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PROF. DR. SERTAÇ GÜNGÖR

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SERÜVEN YAYINEVİ

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İÇINDEKILER

Chapter 1

DETERIORATIONS OF STONE MATERIAL IN CULTURAL HERITAGE: THE CASE OF AKSARAY SELIME CATHEDRAL

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INTRODUCTION

Stone, which is among the traditional building materials, has become a preferred material in the construction of cultural heritage buildings due to its strength and durability. However, the differences in the type and geological formations of the stones cause their mechanical properties to change accordingly (Patil, Kasthurba, & Patil, 2021). Additionally, the properties of stones change negatively due to environmental factors. For example, due to climatic effects and air pollution, damage such as deterioration, decay, color and texture changes can occur in stones (Vazquez, Carrizo, Thomachot-Schneider, Gibeaux, & Alonso, 2016). Such damages damage the aesthetic value and structural integrity of the cultural heritage, thus damaging its authenticity (Li, Yang, Chen, Zhao, & Ni, 2024). Therefore, the factors that cause deterioration in cultural heritage should be examined and research should be conducted by outlining the protection measures according to these factors (Cataldo et al., 2005).

The basis of research methods for cultural heritage is field research and description (Germinario & Oguchi, 2021). In this method, preliminary studies are carried out on cultural heritage. Thus, important data are obtained for the protection and restoration of cultural heritage. Moreover, with this method, changes in the composition and texture of stone plates depending on environmental conditions are determined (Varas-Muriel, Pérez-Monserrat, Vázquez-Calvo, & Fort, 2015). It is also seen in the literature that restoration materials are developed by conducting preliminary studies on cultural heritage. For instance, in their study, Occhipinti, Stroscio, Belfiore, Barone, and Mazzoleni (2021) conducted field research and definitions to determine the deterioration patterns and color changes affecting historical buildings constructed using different limestones in the city of Catania (Sicily). In light of the data obtained from these preliminary studies, it has been shown that limestones are subject to deterioration, color and chemical modifications. In their research, Wu, Shen, Zhang, and Zhang (2022) examined the deterioration of traditional stone houses in China due to environmental and climatic reasons. In the same study, it was determined that the surface hardness of the traditional stone house decreased by more than 50% due to decay caused by condensation on the interior walls. Furthermore, the study stated that water absorption should be reduced and air circulation should be provided in order to ensure resistance of the stones against deterioration caused by condensation. In another study conducted by Saba, Quinones-Bolanos, and Batista (2019), examined the deterioration of stones and mortars in the Cartagena de Indias Wall (Colombia), which is considered a cultural heritage by UNESCO, due to environmental factors. In the preliminary research conducted on the cultural heritage, it was determined that the factors causing the deterioration of the stones were moisture and inadequate

drainage. As can be seen in the literature, conducting preliminary studies on cultural heritage prevents greater damage by preventing the restoration materials to be applied from performing differently. Additionally, it has been emphasized in the literature that preliminary studies based on field research and definition for cultural heritage provide significant benefits in achieving successful restoration due to the differences in materials used, construction techniques, plans and ornamental features in each cultural heritage.

This study aims to examine the stone deterioration on the facades of the Selime Cathedral in Aksaray. For this purpose, firstly the stone deterioration in Selime Cathedral was determined visually. After the observed stone deteriorations were identified, research was conducted to determine the factors that caused these deteriorations. As a result of these studies, deterioration due to environmental, natural and biological factors was determined in Selime Cathedral. The data obtained from this study are expected to form the basis for the restoration projects of Selime Cathedral and contribute to the preservation of stone materials. Additionally, future studies on the development of restoration materials for the stone deterioration of the Selime Cathedral were discussed.

CHARACTERISTICS OF THE STUDY AREA

In this study, the deterioration of the stones on the facades of the Selime Cathedral in Aksaray was examined. In order to analyze the stone deterioration in the structure examined within the scope of the study, the factors that cause deterioration in the stones were determined. When the factors that cause deterioration of stones are examined in the literature, it is seen that they are gathered in four groups: physical, chemical, biological and anthropic factors (Fistos, Fierascu, Doni, Chican, & Fierascu, 2022; Hernandez, Sanjurjo-Sánchez, Alves, & Figueiredo, 2024; Occhipinti, Stroscio, Belfiore, Barone, & Mazzoleni, 2021; Sterflinger, 2010). For this reason, in this study, the deterioration of the stones on the facades of the Selime Cathedral in Aksaray was grouped as physical, chemical, biological and anthropic factors. As a result of this grouping, the damaged parts of the stones were visually identified. Additionally, studies in the literature on the development of restoration materials for structural deterioration were investigated. There are many publications in the literature on the protection of stones in cultural heritage. However, when conducting literature research, it is important to find scientifically reliable information. Furthermore, the study conducted by Chadegani et al. (2013) stated that literature research should be conducted using a reliable, impartial, high scientific value database, and these databases are Web of Science and Scopus. Therefore, in the study, Web of Science and Scopus were used as databases in the literature research on the protection of stones in cultural heritage. Data were collected by writing

keywords related to the subject of the study into these two databases. The information obtained from the studies in the literature and the stone deterioration in the structure examined within the scope of the study were evaluated.

The History of Aksaray Selime Cathedral

Located in the Central Anatolia Region, Aksaray (Türkiye) province has hosted the Hittite, Assyrian, Persian, Roman, Byzantine, Danishmend, Seljuk, Karaman and Ottoman periods throughout its history. The region has become an important centre of attraction, especially with its location on the caravan trade routes, fairy chimneys and natural beauties. Within this region, on a hillside, there is the Selime Cathedral, which attracts attention with its architecture and historical texture (Figure 1). It is known that this cathedral was built between the 8th and 11th centuries during the Byzantine period (Url1, 2025). Selime Cathedral is located in the town of Selime, in the western part of the Cappadocia region, 25 km from the center of Aksaray province (Yılmaz, Yakar, Karabörk, Yıldız, & Kavurmacı, 2009). Moreover, this location of the cathedral enabled it to be both the religious center of the region in the early Christian period and to function as a defensive structure like a castle. Selime Cathedral was built on a high slope by carving rocks. This makes it easier for the structure to provide natural protection and to defend against any attack thanks to the tunnels and passages within the structure. This defensive feature of the cathedral was of great benefit to the Seljuk commander Ali Pasha in successfully defending the cathedral during the war between the Seljuk and Mongol states (Carola, 2020).

Figure 1. *Satellite image of Aksaray Selime Cathedral (processed from Google Earth)*

Geological Structure and Climatic Characteristics of the Study Area

There are different rock groups in the study area, including Paleozoic-Mesozoic metamorphic and ophiolites (Figure 2) (Yilmaz, Yakar, Mutluoglu, Kavurmaci, & Yurt, 2012). Moreover, the geomorphological structure of the region was shaped by the Quaternary. The geological units consist of the products of Neogene volcanism (Yılmaz, Yakar, Karabörk, Yıldız, & Kavurmacı, 2009). The rocks differ in their morphological features due to the two major eruption centers within the study area, namely Hasan Mountain and Keçiboyduran stratovolcanoes (Koçyiğit, Doğan, Gürboğa, & Kalafat, 2024).

When the climate characteristics of the study area are examined, it is seen that it has continental climate conditions with hot and dry summers and cold and rainy winters. Because the region has this climate feature, there is a temperature difference between day and night. This temperature difference increases especially in the winter months (Yayvan, Çelik, & Ersoy, 2008). According to the measurement data of Aksaray Meteorology Station between 1929 and 2024, the lowest temperature was -29°C in February 1991, while the highest temperature was 40.8°C in August 2023. Additionally, the highest annual average rainfall in Aksaray province is seen in winter. During the winter period, the average rainfall in December was 45.8 mm, which was the highest amount of rainfall in the year. However, during the summer months, the amount of rainfall in the region decreases significantly. The average rainfall in August is 5.7 mm, the least amount of rainfall in the year (Url2, 2025).

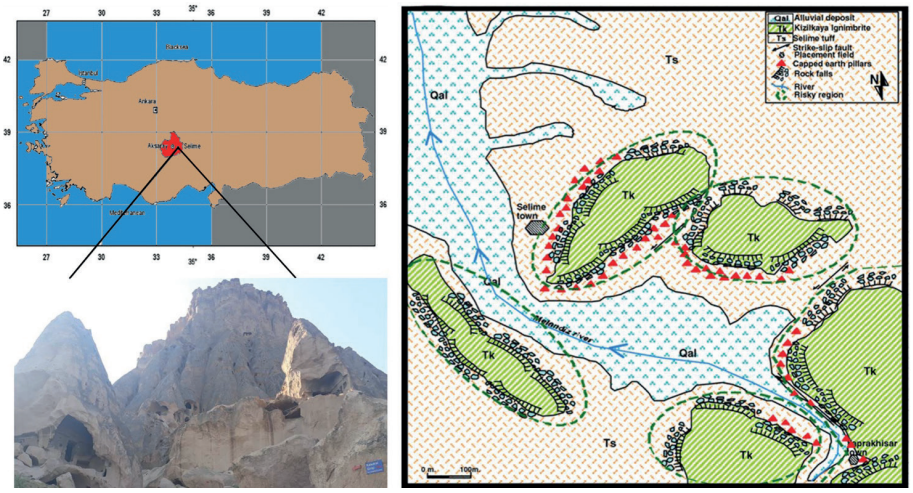

Figure 2. *Location and geological map of the study area (modified from Ref. (Yilmaz et al., 2012))*

Architectural Features of Selime Cathedral

The structure of the Selime Cathedral includes columns and square piers (Figure 3). Each column inside the structure consists of a monumental base and a capital. This cathedral has three naves and two apses. The two porticoes separating the naves end with an apse. The building was illuminated by placing windows in these apses. In the upper part of the building, there is a barrel vault ceiling (Url3, 2025). Furthermore, the cathedral is supported by columns and arches and has a central dome. This cathedral, carved into the rock, consists of sections such as courtyard, storage rooms and living spaces (Url4, 2025). This building has two floors and was designed in the shape of a castle. The cathedral is notable for its pyramid-shaped structure, with tunnels built to connect the side rooms, oil lamps for illumination, and a unique design (Figure 4) (Url5, 2025). The figurative frescoes in the three-nave section of the cathedral increased the aesthetic value of the building (Url6, 2025; Url7, 2025).

Figure 3. *Section drawings representing the structure of the Selime Cathedral (Url8, 2025)*

Figure 4. *Interior and exterior photos of Selime Cathedral*

FINDINGS AND DISCUSSION

It is important to implement comprehensive scientific approaches that take into account restoration strategies in taking measures to prevent deterioration in stone materials of cultural heritage (Coletti et al., 2025). Among these scientific approaches, signs of deterioration of stones are detected

through field research and identification methods. In this way, it ensures that the restoration of cultural heritage begins without further damage (Török & Přikryl, 2010). In order to restore the structure, it is not enough to simply identify signs of deterioration in the stones. At the same time, there is a need to examine the factors that cause deterioration in stones. Because the types of deterioration in stones used in cultural heritage vary depending on natural, internal and external factors (Theodoridou & Török, 2019). For example, due to water absorption, the stone becomes saturated with water, which causes the internal volume of the stone to expand. In this case, physical deterioration such as cracking, disintegration and surface loss occurs in the stone, reducing its mechanical strength (Siedel, 2010). Due to climate and environmental conditions, chemical deterioration such as color change, crusting, salt crystallization and efflorescence are observed in stones (Romano, Abbate, Poli, & D'Orazio, 2019). Biological deterioration occurs due to the development of various microflora such as algae, fungi and lichens on the stones (Liu, Koestler, Warscheid, Katayama, & Gu, 2020). Anthropic factors seriously damage the structural integrity and aesthetic properties of stones. Improper or unsupervised restoration work causes both surface and mineralogical changes in stones due to anthropic deterioration such as graffiti and vandalism (Mariani & Malucelli, 2023). Therefore, in this study, the deteriorations that occurred on the stones in Selime Cathedral were discussed in four groups as physical, chemical, biological and anthropic deteriorations. Data obtained through field research and identification based on visual inspection were used to determine these types of deterioration.

Visual Investigation of Stone Deterioration on the Facades of Selime Cathedral

Physical deterioration on the facades of Selime Cathedral due to environmental and atmospheric factors is shown in Figure 5. Rainwater formed due to atmospheric factors was absorbed on the facades of Selime Cathedral, and with the decrease in air temperature and the freezing of the absorbed water, capillary cracks (Figure 5a) and fragments breaking off on the wall surface (Figure 5b) were observed on the walls. Additionally, surface loss occurred on the stones on the facades of the building due to abrasion caused by dust or sand particles in the air due to wind effect (Figure 5c). Due to the intense tourist visits to the cathedral, wear and tear was observed on the interior walls and floors (Figure 5d).

Figure 5. *Physical deterioration of Aksaray Selime Cathedral*

The chemical deterioration of Selime Cathedral due to humidity and temperature is shown in Figure 6. As shown in Figure 6, crusting and color change are observed on the surfaces of the stones. Due to air pollution, nitrogen and sulfur oxides combine with rainwater and acquire acidic properties. As a result of this situation, it rains down on historical buildings as acid rain (Dakal & Cameotra, 2012). Therefore, due to air pollution and humidity, sulphates accumulated on the stone surfaces of the Selime Cathedral and showed detrimental effects such as crust formation and color change.

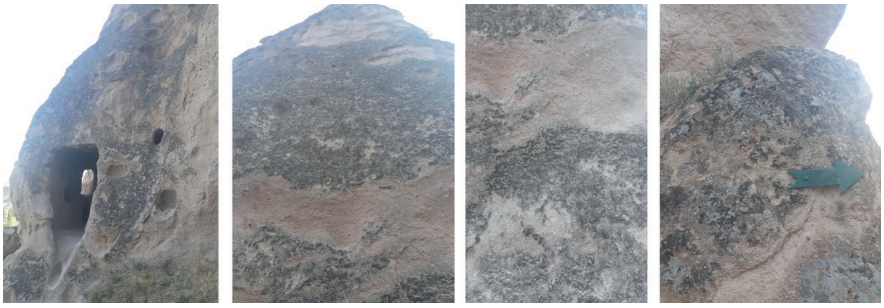

Figure 6. *Chemical deterioration of Aksaray Selime Cathedral*

The biological deterioration on the facades of Selime Cathedral is shown in Figure 7. It has been observed that plant formations and various microflora have developed on stone surfaces on different facades of the building. Environmental conditions such as climate, humidity, wind and temperature where the building is located have played an important role in the development of various microflora on stone surfaces (Cozzolino, Adamo, Bonanomi, & Motti, 2022).

Figure 7. *Biological deterioration of Aksaray Selime Cathedral*

The deterioration of the Selime Cathedral due to anthropic effects is shown in Figure 8. As seen in Figure 8, graffiti on different facades of the building has seriously damaged the aesthetic feature of the building. Furthermore, due to the uncertainty of the security areas within the building, it has been observed that damage has occurred to the interior and exterior of the building by unconscious visitors.

Figure 8. *Anthropic deterioration of Aksaray Selime Cathedral*

Restoration Materials That Can Be Used in Stone Deterioration in Selime Cathedral

Repair mortars stand out as restoration materials that can be used in the Selime Cathedral for physical deterioration on the facades of the building due to environmental and atmospheric factors. It is also seen in the literature that repair mortars are used for physical deterioration in the stones of cultural heritage. For example, in the study conducted by López-Arce et al. (2016), the properties of repair mortars for the restoration of surface damages in historical buildings made of limestone in Paris were examined. In the same study, it was

stated that repair mortars have significant potential in the restoration of stone surface damage. In the research conducted by Abbass, Lourenço, and Oliveira (2020), it was stated that natural fiber reinforced repair mortars can contribute to the strengthening of weak structures in the restoration of cultural heritage due to their high performance under seismic loads. In another study conducted by Marvila, Azevedo, Barroso, Barbosa, and de Brito (2020), it was determined that the mortar produced using rock waste increased the mechanical strength of historical structures.

Cleaning strategies can be used to eliminate chemical deterioration such as incrustation and discoloration of the Selime Cathedral. For example, El-Gohary (2009) used cleaning methods such as dry and vacuum cleaning, ultrasonic cleaning and poultice cleaning for the restoration of deteriorations such as encrustation and discoloration in the granite stones of cultural heritage in Egypt. After the stones were cleaned, the gaps were filled and strengthened with filling material. Marakis, Pouli, Zafiropulos, and Maravelaki-Kalaitzaki (2003) determined that infrared and ultraviolet nanosecond laser cleaning has significant potential for the removal of encrustation deterioration on marble monuments.

Biocide mixture materials can be used for the restoration of biological deteriorations such as plant formations on the facades of the Selime Cathedral and various microflora occurring on stone surfaces. For example, in their study, Zhu et al. (2023) prepared a biocide mixture to prevent the growth of microorganisms on cultural heritage stones. In the same study, it was determined that the biocide mixture was significantly effective in preventing biocolonization and thus revealed the original color of the stone. In another study, Pinna, Salvadori, and Galeotti (2012) showed that the addition of stabilizers or water repellents in biocide mixtures was more effective in preventing biological growth on stones than traditional biocide mixtures.

For the restoration of the Selime Cathedral due to deterioration caused by anthropic effects, structural integrity of the stones can be achieved through the consolidation method. For instance, in the study conducted by Santo et al. (2021), it was stated that some stones were replaced with new ones by the consolidation method in order to restore the decay that occurred on the stones due to the increasing anthropic pressure and the increased extraction of underground fossil waters in the region of Al-Nasir Faraj Ibn Berkuk tomb in Cairo city. In another study, Germinario, Oguchi, Tamura, Ahn, and Ogawa (2020) stated that tourists visiting the Taya caves, one of Japan's Buddhist temples, increased the CO_2 level and air temperature, thus changing the climate of the building, and vandalistic damage such as erosion on the walls and the proliferation of microorganisms occurred due to condensation events. In the same study, it was emphasized that stone deterioration should be repaired through consolidation and structural strengthening methods.

CONCLUSIONS AND RECOMMENDATIONS

This study focuses on examining the stone deterioration on the facades of the Selime Cathedral in Aksaray. In the light of the examination and data obtained within the scope of the study, the following conclusions were reached.

- It has been determined that physical deterioration such as capillary cracks on the walls and fragments breaking off on the wall surface occurred as a result of the absorption of rainwater formed due to atmospheric factors on the facades of the Selime Cathedral and the freezing of the absorbed water due to climatic effects.
- Due to air pollution and humidity, sulfates accumulated on the stone surfaces of the Selime Cathedral, causing chemical deterioration such as crust formation and color change.
- Environmental conditions such as climate, humidity, wind and temperature caused biological deterioration such as the development of microflora and the formation of plants on different facades of Selime Cathedral.
- The graffiti on the Selime Cathedral, which was formed due to anthropic effects, has damaged the aesthetic feature of the building.
- Furthermore, deformations occurred on the interior and exterior of the building due to the uncertainty of security area locations and unconscious visitors.

Solution suggestions are presented below, in line with the information obtained from the literature regarding the restoration of the stone deterioration on the facades of the Selime Cathedral.

- Repair mortars can be recommended as restoration materials that can be used in the physical deterioration of the facades of the Selime Cathedral due to environmental and atmospheric factors. It can contribute to the strengthening of the structure under seismic loads and the elimination of surface damage with repair mortars.
- Cleaning methods can be used to remove chemical deterioration such as crusting and discoloration of the Selime Cathedral. Traditional cleaning methods such as dry and vacuum cleaning, ultrasonic cleaning and poultice cleaning, or today's technological cleaning methods with infrared and ultraviolet nanosecond lasers can be used. Future studies can determine which of these cleaning methods contributes to the preservation of both the material and the historical and aesthetic features of the building.

- Biocide mixture materials can be used for the restoration of biological deteriorations such as plant formations on the facades of the Selime Cathedral and various microflora occurring on stone surfaces. Additionally, research can be conducted on the effectiveness of biocide mixtures in preventing the proliferation of microorganisms in stones.
- In case of deterioration of Selime Cathedral due to anthropic effects, the damage to the stones can be repaired by the consolidation method for restoration. Moreover, in order to prevent deterioration due to anthropic effects, it is recommended to reduce the density of tourists inside the building, to install protective barriers in dangerous areas and to maintain the stairs going up and down the building.

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Chapter 2

SICK BUILDING SYNDROME AND HEALTHY BUILDING DESIGN: A COMPARATIVE STUDY OF WELL-CERTIFIED OFFICES IN DIFFERENT CLIMATE ZONES

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1. Introduction

People occupy 90% of the day indoors, such as at home, in the office, at the gym, or at the mall, to meet their daily needs and routines (Forcada et al., 2021). Therefore, the quality of the indoor environment they are exposed to is of great importance for human well-being, health, and wellbeing (Ghaffarianhoseini et al., 2018). Human health may be impacted by an inadequate indoor environment in both the short and long term. Concerns regarding the effects of buildings on human health are raised by the fact that people spend 80 to 90 percent of their time indoors, particularly during the COVID-19 pandemic (Awada et al., 2021). For this reason, starting in 2019 and beyond, the impact of the pandemic has increased awareness of the quality of indoor spaces and air pollutants, leading to more research on healthy building design (Akalp, 2021). Sick building syndrome (SBS) is a major consequence of indoor air pollutants that are harmful to human health and are caused by both human behavior and building materials in confined areas (Baloch et al., 2020). SBS was first identified by the World Health Organization (WHO) in 1983 and described as non-specific health problem symptoms caused by exposure to harmful substances found in different workplaces. Headaches, mental exhaustion, skin and mucosal irritation, respiratory problems, and other symptoms are common signs of SBS and have a major negative impact on people's health and productivity. The time-spatial association between the sickness and a particular building is also one of the most significant aspects of SBS; that is, symptoms start to show up after working and being in the building for a while, but they go away on their own when you leave (Aigbavboa & Thwala, 2019). The most common causes of SBS include chemical pollutants like organic molecules that are volatile emitted from inadequate building ventilation, carpets, flooring, cleaning products, and other reasons, in addition to combustion byproducts like carbon monoxide and particulate matter from heating systems like stoves and fireplaces. Furthermore, biological pollutants such as mold, pollen, germs, viruses, and animal excrement can cause SBS (Redman et al., 2011). While 31% of university laboratories have SBS, 57% of offices have it, and 23–41% of university administrative buildings have it, office spaces stand out as having the most prevalent SBS risk (Gao et al., 2021). It is of great importance to eliminate SBS and work on designing healthy, breathable structures. Healthy building design consists of detailed aspects that must be addressed from the initial design phase of the building and subsequently considered through to usage and material details. Especially in the post-pandemic period, it has been emphasized that these SBS symptoms are not only related to physical conditions but also to ventilation systems, filtration technologies, and user behavior. Performance-based evaluation systems such as WELL provide an important framework for preventing SBS by defining new criteria focused on health, air quality, and user well-being in

buildings. However, the impact of these criteria varies significantly depending on climatic conditions. This is because in cold climates, energy efficiency policies based on airtightness can negatively affect indoor air quality by limiting fresh air intake, while in tropical climates, high humidity increases the growth of microorganisms. Similarly, in hot, dry regions, air dryness and particle density trigger SBS symptoms in different ways. Therefore, climate appears to be a decisive variable in the formation dynamics of SBS.

The literature shows an increase in studies on sick building syndrome, particularly since 2019. For example, Mansor et al. (2024) studied the relationship between indoor air quality in administrative offices and SBS symptoms. Hu et al. (2023) examined the effects of lighting and thermal factors in underground structures on user comfort, work performance, and sick building syndrome. Suzuki et al. (2021) examined SBS risk factors in Japan through residential and healthcare buildings. Wang et al. (2024), on the other hand, studied indoor air quality and SBS at a subway station in Tianjin, China. In addition, review studies examining and analyzing scientific production on SBS stand out (Niza et al., 2024; Wang et al., 2022; Subri et al., 2024; Igwe et al., 2023).

This study focuses on fundamental components, contributing factors, and progress toward healthy building design solutions on SBS, specifically addressing post-pandemic measures and areas requiring development in relation to climate. The study examines the environmental and technological approaches related to SBS by comparing five office buildings that hold the WELL certification, which is important in healthy building ratings. These office buildings were selected: 425 Park Avenue (humid–continental), Smart 22@ (Mediterranean), Taipei 101 (humid–subtropical), Eminent Office (cold–humid), and The Edge (hot–dry). Within the scope of the study, the effect of climatic differences on SBS risk and the applicability of WELL criteria is discussed based on various parameters such as air quality, filtration systems, humidity control, smart system monitoring, and user comfort. In this context, it is important to accelerate the transition of office buildings to healthy building design in the context of climate change and to prepare for possible pandemics in the future. Despite various studies in the literature, there is a lack of discussion on changing strategies and neglected issues in healthy building design in the context of climate. Office buildings were selected for the study because they are stressful environments where people spend most of their day and where SBS is frequently observed. The strategic measures identified in the context of climate from the studies conducted will form recommendations for providing healthy and comfortable spaces for all building groups through a human-centered design approach.

2. Sick Building Syndrome (SBS) and Healthy Building Design Concepts

This section discusses the concepts of SBS and healthy building design, which form the conceptual framework of the study, and focuses on standards and important considerations for healthy building design in office buildings.

2.1. The concept of Sick Building Syndrome (SBS)

According to the WHO, SBS is defined as symptoms that cause discomfort in individuals, such as respiratory complaints, fatigue, headaches, and concentration disorders, as well as skin diseases, which are frequently encountered by people living or working in a closed space or building and arise in relation to the building (WHO, 1982). It is understood that the first information in the literature on SBS dates back to 1975 and that this study examined the effects of social behavior on health (Günaydın, 2013). Stucki's study examined psychological protection in children with cancer and outlined certain measures from the perspective of preventive medicine in the planning of buildings. In the 1982 paper "Sick Buildings, Sick Offices," Ricks addressed the concept of buildings becoming sick and the resulting health issues experienced by occupants due to their connection to the building (Ricks, 1982). In recent years, the concept of SBS, which has been the subject of numerous studies targeting locations such as residences, high-rise buildings, workplaces, shopping centers, and healthcare facilities, has become increasingly important since the beginning of 2020 due to the Covid-19 pandemic. Restrictions requiring individuals to stay at home, the rapid shift to remote work and online education, and the increased amount of time spent indoors have all contributed to this trend. making it more important today. SBS causes different symptoms to appear in individuals. These symptoms can cause acute disorders that are not only difficult to understand but also difficult to treat. Symptoms revealed in SBS include irritation of the eyes and throat, coughing, itching, redness, and dryness of the skin, headache, dizziness, vomiting, neurotoxic effects such as mental fatigue, changes in vision, smell, and taste, and respiratory problems such as shortness of breath (Akalp et al., 2021).

2.2. The Concept of Healthy Buildings and Examination in the Context of Office Buildings

The concept of health has taken center stage in our lives due to the impact of the Covid-19 virus. According to the WHO, health is not merely the absence of disease or infirmity; it is defined as a state of complete mental, physical, and social well-being (WHO, 1946). According to this definition, it is important to work to ensure health conditions by addressing individuals' biological, psychological, and sociological needs during the pandemic period. The WHO states that individuals spend 90% of their day enclosed and 70% of

that time at workplace. The healthy design of these spaces and ensuring user comfort are of great importance. Healthy buildings are based on standards that can meet the needs and comfort conditions of individuals. According to a definition made in 1995, a healthy building is one that does not negatively affect either its users or the environment (Levin, 1995). Healthy buildings should focus on environmental health as well as human health through their technical equipment and design. When considering the interior conditions of a building, well-designed ventilation, climate control, heating, cooling, and other basic requirements contribute to the healthiness of the building. Research has also shown that well-designed buildings that undergo regular system maintenance are healthier and contribute to user productivity (Clements Croome, 2004). This process involves important planning from the design stage to usage, maintenance, and material details. The "healthy building principles" that collectively influence the entire building production process can generally be grouped under five main headings. These can be listed as: User Health, Energy Efficiency, Resource Efficiency, Environmental Responsibility, and Cost-Effectiveness (Table 1).

Table 1. *Subheadings under the principles of healthy building (Deniz, 2002).*

User Health	Energy Efficiency	Resource Efficiency	Environmental Responsibility	Cost-Effectiveness
-Resilience -Indoor air quality (IAQ) -Water quality -Light, sound, and radiation	-Thermal performance of the building -Heating, cooling, and ventilation energy -Renewable energy technologies	-Energy-efficient resource use -Construction waste -Water -Resilience and longevity	-Reducing emissions generated by products -Wastewater recycling -Public environmental planning -Disposal of hazardous materials	-Cost-effectiveness -Feasibility in the construction industry -Ensuring an appropriate market -Adaptability

SBS symptoms are particularly common in office buildings. The factors contributing to SBS, which are closely related to users working in comfortable and healthy spaces, coincide with post-pandemic office environment issues. It is expected that making unhealthy buildings healthy will have a positive impact on individuals and society. The following principles are considered in the context of healthy buildings (Ghaffarianhoseini et al., 2018);

- Ensuring indoor air quality through natural ventilation
- Use of daylight and absence of glare
- Ensuring thermal comfort

- Ensuring humidity control
- Use of natural and antimicrobial building materials
- Minimizing indoor pollutants
- Minimizing noise levels
- Appropriate land use and ensuring contact with nature
- Use of flexible and functional furniture
- Ensuring harmonious use of color and form
- Ensuring an ergonomic plan layout

The primary function of offices is to ensure that work activities are carried out effectively. Over time, offices have acquired different functions and forms according to emerging needs. Worker density, spatial characteristics, transformations in working methods, and individual needs are the fundamental factors that pave the way for these changes (Allen et al., 2016). When examining the historical development and spatial characteristics of offices, it is observed that the first examples were defined as enclosed spaces and that the element of privacy was prioritized. Depending on the form of the building, closed (cell) offices may be arranged around a corridor (Kayan, 2009). During the process, open, group layout, and mixed office types have emerged. In the group layout office type, fixed walls are removed and access routes are integrated into the spaces. Thus, it can be observed that divisions in workspaces are planned and flexible. In open-plan offices, workspaces located around a core are supported by movable elements, emphasizing flexibility and accessibility. In a mixed office layout, closed, open, and group types are combined (Karakurumer and Benli, 2022). All office types should be designed according to the conditions required by the design and user needs, taking into account both their positive and negative aspects. Additionally, they should be designed to be suitable for the microclimate, taking advantage of the technological opportunities of the period.

When examining the transformation in office designs after the pandemic (Figure 1);

- Flexible planning, wide corridors, more partitioning elements, staggered working hours, good ventilation, and social distancing concepts are at the forefront in shared workspaces (Ak, 2020).
- Reducing floor occupancy to 25-30% can minimize the virus's propagation and provide a healthy working environment (Parker, 2020).
- To ensure hygiene in spaces and take precautions against the risk of virus transmission, individuals must be provided with protective personal equipment. Basic measures that can be taken in office

building design include doors that open with motion and sound sensors, high-quality air filtration systems, the use of antimicrobial materials on contact surfaces, and the use of UV cleaning devices in common areas.

- During the pandemic, smart systems have come to the fore in addition to natural and mechanical ventilation systems. Smart ventilation systems that detect employee density in the office and automatically activate can be used (Dietz et al., 2020).
- To ensure continuous health and comfort conditions in work areas, temperature, humidity, and occupancy control can be achieved using scanning systems. Access to the data from these scanning systems can be provided from a single point, and regular checks can be performed (Yüksel et al., 2022).
- Sensor-based systems should be preferred for areas and surfaces that employees frequently come into contact with.
- Closed offices should be customized as individuals are at greater risk of contact in these areas. In open-plan offices, various measures can be implemented to reduce direct contact. A new desk layout can be created to reduce the density of people in workspaces. Individuals' workspaces can be separated using dividers to eliminate direct contact (Alankuş, 2023).

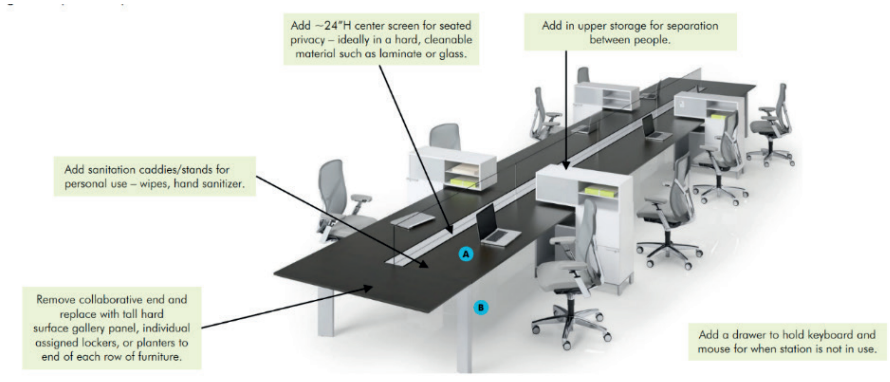

Figure 1. *Post-pandemic arrangements in open and closed offices (Deignan, 2020).*

Strategies implemented to improve indoor air quality include: modifications to building entry systems (permanent mats or grilles installed inside buildings to capture dirt and particles from outside), interventions to prevent cross-contamination within the building, use of filtration (air handling systems should have particle filters with higher efficiency, such as MERV 13 or HEPA filters, in accordance with ASHRAE Standard 52.2-2007),

prevention of external contaminant ingress (installing air intake vents), enhanced ventilation systems, monitoring and controlling building CO_2 levels (indoor CO_2 levels should not exceed 10%) are among the available methods (Çakmanus, 2014; Orhan & Kaya, 2016).

3. WELL Healthy Building Certification and Standards

Whether the existing building is healthy or unhealthy affects the individual physiologically, biologically, and psychologically. While there are studies on healthy building design, there is a need for standards that embrace user-centered design. The WELL certification addresses this need by including standards designed to demonstrate the contribution of healthy buildings to people (Alankuş, 2023). The International WELL Building Institute initially released the WELL Building Standard in 2014 as a scoring system that addresses human health and well-being in the built environment (WELL Certified, 2014). Identifying, measuring, and monitoring parameters that affect the health of buildings and people are among its primary objectives. Although the WELL certification shares common features with the widely used green building certifications LEED and BREEAM, it stands out as a human-centered certification (Samsunlu and Bahar, 2020). The first version of the certification published by IWBI in 2014, WELL v1, prioritizes user comfort with its fundamental objectives and strategies. The WELL v1 certification stands out for its ability to work in harmony with other green building certifications and its complementary nature. WELL v1 standards are evaluated based on seven core criteria. These criteria are air, nutrition, water, comfort, movement, light, and mind (Çakır, 2018). Prerequisites and optimizations for these parameters are available. WELL v1 addresses buildings in three different typologies. These typologies are defined as new and existing interiors, new and existing buildings, and core and envelope. The certification includes three different levels: silver, gold, and platinum (IWBI, 2014, Table 2).

Table 2. *WELL V1 core criteria.*

							
WELL V1 Criteria	Air	Water	Nutrition	Illumination	Physical well-being	Confort	Mind
Typologies	New and existing buildings		New and existing interiors		Core and envelope		
Degrees	Silver		Gold		Platinum		

Following the publication of WELL v1 in 2014, IWBI conducted detailed research and published WELL v2 in May 2018. The requirement to implement all subheadings of the desired optimization in WELL v1 has been removed in v2.

In order for the project to be certified, it must earn at least 50 points in addition to meeting the prerequisites. Changes have also been made to the certification levels in WELL v2. Instead of the certification system classified as silver, gold, and platinum based on the number of optimization criteria after fulfilling the prerequisites, the level is now determined based on the total credit score. Bronze certificates are awarded to projects that meet the prerequisites, silver certificates to those scoring 50-59 points, gold certificates to those scoring 60-79 points, and platinum certificates to those scoring 80-100 points. There are a total of 10 main credit categories in WELL v2. Air, water, nutrition, light, movement, sound, thermal comfort, mind, materials, and community are considered fundamental criteria (WELL Certified, 2018, Table 3-4).

Table 3. *WELL V2 core criteria.*

										
WELL V2 Criteria	Air	Water	Nutrition	Illumi-nation	Move-ment	Thermal Confort	Sound	Materials	Mind	Commu-nity
Degrees	Bronze			Silver		Gold		Platinum		

Table 4. *Precondition and optimization scores according to main headings in the WELL v2 standard.*

Evaluation Criteria	**Preconditions**	**Precondition Score**	**Optimizasyon Puanı**	**Toplam**
Air	Indoor Air Quality, Smoke-Free Environment, Adequate Ventilation Design	4	10	14
Water	Water quality indicator, Drinking water quality Water quality monitoring and Legionella management	3	5	8
Nutrition	Availability and visibility of fruits and vegetables	2	11	13
Illumination	Exposure to daylight or circadian lighting provides visual comfort and improves visual acuity.	2	6	8
Movement	Workstation with an ergonomic design that facilitates exercise	2	10	12
Thermal Confort	Acceptable thermal environment	1	6	7
Sound	Acoustic design plan and labeling of acoustic zones	1	4	5
Materials	Restriction, management, and handling of hazardous substances such as chromium-containing copper arsenate, asbestos, mercury, polychlorinated biphenyls, and lead	3	11	14
Mind	Provide mental health support, integrate local nature art and culture	2	13	15
Community	Communication of the WELL feature to users, integrated design by stakeholders, emergency management, user surveys	3	13	16
Total Score		**23**	**89**	**112**

In March 2020, IWBI and the special team formed began work and presented the Health-Safety Rating (HSR), defined as the Covid-19 Healthy Building Rating, besides WELL v1 and v2. There are five main topics within the WELL HSR. These include stakeholder participation, disaster preparedness plans, healthcare resources, cleaning and hygiene practices, and control of air and water quality (IWBI, 2020).

4. Evaluating the Concept of Healthy Offices Through WELL Certified Office Buildings

The study aims to examine WELL-certified office buildings, which are part of a healthy building rating system, and to highlight the importance of the concept of healthy offices. For this purpose, the Taipei 101, 425 Park Avenue, and Smart 22@ buildings were selected for examination in the study. Comparisons and analyses were conducted on the three assigned WELL-certified office buildings, and comments were made regarding healthy office buildings.

4.1. Taipei 101, Taiwan

This skyscraper, one of Taiwan's landmarks, was designed by Chu-Yuan Lee and CP Wang (Wang Chung-ping). Construction of Taipei 101 began in 1999 and was completed in 2004. The height of the building to the roof is 460 m. The ground floor area is 412,500 m². Taipei 101 is built to resist seismic shocks and typhoon gusts, which are frequent in Taiwan's eastern region. Taipei 101 was constructed by structural engineering firm Evergreen Consulting Engineering to survive the biggest earthquakes in a 2,500-year cycle as well as storm winds of 60 meters per second (197 feet per second), 216 kilometers per hour, or 134 miles per hour (Poon et al., 2004). The distinctive blue-green glass curtain walls of the Taipei 101 are double-glazed and offer enough UV protection and heat to shield half of the heat from the outside. Every eighth level, the facade system connects to mega columns with high trusses, adding to the overall lateral stiffness. The facade system is made up of glass and aluminum panels set inside a slanted, resistant cage. Between 20 and 30 percent of Taipei 101's water requirements are satisfied by the building's own recycled water system on the facade and rooftop. With the highest possible score of 102.5 points, Taipei 101 has obtained the WELL Certification. All of the strategies used under the WELL Air, Water, and Innovation ideas have earned the project full grades. A LEED Platinum-certified building already, Taipei 101 has become a significant example in both health and environmental sustainability. Taipei 101 is equipped with an ice storage system that uses off-peak power to store ice at night and melt it during the day to supply part or all of the cooling load, thereby helping to reduce peak power consumption. The building and HVAC system comply with LEED IAQ standards and utilize

MERV13 filters that effectively block PM2.5 fine particulate matter in the air. The rental space uses a VAV variable air volume supply system to ensure clean and comfortable air quality. The Taipei building offers a flexible working environment suitable for flexible working by utilizing an open-plan system in its office spaces. Additionally, clean air flow can be achieved through automatic control of indoor air quality and the use of filters. Within the scope of healthy construction, attention has also been paid to human density and volume in furniture design and layout. Through the implementation of superior air purification systems, the provision of high-quality drinking water, increased exposure to natural light, the promotion of physical activity, improved thermal comfort, and the creation of an environment that promotes people's health and well-being, Taipei 101 was able to meet the rigorous requirements of Platinum-level WELL Certification (URL 1, Figure 2).

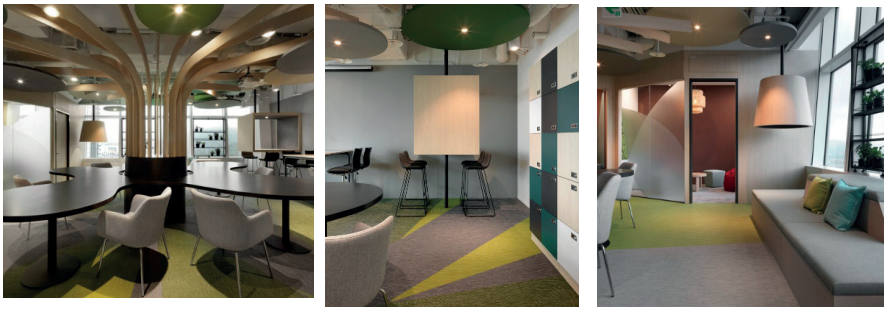

Figure 2. *Views of various types of office spaces in Taipei (URL 1).*

4.2. Smart 22@, Spain

GCA Architects designed the construction of Smart 22@, Spain's first smart building, in the 22@ technology district of Poblenou, Barcelona. The office complex, which has a sizable garden area and three separate buildings, responds to the industrial context while also establishing its personal qualities. Urban integration is the foundation of the building's design, which also shows great regard for nearby structures like the former "La Escocesa" factory. The building's materials reflect the neighborhood's characteristic color palette and combine the traditional importance of a humble material like fired clay with new production processes. Smart 22@ has 24,600 m^2 of office space divided into three large blocks. The open-plan, flexible interiors are designed to meet today's needs. Through a post-tensioned concrete slab structure, natural light filters from the core to the curtain wall facades. The workspace is complemented by common areas such as open terraces, a lounge, a multipurpose room, changing areas, and other amenities designed for socializing and enhancing well-being. The project is notable for its energy-efficient and sustainable elements, including a 45% reduction in water

consumption, a 32% reduction in energy consumption, and 20% of materials used are low-impact on the environment. Additionally, it has 264 photovoltaic panels, 63 parking places for electric vehicles, 25 charging stations, and 75% sustainable disposal of waste. The south facade now incorporates photovoltaic glass panels that help three buildings become more energy efficient. Among other environmental advantages, an air conditioning system with active polarization filters and photocatalysis has been developed to guarantee air quality. The global prop-tech platform Sharry is used by the Smart 22@ building to digitize parking management, visitor experience, and access. Turnstiles, doors, parking lots, and conference rooms can all be opened with a few clicks on a smartphone, allowing users to access the building's amenities. The building has a AAA energy certification, Wiredscore certification, LEED Platinum V4 certification, and WELL Gold accreditation with an emphasis on user well-being (URL 2, Figure 3).

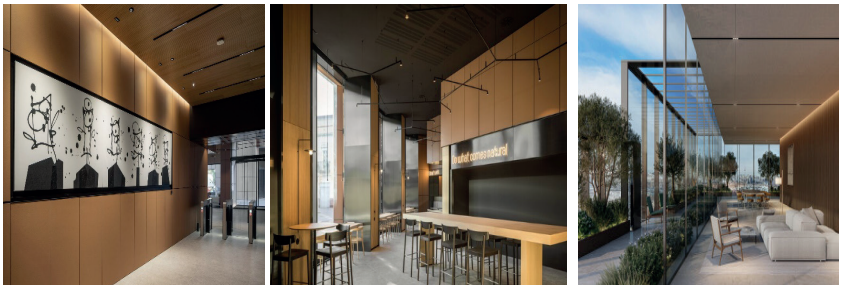

Figure 3. *Smart 22@'s workspaces and office spaces (URL 2).*

4.3. 425 Park Avenue, USA

Working with the project team of L&L Holding, a 47-story skyscraper was designed in the United States. The project consists of a world-class office accommodation units, three-story lobby, outdoor green areas, a spacious social facility floor, and a a penthouse floor that is 38 feet high. The building, constructed according to the LEED Gold standard, has earned a Gold-level Well Core certification due to its characteristics that increase the health and well-being of its users. Three separate volumes make up the tower's vertical division: a recessed center portion, a seven-story base that is blended into the urban fabric at street level, and a narrow arrangement of premium floors at the top (Francés López, 2018). A thorough analysis method was used to produce the design, which included determining the best space distribution to create a balanced composition and modeling site views of Central Park. Within the scope of healthy construction, in the 425 Park Avenue project (URL 3, Figure 4);

- Each of the 41 floors features floor-to-ceiling glass curtain walls, designed to support human circadian rhythms and promote visual, mental, and biological well-being.

- It cleans indoor air through a complex filtration system, sensors, ultraviolet irradiation, and comprehensive cleaning, eliminating pollution, smoke, and germs.
- The building provides an ideal acoustic environment, using advanced sound mapping engineering to reduce background noise and prevent distractions.
- Water distribution and sanitation in the building are proactively managed through routine inspections and 24/7 sensors.
- The building's design encourages constant movement with central staircases and open terraces.

Figure 4. *Views of office spaces in the 425 Park Avenue building (URL 3).*

4.4. Eminent Hyllie, Malmö, Sweden

Located in the Hyllie district of Malmö, Sweden, Eminent is the first office building in Scandinavia to receive WELL certification, representing a design approach that prioritizes user health in cold and humid climatic conditions. Developed by Kanozi Architecture and constructed by Skanska, the building contains approximately 14,500 square meters of leasable office space and is certified at the WELL Gold level. The design focuses on reducing SBS risks such as increased air dryness, low oxygen levels, and the effects of artificial lighting associated with prolonged indoor use during the winter months. The Eminent office has been developed with a holistic design approach that aims to support users' physical and mental well-being. In the design of the building's interior and exterior areas, spatial strategies that encourage daily activity and healthy living habits are prominent. Stairwells are designed to guide users toward stair usage through artistic and design interventions; these areas offer a visual and spatial experience that encourages daily exercise. Group activities organized for tenants (such as yoga sessions on the roof or running events in the park) aim to increase users' physical activity levels. The courtyard at the center of the building provides open-air office space, while the roof terrace, with its view of the Öresund Bridge, serves as both a relaxation and socializing

area. To support sustainable transportation, a bicycle maintenance service and charging points for electric vehicles have been established within the building. While urban farming practices are implemented on a square meter scale in the rooftop garden, vertical gardens created with edible plants on the exterior walls provide both aesthetic and ecological benefits. A menu plan has been adopted in the cafes and bistros within the building, where sugary products are limited and nutritious foods are highlighted. Additionally, informative signs and guidance materials explaining the effects of nutrition and exercise on healthy living have been integrated into the space in a way that increases user awareness. In these respects, Eminent serves as a strong example of the Movement, Nourishment, and Mind categories of the WELL standards, emphasizing that office life is not solely productivity-focused, but rather a lifestyle based on health, community, and interaction with nature. The project focused on material selection and the impact of acoustic design on user experience for Acoustics and Wellbeing. Starting from the entrance area, visual diversity was created based on tactile surfaces and material density; Troldtekt acoustic panels were specifically chosen for social areas. This approach aims to create a calm indoor atmosphere that supports user concentration and reduces stress levels, in line with the acoustic quality criteria of the WELL standards. Furthermore, the use of wooden panels creates a nostalgic cultural reference within the Swedish context, enhancing the emotional dimension of spatial comfort (URL 4, Figure 5).

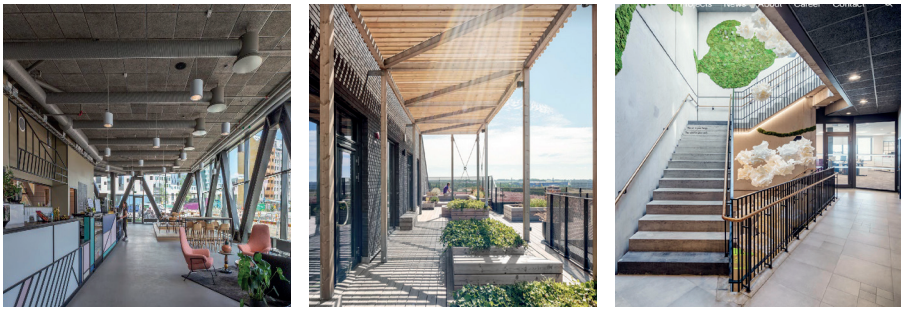

Figure 5. *Views of the interior spaces in the Eminent Hyllie building (URL 4-5).*

4.5. The Edge, UAE

Completed in 2015 by PLP Architecture in Amsterdam's Zuidas business district, The Edge sets new standards in sustainable and user-focused design with approximately 40,000 m² of office space. The building's 15-story atrium creates a visual connection between the office spaces and the outside environment, while optimizing indoor air quality by increasing natural light and air circulation, thereby helping to reduce SBS risks. The facade design strategically incorporates shading and thermal mass on south-facing surfaces, while the north facade features large glass openings to increase natural light

levels. The building collects data from approximately 28,000 points using smart monitoring and building management systems; indoor temperature, light levels, humidity, and carbon dioxide levels are continuously monitored via sensors and automatically managed to optimize energy usage. These data are used to optimize indoor conditions, thereby enhancing indoor air quality and cutting down on energy use. The EDGE's design promotes natural ventilation; open spaces between each floor allow stale air from the offices to flow into the atrium, where it rises and is expelled through grilles in the roof. The ePM1 filters used in the building significantly reduce fine particles in the air, lowering energy use and enhancing indoor air quality. In addition, water usage is optimized through conversion systems, allowing wastewater to be recovered and used in toilet tanks and garden irrigation, thereby supporting both sustainability and user health. The Edge achieved a score of 98.36% in the BREEAM "Outstanding" assessment, demonstrating the highest performance in sustainability and energy efficiency. This holistic approach transforms the building into an office building example that offers proactive spatial solutions against SBS while also focusing on employee well-being, health, and environmental sustainability (Jalia et al., 2019; URL 6, Figure 6).

Figure 6. Views of the interior spaces of The EDGE (URL6).

Within the scope of this study, five WELL-certified office buildings (425 Park Avenue, Smart 22@, Taipei 101, Eminent Hyllie, and The Edge) located in different climate zones were examined in terms of measures taken against SBS risk, indoor air quality, ventilation systems, filter usage, and user health-focused design strategies. Each building implements criteria such as energy efficiency, natural light, humidity control, acoustic regulation, and movement/healthy living incentives, tailored to its own climate conditions and local context. Table 5 provides a comparative summary of these five office buildings in terms of SBS, WELL criteria, and climatic differences.

Table 5. *Evaluation of three WELL-certified office buildings*

Buildings	**Taipei 101** 	**Smart 22@** 	**425 Park Avenue** 	**Eminent Hyllie** 	**The EDGE** 
Country	Taipei, Taiwan	Barcelona, Spain	New York, USA	Gothenburg, Sweden	Dubai, UAE
Year	2004	2022	2022	2016	2015
Climate Zone	Humid subtropical climate	Mediterranean climate	Humid continental climate	Subarctic, long cold and wet winters	Desert climate, extremely hot and dry
Certificates	WELL Platinum LEED v4 Platinum WELL Health-Safety Platinum	WELL Gold LEED v4 Platinum Wiredscore Platinum	WELL Gold LEED Gold	WELL Gold	WELL Gold BREEAM Outstanding
Air Filter	Very high, MERV 13, filtration	High, Photocatalysis and active polarization filters	High, Advanced air filtration process, mixed filtration system	No information found regarding filter class and particle fineness	Very high, ePM1 filter (compliant with EN 779 / ISO 16890)
Prominent feature	Indoor air quality and powerful filtration system	Smart control with monitoring and biophilic design, reducing contact through sensor usage	Natural ventilation, glass curtain wall with circadian rhythm, acoustic performance	Energy recovery ventilation, green indoor applications	Humidity control and digital control with IoT
Strong Points for SBS	The strongest system after the pandemic, providing high-performance filtration and airtightness for air quality	Digital infrastructure, natural ventilation suited to the Mediterranean climate	Ergonomics and air quality management, Daylight-filled core layout, Sustainable system supported by natural ventilation	Stress reduction through acoustic comfort and material selection and air quality optimization in indoor spaces	High-level sensor-based monitoring; air quality optimization individual temperature and light control
Weak Points for SBS	Humidity control challenges for SBS, dependence on mechanical ventilation	Biophilic design and green spaces are limited, air humidity and particulate monitoring systems are limited	Post-pandemic hygiene measures are limited, risk of CO_2 accumulation due to high density in city centers	No post-pandemic health certificate, daylight optimization and indoor greening are partially limited	High dependence on mechanical ventilation; limited natural ventilation options

The comparison of five office buildings demonstrates that, despite differing climate conditions and levels of technological use, the common goal is to enhance user health and comfort. Regarding air quality and filtration performance, Taipei 101 office (MERV 13) and the Eminent (ePM1) have the most powerful systems; these buildings stand out with advanced filtration and humidity control technologies that decrease the risk of SBS. However the Smart 22@ building supports indoor comfort specific to the Mediterranean climate with its smart control systems, but it carries a relative risk in terms of SBS regarding humidity control. 425 Park Avenue offers strong ergonomics with its natural ventilation and daylighting design, but there are risks of CO_2 emissions in high-density use areas and limitations in post-pandemic measures. While Eminent Hyllie integrates energy efficiency and acoustic comfort, the limited use of green interior applications is an area where the building needs improvement. The Edge has the most comprehensive user-focused approach with sensor-based monitoring and personal climate control systems. According to evaluations, buildings located in tropical and desert climates develop higher technological solutions against SBS risk, while buildings located in warm climates strike a balance through user behavior, biophilic design, and energy efficiency. Therefore, it demonstrates that WELL criteria can be applied with different priorities according to different climatic requirements and that user health-focused design must be context-sensitive.

5. Conclusion

Today's modern conditions require prolonged exposure and living in enclosed spaces, which has negative effects on user health. Especially in pandemic situations, factors such as indoor air quality, ventilation strategies, and psychological comfort conditions need to be reevaluated to decrease the risk of SBS. The concept of healthy building design, which is an important solution for coping with this syndrome, has been discussed more frequently in recent times. The WELL certification, which is an evaluation criterion in healthy building design, serves as an important guide in this regard. Office buildings, where a significant portion of our day is spent, must not only focus on productivity but also ensure sustainable performance by meeting healthy design criteria for user health and comfort. In this context, WELL-certified office buildings offer a new design paradigm that integrates environmental factors and design parameters by addressing physical environmental quality with a human health-focused approach.

This study focuses on office buildings, which are enclosed environments where people are exposed for long periods of time, and comparatively examines the potential of WELL-certified office designs in different climate zones to reduce the risk of SBS. This aims to enable us to observe

the transformation in office designs in response to today's changing and evolving conditions and to raise awareness about potential pandemics. The five buildings examined (Taipei 101, Smart 22@, 425 Park Avenue, Eminent, and The Edge) demonstrate different approaches in terms of design decisions, indoor air quality management, user control, and climate adaptation. When the Taipei 101 building is examined according to healthy office standards, it is seen that it has comprehensive details designed to address the problems posed by the humid climate. From the design phase onwards, meticulous attention has been paid to everything from the orientation of the site according to climatic conditions to the decisions regarding the fixtures and fittings in the design. Smart 22@ building 's use of traditional materials provides a breathable, natural, and healthy environment. Additionally, it is observed that technology is being utilized through the air quality provided by the filter system and sensors that reduce contact. When examining the notable measures taken in the 425 Park Avenue office building, it is seen that the design decisions, which focus on acoustic performance and encourage movement, have a positive effect on the visual, mental, and biological health of users. Despite its long and cold climate, the Eminent building supports user well-being by emphasizing psychological comfort and well-being through its green interior spaces, acoustic comfort, and material selection. The Edge building achieves the highest level of indoor air quality with its dynamic sensor-based control and high-level filtration system, utilizing IoT technologies and enabling individual temperature and light control. Findings indicate that high-tech monitoring systems and advanced filtration solutions are effective in reducing SBS symptoms. Overall, WELL-certified buildings in different climates have shown significant progress in reducing the physical and environmental factors that cause SBS.

This study emphasizes the importance of strategies that are climate-responsive, data-driven, and prioritize user participation in healthy office design, based on a comparative analysis of five WELL-certified office buildings located in different climate zones. The findings indicate that in tropical and desert climates, powerful filtration and humidity control systems are effective in reducing SBS risk; conversely, in warm and cold climates, natural ventilation, acoustic comfort, and energy recovery are prioritized. For this reason, designs should be enhanced not only with filtration technologies aimed at reducing SBS risk, but also through the comprehensive integration of user behavior, spatial ergonomics, digital monitoring infrastructure, and green interior components. For future projects, it is recommended that WELL criteria be applied in a more integrated manner with local climate conditions during the design phase, supported to the maximum extent by passive climate strategies, reducing dependence on mechanical systems, and integrating indoor environment

monitoring data with user behavior. Thus, WELL criteria can become a dynamic guide for a healthy and sustainable office life that can adapt to different climate conditions. It is important that all indoor spaces adapt to today's changing and evolving technological conditions and undergo transformation, shifting towards user-centered design. Renovating existing buildings for these purposes and designing new buildings accordingly is becoming increasingly important in protecting against potential SBS. The WELL certification system's evaluation of this multi-layered approach in relation to climate data will enable the production of more resilient buildings that simultaneously support both energy efficiency and user well-being.

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Chapter 3

CARE | REPAIR | VALUE: TRACING TRANSITIONS IN ISTANBUL'S INDUSTRIAL HERITAGE

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INTRODUCTION

Historically, social values, production methods, and power dynamics have all been materialized through architecture. Space design has always been influenced by technical advancements and has consistently remained rooted in social needs, cultural aspirations, and ideological agendas. It is an intellectual practice through which values are defined, negotiated, and reimagined within particular social contexts. Henri Lefebvre's Production of Space (1991) and Laurajane Smith's discussion of the authorized heritage discourse (2006) both remind us that space is never neutral. The meanings and values attached to it are continually shaped by institutions, actors, and systems of power. From this point of view, architecture is not simply an aesthetic or technical discipline but a field where social relations and ethical responsibilities are constantly produced and reinterpreted.

In our time, processes of value formation have come under renewed scrutiny. Growing environmental awareness and shifting social ethics have brought a new level of sensitivity to how values are produced and sustained. This study adopts Values in Transition as its conceptual frame — not to propose a new phenomenon, but to trace how long-standing transformations in value are understood and expressed today. To interpret these shifting formations, Ronald Inglehart's theory of post-materialist values provides a useful lens. His work (Inglehart, 1990; Inglehart & Welzel, 2013) describes how, in post-industrial societies, priorities evolve from material concerns such as security and economic growth toward immaterial ones: quality of life, self-expression, and environmental awareness. While this concept describes why value systems change, then the ethical concepts of care and repair show how these changes take shape in practice. They are the tangible and ethical counterparts of transition — the means through which abstract shifts translate into sustained social and material action.

This framework can be extended to architecture to explain how changing systems of value inform conservation, reuse, and representation (Rigillo, 2023; Avrami, 2019). Heritage preservation and adaptive reuse are not limited to physical artifacts; they also reshape social relations, ecological obligations, and ethical priorities. Inglehart's theory, together with recent approaches such as values-based heritage and ethical sustainability, does not create a new paradigm but rather deepens our understanding of how shifting value systems are manifested within architectural practice (Fredheim & Khalaf, 2016). The ethical dimension of this transformation becomes clearer through the intertwined notions of care and repair. Carol Gilligan (1982) and Joan Tronto (1993, 2013) describe the ethics of care as a moral framework grounded in relationships and interdependence. For Tronto, care is not only a personal virtue but also a political act tied to justice and equality. Viewed this way,

conservation in architecture can be read not merely as the preservation but as an ongoing commitment that sustains social relations. The idea of spatial agency developed by Nishat Awan, Tatjana Schneider, and Jeremy Till (2011) extends this perspective, portraying architectural practice as collective action that carries responsibilities of maintenance and care.

The triad of care, repair, and value was articulated in the exhibition Von Pflege, Wert und Denkmal: For What It's Worth at the Zürich Architecture Centre (ZAZ Bellerive) in 2025. By asking "What is something worth — and to whom?", the exhibition opened a dialogue about the interwoven relations of value, care, and heritage in architecture. It framed conservation not simply as physical repair but as an act of cultural recognition and social transmission. This curatorial lens has strongly inspired the conceptual foundation of the this study.

María Puig de la Bellacasa (2017) expands the idea of care into an ethics of relationality that connects ecological and material worlds. Architecture, from this perspective, becomes part of an ecological web rather than a purely human enterprise. Steven Jackson's Rethinking Repair (2014) likewise redefines repair not as the pursuit of perfection but as the ongoing maintenance of fragile systems.

This study approaches the intersection of care and repair as a conceptual ground through which architectural value can be understood — not as a static object to be preserved, but as a process that requires continuous attention. Architecture, in this sense, is an active practice of maintenance: a continual negotiation between material, user, and environment (Rigillo, 2023; Puig de la Bellacasa, 2017). This theoretical approach provides a way to read contemporary adaptive reuse of industrial heritage. The industrial structures of the nineteenth and twentieth centuries are no longer passive witnesses of the past; they have become laboratories where social and ecological values are re-examined and re-created. Here, conservation is less about aesthetic or historical authenticity and more about ethical questions of resources, ecology, and inclusion. The transformation of industrial heritage, therefore, cannot be reduced to a simple "value shift." It is better understood as a condition of values in transition — a layered field where different systems of value coexist, overlap, and interact (Avrami, 2019; Fredheim & Khalaf, 2016).

Figure 1. Conceptual Structure of the Study

In Istanbul, the transformation of industrial structures from different historical periods into spaces of culture, art, and learning reflects local expressions of a wider global shift. Within the conceptual frame of Values in Transition, this study explores how the adaptive reuse of Istanbul's industrial heritage mirrors evolving ethical, social, and ecological systems of value. Rather than introducing Values in Transition as a new phenomenon, the study treats it as a conceptual framework—one that enables a more conscious understanding of how values have transformed over time.

The discussion unfolds through the triad of care–repair–value, examining how contemporary conservation practices intertwine material restoration with broader social, cultural, and ecological responsibilities. Instead of offering a technical assessment of restoration processes, the research situates these transformations within an ethical and conceptual ground that connects architectural value to public life. It seeks to understand how heritage mediates between the tangible and the ethical—between the act of repairing and the ongoing process of re-valuing.

Methodologically, the study adopts a qualitative, descriptive approach, drawing upon literature, institutional archives, project reports, and contemporary cultural materials such as architectural critiques, exhibition catalogues, and public discourse. The care–repair–value framework serves as a lens for critical discourse analysis across four adaptive reuse projects completed after 2020: Müze Gazhane, Rami Library, Çubuklu Silos, and ArtİstanbulFeshane. Despite their distinct origins—the military background of Rami Barracks versus the industrial production histories of the others—these projects share a common ground in which public, cultural, and ecological values are being renegotiated. Each combines the physical renewal of industrial space with new forms of social interaction and civic belonging, illustrating different dimensions of a contemporary urban consciousness shaped by care, repair, and value.

These nineteenth- and twentieth-century structures thus represent a continuity of values rather than a break. They carry the material traces of their past while evolving into arenas where ethical awareness and public participation are continually redefined within modern urban life. International precedents such as Tate Modern in London, Matadero Madrid in Spain, and the Power Station of Art in Shanghai demonstrate similar ethical and spatial orientations in other cultural contexts. Yet Istanbul's examples reinterpret these shared trajectories through their own local contexts, revealing how global discourses on heritage, sustainability, and public space take root within the city's distinctive cultural landscape.

2. CONCEPTUAL FRAMEWORK: VALUES IN TRANSITION AND THE CARE–REPAIR–VALUE PARADIGM

As outlined earlier, the concept of Values in Transition provides a theoretical foundation for understanding how systems of value within architecture evolve. Rather than proposing a new paradigm, this framework allows for a more conscious interpretation of how changing ethical, cultural, and ecological sensibilities influence architectural thinking and practice. Ronald Inglehart's theory of post-materialist values (1990; 2013) offers a sociological perspective through which these shifts can be situated. As industrial societies evolve, priorities tend to move away from material security toward quality of life, environmental awareness, and individual expression. When applied to architecture, this transition becomes visible in how spaces are designed, conserved, and adapted—revealing the discipline's ongoing redefinition of what is considered valuable.

Traditional conservation practices often defined value through aesthetic, historical, or authenticity based criteria (Avrami, 2019), is now understood as a more fluid and socially embedded process. Contemporary scholarship acknowledges that heritage values are not fixed or inherent but socially constructed and continually renegotiated (Fredheim & Khalaf, 2016). In this light, conservation extends beyond the act of material preservation to include the rearticulation of social relations, ecological responsibilities, and ethical commitments. Architectural value, therefore, emerges not as an attribute of objects but as an evolving process—a continuous negotiation between history, society, and the environment. Decisions about what to preserve, transform, or reinterpret become expressions of collective agency that mirror shifting moral and cultural priorities.

Within this frame, the care–repair–value triad provides both an ethical orientation and a practical framework for analysis. Care represents attentiveness and responsibility toward human and non-human worlds;

repair encompasses the material and social acts that maintain continuity; and value arises through their ongoing interaction. Together, these concepts transform conservation from a static exercise in preservation into a living field of relational ethics—one in which architecture sustains, adapts, and reinterprets its meanings through time.

The Ethics of Care and the Concept of Repair

A meaningful way to interpret the transformation of value in architecture is to frame the notions of care and repair within an ethical context. Carol Gilligan (1982) defines the ethics of care through relationships and interdependence, while Joan Tronto (1993, 2013) expands it into a collective and political responsibility, describing care as a social practice inseparable from justice, equality, and civic duty. Within this understanding, architecture gains ethical depth not through creation or possession, but through acts of maintenance and stewardship.

Nishat Awan, Tatjana Schneider, and Jeremy Till (2011) articulate this relational dimension through the concept of spatial agency, reimagining the architect not merely as a designer of form but as a mediator and caretaker of relationships. The notion of repair further reframes how architecture engages with material and social fragility. Steven Jackson (2014), in Rethinking Repair, describes repair not as technical correction but as a practice of solidarity that sustains fragile systems. In architectural terms, this implies preserving continuity without erasure—maintaining the traces of the past while allowing renewal. María Puig de la Bellacasa (2017) extends the concept of care into an ethics of relationality that embraces non-human entities—materials, ecosystems, and energy flows—thereby situating architecture within a broader ecological and ethical field. From this post-anthropocentric perspective, care and repair operate as intertwined spatial ethics that connect the material and social dimensions of architecture.

In this light, care in architecture signifies an enduring responsibility enacted through use, maintenance, and adaptation, while repair makes this continuity tangible. Together, they reveal architecture as an evolving condition rather than a completed object. In the context of industrial heritage, repair becomes an act of engaging with the past without erasing it, integrating material memory into future use. Together, care and repair reposition architecture as a sustained practice that binds the physical and social worlds through attentiveness, reciprocity, and adaptation.

The Continuity of Value in Architecture: From Object to Process

Architectural value has long been understood through the lens of the object — something to be preserved, measured, and fixed in time. Classical conservation practices were rooted in attempts to stabilize value by anchoring it to a historical reference point. Within this paradigm, buildings were treated as artefacts to be recorded and safeguarded, while heritage was conceived as a static entity defined by aesthetic, historical, or material criteria. Yet contemporary thought reveals that architectural value has always been fluid, even if that fluidity has only recently been acknowledged and debated more consciously.

The intellectual roots of this shift reach back to Alois Riegl's (1903) theory of heritage values. Riegl argued that every era generates its own hierarchy of meanings, and that the idea of preservation evolves according to these changing value regimes. Today, his insight gains renewed significance as heritage intersects with the urgencies of climate change, social inequality, and digital transformation. Heritage is no longer seen merely as an object that represents the past, but as a continuous relationship of responsibility extending toward the future.

From this standpoint, architecture becomes not just a field of production but also a space of negotiation where values circulate and transform. The significance of a building found not in its form, but in the network of relations it sustains — social, ecological, and temporal. Within this view, care and repair are essential. To care is to maintain a reciprocal relationship with place; to repair is to ensure the material and symbolic continuity of that relationship. Together, these acts create an ethical framework that seeks not to fix value, but to keep it alive.

This perspective rejects the notion of architecture as a "finished product." Every building is instead a living entity that continually acquires new meanings as social, climatic, and cultural contexts evolve. Value, therefore, is not a stable property to be preserved but a relational condition, maintained and renegotiated through time. The historical, material, and symbolic layers of architecture form the medium through which this relational production of value unfolds. The care–repair–value triad anchors this ethical understanding. Care embodies mutual responsibility toward both space and society; repair represents the material practice that sustains that responsibility; and value emerges as the continuity of meaning generated through their interaction. At the intersection of these dimensions, architecture transforms the tension between conservation and transformation into a productive ethical field.

This approach becomes particularly tangible in the realm of industrial heritage, where layered histories and material traces converge. Such sites are not only witnesses to past modes of production but also social laboratories in which values are continually redefined. Their preservation is less an aesthetic or technical task than a negotiation among collective memory, resource responsibility, and public engagement. Within this process, architecture acts as an instrument of care directed simultaneously toward the past and the future — reframing conservation not as static preservation but as an evolving practice of responsibility through time.

Spatial Representations of Value

The spatial expressions of the Values in Transition framework, can be seen in recent examples of adaptive reuse in industrial heritage. These projects reveal not only how production spaces have been transformed, but also how social values and public relationships have been reconfigured in the process. Where industrial heritage meets culture and the arts, a new paradigm emerges—one that reconsiders the ethical, aesthetic, and social boundaries of architecture through the lens of the care–repair–value triad.

Early Phases: From Preservation Awareness to Cultural Transformation: The public opening of industrial heritage sites began across Europe in the second half of the twentieth century. The Ironbridge Gorge Museum Trust, founded in England in 1967, is considered as the first systematic effort in industrial archaeology (Cossons, 1975; Douet, 2013). This early phase was marked by a predominantly technical approach that focused on documentation, preservation, and material stabilization.

By the 1980s, however, the understanding of reuse had expanded into a more socially and culturally embedded practice. Landmark projects such as La Villette in Paris (1987) and Zeche Zollverein in Essen (1980s) pioneered a shift from mere preservation to cultural regeneration, turning former industrial complexes into vibrant centers for education and the arts. These transformations merged physical repair with social reactivation, redefining the architectural role of industrial sites and reframing heritage as a living component of the public realm—one where memory, participation, and creativity intersect.

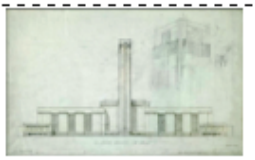
Tate Modern | London (2000) *Power station → Museum of Modern and Contemporary Art* *Architects: Herzog & de Meuron*	**Matadero Madrid | Madrid (2007)** *Municipal slaughterhouse → Cultural, creative, and community complexProgram: Madrid City Council Cultural Initiative*	**Power Station of Art | Shanghai (2012)** *Power generation plant → Museum of Contemporary ArtArchitects: Shanghai Municipal Government Conversion*
 	 	 
The conversion of Bankside Power Station into Tate Modern marks a turning point in the cultural reuse of industrial heritage. More than physical restoration, it represents a social and cultural reactivation — shift from preservation toward shared public experience. Within this space, value is no longer anchored in material authenticity but in collective participation and accessibility. The project demonstrates how architectural transformation can act as social repair, reweaving public engagement through cultural production. By preserving the material traces of industrial history while fostering new forms of public life, Tate Modern embodies the continuity of care–repair–value as an ethics of coexistence and renewal.	Matadero Madrid exemplifies the integration of industrial heritage into everyday urban life through social collaboration. Retaining its original spatial fabric, the complex has been transformed into a constellation of workshops, exhibition spaces, and open-air venues that host collective production and cultural exchange. This approach reframes heritage as a living process—continuously negotiated through participation, shared use, and care. Repair here extends beyond the physical realm, manifesting as the renewal of social relations and community bonds. The site thus illustrates how architecture can cultivate urban care, enabling spaces of collective creativity and solidarity within the care–repair–value continuum.	The transformation of a former coal-fired power plant into the Power Station of Art extends the ethics of care and repair toward an ecological dimension. The project reinterprets sustainability through restorative ecology—an approach that seeks not only to conserve but to repair damaged environmental and social systems. By integrating material reuse, energy efficiency, and environmental awareness within its design, the building embodies a spatial ethics of continuity between nature, industry, and culture. It reveals how architectural reuse can become an act of ecological care—preserving the past while nurturing the conditions for future resilience.

Figure 2. International precedents illustrating the care–repair–value continuum in adaptive reuse of industrial heritage

Viewed together, these examples—emerging across different geographies and socio-economic contexts—reveal a shared ethical foundation:

- Heritage is no longer a static object, but a dynamic field of relations.
- Publicness is defined not simply by access, but by active participation.

- Repair is understood not as a return to the past, but as an act of care oriented toward a sustainable future.

Collectively, these approaches represent the spatial expressions of the care–repair–value paradigm on a global scale. The same framework provides a compelling lens through which to interpret the recent transformations of industrial heritage in Istanbul.

Each case, while shaped by its own historical and cultural context, articulates a locally grounded expression of a shared cultural ethics of care—an ethics that values heritage not through preservation alone, but through sustained attention, renewed engagement, and the cultivation of collective belonging.

3. REFRAMING VALUE IN INDUSTRIAL HERITAGE: CONTEMPORARY REFLECTIONS FROM ISTANBUL

Throughout history, architecture has been a field through which social, economic, and cultural values are continually reshaped. The concept of Values in Transition does not introduce a new phenomenon to architectural discourse, but rather highlights contemporary forms of awareness within an ongoing process of value transformation. Shifting social priorities, ecological sensitivities, and ethical responsibilities have not initiated this transformation, but have rendered it more visible and self-reflective. In this sense, the concept does not mark a rupture with earlier systems of value; instead, it calls for a renewed examination of the ethical frameworks of architecture within contemporary contexts.

Within this broader understanding, industrial heritage stands out as one of the most dynamic sites where values are constantly redefined. In such structures, value emerges not only as a historical attribute representing the past, but also as an active process through which social relations, public responsibilities, and ecological sensibilities are renegotiated. As Fredheim and Khalaf (2016) argue, heritage is "not a static entity to be preserved, but a continuously (re)negotiated social construct." Similarly, Avrami (2019) emphasizes that historical, social, and political dimensions of value must be understood as interdependent components of conservation practice. Together, these perspectives provide the theoretical foundation for understanding how industrial heritage has evolved from an object of preservation into a site of value production.

The emergence of "new value regimes" does not signal a break between past and present, but rather the coexistence of multiple systems of meaning. Alongside economic, aesthetic, and functional considerations, ethical, ecological, and participatory values increasingly shape adaptive reuse practices. Within this framework, the care–repair–value triad offers a powerful interpretive lens for examining this layered production of value. Care embodies ethics and social responsibility; repair involves both physical and symbolic restoration; and value arises through the continuous interplay of these dimensions in public

life. Accordingly, the transformation of industrial heritage today extends beyond the preservation of material fabric—it becomes a spatial process that nurtures social justice, ecological awareness, and collective belonging.

This renewed ethical and cultural consciousness is vividly reflected in Istanbul's recent industrial heritage projects. Structure such as ArtİstanbulFeshane, Müze Gazhane, Rami Library, and Çubuklu Silos illustrate localized interpretations of these evolving value regimes, where conservation is conceived not merely as physical restoration but as the reconstitution of public life itself. These four examples were selected for their diversity in scale, historical background, and programmatic approach, collectively offering a comprehensive perspective on Istanbul's contemporary value transitions. Through these cases, this chapter explores how the care–repair–value framework is rearticulated within Istanbul's cultural landscape.

Over the past decade, Istanbul's industrial heritage sites have undergone transformations that extend beyond physical renewal, evolving into arenas where values are continuously negotiated. Rooted in different historical periods, these structures embody the city's socio-economic memory as it shifts from production to consumption, and from industrial labor to cultural life. At the same time, they express local variations of broader ethical, ecological, and social value regimes. From this perspective, Values in Transition provides a framework for understanding these projects not simply as acts of restoration, but as conscious processes of reinterpretation within evolving architectural value systems. Beyond the cases discussed here, many other industrial sites in Istanbul are also undergoing similar transitions—reflecting the city's wider and ongoing engagement with the adaptive reuse of heritage.

Müze Gazhane: Ecological Transformation and Public Repair

Located in Hasanpaşa on the Asian side of Istanbul, Müze Gazhane (Hasanpaşa Gasworks) was constructed in 1891 and began operation in 1892 as one of the most prominent examples of late Ottoman industrial architecture, designed to meet the city's growing energy needs. After production ceased in 1993, the complex remained unused for decades before undergoing an extensive restoration and adaptive reuse process led by the Istanbul Metropolitan Municipality between 2014 and 2021. Today, under the name Müze Gazhane, the complex has been transformed into a multifunctional space for culture, art, and learning. It hosts the Climate Museum, the Museum of Cartoon and Humor, the Afife Batur Library, theatres, workshops, and generous public open spaces—together forming a new civic hub within the city.

This transformation represents more than the physical repair of an industrial heritage site; it signifies the reconnection of Istanbul's former coal-gas infrastructure with the ecological consciousness of the present. Once a

vital component of urban modernization, the gasworks that powered the city's growth now serves as a public platform for climate awareness, environmental responsibility, and collective learning. Within this process, care emerges as an ethical attentiveness directed toward both heritage and the environment, while repair extends beyond structural restoration to encompass the symbolic mending of a historically carbon-based mode of production embedded in the city's collective memory.

Müze Gazhane thus stands as a landmark case at the intersection of Istanbul's energy history, ecological reflection, and cultural production. Its value today lies not in its past industrial productivity, but in its capacity to generate environmental awareness and civic engagement for the future. In this sense, the project embodies a restorative approach to cultural ecology—linking environmental responsibility and public participation through the principles of the care–repair–value paradigm.

Hasanpaşa Gasworks → Müze Gazhane	
Location	Hasanpaşa | Kadıköy
Construction Period	1891 – 1892
Original Function	Coal-gas production (for urban lighting and energy supply)
Operation Period	1892 – 1993
Heritage Status	Declared a conservation site in 1994; registered industrial heritage complex
Implementing Inst itution	Istanbul Metropolitan Municipality (IBB)
Restoration Team | **Contributors**	Istanbul Technical University Faculty of Architecture (Afife Batur et al.) in collaboration with the IBB Department of Cultural Heritage and Restoration
Reopening Year	2021
Current Use / Program	Climate Museum, Cartoon & Humor Museum, Afife Batur Library, theaters, workshops, public open spaces

Figure 3 : Hasanpaşa Gasworks → Müze Gazhane

Rami Library: Knowledge, Publicness, and Sustainable Heritage

Originally built in the early nineteenth century as a logistics hub for the Ottoman army, the Rami Barracks continued to serve military purposes throughout the Republican era. After decades of disuse, a comprehensive restoration and adaptive reuse project was initiated in 2014 under the auspices of the Turkish Ministry of Culture and Tourism and completed in 2023, transforming the complex into the Rami Library. Encompassing 36,000 m^2 of enclosed area and a 51,000 m^2 courtyard, it now stands as one of Istanbul's largest cultural and public learning environments—marking the city's transition from a military infrastructure of control to an open civic landscape of knowledge and exchange.

This transformation invites a reconsideration of repair not merely as physical restoration, but as a symbolic and social act. A building that once embodied hierarchy and discipline has been reinterpreted as a space of openness, accessibility, and shared intellect. In the spirit of Joan Tronto's (1993) ethics of care—which links care to justice, equality, and public responsibility—the project demonstrates that care in architecture resides not in the preservation of stone and mortar, but in the restoration of collective memory.

The same architectural shell that once signified authority and surveillance now supports a participatory spatial language of circulation and interaction—through open-shelf archives, expansive reading halls, and public gathering areas. This reconfiguration echoes Steven Jackson's (2014) notion of repair as "keeping fragile systems in working order," here reframed as a spatial practice that sustains cultural continuity and civic engagement.

The value of the Rami Library thus lies not in its military past, but in its capacity to reconstruct public life. As Ronald Inglehart (1990) observes in his post-materialist values theory, societies evolve from the pursuit of material security toward self-expression and quality of life—a shift vividly mirrored in this adaptive transformation. Within the care–repair–value framework, the Rami Library transcends physical adaptation to become a spatial manifestation of ethical renewal and cultural openness. By transforming the geometry of military order into a civic ground for inclusivity and learning, it reminds us that in architecture, care is not about preservation alone, but about reconnection, continuity, and meaning-making.

Rami Barracks → Rami Library	
Location	Eyüpsultan
Construction Period	1828–1829 (Ottoman military barracks)
Original Function	Military logistics and accommodation complex for the Ottoman army
Operation Period	1829 – 1971 (used as a military facility under both Ottoman and Republican administrations)
Heritage Status	Registered cultural heritage site; one of the largest surviving 18th-century military complexes in Istanbul
Implementing Institution	Turkish Ministry of Culture and Tourism
Restoration Team | **Contributors**	Lead Architects: Han Tümertekin Project Architects: Zehra Uçar, Ferhat Zeycan
Reopening Year	2023
Current Use / Program	National Library and Cultural Complex including reading halls, open-shelf archive systems, children's and youth libraries, study spaces, cafés, and a restored mosque 36 000 m² enclosed area | 51 000 m² courtyard

Figure 4: Rami Barracks to Rami Library

Çubuklu Silos Digital Arts Museum: Industrial Infrastructure and the Digital Future

Located on the northern shores of the Bosphorus between Paşabahçe and Kanlıca, the Çubuklu Silos stand as a significant remnant of Istanbul's modern industrial era. The area, first opened to industrial development in the late nineteenth century to meet the city's growing energy demand, was converted into a petroleum storage zone operated by private oil companies from the 1930s onward. Following decades of abandonment, the site

underwent a comprehensive restoration and adaptive reuse process led by the Istanbul Metropolitan Municipality and reopened to the public in 2024.

Today, the 20,000 m² complex has been reimagined as a multifaceted cultural and artistic venue, hosting the Museum of Digital Arts, the Museum of Nature and Science, a library, workshops, and a Children's Art and Science Center—together forming a new cultural corridor along the Bosphorus. Guided by universal conservation principles and a strong public vision, the project redefines heritage not as a static object, but as a living component of urban life.

As spaces of memory, the silos preserve the social and cultural imprints of the industrial era, allowing collective memory to be reactivated through new forms of creative production. This transformation reflects a broader value transition, in which industrial infrastructures reconnect with the dynamics of the digital age. Once symbols of fossil energy and material production, the petroleum silos now function as spaces of digital energy—sites for the creation of data, art, and knowledge. In doing so, the Çubuklu Silos preserve the tangible forms of the industrial age while engaging in dialogue with the symbolic production logics of the digital one. This evolution signals a fundamental shift in value—from fossil-based infrastructures to cognitive and cultural creation within the data economy.

Within this framework, repair manifests as a practice of adaptation and refunctioning in Steven Jackson's (2014) sense—integrating the massive, raw geometries of the industrial age into the technological and cultural infrastructures of the digital age. Care, meanwhile, emerges as an attentiveness to both nature, represented by the ecological setting of the Bosphorus, and memory, embodied in the industrial heritage of the silos themselves. Rather than adopting a nostalgic preservationist stance, the project enacts a forward-looking ethics of care, synthesizing the physical traces of the past with the creative production culture of the future.

Once an abandoned fuel depot, the site now operates as a living cultural ecosystem—marking a profound shift from energy infrastructure to cultural infrastructure. The Çubuklu Silos thus embody a unique dialogue between the materiality of industrial heritage and the abstraction of digital culture. Here, value creation is no longer tied to reproducing the production modes of the past, but to imagining and shaping new cultural and technological futures. In this way, the project stands as a contemporary site of public heritage—ensuring continuity within the city's collective memory while offering a spatial response to the ethical and aesthetic challenges of the digital age.

Çubuklu Fuel Depots → Çubuklu Silos Digital Arts Museum	
Location	Çubuklu, Beykoz,
Construction Period	Late 19th century (industrial zone established) – 1930s (petroleum storage facilities constructed)
Original Function	Petroleum storage and industrial depot area.
Operation Period	1930s – early 2000s
Heritage Status	Recognized as an industrial heritage complex; part of Istanbul's modern industrial legacy
Implementing Institution	Istanbul Metropolitan Municipality (IBB) – İBB Miras
Restoration Team | **Contributors**	Under the leadership of IBB Heritage
Reopening Year	2024
Current Use / Program	Museum of Digital Arts, Museum of Nature and Science, Library, Workshops, Children's Art and Science Center, and public open spaces

Figure 5: Çubuklu Fuel Depots→ Çubuklu Silos Digital Arts Museum

ArtIstanbul Feshane: A Public Cultural Space Where Production Is Redefined

Located in the Eyüpsultan district of Istanbul, the historic Feshane-i Amire stands as one of the earliest examples of Ottoman industrial architecture. Established in 1827 for the production of fez hats and textiles for the Ottoman army, the complex expanded from its first workshop in Kadırga to the shores of Eyüp, becoming a symbol of Ottoman modernization through its technological innovation and socio-economic influence. After decades of

neglect, the site underwent a comprehensive restoration and adaptive reuse process led by the Istanbul Metropolitan Municipality and was reopened in 2023 as ArtİstanbulFeshane. Today, the 8,000 m² cultural complex hosts contemporary art exhibitions, workshops, event halls, a library, and social spaces—making it one of the city's largest and most vibrant public cultural venues.

The transformation of Feshane represents more than the physical repair of an industrial heritage site; it marks a cultural redefinition of value itself. Once a factory symbolizing imperial economic power and centralized authority, the space now serves as a platform for public expression—producing art, ideas, and shared experiences instead of goods. Production continues, yet its object and meaning have profoundly shifted. This passage from mass production to creative production, and from an industrial economy to a cultural one, can be understood as a spatial manifestation of Ronald Inglehart's (1990) post-materialist value shift.

Within this framework, repair signifies the adaptation of industrial infrastructure to the evolving needs of contemporary cultural life: the factory of the past has been transformed into a laboratory for art and thought. Care, meanwhile, embodies the human dimension of this transformation—creating an inclusive environment where artists, audiences, and citizens engage through shared creative processes. In doing so, Feshane demonstrates that repair in architecture extends beyond technical restoration to become a form of social care.

Ultimately, ArtİstanbulFeshane exemplifies a process in which value evolves from material production to symbolic creation. The adaptive reuse of industrial heritage here is not merely a change of function, but a redefinition of what a place can produce. Once the heart of imperial manufacturing, the complex now operates as a public laboratory of cultural capital—a space that both sustains Istanbul's creative vitality and expands opportunities for civic engagement.

Feshane (Textile factory)→ArtİstanbulFeshane	
Location	Eyüpsultan
Construction Period	1827 – 1839 (initial establishment and expansion)
Original Function	Ottoman Imperial Fez and Textile Factory (Feshane-i Amire) producing military and civilian garments
Operation Period	1827 – early 20th century
Heritage Status	Registered industrial heritage site
Implementing Institution	Istanbul Metropolitan Municipality (IBB)
Restoration Team | **Contributors**	Under the leadership of IBB Heritage- – KG Architecture
Reopening Year	2023
Current Use / Program	Contemporary art center hosting exhibitions, workshops, performances, library, and public gathering spaces; a multidisciplinary cultural hub

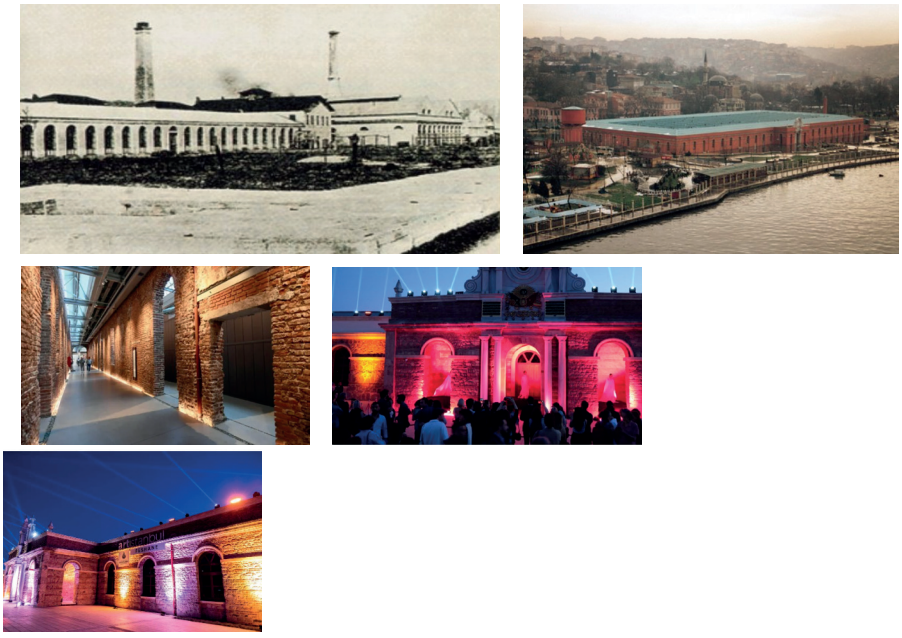


Figure 6: Feshane (Textile factory)→ArtİstanbulFeshane

4. CONCLUSION: CARE, REPAIR, AND VALUE IN TRANSITION

The adaptive reuse of industrial heritage signifies far more than an effort to preserve traces of the past; it embodies a reconfiguration of public awareness, social relations, and ethical sensibilities. Within this context, Values in Transition

can be understood as an ongoing process through which shifting ethical priorities, environmental responsibilities, and collective values are shaped and expressed through architecture. Despite their differing scales and programs, the examined examples converge on a shared ground where publicness is redefined, and cultural production becomes a medium of renewal.

The recent transformations of Istanbul's industrial sites can thus be read not merely as acts of physical reuse, but as social and cultural fields in which value is continually renegotiated. Each project mediates the relationship between past and present through an evolving dialogue. Accordingly, value no longer resides in the material object itself but in the relationships it generates—sustained through care and repair rather than static preservation. In this sense, Values in Transition reveals heritage as a dynamic ethical field, reconstructed through time, space, and collective interaction.

These modes of transformation shift the focus from architectural production to relational agency. Ecological awareness in Müze Gazhane, public knowledge in Rami Library, cultural participation in ArtİstanbulFeshane, and digital spatiality in Çubuklu Silos each represent distinct layers of the care–repair–value triad—yet all converge around a shared ethic of mutual responsibility. Here, preservation is reframed not as an act of safeguarding the past, but as an ethical commitment oriented toward the future.

At the same time, these buildings remind us that architecture is never a completed object but a living process. While shaped by contemporary practices and needs, they remain open to future reinterpretations—functioning as dynamic organisms rather than static monuments. This perspective locates architectural permanence not in material endurance, but in transformative capacity, positioning regeneration as a continuous negotiation among the social, ecological, and cultural dimensions of value. Within this framework, care–repair–value privileges awareness and participation over mere physical intervention. Repair signifies not only the restoration of structures, but also the reconstitution of social bonds and shared meaning. In this way, Istanbul's industrial heritage sites transcend their role as remnants of the past to become ethical bridges between memory and the city's evolving future.

This study has examined these transformations through the conceptual lens of Values in Transition, exploring the multilayered relationships among preservation, adaptive reuse, and ethical responsibility in architecture. Rather than approaching restoration as a technical operation, it has viewed these projects as cultural processes that generate new forms of relation and shared value. Focusing on four examples adaptively reused after 2020 provided a concise yet revealing framework to observe how spatial repair intersects with contemporary social concerns. Future research may extend this inquiry through user experience, public perception, and participatory design analysis.

Ultimately, the care–repair–value triad may be understood not only as a methodological lens for heritage preservation, but as a conceptual foundation for reimagining architectural culture along ethical, ecological, and social lines. In this regard, Istanbul's industrial heritage exemplifies how architecture can simultaneously preserve the traces of the past and shape the collective imaginaries of tomorrow.

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Chapter 4

PROPOSAL TO RECONTRUCT CINEMATIC EXPERIENCE THROUGH SPATIAL AND THEMATIC ANALYSIS OF ARCHITECTURAL SEQUENCES: COLUMBUS CASE STUDY

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1. Introduction

The fact that cinema and architecture influence each other and in this context, architecture is perceived not only as a background element but also as a visual art data set that cinema can use, creates a strong synthesis area for these two branches of art to work together. The idea that films can be not only a background element but also a participant reflects the reality while providing the opportunity to reconsider the narratives offered by alternative approaches in addition to the moods and general emotional orientations in society makes architecture special in this context. In addition to popular places attracting the attention of tourists and being used as reference points in films, the fact that lesser-known places also find a special place in cinema indicates a pattern that films can gain with the context of spaces (Musiyevska, 2023). The common principles shared by cinema and architecture are realized thanks to some common inspiration points in defining the concept of space between the two. These basic principles regarding the discovery of some connections for the improvement of spaces are realized within a partnership area by referring to the oldest forms of architectural art and considering its achievements in the art of cinema. In this context, the inclusion of concepts that refer to architecture in some basic elements in understanding the sense of place operates a process that contributes to the partnership of the two disciplines. The main elements that mediate the meeting of cinema and architecture on a common ground are repetition, geometry, continuity and rhythm (Sayyari et al, 2023). When we go down to lower scales, it can be seen that there are basic materials as well as basic strategies that mediate the meeting of cinema and architecture on a common ground. Just like the basic feelings of warmth and cold represented by gross concrete, natural stone or a wooden surface, glass elements can be referred to basic emphases such as transparency, permeability and fluidity. One of the aspects that makes this dual field most special is seen in the creation of situations that will allow the use of openness and closeness in creating unique images to transform the atmosphere of the space. In this context, glass both mediates the creation of a special composition and offers a series of transparencies that trigger special possibilities that can enrich the narrative in the scenario (Nasybullina et al, 2024). Architecture can be represented in different ways in cinema. In this context, the representation of modern architecture in cinema also holds a very special place. Modern architecture is generally expressed with a formal representation in which structural elements are characterized by flat forms with orthogonal representatives. In this context, depending on how exciting or invigorating modernism can be in cinema, it can also be observed that it can remain inhumane and oppressive in different scenarios. In this context, in order for modern architecture to continue to play a complementary role, it should first be discussed whether its role in cinema should be dated and a series of paths compatible with this role should be followed and whether it can

be considered as an extension of industrialization and applied decoration or as an autonomous representation (Wilson, 2022).

In this context, some basic findings can be made: Architects should anticipate users' visual-spatial experiences at the beginning of their designs. While architecture creates physical spaces, film offers a way to see these spaces in time. Cinematic narratives use spatial cues to evoke viewers' emotions. Viewers act as users of the spaces shown in the film. The research examines how cinematic narratives are created using architectural cues. Cinematic narratives can be used to understand architectural narratives. Bringing time together with space helps to understand architectural elements in action. Cinema provides access to both time and space dimensions. Examining architectural narratives in films is important for evaluating interiority and exteriority. The relationship between space and characters should be carefully observed in films. The movements of characters in space and time are part of the architectural narrative. Cinematic narratives show how emotional experiences are created in architecture. Architectural cues direct the emotional responses of the audience in films. Spatial design can be analyzed more deeply through cinema. The use of space in films can contribute to architectural theory. Space is an important component of the narrative in cinema. Architecture and cinema offer the experience of space-time together. The display of architectural elements in action in cinema emphasizes the dynamism of the space. Cinematic techniques can make the architectural narrative more understandable (Kaur Sabharwal, 2021). Architecture and cinema are two arts that influence each other in different ways. Both arts emerge as a result of the artistic thought and teamwork of their creators. Cinematic style includes the techniques a director uses to give meaning to his film. Cinematic style can be limited to a specific time or place. As an important detail related to the subject, expressionist cinema is an example of cinematic style. Architecture, on the other hand, contributes to the formation of the frame and abstract forms in cinema. Expressionist cinema facilitates the creation of architectural spaces. Cinema and architecture are considered innovative arts. The influence of the two arts stems from the artistic thoughts of their creators. Expressionist cinema is closely related to architecture. The architectural elements used in cinema affect the atmosphere of the film (Haghjou et al, 2016).

2. Importance of "Columbus" in terms of Relationship Between Architecture and Cinema

"Columbus," directed by Kogonada, is a contemplative drama set in Columbus, Indiana, known for its modernist architecture. The film follows the story of Casey (Haley Lu Richardson), a young woman who is passionate about architecture but feels tied to her hometown due to her obligation to care for her recovering drug addict mother. Her life intersects with Jin (John

Cho), a Korean-born man who comes to Columbus because his estranged architect father falls into a coma there. As Casey and Jin form an unexpected bond, they explore the town's buildings and reflect on their personal lives. Jin grapples with his strained relationship with his father, while Casey faces the decision of whether to pursue her architectural dreams or remain in Columbus. The film delves into themes of family, responsibility, and the impact of physical spaces on emotional landscapes, all underscored by Kogonada's meticulous visual style and thoughtful storytelling. In Columbus, Kogonada incorporates the architectural richness of Columbus, Indiana, as a central theme and visual element. The movie is notable for its meticulous attention to the town's modernist architecture. Here are some key architectural details and locations featured in the film: First Christian Church**,** Irwin Union Bank**,** Miller House**,** Columbus Regional Hospital**,** Cleo Rogers Memorial Library**,** Bartholomew County Veterans Memorial**,** North Christian Church and The Commons (Figure 1).

Figure 1. *Architectural spaces and main related themes in Columbus.*

Kogonada uses these buildings not just as backdrops but as integral parts of the narrative, enhancing the characters' inner journeys and the film's exploration of architecture's emotional and psychological impact. The

meticulous framing and cinematography emphasize the harmony, simplicity, and beauty of modernist architecture, creating a reflective and immersive experience for the viewer.

3. The Contextual Background of Cinema for the Usage of Architectural Themes

The historical importance of the cinema comes from the fact that it has a place in the memory of the city's residents. In one example of this, an abandoned building in the historic city center of Potenza was reused. It is stated that this building was the Ariston Cinema, built in the 1950s. The Ariston Cinema is an important example of modern concrete architecture in the city. The renovation project aims to strengthen the cinema as a central element. The project requires the definition of correct metrics and research. The rehabilitation project also includes structural rehabilitation. The new construction envisages the completion of the partially demolished building with modern materials. The conservation policy aims to provide a new future for the Ariston Cinema. This policy aims to keep the social and historical memories of the building alive. The project focuses on the preservation of this important structure for the city. The new use aims to increase the functionality of the building. The aim is not only physical protection but also to keep social memory alive (Guida et al, 2016). Its theological and philosophical roots extend from modern literature to post-modern cinema and animation. Dystopian fiction offers opportunities to enrich architectural story design. Cinema is one of the important elements of storytelling in a collective environment. The creation of sets and environments where the story takes place is expressed through production design. Production design includes the creation of sets, environments and atmosphere using architectural design. Sets, colors and textures are collectively used as narrative tools. Cinema uses the architectural design environment to visually tell the story. Studies that consider dystopian cityscapes as an exploration film genre are important in this context. It reveals how dystopian cityscapes are used in architectural design. Dystopian fiction enriches the story design of architecture (Suresh, 2023).

Films reflect society's desire to tell stories. Characters create space on the screen by interacting to create stories. Filmmakers take on the role of architects in the effort to convey spaces and enrich stories. Architecture is imagined and created from the perspective of the story. Science fiction and fantasy films present architecture free from the constraints of reality. Hypothetical spaces reflect people's desires and fears for architecture. Architects have the responsibility to turn dreams into reality. The architecture sector has a structure that progresses step by step in the design process. This process both facilitates the work and limits imagination by causing recycling (Zaneb et al, 2022). In a study examining the emotional reactions of a group of film fans consisting of architects and ordinary people in three different movie

scenes, it was noted that the participants reported their feelings about the scenes and the architectural features that affected these feelings with surveys. In this experiment, which evaluated emotional states and determined the architectural elements that triggered these emotions, it was determined that positive emotions and negative emotions were affected by different architectural components. This study can provide a better understanding of the role of architecture in scene creation for filmmakers. In this context, it can be concluded that the behavioral environment, which is the basic element of environmental design, can be dramatized with architectural design elements, can be an alternative tool for architects to test fictional experiences and architectural ideas, and that cinematic thoughts and practices can contribute to architectural design thinking (Abu-Obeid and Abuhassan, 2023). In another study examining light in the context of cinematic architecture theory, light illusions in spaces where cinema and architecture meet are discussed. Virilio's spatial experience and the image of disappearance are used as metaphors for architectural aesthetics for cinema. Pallasmaa's emphasis on the need for architects to look at society and daily life with a phenomenological approach is emphasized in this context. Architectural images in the films of Antonioni, Malick and Kore-eda are discussed. These films emphasize the role of architects in establishing human relations. The workshops are linked to the theme of establishing human relations. Projection aims to illuminate disappearing memories. The aesthetics of disappearing light, memory and history are examined. Spatial quality is focused on through poetic images and narratives. The importance of communication design is emphasized. These elements bring new perspectives to the integration of architecture (Ogata, 2022).

Context building strategies, which are seen as one of the most important common points of cinema and architecture, are important in many ways. In architecture, it is important to design buildings according to their contexts, which can be historical, physical, cultural-social or climatic. In the example of Abadan, a city shaped during the Pahlavi period and influenced by local architecture and modern style, the contextual architecture of three important buildings of the Pahlavi period (Petrol Cinema, Petroleum Industry College, National Bank) is examined, and the aim is to estimate the relationship between the cultural and identity factors of these buildings and European modern architecture. The fact that the use of structure and plan indicators in the Pahlavi period architecture has gained less importance compared to European modernism has been seen as one of the important results in this context (Kaboli et al, 2022). Just as in the relationship between space and cinema, in order for cinema to be placed at the center of the sociological fiction of society as a part of the sound image culture, the developments in sound culture and sound technology must first be addressed together with the film industry. The relationship between popular music and cinema should be evaluated together with the economic structure of the film industry and

the meanings of labor practices for the moviegoer, and the place of pop music adaptations that have replaced musicals in cinema should be discussed again in order to address the relationship between cultural modernity and technology in the context of cinema. All of these can provide a framework for how the concept of space created by music in cinema has evolved over the years and how this spatial context is processed with each other (Chie, 2020).

4. Related Figures' Approaches for Cinema with Architectural Themes

In relation to the subject, Walter Benjamin's article on cinema explains his predictions. He criticizes the capitalist mode of production and shows the direction of capitalism. While the exploitation of the proletariat increases, he also predicts the collapse of capitalism. He discusses the change and function of art, the loss of the aura of the work of art. He draws attention to the transformation of art with the weakening of the aura. He examines the possibilities that confirm the continuity and new roles of art. In this context, he emphasizes the relationship between cinema and architecture. Cinema is a modernist example that Benjamin evaluates as a form of art. The aim should be to see this parallelism and urban interventions as a part of aesthetic modernity. In this context, the main thing is to investigate modernity and the way the world is presented to us and our perception. Cinema is a way of overcoming bodily determinations. Theater is also evaluated as a part of this process. Benjamin's theories of cinema overlap with the criticism of capitalism. The loss of the aura of art gives birth to new art forms. Cinema and architecture represent the artistic forms of modernity. The parallelism between these two fields explains the products of modernity. It investigates how the world is given to us and understood. Cinema plays an important role as the aesthetic form of modernity. Theater, like cinema, offers ways to overcome bodily determinations. Benjamin's predictions address the relationship between art and capitalism (Campaner, 2019). As an important emphasis related to this subject, Eisenstein divided cinema into two as the image method and the figurative formation method. The image in cinema is an image of becoming. The image method is related to spatial arts, while the formation method is found in the nature of poetry. Lessing brought the formation method to the forefront. Hegel also addressed a similar issue and created the doctrine of the formation image that develops over time. According to Eisenstein, cinema is the art of space-time and is related to both spatial and temporal arts. Cinematography is based on the Dionysian method, which relates cinema to other art forms. According to Eisenstein, the film frame is a montage complex, which connects it to spatial arts. Cinema is a complex system of images and signs. Eisenstein defines cinema as a field of language. The formation of the image in film takes place over time (Popova, 2024).

In this context, Benjamin's foresight about art, how cinema changes the transformation and function of art, the decrease in the aura of the work of art

and the loss of transcendence, and the possibilities that confirm the continuity of art with new roles gain importance. Cinema can be evaluated through the parallels that Benjamin establishes between cinema and architecture, and this parallelism, to the extent that it is associated with urban interventions in the context of modern aesthetic forms, can suggest discussing the concept of art from a broader perspective and mediates the idea of the art axis as a regulatory and defining tool. While the proposal to address art through the center-periphery axis is discussed in Latin America, analyzing the effects of urban growth and financial capitalism has become easier in terms of the tools used, but has become difficult due to the developing hybrid language. The tendency to transform everything into exchange value triggers discussions about the original value of art (Ferrari, 2020). Cinema is a method of creating a world and presenting the appearance of this world. Cinema offers a perspective on the future. The "look" of a film includes mood, ambience and atmosphere. Cinema creates worlds and is cosmogonic and ethical in this respect. Cinema creates lived worlds through the combination of people and places. Atmosphere, ambience and mood are important categories in cinema and architecture. These elements can be produced through deliberate organizational strategies. Cinema provides architecture with an example of a coherent contradiction. In cinema, atmosphere can be analyzed and applied to architecture. Cinema can enrich the design and experience of architecture. In cinema, a coherent contradiction can operate at the level of narrative, space and time. Godard combines film and still images, texts, sounds and music with complex meanings. Nicholas Roeg interweaves past and future events. For example, Antonioni uses multiple time periods in the same space. Lynch explores the shifts between dreams, imagination, memory and reality. Haneke questions causality and verisimilitude through ambiguous narrative perspectives. Andersson examines pre- and post-human states through liminal environments and characters. The two fundamental characteristics of atmosphere in cinema are coherent difference and spatial porosity. As another example, Tarr's film "Werckmeister Harmonies" examines the production of atmosphere, ambiance and mood (Tawa, 2017).

5. Columbus by Spaces and Architectural Themes

Architecture and cinema are combined in the movie "Columbus" by Kogonada with the following themes in following figures (Figure 2-3-4).

Figure 2. *Columbus' spatial themes, group 1*

Figure 3. *Columbus' spatial themes, group 2*

Figure 4. *Columbus' spatial themes, group 3*

These spots highlight how "Columbus" harmonizes architecture and cinema, using the built environment not just as a setting, but as a central element that enhances the narrative and emotional depth of the film.

6. Sociological Aspects of Spatial Choices and Technology Focused Layouts for Spaces' Cinematopraphy

Just as cinema became a popular form of entertainment in big cities in the 1910s, it is known that today, people are interested in cinema for entertainment and socializing. As a result of the research conducted by scientists on why cinema is so popular in Latin America, it is understood

that the content of the films is shown as the main reason for the popularity of cinema. The most prominent similarity in this regard is seen as the overlap of the daily practices and leisure activities of moviegoers with the melodramatic atmosphere in the cinema. The appeal of cinema as a modern experience and basic variables such as the moral content of the films are described as the essences that mediate the self-definition of modern people, since going to the cinema is perceived as a part of the perception of modernity. In this context, it should not be forgotten that thinking about modernity in cinema also means rethinking the factors that determine the popularity of a film. It is important to remember that cinema magazines emphasize that going to the cinema is a way of being modern and to know that cinema architecture and the language of films are important in terms of the cinema experience (Tossounian, 2024). Cinema can be considered as a means of increasing the attractiveness of architecture. In cinema, architecture has been evaluated as a mirror of society. If the mutual interaction and borrowing between cinema and architecture and the interaction of these two branches of art are addressed in a deeper and more holistic way, a common language can be achieved. Discussions on how these two arts, cinema and architecture, can borrow ideas from each other contribute to the development of both disciplines. Cinema and architecture have been evaluated as visual arts that complement each other. Cinema plays an important role in increasing the attractiveness of the architectural environment. In cinema, architecture is not just the background, but an active participant in the film. Cinema helps to rethink certain moods and narratives of society. Cinema supports film tourism by increasing the attractiveness of the architectural environment. Cult and popular films transform certain places into tourist attractions (Musiyevska, 2023).

The fact that the most important similarity between architecture and cinema is in terms of context is important in terms of understanding the meaning and logic of the relationship between these two branches of art. The place and importance of indicators in the modern trace can facilitate the association of some physical, cultural, social, historical, climatic contents with each other and their evaluation in terms of the modern trace. In the analyses and studies to be conducted on the subject, some period of the structure and plan in my neighborhood can be evaluated in relation to the use of indicators in European modernism and cinema, and it can be observed that the approach between culture and film identity factors is associated by building an important context both in cinema and in the spaces (Kaboli et al, 2022). Looking at the film as an ideological product of the filmmaker ensures that the language of the film is among the most dominant tools in

terms of intellectual and ideology. The value given to cinema is not only related to the use of strong dialogues as a tool of social reform, but also to creating a reaction against the fundamental power created by those who condemn cinema and in this context, the concerns of the film industry to rebuild. The possibilities provided by the film industry regarding what a social reform film with a script and strong dialogues can do culturally provide important evidence of how powerful a tool called cinema offers in terms of the film industry and the gains of this industry in daily life (Manian, 2024). For example, in an example based on the description of the forms of communication common in Iranian society through cinema, a strategy that uses the Deleuzian power of the fake to produce a time-image cinema has been followed. There is a lot of social evidence that allows this to be described as a kind of cinema of hypocrisy. Cinema infiltrates our lives as a direct output of culture and shows the patches of culture directly and openly (Darvishzadeh, 2024). In another sociological example, the importance of cinema for the post-war audience stems from its work as a base that eliminates the hidden between the lower class and the upper class and focuses on destroying the basic hidden between the rural and the urban areas. The masses that talk about cinema have strong representations of moments related not only to regional diversity but also to changing areas and spaces. In this context, going to the cinema allows viewers to see other parts of the world from both a fictional and regional perspective and to share this information with each other, thus enabling new places, which are considered as geographical places, to be detailed as original studio-made areas that are not known one-to-one but are reproduced and derived through this social sharing. In this context, the fundamental distinctions regarding the lives of the masses who watch cinema become blurred, and a spatial and original unity is achieved among people who have not yet seen other parts of the world (Coates, 2023).

Mobile cinema, which is seen as an important field of study related to the subject, is a type of narrative presented on wireless devices as users navigate physical locations. These narratives are presented in discontinuous segments in time and space. Mobile cinema is based on the idea that "every story is a journey". The narrative is enriched by the physical environment, social participation and contextual awareness. The participant experiences context-sensitive and evolving story experiences. In addition, mobile cinema requires flexible technology to create consistent and engaging content. This technology allows story creators to create effective content. The system architecture includes an indoor location detection system for wireless networks. The universal messaging framework supports story scripting. The

heuristic engine provides user profiling. These features support the rapid prototyping and evaluation process. MIT's Pocket project is an example of mobile cinema. It offers users a sense of campus life. Mobile cinema offers an interactive narrative experience with the physical environment. Narratives change according to the user's location. Social participation becomes a part of the story. Contextual awareness contributes to the enrichment of the narrative. Mobile cinema represents an innovative approach in storytelling. This system increases the interaction between users and story creators (Crow et al, 2003). Studies examining how understandings of the scope and nature of the role of the set designer differ are also important in this context, as they represent an alternative and niche area. As filmmakers increasingly appreciate the expressive potential of cinema as an art form and the proposition of the relationship of the practice of cinema set design with painting, decorative arts, architecture and other creative disciplines is increasingly understood, the role of the cinema set designer and the understandings related to this role are addressed from a broad perspective in relation to the artistic discussions of the period, cinema provides an even stronger area of interaction with space and its products (Rees, 2021). Cinema is one of the important cultural phenomena of the 20th century and symbolizes modernity and technological progress. In the history of modern architecture, cinema design has progressed parallel to the experimentation of new architectural forms. Modern building materials such as reinforced concrete have enabled innovations in cinema architecture. Cinema, unlike theaters, offers new spatial concepts. Cinema, a functional and usable architectural space, has become an expression of social and economic development. Cinemas have become symbols of rapid growth and urban prestige. In Portugal, cinemas are concrete indicators of architectural change in the first half of the 20th century. As in the rest of Europe, Portuguese cinemas have been representatives of modern architecture. Cinemas are considered to be the spokespersons of a new and modern image that adorns Portuguese cities. Cinema architecture is an important testing ground both in terms of the use of modern building materials and the validation of technological innovations (Licordari, 2018). Studies focusing on the evaluation of cultural and artistic heritage within the framework of the New History of Cinema examine the integration of VR and AR projects with cinema heritage and microhistory with local cinemas and investigate the role of digital media, especially Augmented and Virtual Reality, in the preservation of cultural heritage. In an approach related to the architecture of the Odeon cinema and the reconstruction of cinema-going habits with VR, at least four different perspectives have been brought together, aiming to revive the moment of watching a movie and historical spectatorship in a virtual environment, and using relevant literature, public and private

archives, oral sources and photographs taken in the field. Projects that aim to combine cinema heritage and history with new generation technologies are close to the view that the architecture and historical spectatorship of cinema can be revived with VR technology. Virtual reality offers a new method in the preservation of cinema history and heritage. Using Oculus Rift, it is possible to simulate the experience of watching historical films in an immersive way. Studies examining the relationship between digital media and the preservation of cultural heritage indicate that virtual reality can be used to revive historical moments of cinema spectatorship. In studies that combine microhistory and broad cultural context of cinema history, aiming to reveal the potential of VR and AR technologies in the evaluation of cinema heritage is seen as an important achievement (Roaro, 2021).

The evaluation of information technologies that make cinema accessible and new technological developments related to media together not only leads to an increase in the demand for intellectual products outside the production industry, but also includes a series of common results that allow us to address the interpretive effects of the reality that cinema points to on semiotics and textual objects. This situation can make it difficult to simulate autonomous spaces defined by communication-related action areas and increase cinema's concern to create a form within its own language unity, while also allowing us to discuss the place and meaning of cinema's ability to speculate about the future with the death of the author. While cinema creates its own field of action, it also says some words about the potential of the present and the future, but these words are special sentences derived from the concern to produce a common field and change from day to day (Barnych, 2024). Similarly, interactive cinema has been a subject that has been researched since the history of cinema. The emergence of video games has offered new ideas and possibilities. Today, interactive film projects have become more common. However, the general cinema experience is still largely non-interactive. It should not be ignored that closed categories may be inadequate when creating new categories. The developments in interactive experiences between cinema and video games should be examined, the limitations of linear film narratives and the potential of interactive cinema should be discussed, how video games add new dimensions to the cinema experience should be examined, and prominent examples of interactive cinema within creative media should be addressed. In addition, as we discuss how interactive cinema contributes to the audience experience and its future potential, and as we consider the effects of modern technology on interactive cinema and the innovations it brings to the art of cinema, it can be more easily assimilated that closed definitions can be limiting and that new perspectives are necessary (Figueiredo and De Sousa, 2024).

7. Columbus by Spaces' and Architectural Themes' Representative Essences

The evaluation of the spaces in the Columbus movie in terms of architectural context and keywords is as follows (Figure 5-6-7).

00:00-30:00 (1/2)		
SPACE	ARCHITECTURAL CONTEXT	KEYWORDS
LIVING ROOM OF A HOUSE	daily house interiors	calmness, coziness
OUTSIDE OF THE MINIMALIST HOUSE	minimalism, modernism	silence, singularity, individuality
A GIANT GREEN SPACE WITH FRAMING TREES	therapeautic spaces	relaxation
OPEN GROUND FLOOR WITH MINIMALISTIC CONCRETE COLUMNS AND UPPER CONCRETE CEILING	minimalism, modernism	silence, singularity, individuality
LIBRARY BUILDING WITH BRICK FACADE	minimalism, modernism	silence, singularity, individuality
SAARINEN'S MODERN CHURCH AND AVANTGARDE SCULPTURE	minimalism, modernism	diversity, information, regularity
LIBRARY BUILDING FRONT FACADE	demonstration of function	silence, singularity, individuality
LIBRARY INTERIOR	modernism, systematization	silence, singularity, individuality
LIBRARY INTERIOR, DIFFERENT CLOSER ANGLES	modernism, systematization	silence, singularity, individuality
LIBRARY INTERIOR	modernism, systematization	diversity, information, regularity
THE ROBERT N. STEWART BRIDGE	demonstration of function	silence, singularity, individuality
HOUSE, KITCHEN	daily house interiors	chaos, warm atmosphere
CARPARK	demonstration of function	silence, singularity, individuality
MODERN HOUSE FACADE	minimalism, modernism	silence, singularity, individuality
COLUMBUS REGIONAL HOSPITAL MAIN ENTRANCE	healthcare architecture	silence, singularity, individuality
HOSPITAL INTERIOR	healthcare interior	silence, singularity, individuality
GREEN EXTERIORS	therapeautic spaces	diversity, information, regularity
RESTAURANT INTERIOR	social interaction spaces	silence, singularity, individuality
ACCOMODATION INTERIOR	residential antiquity, modernism	diversity, information, regularity
BATHROOM	daily house interiors	silence, singularity, individuality
KITCHEN	daily house interiors	chaos, warm atmosphere
COZY LIVING ROOM	daily house interiors	silence, singularity, individuality
THE ROBERT N. STEWART BRIDGE	modernism, functionality	silence, singularity, individuality
CONFERENCE CENTER	modernism, functionality	diversity, information, regularity
LIBRARY GREEN EXTERIOR	therapeautic spaces	silence, singularity, individuality
LIBRARY INTERIOR	modernism, systematization	silence, singularity, individuality
HOTEL BATHROOM	residential antiquity, modernism	diversity, information, regularity
HOTEL INTERIOR EXTENDED	residential antiquity, modernism	silence, singularity, individuality
LIBRARY INTERIOR	modernism, systematization	chaos, warm atmosphere
HOTEL EXTERIOR	isolated exteriors	silence, singularity, individuality
HOTEL GARDEN	isolated exteriors	silence, singularity, individuality
LIBRARY GARDEN	isolated landscapes	calmness, coziness
CHURCH GARDEN	isolated landscapes	silence, singularity, individuality
COZY HOUSE KITCHEN	daily house interiors	calmness, coziness
STREET	isolated circulation lines	diversity, information, regularity
OPEN GROUND FLOOR WITH MINIMALISTIC CONCRETE COLUMNS AND UPPER CONCRETE CEILING	minimalistic concrete landscapes	silence, singularity, individuality
HOTEL INTERIOR	residential antiquity, modernism	loneliness, maximalism
COZY HOUSE INTERIOR	daily house interiors	chaos, warm atmosphere
COZY KITCHEN	daily house interiors	chaos, warm atmosphere

Figure 5. *Columbus' spaces' architectural context and keywords, group 1*

00:00-30:00 (2/2)		
SPACE	ARCHITECTURAL CONTEXT	KEYWORDS
MODERN OFFICE BUILDING	minimalism, modernism	silence, singularity, individuality
LIVING ROOM OF A HOUSE	daily house interiors	silence, singularity, individuality
OUTSIDE OF THE MINIMALIST HOUSE	minimalism, modernism	calmness, coziness
A GIANT GREEN SPACE WITH FRAMING TREES	isolated landscapes	calmness, coziness
OPEN GROUND FLOOR WITH MINIMALISTIC CONCRETE COLUMNS AND UPPER CONCRETE CEILING	minimalistic concrete landscapes	silence, singularity, individuality
LIBRARY BUILDING WITH BRICK FACADE	minimalism, modernism	diversity, information, regularity
SAARINEN'S MODERN CHURCH AND AVANTGARDE SCULPTURE	minimalism, modernism	silence, singularity, individuality
LIBRARY BUILDING FRONT FACADE	minimalism, modernism	chaos, warm atmosphere
LIBRARY INTERIOR	modernism, systematization	diversity, information
LIBRARY INTERIOR, DIFFERENT CLOSER ANGLES	modernism, systematization	calmness, coziness
LIBRARY INTERIOR	modernism, systematization	diversity, information
THE ROBERT N. STEWART BRIDGE	modernism, functionality	silence, singularity, individuality
HOUSE, KITCHEN	daily house interiors	silence, singularity, individuality
CARPARK	isolated circulation lines	singularity, loneliness
MODERN HOUSE FACADE	isolated exteriors	silence, singularity, individuality
COLUMBUS REGIONAL HOSPITAL MAIN ENTRANCE	isolated exteriors	modernism, diversity
HOSPITAL INTERIOR	healthcare interior	silence, singularity, individuality
GREEN EXTERIORS	isolated landscapes	modernism, diversity
RESTAURANT INTERIOR	social interaction spaces	silence, singularity, individuality
ACCOMODATION INTERIOR	residential antiquity, modernism	diversity, information, regularity
BATHROOM	daily house interiors	chaos, warm atmosphere
KITCHEN	daily house interiors	chaos, warm atmosphere
COZY LIVING ROOM	daily house interiors	chaos, warm atmosphere
THE ROBERT N. STEWART BRIDGE	modernism, functionality	silence, singularity, individuality
CONFERENCE CENTER	modernism, functionality	silence, singularity, individuality
LIBRARY GREEN EXTERIOR	modernism, functionality	modernism, diversity
LIBRARY INTERIOR	modernism, systematization	silence, singularity, individuality
HOTEL BATHROOM	residential antiquity, modernism	silence, singularity, individuality
HOTEL INTERIOR EXTENDED	residential antiquity, modernism	diversity, information, regularity
LIBRARY INTERIOR	modernism, systematization	boundaries, seperation
HOTEL EXTERIOR	isolated exterior	silence, singularity, individuality
HOTEL GARDEN	isolated landscapes	silence, singularity, individuality
LIBRARY GARDEN	isolated landscapes	modernism, diversity
CHURCH GARDEN	isolated landscapes	silence, singularity, individuality
COZY HOUSE KITCHEN	daily house interiors	chaos, warm atmosphere
STREET	isolated circulation lines	silence, singularity, individuality
OPEN GROUND FLOOR WITH MINIMALISTIC CONCRETE COLUMNS AND UPPER CONCRETE CEILING	minimalistic concrete landscapes	silence, singularity, individuality
HOTEL INTERIOR	residential antiquity, modernism	silence, singularity, individuality
COZY HOUSE INTERIOR	daily house interiors	chaos, warm atmosphere
COZY KITCHEN	daily house interiors	chaos, warm atmosphere
MODERN OFFICE BUILDING	modern office architecture	modernism, diversity

Figure 6. *Columbus' spaces' architectural context and keywords, group 2*

30:00-60:00		
SPACE	ARCHITECTURAL CONTEXT	KEYWORDS
CAR INTERIOR	daily life interiors	silence, singularity, individuality
SAARINEN'S GLASS BANK	minimalism, modernism	modernism, diversity
GARDEN	isolated landscapes	silence, singularity, individuality
HOSPITAL FACADE AND RIVER	isolated landscapes	modernism, diversity
RIVER	isolated landscapes	silence, singularity, individuality
HOSPITAL FACADE	minimalism, modernism	diversity, information, regularity
FACTORY	minimalism, modernism, functionality	silence, singularity, individuality
STREET	isolated landscapes	chaos, warm atmosphere
LIBRARY	modernism, systematization	silence, singularity, individuality
NEIGHBORHOOD	housing lines	silence, singularity, individuality
COZY HOUSE INTERIOR	daily house interior	chaos, warm atmosphere
OFFICE EXTERIOR	minimalism, modernism	silence, singularity, individuality
HOTEL EXTERIOR	isolated landscapes	modernism, diversity
CAR INTERIOR	daily life interiors	silence, singularity, individuality
MODERN BUILDING FACADE	minimalism, modernism	silence, singularity, individuality
HOTEL INTERIOR	residential antiquity, modernism	calmness, coziness
COZY HOUSE INTERIOR	daily house interiors	diversity, information, regularity
MARBLE FACADE	isolated landscapes	silence, singularity, individuality
BUILDING AND SKY	isolated exteriors	chaos, warm atmosphere
GARDEN	isolated landscapes	silence, singularity, individuality
STREET	isolated landscapes	silence, singularity, individuality
STORE INTERIOR	modernism, functionality	silence, singularity, individuality
HOTEL INTERIOR	residential antiquity, modernism	silence, singularity, individuality
TOWER AND EXTERIOR	modernism, functionality	calmness, coziness
TOWER AND INTERIOR	modernism, functionality	silence, singularity, individuality

Figure 7. *Columbus' spaces' architectural context and keywords, group 3*

60:00-100:00		
SPACE	ARCHITECTURAL CONTEXT	KEYWORDS
EXTERIOR	isolated exteriors	silence, singularity, individuality
TOWER AND STAIRS	minimalism, modernism, functionality	modernism, diversity
GRASS AND SKY	isolated exteriors	silence, singularity, individuality
HORIZONTAL BUILDING AND LAKE	minimalism, modernism, functionality	silence, singularity, individuality
LAKE AND GRASS	isolated exteriors	action, calmness, isolation
WOODEN BRIDGE INTERIOR	isolated exteriors	silence, singularity, individuality
HOUSE INTERIOR	daily house interiors	chaos, warm atmosphere
HOSPITAL EXTERIOR	healthcare architecture	silence, singularity, individuality
COZY HOUSE INTERIOR	isolated exteriors	silence, singularity, individuality
HOTEL INTERIOR	isolated exteriors	silence, singularity, individuality
HOSPITAL INTERIOR	healthcare interior	silence, singularity, individuality
STREET AT NIGHT	isolated exteriors	silence, singularity, individuality
RESTAURANT	social interaction spaces	chaos, warm atmosphere
HOTEL INTERIOR	residential antiquity, modernism	silence, singularity, individuality
MODERN BUILDING FACADE	minimalism, modernism	silence, singularity, individuality
COLUMNS	isolated exteriors	modernism, diversity
CARPARK	social interaction spaces	silence, singularity, individuality
HOTEL INTERIOR	minimalism, modernism	chaos, warm atmosphere
BATHROOM INTERIOR	daily life interiors	silence, singularity, individuality
HOSPITAL INTERIOR	healthcare interior	silence, singularity, individuality
COZY HOUSE INTERIOR	daily house interiors	silence, singularity, individuality
RIVER AND HOSPITAL	isolated exteriors	modernism, diversity
MUSEUM INTERIOR	residential antiquity, modernism	silence, singularity, individuality
MONOLITHIC BUILDING FACADE	isolated exteriors	silence, singularity, individuality
MUSEUM INTERIOR	residential antiquity, modernism	modernism, diversity
MUSEUM EXTERIOR	isolated exteriors	silence, singularity, individuality
HOSPITAL INTERIOR	healthcare interior	silence, singularity, individuality
COZY HOUSE INTERIOR BEDROOM	daily house interiors	chaos, warm atmosphere
HOUSE INTERIOR	daily house interiors	chaos, warm atmosphere
CAR INTERIOR	daily life interiors	silence, singularity, individuality
GRASS OUTDOOR	minimalistic landscape	calmness, isolation
THE ROBERT N. STEWART BRIDGE	monumentalism, modernism	singularity, power

Figure 7. *Columbus' spaces' architectural context and keywords, group 4*

Discussion and Conclusion

Kogonada's "Columbus" film makes significant contributions to the analysis of the relationship between architecture and cinema. The film manipulates spatial perception by showing the aesthetic and emotional effects of modernist architecture. It emphasizes the spatial effects of natural and artificial light and provides architects with new perspectives in the use of light. The symmetry and balance in the film teaches how these elements can be used in their structures. Emphasizing the importance of building design in harmony with nature, the film inspires architects to create designs integrated with nature. It reveals the importance of designing spaces according to human scale. It shows how reflection surfaces can be used to create spatial depth. It shows how a structure gains meaning within its context. It emphasizes the importance of preserving cultural heritage and integrating it with new structures. It shows how to increase the emotional impact of structures. It emphasizes the importance of small details in overall design and how spaces can leave a mark on memory. Also demonstrates how to harmonize different design elements and how to apply innovative design ideas. This film offers valuable lessons for architects in understanding patterns between spaces and sequences, helping them make more informed decisions in their designs. Through these analyses, it is aimed to provide a multidimensional basis for the dynamic theme of city identity. The movie Columbus offers a thoughtful tour through the architectural highlights of the state of Indiana and the city of Columbus. This tour is carried out by re-reading prominent themes such

as spatial narrowness, loneliness, singularity, desolation, and some clichés, such as singular structures positioned on huge spaces, access areas requiring long distances, and the contrast of large masses with the general composition, through the city. In the film, where the relationship between the characters' stories and architecture is frequently emphasized, some emphasized spatial repetitions between different sequences are presented through a photographic framing. In this way, the introverted spatial structure of the city and the state is reinforced with a dramatic feeling of desolation, and a holism that emphasizes individuality and the singularity of the individual in space is achieved. A character sequence shaped around the prominent architect figure in the family depicted in the film and the dramatic structure progressing through Saarinen's architectural works contribute to the reading of the film by strengthening the bond between the thematic relationship of buildings and the city and the singularity of the individual, step by step. In architectural studies focusing on the relationship between cinema and architecture, the contributions of the cinematic questioning of the city image to the image of the city are evaluated in this study, discussed and presented in a relational context. As a result, it points to a model in which, in a film focusing on the spatial identity of a city, examining sequences first as single elements and then as related clusters, the prominent theme of the city can provide a basis for subsequent areas of cinematic presentation. The way the prominent themes of the city are depicted in films depicting the lives of individuals in the city will trigger a series of fields of study that directly affect the future spatial absorption forms of the city.

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Chapter 5

A VISUAL AND ILLUSTRATIVE EXPERIMENT OF CRITICAL THINKING IN ARCHITECTURE: ON THE ANKARA-KIZILAY IN 2018

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Introduction

Architecture's interdisciplinary content, multidimensional structure, and the direct and indirect connections it establishes with history, context, time, human needs, society's socio-cultural and socio-economic existence, and ideological approaches underscore the importance and significance of critical thinking. Every thought in architecture is critical, whether positive or negative. Fundamentally, every architectural design is a critique of the problem it addresses. Therefore, critical thinking can be considered the essence of both the architect and architecture. Indeed, Jannière (2010) highlights the difficulties in defining the object of architectural criticism, similar to the difficulty of determining the boundaries of architecture. According to him, architectural criticism encompasses academic discourse, the content of the discipline, social practices, and an internal decision-making process. This, according to Leatherbarrow (2009), is part of criticism's responsibility to build the world. In this context, it is possible to conclude that critical thinking in architecture is both a multidimensional act and a field with a significant scope of influence.

The purpose of criticism is both to develop negative/opposing discourses and to defend "situated knowledge" (Cengizkan, 2006, p. 53). Defending situated knowledge also implies documentation. All information provided about the object being criticized is documented. Dinç Kalaycı (2015, p. 4) states that criticism can be achieved through the act of simply defining or judging; determining good and bad characteristics or making distinctions between similar things can also constitute criticism. It draws its reference from the realities determined by the pace and form of daily life (Leatherbarrow, 2009). Its object should be all contemporary phenomena, new concepts, discourses, and objects (Cengizkan, 2006, p. 54). Understanding the scope and limits of criticism in this way is essential for laying the foundation for practicing critical thinking. The contemporary nature of the object being criticized, the multidimensional descriptive nature of the critical method, and the fact that the critical situation points to documentation all point to the character of critical thinking in architecture.

Critical thinking requires considering multiple aspects simultaneously; it involves empathy by considering context, history, and the present; it is a process of rethinking (Yurtsever, 2011, p. 86). This study presents a critical thinking practice in architecture. The use of photography and illustrative images as representational tools for critical thinking enabled the practice to be realized through a method accompanied by text, photography, and illustrative imagery. Indeed, according to Yavuz Öden (2002), illustration, unlike photography, is a depiction made using representational tools such as drawing, painting, photography, and imagery, dependent on the artist's

intervention. According to Barthes (2007, p. 18), photography, as an objective message, is related to text, which carries connotative meanings, and today, photography and text are in a state of interconnected, expanding activity. He argues that in illustrative styles, connotative meanings arise indirectly. According to him, illustration is shaped by a text and represents the message being conveyed. Therefore, this study constructs the relationship between critical thinking text and photography, critical thinking text and illustrative imagery, and architectural photography and illustrative imagery.

Pousin (2013, p. 72) argues that in the contemporary world, architectural criticism must transform into an evaluation at the building scale within the context of high technology and in the context of communication with the city. Based on this view, the scope of this study is the 2018 situation of Kızılay, one of Ankara's urban centers, where building and urban scales can be considered together. The study aims to document the historical, social, and ideological context of Kızılay city center in 2018 through the practice of critical thinking, utilizing the representative power of illustrative images and photography. The study's unique qualities include addressing a segment of the city before the 2020 pandemic, which caused significant paradigm shifts in daily life worldwide, and encompassing a future vision and prediction that can envision times beyond 2025.

A high density of encounters and overlaps, a multilayered architectural form, and a unique physical environment characterize the Ankara-Kızılay city center. Between 1923 and 1930, Ulus served as Ankara's bureaucratic and political center. Between the 1930s and 1950s, its commercial and cultural value increased, and it was used extensively by intellectuals, artists, and politicians. The bureaucratic and political center became Kızılay. Between 1950 and 1980, Ulus's commercial significance, rather than its cultural value, emerged, and Kızılay became a political, cultural, and commercial center. The post-1980 period saw Ulus become a privatized commercial district, while Kızılay began to undergo the same processes as Ulus (Bayraktar, 2013). From its days as Yenişehir to its most recent period as Kızılay, it transformed into the political center where the country was governed, a commercial center, and an urban center where its users and architecture changed. However, the existence of the Red Crescent, which was established on December 27, 1919, when Ankara became the capital, has solid foundations and is accepted as more resilient than other urban centers formed in Ankara.

Methodology

This study presents an illustrative practice of architectural critical thinking through the documentation of Kızılay, one of Ankara's urban centers, in 2018. Attoe (1978) states that everything an individual does while

residing in the urban-built environment constitutes criticism (p.xii) and that architectural criticism can include not only literary but also photographic or scientific information. In this study, the interplay between text, photography, and illustrative imagery as a representation of thinking is developed as a methodological approach to foster critical thinking. Photomanipulation illustrations, one of the classes of illustration (Teymur, 2017, p. 23), are a form of representation that embodies critical thinking, referred to as illustrative images in this study.

A 2018 assessment of Kızılay's current situation is conducted, and by considering Kızılay's past context, social status, identity, and memory, a critical reflection is developed regarding its existence in 2018, and a future vision is envisioned. For every topic where the future vision is to be elevated, its current status and meaning must be thoroughly examined. The study presents ten different photographs/illustrator images and critical thinking texts. The topics addressed, in this order, are the current building stock, commercial function, artistic function, the safety of public spaces and their relationship with children and urban residents, quality of life, green space, urban spaces, lack of design, and descent. When each separate critical thinking piece is combined, it forms a critical whole, and a determination of the state of Kızılay in 2018 is presented. The study boundaries in Kızılay include Karanfil Street, Ihlamur Street, Güvenpark, Atatürk Boulevard, Sakarya Street, Meşrutiyet Street, Konur Street, Ziya Gökalp Street, and İzmir-1 Street.

Critical Thinking Practice on the 2018 Kızılay

Karanfil Street- No: 37 (Gizem Özkan Üstün Archive)

"Ankara is a city of dreams. Not because the city itself transports people to a world of dreams:

Because one cannot live in Ankara without dreaming. You either have a dream about government,

or about happiness, or about good humanity, or about good artistry.

You cannot live in Ankara without dreams: Because horizons are limited by mountains, unless we dream of a broad horizon. Because streams are shallow and 'under control,' unless our hearts in our chests form the source of a waterfall. Because the Castle appears abandoned from afar, if there is no government that reigns within us, that reigns, that hangs what we hang, that slaughters what we slaughter, but also slaughters itself in the process.

Because relationships are stale, 'official,' and calculated, and you don't do everything for nothing." (Cengizkan, 2017).

This part is how the introduction to Ali Cengizkan's poem "Ankara Ankara Güzel Ankara'dan" begins. The imperative to dream persisted in Ankara in 2018. Are the reinforced concrete structures of Kızılay examples of an understanding of the formal and spatial language, technical solutions, and the life and program it envisioned, and of a cumulatively advanced knowledge of the Wilkinson House, built in 1854? While the world utilizes all the possibilities of technology in its effort to produce energy-efficient, user-centered, and nature-respecting architecture, dreaming in the static city center of the capital has become a source of life for the city's inhabitants. This photograph shows an apartment building on Karanfil Street, a building that stands out from its surroundings with its symmetrical, orderly, large windows, vibrant colors, scale, and "Sahnesanat" sign. In many parts of Kızılay, one might have to blink and then blink again to understand which building one is encountering. Numerous layers of structure require formal separation to facilitate understanding. Numerous elements, often undesigned, are hidden in the details. It can be argued that architects and engineers, well-versed in the easiest and most cost-effective methods of constructing reinforced concrete buildings, urban planners who must be sensitive to the appearance of adjacent buildings, and capitalists/employers who exceed the boundaries of plots with height, all contribute negatively to the development of spatial experience. This photograph serves as an introductory representation summarizing the current state of Kızılay in 2018.

Karanfil Street- No: 23 (Gizem Özkan Üstün Archive)

A 1952 decision recognized Kızılay as the city's new business center. This paved the way for the construction of attached apartment buildings, allowing the ground and basement floors to be used as arcades. Fashion houses, insurance and travel agencies, bank branches, hotels, restaurants, photographers, and hairdressers settled on the upper floors of the apartment buildings in Kızılay. Following this decision, Yenişehir ceased to be an area accessible only to the elite and began to serve lower-income groups as well.

Different social groups began to encounter one another (Batuman, 2017). Since 1952, one commercial venue has been opening and another closing in Kızılay. All commercial activities are offered to the city's residents in a mixed environment. A commercial function that is not immediately needed can be passed by without being noticed. Therefore, the need for more striking signs was felt: illuminated, large, and colorful. If the opportunity arose, the entire building would be covered in signs. Where is the architectural product? Is an architectural product with a signboard preferable, or one whose facade, even without a signboard, would be preferable? In the Kızılay district of 2018, an architectural solution may be necessary for citizens whose greatest opportunity lies in their signboards, as they compete for commercial activity. The increasing hegemony of commerce led first to the loss of the Uybadin House, then to the loss of public spaces like Hürriyet Park and Zafer Square. This type of function has encompassed the facades of buildings and the setbacks on parcels between them. Building front yards were insufficient, and even the central areas of sidewalks were encroached upon. In the face of criticism of the time spent in shopping malls by the consumer society, preventing the city center from expanding commercial activities onto the streets may not be the right approach. However, it can be argued that this hegemony has created an attitude that completely erases architecture and fosters its own eclectic solutions.

Ihlamur Street - No: 17 (Gizem Özkan Üstün Archive)

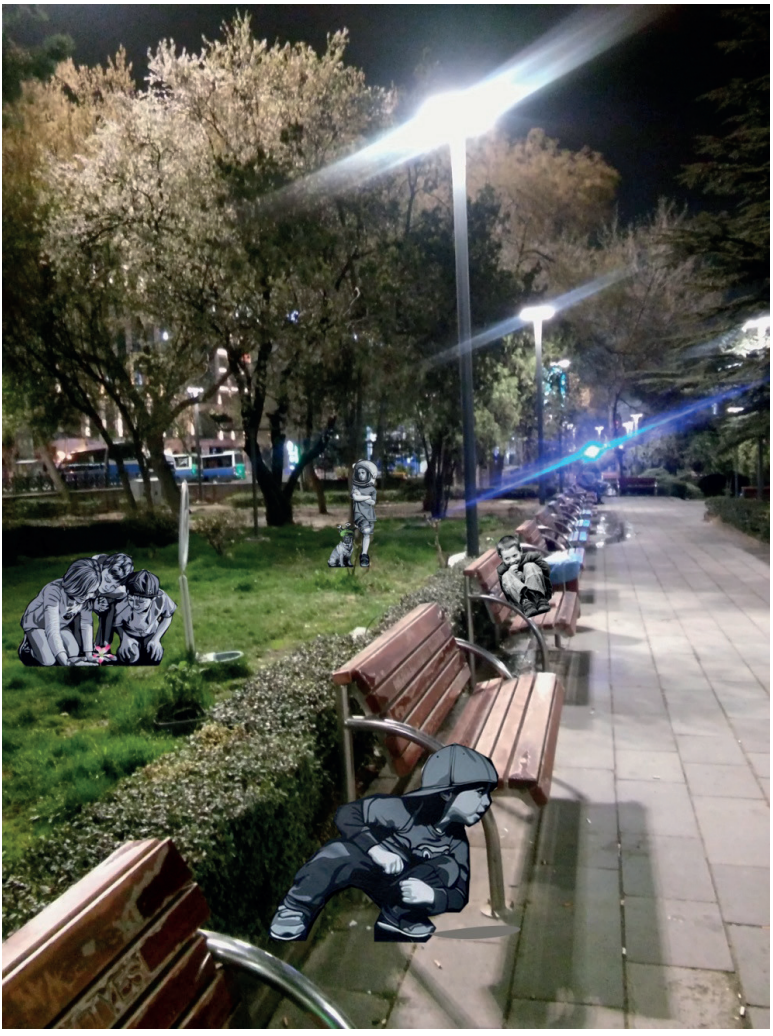
The Ankara Art Theatre, located on Ihlamur Street No. 17 in 2018, was established in 1963 (AST, 2025). This photograph illustrates the filling of the gaps between buildings, as mentioned in the previous photograph. However, this photograph differs from the phenomenon that can be seen throughout Kızılay. Although the Ankara Art Theatre is a private institution, it is a space for art, culture, and intellectual activity. Its entrance is small compared to the

commercial units surrounding it that are quite foreign to it, as its location is between two buildings. It is situated between the parcel boundaries of the building next to one and the other. This situation can be interpreted either as an art theatre perpetuating the attitude of purely profit-oriented units or as an indifference to the closure of theatres by some citizens who no longer need this program. It can be argued that the theatre is not provided with public living spaces, that specialized spaces are not provided to make it more livable, and that it is left with only a door to be walked past. In addition to all this, questioning the number of plays that city residents, who advocate for increased theaters and more inviting spaces, attend annually could be useful in assessing their contribution to the city's development. It's also observed that the time and money people are forced to spend daily, as well as the money they choose to spend, are largely directed toward non-artistic pursuits, both virtual and real. Consequently, as evidenced by the clothing stores to the right and left of the Ankara Art Theater, artistic units in the area are relatively few compared to commercial units. Beyond all these questions, art may also question its own adaptation to the current system. The Ankara Art Theater left its location in Kızılay in 2025.

Guvenpark (Gizem Özkan Üstün Archive)

Numerous events and decisions may have led to Güvenpark losing the public character it enjoyed in the early years of the Republic. However, the security problems facing Kızılay's Güvenpark in the 21st century require architectural solutions. The area at the southernmost point of Güvenpark, seen in this photograph, has been deliberately cleared by the government. No public events are held in this area; it becomes a parking area for vehicles authorized by security personnel. Perhaps park security, which is handled with conventional security methods, could be reconsidered. For a society that relies primarily on technology, particularly smartphones, introducing new technological tools could be a step toward creating a smart city. These tools could ensure urban security. Thus, both public and secure programs could

emerge spontaneously. In 2025, a restoration project (Güven Monument restoration) and landscaping were carried out in Kızılay, where public spaces were renovated, green areas were expanded, and lighting opportunities were enhanced, resulting in improved night use compared to the situation in 2018 (Ankara Metropolitan Municipality, 2024).



Night in Guvenpark (Gizem Özkan Üstün Archive)

The photograph that forms the basis of this illustrative image was taken at 10:00 p.m. on March 17, 2018, while examining the difference between daytime and nighttime life in Kızılay. At 10:00 p.m., children are required to be in their residential recreation areas. However, parents also avoid going anywhere they haven't taken their children. Thus, after the first domino falls, a cascade of events leads to 10:00 p.m. becoming a deserted hour for Kızılay. Before this conclusion was drawn, child users were literally 'searched' during

the weekdays. Apart from the refugee children, only one or two children were encountered. On weekends, the number was only counted on the fingers of one hand. The problem mentioned in the previous photograph was security. It's not hard to conclude that a place without children is unsafe. Children were specifically chosen for this illustration, as they can spontaneously construct spatial experiences without being publicly defined. One option could be to transform the city center's program, its dilapidated areas, and areas on the verge of collapse with a new projection; to produce designs that are 'self-organizing' and allow for creative events; and to provide security support to the new generation, who can establish strong relationships with technology from the moment they are born, to establish a relationship with the city.

A collage from various parts of Kızılay (Gizem Özkan Üstün Archive)

This illustrative image represents how Kızılay is consumed and discarded by the city's inhabitants. A human CD with eyes closed, resembling CDs, a multiplication of garbage, and empty floor tiles are depicted. A city dweller comes to Kızılay, consumes it, and throws it away. Kızılay is retrieved from the trash by another city dweller. The same activity occurs again at the next meeting. Instead of gaining dynamism through diversity, Kızılay has become a center for urbanites who engage in similar activities without question, and people pass by the garbage without reaction. Such garbage piles are unheard of in the spaces where city dwellers live. However, home and 'outside' have become so segregated that a perception of spaces that need to be kept clean

and those that do not has emerged. The first photograph in the collage is the Güvenpark subway exit on Atatürk Boulevard, while the one on the right is the park sidewalk opposite the old Zafer Square. Both photographs feature garbage in blue bags. The photo with the CDs was taken on the median strip on Atatürk Boulevard, and the final photo was taken at the pool in front of the Security Monument. These photos were not intentionally put together. They coincidentally represent the garbage deposits captured throughout the entire Kızılay trip. However, it is striking that when combined, these locations hold the most significance for Kızılay. As a city fixture, the trash can must be well-designed. It is not just the administration responsible for collecting the trash, nor are the citizens who recklessly scatter it everywhere, at fault. Accessibility, even for needs like trash cans, can be achieved through the design of a landscape architect and urban planner.

Sakarya Street (Gizem Özkan Üstün Archive)

This illustrative image evokes a view of the city's greenery through a window. Therefore, the area outside the frame created by the broken billboard is rendered in black and white. The greenery has diminished to such an extent that it is barely noticeable in daily life; however, the remaining fragments of the broken billboard frame the existing greenery, lending it a sense of contrast. Awareness of the greenery is achieved through a frame. Kızılay's urban experiences, affirmative programs, and new ideas for green spaces require new windows.

'Intervals' from various parts of Kızılay (Gizem Özkan Üstün Archive)

Throughout the city, the zoning plan creates intersecting streets and avenues. In Kızılay, building spaces on the ground floor, extending up to the parcel boundaries, have been filled with commercial activities. Buildings on parallel streets fill the remaining vertical space. These spaces reveal unsightly displays of fire escapes, ventilation systems, and air conditioning units, as well as the unsightly rear facades of distant buildings. To counter the perception of being confined to the city center, the goal was to create much larger spaces with vantage points, yet even these spaces were filled to the brim. The final piece of this collage features a new 14-story building rising opposite Zafer Bazaar. This structure, still unfinished in 2018, is a sign of how much higher Kızılay's

buildings could rise in the future. However, before the building is even built, research needs to be conducted to determine how it will be perceived from the ground up and what appearance it will present to the city. Buildings rising in the capital's center are incompatible with the environment, ecology, user-centered design, and public life. Kızılay's consumer-oriented structure also consumes energy. The city's gaps and spaces need to create perspectives that plan for the next sixty years.

Konur Street - No: 45 (Gizem Özkan Üstün Archive)

The buildings in Kızılay from the 1970s and 1980s are failing to meet new needs. In this photo, the demolition of a building that was used as a parking lot exposed the ventilation pipes at the rear of the building. The mechanical components needed for the building must be integrated into the structure. Fire escapes, mechanical requirements, and air conditioning should be considered during the initial design phase. Furthermore, companies like world-renowned Snøhetta monitor the sun's rays year-round, creating buildings that minimize sunlight in the summer and maximize its use in the winter. Our perspective should not be directed toward add-on solutions like the one in this photo, but rather toward spaces that fully embody a sense of holistic design.

Illustrations for Karanfil Street, Ziya Gökalp Street, and İzmir-1 Street (Designed by Gizem Özkan Üstün)

This illustration was created for three separate streets in Kızılay. Each street and avenue features ordinary buildings. The differences between them are insignificant in their facades. Streets and avenues have characteristics that emerge from spatial practices. However, these spatial practices are also full of shortcomings and errors. Matchboxes become empty, and the surface becomes useless and exhausted. The city center must become much more than just a matchbox. It must become productive and conducive to creativity, rather than one that consumes and encourages consumption.

Conclusion

The present study demonstrates that critical thinking in architecture can be considered within the context of communication with the city and can be linked not only to verbal and theoretical narratives but also to visual narratives. The critical thinking practice is both a document of the 2018 Kızılay and a rethinking of it. Consequently, this practice constitutes a practical production. The analysis, which was based on a combination of photographs and illustrative images, examined the political, aesthetic, and social layers of the 2018 Kızılay. The spatial contradictions of everyday life, which persist in 2025, point to the need for an intellectual interpretation. The study can be regarded as a means of engaging with, reevaluating, conceptualising, or comprehending architecture and the city. It can be considered an alternative mode of reading that facilitates a nuanced understanding of these concepts.

In Ankara's Kızılay city center, it is not an investigation of the mundane face of daily life, but rather an analysis of objects in detail, examining a multilayered structure. In this context, the present study focuses on the overlooked details of the city. The theoretical framework sought in these details has enabled visual production to become not only a means of representation but also a form of critical thinking. It is recommended that future research endeavors involve the exploration of revisiting the same location from different periods of time, accompanied by photographs from the same angles and new illustrative images. Such studies have the potential to exert a considerable influence, as they call for a re-evaluation of the illustrative interpretation of critical thinking. In addition to the provision of periodic documentation of architectural and urban memory, these initiatives have the potential to facilitate discourse on the subject, thereby delineating the boundaries of architecture's responsibilities through the process of updating.

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Chapter 6

EVALUATION OF CAMPSITE DESIGNS IN TÜRKİYE WITH THE FRAME OF CREATING AN AGE-FRIENDLY ENVIRONMENT

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1. INTRODUCTION

As people age, their physical mobility decreases and they often develop chronic diseases due to inactivity (Anonymous, 2022a). In this context, the ability to maintain physical mobility in older age and to engage in physical activity safely and independently without the need for assistance is very important for elderly people to maintain their quality of life. Physical mobility and participation in outdoor leisure activities depend on individual preferences, internal communication and motivation, as in other age groups, but the impact of environmental elements is also too great to be ignored. Particularly in urban areas, there is a growing body of supportive research and experience in maximising the participation of older and disabled users in social life. However, the design of rural areas such as campsites, woodlands, outdoor recreation areas, beaches, etc. does not yet give the necessary importance to the issue of elderly and disabled people being able to use their environment independently.

Kaya and Müderrisoğlu's (2015) study found that *environmental, structural, psychological* and *emotional factors* were the least effective restrictors for users over the age of 60 in participating in recreational activities compared to other disability groups. This situation indicates that although older people are less affected by these factors, they are more motivated and willing to participate if the aforementioned restrictions are minimised.

The importance of the study is revealed by statistical studies conducted by the World Health Organization (WHO, 2018). Accordingly, it is predicted that between 2000 and 2050, the proportion of the world population over the age of 60 will double from 11% to approximately 22%. This shows that studies on the quality of life of elderly people should be given more attention.

This study aims to investigate the effects of accessibility of camping activities in nature-based areas on the composition of elderly visitors and the limiting factors in terms of visitor preferences, perceptions and behaviors.

1.1. Age-Friendly Environmental Design

Population aging and urbanization are two of the most significant global issues we face today, and they will shape the 21st century in profound ways. As cities expand, the proportion of individuals aged 60 and over also rises. Older people contribute economically to their communities and the societies in which they reside.

WHO considers active aging to be a lifelong process influenced by various factors that, individually or together, enhance health, participation, and security in the lives of older people.

Open spaces and community facilities greatly affect the movement, autonomy, and well-being of older adults, influencing their capacity to grow old in their own homes and neighborhoods. To support older individuals and those who engage with them, it is essential to design environments that promote age-friendly urban landscapes. Common themes in cities worldwide include *quality of life*, *accessibility,* and *safety*.

Social participation and support play a vital role in promoting health and well-being throughout life. Engaging in leisure, social, cultural, and spiritual activities within the community, as well as with family, fosters social integration. This involvement allows older individuals to utilize their skills, gain respect and dignity, and maintain or develop supportive and caring relationships.

The World Health Organization (WHO) states that participating in formal and informal social activities relies on more than just the availability of events; it also depends on having proper access to transportation, facilities, and information about these activities. Offering free or low-cost options encourages older individuals to engage in social life. However, the expense of such activities often poses a significant barrier, particularly in cities within developing countries and those with transitioning economies (World Health Organization, 2007).

One of the primary goals of creating age-friendly cities is to harness the potential that older people provide to society. *An age-friendly city* encourages active aging by enhancing health, participation, and safety, ultimately improving the quality of life for older individuals. In this context, it provides an accessible environment for older people with different needs and capacities in terms of infrastructure and service quality and adapts spaces to be inclusive.

One of the most important age-friendly features is the beauty of the city's natural environment with its green spaces. However, in many cities, some obstacles prevent the elderly from using green spaces. One essential urban feature for the elderly is the availability of seating areas; without places to rest, it can be very challenging for them to navigate both urban and rural environments. Furthermore, the current condition of the pavements has a clear impact on the walking ability of elderly people. Narrow, uneven, cracked, high-curbed, or obstructed pavements present potential hazards and directly impact their mobility.

To design sidewalks to be age-friendly, the following features are often recommended:

- A smooth, flat, non-slip surface,
- Adequate width for wheelchairs,

- Curbs that are flush with the road,
- Avoidance of obstacles such as street vendors, parked cars, and trees,
- Priority access for pedestrians.

People in both developed and developing countries feel that their cities are not designed for older people. In many cities, there are references to physical access barriers that can discourage older people from leaving their homes.

A sense of safety in one's environment greatly affects individuals' willingness to navigate their surroundings, which subsequently influences their independence, physical health, social engagement, and emotional well-being. In this context, issues such as inadequate street lighting, overcrowded areas, social crime and homelessness in public places raise safety concerns for older people. Spending time outdoors, especially at night, is frightening for many older people.

Walking paths and cycling routes are seen as part of a health-promoting, elderly-friendly environment, but they also present hazards.

Social spaces and open green spaces need to be located close to where older people live so that they can easily access services and facilities.

Roads should feature well-designed and suitably placed physical elements such as traffic islands, overpasses, or underpasses to support pedestrians in safely crossing busy roads.

Crosswalk lights should provide sufficient time for older people to cross the road and receive visual and auditory signals.

Special customer service arrangements are provided for older adults, such as dedicated queues or separate service counters designed specifically for their convenience.

Transportation, including accessible and affordable public transport, is an important factor influencing active ageing. Mobility, especially in the city, is important for social and civic participation and access to community and health services.

Prioritized parking spaces for older and disabled people near public spaces, together with drop-off and pick-up locations, are seen as age-friendly features. However, in many cities inadequate and costly parking is identified as a barrier for older people.

Environments that are friendly to older adults strive to encourage active and healthy aging by enhancing health and quality of life in later years. Two key approaches to reaching this aim include strengthening and preserving individuals' intrinsic abilities throughout their lives, and enabling people with varying levels of ability to carry out activities they find meaningful. (WHO, 2016).

Ideally, they encompass three key areas where environments can be inclusive and accommodating for older adults with varying abilities: the built environment, the social setting, and local government services. Within these three broad interconnected dimensions, the WHO (World Health Organization) classifies eight domains (Figure 1), which are key areas of work covered by different sectors (WHO 2016).

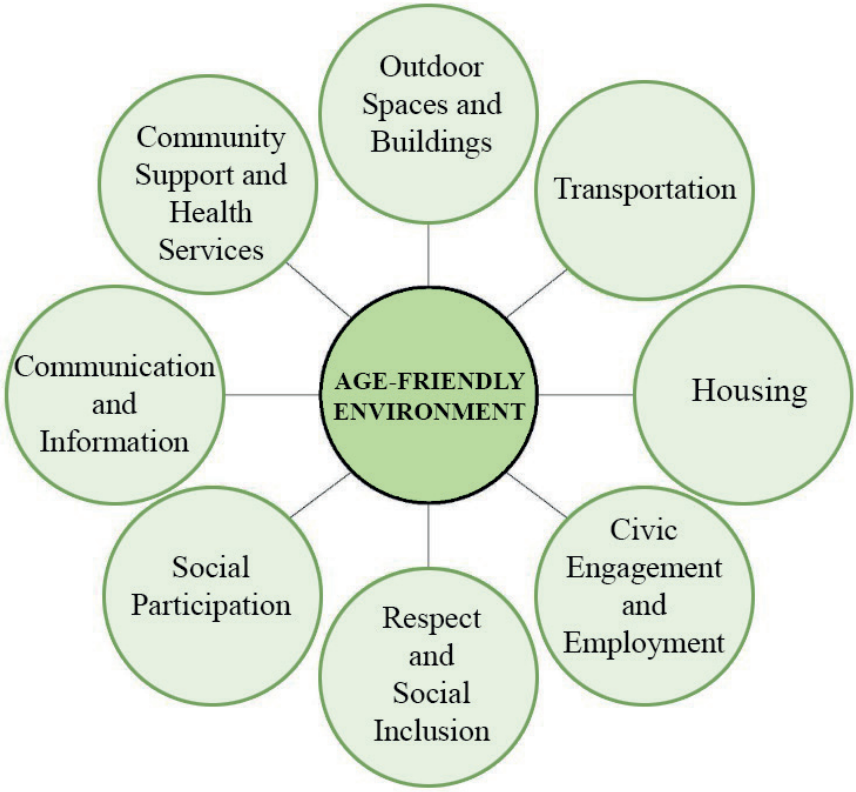

Figure 1. *Eight space figures for age-friendly action nested in three dimensions of supportive local environments (modified from WHO 2016).*

An age-friendly environment functions at the intersection of key domains, identifying obstacles and modifying systems across all eight areas and three dimensions in a coordinated and holistic manner. Operating within this complex network, age-friendly interventions play a crucial

role in addressing major challenges to healthy and active ageing, including social isolation, loneliness, falls and injuries, physical inactivity, elder abuse, and mental health issues (WHO, 2016). In addition, the aging of individuals should mean changes at the urban level, especially in countries like Europe where birth rates are lower than death rates. There is a need for reshaping in many areas from housing, transportation, health services to social needs.

For example, the elderly tend not to use cars and generally prefer public transportation and walking. While the average walking speed of a person over 65 years of age is three kilometers per hour, this speed drops to 2 kilometers by the age of 80. The average speed of working age individuals is 4.8 kilometers per hour. In the design decisions considered in this context; reducing the distance between units such as public transportation stops, shops, benches, shaded areas with trees, public toilets and extending the time allowed for pedestrians to cross the street will increase the rate of elderly people going out (Grahame, 2016).

Although this study focuses on the existence of elderly-friendly environments in campgrounds, it should not be forgotten that there is a current issue that needs to be addressed on a city scale.

1.2. Camping Tourism and Campsites

People have been walking and camping for as long as there have been human beings. In recent centuries, especially in developed countries, urbanisation has meant that a large proportion of the population has had little need to walk from place to place. In the last half century in particular, this trend has reversed. As the proportion of people with leisure time has increased, people have begun to turn to hiking and camping as recreational activities.

In recent years, the number of individuals choosing camping as a holiday activity has grown significantly, making it one of the most popular ways to engage in outdoor leisure. Camping is an open-air recreational pursuit in which participants typically bring along tents and camper vans, escape urban areas, and stay in natural settings for one or several nights. It is often paired with other outdoor pastimes like hiking, picnicking, fishing, or swimming. Camping tourism has become an expanding sector within the broader travel and tourism industry.

Camping tourism is a popular outdoor activity where participants travel to stay in tents or caravans (MacLeod, 2017; Poldrugovac, Janković, & Peršić, 2019). As interest in camping tourism rises, the need for high-quality amenities and facilities is also expanding. For this reason, it is necessary

to meet the various needs and expectations of the camping visitors in the areas where camping activities take place. At this point, it is particularly important to understand the motivation of individuals to participate in camping (MacLeod, 2017). Especially, the connection between motivation and satisfaction has consistently been a favored subject of study among many scholars, since satisfaction has been shown to positively influence camper actions like recommending and planning to return (Prebensen et. al., 2010; Alegre & Cladera, 2009). Therefore, those who take part in camping will undoubtedly depart with unique emotions and memories following each recreational experience. This situation will both increase the recognition of campsites and contribute to the improvement of the environmental and physical infrastructure of campsites by measuring the satisfaction and expectations of camping participants (Lin & Chuang, 2021).

Camping tourism, as a type of nature-based special interest tourism, is primarily characterized by the flexible, temporary, and mobile nature of accommodation options such as tents, caravans, and mobile homes, as well as their close relationship with the natural environment (Blichfeldt & Mikkelsen, 2015). It is among the quickest expanding sectors within the tourism industry (Mikulić et. al., 2017; O'Neill et. al., 2010). Especially in the last decade, it has evolved from basic tents to more luxurious settings in natural and open environments (Brochado & Pereira, 2017).

Previous researchs on camping tourism show that camping tourism can be categorised into three main issues. These are user experience, marketing and development, and campsite selection and characterisation (Brooker & Joppe, 2013).

The urban environment and services reflect the determinants and characteristics of an age-friendly city, as shown in Table 1.

Table 1. *Landscape features preferred by older people for nature-based recreation (Wen et. al., 2018).*

Category	Sub-Category	Landscape Characteristics for Nature-Based Recreation
Landscape Features	Aesthetics	Naturalness (a variety of plant species varying in color and size)
		Watching wild animals
		Visual Architecture and sculptures
		Water features (lake, pond, fountain, etc.)
		Open landscapes, but with a visual center that can be a sculpture, stone, water feature or distinctive plants
	Legibility	Seasonally changing landscape
		Predictable environment
		Landmarks or distinctive features
		Map information in green areas
	Auditory Landscape- Air Quality	Silence in urban green spaces
		Natural sounds like birds chirping and sounds of wind and water
		Fresh air and avoidance of automobile exhaust in urban areas.
	Daylight and Shadow	Awnings and shades in summer and sunbathing places in winter
	Cultural Heritage	Places of worship in green spaces
		Green spaces with cultural heritage, festival events or traditional atmosphere
Infrastructure and Facilities	Roads	Flooring with anti-slip and water-resistant material
		Barrier-free roads and slopes less than 5%
		Long, continuous and meandering paths in parks for recreational walking
		Well-designed paths connecting different interesting parts of the green spaces
	Intersections	Crowded and collision-free roads
		Light traffic on roads leading to green areas
		Fewer intersections to avoid traffic congestion
		Presence of bridges or underpasses to cross streets
		Traffic lights with enough time for the elderly to cross the road
	Seating Units	Chairs in green areas, optimally with seat backs and armrests
	Recreational Areas	Access to recreational areas such as outdoor exercise equipment, ball playgrounds or cycling paths
		Playgrounds
		Do-it-yourself spaces
	Business centers and Toilets	Cafes and restaurants close to green spaces
		Toilets

Maintenance	Cleaning	Sidewalks cleared of litter, surface water and fallen leaves
		Well-maintained chairs, lights and exercise facilities
	Security	Green spaces with good visibility and supervision
		Avoiding nuisance, crime and vandalism
		Avoiding stray dogs
		Lighting in green areas
Accessibility	Proximity to Green Areas	Walking distance from home to public open green spaces
		Well-connected street network where older people can easily travel from anywhere to green spaces
		Increase the number of parks within a certain proximity from home
		Small green spaces near the house
	Alternative modes of transportation besides walking	Public transportation from home to green spaces
		Cycle paths from home to green spaces or within green spaces

Camping is a form of recreation that is carried out by using shelters such as tents, huts, caravans for various purposes such as recreational or sports activities in nature, staying for a short time and resting (Tanrıverdi, 1987; Tourism Dictionary, 2008; Türkiye Camping and Caravan Association, 2007; Topay & Koçan, 2009).

Clark et al. (2009) stated that camping has traditionally been viewed as a chance to withdraw from society, enjoy the raw appeal of nature, and briefly get away from the complexities of city living. However, many modern campsites have been greatly improved with water systems, flush toilets, paved roads and special facilities for caravans. These modern camping facilities have become indispensable to all visitors. Modern camping facilities, including clean water and a place to stay without pitching a tent.

Because of the rising popularity of camping, numerous campsites, both private and public, have been newly constructed or upgraded with comfort and convenience amenities (such as paved roads, water systems, flush toilets, tents, and picnic areas) to meet the needs of today's campers. The number of campsites is growing rapidly. As camping grows in popularity around the world, with the aim of extending the attraction of camping to a broader and more varied group of campers, many once small campsites are now extensive and highly developed, featuring water supply systems, flush toilets, paved roads, enhanced supervision, and dedicated amenities for caravans. However, the increase in demand is also leading to increased problems such as overcrowding, environmental pressures and fierce competition for limited resources (Lee, 2020). In addition, many active and former campers have argued that cost, pollution, overcrowding and unfavourable conditions limit camping activities (Lapage & Cormier, 1977).

Camping/camping areas are set up along motorways and their immediate surroundings, at the entrances to towns, in places of natural beauty such as the sea, lakes and mountains, and in places that are generally owned by campers. They are facilities with at least 30 units (caravans, tents, bungalows) where the needs of overnight accommodation, catering, recreation, entertainment and sports are met (Tanrıverdi, 1987; Tourism Dictionary, 2008; Türkiye Camping and Caravan Association, 2007; Topay & Koçan, 2009).

Campsites are divided into four groups (Table 2) as transit, recreational, transit-recreational and organisational campsites (Gülez, 1983; Koç & Şahin, 1999; Topay & Koçan, 2009).

Table 2. *Types of camping (modified from Topay & Koçan, 2009).*

Transit Campsites	These camping sites, which provide short-term accommodation (1-3 days), are generally located near cities or at highway junctions. They are narrow in terms of both area and structural elements (Gülez, 1983).	
Recreational Campsites	Since the main purpose of this group is recreation, they are established in special areas around regions with natural beauty and features (coast, lake, river, forest), away from cities and the noise of main roads. The length of stay is longer (over 8 days). Density and daily changes are less, and standards for structural elements and various areas of use are higher (Gülez, 1983).	
Transit-Recreational Campsites	It combines the purposes of the two types of camping mentioned above in its structure and provides both short and long term accommodation opportunities. Site selection and facilities are similar to transit camping (Koç and Şahin, 1999).	
Organization Campsites	They are established for organizations such as scouts, guides, etc. Usually distinctions are made for age groups (Koç and Şahin, 1999).	

The general criteria that should be considered for a region to be separated as a camping/tent campsite can be listed as follows (Tanriverdi, 1987; Doğru, 1989; Anonim, 1996; Sözen & Şahin, 1998; Koç & Şahin, 1999; Topay, 2003; Sakaryaizcileri, 2008; Topay & Koçan, 2009);

- An ideal camping site should be in an open area and the ground should be slightly sloping so that rain can drain,
- There should be no avalanche and landslide risk that could endanger the lives of people living in the camping area,
- Especially in terms of bioclimatic comfort, areas with an altitude between 800-2000 meters, facing east and south, and where the wind speed is not high enough to affect the activities and facilities in the area (between 0-10 m/sec) should be preferred,
- The relative humidity should be between 25-75%, which will not adversely affect the activities,
- There should be a source of water for drinking and use near the site and the quality of the water should be good.
- In order to facilitate life and the establishment of facilities on the site, it should be a coarse or medium textured area with a low water table and the ability to drain surface water quickly.
- In terms of fauna and flora, they should be areas that are not protected by law or regulation and are not sensitive in terms of plant and animal life.
- Current land use patterns such as pasture, meadow, woodland, scrubland should be areas that can make a positive contribution to camp life.
- There should be areas (rich in endemic plant species) with features that can offer people different recreational activities during their stay, interesting geological-geomorphological formations, and features that provide opportunities to see new plant and animal species,
- Regions outside the flood zone should be preferred,
- In order to facilitate the camping activity, areas are suitable for camping if the people living in the vicinity of the camping area have a positive attitude towards this activity, if there is no noise, and if it is possible to reach infrastructure facilities such as communications, health facilities and electricity supply in a short time.

1.3. Ageing and Outdoor Recreation

Despite different cultural backgrounds and goals, elderly people share common preferences for nature-based recreation. For example, they are interested in accessibility, safety, physical activity, social relationships and beautiful and perceptible landscapes (Loukaitou-Sideris et. al., 2014; Matsuoka & Kaplan, 2008; Yen et al., 2014).

In particular, accessibility plays a dominant role in influencing nature-based recreation among elderly people. Nonetheless, concentrating mainly on walking and general exercise might restrict the development of green spaces to just their sports-related purposes, like the quality of walking paths or recreational amenities. In addition, the emotional links between elderly people and nature, such as memories and cultural heritage, are overlooked. In this context, few studies have explored the needs for creativity, participation and freedom. Few studies have found that elderly people feel creative, grateful and connected when they create their own living environments and form social bonds with other elderly peers (Leaver & Wiseman, 2016; Milligan et. al., 2004). In addition, as there are very few studies that address or compare rural and agricultural areas, it is still uncertain whether the preferences of older adults living in urban areas align with those residing in rural environments. The way elderly people choose to interact with nature is reflected in their interaction with landscape features. In terms of green space types, elderly people are more sensitive to connectivity, air quality, noise and working environment, seasonally changing landscape, open views and adequate shade in institutional green spaces. In parks, for example, they prioritise safety, aesthetics and naturalness. Older adults tend to prefer sitting and utilizing exercise equipment, not only for rest but also for the chance to spend extended time in green areas. Some studies have suggested that elderly people pay more attention to environmental barriers and hazards because they are concerned about accessibility, mobility and safety.

This concern reflects the expectation that elderly people may be vulnerable to regulation of their outdoor recreation due to declining physical abilities. Some research has found that elderly people visit parks less often or are less interested in woodland or park facilities than younger adults. However, in terms of preferences for urban spaces, despite contextual differences, older people share common preferences that can be categorised as accessibility, infrastructure and facilities, maintenance and aesthetics, and diverse and understandable landscape features. Meanwhile, the relationship between individuals and nature influences the prioritization of landscape elements. These insights could assist landscape architects in more effectively addressing the needs of older adults and enhancing their quality of life. More research is needed to explore elderly people's emotional connection to green spaces, such

as their exploration, creativity, identity, freedom or any local cultural activity in green spaces. Studies have tended to focus on functional attributes, such as how a landscape determines elderly people's walking or physical activity. The comprehension of older adults' emotional and cultural connection to green spaces is still not well understood.

It is necessary to reveal the urban/rural differences in nature-based recreation preferences of the elderly. As most existing studies focus on urban areas dominated by streetscapes or urban parks, more information is needed on the preferences of elderly people living in rural areas. Rural areas may have different distinctive land cover (farmland, forest or wetland), different public services (public transport, safety) and different local cultures (holiday celebrations, inherited traditions and social organisation). Planners and designers should consider the potential differences between urban and rural contexts (Wen, Albert & Von Haaren, 2018).

2. RESERCH AND FINDINGS

Within the scope of the study, 10 different campsites located in the provinces of Istanbul, Çanakkale, Düzce, Artvin and Denizli in Türkiye (Figure 2) were evaluated regarding the presence of design elements that support active aging.

Figure 2. *Distribution of urban areas in the study region.*

Observations were made in the study areas by determining 3 main criteria and 12 sub-criteria regarding accessibility, activity suitability, and user preferences (Table 3).

Table 3. *Observation form for the study areas*

User Preferences	1. Location (forest/sea-north/east…etc.) 2. Opportunities (lighting, garbage, building elements, etc.) 3. Security 4. Comfort 5. Proximity to recreational resources 6. User profile 7. Cultural landscape elements (architecture, gastronomy, folklore, etc.)
Activity Suitability	8. Type of activity (active/passive) 9. Number of activities 10. Social areas for participants
Accessibility	11. Outside the campsite 12. Inside the campsite

2.1. Artvin, Şavşat/Karagöl Camping Area

Karagöl camping area in Şavşat district of Artvin is 88 km away from the city center and is located within the Sahara National Park. There are also picnic areas in the camping area by the lake (Figure 3). It's important to note that the camping area lacks any developed amenities, such as leveling, lighting, or concession stands.

Figure 3. *Photographs from Artvin, Şavşat/Karagöl Camping area*

2.2. Çanakkale, Eceabat/Kabatepe Camping Area

Kabatepe Forest Camp, situated in the Gallipoli Peninsula Historical National Park in the Eceabat district of Çanakkale, is a popular camping area for visitors looking to enjoy a day of swimming. Spanning approximately 30 hectares, it caters to the picnic, beach, and camping needs of both residents and tourists (Figure 3). However, it is important to note that the area does

not include barrier-free designs for recreational activities or accommodate physical needs.

Figure 4. *Photographs from Çanakkale, Eceabat/Kabatepe Camping area*

2.3. Düzce, Aydınpınar Waterfall Camping Area

Aydınpınar Waterfall is situated within a nature park, nestled between Samandere Waterfall and Güzeldere Waterfall. The area offers various activities such as trekking, photo safaris, and tent camping amidst a mixed-leaved forest featuring trees like hornbeam, oak, and chestnut. Aydınpınar Waterfall is known for having one of the most significant walking trails in Düzce, which includes both easy and moderate-difficulty paths suitable for anyone in good health (Figure 5).

Figure 5. *Photographs from Düzce, Aydınpınar Waterfall Camping Area*

2.4. Düzce, Güzeldere Waterfall Camping Area

Güzeldere Waterfall, located within the borders of the Gölyaka district of Düzce, is located in Gölyaka-Güzeldere Village. It is located 28 km from Düzce and 16 km from Gölyaka. The area offers tent sites as well as bungalow

and caravan camping options. Facilities available for shared use in the camping area include restrooms, a fountain, a prayer room, and showers (Figure 6).

Figure 6. *Photographs from Düzce_Güzeldere Waterfall Camping Area*

2.5. Düzce, Akçakoca Camping Area

Akçakoca Camping Area, located in the Akçakoca district of Düzce, is a holiday destination where green and blue come together. Activities such as day trips, sea enjoyment, camping, and picnics are carried out on the long beach area in the district center (Figure 7). There are no facilities such as toilets, fountains, or showers in the camping area (Anonymous 2022a).

Figure 7. *Photographs from Düzce, Akçakoca Camping Area*

2.6. Düzce, Dipsizgöl/Çamlıpınar Pond Camping Area

Çamlıpınar Pond (also known as Dipsizgöl) is located in the Dipsizgöl Village of Düzce's Kaynaşlı district. While there are various camellias for picnics in the region, various activities such as trekking, bicycle tours, photography and safaris can also be done (Figure 8). The bungalow has no structures such as hostels or country houses in the camping area. It is a suitable area for daily picnics or tent camping. There are no shower areas.

Figure 8. *Photographs from Düzce, Dipsizgöl/Çamlıpınar Pond Camping Area*

2.7. Düzce, Torkul Pond Camping Area

Torkul Pond is located 1 km behind Torkul Plateau. The nearest shopping area is located 25 km away from this campsite, which is a virgin area. Although there is a fountain, drinking water and WC, there is no shower (Figure 9). Vehicles cannot come to the lakeside, so it appeals to limited users.

Figure 9. *Photographs from Düzce, Torkul Pond Camping Area*

2.8. Düzce, Pürenli Camping Area

Pürenli Plateau, which is approximately 24 km away from Gölyaka district of Düzce, has an altitude of 1400. The plateau houses in the region are full during the summer periods due to weather conditions. For this reason, it is possible to stay in tents during these periods so as not to disturb the houses too much. However, there is no fenced area for camping (Figure 10). There is no shopping area, wc and shower facilities.

Figure 10. *Photographs from Düzce, Pürenli Camping Area*

2.9. Denizli, Honaz Camping Area

Camping and picnics are carried out in the Honaz Mountain National Park area, which is located within the borders of Honaz district of Denizli and very close to the district center (Figure 11). In the region where the Mediterranean climate prevails; trekking, landscape viewing, mountaineering and photography activities can be carried out (Anonymous 2022b).

Figure 11. *Photographs from Denizli, Honaz Camping Area*

2.11. İstanbul, Polenezköy Nature Park Camping Area

Polonezköy Nature Park Campground is one of the natural camping areas within the borders of Beykoz district of Istanbul, which offers paid and free camping. Many businesses give permission for camping here. Tent and caravan camping is also possible in the forest or in a suitable area (Figure 12). There is a long hiking trail and many restaurants and cafeterias around the area.

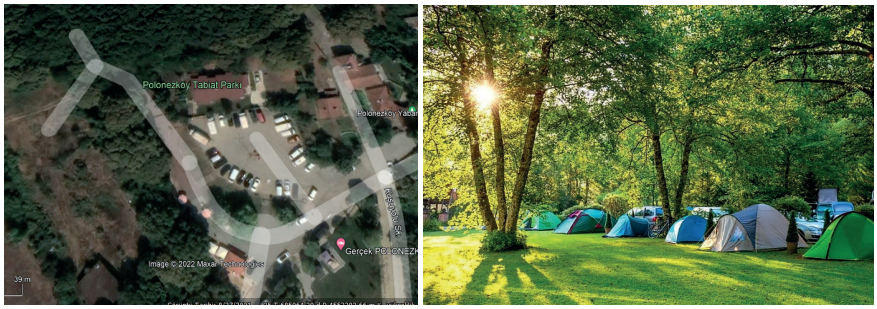

Figure 12. *Photographs from İstanbul Polenezköy Nature Park Camping Area*

Table 4. *Observation form for study areas*

		İstanbul	*Çanakkale*	*Düzce (Güzeldere)*	*Artvin*	*Denizli*
User Preferences	*Location*	Forest	Sea+ Forest	Forest	Lake+ Forest	Mountain
	Opportunities	Shower-Restroom, Buffet, Restaurant, Bungalow	Shower-Restroom, Buffet, Restaurant, Fountain	Restroom, Restaurant, Fountain, Masjid, Bungalow	Restroom, Rubbish sites, Social Facility, Fountain	Restroom, Rubbish sites, Buffet, Masjid, Fountain
	Security	Avaliable	Avaliable	Avaliable	Avaliable	Avaliable
	Comfort	Well-kept	Well-kept	Well-kept	Poorly maintained	Well-kept
	Proximity to recreational resources	Close	Very close	Very close	Close	Close
	User profile	Suitable for all ages	Suitable for all ages	Suitable for all ages	Young-Middle age	Young-Middle age
	Cultural Landscape Elements	Historical places (Church, Cemetery)	Sea	Waterfall	Gastronomy, folklore	Waterfall, Mountain (Geological Formations)
Activity Eligibility	*Activity Type*	Hiking, Picnic, Photography, Horse riding, Canoeing, Cycling	Hiking, Picnic, Photography, Swimming	Hiking, Picnic, Photography	Hiking, Picnic, Photography, Kano	Hiking, Mountain Climbing, Picnic, Photography, Angling, Bird Watching
	Number of Activities	6	4	3	4	6
	Social Areas for Participants	Observation tower, Seating areas, Open green areas	Beach, Seating units	Seating units, Open green areas	Social Facility, Gazebos, Open green areas	Pond surroundings, Gazebos, Open green areas
	Camping Type	Tent+Caravan +Daily	Daily	Tent+Caravan +Daily	Tent+Caravan +Daily	Daily
Accessibility	*Outside the campsite*	Avaliable Public transportation	Avaliable Public transportation	No public transportation	No public transportation	No public transportation
	Inside the campsite	Pedestrian	Pedestrian	Pedestrian	Vehicle / Pedestrian	Pedestrian
	Distance to city centre	25 km	18 km	18 km	87 km	21 km

3. CONCLUSION AND RECOMMENDATIONS

Within the scope of the study, campsites with different locations such as lakeside, seaside, forest, plateau and city surroundings were evaluated. The results show that all natural and structured campsites have deficiencies in lighting, security and superstructure.

It was noted that the campsites in natural areas such as lakeside and plateau have suitable topographical conditions for the elderly, disabled, pregnant women and children and also man-made campsites lack a variety of activities and ramp solutions.

In particular, distance is an important parameter for participants. In addition, passive activities are an important factor for the participation of elderly people in camping activities. Comfort and maintenance is one of the most important user preferences. In the context of this study, the analysis of Table 4 shows that there are campsites that are more accessible, offer a variety of activity types and have high values in terms of safety and comfort. It was found that more enclosed and quiet areas, such as forests, were preferred as campsites. In addition, considering that water is also an effective factor, areas such as the sea and lakeside are the areas where camping activities are preferred.

It has been observed that campsites in Turkiye are designed according to the average user group and the participation of elderly and disabled people in outdoor recreation activities is quite low. Campsites are mostly designed for young and physically healthy people. Inclusive design for the elderly, disabled, pregnant women and children is not considered.

- Geomorphology (slope, aspect, elevation)
- Areas with slopes in the range of 2-6 per cent, south faces and areas with a slope of 700-1000 m are considered to be the most suitable areas for camping activities (Uzun et al., 2018).
- Climatic conditions of the campsite
- Accessibility to camp activities
- Safety
- Accommodation comfort
- Daily routines of the elderly
- Potential of the campsite
- All campsites should be designed taking into account natural and cultural landscape elements.
- Each one should have its own unique design and concept.
- There should be ramp solutions in sloping areas for disabled and elderly people.

Ramp widths must be at least 120 cm. In addition, ramps longer than 10 m require 2.5 m landings. A disabled individual can access areas with slopes of up to 6 percent without needing assistance. The width of pedestrian paths must be designed as at least 150 cm and ideally 200 cm. Sidewalk heights must be between 3 cm and 13 cm (TS 12576, 2022).

- Access to the campsite and nearby natural resources should be planned.
- Solutions should be offered to eliminate the negative effects of climatic conditions.
- Facilities should be made comfortable for people with disabilities and elderly people.
- Activities for disabled people should be included.

Campsites are areas where people with disabilities and elderly people can socialise. This purpose cannot be achieved unless the design criteria are improved.

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Chapter 7

ECOLOGICAL SOLUTIONS TO NOISE POLLUTION

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1.Introduction

Cities exist within the natural and physical environment. Cities are undergoing a rapid transformation process driven by the changing needs of our age and powerful technological interventions. The negative impacts of rapid and unprepared urbanization affect cities the most (Toksoy & Bayramoğlu, 2017). Therefore, taking the necessary precautions for the physical and mental health of urban residents has become a necessity (Bayraktar, 1985; Yılmaz & Özer, 1997; Düzenli et.al., 2024). Industrialization, rapid population growth, and migration from rural areas are disrupting the natural and cultural balance in cities. They are rendering cities an inadequate environment for human life in social, cultural, economic, and biological terms. It is necessary for the functions of contemporary planning to be implemented in a harmonious and healthy manner in urban planning. Urbanization policies must be based on three fundamental principles: a healthy, planned, and cultural environment. Creating a healthy environment requires ensuring the necessary measures are taken to prevent deterioration of people's physical and mental health and creating residential areas with noise control (Önder & Gülgün, 2010). Although not a pollutant in the environment, noise pollution has negative physiological, physical, and psychological effects on people. Noise negatively affects people's hearing health and perception. It is environmental pollution that causes a person to lose self-confidence, experience psychological stress, and destroy pleasant and peaceful feelings.

Noise is defined as a sound spectrum with a random structure and is subjectively undesirable. Sound is created by fluctuations in air pressure caused by a vibrating source. It is a physical phenomenon that evokes the sense of hearing in humans. Noise control is the reduction of noise emitted from any sound source to an acceptable level. It involves changing the acoustic properties and reducing the duration of the sound. It is the complete elimination or reduction of its harmful effects to a reasonable level through methods such as masking with a pleasant or less disturbing sound (Önder & Gülgün, 2010). Noise pollution is defined as an environmental and health problem that contributes to the emergence of various physical and psychological problems in people's lives. Researchers in many countries have investigated the negative effects of noise pollution on people's lives (Bayramoğlu et. al., 2014).

The most common type of noise in today's cities is noise from motor vehicles. The increase in the number of vehicles and human mobility has led to significant increases in traffic-related noise levels. Traffic-related noise varies in volume over time. It is also a pollution element present at all times of the day. Many parameters influence the level of noise from motor vehicles. Factors such as the number of vehicles passing per unit of time, the type of vehicle, and its speed significantly affect the noise level (Yeşil et. al., 2015). Solutions for noise pollution have been developed to address all these negative effects.

The need to address noise pollution stems from its fundamental effects on both human health and the environmental and social quality of life. Therefore, noise should be prevented to protect human health, manage physiological stress, and reduce the psychological effects on people. From a quality-of-life perspective, noise pollution directly negatively impacts the most basic activities of daily life, such as resting, working, or sleeping at home. Reducing noise levels in urban life contributes to a more peaceful and productive social life. The effects of noise pollution are not limited to humans; it also has negative consequences on the environmental and ecological balance.

Noise can disrupt birds' communication systems, migration routes, and breeding behavior. It can negatively impact the navigational abilities of land and marine mammals, leading to disruptions in ecosystems. This can alter species' behavior and create food chain imbalances. Furthermore, the economic and legal implications of noise pollution cannot be ignored.

Noise reduces employee focus and productivity, leading to economic losses. Many countries have legally mandated noise limits that comply with World Health Organization (WHO) and European Union standards. Exceeding these limits results in fines and legal penalties. Finally, reducing noise pollution is crucial for public peace. Excessive noise in residential areas can lead to conflicts between neighbors, social unrest, and disruptions to public order. Noise management is an essential requirement for maintaining social order and improving quality of life, especially in densely populated urban centers (Demirkale & Aşcıgil, 2007; Bayramoğlu et. al., 2014).

2.Measures Against Noise Pollution

Measures that can be taken against noise damage can be categorized into three groups: "technical," "biological" (ecological), and "social" measures.

A-Technical Measures: Technical measures that can be taken against noise pollution include reducing sound at the source, preventing its propagation, and protecting the receiver. To reduce noise damage from vehicles, roads can be planned to pass away from residential areas. Road pavements and vehicle tires can be designed to minimize noise and noise reduction (Çepel, 2010). Controlling noise at the point of origin through noise reduction is another solution. In this context, low-noise engines, machinery, and fan systems should be preferred. For this purpose, vibration isolation should be provided for vehicles and equipment. Regular maintenance procedures significantly reduce machine noise (Figure 1).

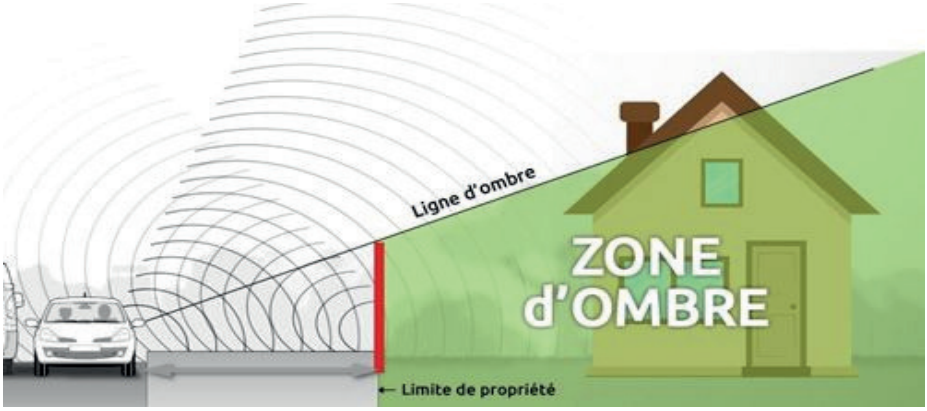

Figure 1. "Technical" Measures Against Noise Harm (URL-1)

In construction and industrial activities, it is crucial to avoid noisy work at night and to use silencer systems on construction equipment. Measures to prevent noise from spreading into the environment aim to limit its spread. Noise levels can be reduced by installing sound barriers around highways, railways, and industrial zones. Vegetated earthen embankments provide natural formations, blending in with the surrounding environment and providing effective insulation. Furthermore, tree and shrub belts planted along roadsides and in residential areas help dampen sound. During urban planning, noise sources should be located away from residential areas. The creation of buffer zones also falls into this category (Figure 2).

Figure 2. Noise control on highways (URL-2; URL-3)

Receiver protection methods focus on minimizing the effects of noise on individuals. Double-glazed windows and acoustic windows are prime examples in buildings. Soundproof doors and insulation materials are used in this context. This can reduce indoor noise. The use of acoustic panels and sound-absorbing elements in interior spaces is also an effective solution. Therefore, technological and innovative solutions have become increasingly important in recent years. Active noise control systems can reduce noise by

generating antiphase sound waves. Smart city applications use sensors to monitor noise levels in real-time, providing automatic warnings if exceeding levels are exceeded. Furthermore, quiet asphalt types that reduce noise from road contact are also effective tools in modern noise management (Figure 3).

Figure 3. Reducing the effects of noise (URL-4)

B-"Biological" (ecological) Measures: From a biological perspective, measures using artificial elements are quite effective. However, they accelerate the concrete of cities. Indeed, the already limited amount of green space in cities is being destroyed for various reasons, primarily economic ones. Green spaces, in addition to their positive psychological effects, also play a crucial role in maintaining ecological balance. Therefore, while structural measures are more effective against noise, methods using living materials and a combination of living and non-living materials are preferred (Yılmaz & Özer, 1997).

Studies have shown that vegetation, especially forests, reduces noise levels. According to these studies, a 250-meter-wide strip of forest along a highway can reduce highway noise levels by 40 dB(A) (Çepel, 2000). Curtains made of plants offer even more advantages. With their constantly changing aesthetic structures, plants provide climate improvement, shading, dust filtering, erosion prevention, and recreational opportunities. Their cultural impact significantly positively impacts the physiological and psychological needs of residents. They are more aesthetically pleasing than noise curtains made of artificial elements (Gür & Önder, 2000).

C-"Social" measures: Measures such as legal regulations and education are significantly effective in combating noise. Awareness and education efforts are crucial. The negative effects of noise on human health should be conveyed to the public through public awareness campaigns. A culture of silence can be instilled in children through seminars and events held in schools. Additionally, neighborhood meetings, local associations, and civil society organizations can be established. Conducting informational activities will enable the outreach of

all segments of society. Furthermore, behavioral and habit modification should be targeted. Habits such as listening to loud music, honking unnecessarily, or uncontrolled increases in volume at public events should be reduced. This will significantly reduce noise pollution. Preventing behaviors that create noise in public transportation and traffic is an integral part of this process. At events such as weddings, concerts, and celebrations, sound levels should be kept within legal limits.

Publicly announcing noise limit values and the sanctions that will be applied in case of violations helps raise public awareness. Noise complaint hotlines, mobile applications, or web platforms should be established for quick and easy reporting. Finally, developing cultural and social norms has a long-term impact. Maintaining a culture of silence in areas such as libraries, hospitals, schools, and public transportation should be made of value in society. Regular publications on noise pollution through local media channels and digital platforms also help maintain public awareness.

3.What are the ecological solutions?

Ecological solutions to noise pollution aim to develop environmentally sound and sustainable methods by utilizing the sound-absorbing, reflection-reducing, and visual-blocking properties offered by nature. When supported by engineering-based techniques, these solutions provide lasting benefits for both human health and ecosystem integrity (Bayramoğlu et. al., 2025). Due to the high costs and unaesthetic appearance of barriers used to prevent traffic noise, especially in urban environments, the idea of using plants in screening works is considered as an important alternative (Yeşil et. al., 2015; Doygun & Doygun, 2018).

Vegetative noise barriers emerged due to the incompatibility of structural noise materials with the environment. Due to the aesthetic appeal of these practices and their lack of acceptance by the local community, their use has been suggested in recent years (Şahin & Barış, 2023). Vegetative buffers have the potential to reduce noise to levels that allow for normal outdoor activities. Vegetative noise barriers not only reduce noise but also contribute to its ecological benefits.

Green barriers and vegetative landscaping are among the most common ecological methods for reducing noise pollution. They consist of vegetative material planted along roadsides, in industrial zones, or around residential areas. Densely deciduous trees, shrub clusters, and groundcovers reduce noise levels by dampening sound. Plant clusters of varying heights and densities help disperse and absorb sound waves(Eren et.al.,2018). Vertical gardens and green walls applied to urban buildings also offer both aesthetic and acoustic benefits (Figure 4).

Figure 4. Green barriers and vegetative landscaping (URL-5; URL-6)

The use of natural topography and earthen(Figure 5) embankments reduce noise. Artificial hills covered with vegetation serve as visual and acoustic barriers, blocking road and industrial noise. Such natural-looking barriers offer a more ecosystem-compatible solution than concrete barriers. Natural topography provides a significant advantage in noise control. Land slopes, hills, and valleys can deflect or block sound waves. Separating residential areas from roads, railways, or industrial facilities with natural elevations reduces noise pollution without additional artificial barriers. Therefore, the acoustic effects of natural terrain should be considered in urban and rural planning.

Earthen bunds (Figure 5) are one of the most frequently used artificial solutions for reducing noise pollution. Typically constructed along roadsides or in industrial areas, these bunds act as a raised barrier between the sound source and residential areas. Planting grass, shrubs, or trees on earthen bunds both enhances sound insulation and provides visual aesthetics. This provides a more natural, environmentally sound, and ecological solution than concrete barriers. Earthen bunds are particularly effective in preventing traffic-related noise. The height and slope of the bund dampen the sounds generated by vehicle tire-road contact, engines, and horns, dissipating them before they reach residential areas. Furthermore, the porous structures within earthen bunds can absorb sound waves.

Figure 5. Earthen bunds (URL-7; URL-8)

Water features and wetlands(Figure 6) also play an important role in ecological noise control. Artificial ponds, water channels, and wetland plants provide aesthetic and psychological relief in urban areas. They also help mask unwanted noise with the natural sounds of water. They are particularly effective in parks, squares, residential complexes, and recreational areas. The sound of flowing water, waterfalls, fountains, or ponds reduces the perception of disturbing noise. Densely vegetated wetlands provide acoustic insulation like green barriers and increase biodiversity. Furthermore, reclaimed wetland projects create ecological zones that buffer noise in transitional zones between urban and natural environments. Rather than directly reducing noise pollution, water features and wetlands play a complementary role in ecological noise control by masking it with natural sounds, providing acoustic insulation through planting, and providing psychological relief (Eşbah et. al., 2022). The Arcata Marsh & Wildlife Sanctuary – Arcata, California (USA) is built on a biological wastewater treatment system that includes oxidation ponds, artificial wetlands, and improved marshlands. These areas, equipped with reeds and other marsh plants, not only clean the water but also create a natural habitat, making noise and adding aesthetic value.

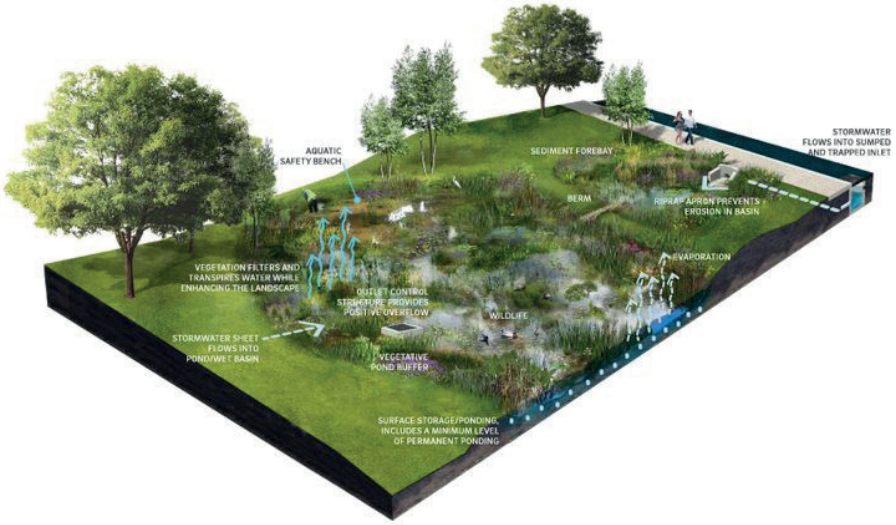

Figure 6. Water features and wetlands (URL-9)

Forest belts and green corridors(Figure 7) are important ecologically based tools for reducing noise pollution. Multi-layered plant communities consisting of trees, shrubs, and groundcovers absorb, scatter, and refract sound waves. This reduces the intensity of high-frequency sounds (Eren et. al., 2020). An example of a sound barrier made of natural materials covered with vegetation—providing both visual aesthetics and noise-absorbing functions. Plants placed on a wire structure above the artificial barrier create an urban aesthetic effect along with acoustic performance.

It also provides psychological relief. When vegetation obscures the noise source, people perceive sound as less disturbing. Research shows that a dense forest belt 30 meters wide reduces noise levels by approximately 5–8 dB, while a 100-meter-wide belt reduces up to 10–12 dB. Green corridors act as buffer zones between busy roads and residential areas. For example, extensive forest belts established along highways in Germany and the Netherlands are used to reduce both noise and air pollution. Similarly, green corridors between city parks and residential areas in Japan create quiet zones that enhance social peace. Very narrow and sparse plantings cannot adequately block noise. Belt width, tree density, and species selection are crucial for successful noise control. For example, evergreen, densely textured, and layered trees and shrubs are more effective.

Figure 7. Forest belts and green corridors (URL-10; URL-11)

The London Green Belt (England) protects agricultural, forest, and natural areas on the city's periphery, limiting residential and industrial development. This buffer zone reduces traffic and industrial noise levels that infiltrate residential areas. The Seoul Green Belt (South Korea) has not only preserved air quality and quietness within the city but also prevented uncontrolled construction. Furthermore, parks and tree plantings along the green belt have created "quiet escape zones" for city residents.

Sound barriers from ecological materials (Figure 8) can also be preferred for sustainable noise control. Acoustic barriers made from CLT (cross-laminated timber) or recycled wood panels offer an environmentally friendly solution with a low carbon footprint. Sound barriers from ecological materials provide both ecologically friendly and acoustic effective solutions compared to traditional concrete or steel barriers. The way they block noise depends on the structure and acoustic function of the material used. Thanks to their porous structures, wood, bamboo, composite natural fibers (e.g., hemp, flax), and recycled materials prevent sound from reflecting from hard surfaces. While concrete barriers reflect sound to the source, ecological materials absorb and disperse sound waves. This makes high-frequency traffic and machinery noise less disruptive.

Figure 7. Sound barriers from ecological (URL-12; URL-13)

4. Conclusions

Urbanization, technological advances, and industrialization have led to an increasing presence of noise in human life. Noise pollution is one of the most significant forms of pollution today. It brings with it numerous health problems and illnesses. The increasing number of vehicles negatively impacts all urban life, especially hospitals, educational facilities, and city parks, where noise levels are expected to be minimal (Özer, 2014). Noise pollution is one of the most significant environmental problems of modern urban life, threatening human health and the integrity of ecosystems. Therefore, ecologically based solutions are as crucial as technical measures in controlling noise. Using natural topography and earthen embankments, the sound masking provided by water features and wetlands, the buffering effect of forest belts and greenways, and sound barriers manufactured from ecological materials reduce noise levels and contribute to environmental sustainability.

These methods are not limited to physical noise reduction; they also provide multifaceted benefits such as aesthetic value, psychological relaxation, biodiversity conservation, and carbon footprint reduction. Therefore, ecological solutions allow for developing a holistic, sustainable, and nature-compatible approach to noise pollution. Integrating ecological noise control methods with technical applications in future urban planning studies will significantly contribute to creating healthier living spaces and protecting the natural environment.

From this perspective, they should be integrated into urban planning. Green belts, forest strips, and wetlands should be placed as buffers between noise sources and residential areas in urban plans, considering noise maps. Materials should be implemented with ecological consideration. Instead of concrete walls, sound barriers made of environmental materials such as wood, bamboo, and hemp should be used and supported by planting. Community participation and collaboration also increase the effectiveness of social measures. Municipalities, environmental organizations, and professional chambers can develop noise prevention projects jointly. Volunteer noise

monitoring networks established in neighborhoods will help identify noise violations. Implementing quiet hours in common areas such as parks, gardens, and beaches contributes to maintaining public peace. Legal and administrative practices supporting these measures are also essential.

The use of water features should be increased by creating wetlands in cities. For acoustic masking and aesthetic benefits, water features should be placed in parks, squares, and recreational areas. Policies and local regulations should be encouraged. Local governments should legislatively promote ecological solutions to reduce noise pollution and make these methods mandatory in green space planning. Furthermore, public awareness should be raised. Raising public awareness of the benefits of ecological solutions will increase social ownership. Public awareness campaigns should convey the adverse effects of noise on human health to the public. Seminars and events in schools can instill a culture of silence in children. Furthermore, informational activities conducted through neighborhood meetings, local associations, and civil society organizations will enable access to all segments of society.

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Chapter 8

SUSTAINABLE ARCHITECTURE IN EARLY CHILDHOOD EDUCATION: ECOLOGICAL SCHOOLS AS LEARNING ENVIRONMENTS

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1. INTRODUCTION

Today, environmental problems experienced on a global scale are not limited to the depletion of natural resources; they lead to multidimensional crises such as climate change, loss of biodiversity, pollution, and social injustice. The most fundamental step in preventing these problems is to develop environmental awareness in societies. However, this awareness can only become permanent if individuals are raised with ecological consciousness from an early age. The behaviors children acquire in their early years determine their lifelong habits and values. Therefore, the sustainability-focused design of educational structures is not only a pedagogical but also a social and environmental responsibility.

The concept of sustainability redefines individuals' responsibilities towards nature and society, transforming education into a learning process where this responsibility is internalized. Education provided at an early age, in particular, enables individuals to undergo a transformation in their level of environmental awareness, values, and behavior. In this regard, the concept of Education for Sustainable Development (ESD) provides both a pedagogical and ethical framework. As defined by UNESCO (2020), ESD is a learning process that enables individuals to make informed decisions and take responsible actions in line with environmental integrity, economic sustainability, and social justice.

Early childhood is the most critical stage of this learning process. Preschool and elementary school years are a period when children are most receptive to learning and their behaviors and habits are rapidly shaped. Positive habits acquired during this period enable individuals to become both environmentally conscious citizens and active individuals seeking solutions to global problems. The school where children are educated is not just a place for the transfer of knowledge; it is also a living space where values, attitudes, and behaviors are shaped. Therefore, school structures centered on sustainability principles strengthen children's ecological awareness by enabling them to establish a direct relationship with nature.

Sustainable school buildings are important tools that enable children to learn by experiencing the knowledge they acquire in theory in their daily lives. These buildings offer environmentally conscious solutions in terms of energy, water, and material use while also supporting pedagogical functions. For example, storing rainwater for irrigation, generating energy with solar panels, or using natural ventilation systems not only increases resource efficiency but also allows children to directly experience environmentally friendly practices. In this way, the school serves as a "living laboratory" for children.

Traditional school buildings are mostly designed as spaces that aim to provide uniform education, leaving students in a passive position. However, expectations from education have changed today. The role of schools is no longer just to impart academic knowledge; supporting individual learning

methods, developing problem-solving skills, encouraging creativity, and preparing students for global citizenship are also among their fundamental tasks. Sustainable schools play a critical role in this regard. These structures are not only equipped with environmentally friendly systems, but also provide students with a healthy, safe, and inspiring learning environment.

Another important function of sustainable schools is to raise social awareness. These structures send a message not only to students, but also to teachers, parents, and the surrounding community. The architecture of the school, the materials used, energy production methods, and landscaping can transform communities' perceptions of the environment. In this context, the school becomes a public focal point that exemplifies sustainable living in its surroundings.

This chapter examines the concept of sustainability in educational structures in a multidimensional way, focusing on the early childhood period. The aim of the study is to examine how the principles of sustainable architecture are embodied in preschool educational structures and to reveal the effects of these structures on children's environmental awareness and learning processes. The chapter establishes the relationship between sustainability and education on a theoretical basis through a literature review; it then discusses the principles of sustainable space design for the early childhood period. Finally, the reflections of these principles in practice are evaluated through fieldwork conducted using national and international examples.

2. LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1. Sustainability and Education

The concept of sustainability is an issue that has come to the fore for people to fulfill their responsibilities towards themselves and nature in preserving the balance of the ecosystem. It necessitates changing existing habits and introducing new habits that can develop or transform as appropriate. In the report "Our Common Future" published by the United Nations in 1987, sustainability is defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). This emphasizes that environmental responsibility is based on the principle of intergenerational justice, and that today's decisions must be made in a way that ensures justice not only for the current generation but also for future generations (Gilman, 1990).

"SDG 4-Quality Education," included in the Sustainable Development Goals (SDGs) set by the United Nations, is seen as a key tool in achieving all other goals. Education is not only a result of sustainable development but also the most powerful tool for achieving it. In this context, the concept of Education for Sustainable Development (ESD) aims to promote social transformation by providing individuals with knowledge about sustainable development (Steffen et al., 2015).

ESD has been systematically addressed by UNESCO since 1992 and was given a global framework through the 2005–2014 "Decade of Education for Sustainable Development" program. According to UNESCO, ESD aims to equip individuals with "the ability to make informed decisions and take responsible actions in line with environmental integrity, economic sustainability, and social justice, while respecting cultural diversity in the process" (Zhou and Lee, 2022).

Integrating the concept of sustainability into education enables individuals to understand the interdependence between nature, society, and the economy and to realize that they are part of these systems. In this sense, education is a learning process that enables individuals to undergo transformation in terms of environmental awareness, values, and behavior. ESD aims not only to convey environmental knowledge theoretically but also to help students internalize sustainability principles through experience, observation, and participation in their daily lives.

UNESCO (2020) has identified five key areas of action for implementing ESD. One of these areas is "promoting learning environments that support sustainable lifestyles." Therefore, integrating sustainability into education is not limited to the curriculum; it is directly related to the physical, social, and cultural environments of educational structures. This approach is also highlighted in "SDG 11 - Sustainable Cities and Communities." In this context, school spaces stand out as important educational environments where sustainability principles are embodied and environmental values are learned through daily experience.

2.2. Sustainable Design for Early Childhood

According to Davis (2010), developing environmental awareness in individuals from early childhood is one of the most important steps in the ESD approach to achieve a more sustainable world. This is because early childhood is a critical developmental stage during which individuals become familiar with their surroundings, interact with nature, and form the foundations of environmental awareness. During this period, children's interactions with their physical environment play a decisive role in their cognitive, emotional, and social development (Arslan Karaküçük, 2008).

The school is a multi-layered learning environment that shapes an individual's behavioral development through all its components. A well-designed school environment supports children's motivation, attention, curiosity, and sense of discovery while also strengthening their motor skills and self-regulation abilities (Bower et al., 2008). Therefore, the architectural quality of school buildings is directly related to the quality of pedagogical processes. Maiden and Foreman (1998) stated that the physical conditions of educational

structures greatly affect students' behavior and success. Meek (1995) considered the perception of architectural elements as part of the learning process to be one of the fundamental conditions of modern educational reform.

Educational structures are one of the most important spaces where the culture of sustainability is embodied. School buildings are not only places where knowledge is transferred; they are also dynamic learning spaces where sustainable lifestyles are experienced and interaction with the environment takes place. Prakash and Fielding (2007) state that energy-efficient systems provide children with direct experience in energy use and interaction with the environment, while Taylor (2009) argues that leaving some of the systems exposed for students to observe can transform the structure into a living experiment and museum space, fostering awareness among students.

Murphy and Thorne (2010) define the concept of sustainable schools based on the principles of efficient use of energy and water, waste management, support for natural life, and encouraging user participation. Such schools are important not only in terms of environmental performance but also in terms of developing environmental awareness, a sense of responsibility, and social awareness among students. Tonguç and Özbayraktar (2017) define sustainable schools as "living laboratories" where students can directly observe nature, energy, and resource cycles. In this understanding, the building is not just a physical shelter; it becomes a teaching tool integrated with nature, energy, water, and the waste cycle. A sustainable school has a mission to reduce vehicle use, change eating habits, and demonstrate energy-saving behaviors (Tonguç and Özbayraktar, 2017).

Ford (2007) and Gelfand (2010) have demonstrated that such designs improve students' academic performance, attention span, and teachers' job satisfaction; thus, sustainable school environments enhance educational efficiency. Gelfand (2010) also lists the benefits of sustainable schools as follows: higher student achievement, lower operating costs, increased teacher satisfaction, extended building life, and reduced environmental impact. Structures designed for this purpose must be developed around specific criteria. Features such as sufficient daylight, color choices, energy-efficient design, better indoor air quality, acoustic comfort in classrooms, durability, and the selection of easy-to-clean materials should be taken into consideration.

Ford (2007) emphasizes that environmentally friendly school designs should not only be energy-efficient structures but also spaces that are "rich in architectural character" and pedagogically stimulating. According to him, sustainable schools are based on high-performance design principles, which include efficient water use, energy efficiency, indoor air quality, use of recycled materials, and transportation options that are integrated with the environment. The design tools Ford proposes consist of environmentally

sensitive applications such as rainwater harvesting and treatment systems, photovoltaic and geothermal energy use, natural ventilation and solar chimneys, recycled materials, and green roofs.

Similarly, Taylor (2009) also approaches sustainable school design not merely as a technical energy efficiency issue, but as a "process that enhances the livability of learning environments." According to Taylor, in planning schools as sustainable living spaces, spatial arrangements that enable students to interact with nature are as important as ecological parameters such as location selection, solar orientation, and wind and water reuse. Design potentials include making the water cycle visible, creating transition areas with courtyards and shade structures, encouraging agriculture and nature-based learning areas, involving students in maintenance and responsibility processes, and using local architectural and landscape elements.

In parallel with these approaches, Gelfand (2010) has also summarized the key determinants of successful sustainable school designs under four main elements: effective use of natural daylight, energy performance of the building envelope and structure, efficiency of heating, ventilation, and cooling systems, and linking landscape design to environmental integrity.

The different perspectives of Ford, Taylor, and Gelfand converge on a common framework for sustainable school design: conservation of energy and water, natural ventilation and lighting, user health and comfort, material sensitivity, integration with the landscape, and pedagogical experience. These criteria not only enhance environmental performance but also serve to create holistic learning environments that encourage students' interaction with nature and strengthen their awareness and sense of responsibility.

3. CASE STUDY

In accordance with the studies evaluated in the literature, this section examines sustainable school buildings for the early childhood period based on the specified criteria. The aim of the study is to reveal how sustainable design principles are interpreted in different geographical, climatic, and cultural contexts and to evaluate how ecological, economic, and pedagogical approaches are reflected in architectural design.

Within this scope, five early childhood education structures that stand out in the world architecture literature and are considered examples of sustainable design at national or international platforms have been selected. These examples vary in terms of scale, climatic conditions, design approach, and cultural context, allowing for a comparative analysis of different sustainability strategies.

The evaluation criteria, aimed at determining the environmental and pedagogical performance of sustainable educational structures, are grouped

under the following headings:

- Orientation: The building's compatibility with climatic conditions, its relationship with sunlight and prevailing wind directions.
- Planning: The functionality of spatial organization, circulation design, and compatibility with user needs.
- Climate: The impact of local climate data on design, its contribution to energy requirements and comfort conditions.
- Landscape: The building's relationship with the natural environment, use of green spaces, and nature-based learning potential.
- Passive Systems: Energy efficiency through natural lighting, ventilation, heating, and cooling solutions.
- Active Systems: Use of renewable energy (solar panels, wind turbines, heat pumps, etc.) and the level of integration of these systems with the architecture.
- Materials and Water Conservation: Environmental impact of building materials, recyclability, water collection and reuse systems.

These criteria ensure a comprehensive examination of the fundamental elements that guide sustainable school design. The assessment focuses not only on environmental performance but also on the potential of buildings to support children's learning experiences, increase interaction with nature, and strengthen sustainability awareness.

To identify the characteristics that influence design, successful examples located in different climate zones and designed with different architectural approaches were examined. These examples provide a comparative view of how sustainability principles are interpreted in educational buildings:

1. Kingsmead Primary School – Cheshire, England (2004)
2. Heidenau Kindergarten – Heidenau, Germany (2008)
3. Barbapapà Kindergarten – Vignola, Italy (2009)
4. Farming Kindergarten – Bien Hoa, Vietnam (2013)
5. Kadıköy Municipality Bahriye Üçok Kindergarten – Istanbul, Türkiye (2015)

The reason for selecting these structures is that they allow for a comparison of how sustainability principles are applied in different cultural and climatic contexts. Thus, through examples from both European and Asian geographies,

the relationship between universal principles of sustainable school design and local approaches is revealed.

3.1. Kingsmead Primary School, Cheshire, England, 2004

Kingsmead Primary School has pioneered sustainable school design in England with its structure that balances passive and active systems. The design approach of the building ensures energy efficiency while also allowing students to learn by observing environmental processes. The 250-student school was built in response to population growth in the surrounding residential areas. The project is a result of Cheshire County Council's sustainable construction policy and the Department for Education and Skills' (DfES) Future Schools Project (Gökmen, 2012).

Orientation: The building extends along an east–west axis; classrooms are located to the north, while administrative and service units are situated to the south. This layout provides balanced daylight throughout the year and limits excessive heating in summer. The facade form and openings are designed to optimize daylight control throughout the day. The ability of students to learn under natural light in all seasons is considered one of the fundamental principles of pedagogical comfort (DfES, 2006).

Planning: The spatial layout is based on an integrated learning approach with the environment. The central curved corridor acts as a spine connecting the classrooms; each classroom has its own individual garden or winter garden opening onto the outdoor space. This allows students to maintain constant visual/physical contact with nature, creating a permeable learning environment between indoor and outdoor spaces. Winter gardens are used as play and observation areas while regulating microclimate transitions between spaces (DfES, 2006).

Climate: A directional strategy compatible with the climate conditions of Northwest England has been adopted. In Northwich, summers are mild and partly cloudy; winters are long, cold, windy, and very cloudy. Annual temperatures generally range from 2–20°C; temperatures below -3°C and above 26°C are rare (URL-1). In keeping with Cheshire's temperate maritime climate, the building has been constructed with materials resistant to high humidity and variable temperatures. Window openings are arranged according to prevailing winds, and natural ventilation is supported (DfES, 2006).

Landscape: Spaces opening onto winter gardens and green areas establish a direct connection with nature. Gardens where students can grow plants support nature-based learning. Permeable surfaces that help collect and direct rainwater have been preferred in the environmental design (DfES, 2006).

Passive Systems: Natural lighting, cross ventilation, and thermal buffer zones work together. The school, which receives light from four sides, has two large skylights in each classroom; many areas, including corridors, the library, and the hall, benefit from daylight (Gökmen, 2012). Winter gardens reduce the need for lighting throughout the day; the highly insulated shell reduces energy loss.

Active Systems: Part of the energy requirement is met through a biomass boiler and photovoltaic panels. Approximately 20% of hot water is obtained from solar panels. These systems have been made visible to users and integrated into the educational process. The electronic display panel shows children how rainwater is collected, and in rainy weather, these panels are used as educational tools for children's math and geography lessons (DfES, 2006).

Material and Water Conservation: Sustainable laminated wood is used in the carrier, and recycled glass wool insulation is used on the walls. Low-emission, argon-filled double-glazed windows increase thermal performance. The rainwater collection system recovers approximately 30% of the water used in toilets (DfES, 2006) (Figure 1).

Figure 1. Images of Kingsmead Primary School (Source: DfES, 2006)

3.2. Heidenau Kindergarten, Germany, 2008

The fundamental principle in the design of Heidenau Kindergarten is to integrate the structure harmoniously with its surroundings. The south-facing mass tapers eastward from the highest point, blending with the existing hill. The flat roof form, which appears to rise from the terrain and creates a wave effect, supports this organic concept. Vibrant colors accentuate the entrance; access to the roof is provided via a walkway from the east facade, transforming the roof into a play area for children (URL-2).

Orientation: Considering the region's prevailing climate data, the mass is oriented towards the south. Classrooms and play areas with large openings are located on the south side; on the north facade, openings are kept to a minimum to limit wind effects. The gently sloping roof form creates variable ceiling heights indoors, offering a child-scale spatial experience, while also ensuring controlled drainage of rainwater (URL-3).

Planning: The plan, designed on a wave form that follows the natural slope, offers spatial continuity and flexibility with wide corridors. The school educates 72 students each year and includes 4 group rooms, a workshop, a computer room, 4 play areas, a theater room, and a kitchen reserved for children (URL-4).

Climate: Heidenau has a warm/temperate climate with significant rainfall; the annual average temperature is 9.5°C, and rainfall is 881 mm (URL-5). To maximize solar gain, large openings are used on the south facade; openings are reduced on the facade facing the prevailing north wind. This increases solar gain in winter while limiting thermal bridges on the north side (URL-3). Heat recovery ventilation is used in the building; the heat from the exhaust air is recovered to reduce energy loss. Triple-glazed low-emissivity glass reduces heat loss and improves acoustic comfort (URL-6).

Landscape: The green roof integrates the structure with the landscape; it creates a microclimate effect and works in conjunction with garden areas that support educational and recreational activities. The green roof contributes to the water cycle by storing part of the rainwater. During the building's landscape design process, trees were planted on the south and west facades, where sunlight is intense during the summer months, to provide shade (URL-6).

Passive Systems: Movable wooden panels on the facade and eaves on the roof shell provide seasonal light control and reduce energy consumption. Large openings allow daylight to penetrate deep into the interior, while passive solar gain is achieved during winter months. The need for mechanical heating has been minimized (URL-3).

Active Systems: Solar panels are used in the building to harness solar energy, significantly reducing the energy load of the heating system. Fresh air is also supplied to the building via a heat recovery ventilation system. Underfloor heating is used to provide the basic heat requirement when the ventilation system is not operating and as an additional source during the heating phase. Minimum temperature monitoring is performed in the building; if the temperature drops below 17°C, the ventilation system activates to prevent the temperature from dropping further (URL-6).

Material and Water Conservation: Wooden structures were preferred for their low carbon emissions and use of local resources. Natural stone wool insulation is used on the facade and interior spaces; the shell performance has been enhanced with bricks with high insulation values on the walls (URL-3). The green roof provides approximately 50% water conservation; rainwater is stored and used for watering green areas (Tonguç and Özbayraktar, 2017).

Figure 2. Heidenau Kindergarten Images (Source: Top row URL-2, others URL-6)

3.3. Barbapapa Kindergarten, Vignola, Italy, 2009

Barbapapa Kindergarten is a structure that stands out for its relationship with the slope, designed as a result of a competition. The aim of the design concept is to develop an architectural expression with a sustainable theme that integrates with nature and the landscape of the region (URL-7).

Orientation: Suitable for the Mediterranean climate, the mass faces southeast, with classrooms positioned to receive maximum daylight; the north facade is protected from the wind. While learning spaces face the open area, technical spaces such as laboratories are placed facing the land.

Planning: In the linear plan scheme following the slope of the topography, the corridors are designed to create a Trombe wall effect; the stored heat is distributed evenly throughout the interior spaces. Building 1 provides full-time education for 60 students with a multipurpose hall and 4 learning areas. All learning spaces are located on the southeast side; each classroom opens directly onto the open play area, strengthening the indoor-outdoor relationship (URL-7).

Climate: The region where the building is located, Vignola, has a warm and temperate climate, receiving significant rainfall throughout the year (URL-8). Due to the hot summers and mild winters, natural ventilation has been prioritized in the building. Importance has been given to ideal orientation according to the climate, and learning spaces in the building have been placed on the south facade, with large windows used on this facade to provide optimal lighting. On facades dominated by wind, fewer and smaller windows have been preferred. At the same time, skylights are another element that provides natural light to the spaces.

Landscape: The green roof application and the planting areas spread throughout the environment both reduce the heat island effect and create a natural learning environment. The garden areas reserved for children support nature-based learning through planting and observation activities (URL-7).

Passive Systems: Roof windows enhance natural lighting, reducing the need for artificial lighting throughout the day. In the single-story structure, the floor height is not kept constant, and the resulting variations in the building create openings that provide both natural lighting and natural ventilation. The windows in these openings can be manually controlled, optimizing the benefits of natural ventilation. The buffer zone function of the corridors increases interior comfort by maintaining energy balance. Sunshades are used on the facade of the building where the multipurpose hall is located to provide protection from climatic factors (URL-7).

Active Systems: Solar collectors and PV panels convert sunlight into electrical energy to generate electricity and hot water. These systems have resulted in significant energy savings. Geothermal probes, which trigger heat exchange between the ground and the thermal pump, make an important contribution to heating (URL-7).

Material and Water Conservation: Local stone and wood materials were preferred; the building was made to comply with a holistic sustainability approach using products with a low carbon footprint. The rainwater treatment system ensures that treated water is used in toilets and green areas (URL-7).

Figure 3. Barbapapà Kindergarten visuals (Source: Images URL-7, drawings URL-9)

3.4. Farming Kindergarten, Bien Hoa, Vietnam, 2013

Located in Vietnam, a country known for its agriculture, the building is designed to help children learn about sustainable living and shape their habits accordingly. It is designed in a spiral shape surrounding three inner

courtyards. With its green roof, green facade, agricultural areas, and landscaping, the Farming Kindergarten is designed as a truly green building with the aim of enabling children to learn through experience (URL-10).

Orientation: The Farming Kindergarten is designed with a circular layout, taking into account wind and sun directions to adapt to the climate. The spiral-shaped structure allows for open air circulation in all directions while also receiving light from all sides.

Planning: The building contains 18 classrooms, including activity areas, cooking, health, art, music, play, and exercise rooms, and the spaces are located around corridors facing the courtyard. The three-courtyard plan directly connects with the green roof. Classrooms, circulation areas, and agricultural terraces intertwine, reinforcing the metaphor of a "learning journey." Children interact with nature at every point in space (URL-10).

Climate: The city of Bien Hoa, where the building is located, has a tropical monsoon climate, with more rainfall in the summer months than in the winter months. The annual average temperature is 26.9 °C, and the average rainfall is 1960 mm (URL-11). The building operates entirely on natural climate control principles; cross ventilation eliminates the need for mechanical cooling. Tropical humidity and temperature are balanced by form and openness ratios; classrooms can be operated without air conditioning (URL-12). Rainwater is utilized for plant cultivation, in line with the region's high rainfall (URL-13).

Landscape: The green roof provides both agricultural production and thermal insulation. Children experience nature directly by growing vegetables and fruits. Water collection areas in the courtyards provide natural coolness and support the local ecosystem (URL-13).

Passive Systems: The building has a passive energy balance based on the principles of natural lighting, shading, and airflow. The educational spaces within the building are oriented towards the interior and exterior facades to maximize the use of natural lighting. Sunshade systems installed on the building facade and the vines covering these systems serve as natural shading elements (URL-13). Large windows on both sides of the building, designed to maximize light and fresh air intake, allow daylight to enter and provide natural airflow through cross ventilation, eliminating the need for an air conditioning system (URL-12).

Active Systems: Solar panels provide energy to water pumping systems and lighting units. Furthermore, all these systems are visible, making them an educational tool for children (URL-11).

Material and Water Conservation: Local brick and reinforced concrete systems were used, making the structure low-cost and easy to maintain. Rainwater is stored and used to irrigate the green roof (URL-13).

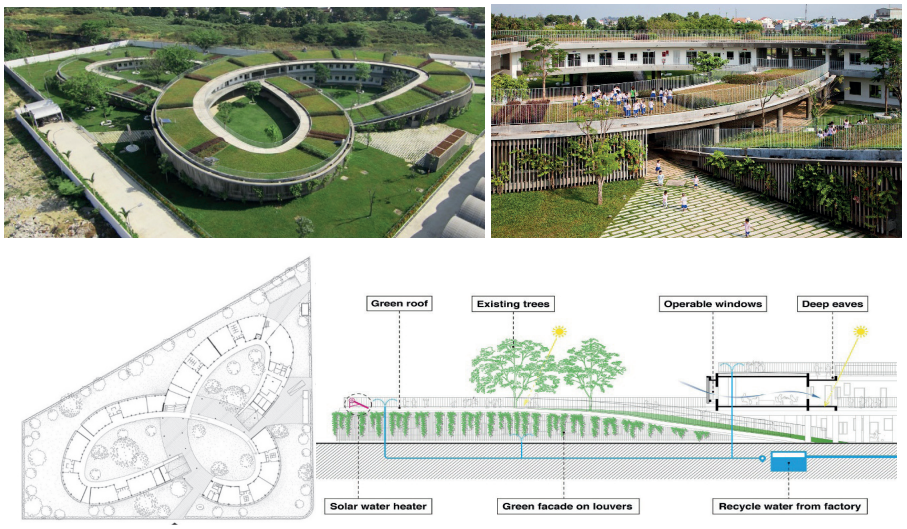

Figure 4. Farming Kindergarten Images (Source: URL-10)

3.5. Kadıköy Municipality Bahriye Üçok Kindergarten, İstanbul, Türkiye, 2015

Known as Türkiye's first kindergarten in terms of sustainable architectural design and ecological environment applications, it has been operating since 2016 and provides education to children aged 3-6 (Kızılkan and Türkyılmaz, 2021). The building was designed based on the concept of "a house created with origami," and the design was developed accordingly. The forms and functional approaches created on the building's facade and roof were shaped within this concept, creating a sincere playhouse suitable for children's scale (Kaya and Kaya, 2019).

Orientation: The kindergarten is located at a sufficient distance from the surrounding buildings to receive sunlight and beneficial wind effects. The structure is designed to face southwest to adapt to Istanbul's temperate climate. This orientation maximizes daylight utilization and naturally balances the interior temperature (Kaya and Kaya, 2019).

Planning: The modular plan creates permeability between open, semi-open, and closed spaces. The placement of learning spaces on the south, southwest, and east sides and administrative units on the east side provides energy gains. Areas with low daylight requirements and limited circulation are located in the basement to reduce the heating load. The areas above ground are landscaped for children's outdoor play and the ecosystem (Kaya and Kaya, 2019).

Climate: Kadıköy has a warm and temperate climate, with hot and dry summers and mild and rainy winters (URL- 14). Natural ventilation systems and shading elements provide coolness in summer while reducing heat loss in winter. Movable panels used in the facade design offer seasonal control. Plants selected according to the climate have been planted around the building to reduce the heat island effect.

Landscape: Open areas are equipped with playgrounds, sand pits, walking paths, ecological farming areas, and landscaping elements compatible with the surrounding vegetation. Permaculture gardens around the building allow children to gain environmental awareness through agriculture and nature activities. The landscape design is continuous with play areas and green roofs (Kızılkan and Türkyılmaz, 2021).

Passive Systems: Natural lighting strategies are provided by large openings on the facade and skylights. Skylights are the elements that provide natural light to the kindergarten's learning spaces and common hall. These windows provide sufficient lighting for the environment. Movable sunshades have been added to the facade to reduce the amount of sunlight entering the learning spaces located on the south and west sides of the site. Additionally, the building form on the west facade has been shaped to deflect sunlight. This ensures that sunlight, which varies according to climatic conditions, is controlled as it enters the space (Kaya and Kaya, 2019).

Active Systems: The building's roof features photovoltaic solar panels facing entirely south and a green roof application that also contributes to climate control (Kızılkan and Türkyılmaz, 2021). Part of the building's energy requirements are met through photovoltaic panels. Another active system feature is the use of rainwater in the building or its surroundings, the control of the amount of water used in the building, and the treatment and reuse of gray water.

Material and Water Conservation: Building materials sourced locally and certified as recyclable and ecological were specifically selected. Natural wood and linoleum were used indoors, while prefabricated concrete panels were used on the facade. The choice of materials is sustainable in terms of both health and ease of maintenance (URL-15). Rainwater is collected at the kindergarten and used for garden irrigation and in toilets in wet areas. Additionally, water consumption can be reduced in wet areas using sensor-operated faucets or step-by-step flush systems (Kaya and Kaya, 2019).

Figure 5. Kadıköy Municipality Bahriye Üçok Kindergarten images (Source: URL 16)

4. EVALUATION AND CONCLUSION

The five school buildings examined in this study reveal how sustainability principles are interpreted within different climatic conditions, cultural contexts, and technological capabilities. Although each structure is shaped according to the climatic data, local resources, and social needs of its geography, they all converge on a common goal: to produce energy-efficient, healthy, and responsive educational spaces that support learning in interaction with the environment. Here, sustainability is not merely a technical performance indicator, but a process integrated into education itself, developing children's environmental awareness and sense of responsibility. Therefore, the schools examined are examples that have embraced sustainability not just as an architectural strategy, but as a pedagogical culture.

In all examples, the building is designed not merely as a shelter or educational shell, but as an active component of learning. Solutions such as energy and water monitoring panels, visible plumbing systems, controllable shading elements, and productive agricultural roofs have provided children with the opportunity to observe environmental systems and experience causal relationships. This approach transforms sustainability from an abstract concept into a form of learning that translates into behavior; thus, these

structures stand out not only for their technical achievements but also for their educational impact.

Table 1. Comparative analysis of the 5 building examples examined

Category / Subheading	Kingsmead Primary School	Heidenau Kindergarten	Barbapapà Kindergarten	Farming Kindergarten	Bahriye Üçok Kindergarten
Orientation and Planning					
East–West					
North-South					
Design according to wind direction					
Child-friendly spaces					
Climate Adaptation					
Design based on local climate data					
Landscape					
Green roof application					
Nature-based learning garden					
Passive Systems					
Natural lighting					
Natural ventilation					
Shading elements					
Cross ventilation					
Active Systems					
Solar panels (PV)					
Geothermal system					
Smart systems					
Biomass boiler					
Material and Water Conservation					
Local/natural materials					
Recycled materials					
Rainwater/gray water recycling					
Pedagogical Features					
Educational use of energy systems					
Landscape as a learning tool					
Visual/interactive environmental awareness					

When examining country differences in application examples, it is observed that in countries with strong sustainability policies, such as Kingsmead Primary School in the UK and Heidenau Kindergarten in Germany, environmental performance is addressed in a measurable and systematic manner. Barbapapà Kindergarten in Italy has developed a design approach integrated with the location by combining the Mediterranean architectural tradition with contemporary sustainability principles. This structure emphasizes the concept of "cultural sustainability" with its use of local materials and simple technological solutions. The Farming Kindergarten in a tropical climate embodies the ecological learning laboratory model with its low-cost but highly effective solutions. This example proves that integrating natural cycles with pedagogical awareness, rather than technological intensity, yields the most effective results. The Bahriye Üçok Kindergarten in Türkiye is an important example in terms of demonstrating the applicability of sustainable architecture at the local government level. The integration of solar energy use, rainwater and greywater systems, and permaculture gardens into the learning program proves that environmental awareness can be supported at the local level through educational tools. This project demonstrates that sustainable school design in Türkiye can be approached not only as a technical project but also as a social awareness project.

When comparing the structures examined, the following situations were identified (Table 1):

- **Orientation**- In cold/temperate climates (England, Germany), south-facing orientation and limiting openings on the north facade increased heat gain and reduced heat loss. In tropical climates (Vietnam), spiral/circular designs that allow for multi-directional airflow have been favored over single-directional orientation. In temperate–Mediterranean contexts (Italy, Istanbul), shading elements have balanced south–east/south–west orientation.

- **Planning**- In all examples, the permeability between interior and exterior spaces is strong. The direct relationship between classrooms and gardens at Kingsmead and Bahriye Üçok; the wave form at Heidenau; the linear buffer corridor at Barbapapà; and the continuity of the courtyard and agricultural terrace at the Farming Kindergarten spread learning to every point in the space. Ceiling heights and intermediate spaces (winter garden, transition zones) appropriate to the scale of children support behavior and attention management.

- **Climate** - Passive strategies are prioritized in all examples: heat conservation and insulation in the north, natural ventilation and shading in the south. Heidenau's heat recovery and triple glazing; Barbapapà's Trombe wall effective corridors; Cross ventilation at the Farming Kindergarten demonstrate how climate adaptation is integrated into the architecture.

- **Landscape** - In all five buildings, landscape is not merely a "backdrop" but a pedagogical tool: Winter gardens and permeable surfaces at Kingsmead; green roof–afforestation at Heidenau; planted play areas at Barbapapà; productive green roof at the Farming Kindergarten; permaculture gardens and green roof at Bahriye Üçok. Landscape has made nature-based learning visible while reducing the heat island effect.

- **Passive Systems**—Daylight, natural ventilation, thermal buffers, and shading have significantly reduced mechanical loads. Roof windows per classroom (Kingsmead, Bahriye Üçok), movable panels (Heidenau, Bahriye Üçok), highly insulated shells (Kingsmead, Heidenau), and seasonal solar control (Barbapapà) are key features.

- **Active Systems** - Active technologies play a supporting role: PV/solar collectors (in all examples in some form), biomass (Kingsmead), geothermal (Barbapapà), PV-supported irrigation/lighting (Farming). All deliver the greatest impact when working in conjunction with passive strategies.

- **Material and Water Conservation** - Local–natural–low VOC materials; recycled content; rock wool and wood structures have reduced the life cycle impact. Rainwater harvesting and grey water use (especially Kingsmead, Heidenau, Bahriye Üçok) have significantly reduced water consumption.

As a result, sustainable school buildings can be defined as living ecological spaces where environmental awareness is integrated with education and learning takes place in constant interaction with nature. This approach develops not only environmental awareness in children, but also their sense of responsibility, cooperation, and observation skills. Sustainable school architecture thus becomes a structural system that educates the environmentally conscious individuals of the future, serving as an educational tool in its own right.

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Chapter 9

THE TRANSFORMATION OF SPACE INTO PLACE IN LANDSCAPE ARCHITECTURE: THE CONVERGENCE OF NATURE AND DESIGN

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1. Introduction

Landscape architecture is an interdisciplinary art and science that reinterprets the relationship between humans and the natural environment, transforming spaces into meaningful places. The transformation of space into place constitutes one of the fundamental focuses of landscape architecture. This process requires not only a physical transformation but also a holistic approach that encompasses the cultural, social, and ecological contexts of the space (Beatley, 2016; Düzenli & Alpak, 2021). While "space" refers to a geographical location, the concept of "place" is shaped by the meanings, experiences, and sense of belonging attributed to that space. Landscape architecture achieves this transformation by integrating natural elements, historical fabric, and human needs to create sustainable and functional designs.

The convergence of nature and design is one of the core principles of landscape architecture. This convergence aims to enhance the quality of human life while preserving the ecological balance of spaces (Yılmaz et al., 2021). Landscape architects are tasked with understanding the character of the natural landscape, analyzing existing ecological systems, and integrating this knowledge into the design process. As a result, spaces become not only aesthetically appealing but also environmentally sensitive and socially inclusive (Karadağ & Yıldız, 2022). Space is not merely a physical entity with boundaries but a dynamic structure shaped by historical, cultural, and ecological layers (Corner, 1999; Kurdoğlu et al., 2013). In landscape architecture, the concept of "the transformation of space into place" refers to the reintegration of human-shaped spaces with the natural environment. This process involves the restoration of natural ecosystems, the enhancement of biodiversity, and the harmonization of space with local components such as topography, climate, and water cycles (Arslan, 2018; Atik & Erdoğan, 2016).

In today's rapidly urbanizing world, the covering of natural areas with artificial surfaces disrupts ecological cycles and weakens the connection between space and place. In this context, landscape architecture emerges as a crucial tool for reintegrating spaces with natural systems (Forman, 2014). Nature-based solutions, green infrastructure, ecological restoration, and biophilic design approaches are among the strategies used to facilitate the transformation of space into place (Spirn, 1998; Thompson & Aspinall, 2011).

This study aims to examine the process of transforming space into place in landscape architecture through the interaction between nature and design. In this context, the physical, cultural, and ecological dimensions of space will be addressed, and the role and contributions of landscape architecture in this process will be discussed. Additionally, through case studies of projects where this transformation has occurred, the ways in which landscape architecture

turns space into "place" and the social and environmental impacts of this process will be explored. This analysis will provide important insights into the current and future potential of landscape architecture. The effects of nature-compatible design approaches on spatial organization, material use, and ecosystem services will be discussed. Furthermore, the critical role of sustainable landscape design in enhancing urban quality of life and combating climate change will be examined. The transformation of space into place is not merely a physical change but also a reconstruction of spatial identity, social belonging, and ecological awareness. In this regard, the innovative solutions offered by landscape architecture will contribute to both the preservation of natural systems and the strengthening of the relationship between humans and nature.

2. Space and Place in Landscape Architecture

In landscape architecture, the concepts of "space" and "place" are two fundamental components that form the basis of design processes. Space is defined as an entity with specific boundaries, encompassing physical, perceptual, and functional components, while the concept of place refers to a space that has gained meaning, developed an identity, and established a strong connection with its users. Therefore, every place is a space, but not every space possesses the qualities of a place. For a space to become a place, it must interact with historical, cultural, ecological, and social layers (Yılmaz & Öztürk, 2019; Düzenli & Alpak, 2020). Space is often understood as a defined area characterized by its physical attributes, such as geographical location, topography, climate, and vegetation. However, the transformation of space into "place" occurs through the emotional, cultural, and social bonds that people form with that space. Place emerges as a result of the space being experienced, interpreted, and integrated into personal or collective memory (Tanyeli, 2017; Düzenli et al., 2018). Thus, in landscape architecture, the concepts of space and place are considered complementary dimensions.

Landscape architecture does not address space solely through its physical components; it also evaluates its social and ecological contexts to create meaningful, sustainable, and identity-rich places (Yavuz, 2014; Düzenli et al., 2018). Particularly with the processes of globalization and urbanization, the increase in anonymous and contextually disconnected spaces has further emphasized the importance of place-specific design approaches in landscape architecture (Kubat, 2007; Yavuz, 2015). In this context, the concept of "place sensitivity" has gained prominence in landscape design, and designers are expected to produce solutions that integrate with the natural and cultural dynamics of the space.

The process of transforming space into place can be evaluated at different scales. At the micro scale, individuals' personal relationships with space and

their everyday practices strengthen the sense of place. At the macro scale, the historical, ecological, and cultural context of the space shapes its identity as a place (Schulz, 1980; Gür, 2015). In landscape architecture, the successful realization of this process is achieved through strategies such as sustainable landscape design, biophilic design, the use of local materials, ecological restoration, and the preservation of cultural landscapes (Yavuz, 2019). The relationship between the concepts of space and place is a significant area of research in landscape architecture, both theoretically and practically. Adopting a place-sensitive design approach ensures that spaces are not only physically sustainable but also ecologically and socially sustainable. In the future, the responsibility of landscape architects to create sensitive, context-focused, and identity-rich places will continue to grow. Landscape architecture serves as an interdisciplinary field that bridges the natural and cultural environments, transforming spaces into meaningful places (Spirn, 1998; Düzenli et al., 2017a).

The concepts of space and place are two fundamental elements that form the basis of landscape architecture. While space refers to a physical and geographical entity, place is shaped by the meanings, experiences, and sense of belonging attributed to that space. These two concepts lie at the heart of the design process in landscape architecture, and understanding how a space becomes a "place" is one of the discipline's primary goals. Landscape architecture brings together natural, cultural, and social factors in the process of transforming space into place. This process begins with the analysis of the physical characteristics of the space. Natural elements such as topography, climate, and vegetation form the foundation of the design (Düzenli & Alpak, 2016; Kurdoğlu et al., 2022). However, in addition to these physical features, the historical and cultural context of the space also plays a crucial role in the design process (Uzun, 2013). For example, the past uses of a space, the connections that local communities have with it, and the narratives associated with it influence the shaping of the design.

In the process of transforming space into place, landscape architects aim to enhance people's interaction with the space and create a sense of belonging. To achieve this, they balance the functional and aesthetic qualities of the space while also considering ecological sustainability (Bayramoğlu & Seyhan, 2021). For instance, in the design of a park, ecological elements such as the preservation of the natural landscape, the use of native plant species, and water management form the basis of the design. At the same time, the park's ability to meet users' needs, encourage social interaction, and reflect cultural identity are also critical components of the design. Landscape architecture seeks to establish a balance between the natural environment and humans while shaping the relationship between space and place. This balance is supported by sustainable design approaches. For example, in urban landscape

designs, green infrastructure systems, stormwater management, and energy efficiency ensure the ecological sustainability of the space. Simultaneously, these designs enhance residents' interaction with nature, fostering a sense of belonging to the space.

Landscape architecture also contributes to the formation of collective memory and identity in the process of transforming space into place. For instance, in the adaptive reuse of a historical site, traces of the space's past are preserved while new functions address contemporary needs. In this way, the space serves as a bridge between the past and the future, keeping collective memory alive. Landscape architecture integrates natural, cultural, and social factors while shaping the relationship between space and place. The transformation of space into place involves not only a physical change but also the creation of meanings, experiences, and a sense of belonging associated with the space. In this process, landscape architects aim to protect the natural environment through sustainable design approaches while enhancing the quality of human life. The concepts of space and place, as two fundamental elements of landscape architecture, offer important insights into the future development of the discipline. In this context, understanding how landscape architecture constructs the relationship between space and place is crucial for evaluating the discipline's social and environmental impacts.

3. Nature and Design in Landscape Architecture

Nature and design is an approach aimed at ensuring that the built environment is harmonious and sustainable with natural ecosystems. Within the scope of this study, the fundamental stages of the nature and design process, sustainability principles, ecological design methods, and the integration of nature within the context of creating spatial identity are examined. In landscape architecture, nature and design is an approach that redefines the relationship between humans and the environment. Landscape architecture is an interdisciplinary field that regulates the relationship between humans and nature, aiming to transform space into place and create meaningful and sustainable environments. In this process, nature and design require an approach that is not only concerned with aesthetics but also deeply intertwined with ecological, social, and cultural contexts. The transformation of space into place is a process of redefining the relationship between humans and nature and materializing this relationship through spatial practices (Beatley, 2016). This study aims to examine the nature and design process in landscape architecture within the context of the transformation of space into place. Since the Industrial Revolution, rapidly changing urban structures have created spaces disconnected from natural ecosystems. This situation has threatened the ecological sustainability of cities while highlighting the necessity of designs that integrate with nature. In this context, the nature and design process in landscape architecture involves harmonizing spaces

with their natural surroundings and adopting ecosystem-based design solutions (Özkan et al., 2024). In the design process, the preservation of natural landscape elements and the enhancement of biodiversity should be prioritized. Designs should be developed by considering the cultural and natural context of the space. Factors such as the use of renewable resources, water management, and energy efficiency should be integrated into the design process (Düzenli & Alpak, 2022). Design approaches that can adapt to changing climatic conditions and spatial dynamics should be adopted. The nature and design process is one of the fundamental principles of landscape architecture. This process involves understanding and preserving natural systems and developing design strategies that are compatible with these systems (Gunderson & Holling, 2002). Nature and design is not limited to the use of natural elements such as vegetation and water resources; it also requires the integration of ecological processes into design decisions (Nassauer, 1997; Özkan & Güngör, 2024). This approach becomes possible in the process of transforming space into place by understanding the dynamics of nature and incorporating these dynamics into the design process.

The transformation of space into place is a process that integrates space with its natural context (Düzenli et al., 2017b; Çorbacı & Ertekin, 2017). In this process, ecological design methods are used to preserve natural landscape elements and integrate them with the built environment. The following strategies stand out in the transformation of space into place:

· Use of Green Infrastructure: Nature-friendly solutions such as rain gardens, bioponds, and permeable surfaces that support natural water cycles should be implemented.

· Biophilic Design Principles: Design elements that enhance human-nature interaction (natural materials, organic forms, green roofs, etc.) should be used to improve spatial perception and well-being.

· Ecosystem-Based Design Approaches: Urban natural habitats should be supported, microclimatic solutions should be implemented, and carbon sink areas should be created to ensure ecosystem integrity.

The nature and design process in landscape architecture is an approach that strengthens the ecological, cultural, and aesthetic context of space. The transformation of space into place is achieved through design decisions that integrate natural systems. In the nature and design process, sustainability, local context, and ecological balance are prioritized to create more livable spaces in the future (Beatley & Newman, 2013). In this context, landscape architects have the responsibility to adopt ecological design principles and make cities more resilient and harmonious with nature. In summary, within the context of the transformation of space into place, the nature and design process in landscape architecture represents an approach that redefines the

relationship between humans and nature and materializes this relationship through spatial practices. This process brings together ecological, cultural, and social contexts to create sustainable and meaningful environments. Nature and design require an approach that is not only concerned with aesthetics but also intertwined with the preservation of natural systems and the fulfillment of societal needs. Therefore, the nature and design process in landscape architecture aims to transform space into place, creating environments where humans can live in harmony with nature.

4. Defining the Transformation of Space into Place in the Context of Nature-Design Through Project Examples

In landscape architecture education, the Environmental Project Design course is a comprehensive course that offers students the opportunity to combine theoretical knowledge with practical applications. This course aims to develop students' design skills, enable them to produce solutions to environmental problems, and apply sustainable design principles. The Environmental Project Design course involves a semester-long process consisting of various stages. This process includes steps ranging from analysis to the presentation of the design. Among the key objectives of the course are to equip students with the ability to analyze environmental design problems and generate solutions, teach sustainable design principles through practical applications, provide opportunities to apply techniques and methods used in landscape architecture, teach the creation of place and space, enhance students' creativity and design abilities, and develop skills such as teamwork, presentation, and project management.

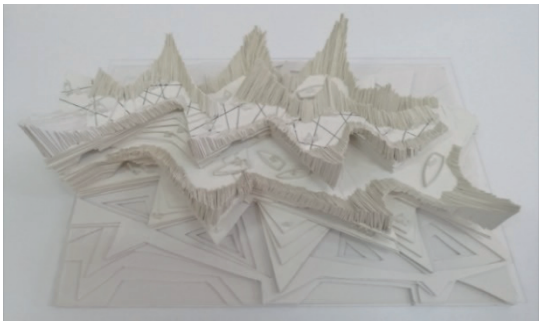
At the beginning of the semester, the project topic and scope are determined. This topic typically involves an environmental issue or a design problem. Students are provided with detailed information about the project site, design goals, and expectations. Additionally, the steps to be followed during the project process and submission deadlines are explained. Once the project topic is determined, students begin to thoroughly analyze the requirements of the project. In this study, the works conducted in the Environmental Design Project 1 course, a second-semester course in the Landscape Architecture Department at Karadeniz Technical University, were examined. In this course, students were tasked with designing an original topography inspired by nature and using examples of unity of character, as well as planning activities to be carried out within this topography. Based on the topic, students begin the conceptual design phase. At this stage, design ideas and concepts are developed. Conceptual design reveals the fundamental philosophy and design approach of the project. Students outline the main features of the design and establish the general framework of the project.

After the conceptual design is approved, students move on to the detailed design phase. At this stage, all details of the design are determined, and planning is carried out. Following the completion of the detailed design, students present their projects to a jury or instructors. During the presentation phase, students visually and verbally express their design ideas, analyses, and proposed solutions. The jury evaluates the projects and provides feedback. This stage allows students to develop their presentation skills and defend their designs.

The primary goal of the course is to enable students to use their imagination effectively, demonstrate what they can achieve through imagination, and enhance their creativity. Another objective of the course is to inform students about the types of human needs, user activities in open spaces, and appropriate facilities for these activities. Thus, the course aims to establish a foundation for creating human-space relationships through design and transforming space into place. Additionally, the course seeks to provide students with knowledge about design principles and elements, the relationship between human-scale and form, and concept-form relationships in spatial organization, as well as to facilitate the perception process through the senses of sight and touch during the design stages, and to establish the relationship between nature and design. In summary, the Environmental Project Design course is one of the cornerstones of landscape architecture education and significantly contributes to the development of students' professional skills. In this study, three examples from the Environmental Design 1 Project were examined in the context of the transformation of space into place, focusing on nature and design.

Table 1. *1st Student's project and Evaluation*

PROJECT 1



In this project, the activity of canoeing has been selected. When evaluated in the context of the nature-designrelationship and the transformation of space into place in landscape architecture, the study presents an abstract representation of land formations and topography.

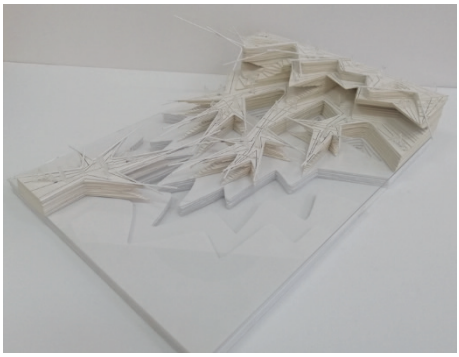
Emphasis on Topography: The model was created using cardboard plates, producing a wavy, fractured surface effect. This demonstrates the use of a design language that mimics natural landforms and processes such as erosion and rock formations.

Space and Surface Relationship: The model shows an integration between the ground plane and the abstract forms above. This highlights that in landscape architecture, space should not only be articulated as a surface addition but also conceived as an extension of the place itself.

Design Integrated with Place: The design evolves in harmony with nature, shaped in accordance with the essence of the place. The fluid forms created by the cardboard plates represent the dynamic structure of the place and its transformation over time.

Parametric and Digital Design Approach: The structure, built in sections, may have been inspired by parametric design processes. This represents a reinterpretation of nature's organic flow and geological processes through digital tools.

Table 2. *2 nd Student's Project and Evaluation*



PROJECT 2

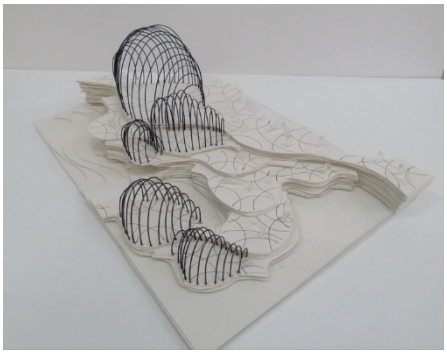
In this project, the activity of observation has been selected. The study presents a parametric topography and spatial transformation analysis composed of different layers, interpreting the relationship between nature and design and the transformation of space into place.

Emphasis on Topography: The model abstractly expresses topographic movements and landforms in nature through sharp lines and layered surfaces. The distinctness of the land sections demonstrates how topography can integrate with design in landscape architecture and how space can adapt to place. The combination of sharp and organic forms simulates geological formations, erosion, or the effects of natural disasters on space.

Space and Surface Relationship: The model features areas where the surface fragments and transforms into organic forms. This may illustrate how natural processes (erosion, geological movements) guide spatial design. The elevation and fractures of the surface at certain points show that space is not limited to the ground but is also connected to place through vertical movements. In terms of sustainable space production in landscape design, such organic and topographic forms offer a spatial solution that harmonizes with nature.

Design Integrated with Place: The repetitive geometric forms and layered structure in the model may have been produced using parametric design techniques. The use of digital design techniques in landscape architecture enables the development of spatial solutions that mimic nature's random processes while maintaining design control. This approach, emphasizing the integration of space with topography, suggests that design should not be an element added to nature but rather a part of it.

Table 3. *3rd Student's Project and Evaluation*



PROJECT 3

In this project, the camping activity has been selected. It presents a highly intriguing study in terms of analyzing the transformation of space into place within the context of the nature-design relationship.

Emphasis on Topography: The model represents natural landforms through the use of layered surfaces. The sectional structure may illustrate how topography is shaped in stages and how it changes over time. By integrating with land movements, the design emphasizes harmony with nature. The curved surfaces of the camping areas align with natural flow patterns.

Space and Surface Relationship: The wireframe structures in the model represent an approach that abstracts organic forms found in nature. These structures symbolize natural elements such as caves, rock formations, vegetation, or ecological shelters within the context of biomimicry (design inspired by nature). The use of wire points to design approaches in landscape architecture that support spatial experiences like permeability and openness.

Design Integrated with Place: In terms of the transformation of space into place, the model includes structures that integrate with the surface and rise from it. This highlights the need for space to develop in harmony with the natural environment in landscape design. The design blurs the boundaries between the man-made and the natural, offering spatial solutions that can be shaped with minimal or no intervention in nature. The addition of organic forms expresses a flexible and sustainable landscape approach, where nature can reshape itself over time and adapt to the space.

5. Results

In landscape architecture, the relationship between nature and design is evaluated based on how space integrates with its surrounding environment and adapts to ecological processes. The organic processes of nature inspire landscape design, ensuring that the design evolves alongside natural dynamics rather than being merely a human-imposed intervention. In this context, the existing topography and ecological structure of the site should be considered the primary determinants of the design. Surface movements, topographic transitions, and spatial solutions that reflect natural processes are important factors that strengthen the integration of the design with the site.

The transformation of space into place is one of the fundamental principles of sustainable and nature-integrated design approaches in landscape architecture. Guiding the design through topographic analyses and consideration of natural data enhances spatial sustainability while preserving the ecological values of the landscape. Settlement decisions should aim not only to meet physical needs but also to align with natural processes. Therefore, a layered structure should adopt a design approach that transforms the temporal changes of topography and natural flow processes into a spatial narrative, harmonizing with nature. Today, parametric design approaches analyze the dynamic processes of nature digitally, offering new perspectives to landscape design. The use of organic forms and parametric modeling allows for the consideration of concepts such as fluidity, transition, and transformation in nature as a spatial system. Parametric design techniques analyze the geometric patterns of nature and incorporate them into the design, creating spatial organizations that align with the natural structure of the site. In this context, sectional surfaces and organic structures provide spatial solutions that strengthen the nature-design relationship and support ecological processes.

In conclusion, the transformation of space into place within the context of the nature-design relationship should be regarded as one of the fundamental principles of landscape architecture. Spatial solutions that integrate with the site not only preserve the physical environment but also support the development of user experiences in harmony with nature. Landscape designs that integrate with topography, adopt organic forms, utilize parametric design techniques, and aim for ecological sustainability will contribute to the creation of more nature-integrated spaces in future cities. Therefore, spatial organizations that do not merely mimic nature but transform and evolve alongside it should be embraced as an important design strategy that strengthens the identity of the place.

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Chapter 10

NEUROLANDSCAPE ARCHITECTURE: ENHANCING THE QUALITY OF URBAN LIFE[1]

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1. Introduction

Urbanization has profoundly shaped human life, offering opportunities for social and economic growth while also generating significant challenges for mental health. The World Health Organization (2003) has reported that urban environments are closely associated with increased risks of mental disorders, with young adults bearing the greatest burden. Dementia and major depression are the two leading contributors, accounting, respectively, for one-quarter and one-sixth of all disability adjusted life years (DALYs) in this group (Jitendra, et al., 2008). Within this context, architecture and landscape architecture are more than a shelter for human beings. They play an essential role in shaping human well-being by fostering health, social interactions, and knowledge (Arellano, 2015).

Physical environments offer contexts for perception, memory, cognitive mapping, and everyday activities, generating mutual responses between spaces and their users. The Neurolandscape Architecture emerges as an interdisciplinary field that examines the neurological effects of these environments. As Ajai (2023) emphasizes, science and design are not mutually exclusive; their integration enables the creation of responsive spaces tailored to human needs, addressing health, problem-solving, and quality of life. At the core of this approach lies the concept of person-centered design, emphasizing intuitive environments that support psychological restoration and promote overall well-being. If natural settings alone facilitate recovery and resilience, then the question arises: how can landscape architecture amplify these effects and shape human emotions and behavior? More specifically, how can design principles address the mental health challenges increasingly prevalent in urban societies?

This study addresses these questions through a theoretical framework, drawing on literature synthesis to examine how neuroscience can inform the design of landscapes that actively contribute to human health and well-being. By integrating insights from neuroscience and landscape design, the study proposes a conceptual understanding of public spaces as restorative environments that support mental and emotional health.

2. Quality of Urban Life (QoUL)

The concept of Quality of Urban Life (QoUL) has become a central theme in urban studies, reflecting the complex interplay between social, economic, environmental, and psychological dimensions of city living (Javanbakht et al., 2020). Globally, the notion of "quality of life" encompasses not only material well-being but also broader aspects of social cohesion, cultural vitality, and environmental sustainability (Psatha et al., 2011). While cities offer opportunities for innovation, education, and employment, they simultaneously present challenges such as inequality, congestion, environmental degradation, and social fragmentation.

A high quality of the urban environment and overall QoUL appears to play a significant role in promoting business growth and supporting the workforce, thereby enhancing the competitiveness of cities within the contemporary economic landscape (Gospodini, 2002). However, QoUL remains largely theoretical due to its inherently subjective and context-dependent nature.

QoUL is a multifaceted concept encompassing physical, social, economic, and environmental dimensions, all of which are essential for developing livable, sustainable, and inclusive urban spaces. The residential context of individuals inevitably shapes their life experiences and, consequently, their overall quality of life. Schwirian et al. (1995) highlighted that residents of metropolitan areas may encounter stressful circumstances arising from economic, social, and environmental pressures. Accordingly, efforts to enhance the general quality of life are central to strategies aimed at improving urban living conditions (Marans and Stimson, 2011).

In this context, Psatha et al. (2011) identify several key determinants of Quality of Life (QoL) (Figure 1), including economic and social conditions, natural and built environments, urban and suburban green spaces, public spaces and buildings, cultural and leisure opportunities, demographic characteristics, education, healthcare, democratic institutions, and transportation infrastructure. Additional factors, such as security and social networks, also play a significant role in shaping urban quality of life. Urban greenery boosts happiness by fostering unity, reducing pollution, and encouraging exercise (Chen et al., 2025). Similarly, the results of Edeigba et al. (2024) showed that there is a direct and significant relationship between access to green space in residential areas and the quality of life of residents.

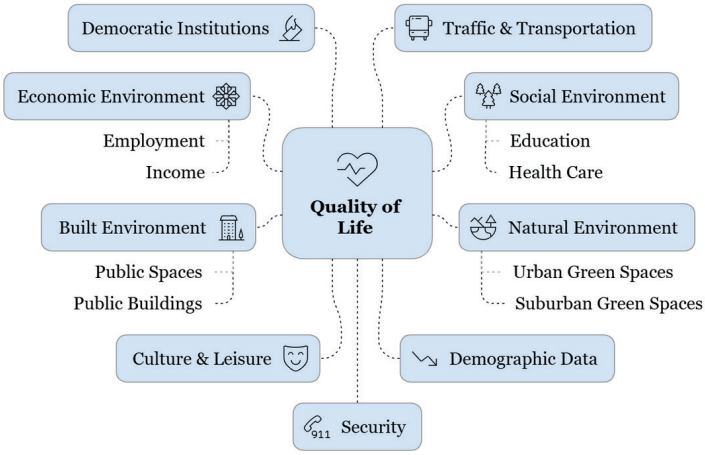

Figure 1. *Factor determinants of QoL (produced from Psatha et al., 2011)*

In this regard, landscape architecture plays a critical role. Urban green spaces, parks, and contemplative environments are increasingly recognized not only for their ecological value but also for their psychological and social contributions. By fostering relaxation, encouraging social interaction, and supporting a sense of belonging, these spaces can significantly enhance QoUL. Improving the quality of urban life, therefore, requires an integrated vision that combines infrastructure development with human-centered design strategies, ensuring that cities remain inclusive, resilient, and supportive of both individual and collective well-being. As Dmitrović et al. (2025) stated that public green spaces have been shown to significantly improve life satisfaction among urban residents, and their thoughtful integration into urban planning can contribute meaningfully to individual well-being and collective quality of life.

3. Urban Environment and Mental Health

Mental health is an essential component of overall well-being. As Roe (2016) notes, one in four individuals worldwide will suffer from a mental health problem at some point in their life. Good mental health not only enhances personal enjoyment, coping skills, and social relationships but also contributes to educational achievement, employment opportunities, housing stability, economic productivity, and the reduction of physical health outcomes. Furthermore, it can help reduce physical health risks, ease healthcare and social care costs, and foster social capital, thereby strengthening both individual and societal resilience (Roe, 2016; OECD, 2021).

The relationship between urban living and mental health is complex. On the one hand, cities offer opportunities for education, culture, and employment; on the other, they expose residents to stressors such as noise, congestion, crowding, and social inequality (Vlahov and Galea, 2002; Sahi et al., 2024). This paradox has been referred to as the "urban penalty", whereby urban residents may face higher risks of mental and physical health problems compared to their rural counterparts (Zhu et al., 2021) Recent studies highlight that these challenges have intensified in the context of climate change, housing insecurity, and post-pandemic recovery, making mental health a pressing urban policy concern (OECD, 2021).

Within this context, urban green spaces, which can range from trees planted in the street to children's play areas, and even extends to aquatic "blue spaces" such as water features, have been shown to positively influence mental health through multiple pathways. These include promoting physical activity, reducing stress, and facilitating social interaction and cohesion (Collins, 2016). Several medical studies examining the cognitive effects of exposure to natural environments indicates that engagement with green spaces can lower cortisol levels, a key biomarker of chronic stress. Interaction with nature provide

restorative benefits by alleviating stress and promoting mental relaxation (Hartig, 2007; Keçecioğlu, 2014; Collins, 2016).

Urban soundscapes also play a critical role in psychological well-being. Certain practical methods such as integrating bird calls, water features, and vegetation-based noise buffers have been implemented to mitigate harsh urban sounds. The results proved that the soundscapes could reduce the blood flow which means reduce the stress (Collins, 2016). In this way, the sensory design of the urban environment becomes a crucial factor in shaping emotional balance.

The role of urban green spaces as social determinants of health is increasingly recognized. Natural environments can buffer the effects of life stressors and reduce symptoms of psychiatric disorders. Exposure to natural stimuli—such as trees, water, light, and organic patterns—promotes "involuntary attention," enabling the brain to recover from cognitive fatigue and mental exhaustion (Roe, 2016). Beyond cognitive restoration, green areas foster social cohesion, trust, acceptance, and belonging, while mitigating loneliness and social isolation. They provide spatial frameworks that support social integration and networking, particularly among children and adolescents (Kim and Kaplan, 2004; Collins, 2016).

Green spaces also influence emotion and mood through their sensory qualities (Keçecioğlu, 2014). Grahn and Stigsdottir (2010) describe parks as serene, safe, and calm spaces, capable of inducing feelings of tranquility and reducing stress. Research by Alcock et al. (2014) indicates that overall visibility of greenery may be more important than mere proximity, suggesting that even visual access to trees and vegetation from urban dwellings can reduce mental fatigue, aggression, and stress. Conversely, poorly managed vegetation may signal neglect, increasing anxiety and fear of crime, emphasizing the importance of thoughtful design and ongoing maintenance of urban green spaces (Collins, 2016).

4. Neuroscience and Neurosustainability in the Urban Environment

Neuroscience, the scientific study of the nervous system, provides critical insights into how humans perceive, interpret, and respond to spatial environments. It underpins essential processes such as orientation, navigation, emotional engagement, and aesthetic appreciation, thereby shaping how individuals experience and adapt to urban settings (Pearce et al., 2016; Küçük and Yüceer, 2022).

A central concept in neuroscience is neuroplasticity. Neuroplasticity is the brain's capacity to reorganize itself by forming new neural connections throughout life. This dynamic ability enhances learning, memory, spatial navigation, emotional regulation, and adaptive responses, particularly within

the cortex, hippocampus, amygdala, and other brain regions (Kolb and Gibb, 2015; Squire et al., 2015; LeDoux, 2000). The cerebral cortex, the brain's outermost layer, is a highly organized and complex structure responsible for a wide range of cognitive, sensory, and motor functions (Khalil, 2024). It plays a crucial role in perception, language, memory, attention, thought, consciousness, and decision-making.

Neuroplasticity can be assessed through both structural and functional measures. Structural plasticity involves parameters such as cortical thickness, gray matter volume, and white matter integrity, which can be measured using neuroimaging techniques like magnetic resonance imaging (MRI) and diffusion tensor imaging (DTI) (Tardif et al., 2016; Khalil, 2024). Functional plasticity, on the other hand, can be evaluated through functional MRI (fMRI), electroencephalography (EEG), and transcranial magnetic stimulation (TMS), which provide insights into the brain's ability to reorganize its neural networks and adapt its activity patterns in response to various stimuli and experiences (Pascual-Leone et al., 2005; Khalil, 2024). Understanding these mechanisms is essential for exploring how the urban environmental influences brain function and urban well-being. A review by Gazerani (2025) explores the fundamental mechanisms of neuroplasticity, emphasizing the balance between adaptive and maladaptive changes in the brain. This research underscores the importance of environmental stimuli in shaping neural pathways and cognitive functions. Another systematic review demonstrates that exposure to green environments positively influences neuroplasticity across the lifespan, from pregnancy to late adulthood. This highlights the significance of integrating natural elements into urban design to support cognitive and emotional well-being (Khalil, 2025).

Building upon these insights, Khalil (2024) introduced the concept of Neurosustainability, a cyclical paradigm that highlights the role of built, architectural, and interior environments in sustaining long-term neuroplastic processes through epigenetic adaptation. In other words, environmental stimuli and neural adaptation engage in a continuous dialogue—offering a rich interdisciplinary foundation for enhancing cognitive and emotional wellness over time.

Khalil (2024) further identifies four main categories of enrichment within Neurosustainability: spatial, natural, aesthetic, and social (Figure 2). Each domain represents a type of environmental stimuli capable of producing measurable effects on brain activity and adaptability. By considering these domains in the design of urban and architectural spaces, Neurosustainability offers a theoretical foundation for creating environments that support cognitive and emotional well-being across the lifespan.

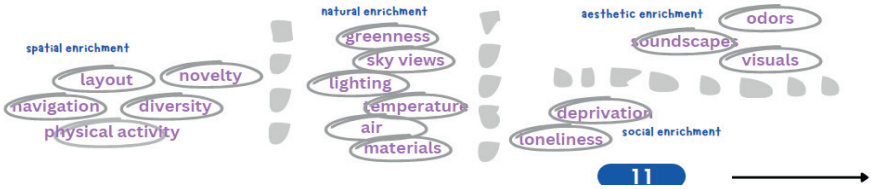

Figure 2. *Enrichments of neurosustainability (Khalil, 2024).*

Building on this framework, the emerging field of Neurourbanism explores how urban environments, particularly public spaces, influence human cognition, emotion, and behavior. Askari et al. (2025) explores regenerative design strategies through the emerging framework of Neuro-Urbanism, integrating urban design, neuroscience, and psychology to create psychologically enriching environments. This interdisciplinary approach aims to address the challenges of rapid urbanization and its impact on well-being. Similarly, research published by Brunner (2025) discusses how the design and characteristics of urban spaces influence mental well-being, emphasizing the importance of understanding cognitive mechanisms associated with exposure to public spaces. Therefore, recent studies show that elements such as walkable pathways, green and natural areas, accessible social spaces, and well-designed public amenities can enhance neuroplasticity, reduce stress, and promote overall mental well-being.

By integrating neuroscience insights into urban planning, Neurourbanism emphasizes creating environments that not only fulfill functional needs but also support cognitive adaptability, emotional resilience, social cohesion, and a strong sense of community.

5. Neurolandscape Architecture

Neurolandscape architecture has emerged at the intersection of neuroarchitecture and urban research. It aims to establish the relationship between sensory experience and architectural perception in order to foster healthier urban life and environments (Ritchie, 2021; Küçük and Yüceer, 2022). This interdisciplinary approach not only enhances individual quality of life but also creates more vibrant, sustainable, and inclusive urban environments.

By integrating insights from neuroscience, neurolandscape architecture seeks to design cities that enhance emotional, cognitive, and physical well-being. This approach contributes to creating resilient, sustainable and inclusive urban environments while directly improving the quality of life of individual (Santos, 2023). For instance, in healthcare settings, neurolandscape principles can inform the design of environments that promote faster patient recovery, enhance comfort, and stimulate cognitive engagement. Carefully designed spaces can accelerate healing processes by simultaneously providing physical comfort and mental stimulation (Eberhard, 2009; Jedon, 2019; Santos, 2023).

A leading institution in this interdisciplinary field is the "Academy of Neuroscience for Architecture" (ANFA). ANFA focuses on understanding how the brain perceives, interprets, and reconstructs spatial environments. Its research emphasizes the bidirectional relationship between cognitive processes and the built environment, offering valuable insights for evidence-based design practices (Xia, 2020; Santos, 2023).

In parallel, "NeuroLandscape", a non-profit research organization, advances the integration of neuroscience, landscape architecture, and computer science. Its focus lies in exploring how built and natural environments influence human health and well-being, particularly in the context of neuro-spatial design and sensory-sensitive populations (NeuroLandscape, n.d.). NeuroLandscape actively fosters collaboration between landscape architects and neuroscientists by organizing seminars, workshops, and academic events. For example, at the forthcoming 2025 ANFA Conference, discussions will specifically address the health impacts of neuro-spatial design (ANFA, n.d.).

Through such collaborative initiatives, organizations like ANFA and NeuroLandscape contribute to knowledge exchange and interdisciplinary research, strengthening our understanding of how environmental design shapes human health. Taken together, these efforts position neurolandscape architecture as both a theoretical framework and a practical methodology for designing urban spaces that actively promote psychological well-being, social cohesion, and overall quality of life.

6. Neurolandscape and Quality of Urban Life (QoUL)

Neurolandscape, an interdisciplinary field that integrates neuroscience and landscape architecture, investigates the ways in which built environments shape human emotions, behavior and cognitive functioning (Raisi et al., 2025). By aligning spatial design with the psychological and physiological needs of individuals, this approach plays a critical role in shaping urban environments that enhance well-being. Increasingly, its principles are being applied in contemporary urban design to create healthier, more engaging, and functional cities.

(1) Enhanced emotional well-being: Neurolandscape highlights the significant influence of urban environments on mental health. Natural elements such as parks, green corridors, and water features have been shown to reduce stress and promote emotional balance by stimulating the brain's positive response mechanisms (Ulrich, 1984). Biophilic design, a key component of neuroarchitecture, strengthens human connection to nature, which has been demonstrated to enhance well-being, particularly in dense urban settings (Kellert, et al., 2008). Recent studies further support these findings, indicating that biophilic design elements, such as indoor plants and natural lighting, can significantly reduce stress and improve mood, contributing to better mental

health outcomes (Bulaj, 2025).

(2) Improved cognitive function: The cognitive load in urban environments can be overwhelming due to noise, crowds, and visual clutter. Neurolandscape addresses this by promoting design strategies that reduce sensory overload and foster mental clarity. The integration of quiet zones, intuitive wayfinding systems, and recognizable landmarks supports orientation, reduces cognitive fatigue, and enhances attentional capacity (Kaplan and Kaplan, 1989). Integrating neuroarchitecture principles, which combine neuroscience with architectural design, can further enhance cognitive function by reducing sensory overload and supporting mental clarity (Domingos and Barros, 2025).

(3) Promotion of social interaction: Urban spaces designed with Neurolandscape principles encourage social connectivity. Public squares, open seating areas, and well-lit streets provide opportunities for interaction and collaboration. Such design choices strengthen community bond and cultivate a sense of belonging, both of which are vital to improving quality of life (Gehl, 2011; Bostancı and Keçecioğlu Dağlı, 2024).

(4) Physical health benefits: Urban designs influenced by Neurolandscape promote physical activity and healthier lifestyles. Walkable streets, accessible cycling infrastructure, and recreational facilities promote regular physical activity, counteracting sedentary behaviors common in urban life. Physical activity not only improves physical health but also supports the brain's neuroplasticity, linking movement to mental (cognitive and emotional) health benefits (Ratey and Hagerman, 2008; OECD, 2021).

(5) Stress reduction through sensory design: Neurolandscape emphasizes the importance of multisensory design in reducing stress within urban environments. The use of natural lighting, calming color palettes, and acoustically optimized spaces can regulate brain activity and promote relaxation. These sensory interventions are particularly relevant in densely populated urban contexts, where stress levels are often elevated (Sternberg, 2009). Additionally, access to urban green spaces has been associated with increased happiness, as they promote both physical and mental health, particularly in dense or highly developed urban areas (Kwon et al., 2021).

(6) Enhanced urban resilience and adaptability: Neurolandscape emphasizes flexibility and adaptability in urban spaces. Designs that accommodate multiple uses—such as public squares that can host markets, performances, or community gatherings—reflect the dynamic needs of urban populations. Such adaptability ensures that urban environments remain responsive to evolving patterns of behavior and social interaction (Aminoff et al., 2013). Incorporating neuroarchitecture principles can guide the creation of sustainable and healthy urban environments by considering the impact of

built environments on human brain function (Domingos and Barros, 2025).

(7) Fostering a sense of safety and security: Neurolandscape principles contribute to perceptions of safety and security in the urban realm. Open layouts, clear sightlines, and adequate lighting reduce fear of crime and create environments where individuals feel secure. This sense of safety is an essential determinant of overall quality of life, as it underpins both social interaction and psychological well-being (Cozolino, 2014).

7. Contemplative Landscape Model (CLM)

The Contemplative Landscape Model (CLM) was developed to identify and design spaces that elicit positive psychological outcomes, particularly contemplative states of mind. Its principles are grounded in recognizing and enhancing the natural and scenic qualities of a site by incorporating specific features and strategies, while also leveraging the narrative power of landscapes (Olszewska-Guizzo et al., 2022).

A contemplative landscape is defined as a scene that, through passive sensory exposure alone, can evoke and restore positive emotions. It can also reduce stress and mental fatigue and counteract the negative effects of urban environments. Importantly, these benefits appear to extend across age groups, socioeconomic backgrounds, and health conditions. This demonstrates how the spatial attributes of green areas convey not only aesthetic but also therapeutic value. The CLM provides a structured framework to identify and create such spaces within the urban context (Olszewska-Guizzo, 2023).

The model operates as an expert-based assessment tool that evaluates the mental health potential of urban green space scenes. It assigns a contemplative landscape score, which is derived from an average of score of seven key components: (1) Layers of the Landscape, (2) Landform, (3) Vegetation, (4) Color and Light, (5) Compatibility, (6) Archetypal Elements, and (7) Character of Peace and Silence. Each component is rated on a six-point scale, where 1 represents the lowest and 6 the highest possible score (Figure 3) (Olszewska-Guizzo et al., 2022).

(1) Layers of the landscape— Evaluates the visual depth of a scene, considering the presence of foreground, middle ground, and background elements.

(2) Landform— Examines the natural irregularities of the terrain and the skyline, including whether the topography encourages upward visual engagement.

(3) Vegetation— Refers to plant diversity and the presence of species that appear naturally occurring rather than heavily maintained, reflecting seasonal and life-cycle changes.

(4) Color and light— Considers the interplay of light and shadow on the ground, the availability of shaded viewpoints away from direct sunlight, and the use of softer, less saturated colors.

(5) Compatibility— Assesses the overall harmony and balance of the landscape composition, ensuring the absence of disruptive or incongruent elements.

(6) Archetypal elements— Involves the inclusion of landscape features with symbolic or universal meaning, such as a solitary tree, stone, or waterfall.

(7) Character of peace and silence— Evaluates the potential of the space to foster rest, comfort, and solitude, offering a calming counterpoint to the intensity of urban life.

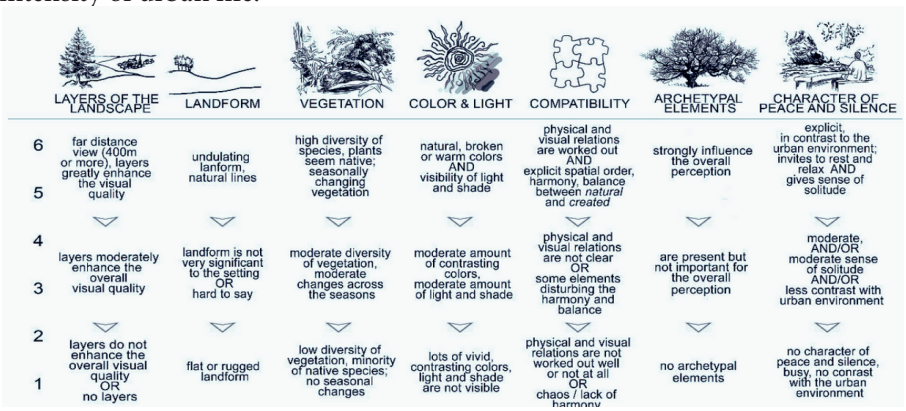

Figure 3. *Contemplative Landscape Model for landscape evaluation with 1 - 6 scoring scale (Olszewska-Guizzo et al., 2022).*

Empirical validation has demonstrated the effectiveness of the CLM. Correlations between expert-assigned CLM scores and electroencephalography (EEG) data revealed strong associations with four psychophysiological measures: frontal theta and alpha oscillations, improved mood, and emotional intensity (Olszewska-Guizzo et al., 2022). Olszewska-Guizzo (2018) further suggested that scores exceeding 4.90 are sufficient to trigger brain responses linked to positive attitudes and motivation, thereby enhancing both mental and physical health. Similarly, Yanru et al. (2020) highlighted the neural mechanisms underlying CLM responses, demonstrating that specific landscape features stimulate brain regions associated with attention, emotional regulation, and restorative processes.

Building upon the expert-based CLM framework, the Contemplative Landscape Automated Scoring System (CLASS) applies artificial intelligence to evaluate digital images of landscapes and assign CLM-based scores with expert-level accuracy (Olszewska-Guizzo, 2018). However, as CLASS remains under development, its use in research is still limited and requires further testing and validation.

8. CLM-based Neurolandscape Case Studies

While numerous studies have examined the intersection of neuroscience and architecture, relatively fewer have explored its application in the field of landscape architecture. One of the most significant contributions in this area comes from the work of Agnieszka Olszewska and collaborators, who have developed and applied the Contemplative Landscape Model (CLM) in empirical research.

8.1. CLM in Therapeutic Gardens: HortPark and Roof Garden, Clementi, Singapore

This study (Olszewska-Guizzo et al., 2022) involved 74 participants and consisted of three sessions: one conducted in a laboratory and two carried out in urban green spaces. Participants wore portable EEG caps to monitor brain activity during the experiments.

The findings demonstrated that naturalistic exposure to landscapes with higher CLM scores was associated with increased frontal alpha and theta activity, indicating heightened mindfulness and wakeful relaxation. Importantly, these effects were not observed in the laboratory setting.

Among the seven CLM features, Character of Peace and Silence, Layers of the Landscape, Archetypal Elements, and Vegetation showed the strongest associations with brain activity. Moreover, these relationships were more pronounced in outdoor environments compared to laboratory conditions. Based on these findings, the researchers proposed new design strategies:

- Enhancing visual depth by opening views toward distant scenery, allowing visitors to perceive both nearby and faraway elements.
- Emphasizing aerial perspective, where distant objects appear bluer and less distinct due to atmospheric effects, thereby reinforcing a sense of depth.
- Establishing visual and acoustic buffers to separate the garden from the surrounding urban environment, complemented by comfortable seating areas designed for solitary rest.
- Accentuating archetypal elements by ensuring they become focal points in the view—for example, clearing the area around a solitary tree to highlight its distinctive silhouette.
- Implementing naturalistic planting schemes that mimic spontaneous growth, incorporating diverse vegetation that reflects seasonal and diurnal change.

8.2. CLM in Singapore's Central Business District

This study (Olszewska-Guizzo, 2018) evaluated four popular walkways within the Central Business District, representing varied spatial compositions.

A total of 204 viewpoints were assessed manually by three landscape architecture experts using the seven CLM characteristics.

The results revealed that the highest score recorded was 2.82, while the lowest was 1.34. None of the evaluated sites surpassed the median contemplative threshold of 3.5 points, a score necessary to trigger brainwave patterns linked to positive mood and restoration. Low scores were particularly evident in landform and vegetation categories.

Recommendations for improving low-scoring areas included:

· Enhancing landform quality by introducing natural asymmetry through undulating terrain or organic lines.

· Improving vegetation scores by incorporating a greater diversity of plant species arranged in seemingly natural compositions, with forms and colors that change seasonally.

· Strengthening archetypal elements by modifying path widths or introducing alternative, narrower boulevard patterns to create symbolic spatial cues.

· Fostering peace and silence by providing more comfortable seating combined with visual separations that support a sense of solitude.

The CLM-based methodology offers valuable insights for planning and designing healthier cities by providing site-specific, targeted solutions. Findings from this research suggest that even small-scale interventions—such as opening view corridors, planting street trees, or eliminating distracting elements—can significantly enhance the contemplative quality of urban environments.

9. Conclusion and Discussion

Neurolandscape, an interdisciplinary approach integrating neuroscience and landscape architecture, provides a valuable framework for understanding how urban and natural environments influence human cognition, emotion, and mental health. Empirical studies indicate that design elements such as layered vegetation, archetypal features, and spaces for solitude support mindfulness and emotional restoration (Olszewska-Guizzo et al., 2022). Even small-scale interventions, such as opening viewsheds, introducing naturalistic plantings, or providing quiet seating areas, have been shown to enhance the contemplative and restorative qualities of urban spaces (Olszewska-Guizzo, 2018; Olszewska-Guizzo et al., 2022).

Beyond individual benefits, Neurolandscape-informed designs contribute to social cohesion, cognitive functioning, and psychological well-being. Exposure to natural elements reduces stress and facilitates recovery (Roe, 2016), while green and blue spaces encourage social interaction and strengthen

community bonds (Collins, 2016). Thoughtfully designed urban environments also support orientation, reduce cognitive overload, and enhance attentional capacity (Kaplan and Kaplan, 1989; Kim and Kaplan, 2004). Multisensory and adaptive design strategies—including natural lighting, calming color palettes, flexible spaces, and acoustic optimization—further enhance safety, reduce cognitive fatigue, and reinforce social connections (Sternberg, 2009; Gehl, 2011; Cozolino, 2014).

Future research should investigate the long-term impacts of Neurolandscape interventions across diverse urban contexts, using tools such as CLASS and other AI-based assessment systems to enable large-scale evaluation and simulation-based planning (Olszewska-Guizzo, 2018). Interdisciplinary collaboration among neuroscientists, urban planners, and landscape architects is essential to refine assessment methods, validate outcomes, and develop interventions that optimize both mental health and urban livability (Khalil, 2024; Pearce et al., 2016).

Overall, Neurolandscape represents a forward-looking paradigm for landscape architecture. By emphasizing adaptive, restorative, and cognitively supportive design, it offers a robust framework for creating sustainable, resilient, and human-centered urban environments, ensuring that urban landscapes actively contribute to emotional, cognitive, and social quality of life.

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