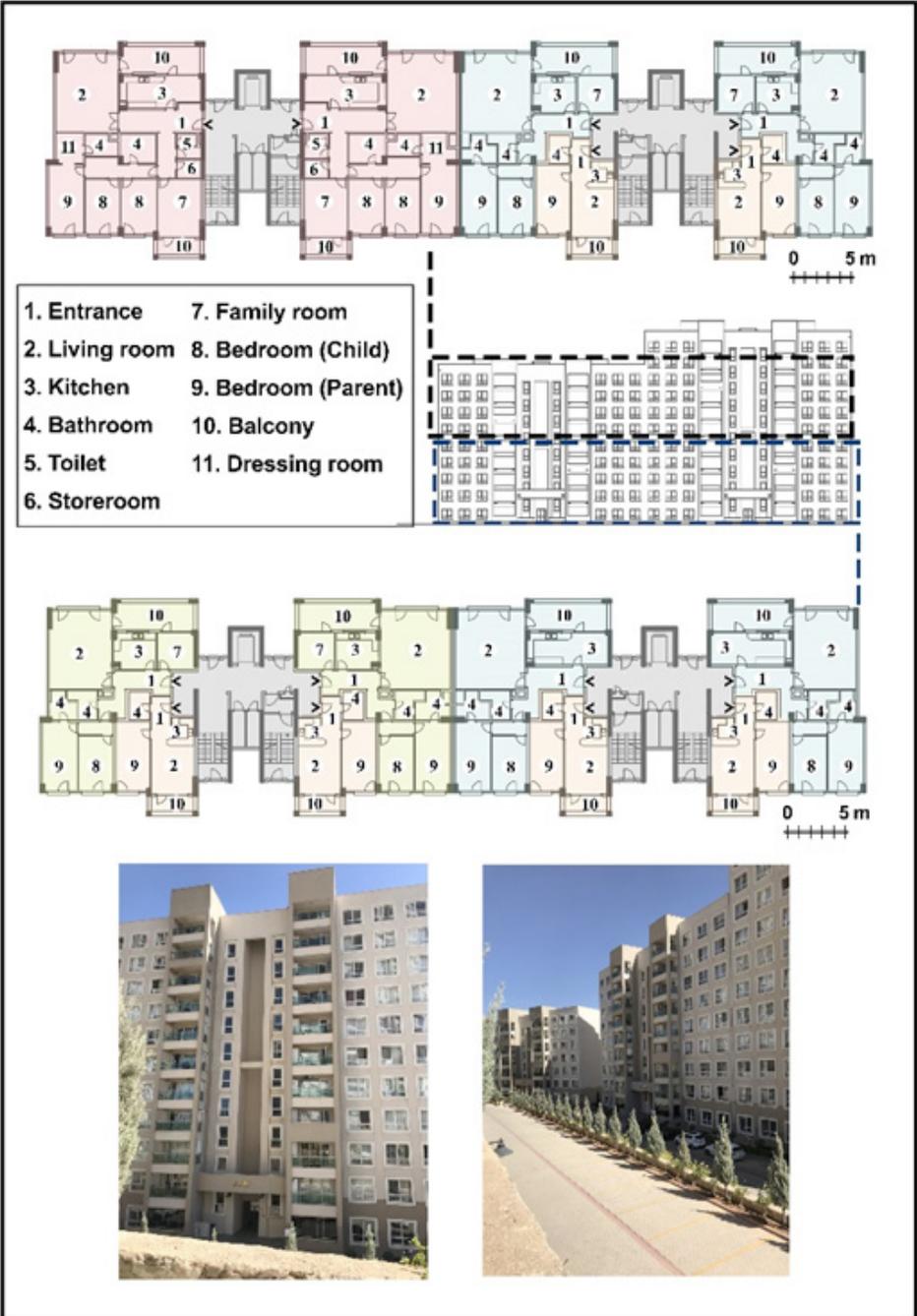


Figure 4: Floor Plans and Views of Block C1

2.2. Data Collection Tools and Data Evaluation

In the present study, the required documents (all plans, sections, and elevations) of the application projects of the houses in Altınşehir GC were obtained from the relevant municipal units and the contractor company. Questionnaires were used to collect data from the users, while observation and documentation techniques were used for the details of the study area. Ethics committee approval was obtained from Dicle University Social and Human Sciences Ethics Committee (dated August 6, 2021, and numbered 115372) for the questionnaire prepared to obtain users' subjective evaluation of their residential area. Within the scope of the study, permission was also obtained from the management of Altınşehir GC to enter the buildings and settlement at various times, make various observations, improve the data with photographs, and administer the questionnaire.

In 2021, when the Covid-19 outbreak was still intense all over the world, the researchers decided to conduct the survey via digital media to prevent human contact due to the concerns that otherwise the participation would be low. The survey was delivered using Google Forms and promoted primarily via WhatsApp Messenger. 120 out of 350 participants responded to the questionnaire. Therefore, participants were selected randomly.

The questionnaire is composed of four sections and 61 questions. Section 1 focuses on determining the demographic characteristics of the users. Section 2 includes questions on house satisfaction (location, size, usefulness, ease of maintenance, structural condition, number of rooms, living room size, kitchen size/use, balcony size/use, bathroom use, plumbing system, circulation areas, artificial and natural ventilation/lighting level, sound insulation quality, noise level, visual privacy, number of stories and exterior design of the blocks, prestige/status indicator, expense level). Section 3 consists of questions related to the neighborhood (security system, exterior wall barrier, children's playgrounds, social facilities, site management, green space adequacy, walking paths, recreation, and parking areas, distance to the city center, transportation facilities) and Section 4 includes questions related to user satisfaction with neighborhood relations. There is also an open-ended question at the end of each section (second, third, and fourth) for users to write down their thoughts about the house, neighborhood, and neighborhood relations. Statistical analysis was performed using SPSS (Statistical Package for the Social Sciences).

Sections 2, 3, and 4 comprised mainly of close-ended items with a four-point Likert scale (very satisfied, satisfied, dissatisfied, very dissatisfied). The Cronbach Alpha reliability test coefficient of the questionnaire (questions in Sections 2, 3, and 4) was found to be 0.95. Reliability values of 0.7 or higher indicate acceptable internal consistency (Pallant, 2005).

The following formula was used to calculate the average satisfaction value for each dependent variable. A point value has been attached to each answer option as follows: very satisfied= 4 points, satisfied= 3 points, dissatisfied= 2 points, and very dissatisfied= 1 point. These options constitute the weight levels (w_{ij}) of the evaluation. The sum of user responses to each of the weight levels is symbolized by n_i .

$$\text{Average satisfaction value} = \frac{\left(\sum_{i=1}^{i=4} w_{ij} n_i \right)}{\left(\sum_{i=1}^{i=4} n_i \right)} \quad (1)$$

If the average satisfaction value is 3.50 and above, residents are very satisfied; between 3.49-2.50, they are satisfied; between 2.49-1.50, they are dissatisfied; and 1.49 and below, they are very dissatisfied (Hassanain & Iftikhar, 2015).

Resident satisfaction levels for all variables were obtained with the formula presented above. Using this formula, the average satisfaction values for the house, neighborhood, and neighborhood relations in the GC were determined. Then, the average of these three values was calculated to determine the resident satisfaction level of the residential area.

2.3. Characteristics of participants

As can be seen in Table 1, the majority of the residents participating in the survey were male (72.5%). It was found that the residents, most of whom were in the age range of 31-40 (51.7%), were mostly working in the public sector (49.2%). Most of the residents were married (76.7%), and a majority of them had bachelor's degrees (66.7%). 24.2% of the residents were families of four. Most of them were homeowners (70.8%) and had a residence period between 6 months and 1 year (46.7%).

Table 1: Characteristics of Residents

		N	%
		(N=120)	
Gender	Male	87	72.5
	Female	33	27.5
Age	21-30	14	11.6
	31-40	62	51.7
	> 41	44	36.7
Occupation	Housewife	4	3.3
	Public sector	59	49.2
	Private sector	56	46.7
	Student	1	0.8
Marital status	Married	92	76.7
	Single	28	23.3
Education	Primary education	2	1.7
	Secondary education	13	10.8
	Bachelor's degree	80	66.7
	Master's degree	25	20.8
Household size	1	23	19.2
	2	22	18.3
	3	22	18.3
	4	29	24.2
	5 or more	24	20
Length of residence (years)	0-1	56	46.7
	2	23	19.2
	3	20	16.7
	4	19	15.8
	5 or more	2	1.7
Tenure status	Owner-occupied	85	70.8
	Rented	35	29.2

3. Results and Discussion

This section provides the findings and associated discussions concerning the research inquiries.

3.1. To What Extent Are Residents of Altınşehir GC, Mardin's Largest Residential Development, Satisfied with Their Residential Area Encompassing Their Houses, Neighborhood, and Neighborhood Relations?

To comprehensively evaluate the quality of residential areas, it is crucial to examine residents' satisfaction levels from three distinct perspectives: house, neighborhood, and neighborhood relationships (Amerigo & Aragonés, 1997; Checa & Arjona, 2010; Aslan, 2022). The data obtained from these three dimensions also reveals the alignment between residents' actual needs and preferences, offering a more detailed analysis opportunity (Lu, 1998). Consequently, it becomes possible to more clearly identify which aspects of residential areas require improvement and how to enhance residents' quality of life.

It was found that the resident satisfaction level ($M= 3.18$) was quite high in Altınşehir GC (Table 2). This value is the average of the mean values for the neighborhood ($M= 3.24$), the house or apartment ($M= 3.20$), and neighborhood relations ($M= 3.12$). The resident satisfaction levels obtained reflect that Altınşehir GC is a residential area with qualities that meet residents' expectations.

Table 2. Residents' Satisfaction Levels

Satisfaction Levels	Mean
House	3,20
Neighborhood	3,24
Neighborhood relations	3,12
Altınşehir GC (House + Neighborhood + Neighborhood relations) / 3	3,18

3.1.1. Residents' satisfaction levels regarding their houses

It was determined that the residents were satisfied with the features of the apartment such as location ($M= 3.38$), size ($M= 3.37$) and usefulness ($M= 3.38$), size (Mliving room= 3.42, Mkitchen= 3.08) and use (Mkitchen= 3.11, Mbathroom= 3.08, Mcirculation areas= 3.35) of some spaces, number of rooms

(M= 3.28), possibility to host guests (M= 3.29), ease of maintenance (M= 3.22) and structural condition (M= 3.11), adequacy of windows (Mventilation= 3.25, Mlighting= 3.34), artificial lighting quality (M= 3.25) and indoor air quality (M= 3.16), noise (M= 3.08) and daylight utilization level (M= 3.40), humidity (M= 3.14) and airflow (M= 3.28), plumbing system (M= 2.88), heating level in winter (M= 3.01) and coolness level in summer (M= 2.93), temperature differences between rooms (M= 2.84), expenditures made (M= 2.97) (Table 3). Many features of the house, as indicators of quality, are appreciated in these living spaces. Echoing the results of Lu (1998) and Galster (1987), residents' high satisfaction in this community indicates a strong alignment between their needs and their preferred housing conditions. High satisfaction can be interpreted as a situation where user needs align closely with their preferences. This is precisely the case in this community.

It was also revealed that the residents were satisfied with the number of stories (M= 3.15) and ventilation quality (M=3.11) of the blocks, the exterior façade (M= 3.28), and the visual privacy between the blocks (M= 3.33) (Table 3). It is also understood from the interviews with the residents that the provision of apartments of different sizes to the residents in Altınşehir GC has contributed to the high level of satisfaction with the house in terms of diversity of preferences.

Residents of Altınşehir GC experience high levels of satisfaction with their housing, which in turn contributes to their overall satisfaction with their residential area. This aligns with the findings of Peck and Stewart (1985), who demonstrated that housing satisfaction significantly enhances quality of life.

Table 3. Residents' Satisfaction Levels in Detail
(House, Neighborhood, and Neighborhood Relations)

Features of Altınşehir GC	Satisfaction (N=120)								Mean	%*
	4		3		2		1			
	N	%	N	%	N	%	N	%		
House (apartment)										
Location	48	40,00	70	58,30	2	1,70	0	0,00	3,38	98,33
Size	50	41,70	65	54,20	5	4,10	0	0,00	3,37	95,83
Usefulness	50	41,70	66	55,00	4	3,30	0	0,00	3,38	96,66
Ease of maintenance	41	34,20	67	55,80	10	8,30	2	1,70	3,22	90,00
Structural condition	37	30,80	64	53,30	15	12,50	4	3,30	3,11	84,16
Number of rooms	43	35,80	68	56,70	9	7,50	0	0,00	3,28	92,50
Size of the living room	56	46,70	59	49,20	5	4,20	0	0,00	3,42	95,83
Size of the kitchen	38	31,70	55	45,80	26	21,70	1	0,80	3,08	77,50
Use of the kitchen	35	29,20	65	54,20	19	15,80	1	0,80	3,11	83,33
Size of the balcony	78	65,00	41	34,20	0	0,00	1	0,80	3,63	99,16
Use of the balcony	70	58,30	46	38,30	3	2,50	1	0,80	3,54	96,66
Use of the bathroom	38	31,70	65	54,20	15	12,50	2	1,70	3,15	85,83
Plumbing system	28	23,30	58	48,30	26	21,70	8	6,70	2,88	71,66
Use of circulation areas	58	48,30	51	42,50	7	5,80	4	3,30	3,35	90,83
Level of daylight utilisation	56	46,70	56	46,70	8	6,70	0	0,00	3,40	93,33
Quality of artificial lightin	39	32,50	73	60,80	7	5,80	1	0,80	3,25	93,33
Indoor air quality	37	30,80	70	58,30	9	7,50	4	3,30	3,16	89,16
Internal humidity	29	24,20	81	67,50	8	6,70	2	1,70	3,14	91,66
Ventilation quality of the block	32	26,70	72	60,00	14	11,70	2	1,70	3,11	86,66
Window size for ventilation	37	30,80	77	64,20	5	4,20	1	0,80	3,25	95,00
Window size for lighting	43	35,80	75	62,50	2	1,70	0	0,00	3,34	98,33
Internal air flo	41	34,20	74	61,70	3	2,50	2	1,70	3,28	95,83
Heating level in winter	30	25,00	67	55,80	18	15,00	5	4,20	3,01	80,83
Coolness level in summer	23	19,20	72	60,00	19	15,80	6	5,00	2,93	79,16
Temperature differences between rooms	15	12,50	77	64,20	22	18,30	6	5,00	2,84	76,66
Sound insulation quality	18	15,00	34	28,30	41	34,20	27	22,50	2,35	43,33
Noise level (mechanical system, traffic, etc	34	28,30	65	54,20	18	15,00	3	2,50	3,08	82,50
Visual privacy	52	43,30	57	47,50	10	8,30	1	0,80	3,33	90,38
Number of stories of blocks	33	27,50	74	61,70	12	10,00	1	0,80	3,15	89,16
Façade design	42	35,00	71	59,20	6	5,00	1	0,80	3,28	94,16
Guest hospitality comfort	42	35,00	72	60,00	5	4,20	1	0,80	3,29	95
Prestige/status symbol	67	55,80	52	43,30	1	0,80	0	0,00	3,55	99,16

Expenditure	30	25,00	63	52,50	21	17,50	6	5,00	2,97	77,50
Neighborhood										
Site security	59	49,20	57	47,50	4	3,30	0	0,00	3,45	96,66
Enclosure of the site with a wall	64	53,30	52	43,30	2	1,70	2	1,70	3,48	96,66
Safety of children's playgrounds	52	43,30	64	53,30	4	3,30	0	0,00	3,38	96,66
Social relations with those outside the site	28	23,30	82	68,30	7	5,80	3	2,50	3,12	91,66
Use of social facilities by foreigners	16	13,30	14	11,70	43	35,80	47	39,20	1,99	25,00
Site management	71	59,20	41	34,20	5	4,20	3	2,50	3,50	93,33
Block cleaning	62	51,70	50	41,70	7	5,80	1	0,80	3,44	93,33
Garden care	74	61,70	42	35,00	4	3,30	0	0,00	3,58	96,66
Adequacy of green areas	63	52,50	51	42,50	6	5,00	0	0,00	3,47	95,00
Use of walkways	59	49,20	52	43,30	9	7,50	0	0,00	3,41	92,50
Use of social areas	36	30,00	71	59,20	11	9,20	2	1,70	3,17	89,16
Use of car parking areas	45	37,50	63	52,50	8	6,70	4	3,30	3,24	90,00
Distance from the city center	37	30,80	69	57,50	10	8,30	4	3,30	3,15	88,33
Transport facilities	22	18,30	70	58,30	25	20,80	3	2,50	2,92	76,66
Neighborhood relations										
Social relations between neighbors	24	20,00	87	72,50	6	5,00	3	2,50	3,10	92,50
Use of common areas with neighbors	27	22,50	85	70,80	5	4,20	3	2,50	3,13	93,33
Frequency of encounters with neighbors	24	20,00	91	75,80	4	3,30	1	0,80	3,15	95,83

4: Very satisfied, 3: Satisfied, 2: Dissatisfied, 1: Very dissatisfied

* Sum of the percentages of "very satisfied" and "satisfied" responses

The following user comments, which are answers to open-ended questions regarding house (apartment) satisfaction, explain the high satisfaction levels.

"My residence appeals to me" (Participant 1).

"I am also satisfied with my house because of the well-designed site" (Participant 2).

"I am satisfied due to its location, usefulness, and environmental layout" (Participant 4).

"My house is very good in terms of security" (Participant 6).

"Due to its location, it is very important for us that it is quiet and away from the city chaos. Both security personnel and site management attach great

importance to the rules. Our site is clean. The pool is very nice, it is as if we are living in a summer house rather than in Mardin” (Participant 9).

“I am happy with everyone working for management and security. This makes me happy with my home” (Participant 11).

“I am pleased that residents on the site are aware of the general rules of conduct and co-existence. “I am satisfied with the management” (Participant 12).

“My house is quite good in Mardin conditions” (Participant 13).

“I am satisfied with the location, environmental order, cleanliness, security, and neighbors of the place I live in” (Participant 18).

“It meets our needs” (Participant 19).

“I am pleased that there is sufficient living space in terms of daylight, coolness, and security” (Participant 23).

“I am very pleased with the site management” (Participant 25).

“I love my home; big, comfortable, useful” (Participant 27).

“Large, airy” (Participant 28).

“It’s a peaceful place” (Participant 29).

“I can use the balcony easily. I love it very much because of its privacy” (Participant 30).

“I am pleased that it is away from noise and social and green areas. The education levels of the residents are also good” (Participant 31).

“I am pleased that it met my expectations. Landscaping, seating areas in the garden, sports field, swimming pool, exterior, and security are what I want. My flat is I+1. I would be more satisfied if there was another room” (Participant 32).

“Useful” (Participant 34).

“It is clean, quiet, well landscaped, and safe” (Participant 35).

“Nice” (Participant 36).

“It is a site with a high level of security, clean and well-maintained” (Participant 39).

“Quality of life is at the highest level” (Participant 56).

“Altınşehir residences are indicators of prestige. I am satisfied with its quality and location” (Participant 69).

“My living space is quite good for children” (Participant 71).

“Secure site and plenty of green space for my children” (Participant 74).

“The view seen from the windows opened from all over the house, the peace felt with the open air and view of the balcony...” (Participant 82).

In their comments regarding house satisfaction, users also refer to the advantages of neighborhood and neighborhood relations. GC's environmental layout, site management, education levels of the users, opportunities offered by the neighborhood, positive behavior of neighbors, and neighborhood relations are emphasized as features that increase house satisfaction.

3.1.2. Residents' Satisfaction Levels Regarding Their Neighborhood

In terms of neighborhood, it was also found that the residents were satisfied with the surrounding of GC with a wall (M= 3.48), site security (M= 3.45), safety of children's playgrounds (M= 3.38), site management (M= 3.50) and cleanliness of the buildings (M=3.44), adequacy of green areas (M= 3.47), walking paths (M= 3.41), recreation (M= 3.00), and social areas (M= 3.17), the distance of the site to the city center (M= 3.15), car parking areas (M= 3.24) and transportation facilities (M= 2.92) (Table 3). It was determined that the residents in GC were satisfied with their social relations (M= 3.12) with people outside (Table 3). In the interviews, the residents attributed this situation to the fact that they live in a smaller city and therefore have a wider social circle.

The following user comments, which are answers to open-ended questions about neighborhood satisfaction, explain satisfaction in detail.

"The design of the site is very nice" (Participant 2).

"The landscaping is good" (Participant 7).

"It adds value to the region" (Participant 8).

"It is neither too far nor too close to the city center" (Participant 11).

"Being close to the village makes it easier to access natural food products from the site" (Participant 20).

"It is a quiet place without noise" (Participant 23).

"An area surrounded by green elements" (Participant 27).

"I am glad that there is no other site very close to us" (Participant 30).

"It's empty around" (Participant 31).

"I am glad to live in a secure gated community" (Participant 45).

"It's nice for me that it's not crowded" (Participant 49).

"I live with my children in a safe environment and a site with social activities" (Participant 59).

"We felt safer here during the pandemic period" (Participant 73).

"This place is like a holiday village" (Participant 76).

“In the city but peaceful like a village” (Participant 77).

“We are here because it is the most beautiful and clean site to live in Mardin” (Participant 90).

“I think this is the best site in Mardin” (Participant 106).

“It is far from the surrounding buildings” (Participant 112).

“Being safe and prestigious” (Participant 117).

Residents of Altınşehir GC are highly satisfied with their neighborhood, and this satisfaction is a major driver of their overall satisfaction with living there. This stems from the community meeting residents’ expectations. The clean and well-maintained environment further contributes to residents’ positive perceptions, and the inherent security of the community also enhances satisfaction and property values (Akgün & Baycan, 2012).

Residents’ satisfaction in Altınşehir GC is predominantly driven by its tranquil environment. This tranquility stems from the community’s secluded nature, characterized by a distance from the city center and a corresponding lack of crowds and noise. This peaceful atmosphere is further enhanced by the inherent security provided by the gated community and the convenience of on-site amenities. Significantly, these characteristics align with established research on resident expectations within gated communities (Almatarneh, 2013; Blakely & Snyder, 1997; Pow, 2011; Roitman, 2005; Tan, 2016). Moreover, these same attributes contribute to a stronger sense of place attachment among residents (Andersen, 2008; Kaba, 2018).

3.1.3. Residents’ Satisfaction Levels Regarding Their Neighborhood Relations

The residents also stated that they are satisfied with their neighborhood relations (social relation between neighbors (M= 3.10), use of common areas (M= 3.13), and frequency of encounters (M= 3.15) with neighbors). In environments where neighborhood relations are strong; There are many studies confirming that housing and neighborhood satisfaction are high, thus creating the perception of a safe area (Andersen, 2008; Vera-Toscano & Ateca-Amestoy, 2008; Newman, 1972). The findings from the GC examined reflect the existence of a trend in this direction. Good neighborly relations cause users to evaluate their environment positively. It is also known that the characteristics of the built environment contribute to the development of positive relationships between neighbors (Abdollahpour et al., 2021; Wilkerson et al., 2012). This

built environment also shows that it has features that contribute to neighborhood relations in terms of the quality of living space and user appreciation.

Some user comments regarding neighborhood relations have been identified as follows

“Peaceful” (Participant 10).

“I am satisfied with my neighbors” (Participant 18).

“The neighbors are nice” (Participant 37).

“I live together with valuable people” (Participant 52).

“It is nice to live together with educated individuals” (Participant 56).

“I like living in a site like my old neighborhood” (Participant 60).

“I am satisfied” (Participant 100).

The results of this study show that the users are generally satisfied with their neighborhood relations (Table 3). The social interaction between individuals in Altınşehir GC reinforces the sense of place attachment. The fact that a homogenous community lives in the same area within the framework of certain site rules reinforces the feeling of living in a safe area. The findings of different studies had similar findings and revealed that neighborhood relations are effective in the perception of security (Bekleyen & Aras Baylan, 2018; Vera-Toscana & Ateca-Amestoy, 2007; Aras Baylan, 2018).

3.2. What Are the Prominent Features that Emerge from User Evaluations Regarding Satisfaction Levels within the Residential Area? What Are the Features that Contribute to Negative Satisfaction Levels?

Averages with a satisfaction level of 3.50 and above indicate that the residents are very satisfied, while averages of 1.49 and below reveal variables that indicate that residents are not satisfied. Some of the features that residents are very satisfied with (such as balcony size and usage, perception of the dwelling as a symbol of prestige/status, and garden maintenance) raise the level of user satisfaction with the residential area to high levels (Table 3).

As reflected in Table 3, it was determined that the resident satisfaction level was quite high (>3.5) regarding the size of the balcony (M= 3.63, 99.16%) and its use (M= 3.54, 96.66%). Balconies have an important role in the design of the apartments in Altınşehir GC. It is noteworthy that the balconies, which vary in size between 5.5 to 28.80 square meters, are larger than the kitchen unit (Figure 5). Especially the balconies connected to the living room and kitchen

are among the spaces that increase user satisfaction in the hot and arid summer season in terms of their usage.

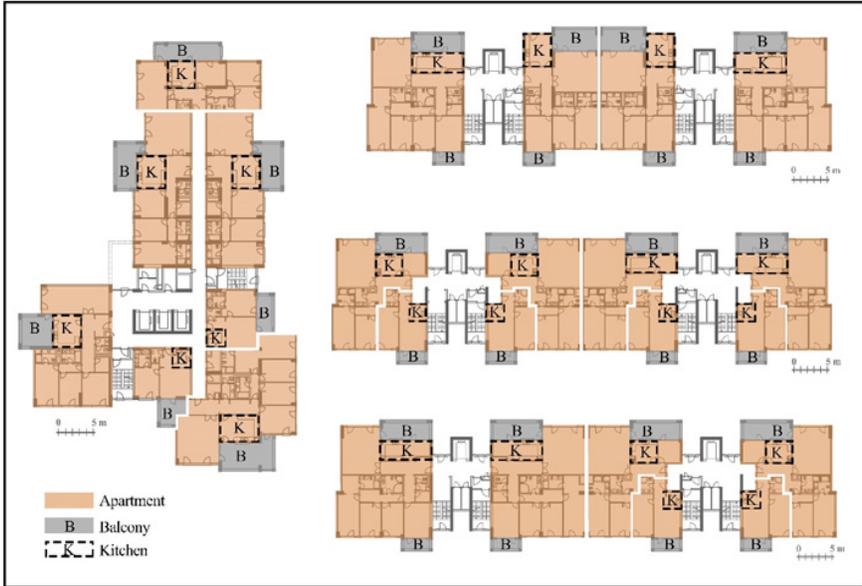


Figure 5: Location and Size of the Balcony in Different Types of Apartments

The historical city where the traditional Mardin houses are located is situated on the south-facing sloping skirts of a high mountain. All of the houses on this sloping topography face south with iwan and terraces. The iwan unit, which is closed on three sides and open on one side, is a semi-open space in all houses and is designed to be built-in in order not to be affected by the sun. Therefore, since it is designed deep, it does not receive too much sun. Sometimes there is also a terrace in front of this unit (Bekleyen et al., 2014; Dalkılıç & Aksulu, 2004; Yıldırım & Akın, 2020). In addition to its climatic advantages, the traditional iwan, which is mostly used in the summer because it is semi-open, is a multi-purpose unit in which many of the daily activities take place (sitting, eating, sleeping, etc.) (Alioğlu, 2003). With this feature, it is the most used space after the courtyard. In terms of its functional features, the iwan unit also has the feature of a transition space between the surrounding spaces. It is the center of traffic within the house. In all traditional Mardin houses, the iwan space, with its single opening, generally overlooks a wide plain towards which all the houses of the city are directed. In order to see the full view, iwans are usually located on the upper floors

In Altınşehir GC, balconies, which have a high satisfaction value, are generally built-in and large. In a way, balconies are considered a reflection of the iwan unit in traditional Mardin houses, which contributes to improving comfort levels in the hot summer season. The iwan, one of the special spaces of the past, is interpreted as a balcony in these modern residential areas. The kitchen and living room, in some examples, even the family room can be accessed from the balcony. Modern interpretations of the balcony as a traditional unit like the iwan are also seen in the studies of Bekleyen and Dalkılıç (2007). It is also known that the balcony unit is an important element that increases housing satisfaction, livability perception, and property value for those living in multi-story buildings (Allesina et al., 2019; Ribeiro et al., 2020). The balconies in the apartments of Altınşehir GC are described by the residents as a nostalgic space because they are designed as a beautiful interpretation of traditional architecture and they maximize resident satisfaction with their open and view-dominant structure. As noted in the research of Akin and Koçhan (2024), people became overwhelmed by indoor spaces during the pandemic, and balconies became a breath of fresh air for them. During this process, the open-air functions of balconies came to the fore and made significant contributions to their users. As emphasized by Bayazıt Solak and Kisakurek (2023), balconies have had positive effects on the physical and mental health of residents.

The balconies in Altınşehir GC stand out with their size and versatile use similar to the eyvans or terraces in traditional Mardin Houses. This has made balconies an even more valuable space for users.

As shown in Table 3, another item with a high mean score ($M=3.55$, 99.16%) is related to the residents' perception of the house as a symbol of prestige and status. In the interviews, the residents generally define Altınşehir GCs with the words decent and elite and as an example of a prestigious location. The desire to live in a prestigious environment has been very effective in the preference of this GC. Some of the residents stated that living together with people with high education levels and having high living standards and opportunities made this environment prestigious. It is a remarkable finding that the item related to higher prestige ($M=3.55$) had a higher mean score than security ($M=3.45$). In Altınşehir GC, individuals with similar educational levels and socio-economic characteristics live in the same setting (Table 3). The comments of the residents about Altınşehir GC as being different and privileged from other residences in Mardin reinforce the perception of being elite. As prestige and lifestyle are more important for upper middle-income users, this perception is used effectively in

marketing (Leisch, 2002). Consequently, the fact that residents sometimes want to move to a gated community (Csefalvay, 2011) and sometimes an existing neighborhood is closed down and turned into a gated community (McKenzie, 2005) provides a great opportunity to increase the property value.

Some studies have found that lifestyle is very important in the preference for gated communities located far from the city center (Salah & Ayad, 2018). Common social and open spaces such as landscaping, recreation, sports areas, and parks are environmental factors that increase the preference potential of gated communities (Berköz, 2010). Similarly, the location of Altınşehir GC is liked by its residents. The fact that the GC is far away from the city center encourages optimum use of the garden and provides opportunities for leisure and recreational activities. As shown in Table 3, user satisfaction with garden maintenance ($M= 3.58$, 96.66%), which is directly related to the neighborhood, is quite high. The responses of the residents to the open-ended questions show that one of the main reasons for satisfaction with the house and its environment is related to the location of the Altınşehir GC. Most of the residents stated that they prefer to live in a quiet, natural, and peaceful environment in the face of the negativities brought by crowded city life.

Some of the findings on user satisfaction levels from this GC also reveal some dissatisfying issues, one of which is related to the apartment while the other one is related to the neighborhood. In the quality assessment of sound insulation, the dissatisfaction with the insulation between apartments ($M= 2.35$, 43.33%) is noteworthy (Table 3). Inadequate sound insulation of floors and walls negatively affects the auditory privacy between apartments. The findings in this direction are similar to the findings of Bekleyen and Aras-Baylan's (2018) study on GCs. Another source of dissatisfaction is related to the use of social areas in the neighborhood. Table 3 reveals that the use of social areas by strangers is one of the factors that decrease neighborhood satisfaction ($M= 1.99$, 25%). In Mardin, where kinship relations are still strong, it was found that some of the individuals living in Altınşehir GC invited their relatives living outside the neighborhood to benefit from environmental facilities. This situation has a negative impact on the other residents of the GC. In particular, many of the residents stated that they were uncomfortable with having strangers in the GC.

One standout feature of Altınşehir GC contributing to user satisfaction is its spacious and functional balconies, serving as semi-open areas that enhance the residential experience. Additionally, a noteworthy aspect of Altınşehir GC, not limited to housing but extending to the neighborhood, is the well-maintained

garden and surrounding spaces, which also receive high satisfaction from users. The presence of expansive and well-kept gardens provides residents with opportunities for relaxation and social interaction, while also offering children a safe environment for play. Although overall user satisfaction is high, certain concerns could potentially be addressed through additional measures and initiatives implemented by the site management.

4. Conclusion

GCs, which are widely produced worldwide, have reached a remarkable dimension in the housing market. In addition to providing a good residential area, it is developing as a living model that will contribute to social segregation. Recently, these residential areas have been preferred by upper and upper-middle-income groups as they create a safe and privileged area and provide comfortable physical environments.

GCs, which are generally located far from the city centers, can be considered a response to the desire of individuals to get away from the crowded and tiring atmosphere of the city. The pandemic, which had a pervasive effect all over the world, increased the importance of living in a GC, far from the crowds in the city center. The residents describe Altınşehir GC as an environment where they felt safe during the pandemic contributed to the creation of a safe environment in another dimension.

Instead of imposing a standard and uniform housing design on the users, alternative housing typologies have been developed to address various user needs in Altınşehir GC. 13 different types of plans were applied in the area. It is noteworthy that in all plan types where housing forms differ, the balcony unit competes with the living room unit in terms of size and is designed larger than the kitchen unit. In a hot and dry climate like Mardin, the semi-open spatial features of traditional houses provide some design clues. The balcony has the highest value with its formal characteristics regarding housing satisfaction. As a reflection of the traditional iwan unit, large and built-in balconies offer functional spaces for users. This essential finding should be taken into consideration in future housing designs in the area.

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CHAPTER VIII

PUBLIC SPACES, CULTURAL LIFE, AND PUBLIC ART: INTERACTION AND TRANSFORMATION

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1. Introduction

With the prominence of human-centered approaches in urban development, analyzing urban public spaces from the user's perspective has become essential for effective urban design, planning, and policymaking (Zhu et al., 2025). Urban public spaces have evolved from being areas accommodating visual, auditory, and verbal communication to spaces that promote social interaction and community engagement. These areas allow individuals to analyze their surroundings and respond to them accordingly (Hatem et al., 2024). Public spaces are defined as communal areas open to everyone, serving as shared resources for society. Typologically, they range from small corners in historic neighborhoods to expansive urban parks, streets, and squares in various parts of a city. These spaces function as vital elements of the urban system, helping to reduce urban density and offering areas of respite (Alves, 2007). Moreover, public spaces have gained value as physical and social environments where individuals can freely gather, interact, and experience the dynamics of social life. These spaces are not limited to streets, parks, and

squares but also include venues for political, cultural, and social interactions, making them integral to the functioning of urban environments.

Public spaces are fundamental concepts and key physical elements in urban areas, playing a significant role in enhancing the quality of life and well-being of society (Carmona, 2010; Zhu et al., 2025). Based on this importance, the core qualities of urban public spaces are often defined by their “publicness,” which establishes a strong connection between the spaces and their users.

A widely accepted argument suggests that urban designers and policymakers should prioritize the needs of the public during the space-shaping process, acknowledging people’s right to evaluate and influence the quality of urban public spaces. Consequently, exploring spatial quality from the users’ perspective has become a notable subject in urban studies (Zhu et al., 2025). These spaces offer individuals opportunities to construct their identities, engage in discussions about social issues, and connect with art and culture. Thus, public spaces have transformed into venues not only for social interaction but also for cultural and artistic production.

Cultural life refers to the expression of cultural identity by individuals and groups through art, literature, music, traditions, festivals, and other forms of artistic expression. Public spaces function as platforms where cultural life is displayed, intercultural interactions take place, and culture is both produced and consumed.

Public art refers to artworks accessible to individuals from all segments of society, often displayed in open spaces and designed to have a direct impact on viewers. These artworks can take various forms, including monuments, sculptures, murals, installations, and performances. Beyond their aesthetic value, public art serves as a significant tool for raising awareness of societal issues, articulating social critiques, and fostering cultural connections.

Public art installations designed to heighten the audience’s senses and provoke responses can create physically, emotionally, and intellectually accessible experiences for diverse viewers. Similar to site-specific public art, landscape installations are deeply connected to the physical attributes of their location, providing direct responses to the space and facilitating its interpretation (Aragon et al., 2019). These installations engage with the transient elements of the landscape, reveal dynamic spatial relationships, and make ecological and urbanization processes more comprehensible. Artworks in public spaces evolve as reflections of processes of change and transformation. With globalization and digitalization, the meaning and function of public art have shifted significantl .

Technological advancements have enabled public art to become more interactive, dynamic, and accessible. For instance, digital installations, interactive art projects, and art actions carried out through social media have amplified the reach and impact of public art.

2. Public Art in Urban Spaces and Public Art Typologies

Among the forms of public art, temporary artworks include sculptures or other objects, street lighting, urban furniture, architectural structures, landform artworks, and festival decorations. Cities around the world view public art as a tool for creating spaces, using it to design distinctive and characteristic environments (Matthews & Gadaloff, 2022). This paper examines examples of public art worldwide, following the classification system proposed by Jasmi & Mohamad (2016), which categorizes public art products based on their specific purposes and contributions to urban space.

- **“Monuments”** to convey an important person or a historical-current event of public importance,
- **“Impressive works of art”** to bring artistic vitality to people’s daily lives,
- **“Productive works”** to revitalize the quality of public space and provide comfort and convenience while adding functionality to the space,
- **“Community works”** to reflect social memory, traditions, customs, values and aspirations,
- **“Technological works”** among the shows that use artists’ works and digital screens

In this section, based on Jasmi & Mohamad’s classification of public art, installation arts are categorized as follows:

2.1. Monuments for Conveying Important Historical or Publicly Significant Events:

The Eiffel Tower was constructed between 1887 and 1889 by Gustave Eiffel’s firm as the entrance gate for the Paris Fair, held in celebration of the 100th anniversary of the French Revolution. This iconic tower, visible from all parts of the city, stands at a height of 300 meters and is constructed primarily of iron and steel (Alici, 2017). Architectural structures have historically gained cultural significance as symbols in the regions where they exist. The Eiffel

Tower is a cultural symbol for France and the city of Paris (Eğinli & Nazlı, 2018). From the past to the present, the Eiffel Tower, serving as a symbol of Paris, exemplifies an icon within urban open spaces, representing a monument and thereby an example of public art (Figure 1).



Figure 1. Eiffel Tower in Paris by Gustave Eiffel (Arkitektuel, 2023)

The Siponto Basilica in Italy's Puglia region dates back to the 13th century (Figure 2). Italian artist Edoardo Tresoldi recreated this majestic architectural sculpture using wire mesh to revive the basilica's ancient form. The installation not only brings new vision to the Siponto Historical Park where the basilica is located but also emphasizes the park's significance. The transparency effect during the day triggers a sense of dynamism, while the illuminated display at night creates a complete visual spectacle. Tresoldi, describing himself as a sculptor who can speak the language of architecture, recognizes the human need to connect with both man-made spaces and nature, which he captures through transparency within the landscape. This marks a phase where sculptures dissolve into the landscape of architecture (Arkitera, 2018).



Figure 2. Basilica of Siponto – Edoardo Tresoldi – Italy (Peyzax, 2020)

2.2. Impressive Artwork to Infuse Artistic Vitality into People’s Daily Lives:

The renowned Chinese artist and activist Ai Weiwei’s monumental 3D structure, created in Toronto in 2013, is made from approximately 3,144 bicycles. This installation, constructed by placing bicycles in succession to achieve a three-dimensional image, covered a large part of Toronto’s Nathan Phillips Square. The artist’s work resembles a labyrinth ascending towards the sky. The interconnected bicycles create a sense of infinit , while Weiwei aims to emphasize the transformation of urban life. The installation is titled “Forever Bicycles.” Subsequently, the artist showcased smaller versions of the same installation in various locations worldwide (Figure 3).

Constructed using 179 steel bicycles, this artwork forms an intriguing construction perceived differently from various perspectives, creating a visual illusion with depth and height. The artist named the piece “Forever Bicycles” in reference to the Forever brand that has produced bicycles in Shanghai since 1940 (Pazarlıoğlu and Keskin, 2023).



Figure 3. Forever Bicycles - Ai Weiwei - Toronto (Playtuşu, 2014)

Another example of a public artwork is Mehmet Ali Uysal’s piece titled “Ten.” This artwork, selected among the top ten public art examples in the world, was created using wood, earth, and grass seeds. The artist specializes in large-scale installations that integrate with the materials of the surrounding building, transforming the space and altering the viewer’s perception and movement within the environment.

Standing six meters tall, this monumental conceptual piece has been located in Chaudfontaine Park in Liege, Belgium, since 2010. Uysal’s work is displayed in a public park, allowing for direct interaction with visitors and

providing viewers with the opportunity to encounter the artwork with surprising impact without exerting special effort (Figure 4). (Saparcontemporar , 2016).



Figure 4. Ten- Skin (2010) -Mehmet Ali Uysal – Belgium (Saparcontemporary, 2016) and (Paris-B, 2023)

Brazilian artist Henrique Oliveira’s installation at the Palais de Tokyo museum in Paris features tree branches intricately coiled around the beams of the museum, giving the appearance of organic growth. Designed to resemble an incredibly tangled Gordian Knot, the Baitogogo sculpture is installed within an exhibition space as a mass of plywood branches resembling a tree-like structure. The artist, using materials such as tree bark and furniture tape, drew inspiration from nature, plants, and the growth patterns of trees.

Oliveira, as a practitioner of architectural integrations, guides the space by expanding and multiplying columns in this work, trapping the viewer within an impressive cycle made of root-like materials. Using reclaimed wood specific to his home, Oliveira references Brazilian culture and identity, illustrating the physical and social decay of the city’s urban fabric (Figure 5), (Itsliquid, 2013).



Figure 5. Henrique Oliveira, Baitogogo (Dezen, 2013)

Bruce Munro, his best-known project “Field of Light,” was conceived in 1992 while camping near Uluru, a sandstone monolith in Australia also known as Ayers Rock and considered sacred by the Aboriginal people (Figure 6). Munro explains, “I wanted to create an illuminated field of gentle light rhythms under a starry canopy that would bloom like a seed sleeping in a dry desert, awakening at twilight.” Munro’s first solar-powered “Field of Light” represents the artist’s spiritual homecoming. “Field of Light Uluru” will gently illuminate a distant desert area within the view of majestic and ancient rocks. As darkness falls and Uluru turns into a silhouette, the “Field of Light” is illuminated, softly lighting up the desert with gentle color rhythms for as far as the eye can see (Ayersrocketresort, 2024).



Figure 6. Field of Light-Işık Alanı- Bruce Munro;
(AspirantSG, 2023) and (Calendar, 2023)

2.3. Productive Works to Enhance Public Space Quality and Functionality While Providing Comfort and Convenience”:

“On the Water” is an invisible or partially visible underwater pedestrian bridge located in the port of Münster (Figure 7). It was designed by the artist Ayşe Erkmen in 2017. For this installation, Erkmen utilized the inner harbor of Münster, specifically establishing a pier just below the water surface that connects the lively Nordkai (north pier) with the industrialized Südkai (south pier). Through this context, the artist creates an illusion of walking on water for visitors, drawing attention to sociological and urban planning issues. The Sculpture Projects in Münster, which invites artists to explore the structural, historical, and social context of the city and create site-specific productions, has largely succeeded in maintaining its critical and original approach by challenging conventional and established understandings of art (Peyzax, 2020).



Figure 7. On Water Installation Art – Ayşe Erkmen-Münster (Divisare, 2017)

Indian-born artist Anish Kapoor’s monumental sculpture titled “Cloud Gate,” which merges people with clouds, has become a symbol of Chicago in the United States (Figure 8). With its geometric structure and transparency, it serves as a concave mirror, reflecting and gathering everything around it. The sculpture, made using one hundred tons of steel, is a focal point of interest for Chicagoans and tourists due to its massive size and material. Additionally, the artwork serves as a meeting point and is considered a landmark in the city. By placing an interactive art piece in one of the largest squares in the region, Anish Kapoor has interacted with and engaged his audience through this magnificent work that encapsulates the characteristics of its surroundings.

The sculpture is designed as a curved and soft form, in stark contrast to the sharp lines of the structural elements of the area, ensuring that the sculpture complements the structural culture of the space and is designed in a form that ensures the sculpture’s presence will not be overshadowed, reflecting the artist’s deliberate approach during the design phase (Indigo, 2016).



Figure 8. Anish Kapoor, Cloud Gate, Chicago, ABD (Indigo, 2016)

The installation designed by Bulgarian artist Christo and his late wife Jeanne Claude in 2009 connects the shores of Italy's Lake Iseo to the central islands of the lake temporarily through three kilometers of saffron-colored walkways (Figure 9). The artwork titled "The Floating Piers" is located in Lake Iseo, situated 100 km east of Milan and 200 km west of Venice, and is just 35 cm above the water surface. This walking path, made of yellow fabric-covered floating cubes, is a modular system consisting of a high-density of 200,000 polyethylene cubes designed to move up and down with the motion of the waves. After being exhibited for 16 days, the installation was removed and the materials used were recycled (Arkitera, 2016).



Figure 9. Christo Vladimirov Javacheff, Lake Iseo (Natura, 2016)

2.4. "Community works" reflect social memory, traditions, customs, values, and aspirations:

Italian sculptor Lorenzo Quinn showcases his art in public spaces, believing in its unifying power and universality. He emphasizes that he uses hand figures to convey messages that can be understood by all of humanity. Quinn particularly draws attention to environmental issues and climate change. One of his most famous temporary installations in Venice, titled "Support," was created to support the efforts of the United Nations Climate Change action in collaboration with Halcyon Art International. In this sculpture, one hand supports the façade of a building while the other appears to reach through a window on the first floor, gripping the corner (Figure 10). These two white hands emerging from the Grand Canal give the impression of momentarily halting the building's collapse, reminding viewers of the rising sea levels threatening Venice. The sculpture was designed for the 2017 Venice Biennale and was removed after the event (Arkitera, 2017).



Figure 10. Support- Lorenzo Quinn (Aposto, 2022)

Brazilian artist Nele Azevedo gained significant attention worldwide in 2009 by exhibiting 1000 melting ice figures, sculpted from Arctic ice, to raise awareness about global climate change. The installation, titled “Melting Men,” was displayed for 30 minutes at the Berlin Concert Hall and on the steps of Gendarmenmarkt Square in Berlin (Figure 11). The perception created by watching these ice sculptures melt drop by drop in front of everyone’s eyes drew considerable interest, highlighting one of the most compelling artworks addressing environmental catastrophe. As a result, the exhibition has been repeated numerous times at various events across many countries around the world (Türe, 2014).



Figure 11. Melting Men- Nele Azevedo, (Artfulliving, 2016),
(UrbanIntervention, 2015)

Chinese artist Ai Weiwei’s installation, created using 14,000 life jackets and one inflatable boat, and placed at the entrance of the Berlin Concert Hall, was intended as a response to the refugee crisis and migrant issue in Europe (Figure 12). The artist inscribed “safe passage” on the inflatable boat. The purpose of this art installation was not only to draw attention to the refugee crisis but also to emphasize “the countless lives affected by the crisis, with each jacket symbolizing the individual life of a man, woman, or child entering the country (IQ, 2021).



Figure 12. Konzerthaus Berlin- Ai Weiwei (IQ, 2021), (Medium, 2017)

Public art that utilizes city furniture or spatial features of public areas falls into various classifications of public art. For example, “yarn bombing” is a practice where public furniture and objects in public spaces are covered with yarn to draw attention to a specific issue. These art projects are particularly done in public spaces, altering design elements of everyday urban furniture, impacting the behavior of city dwellers in the area, and potentially changing the duration and use of the space (Orhan, 2021).

“Yarn bombing” emerged in 2009 as a concept of using knitted and crocheted creations as a form of political resistance, often related to issues of social justice, politics, feminism, and women’s issues (Figure 13). It typically serves a purpose and has the potential to evoke strong emotions and meanings through the materials used and the techniques applied (Knitpal, 2018).



Figure 13. Yarn Bombing (Artsforager, 2011),(Knitpal, 2018)

Graffiti is used to depict individuals or events of public significance, often incorporated into architectural designs and facade embellishments, thus directly existing within public spaces. Referred to commonly today as street art, graffiti is applied in various locations within urban public areas (Figure 14). It serves as a platform for artists to convey societal messages and critique everyday life across different parts of the city (Krzyrkowska & Gron, 2020)



Figure 14. Graffiti examples (elvetescape, 2018), (Akçalı, 2019)

Among visual arts created as public art, murals, referred to as “mural” after graffiti are the most commonly seen large-scale paintings on the facades of vacant buildings. Examples of wall art as a design element in the city sometimes express more than aesthetic value (Figure 15). They serve as a good method for conveying messages, information, and different approaches that directly impact the urban public space, its residents, and the city through visual communication (Orhan, 2021).

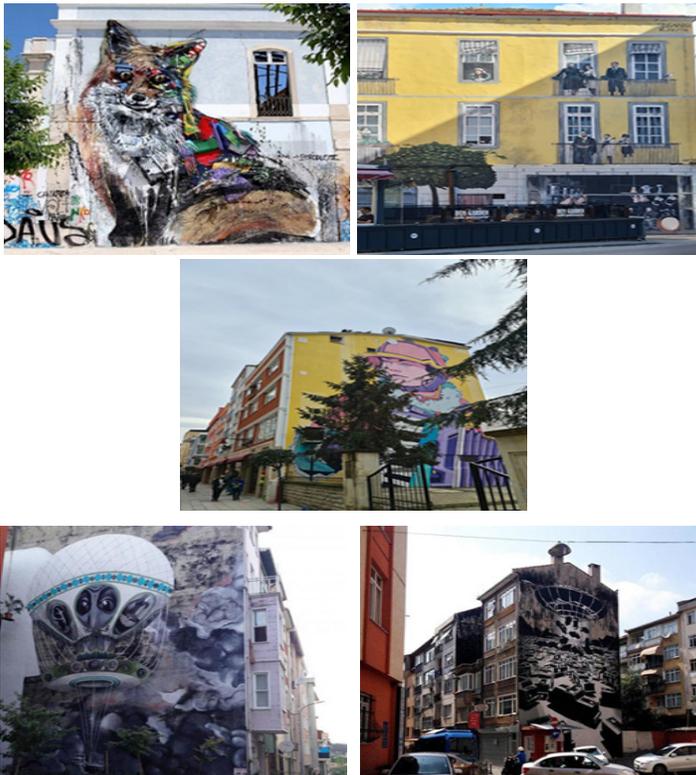


Figure 15. Mural examples a) (Stackpathcdn, 2023)
b) c) (Azaklı, 2023) d),e) (Molatik,2023)

2.5. “Technological works” encompass artistic creations and displays that leverage digital screens and technology

In the context of the artist-space-audience relationship, public art events are beginning to utilize the opportunities provided by today’s technological advancements to introduce new display techniques and presentation formats. These art forms, which convey visual and auditory effects through experiential interaction, can be considered as products of interactive design. Rather than a finished artwork, they involve activities where participants and spectators play a role in shaping the final outcome. The artwork’s ultimate form is determined not by the artist but by the audiences (Kluszczyński, 2010).

A building has been modeled in 3D in a virtual environment, and the movement of water has been created to flow over the building like a waterfall (Figure 16). When a person stands on the waterfall, they act as a rock, obstructing and altering the flow of water. The created virtual visual impacts the semi-public space it is in directly, increasing people’s interest in and use of the area. Consequently, both the value of the building and the space it occupies are elevated through increased use and engagement (Orhan, 2021).



Figure 16. TeamLamb, Universe of Water Particles, Tokushima (Teamlab, 2017)

In the heart of New York City, the installation titled “Blu Marble” broadcasts the live view of Earth from space on a large LED screen, situated in a heavily trafficked public area (Figure 17). This work creates an attraction point for the city at all times of the day. Given that similar installations can be carried out on the facades of different buildings, there is a high potential to increase the value of use for various public spaces (Orhan, 2021).



Figure 17. Sebastian Errazuriz, Blue Marble,
New York (Arkitera, 2023)

In recent years in our country, especially in the bustling areas of major cities, you may have come across streets adorned with upside-down, colorful umbrellas or series of letters spelling out the name of a city with heart symbols placed right next to popular city spots (Figure 18). These multidimensional, tangible artworks are integrated into the urban landscape and contribute to the evolving concept of art that invites participation. Such works can be considered part of public art installations.



Figure 18. a) İstanbul-Karaköy (Azaklı, 2022); b) İstanbul-Büyükkada
(Azaklı, 2022) c) Ordu (Azaklı, 2018)

3. CONCLUSIONS

Throughout history, art has continuously interacted with cultural, social, political, religious, technological, and scientific changes. These transformations have significantly shaped both the creation process and the perception of art. The societal changes that have taken place have directly influenced the content and form of artworks. These dynamic changes demonstrate that art is not merely an aesthetic expression but also a powerful social communication tool that reflects the spirit of its time.

Public art has undergone a significant transformation in terms of exhibition spaces and materials used. This evolution has enabled art to transcend being merely an aesthetic object, becoming a social, cultural, and political communication medium. Consequently, art has become deeply integrated into everyday life, an inseparable part of daily existence.

With the advancement of technology, the ways in which artworks are displayed have also changed. Traditional galleries and museums are now complemented by digital platforms and virtual reality applications. Moreover, forms such as street art and performances have enabled art to find a place in public spaces. In addition to traditional spaces like museums and galleries, everyday locations such as streets, squares, building facades, parks, and even digital spaces have become venues for displaying art. This shift has substantially altered both the artworks themselves and the way they are perceived. Street art, sculptures, and murals, for example, have brought art closer to the public.

Artists, by displaying their works in public spaces such as streets, have demonstrated that art is not only accessible to an elite few, but is open to everyone. The spaces where art is exhibited have transformed from mere display areas into integral parts of the artwork itself. For instance, large-scale paintings or light installations on building facades have not only added new meanings to the space but also made the viewer a part of the piece.

Public spaces play a significant role in shaping cultural identities while also being places where social structures are redefined. Cultural life nourishes art, and art, in turn, makes visible the various layers of culture. This creates a dynamic interaction between public spaces and public art. As a result, public spaces, as key components of cultural life, shape art, societal values, and individual identities. Public art, within these spaces, serves as a powerful form of expression that transforms society and showcases cultural diversity. This interaction emerges as one of the most important indicators of social change and cultural evolution.

A work of art placed within a public space disrupts the ordinariness of that space, raising the viewer's awareness of their surroundings. Various art events in public spaces transform these places from simple transition points or resting areas into meeting and interaction hubs for all. Art events break the monotony of public spaces, making them more meaningful and attractive to city dwellers. For these events to be successful, the design and arrangement of public spaces are crucial. Regular and sustainable art events in public spaces positively affect how these areas are used. Public art events not only enhance the aesthetic or cultural

value of a place but also strengthen its social, economic, and psychological functions. These activities deepen individuals' connections with the city and with each other, making urban life more vibrant and meaningful. The design of public spaces and the art events organized within them are key elements in shaping the social fabric of a city.

This study has illustrated how public spaces interact with cultural life and public art and how this interaction contributes to societal change. The design of public spaces highlights the role of cultural and artistic elements in promoting social integration, preserving cultural heritage, and passing it on to future generations.

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CHAPTER IX

DEVELOPMENT OF LANDSCAPE DESIGN STRATEGIES IN URBAN TRANSFORMATION PROJECTS: THE EXAMPLE OF TRABZON ÇÖMLEKÇİ TRANSFORMATION PROJECT

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1. INTRODUCTION

Today, urban transformation projects are of great importance in terms of both national and urban development strategies. Changes in urban areas are mandatory within the framework of changing conditions and needs. This necessity causes cities to become the focal point of certain actors. (Çakır, 2023). Urban spaces that have undertaken production and service functions need to revive by completing their physical and economic life, while areas that have lost their social and communal functionality need to have a new life and transform into a renewed settlement.

In this process, a popular concept, “urban transformation”, emerges for renewal and the meeting of expected needs by spaces at the urban level. The transformation approach, which has emerged rapidly in cities on a world scale, has simultaneously begun to be implemented in many historical and shantytown areas and city centers in Turkey.

Thomas (2003) defines the concept of transformation as a comprehensive action that aims to provide holistic and permanent solutions to functional and social problems experienced in urban spaces. The aim of urban transformation applications is to determine the reasons that cause physical, social or economic collapse in urban areas and to produce effective solutions to eliminate these reasons and thus to ensure the revitalization of problematic areas. According to Robert and Skys (2000), urban transformation is defined as a compromise on the results that will emerge in the transformation to be carried out, arising from the need to better understand urban deterioration processes. They also advocate the necessity of determining targets related to the characteristics of the transformation areas in urban transformation and making them suitable for the purpose of transformation. On the other hand, Couch (2000) states that in addition to improving physical structures, urban transformation directed to a certain vision also solves urban problems.

Urban transformation occurs with the interaction of different variables depending on the dynamics of each country. When evaluated in this context, urban transformation in metropolitan cities in Turkey occurs as a result of the effects of socio-economic, administrative, environmental and physical variables. In this context, in order to understand and intervene in urban transformation in Turkey, it becomes important to understand economic, social, environmental and administrative/legal changes and to develop models that take these variables into account. (Sönmez, 2003).

2. General Information About Çömlekçi Urban Transformation

Recently, urban transformation projects have gained momentum in Trabzon, renewal works have been initiated in many parts of the city and some transformation and renewal projects have been completed.

Among the urban transformation projects implemented in Ortahisar, which is a central district within the borders of Trabzon province, are the Hagia Sophia transformation project, Narlıbahçe urban transformation project, Ortahisar urban renewal project, Zagnos valley urban transformation project, Tabakhane valley urban transformation project, Çömlekçi urban transformation project and Pelitli urban transformation project (Bogenç, 2009).

This study will focus on the Çömlekçi neighborhood urban transformation project located in Ortahisar district. The transformation project is being implemented in 3 stages, the first stage has been completed and work has begun for the 2nd stage. Within the scope of the study, ideas will be given within the scope of the projects that can be implemented in the 2nd stage.

Çömlekçi neighborhood, its central location, proximity to the city center, the presence of the port in the north and historical structures within the neighborhood borders make it an area with significant potential on the urban scale. Due to its aging physical structure, the formation of negative developments in social life and the obvious effects of this on the city scale, and the lack of maintenance in historical buildings, it has become the main location for transformation. The historical texture of the area differentiates the area from other transformation projects. The fact that the residents in the neighborhood are composed of subgroups in terms of social and economic scope, and that it has become the center of illegal trade, has actually caused the neighborhood to be excluded by other users after a while. This situation of exclusion has caused security vulnerabilities in the neighborhood.

In addition to the opportunities and weaknesses of the neighborhood, the presence of local users born and raised within the neighborhood borders shows us that the actions and practices to be implemented in the transformation of the area should be evaluated in a multifaceted way. Accordingly, social, cultural and spatial solutions have been considered together in the project idea to be presented for the 2nd Stage of the study area.



Figure 1: Çömlekçi 2nd stage project area



Figure 2: Completed 1st stage project area

The project area, which will be carried out in 3 stages, is approximately 60.000m². TOKİ, which undertook the construction of the project, has assigned commercial housing and recreational functions to the transformation area. It plans to design building units and open spaces that will meet these functions (URL-1).

This area was considered as a study area in Environmental Design Project 6, one of the 4rd year courses of the Department of Landscape Architecture at Karadeniz Technical University (KTU). In this study, new landscape design projects introduced in this course are examined. In this process, it is expected that the religious structure and 5 historical buildings in the project area will be preserved and re-functionalized, the problems and spatial alternatives that will solve them will be revealed, and the recreational and socio-cultural needs of the city users will be met.

3. Process of Environmental Design Project

In the KTU Landscape Architecture Environmental Design Project Course, the project area boundaries of the 2nd stage of the urban transformation area were given to the students.

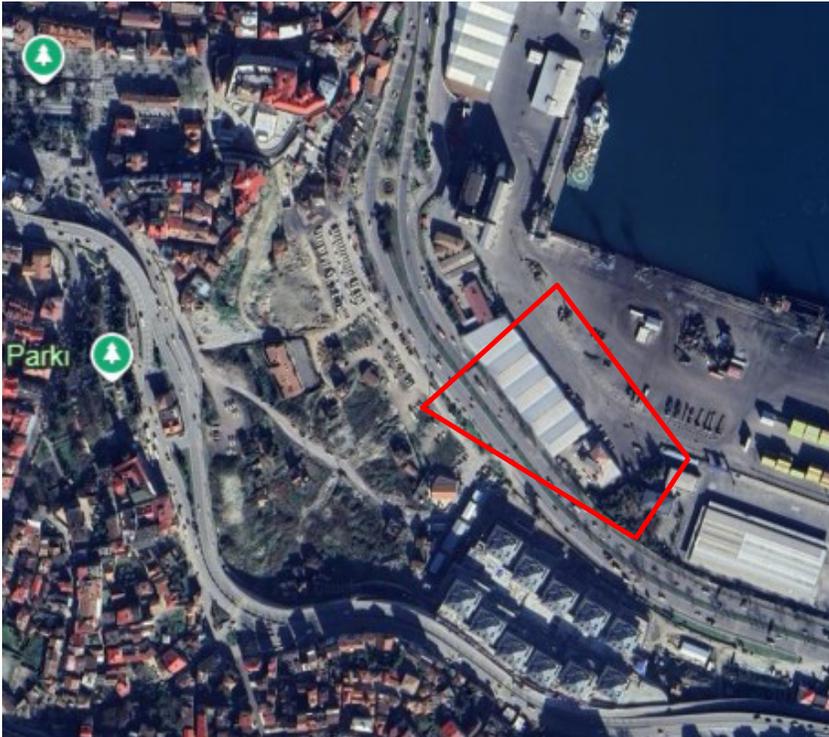


Figure 3: Study area

On-site observations were made for the study area and information about the current situation was collected. Then, some objectives were determined in the light of the purpose of the study. In this context; for the Çömlekçi neighborhood, which has an important place in the historical identity of the city and is planned to be re-functioned within the scope of urban transformation, it is to design open space activities with scenarios to be created for common use areas where city users can meet their social needs in an original transformation concept and to produce space solutions for these activity areas. It is aimed to conduct literature study on the subject, to construct original scenarios on the subject, to determine user needs on the subject, to list of needs, to create a functional diagram, to analyze the needs and possibilities of the area, to present and criticize the sketches of the first spatial organizations in the light of all these evaluations, to develop and criticize suggestions until the end of the semester, and to continue the suggestion-criticism process.

4. Review of The Project Process

In this section, all stages of one of the projects produced for the 2nd stage of the Çömlekçi Mahallesi urban transformation project, which was studied within the scope of the environmental design project course, will be examined. Within the scope of the project course, firstly, data related to the area were collected and analyses were created by interpreting the existing data. Depending on the analysis results, the spatial targets to be created in the area were determined and a conceptual approach was created. In the project examined within the scope of the study, the concept of “diversity”, meaning a multifaceted city reflecting different lifestyles, was developed as a conceptual approach (Figure 4).

It focuses on sociocultural minorities and their perception of urban space. The project will have the potential to reconnect the city while providing a new city center. It combines historical public spaces and new public spaces in a single system. The project aims to ensure the public acceptance of all kinds of facilities and to make the project area an important destination. The project will be a real sharing system that allows both the city and the surrounding neighborhoods to freely use all the potential and activities it produces.

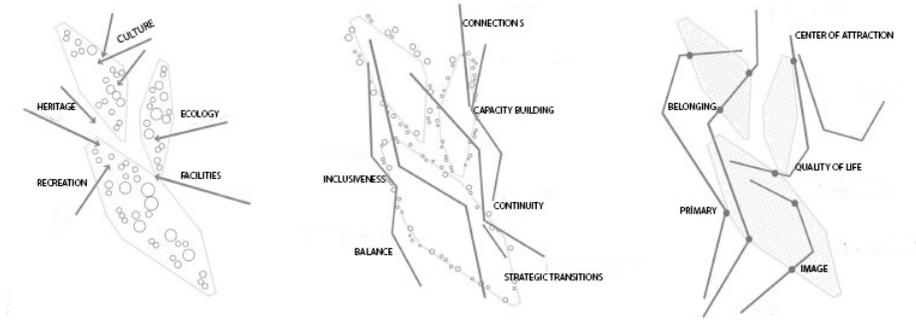


Figure 4: Conceptual approach

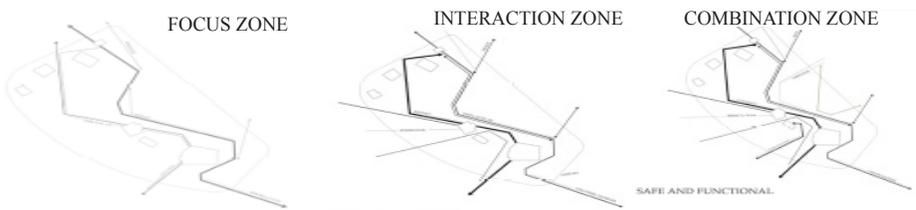


Figure 5: Vision set for the project

After determining the concept, a vision was developed on how the land plastic would be shaped depending on the spatial organization to be made in the project area. Since an inclusive approach was adopted in the project, the project area was divided into 3 sections as the focus zone, interaction zone and unifying zone, and spatially related activities were determined. (Figure 5).

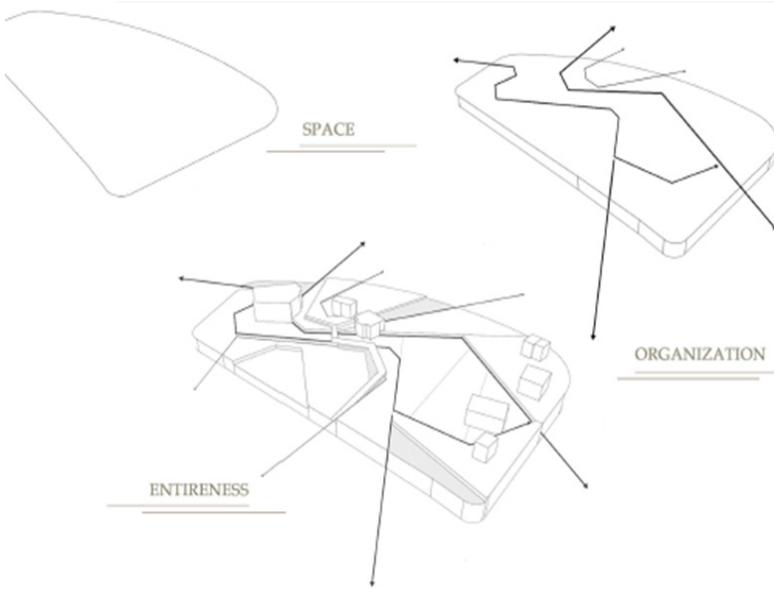


Figure6 : Main design decisions made for the project

The main design decisions for the Area were made with the foresights determined for the project in the vision and the analysis data obtained. Here, the entrances and exits to the Area, the meeting place, the places where the activities will be held are determined and the main circulation is presented. (Figure 6).

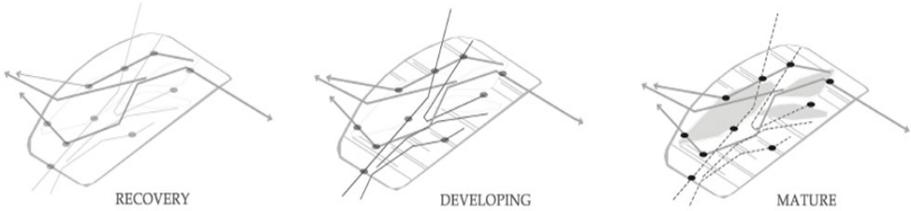


Figure7 : Circulation, hard ground green area solutions

In order to ensure the balance of hard ground and green areas, the hard ground ratio was determined to be suitable for the activities, and the circulation was determined to facilitate transportation, ensure interaction between activity venues, and provide a comfortable and safe walking line. The aim of determining the green areas was to ensure the ecological sustainability of the project. (Figure 7).

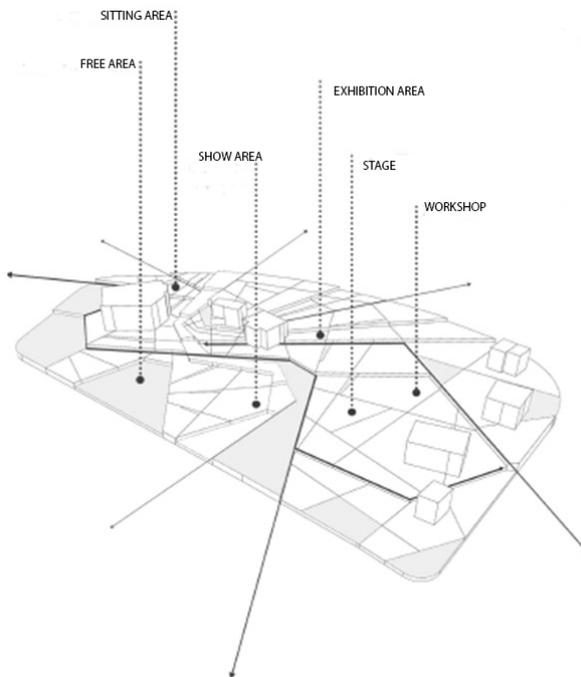


Figure 8: Active and passive event venues

In the next stage, the main design decisions created with the vision were synthesized with the obtained data and the locations of the active and passive activity spaces were shown on the determined plan. (Figure8).

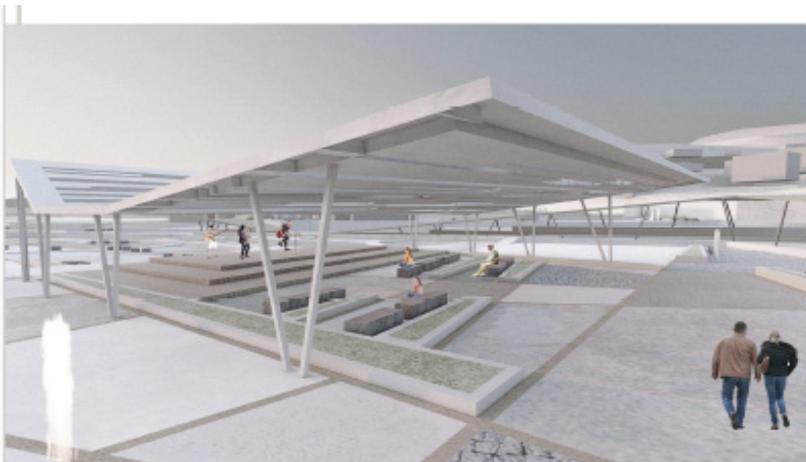


Figure 9 : Scenarios created for activity spaces

After the spaces were determined on the plan, scenarios were visualized to explain the operation, communication and fiction in these event spaces (Figure9). After the scenario visualizations, the technical drawing process was started. All technical details (flooring, equipment, landscape structures, plant representations) were drawn on the plan.

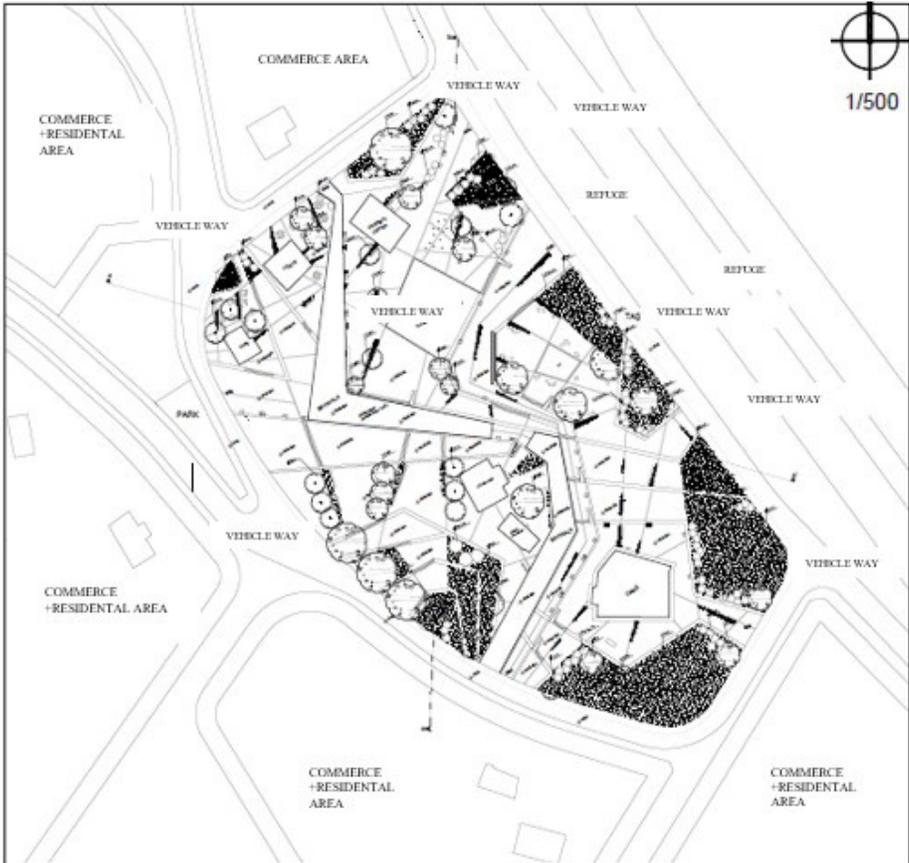


Figure 10: Technical plan

After the technical plan drawings, renderings were created to explain the project idea, spatial organization and the relationship between the area and the surrounding area in a more realistic way.



Figure 11: Render examples for project area

5. Conclusion

Within the scope of the study, the Trabzon Çömlekçi neighborhood, which was declared a left-side transformation area due to not meeting the social and physical needs of the city center in the past, was studied. The aim of the project, which was created as the 2nd stage of the transformation area within the scope of the course, is to provide a city center while having the potential to reconnect the city. It combines historical public areas and new public areas in a single system. The project aims to be a real sharing system that allows both the city and the surrounding neighborhoods to freely use all the potential and activities it produces. These goals and objectives were presented in the light of the analysis comments made during the analysis process, which is the first stage of the project process, and the data obtained. The expectations and requests of the employees in the surrounding neighborhoods and those who still continue to operate in the area and the city users from the project area were asked, and the purpose of the project was determined according to the answers obtained. The determined goals and objectives and the expectations regarding the area, the current status of the land were synthesized and the area uses were determined. The area uses were detailed and the spatial uses and activities were processed in the project base and the project design was created.

Renderings have been used to provide visual support for spatial ideas produced for the area to be more readable and understandable for everyone. This project, created within the scope of the project course, aims to shed light on future projects to be made for the area, to be an example, and to provide a clearer understanding of the expectations of city users.

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CHAPTER X

TEMPERATURE EFFECTS ON THE MORPHOLOGICAL DEVELOPMENT OF *ORIGANUM VULGARE*

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1. Introduction

Rapidly accelerating global climate change, primarily driven by anthropogenic activities, has emerged as one of the most significant environmental challenges of the 21st century (IPCC, 2021). Rising global temperatures, shifts in precipitation patterns, and the increasing frequency of extreme weather events are transforming ecosystem dynamics and posing severe threats to biodiversity. Within this context, understanding the effects of temperature fluctuations on plant species has become an increasingly critical area of research, particularly for species with ecological, economic, and cultural significance (Barnosky et al., 2012; Parmesan & Yohe, 2003). Among these, species utilized as ornamental plants in landscape design or valued for their medicinal and aromatic properties hold a prominent position. These plants not only enhance visual and functional aesthetics but also contribute to the creation of sustainable designs by offering ecological benefit

Among such species, *Origanum vulgare*, commonly known as oregano, stands out for its aromatic and medicinal properties as well as its versatility in landscape design. *Origanum vulgare* is a perennial plant widely distributed in temperate regions and is renowned for its adaptability to diverse environmental conditions (Pignatti, 1982). Its applications in landscape designs range from rock gardens to xeriscaping plans. During its flowering period, the plant displays purplish-pink flowers and lush green foliage, making it a preferred choice as a border plant for visual contrast. Additionally, its drought tolerance, aromatic foliage, and seasonal flowering characteristics position it as an ideal candidate for landscaping projects that promote biodiversity while conserving water resources (O'Brien et al., 2022).

The plant's slow growth rate and dense foliage make it an effective ground cover for preventing soil erosion on slopes (Zuazo and Rodriguez 2008). It can also be utilized as a vertical ground cover along stone walls, offering a natural aesthetic appearance (Francis ve Lorimer, 2011; Treder et al., 2024). Furthermore, its resilience to pollution and stress conditions (Thompson et al., 2012) makes *Origanum vulgare* suitable for use as a rehabilitation plant in roadside landscapes or industrial areas. The aesthetic appeal of its flowers enhances its popularity in thematic gardens and medicinal and aromatic gardens (Hitchmough, 2017).

Despite its multifaceted ecological and landscape value, research examining the responses of *Origanum vulgare* to temperature fluctuations remains limited. This gap leaves an important avenue for understanding the plant's capacity for climate adaptation and optimizing its sustainable use in landscape design.

The relationship between temperature and plant growth is a well-documented phenomenon, as temperature directly influences fundamental physiological processes such as photosynthesis, respiration, and water uptake (Larcher, 2003). For a medicinal and aromatic plant like *Origanum vulgare*, which contributes to both aesthetic and ecological aspects of landscape design, understanding these dynamics is of paramount importance (Arabaci et al., 2019). However, while the agronomic and pharmacological properties of *Origanum vulgare* have been extensively studied, its thermal adaptation has been largely overlooked in the context of landscape architecture (Hitchmough, 2017). This underscores the need for research exploring its role in enhancing the resilience of urban and rural green spaces to the impacts of climate change.

This study aims to investigate the effects of temperature fluctuations on the growth and development of *Origanum vulgare*. By examining the physiological

and morphological responses of the species under varying thermal conditions, the research seeks to provide valuable insights for the development of sustainable landscape designs and climate-resilient planting strategies.

2. Materials and Methods

This study was conducted under controlled environmental conditions to systematically evaluate the effects of temperature fluctuations on the growth and physiological responses of *Origanum vulgare*. The plant material consisted of *Origanum vulgare* specimens sourced from a local nursery known for maintaining genetically stable and high-quality stocks. The selected specimens were approximately three months old, with uniform morphological characteristics to minimize variability in experimental outcomes. Upon arrival, the seeds were stored at +4°C in a refrigerator until the sowing day to maintain their viability under optimal conditions.

The preparation of seeds commenced one day before sowing. The seeds were placed in a beaker, covered with a sterile cloth, and continuously soaked with running water for 24 hours (Figure 1). This process aimed to eliminate any chemical residues, sterilize the seeds, and prepare them for optimal germination.



Figure 1. Seed Preparation for Germination

A sowing medium was prepared using an equal ratio of one part peat, one part perlite, and one part sand. These components were thoroughly mixed to ensure homogeneity. The prepared medium was evenly distributed into seed trays (vials) (Figure 2). After soaking, excess water from the beaker was drained, and the seeds were carefully transferred onto A4 paper. Using sterilized gloves and tweezers, the seeds were individually placed into the trays to ensure even

distribution. Each seed was then covered with a thin layer of soil, approximately 1 cm in depth, to protect them from light and facilitate germination.



Figure 2. Prepared Sowing Trays with Germination Medium

After sowing, the seeds were irrigated with sufficient water to provide initial moisture. The trays were transferred to an automated greenhouse with controlled environmental conditions. Daytime temperatures were maintained in three separate experimental groups to simulate temperature fluctuations: 18-22°C (low temperature), 22-25°C (control), and 25-30°C (high temperature). Nighttime temperatures were adjusted proportionally to daytime temperatures for each group, maintaining relative humidity at 60% during the day and 50% at night. These controlled temperature regimes were selected to mimic realistic fluctuations that may occur in natural settings

Weekly measurements were conducted to assess the vegetative organs, including leaf area, stem thickness, and root length. Data on germination and growth parameters were analyzed to assess the effects of temperature fluctuations. Statistical analyses were conducted using one-way ANOVA to evaluate differences among the three temperature groups, with post-hoc Tukey's HSD test applied for pairwise comparisons. All analyses were performed using Python programming language (version 4.3.0), with statistical significance set at $p < 0.05$.

3. Results and Discussion

Seeds began germinating by the 5th day after sowing (Figure 3), and weekly observations were conducted to monitor vegetative growth parameters,

including leaf area, stem thickness, and root length. Following a 10-week growth period, the vegetative development of *Origanum vulgare* was evaluated under varying temperature conditions. The measurements represent the cumulative effects of the experimental conditions over this timeframe



Figure 3. Germination of Seeds on the 5th Day After Sowing

The effects of varying temperature conditions on the vegetative development of *Origanum vulgare* were statistically analyzed, revealing significant differences among the low-temperature (18–22°C), control (22–25°C), and high-temperature (25–30°C) groups. The control group consistently outperformed the other groups in all measured parameters, including leaf area, root length, stem thickness, and leaf production.

Specifically, plants grown at moderate temperatures exhibited an average leaf area of 20.4 cm² (±1.2 cm²), significantly larger than the low-temperature group (15.2 cm² ± 0.9 cm²) and the high-temperature group (12.1 cm² ± 1.4 cm²). One-way ANOVA confirmed (Figure 4) a strong effect of temperature on leaf area ($F(2,27) = 51.47, p < 0.0001$), with post-hoc Tukey tests (Figure 5) indicating statistically significant differences between all group pair

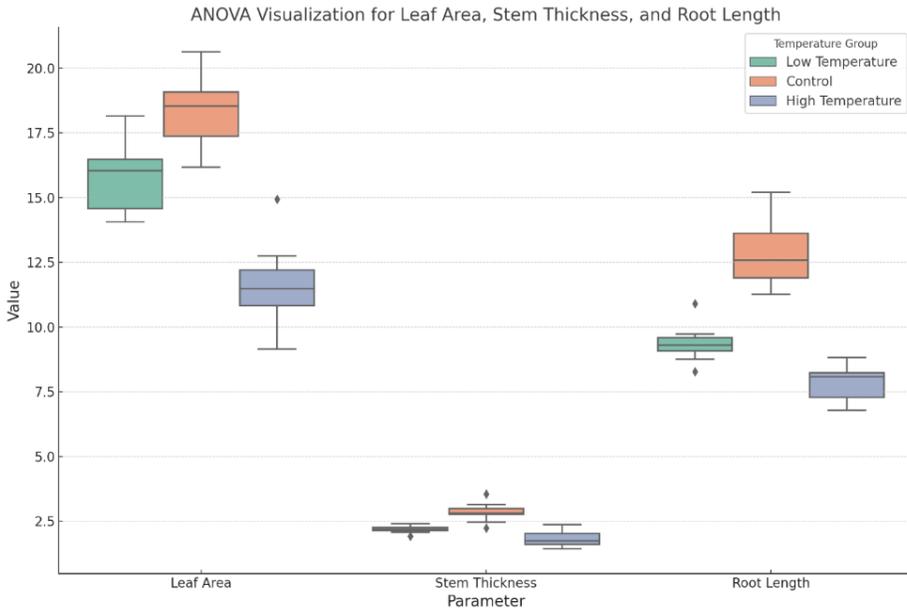


Figure 4. ANOVA Results for Leaf Area, Stem Thickness, and Root Length Across Temperature Groups

Similarly, root length was greatest in the control group, averaging 12.8 cm (± 1.1 cm) compared to 9.4 cm (± 0.8 cm) in the low-temperature group and 7.9 cm (± 0.7 cm) in the high-temperature group. The effect of temperature on root length was significant ($F(2,27) = 39.78$, $p < 0.0001$), reflecting the superior elongation capacity of roots under moderate thermal conditions.

Stem thickness followed a similar trend, with plants in the control group exhibiting thicker stems (mean diameter of 2.8 mm \pm 0.3 mm) compared to the low-temperature group (2.2 mm \pm 0.2 mm) and the high-temperature group (1.9 mm \pm 0.3 mm). Leaf production was highest in the control group, with an average of 10 leaves per plant, while plants in the low-temperature and high-temperature groups produced 7 and 6 leaves, respectively. Statistical analyses demonstrated significant differences among the temperature groups for all measured vegetative parameters.

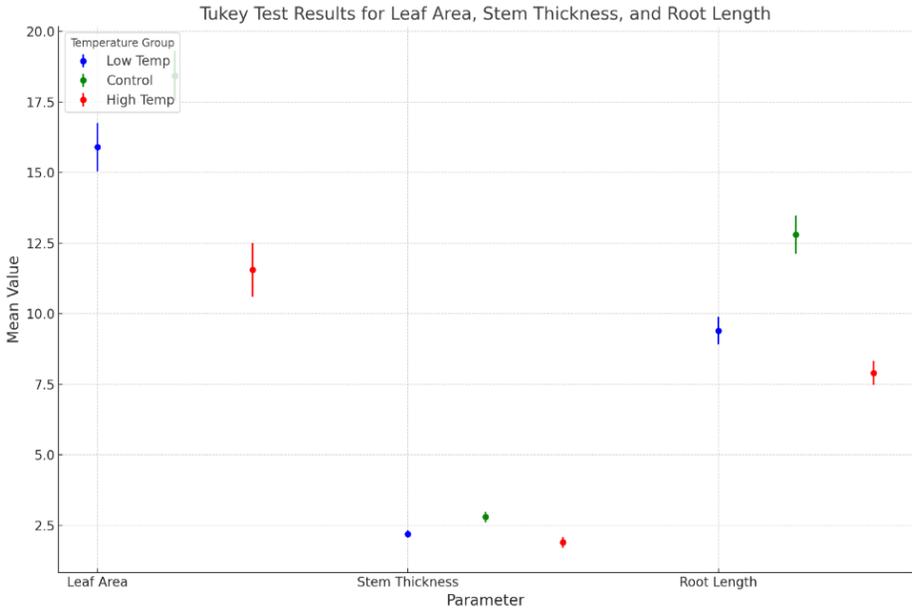


Figure 5. Tukey Test Results for Leaf Area, Stem Thickness, and Root Length Across Temperature Groups

These results emphasize the critical role of temperature in regulating the vegetative growth and physiological performance of *Origanum vulgare*. Moderate temperatures (22–25°C) provided optimal conditions for cellular division, elongation, and metabolic activity, enabling superior growth outcomes. In contrast, low temperatures moderately constrained growth, likely due to reduced metabolic rates and enzymatic activity. The smaller leaf area and shorter root lengths observed in the low-temperature group may be related to findings suggesting that suboptimal thermal conditions can inhibit carbohydrate metabolism and cell wall expansion (Seydel et al., 2021).

High temperatures had the most detrimental effects, significantly reducing leaf area, root length, and stem thickness. Thermal stress is likely to disrupt protein synthesis and significantly impair photosynthetic efficiency (Moore et al., 2021). Additionally, the restricted root development observed under high temperatures suggests impaired water and nutrient uptake, further exacerbating growth limitations (Heckathorn et al., 2013; Giri et al., 2017).

The findings underscore the importance of maintaining optimal temperature ranges in controlled environments for the successful cultivation of *Origanum*

vulgare. Greenhouse management strategies should prioritize temperature control to maximize vegetative productivity and structural integrity. Mitigation approaches, such as shading or evaporative cooling, may effectively reduce heat stress during periods of elevated temperatures (Kumar et al., 2023). Furthermore, integrating these strategies with irrigation management could enhance resource use efficiency, particularly under conditions of combined heat and water stress.

Elevated temperatures impair chloroplast function, leading to reduced photosynthetic efficiency and carbohydrate synthesis (Dutta et al., 2009). This aligns with the observed reductions in vegetative growth under high-temperature conditions in the present study. Low-temperature stress, on the other hand, has been linked to slower enzymatic activity and hindered nutrient uptake (Nawab et al., 2022), which may explain the intermediate growth outcomes in the low-temperature group.

Recent advancements in genetic engineering and breeding strategies offer promising avenues for developing temperature-resilient *Origanum vulgare* cultivars. For instance, incorporating heat-shock protein genes into aromatic plants has shown potential for enhancing stress tolerance (Reddy et al., 2021). Similarly, optimizing greenhouse technologies (Harjunowibowo et al., 2018), such as automated climate control systems (Popov et al., 2020), could significantly improve the cultivation of temperature-sensitive crops.

4. Conclusion

This study underscores the pivotal role of temperature in regulating the vegetative growth and physiological performance of *Origanum vulgare*. Against the backdrop of global climate change, which is characterized by increasingly erratic temperature patterns, the findings of this study provide valuable insights into how moderate, low, and high temperatures affect the morphological and physiological traits of this economically and ecologically significant plant species. Moderate temperatures (22-25°C) were identified as optimal for promoting cellular division, elongation, and metabolic activity, thereby maximizing growth and structural integrity. In contrast, low temperatures moderately constrained growth, likely due to reduced enzymatic activity and metabolic rates, while high temperatures had the most detrimental effects.

To mitigate the adverse effects of temperature extremes, it is critical to prioritize temperature regulation and integrate advanced cultivation strategies such as automated climate control, shading systems, and evaporative cooling.

These measures could enhance the resilience and productivity of *Origanum vulgare*, especially in regions experiencing pronounced climatic variability.

While the controlled greenhouse conditions in this study provide valuable insights, future research should investigate interactions with other abiotic factors, such as soil moisture and light intensity, to provide a more comprehensive understanding of plant-environment dynamics. Moreover, molecular studies focusing on hormonal signaling pathways and stress-responsive gene expression would further elucidate the adaptive mechanisms underlying temperature-induced changes in vegetative morphology.

In light of the accelerating impacts of climate change, the integration of molecular, physiological, and environmental research is essential for developing robust strategies to ensure the sustainability of aromatic plant cultivation. By addressing the complex interactions between temperature and other environmental variables, future studies can pave the way for optimizing cultivation practices and enhancing the resilience of economically important plant species in a rapidly changing world.

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CHAPTER XI

REFLECTIONS OF URBAN LANDSCAPE FROM GEOMETRIC ABSTRACTION: EXPERIMENTS IN FORM CREATION AND URBAN SPACE SOLUTIONS

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1. Introduction

Abstraction is the process of simplifying, stripping away details, and reducing complexity to its core. It involves the effort to remove the general features of a thought and delve into its essence (Özeskici, 2019). Abstraction is not a linear process; rather, it is a cyclical one, facilitating the consideration of relationships between parts and the whole, ultimately capturing their interconnected essence. For this reason, abstraction is frequently utilized in design practices (Ökten et al., 2022). Yılmaz et al. describe abstraction as the ability to think, where thinking itself involves establishing connections between the abstract and the concrete. They further view abstraction as a creative and artistic interpretation by the individual, differentiating it from imitation and mimicry. In this way, the artist-designer perceives and abstracts the world, transforming it into geometric forms and creating a unique world of forms (Yılmaz et al., 2018).

The creative process, generally categorized into idea generation and application, encompasses a series of actions (Messer, 2024). Creating images from abstract paintings represents a distinctive facet of art and creativity. Abstract art focuses on expressing emotions or mental states through color, line, shape, and texture, rather than realistically representing objects or events in the

real world. In spatial design, abstraction often involves moving away from the concrete characteristics of space to emphasize its function, atmosphere, user experience, or emotional impact. This approach provides the audience with an abstract and emotional experience rather than a tangible object or scene.

Charles Bouleau, through extensive research and analysis on pictorial composition, demonstrated that paintings from various periods and places possess distinct geometries that govern their composition. He explained how the flat surface of a painting gains depth through techniques such as geometry, color, light, and shadow. Bouleau also highlighted how compositions acquire qualities like dynamism, movement, gravity, or balance depending on the theme and the artist's emotional and intellectual inputs (Pérez-Fabello & Campos, 2023).

Moreover, integrating principles of mathematics into art and employing geometry in the composition of artworks have significantly influenced artistic production (Kuş & Demir Yılmaz, 2024). In this context, abstraction techniques liberate designers' creative expressions while enabling users to perceive spaces in diverse ways. The most common abstraction techniques include geometric abstraction, color abstraction, emotional abstraction, and formal abstraction. These methods allow artists or designers to convey various concepts or emotional content.

In spatial design, abstraction refers to focusing on abstract concepts by departing from the tangible forms of real-world objects or spaces. This approach involves using abstract elements such as general concepts, emotions, themes, or geometric forms to understand and shape space effectively.

2. The Interaction Between Geometric Abstraction and Landscape Architecture

Geometric art emerged from Cubism, one of the most influential visual art movements of the early 20th century. Cubism involves analyzing, fragmenting, and reconstructing objects into abstract forms. Renowned Cubist artists such as Pablo Picasso, Georges Braque, and Albert Gleizes prioritized the flatness of the canvas over traditional techniques like perspective, modeling, and foreshortening (Low et al., 2021). Abstract art, beginning with Cubism in 1907, has evolved through numerous art movements, including Futurism, Expressionism, Suprematism, Constructivism, Dadaism, Purism, Minimalism, De Stijl, and Surrealism. With abstract art, elements and approaches in figurative art have shifted, giving rise to a new language of expression that emphasizes the relationships between color, line, form, and texture.

Geometric abstraction has become a distinct approach within this evolution, treating geometry as a language of art. It adopts pure forms and harmonious arrangements, transforming “existence” or “meaning” into symbols or objects.

Geometric abstraction is a widely used concept in art and design. It entails the abstraction of real-world objects and forms into simple geometric shapes, such as lines, circles, triangles, and squares, to express abstract ideas. Instead of focusing on realistic details, geometric abstraction emphasizes the fundamental structures and forms of objects. It can also highlight the essential characteristics, emotional expressions, or conceptual meanings of an idea. For instance, a circle in a painting may transcend its literal form to symbolize infinity. Geometric abstraction is a powerful expressive tool commonly applied in art, graphic design, architecture, and other design disciplines, particularly in modern art and contemporary design practices.

In architecture, abstract thinking skills developed through professional training allow for the creation of stripped-down geometric compositions that capture the essence of a design. These pragmatic and meaningful products are evident in architectural practices, where geometric abstraction serves as a foundational approach (Gencosmanoğlu & Nezor, 2010).

In urban landscape design, geometric abstraction is a critical tool. The process of analyzing art, extracting meaning, and integrating these insights into spatial design is an essential educational and creative process. This begins with visual analysis, focusing on an artwork’s colors, composition, texture, form, and other visual elements. The next steps involve selecting key features, understanding their emotional, aesthetic, and symbolic properties, and exploring how they can be applied in spatial contexts.

For example, the dynamic composition of a painting can inspire the design of a plaza that evokes a sense of movement. Similarly, geometric shapes can guide navigation and emphasize focal points in urban spaces. Carefully placed rectangles or circles can define pedestrian pathways or highlight key areas, enhancing the space’s visual appeal and enriching its texture and character.

Geometric abstraction can also be used to functionally divide urban landscapes. Forms like squares or circles can designate areas for lawns, relaxation, or events. In modern urban landscape design, geometric abstraction’s clean lines and simple forms reduce spatial complexity, fostering clarity, order, and aesthetic pleasure.

In design education, teaching methods that incorporate geometric abstraction enable students to analyze artworks and translate their meanings into

spatial design. This process fosters creativity, enhances intellectual flexibility, and equips students with skills to become more effective designers

In conclusion, geometric abstraction bridges the realms of art, urban design, and education. By emphasizing simplicity and structure, it enriches the functionality, aesthetics, and meaning of spaces, particularly in urban landscapes. This versatile approach remains a vital aspect of modern design, both as an expressive tool and as an educational strategy.

3. The Interaction of Art and Landscape Architecture and the Geometric Analysis of Compositions

The development of visual art practices, rooted in understanding and imitating nature, has persisted throughout history through the creation of exemplary models incorporating geometric concepts. Artists contributing to the definition and resolution of problems in visual arts, from Vitruvius to Dürer, Da Vinci to Escher, have supported their work with geometry. They incorporated elements such as the golden rectangle, perspective, Euclidean geometry, typography, and composition into their works, achieving harmony and balance (Cengiz, Uluişik, and Kaya, 2020). Bouleau emphasizes that artists utilize geometry in their compositions to create geometric grids and lines, aiming for balance, harmony, grouping and organizing figures emphasizing focal points, and developing new theories, driven by aesthetic concerns (Kuş and Demir Yılmaz, 2024). From Roman and Greek architecture to the present, designers have drawn inspiration from various art forms in spatial design, using these works to enhance the aesthetic and emotional qualities of spaces.

Design education employs a design-focused, studio-intensive approach to develop original perspectives by integrating the creative aspects of various disciplines and arts (Düzenli and Alpak, 2024). In design studios, creating spatial concepts inspired by art objects is considered a highly valuable approach. Visual arts serve as an unlimited source of inspiration, offering endless ideas and elements for spatial design. Artworks provide diverse themes and concepts, where colors, compositions, and ideas significantly influence the emotional and visual impact of a space. This method offers students a unique opportunity to enhance their creative thinking and design skills. Transforming art objects into spatial designs enables students to approach the concept of space from a broader perspective and gain a different outlook during the design process

Understanding how students use their sources of inspiration and developing new strategies within the design studio are critical components of design education (Yılmaz et al., 2020). For architecture students to create original designs and offer pragmatic solutions in the structural or physical environment, they need to learn and consciously apply abstraction through education. With the appropriate training during their studies, abstraction can enhance a designer's creativity and lead to fundamental, creative, and original designs that provide diverse options to users (Gencosmanoğlu and Nezor, 2010).

Examining artistic works requires a trained vision and a specific perspective that reveals potential relationships between objects. Art students develop skills resulting from their education, such as identifying connections between elements in a painting. One of the capabilities associated with observing and analyzing an artwork is the capacity to form mental images (Pérez-Fabello and Campos, 2023). The process of creating images from abstract paintings offer a wide range of interpretive possibilities, providing a unique experience for each viewer. Individuals interpret abstract images through their experiences, emotions, and imagination, allowing for a deeply personal and emotional connection with the art. These reflections can also be observed in the urban environments we live in.

4. The Application Process of the Landscape Structures Course

With this original study, which was implemented for the first time in the KTU Landscape Architecture Department, it was attempted to reinterpret what was told with objects and symbols and transform them into spaces. This research focuses on a method applied to address the need for developing creative approaches in design education. It is believed that works of one art form can be internalized within another art form and can guide that particular discipline. With this approach, the works of abstract art pioneers, such as Piet Mondrian, influenced by the Cubist movement, with his piece "Composition in Red, Yellow, and Blue" (1921), Kazimir Malevich, the leader of the Suprematist movement, with "Black Square and Red Square" (1915), and Lajos von Ebneth with his piece "Ohne Titel" (1926), have been reinterpreted (Figure 1). This study is original and significant because it not only facilitates the design process for students by utilizing any branch of art in design education but also ensures the transmission of art from generation to generation and its existence in the physical environment.

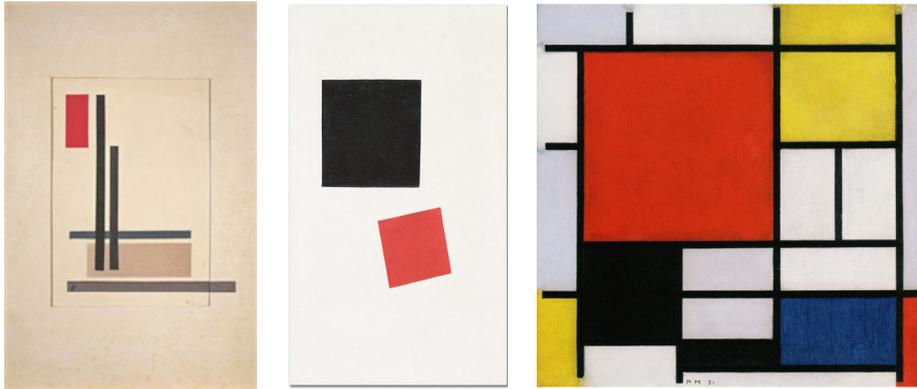


Figure 1. Sources of inspiration a) Lajos Von Ebneith
b) Kazimir Malevich c) Piet Mondrian

5. Findings: Spatial interpretations from an art perspective

Some visual art pieces convey a specific theme or narrative. These themes and narratives can be utilized in spatial design to deepen the meaning and character of a space. From this perspective, students engaged in the effort of creating themes and stories based on their chosen sources of inspiration. They conducted spatial analyses related to the scenarios they interpreted and began to develop their ideas with the guidance and critique of their instructors. The findings section evaluates the student projects completed within the course framework. The examined student works were categorized under the headings of theme, topography, and activities.

In the context of the 2015 “Landscape Structures” course application projects, the 3-D models, themes, and content of four student projects inspired by Lajos von Ebneith’s artwork “Ohne Titel” are presented in Table 1.

In Project 1, where the art object was interpreted, the geometric composition of the piece was preserved, and an urban “water park” focusing on the theme of entertainment was conceived. The activities, selected according to the theme, were translated into the third dimension and transformed into spaces. The ground was designed at different elevations, adding depth to the space. Climbing and viewing activities were planned along linear axes, and pools that establish a connection with water were integrated into the site. The artwork was reinterpreted with spatial transformations enabling activities such as sitting, watching, sliding, jumping, climbing, swinging, and eating. This

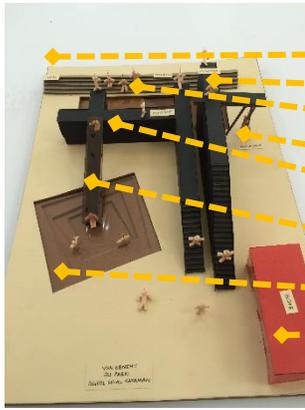
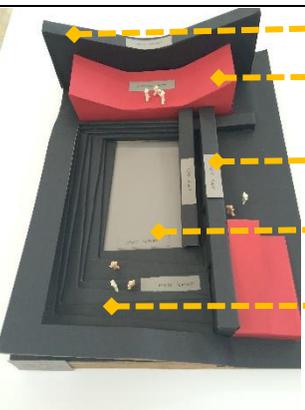
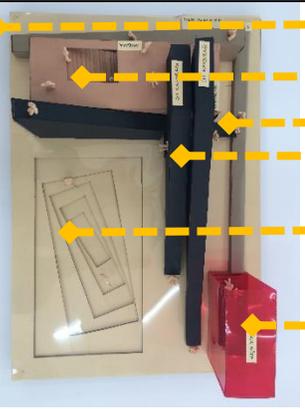
approach guides us in creating images from paintings, exploring the diversity and flexibility of art. The final products offered profound emotional and mental experiences while providing students with freedom of expression and creative space. For this reason, abstract art is considered an important and impactful form of expression.

In Project 2, another student, interpreting the same artwork, developed a concept under the theme of “art exhibition hall.” The design, which transformed the space into an art venue with both open and enclosed areas, added depth through elevation differences. While the basic forms were preserved, a digital display area, cocktail area, amphitheater, and exhibition hall were designed, with a sculpture added as a complementary element. In this project, the transformation of an art object into another artistic space was achieved. Students developed an experimental approach by creating images from abstract paintings, pushing boundaries, and allowing freedom of expression. This provided them with greater freedom in releasing their creativity and self-expression.

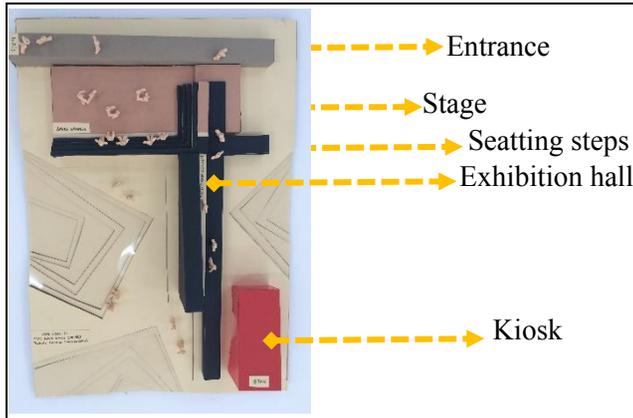
In Project 3, a different solution was developed, focusing on water, one of the fundamental elements of landscape architecture, and continuing the theme of entertainment through the design of a “water plaza.” An effective area for water shows was considered the dominant feature, with water slides, caves for exploration, swings, and food kiosk structures placed around it.

In Project 4, the public open space experience incorporated the theme of music with the goal of social integration. An “open-air dance stage” was designed based on the principle of the universality and boundlessness of art. Along with this, a public space was created that included an exhibition hall, viewing platforms, and food and drink kiosks. Balance is crucial in design education. The creation of spaces from art objects provides students with creative freedom while also requiring them to apply fundamental design principles and cognitive skills. In this way, students demonstrated their effort to interpret artworks from which they could draw inspiration and develop effective design solutions

Table 1. “From Painting to Space: Project Applications of Lajos von Ebneht”

Source of inspiration: Lajos Von Ebneht	
<p>Project 1/ Hilal Karaman Theme: Amusement/ Water park</p>	 <ul style="list-style-type: none"> Entrance Jumping Sitting Swing Viewing Sliding Water Eating and drinking
<p>Project 2/ Mehtap AYYILDIZ Theme: Art/Exhibition area</p>	 <ul style="list-style-type: none"> Digital show Cocktail area Exhibition hall Statue Amphitheatre
<p>Proje 3/ Merve AKTAŞ Theme: Entertainment/ Water square</p>	 <ul style="list-style-type: none"> Entranc Cave Swing Water slide Performance area Açık Büfe

Proje 4/ Duygu YALÇINKAYA
Theme: Music/ Stage

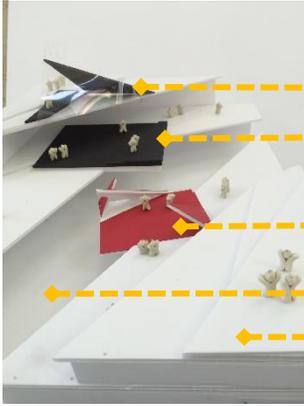


Within the scope of the course, the 3-D models, themes, and content of two student projects produced from Kazimir Malevich's artwork "Black Square and Red Square" are presented in Table 2.

In Project 5, under the theme of nature, a "canyon" was designed within the topographical depth according to the selected activities. The artwork was interpreted as a rural recreation project that responds to the feelings of adventure and exploration through the effective use of elevation differences. Viewing platforms were incorporated to allow the observation of the space from different perspectives.

In Project 6, with the theme of culture, an "urban space" was created. A city museum and its surrounding area were designed as an element of identity. This space, offering opportunities for socialization, communication, and interaction, included a viewing platform, gathering area, and a café for dining and drinking. With this approach, students were taught that the space can influence not only its physical characteristics but also its sensory and mental experiences. Designing spaces inspired by artworks provided students with the opportunity to understand and express the atmosphere and spirit of a place. This enabled designers to create spaces that are not only physical but also functionally effective, aesthetically appealing, and emotionally satisfying.

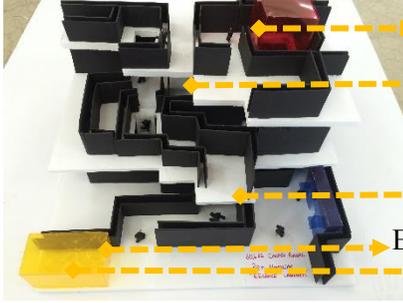
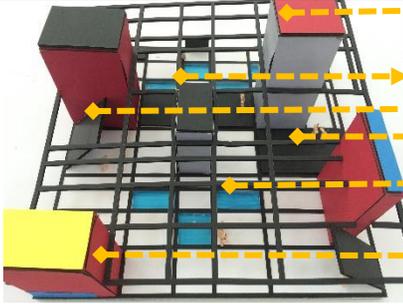
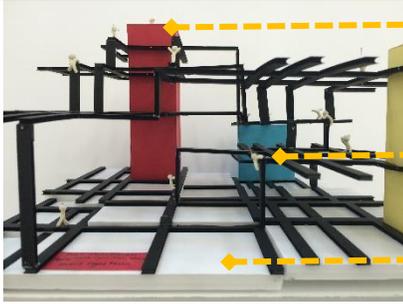
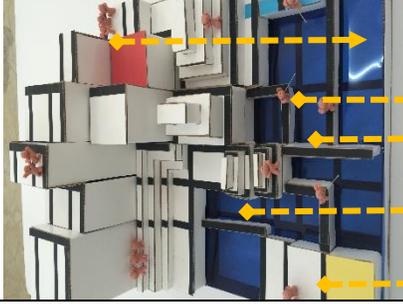
Table 2. From Painting to Space: Kazimir Malevich, Project Applications

Source of inspiration: Kazimir Malevich	
Proje 5/ Elif DÖNER Theme: Nature/ Canyon	
Proje 6/ Ayşe KOSTAK Theme: Culture/ Urban area	

In the third artwork presented within the course, Piet Mondrian’s “Composition with Red, Yellow, and Blue,” four student projects were developed, with their 3-D models, themes, and content presented in Table 3.

In Project 7, themed around entertainment, a “labyrinth” was designed. The aim was to offer users the opportunity to experience ordinary activities in extraordinary environments. The geometric order in the artwork was preserved, but additional planes were introduced in the third dimension to create space. A reception and a café were suggested at the entrance, with fun environments created through movable surfaces along the route, culminating in a tower dominating the area.

Table 3. From Painting to Space: Piet Mondrian, Project Applications

Source of inspiration: Piet Mondrian	
<p>Project 7/ Canan BAŞAR Theme: Entertainment/ Labyrinth</p>	 <ul style="list-style-type: none"> → Viewing tower → Terrace → Kiosk → Entrance → Information
<p>Project 8/ Ezgi AKÇA Theme: Life/ Housing Complex</p>	 <ul style="list-style-type: none"> → House → Sitting/Resting → Shade → Entrance → Pool → House
<p>Project 9 / Feyza KESKIN Theme: Entertainment/ Children's playground</p>	 <ul style="list-style-type: none"> → Observation → Climbing track → Entrance
<p>Project 10/ Ömer Faruk TARHAN Theme: Sensory/ Coastal park</p>	 <ul style="list-style-type: none"> → Observation → Water plays → Pier → Fishing → Entrance

In Project 8, with a theme of life, a “housing complex” was designed. Common areas were proposed between four residential blocks. The geometric order of the artwork was maintained, and both vertical planes and structural solutions were employed to create living spaces. In the light of the artwork, a spatial transformation was made with seating areas, a pool, and shaded areas.

In Project 9, themed around entertainment, a children’s play area was designed. The project, incorporating movement, features climbing walls, a tower, and a viewing terrace, forming an obstacle course. The goal was to create spaces where children could use their creativity to design their own games, develop self-confidence, and socialize. Therefore, a play area was planned that integrates both individual and group activities with art. This approach allowed students the freedom to reinterpret space as they perceived and felt it, helping them to develop their personal styles and design approaches.

In Project 10, with a sensory theme, a “coastal park” was designed. The aim was to explore the positive contributions of water-related spaces to individuals’ psychological well-being. The design aimed to produce an urban space where people could enjoy scenic views from different platforms, seek solitude, or watch others. In this context, spaces where users could interact with water were designed, offering opportunities for fishing, water games, walking on water, and socializing.

The use of abstraction techniques in design education has been shown to enhance students’ creativity, problem-solving skills, aesthetic perceptions, and communication abilities. These techniques enable students to gain a deeper understanding of the design process and to develop their own design style.

6. Conclusion and Recommendations

This study examines the process of creating urban landscape reflections form generation, and urban space solutions through abstraction from art objects within the applied studio environment of the Landscape Structures course. It is well known that abstraction techniques in design education offer numerous advantages and contribute to students’ ability to develop their own design language. By the end of the term, it was observed that students had gained different perspectives and developed creative thinking methods. They experienced the process of producing concrete spaces starting from objects or forms. This approach is notable for enhancing students’ ability to understand and express abstract concepts. It was observed that students acquired the skill of breaking down complex problems and finding alternative solutions.

It is particularly striking that students, using the same source of inspiration, produced different representations of space based on personal perceptions and experiences. Through this method, students enhanced their design problem-solving process.

This experience has provided students with an opportunity to develop their own style and find a unique form of expression. Therefore, the abstract use of design elements such as geometric shapes, colors, and textures is considered significant in terms of enhancing students' visual perception skills and understanding.

Acknowledgements

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CHAPTER XII

PRINCIPLES AND ELEMENTS IN LANDSCAPE DESIGN

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1. Introduction

Design is defined as an effort to add aesthetics to the environment. Aesthetics is an important aspect of design, but design is much more than that: design is an activity based on creative thinking, an unconventional, defined, open-ended problem-solving activity (Bonnardel, 2000) and requires multi-dimensional thinking and the ability to establish connections between different objects-concepts. Therefore, the design process is an activity in which the designer's creativity, mental thinking power, data collected from the environment with his senses and abilities are synthesized as a whole. Landscape design is also the art of organizing or changing areas of different scales for aesthetic and functional purposes (Eren and Yılmaz, 2022; Yılmaz et al., 2018; Yavuz, 2015; Yavuz, 2014). What differentiates landscape design from the definition of "design" is that landscape design is a constantly changing process: in this respect, it differs from other art forms. As plants grow, environmental conditions change, and people use the space, "landscape design" changes. Therefore, landscape designers use a design process that systematically considers all aspects of the site, the environment, the growing plants, and the needs of the user to provide a visually pleasing, functional, and ecologically successful design. Therefore, the designer who designs the landscape must be

a good observer, have the ability to read and predict future formations, analyze and synthesize, and also have artistic skills (Booth, 1990; Dee, 2012; HO-105. 2018). Landscape design is distinguished from landscaping by the “creativity” aspect it contains. Landscaping involves the maintenance and continuity of the existing landscape. However, a landscape architect is someone who has creative skills and knows human perception. Therefore, a landscape architect must know the design elements and design principles related to how the viewer perceives the order of a landscape and how the designer can change this perception (Yılmaz, et al., 2021; Yılmaz, et al., 2019; Özkan, et al., 2016).

1.1. Landscape Design Elements

The design process begins by determining the user’s needs, desires and the conditions of the area and continues with the transfer of the form that the designer visualizes and imagines in his mind to two dimensions in a way that will serve a purpose and include a creative feature. The elements that allow the designer to express his thoughts are listed as follows:

Line

Line in the landscape; is created by the edge between two materials, the silhouette of a form or a long linear feature: when two different materials meet on the ground plane; with the contrast created by the silhouette of an object or plant with the background; with the border effect created by a linear material (Figure 1). Lines are a powerful tool that can be used to create extremely diverse forms for the designer. Landscape designers use lines to produce space, provide direction, and create a form and continuity effect

Lines direct the viewer’s eye movements and affect the person’s perception of the space. For this reason, they are important effective elements in the perception of the physical size of the space and the psychological effect that the space creates on the user (Table 1). Along with its psychological effect, linear touches used in design give objects a direction and continuity effect according to the direction and changes in which they are used. In this way, the line has a functionally useful, visual and verbal language. Horizontal lines are calm and passive, vertical lines are dynamic and static, and diagonal lines have a dynamic and lively effect (Seylan 2005; Hansen, 2010; Ingles, 2009)

Table 1. Types of lines and spatial effects created by lines (Hansen, 2010; Yılmaz, 2008)

Straight lines	Straight lines are formed by the edges of landscape elements and plants that create a border effect. Straight lines are structural and impressive (strong); they create a formal character, are usually associated with a symmetrical design and direct the eye directly to a focal point. Diagonal lines; direction, angled lines; movement and excitement. Horizontal straight lines; strength, stability, that is, calmness and flatness, vertical straight lines; precision.
Curved lines	Curved lines create an asymmetrical balance and a landscape character that is more related to nature with their informal, natural and relaxing characters. Curved lines make the eye move more slowly and create hidden views, adding mystery to the area.
Vertical lines	Vertical lines create a sense of greater space by moving the eye upward. An upward line emphasizes a feature and conveys a sense of movement or motion. Vertical lines in the landscape are created by tall, small-topped trees or materials in a vertical direction (such as structures, walls, border elements)..
Horizontal lines	Horizontal lines move the eye along the ground plane, causing the area to appear smaller than it is. Horizontal lines can also spatially divide an area or connect areas. Short horizontal lines are softer and create a sense of calm and relaxation.

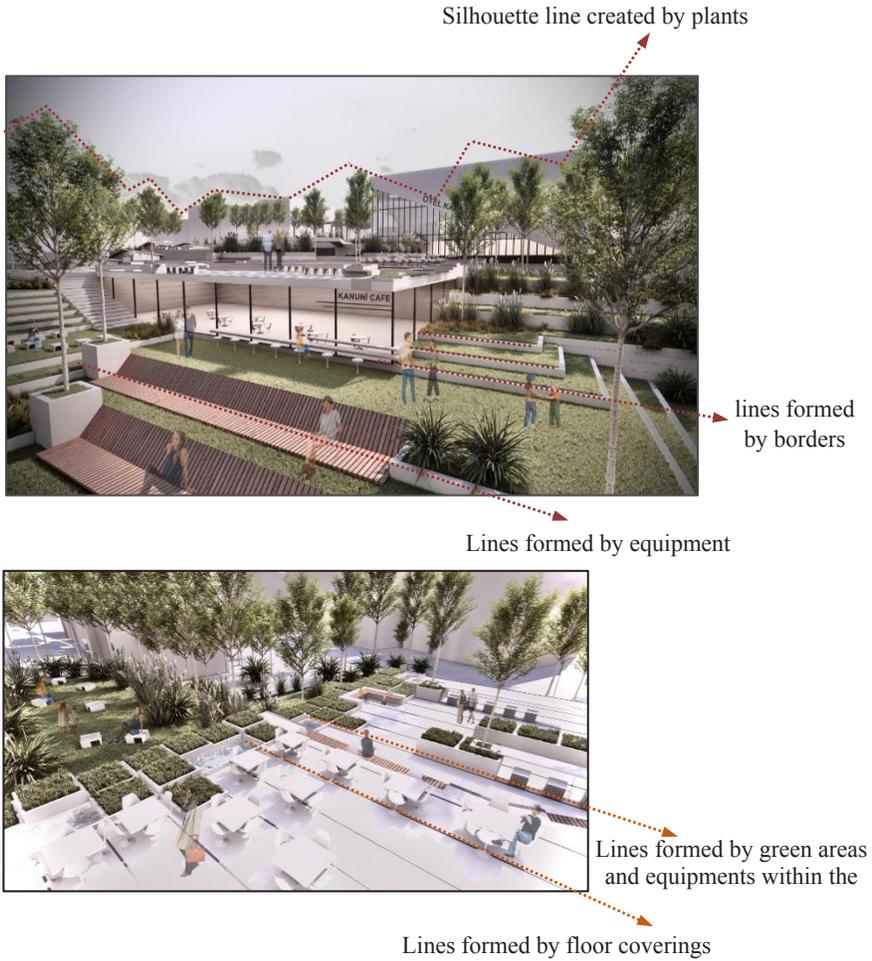


Figure 1. Lines in landscape

Form

Form is a two-dimensional element formed by lines in different directions and to different extents surrounding a space. Form is the three-dimensional mass of that form and its expression reinforced by design elements such as color and texture. Form is defined by structural elements and plants and is the dominant visual element that organizes the landscape spatially and determines the design concept of the landscape. Forms strengthen the sense of space by creating horizontal and vertical surfaces in the outdoor space. Geometric forms include circles, squares and polygons; natural forms include curved and circular

lines (Seylan 2005; Hansen, 2010; Ingles, 2009). Plants are important elements that create forms with their silhouettes in the landscape and the effect of these features continues for four seasons (Robinson, 2016; Yılmaz et al., 2018).

In addition to the visual appreciation that occurs as a result of the perception of forms, forms create various emotions in people and give meaning to the space. All these features are realized in the process of visual relationship between the space and the observer. The effects that forms add to the spaces where they are used can be expressed as follows (Aydınli, 1992; Yılmaz, 2008) (Table 2);

Table 2. The effects of form on spac

Circular forms	Circles are a powerful design form because the eye is always drawn to the center and can be used to emphasize this focal point or to connect other forms. However, because circles direct attention to the center, they cause the space to be perceived as small. Circular forms evoke a soothing, relaxing and balanced effect
Square forms	Since squares have strong corners, they can be lined up side by side and stacked on top of each other to create a linear effect and create forms in various compositions. Right-angled forms express dynamics and balance in space.
Polygon forms	The angled edges of polygons can create interesting shapes, but they should be used carefully to create simple, readable spaces.
Natural forms	Natural uniforms consist of circular lines. These lines add interest and mystery to the landscape and arouse curiosity by providing the observer with landscapes - places to explore as they turn the corner. They bring a strong naturalistic effect to the space

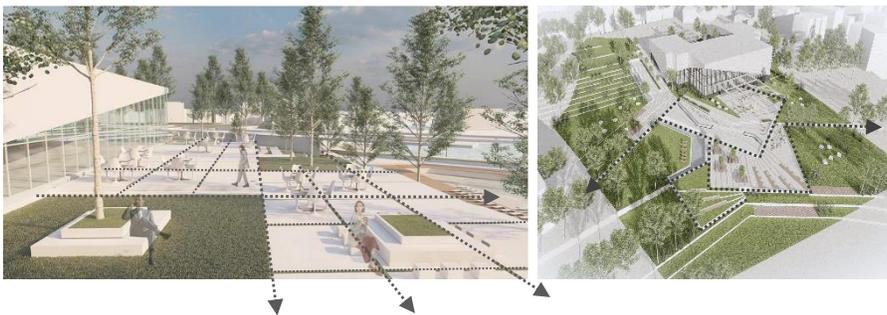


Figure 2. Form understanding in landscape

Texture

In landscape architecture, texture is the visual effect that the surface of the plant or building material leaves on the mind of the person through the eye. Texture is defined as coarse and fine (light) texture according to the light reflection of objects. Texture is used to create variety, harmony, contrast and focus in design and to determine the perception of distance and size. The visual effect of textures on individuals lightens as the surface moves away from the eye, so at the same distance but with different textures, the coarse textured object will be perceived closer than the fine textured one. Textures also leave different effects on individuals according to their color and brightness. Because of these features, texture is important in the design of spaces (Seylan 2005; Hansen, 2010; Ingles, 2009). In landscape design, texture is formed by plant surfaces and ground surfaces:

- Plant surfaces; especially the leaves, flowers, bark and general branching pattern of the plant create texture. However, the effect of leaves on texture formation is remarkable. Often the size and shape of the leaves determine the perceived texture of the plant. A plant can often be described as having a coarse, medium or fine texture. Fine textured plants tend to unify compositions, while coarse textured plants have dominant color and form (Yılmaz, 2008; Robinson, 2016).

- Ground surfaces are the textural effect created by the artificial and natural elements covering the ground. Variable, coarse textured floors disrupt the depth continuity of the surfaces, while homogeneous and fine textures allow the observer to move (Hetherington, 1991).

The effects of texture on the space can be expressed as follows (able 3);

Table 3. The effects of texture on spac

Coarse texture	<p>Spaces consisting of textures with coarse-hot colors and glossy surfaces have the effect of keeping people awake, supporting the will, and exciting them. Spaces with soft-cold colors and matte surfaces give calmness and comfort (Lang, 1987).</p> <p>Coarse textured plants attract the eye and gather the gaze at that point. For this reason, coarse-textured plants can be used in the foreground and fine-textured plants in the background in a space, making the space perceived wider and deeper than it is (Yılmaz, 2008).</p> <p>The use of coarse textured plants in the background creates a border effect because the coarse texture minimizes the distance; the plants appear closer and cause the space to be perceived smaller than it is (Yılmaz, 2008).</p>
Fine texture	<p>Fine-textured plants add a sense of depth to the space by allowing the elements in the background to be fully perceived with their transparency feature and the distance between them to be fully felt, adding a sense of depth to the space and making it perceived wide. Because they exaggerate the distance and create the feeling of a wider, more open space (Yılmaz, 2008).</p>

Color

Color occurs when objects absorb some wavelengths and reflect others depending on their properties (Seylan, 2005). Color is extremely important in the perception of space. Because the perceived object is first judged about its color; then its form and superficial features are evaluated (Eren, et al., 2022; Çorbacı, et al., 2018; Ural, 1995). For this reason, the elements of the space have a strong perceptual effect on the user due to their colors. The color perceived by the observer;

- Light or dark colors
- The characteristics that colors define such as green, red, yellow, purple and
- It is defined by whether the colors are dull or bright (Yılmaz, 2008)

In landscape design, color is the most striking feature. However, it is the most temporary and the most changing element of the landscape. In landscape design, color is formed by the color in plants and building materials and is an

important element in creating focus, diversity and contrast in the landscape. Because colors have features that can affect the senses and spatial perception-distance (Yılmaz, 2008; Gürer and Gürer, 2004). The effects that colors add to the space can be expressed as follows (Table 4);

Table 4. Color and its effects on spac

Cool colors (Blue, green, purple and shades)	<p>Cool colors are soothing and should be used to create a calming, safe and peaceful effect in the space.</p> <p>Cool colors are perceived from a distance, making the space feel larger.</p> <p>Cool and dull colors create a background effect because they emit little energy. They are therefore ideal for use in the background.</p>
Warm colors (Red, yellow, orange and shades)	<p>Warm colors should be used to create excitement, movement and an energetic effect in the space.</p> <p>Warm colors are perceived nearby, making the space feel smaller.</p> <p>Bright and warm colors are used to create focal points because they attract a lot of attention.</p>



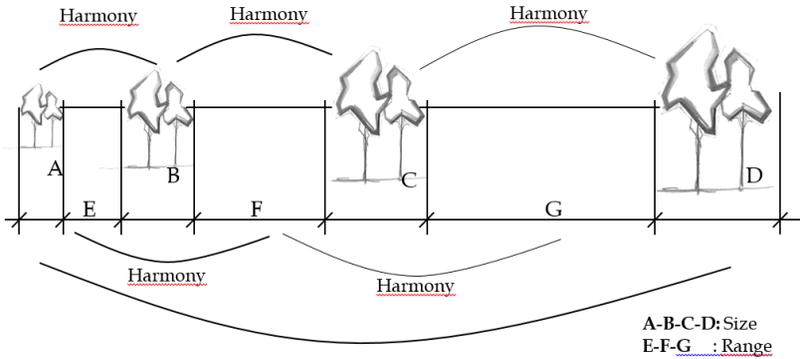
Figure 3. Examples of the use of color in landscape (URL 1-2)

Size

Size is the numerical relationship between two magnitudes or the relationship between the whole and the elements that form it (Gürer and Gürer, 2004). Therefore, measure is defined with two concepts in designs

1. Size (the numerical expression of the size and volume of the object)
2. Range (the relationship of the object with other objects)

In landscape design, the user perceives the size of the elements that form the space according to his own size. Therefore, when thinking about landscape design; which elements should come together in what size and at what range? The question should be answered so that the most appropriate solution for landscape design can be obtained (Figure 4).



The change in the size of the plants depending on the viewing angle adds depth to the space.

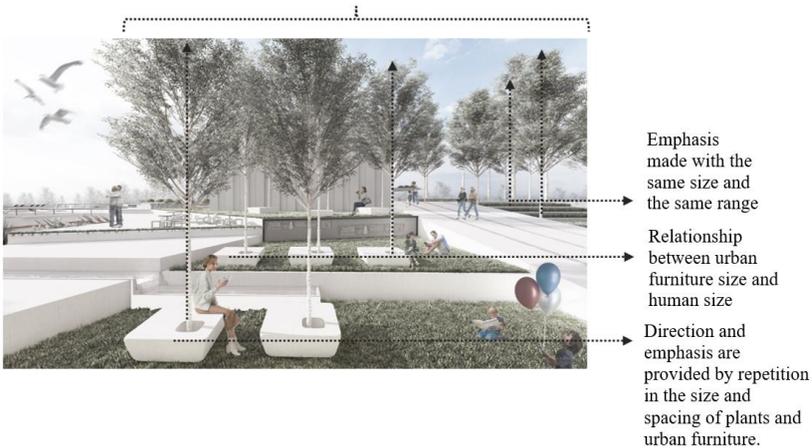


Figure 4. The relationship between size and range in the concept of measurement.

Value

Value refers to lightness and darkness. In landscape design, value is achieved through the texture and colors of plants. It is one of the most important elements that strengthen the depth of space. The clear feeling of the difference and gradation between values is necessary for the perception of depth in space. In this context; dark values are perceived as close to the viewer, while light values are perceived as far away. The effect of depth can be created by using this value difference in design (Gürer and Güre , 2004).

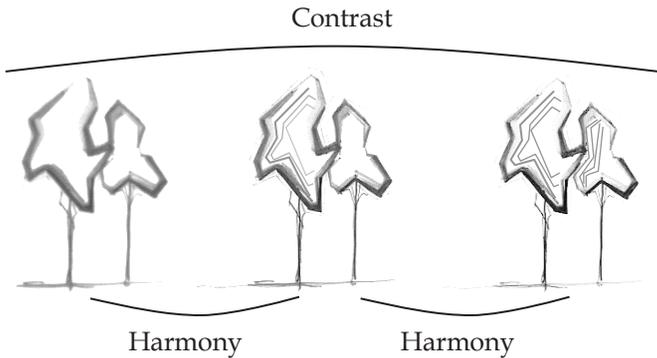


Figure 5. The concept of value

1.2. Landscape Design Principles

Design principles determine how design elements are arranged or organized to create an aesthetically pleasing and satisfying landscape composition. Thus, designs can be discussed and evaluated based on these principles used (Ingels, 2009). Design principles are as follows:

Balance

Balance is the state of stability in a design or composition and is affected by the visual energy that the components put forth. Factors that affect visual energy and therefore balance are direction, size, texture, form and color.

A balanced design is the situation where a sense of stability is created in the interaction of the visual forces created by the components and no further changes are felt (Bell, 2004; Jakle, 1987). Therefore, balance is an important design principle in the landscape design process. Because the need for order can only be provided with balance and thus harmony with the environment can be achieved. There are two types of balance in design:

The mind divides an image that is viewed by assuming that there is an axis in the center and then expects an equal distribution of objects or mass (visual weight). This situation provides two types of balance in the design (Reid, 1993; Hansen, 2016). 1. Symmetrical balance: It occurs when the elements that make up the design have the same visual energy (visual weight) on both sides of the axis (Gürer and Gürer, 2004).

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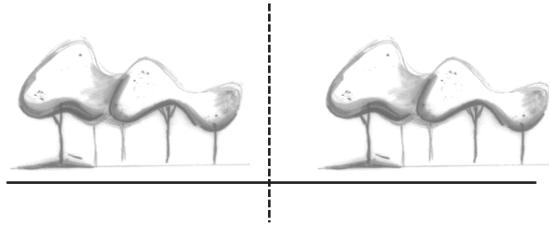


Figure 6. Symmetrical balance

2. Asymmetrical balance: It occurs when the elements that make up the design have equal visual energy (visual weight) even though they are different and contrast (size, shape, color, texture) on both sides of the axis (Gürer and Gürer, 2004).

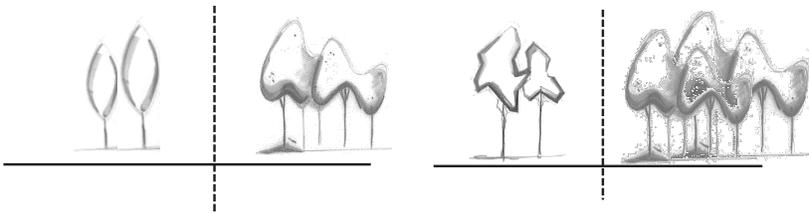


Figure 7. Asymmetrical balance

While symmetrical compositions are regular, static, formal and relaxing designs, asymmetrical compositions present a balanced, freer, more adventurous, dynamic and informal design (Bell, 2004).

Unity

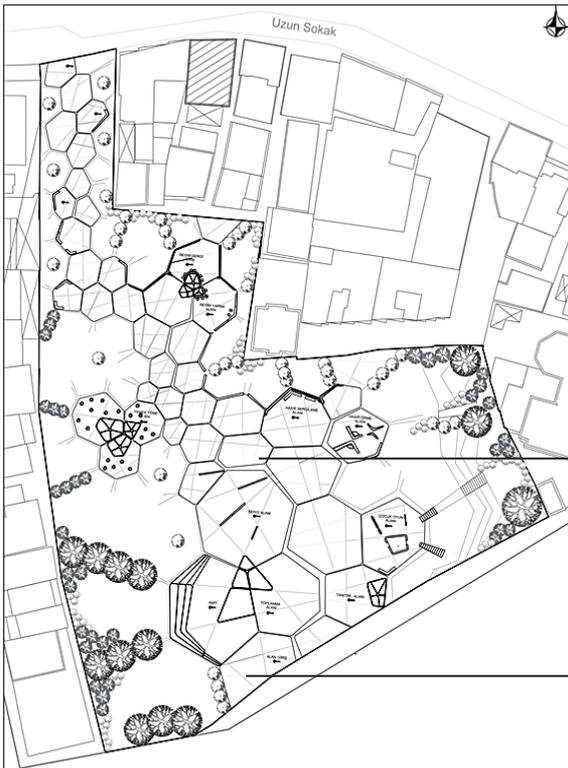
Unity is the association of the parts that make up a design with each other and creating a whole. The parts that make up the whole should be organized in a way that nothing can be added, removed or changed. Because in a good

composition, when the parts are organized, the whole is seen before the parts and this is the main purpose of a design.

Unity is achieved by the consistent use of lines, colors, materials and/or textures in a design. Design elements help create unity when they come together in the following ways (Jakle, 1987; Reid, 1993; Bell, 2004):

- In order to achieve unity, there should be harmony between the elements that make up the design. The similarities created by harmony provide a smooth transition between the elements and are a strong indicator of this unity.
- The more similar the elements in the design are, the more they are perceived as visually connected, thus strengthening the sense of unity in the design.
- A design that provides unity should include repetition and rhythm.
- Unity in a composition should include the measured use of contrasts.

Because contrasts break the continuity of repetition-similarities and ensure that the design is not monotonous, but lively and interesting. While contrast is necessary for liveliness and interest in design, too much of it will cause the unity to be disrupted and visual confusion to emerge.



Unity is created in the design by bringing together polygons of similar shapes. The changes in the dimensions, side lengths and directions of the polygons add liveliness to the design.

Clear and measured contrasts in the dimensions of the polygons disrupt the continuity in similarity, save the design from being monotonous and further strengthen the effect of unity.

Figure 8. Achieving the unity principle

Rhythm-Repeat

Similar elements repeated at regular or similar intervals create a sense of rhythm when taken together with a strong sense of direction. Since form is one of the most powerful variables, the repetition of similarly shaped elements is one of the most powerful tools for producing rhythm (Bell,2004). Rhythm provides continuity within the landscape and the integration of different elements in the design. Using rhythm effectively can guide the eye across the landscape, create a sense of unity between different landscape spaces and add vibrancy to the design (Reid, 1993; Hansen, 2010). In addition, rhythmic variation in certain features of an element is another way of making repetition more interesting and less monotonous.



Figure 9. Rhythm-repetition

Emphasis

When a feature in a design is seen as striking and dominant by the beholder, it is defined as a focal (accent) point. Emphasis is used to support the underlying theme or content of the design solution, to draw attention to a specific location, to guide the eye around the space or to direct circulation. With this feature, emphasis is a necessary design principle to ensure legibility/orientation in the landscape.

The designer can achieve “emphasis” by contrasting the size, form, color and texture of the elements that make up the landscape. In landscape design, plants are effective elements for creating emphasis (Reid, 1993; Hansen, 2010).



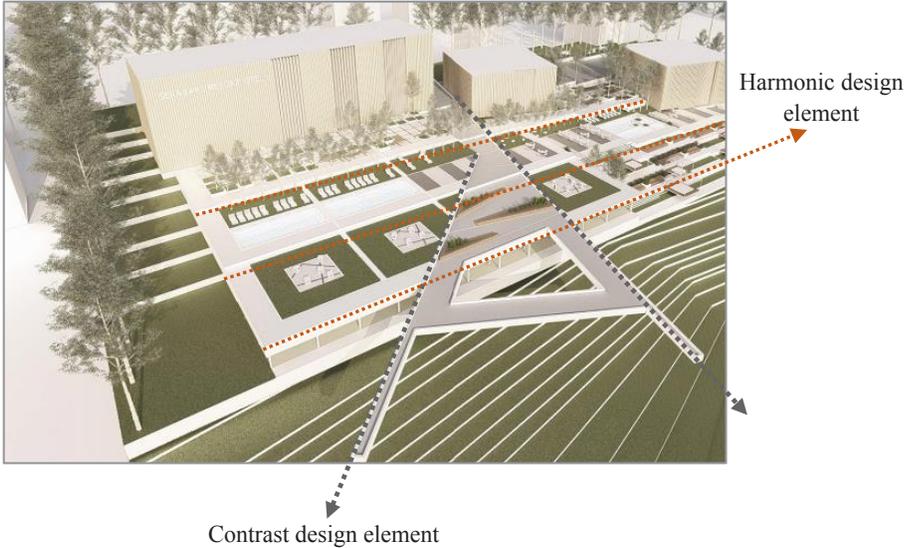
Figure 10. Emphasis on planting

Harmony-Contrast

Harmony is the similarity of one or more features such as form, size, color, etc., and harmony is essential to create a consistent landscape character. Contrast is a design principle used to emphasize a particular point. Its purpose is to focus the user on the process of “using and reading” the environment by creating a sense of difference and vividness among the elements in the environment and to save the design from monotony (Reid, 1993; Bell, 2004; Gürer and Gürer, 2004).

The effects of harmony and contrast principles on landscape design

- The stronger the state of harmony between the elements that make up the landscape, the more visually complete the landscape is perceived.
- When one feature of a landscape element is dominant, the harmonic change between the other features maintains the similarity and continuity in the landscape (such as a change in color or size while the form is the same...).
- Increased contrast makes the space appear smaller when it is there, and harmonic relationships make it appear larger.
- By introducing contrasting elements into a monotonous landscape, it creates vibrancy, variety and dominance in the design.
- Harmony in form, color and texture is an important way to create unity in design or balance in composition.



Scale/Rate

This principle refers to the relationship between different elements in the landscape, such as the relationship between buildings and plants, plants and other plants, and plants and people... All designs or compositions consist of a group of elements or parts of elements. Their dimensions, i.e. the proportion in which they are formed, are very important for ensuring visual harmony and unity. In landscape design, proportion is considered in two ways: relative proportion is the size of an object in relation to other objects; absolute proportion is the scale or size of an object. The absolute ratio, which is important in design, is the human scale because the size of other objects is perceived in relation to the size of the human (Reid, 1993; Bell, 2004; Hansen, 2010).

The effects of proportion/measure on landscape design

- Balance in landscape design can be achieved by creating equal proportions of open space and planted area.
 - “Emphasis and contrast” are achieved by creating a significant difference in the size hierarchy.
 - Similar dimensions help to achieve rhythm and harmony by creating repetition.

- A sense of depth can be added to the space by using scale: large scales in the foreground and smaller scales towards the background create a hierarchy of scale and depth can be achieved.

2. Conclusion

The most important factor that feeds the mental processes in which people gather information from the environment is the information obtained at the level of visual perception. Therefore, information on how to perceive and interpret the landscape is very important. This information is necessary for designing preferred-used spaces and enriching the interaction between the environment and the user. What distinguishes a landscape from others and makes it more preferable than others are the design elements and design principles that form that landscape. Because the user primarily gathers information about a space through the sense of sight. The designer must know the elements that form a landscape and the organizational principles that organize their coming together so that he can direct the user's perception of the space.

Design principles determine how the design elements will be arranged or organized. These principles;

- Create an aesthetically pleasing and
- Satisfying landscape composition.

Thus, designs can be discussed and evaluated based on these principles used.

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CHAPTER XIII

STRESS AND STRESS MANAGEMENT IN LANDSCAPE ARCHITECTURE

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1. Introduction

Stress means “estrece” in French; It is derived from the Latin terms “estrica”. This word expressed the meaning of disaster, calamity and distress in Europe (Altıntaş, 2003; Gökler, Işıtan, 2012). Hans Selye was the first medical expert to examine and bring to the fore the concept of stress. Selye (1956) stress; It is defined as the body’s response to a request placed on the body that has no special value (Johnstone, 1989). Cüceloğlu says stress; It is defined as the effort a person spends beyond his physical and psychological limits due to the negative conditions in his physical and social environment (Cüceloğlu, 1994).

Humphrey and King (2000) defined factors that cause imbalance in the individual’s relationship with his environment as stress.

Steadman’s Medical Dictionary ise stresi: (Valaerie, 1990).

- The body’s reaction to abnormal situations that disrupt its normal psychological balance,
- The body’s resistance to situations that occur as a result of any external influence
- It is defined as a physical and psychological stimulus that is effective in the formation of tension-imbalance experienced by the individual.

Stress can be defined as the feeling of threat felt by pushing the physical and psychological limits of the organism, or it can also be defined as factors that are unique to the person and challenging and disruptive to the individual integrity, which is very important for the person (Baltas and Baltas, 1996; Artan, 1986).

Stress encountered at any time and area of life; It is an introverted reaction that a person shows to situations that he perceives as a difficult or threat. Or stress; Time pressure, which occurs as a result of the individual's interaction with his environment, can be defined as a situation that occurs as a result of an unexpected event or reaction (Durna, 2006; Kara, 2009).

According to definitions, stress; It is a state of mental and emotional tension created by a person's internal reaction to situations in their life that they find challenging in a psychological and physiological context. In other words, stress; These are the physical, mental and chemical reactions of a person to these situations. While stress becomes a constant in a person's life, it can lead to mental health problems, as well as tension, cardiovascular (heart and circulatory system) diseases due to increased heart rate, and serious physical diseases such as stroke and cancer (Kaba, 2019; Lau and Yang, 2009; Eryılmaz, 2009; Kahn and Cooper, 1993). Continuity in the perception of stress; It also increases the likelihood of excessive eating and drinking, alcohol, cigarette and drug use (Kumaraswamy, 2013; Kaba, 2019; Bostancı et al., 2005; Goodman et al., 2003; Kahn and Cooper, 1993). Thus, stress negatively affects a person's health and behavior in daily life and manifests itself with some symptoms (Kassymova et al., 2018; Keegan, 2003; Telman, 1986;

Table 1. Symptoms caused by stress in the individual

	• Emotional symptoms	: Lack of enjoyment of life, excessive worrying, anxiety-frustration, decreased job satisfaction, decreased productivity, apathy-boredom, social isolation
• Psychological symptoms	• Intellectual symptoms	: Forgetfulness, slow thinking, daydreaming, decreased concentration
	• behavioral symptoms	: Change in mood, not going to work, difficult in fulfilling duties, abuse of power, overeating-loss of appetite, acquiring bad habits (substance abuse, excessive alcohol-cigarette consumption, risky behavior)
• Physiological symptoms	Headache, diarrhea, muscle pain, heart palpitations, insomnia, tremors, weakness, sweating, emotional, hypersensitivity, shortness of breath	

In addition to the negative effects of stress on human life, sometimes stress; It can also be a positive stimulus that motivates the person and helps him focus on the work he will do. There are some positive situations that cause a person to experience stress; such as getting a promotion at work, starting a new job, getting married, having a child. Positive stressors often go unnoticed due to the following characteristics:

- It is a short-term event,
- It feels so exciting,
- Improves a person's attitude and performance,
- motivates people (Kassymova ve ark., 2018).

Individuals' encounter with the negative aspects of stress and their reactions to them vary. The general reason for these different reactions is; Factors such as different lifestyles, different education levels, age differences, gender differences, working styles, family problems, economic problems, problems arising from the social environment, social and cultural changes. For this reason, every individual who experiences stress shows some physical or psychological changes.

1.1. Changes That Occur in the Organism During Stress

Stress is the reaction of the organism to a situation that it perceives as danger or threat. This response begins in the hypothalamus region of the brain and leads to a series of psychological and physical changes in the organism. These changes vary depending on whether the stress source is permanent or temporary, its severity, and the individual's response to stress. Selye defined the body's three-stage response to stressful situations as the "General Adaptation Syndrome". Accordingly, the organism's response to stress occurs in three stages. These; alarm response, resistance and exhaustion stages (Johnstone, 1989; Baltaş and Baltaş, 1999; Balcı, 2000).

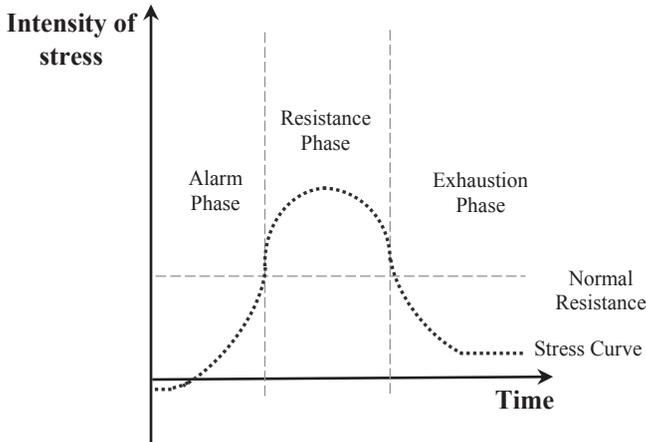


Figure 1. Selye's General Adaptation Syndrome (GAS) and the Three Stages of Stress SELYE, H. (1978)

Alarm Phase: When individuals encounter a stressor, they experience a series of physiological changes known as the 'fight or flight' response as a result of the activation of the sympathetic nervous system. This response involves a series of physiological and psychological changes that prepare the individual to fight or flee the potential threat. This state, characterized by physiological symptoms such as increased heart rate, increased blood pressure and accelerated breathing, is often referred to as the 'alarm phase'.

Resistance Phase: Following the alarm phase, the individual transitions to a second phase called the 'adaptation or resistance phase'. In this phase, the individual mobilizes his physiological and psychological resources to resist the stressor. If the stressor is overcome, the parasympathetic nervous system becomes active and the body returns to homeostasis. Physiological parameters such as heart rate, blood pressure and respiration return to normal, while muscle tension decreases. However, if the stressor continues for a long time, the individual may exhaust their resources and move into a third phase called the 'exhaustion phase'.

Exhaustion Phase: The adaptation phase is a period in which the individual's resistance to the stressor continues but his resources are limited. If the stressor increases in intensity or duration, or if the individual's resources are depleted, the individual may evolve into a pathological state called the 'exhaustion phase'. At this stage, the individual's physiological and psychological reserves are exhausted, the immune system is weakened, and the stress management capacity is seriously affected. Chronic stress can lead to a cycle that negatively affects overall health by making the individual more susceptible to new stressors.

These three stages clearly show that stress enters the life of an individual or individuals not suddenly but in a process. As a result of individuals' reactions and decisions, we can say that those who can manage the process suffer minimal damage, while individuals who are not successful in managing the process are exposed to stress and are affected by the stress factor with maximum damage, while also becoming more vulnerable to the effects of other stress factors

1.2. Factors That Cause Stress

Many environmental factors play a role in the formation of stress in daily life and a stressful environment is created. Factors that cause stress; It is shaped according to the working environment, the individual's specific stress sources, the inadequacy of the physical environment, role relations in the social organization, career development and the effect of climatic data (Serinkan et al., 2012). More than one factor can be a source of stress, depending on the environment and conditions in which the individual lives. A situation that is a cause of stress for one person is not a source of stress for another individual. Therefore, when identifying factors that cause stress, it should be known that each factor may vary depending on the situation, place and individual. In this regard, factors that create stress are; They are examined in two groups: individual stress sources and organizational stress sources.

- Individual sources of stress: Each person and event encountered in daily life carries the potential for stress. However, these create stress in the person; It depends on his age, gender, character, emotional evaluations and the meanings he attributes to his experiences. In addition, when the variability, unknown and uncertainty inherent in stress are added to the personality characteristics, cultural levels and lifestyles of individuals, the level of individuals' exposure to stress varies. Individuals with more tolerant personalities who can control their individual locus of control are more resistant to the events they encounter in their lives. Change; They see it as an opportunity for development and progress, and they act accordingly (Göksel and Tomruk, 2016; Eren, 2007; Moorhead and Griffin 1992). However, individuals who hesitate to meet these change demands become stressed. In short, individual stress sources are observed as individuals' personalities, interpersonal relationships and reactions to life-related events.

- Organizational stress sources: The ability of individuals in business life to perform their duties, ensure continuity in their work, and meet their material and moral expectations. Individuals in an organization are exposed to certain events

or behaviors by the organizations they are in. Factors such as intra-organizational policies, excessive workload, limited time, role ambiguity-conflict and anxiety caused by responsibilities cause stress in business life. This stress that occurs at work is defined as situations that prevent people from their work and routine (Göksel and Tomruk, 2016; Pehlivan, 2000). Organizational stress sources are; These can be summarized as individuals' adaptation processes arising from their working environments, their relationships with colleagues, career problems, and problems arising from working conditions.

Environmental stress: It is the pressure put on the individual by the political, economic and physical conditions of the environment in which he lives (transportation problems, air pollution, noise, lack of green areas, etc.). These conditions can negatively affect the individual's enjoyment of life by creating worthlessness and lack of definition. This situation can change people's lifestyle, people around them and their habits (Göksel and Tomruk, 2016).

1.3. Stress Management

Stress management; individuals' ability to cope with stress successfully or unsuccessfully; It can be defined as the individual's subjective response to perceived stress (Stoica, 2010; Cankurtaran, 2023). Stress management can also be expressed as changing the situation or changing the reactions to the situation in order to cope with stress and improve the quality of life (Ersarı and Naktiyok, 2012). The aim of stress management is not to avoid stress; is to use stress as a positive force to achieve productivity, energy and vitality (Eren Gümüştekin and Öztemiz, 2004). Stress management also enables individuals to keep the stress in their lives at a certain level to ensure their psychological and physiological well-being. Thus, the individual; can lead a productive and efficient life while maintaining personal psychological and physical health.

The basics in coping with stress are; The person's mindset is based on changing unreal and involuntary negative ideas (Aydın and İmamoğlu, 2001). The reason for this is that individuals who face stress may have physical, behavioral, emotional and spiritual problems, and their reactions during stress may negatively affect both themselves and their environment. In today's conditions where stress is inevitable, individuals who are faced with stress must be able to provide correct stress management so that they can learn to live with it and minimize its negative effects in their lives. Thus, individuals can be successful in solving the problems they encounter, making the decisions they need to make in a healthy

way, communicating efficiently in their social environments and reducing current stress (Özel and Karabulut, 2018). Otherwise, when one cannot manage stress, the person perceives stress as a disease, his life becomes difficult and his success and productivity in the organization decreases. Stress management can be addressed individually and organizationally; individual stress management: Individual qualities of people, their reactions to extraordinary conditions and their ability to adapt to constantly changing situations are effective factors that can help the individual to cope with stress (Geybullayev, 2002). Research has shown that individuals who can manage their emotions correctly are more successful in life (Akpınar, 2008). DKBY (Change, Accept, Nevermind, Manage Lifestyle) model is one of the well-known methods of individually coping with stress. Each step of the model consists of various methods to take control of life and transform the harmful effects of existing stress into something beneficial. According to this model, controlling and managing stress includes the following steps (Tutar, 2007).

Table 2. CANM model in coping with stress (Tutar, 2007)

C-Change	<ul style="list-style-type: none"> • Face the stressor • ask for help • use your time wisely • Learn to say “No” • Take a break every once in a while • Anticipate the source of stress
A-Accept	<ul style="list-style-type: none"> • Change your way of thinking • stop worrying • Control your anger • Making the situation worse
N-Never mind	<ul style="list-style-type: none"> • Learn to give up • Stack jobs • Know why you should let go • Son’s voice
M-Manage Your Lifestyle	<ul style="list-style-type: none"> • Avoid negative struggle • Adopt a positive lifestyle • go on a diet • exercise • Take it easy • support

There are many individual stress management strategies that can be used to reduce the negative effects of stress and can be tailored to individual needs and preferences. These strategies are as follows (Kaba, 2019; Cankurtaran, 2023):

- **Time management:** Time management techniques such as creating a schedule, setting priorities, and reducing the tendency to procrastinate help an individual plan and organize their tasks, improving their ability to cope with the workload and therefore reducing stress levels.
- **Healthy diet and exercise:** Adopting a diet rich in phytonutrients such as fruits, vegetables and whole grains supports stress coping mechanisms by lowering cortisol levels. When combined with regular physical activity, this creates a synergistic effect that increases psychological well-being
- **Receiving social support:** Expanding the social support network strengthens the individual's sense of belonging, supports stress coping mechanisms and reduces the risk of psychological disorders such as depression.
- **Learning stress coping techniques:** Mindfulness-based practices such as deep breathing, meditation, and yoga activate the parasympathetic nervous system by reducing the activation of the sympathetic nervous system, thus relaxing the body by inhibiting the release of stress hormones. This increases mental focus and provides emotional balance.

Individual stress management is an effective way to reduce the negative effects of stress and maintain a healthy lifestyle. Knowing oneself, learning strategies to cope with stress, and applying them will increase the quality of life.

Organizational Stress Management: Just as stress is an inevitable phenomenon in the daily lives of individuals, the existence of stress is also inevitable in business life, which is a fundamental part of organizational life (Yılmaz and Murat, 2008). Organizational stress management is a systematic approach that aims to identify the sources of stress that occur in businesses and employees and to minimize the physiological and psychological negative effects caused by these sources. This approach aims to increase the performance of individuals and organizations by understanding and managing stress reactions (Eren Gümüştekin and Öztemiz, 2004). Reducing stress levels increases employees' organizational commitment and performance, while also increasing their job satisfaction (Özdevecioğlu, Bulut, Tekçe, Çirli, Gemici, Tozal, Doğan, 2003). Various organizational stress management practices that can be designed to suit the different characteristics and needs of individuals play an effective role

in reducing the negative effects of stress. Commonly used organizational stress management strategies include:

- Establishing policies and practices designed to reduce stress in the workplace: Reduces employees' risk of burnout by ensuring equal distribution of workload, improves employees' overall quality of life by improving work-life balance with flexible working arrangements, and supports psychological well-being by strengthening employees' ability to cope with stress through stress management training.

- Providing employees with stress coping strategies training: Stress management training for employees may include identifying workplace stressors (stressors), understanding the physiological and psychological effects of stress, and developing effective coping mechanisms at the individual level. In this way, employees' work performance and general well-being can be improved by increasing their capacity to cope with stress.

- Providing social support to employees: The breadth and quality of the social support network increases emotional resilience by reducing the perception of stress in individuals. Emotional support, a sense of social inclusion, and a sense of being valued from coworkers, family members, and friends alleviate stress-related physiological responses and strengthen psychological health.

2. Stress and Stress Management in Landscape Architecture

Under today's fast and complex living conditions, stress has become a common problem that negatively affects the physical and psychological health of individuals. Research conducted to reduce the effects of stress and improve the overall quality of life shows that interaction with nature plays an important role. In this context, landscape architecture offers individuals important opportunities for stress management through the design and arrangement of the natural and artificial environment

Landscape architecture allows individuals to connect with nature and reduce stress levels through carefully designed green spaces, water elements, and natural materials. The basic mechanisms of these effects can be listed as follows: distraction and focus, physiological changes, psychological well-being and social interaction. Natural environments help relax our minds and increase our focus by distracting us. Spending time in green areas provides physiological relief by lowering heart rate, reducing blood pressure and lowering the levels of stress hormones. Natural environments improve mood by triggering positive emotions and relieve symptoms of psychological disorders such as depression

and anxiety. Well-designed landscape areas reduce the feeling of loneliness and strengthen social ties by encouraging social interaction.

Landscape architects use various design strategies with the goal of managing stress. The use of natural materials, plant selection, space arrangement and integration of water elements are among the main strategies. The use of natural materials such as stone, wood and water adds warmth and sincerity to spaces. The use of plants with different colors, scents and textures enriches the sensory experience and reduces stress. The arrangement of different spaces such as seating areas, walking paths and rest corners offers a variety of activities to suit the needs of the users. Water elements such as waterfalls and ponds create a visually and audibly relaxing atmosphere.

Landscape architecture is not only an aesthetic concern but also an important tool for human health and well-being. Properly designed green areas help individuals cope with stress and protect their mental and physical health. Therefore, the importance of landscape architecture in urban planning and design processes is increasing. In the future, in order to build healthier and more livable cities, cooperation between landscape architects and other disciplines should be strengthened and space designs that enable individuals to reduce their stress together with the built environment should be supported.

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