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PROF. DR. SERTAÇ GÜNGÖR

ASSOC. PROF. DR. SEVAL ÖZGEL FELEK

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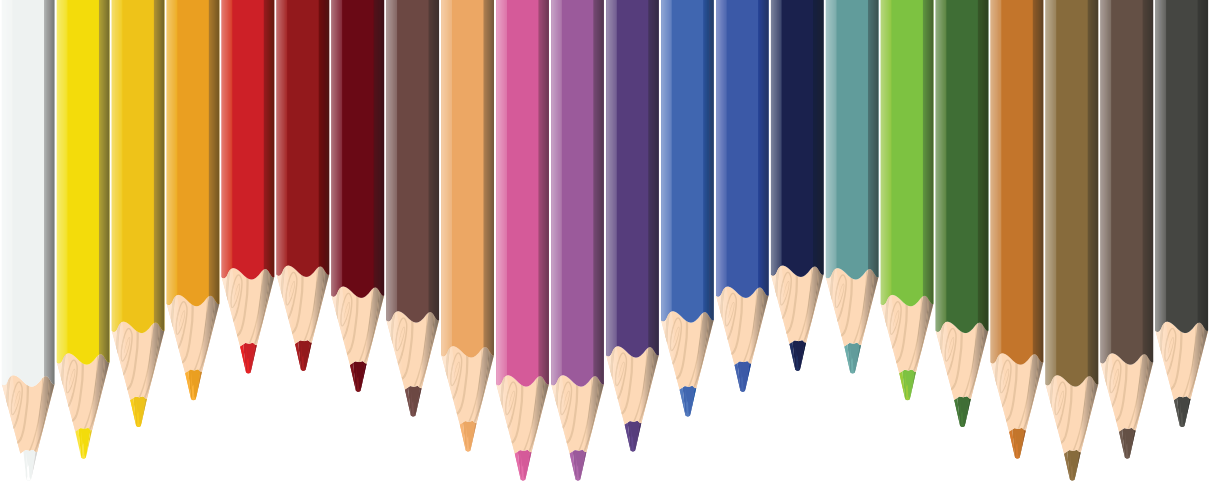

Chapter 1

INTEREST IN CONSERVATION OF INDUSTRIAL HERITAGE AREAS: EREĞLI TRAIN STATION AND SÜMERBANK WEAVING FACTORY[1]

Şevket TÜRKTAŞ[2]
Elif GÜNDÜZ[3]

1 This paper is an excerpt from Şevket Türktaş's Master Dissertation titled"Katılımcı Planlama Yaklaşımı İle Endüstriyel Miras Alanlarının Değerlendirilmesi: Ereğli Tren Garı ve Sümerbank Dokuma Fabrikası Kompleksleri Üzerinden Değerlendirme", supervised by Asst. Prof. Dr. Elif Gündüz at Konya Technical University in 2023.

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Introduction

The industrial period, which started with the discovery of steam power in Europe in the 18th century, lasted until the early 20th century. In the process up to this time, urbanization activities have been observed around the industrial areas. It is also known that different social classes were formed in this process (such as the working class, the middle class and the upper class). The rapid population growth and urbanization movement in cities have brought along problems such as insecurity of cities, insufficient housing areas, and lack of infrastructure. As a result, the middle and upper class preferred to move away from the city centers, so the city centers started to turn into depression areas, and the industrial areas remained in the city center due to the residential areas developed in the surrounding area (Kaya, 2012; Nazik, 2021). In the second half of the 20th century, the location selection criteria of industrial establishments have changed in line with developing technology and changing needs. After this date, in the planning of industrial areas, cheap raw materials and labor, integration and diversity of transportation, and orientation to wider and economic areas have been discussed. Therefore, the industrial areas in the city center were abandoned due to not being able to respond to the changing needs (Uçar, 2013).

The industrialization process has led to changes in spatial and environmental areas as well as in thought, economy and social areas. In this process, discussions and scientific studies on how to evaluate the vacant industrial areas within the scope of planning have started and are still continuing.

In rapidly growing cities, industrial areas have been moved or closed due to the fact that they remain in the city center, their polluting effects and the need for large areas to adapt to changing technological conditions. The search for adapting these structures, which are the indicators of the economic, social and cultural life of a period in the city, to the contemporary living conditions of the city without leaving them to their fate, has found a place in the concept of industrial heritage.

The "industrial heritage, is a concept that emerged in the UK in the 1960s, upon the threat of the destruction of industrial structures that have cultural heritage characteristics as a result of efforts to protect cultural heritage. In this period, the concept of industrial heritage is seen as an expression of reaction and anxiety against the destruction of industrial structures rather than having a scientific character. Industrial archeology is used to express all kinds of industrial inventories, research, recording studies and working stages (Saner, 2012).

The concept of industrial heritage, which plays an important role in shaping the concept of cultural heritage, points to the reusability of buildings based on the principle of city and public benefit (Şimşek, 2006). Industrial heritage includes mining, energy resources, windmills, manufacturing industries,

bridge, road, canal, railway, quarry, brick workshop, residences for workers and managers, social facilities, infrastructure services, etc. It is defined as industrial areas / buildings / landscapes that contain architectural and scientific values, reflecting the historical, social and technological values of the period (Kaya and Yılmaz 2018). What is in question in the concept of industrial heritage is not a structure, but the whole of the structure, building group, equipment and hardware formed by industrial activities. In this context, everything that has become a part of production and socio-cultural history is an industrial heritage (Köksal, 2012). As a matter of fact, in the charter prepared by the International Committee for the Protection of Industrial Heritage in 2003, the concept of industrial heritage is defined as "the remains of industrial culture that include buildings, workshops, factories, places of worship, worship and cultural facilities, infrastructure and warehouses with architectural, technological, social and cultural values". (Url-1).

After the concept of industrial heritage was introduced in urban spaces, which started to be shaped by transformation projects since the 1970s, studies were carried out on this subject and the first session of the International Industrial Heritage Congress was held in 1973. TICCIH (International Committee for the Protection of Industrial Heritage) was established here, which aims to research, document and protect industrial heritage structures. In 1978, the Wieliczka and Bochnia Salt Mines in Poland were included in the world heritage list by UNESCO, thus increasing the awareness of industrial heritage sites. In addition, industrial heritage structures have been the subject of tourism after the 90s. Since the beginning of the 21st century, industrial heritage studies have accelerated. In the process until today, 2006 has been declared the Year of Industrial Heritage by UNESCO and TICCIH, and 2015 has been declared the Year of Industrial and Technical Heritage by the European Council (Uysal, 2018).

From a cultural perspective, the concept of industrial heritage encompasses the entire period and work of industrial history. Although the term industrial heritage seems to be related to industry, it is broad enough to include topics such as production, architecture, equipment, and products of the pre-industrial era (Büyükarslan & Güney, 2013). All types of industrial heritage structures, products, and accessories are in the collective memory of society as witness and evidence of developments in the field of industry as well as socio-cultural and economic developments in the life of society. Industrial heritage emerges as a necessary tool for the society because it provides the information needed by future generations and is a witness of the historical process, since industrialization has historical value because it affects the whole field of society (Delice, 2012).

It was found that the headings were collected under as services, mining energy resources (windmills, steam engines, etc.), manufacturing industries

(textiles, pottery, etc.), transportation elements (railroads, bridges, etc.), building materials (bricks, sawdust, etc.), support units (workers' houses, social facilities, etc.), and infrastructure when the titles created based on the inventory studies of the countries that have carried out important studies on industrial heritage are examined. These titles may vary according to the production diversity and production quality of the countries (Kaya, 2012). As a result, it is seen that the industrial heritage examples are not limited to the buildings or building groups belonging to the post-industrial revolution, but include structures such as factories, railways, transportation vehicles, bridges, quarries, landscapes, irrigation systems (Özüdogru, 2010).

On the basis of the concept of industrial heritage, which emerged as an attitude against the destruction of industrial areas that have an important place in the past of the society, there is the goal of protecting and sustaining these industrial areas with different functions in order to adapt to today's conditions. The industrial heritage should be at the base of the economic, social and cultural developments of the countries, bear the traces of the developments in the production process, have architectural originality, sustainability and economic protection of the urban memory. Industrial areas bring social, economic and physical changes in the immediate surroundings of the region where they are established. First, houses are built in the immediate vicinity, then different services develop and create a functioning to meet the needs of those who live in the houses. In this way, new spaces of primary importance for society are created. Therefore, industrial areas are the spatial reflection of the social memory in the sense that they have a symbol and memory value in the local environment where they are established, then the urban memory because it plays a role in the development of the city, and the national memory due to its role as the locomotive of the country's economy (Delice, 2012).

The main reason why immovable cultural assets are threatened with extinction is loss of function. These structures may become dysfunctional due to reasons such as inability to adapt to developing technologies and needs, environmental pollution caused during the production phase, lack of infrastructure, limited expansion area due to staying in the city center, and city administrators to generate new development policies (Kaya, 2012). In order to maintain the relationship between the industrial buildings that have lost their function and the urban and social memory, a conservation approach has emerged. It is necessary to protect not only the physical protection, but also the values that reflect the characteristics that make the industrial structures meaningful. In this way, in addition to the physical continuity, the relationship, meaning, and perception established with the city and its inhabitants are also preserved, thus ensuring the continuity of urban memory (Avsan et al., 2020). The conservation values of industrial heritage are parallel to those of cultural heritage. (Kaya, 2012).

Buildings and areas that have the characteristics of industrial heritage are the spatial reflection of the common life of the society. The production and continuity of identity depend on the common experiences of the society; it is the objectification of the spatial environment in our memory, experience and knowledge. Spaces, areas and buildings that have such meanings are the main values that make up the social structure, namely the urban identity itself. In short, industrial heritages are not only production-based structures or building areas, but also places where the ongoing life, habits and experiences of the society are located (Delice, 2012). In this context, the disappearance of industrial areas due to reasons such as abandonment, neglect and lack of protection creates a problem in terms of the continuation of cultural continuity and cultural accumulation remains at risk (Kariptaş, 2019). The demolition of industrial buildings will cause the loss of urban memory, and will lead to the interruption of continuity in the spatial and social life of the city. With the loss of memory caused by the destruction of industrial heritage structures, social traces will be erased, habits and social experiences will be forgotten and these experiences will not be transferred to future generations (Avsan et al., 2020).

The industrialization process in Turkey started in the Ottoman period and continued rapidly in the 20th century. Industrial heritage areas in Turkey cover areas such as industries, railways, mining sites, as in other world examples. These buildings are the most important witnesses of transportation, production style and diversity, social life for a period, and there are many buildings that are industrial heritage. However, the refunctioning of industrial areas is slow due to reasons such as the lack of a legal definition of the concept of industrial heritage in Turkey, the lack of inventory of the structures in Turkey, and the insufficient conservation economy. In addition, it is noteworthy that the way industrial heritage structures are handled in Turkey remains one dimension in terms of structure, and that the relations between the environment, identity and upper-scale plan are not correctly constructed and participatory approaches are not given importance (Türktaş, 2023). As the protection value of industrial heritage and the protection value of cultural heritage are parallel, the protection problems also show parallelism.

Although the definition, scope and principles of the concept of industrial heritage have been defined in international platforms, it has not been established on any legal basis in Turkey. The inventories of the heritage buildings were not taken out on time and they were not taken under protection. Except for some special applications, no documentation has been made about the structures that are not under legal protection in general. In the heritage areas that are under legal protection, adequate and regular maintenance has not been carried out. Industrial heritage buildings were given less value than other buildings due to their architectural forms, and the heritage areas in the city center were demolished after new projects and road widening applica-

tions, and industrial heritage lands covering large areas were opened for rent (Aslan, 2019). These can be said as the main problems of protecting industrial heritage structures in Turkey.

With the arrival of the railroad in Konya's Ereğli district in 1904, the settlement came to life and many buildings were constructed. Later, the Sümerbank Weaving Factory, which was built within the framework of the economic development policies of the Republican period, and other buildings that were developed with it, deeply affected the life of Ereğli and played an important role in the development of the city and society. These buildings have been standing for almost a century and are still touching the life of the society.

Within the framework of the above problem definition, the main objective of the study is to measure the awareness of the preservation of the environmental characteristics and identity of the industrial building or group of buildings that have lost their function and have been separated from the city over time for various reasons, in the areas that were important for the social and economic dynamics of the city at the time of its foundation. The aim of the study is to present a framework for evaluating the desires and activity levels of the actors regarding the protection of these heritage sites in the planning approach and to develop a planning approach that ensures that these heritage sites, which should be brought into the city, are used as both protected and livable spaces. In this context, it is aimed to determine the thoughts of the local people, non-governmental organizations and local administration on the concept of protection in the existing industrial heritage area in Ereğli, which has an important industrial heritage area. In addition, suggestions will be made to improve the planning, design and implementation processes that have a negative impact on the sustainability of industrial heritage areas that need to be protected.

Literature Review

Kaya, B. (2012), in his thesis titled "Planning Approach in the Protection of Our Industrial Heritage", emphasized the need to consider industrial heritage in the planning approach in its function and protection by integrating it with the built environment, settlement identity and social life. The study emphasizes the need to adopt a methodology that focuses on regional and historical research, as well as physical observations, in order to define the industrial heritage as a whole, with its historical, cultural, social and spatial dimensions, beyond being a mere material asset. It has been stated that the comprehensive and integrated planning approach is the most appropriate method for the evaluation of the industrial heritage, and that the classical conservation and functional approaches lack stabilizing and transforming power. It was concluded that it is necessary to try to create a cultural public space through the common and constantly accumulating memory of the urban public space in

which these structures and facilities are located, instead of only physical and economic applications.

Delice, E. (2012), in his master's thesis titled "Transformation of Industrial Heritage Sites, Case Study of Haydarpaşa Region", the evaluation of industrial buildings in Haydarpaşa region and suggestions for this area and the deficiencies i in the treatment of industrial heritage sites in Turkey. The study concluded that the re-evaluation of industrial structures is an important necessity and stated that attention should be paid to the necessity of preserving and keeping alive the experiences of the periods lived in this intervention process and the necessity of maintaining the traces of heritage in urban identity and memory.

Saner, M. (2012), in the study titled "Industrial Heritage: Concepts, Institutions and Approaches in Turkey", examined the development and institutionalization of the concept of industrial heritage in the world and evaluated the approaches in Turkey within this framework. In the study, the concept of industrial heritage and its historical development, international organizations related to industrial heritage, information about the protection of industrial heritage in Turkey, and the institutionalization of industrial heritage in our country are mentioned. According to the research, the first thing to do in Turkey is to identify genuine industrial heritage examples, to make an inventory of them, to keep their records, to protect and reuse them. It has been mentioned that it is necessary to develop alternatives that can reveal the knowledge and skills of doing things in the right direction, and that the awareness of the need to protect old industrial buildings should be increased not only in the relevant professions, but also in all parts of the society.

The authors Peng, KH., and Tzeng, GH (2019), focus on the problem that the development of industrial heritage tourism and strategies to improve the performance of these areas are not sufficient research topics in the academic field in the study named "Exploring Heritage Tourism Performance Improvement for Making Sustainable Development Strategies Using The Hybrid-Modified Madm Model", The study is based on investigating performance improvement strategies using the multi-featured decision making (MADM) model. In this context, a conceptual scheme scheme on industrial heritage, the tourism dimension and criteria of industrial heritage has been created. Data (expert opinion and surveys) were collected and evaluated for the content of the MADM model in accordance with the criteria identified for the development of industrial heritage tourism. In the conclusion part, the development of industrial heritage tourism should be seen as a useful tool for regional restructuring, increasing the employment rate, and improving economic development, taking into account the criteria of regional development planning, the historical and cultural value of the industrial heritage should be authentically exhibited, the existing cultural link with the heritage should be

strengthened. It was concluded that it is important to emphasize the value of relevant information and knowledge. It was noted that the integration of regional resources such as human, financial and governmental resources should be ensured in order to facilitate the efficient development of tourism based on industrial heritage.

Karayılanoğlu and Çelik (2021), "What are the Limits? The Role of Designers on Preserving the Identity in Adaptive Reuse of Urban Industrial Areas examines the role of designers and the limits of intervention in adaptive reuse of industrial spaces, focusing on creating sustainable mixed-function structures without losing the spirit of the space. Abandoned factories in the Alcântara region of Lisbon, Portugal were selected for the field study. As a result of the study, it was concluded that designers should adopt a participatory design process and an inclusive approach to preserve regional identity in adaptive reuse projects.

Oevermann and A. Mieg (2021), in their article "Urban Development Planning and World Cultural Heritage: Two Perspectives of Planning Practice Dealing with Industrial Heritage", discuss the contradictions between urban development and the preservation of monuments and world cultural heritage and how such concerns can be integrated within planning frameworks. they examined. In this context, the simultaneous discourse analysis method was used and eight criteria were determined. These criteria are sustainability, education, urban development, research, management, conservation, reuse and community engagement. It has been concluded that a good practice can be achieved by considering these eight criteria jointly, and that actors from different perspectives and discourses work systematically in an integrative way in planning.

Mi, Chen, and Mei (2021), in their article titled "Research on Industrial Heritage Protection and Regeneration Strategy Based on the Concept of "Sharing", used the concept of sharing to mean "common ownership and sharing process. This concept refers to a process in which a large number of users share and use an item. The study explains the tangible and intangible value of industrial heritage and proposes conservation and renewal strategies for industrial heritage. It has been observed that by preserving the original historical and cultural traces of industrial heritage sites, it awakens the common memory and cultural self-confidence of the people of the region, develops their own sense of belonging, provides cultural sharing, and also improves the level of public services. It has been concluded that in order to ensure universal sharing of industrial heritage, to make industrial heritage a part of the lives of the citizens, in addition to museum-like cultural and artistic activities, scenes of life should be included in the process of conservation and renewal.

Material and Method

The material of the study consists of the Ottoman-era station buildings and the Republican-era Sümerbank Weaving Factory area in the Ereğli district of Konya province. In this context, the location and characteristics of the area, its historical development, information about the current status of the buildings in the area, and zoning plans were examined, and field observations and studies studies were carried out. The archives of Ereğli Municipality were examined, the master development plan at the scale of 1:5,000 and the conservation development plan at the scale of 1:1,000, the files and pictures belonging to the study area in the archives of the Development and Urbanization Directorate of Ereğli Municipality were examined. In addition, findings related to the that was collected specifically for the area were obtained. In order to raise awareness about the industrial heritage of the study area, a survey was conducted among the people of Ereğli, non-governmental organizations and the local government, and the method followed in the survey study is detailed below.

The purpose of the survey, in planning approaches, is to determine the thoughts on the concept of protection and industrial heritage in the decisions that will ensure the use of these heritage areas that should be brought to the city as livable and viable places. Personal or private information such as name, telephone, e-mail was not requested in the questions in order to ensure the safety of the participants and high participation.

The survey questions were classified under the headings of demographic structure, awareness of conservation and industrial heritage, its place in urban memory. In order to determine the demographic characteristics of the participants, gender, age, educational status and occupational information were asked. Questions were asked about their knowledge of the concepts of industrial heritage/cultural heritage and conservation. In addition, the participants were asked about their opinions on the protection of the industrial heritage structures in the area, the reasons for the buildings' abandonment, the purpose for which the buildings should be used, and their knowledge of the planning studies carried out in the area. Statistical tools were used to determine the sample size of the number of interviews to be conducted with the local population. The surveys were conducted face-to-face and online using the Google Forms application. In order to calculate the minimum number of people needed to conduct the survey in Ereğli, the population of Ereğli district in 2022 was taken as the basis. The size of the universe is 114,383 people. The margin of error was 5% and the confidence interval was 95%. In the sample calculation, at least 383 surveys must be conducted in order for the sample number to represent the people of Ereğli. A total of 389 people participated in the study. In the elaboration stage, the answers of the public and the experts were compared and the results were obtained by using SPSS and Excel programs.

Case Study

Ereğli district is connected to Konya province and after the central 3 districts (Selçuklu, Meram, Karatay), it is the largest populated district of Konya. The district is located southeast of Konya. The distance of the district to the center of Konya is approximately 153 km. The population of Eregli in 2022 is 150,978. The population of Ereğli city center is 114,383 people. (Url-2). The area of Ereğli district is 2,560 km² and the zoned area of the district center is approximately 35 km². As shown in Figure 1a, the district is surrounded by Aksaray in the north, Niğde in the east, Karaman and Mersin in the south. Ereğli's presence of rail transportation out of the highway has diversified the transportation in the district. The presence of Ereğli's railroad from the highway has diversified transportation in the district. The railway line, which was built in 1904, has played an important role in both passenger and raw material transportation from the time of its construction until today. Although it is no longer in demand for passenger transportation, the construction of the high-speed train is attracting attention.

Location of the Study Area in the District

There are architectural buildings of two different periods in the study area. One of them is the railway and its other buildings built in the Ottoman period in 1904, located between the Istanbul-Baghdad railway line, and the other is the Sümerbank Weaving Factory built in the Republican period in 1934 and the structures belonging to the factory, officials and workers' houses.

The area is within the borders of Sümer, Gülbahçe and Türbe neighborhoods, which are the center of the district. The study area covers an area of approximately 35 ha in the city center. As seen in Figure 1b, the blue border represents the city center zoned areas and the red border represents the study area. The city has developed and continues to develop around the station and factory. The factory and the station are the most important landmarks of the city.

In the study area (Figure 1c), there are the Sümerbank Weaving Factory and workers' dormitories, officers' houses, warehouses, sports facilities, school buildings, Ereğli Railway Station building, a water tank belonging to the station, a fountain that supplies water to the trains, dormitories, a locomotive depot, and turntable structures.

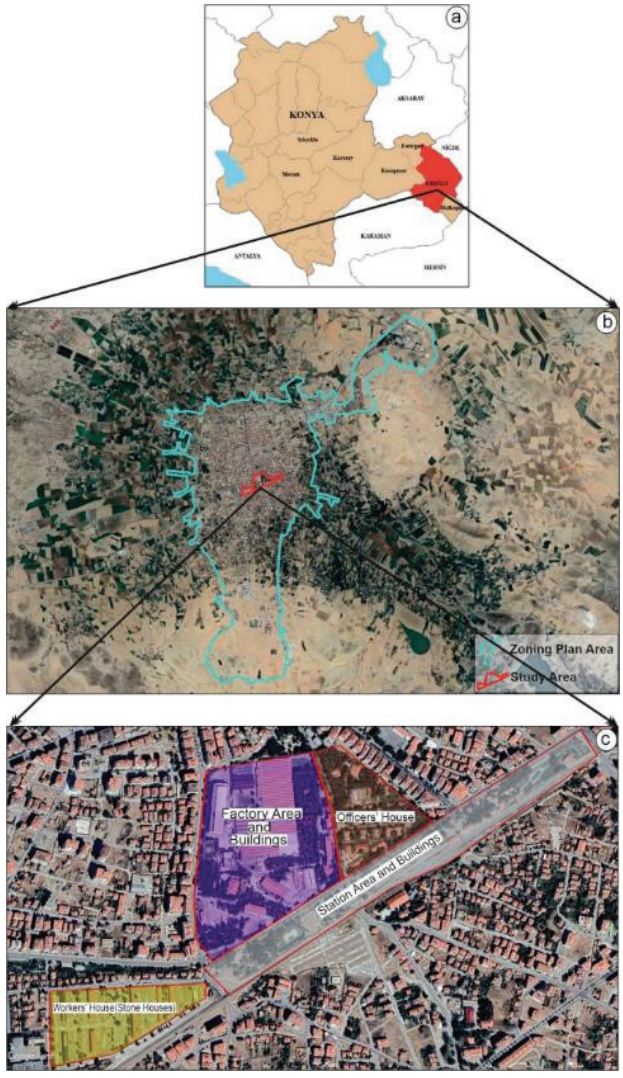


Figure 1. *Location of the study area*

Planning Processes Affecting the Work Area

1/5.000 Master Zoning Plan

It was approved by Konya Metropolitan Municipality on May 12, 2017. The working area according to the plan, is located within the industrial area, commercial area, parking area, social facilities area, sports area, railway station and urban site area (Figure 2). When the plan and the explanatory report are examined, important facility areas such as social and cultural areas, education and parking areas are not planned over the standards.

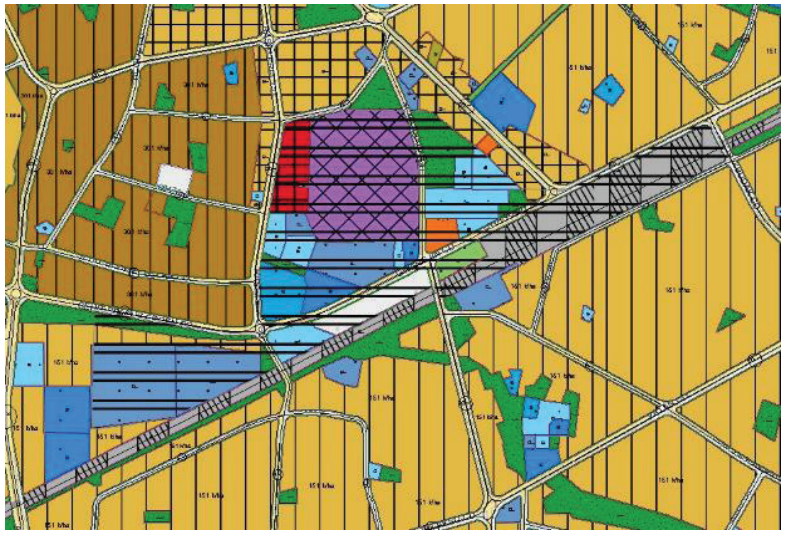


***Figure 2**. 1/5.000 Master Zoning Plan*

1/1000 Conservation Zoning Plan

The conservation plan was approved on May 2, 2013. However, the history of efforts to protect the area predates the approval of the plan. The first conservation studies in the area of the TCDD station were conducted in 2005. It was decided to register the buildings in the area within the scope of 2863 numbered with the decision of Konya Cultural Heritage Preservation Regional Board on June and numbered 379. Due to the socio-economic and historical importance of the urban protected area outside the TCDD area, the area where Sümerbank Workers' Housing, Officers' Housing and Station Buildings are located was declared as an urban protected area with the decision of Konya Cultural Heritage Preservation Regional Board on 31.08.2005 and numbered 483. As a result of the area covered by the urban site, various court decisions and evaluations, Sümerbak Factory, workers' residences, officers' houses, Sümer School, nursery school, mosque, hospital and TCDD, with the decision of Konya Cultural Heritage Preservation Regional Board on 27.09.2012 and numbered 843. It was extended to include the station areas and took its present form. In Figure 3, the black shaded buildings within the working boundary (red boundary) represent the registered buildings.

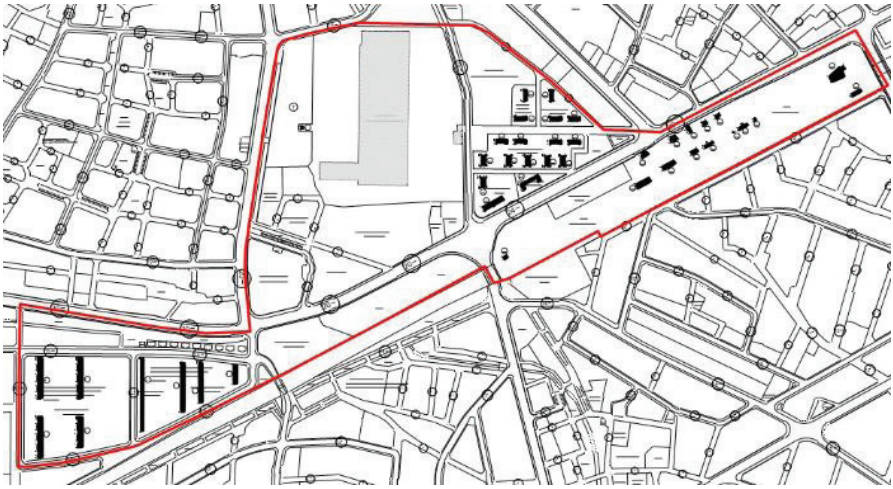


Figure 3. *Urban site and registered buildings*

In the conservation plan report, within the scope of the conservation approach specific to the area, Ereğli Station, one of the important stations of the Istanbul-Baghdad railway line, has become one of the focal points of the people of the region, developed as the physical equivalent of the development move initiated in the early years of the Republic, and is an important industrial heritage site in the history of the Republic. It is stated that there are registered examples of civil architecture, consisting of workers' dormitories of Sümerbank, officers' houses and station buildings, within the urban registered area. Taking into account the upper scale plan decisions in the conservation plan, a conservationist approach in accordance with the general planning principles in the context of sustainability has been demonstrated. A conservation approach that does not see the protection as the protection of buildings and space, but takes into account the local characteristics of Ereğli has been accepted as the upper framework. One of the main objectives of the plan is to be able to create conservation awareness beyond the decisions taken and the planning period (EKAİP, 2013).

As part of the conservation zoning plan, the physical characteristics of the urban texture and structures in the area were examined, and decisions were made about new functions and uses, taking into account existing functions and areas of need. Existing functions were evaluated both in terms of required equipment standards and according to the needs of the new space setup. The largest proportion of land use decisions is reserved for social and cultural facilities (25%). It covers an area of approximately 95,500 m². The land use decision that has the largest share after the social and cultural area is the industrial area (18%) (EKAİP, 2013).

Station Site Buildings

There are many buildings in the station area that have survived since 1904. There are the main train station building, the guard house, logistics chief, the local, the lodging, the maintenance chief, the water tank, the locomotive depot, the rotating platform and the worker's barracks in the field (Figure 4).

Figure 4. *Station site buildings (Türktaş, 2023)*

Ereğli Weaving Factory

The factory, designed by German architects, was begun in 1934 and completed in 1937. The criteria for choosing the location of the factory are the presence of railway transport, the proximity of raw material sources and the presence of labor potential. Some structures were built to meet the needs of the factory and its employees. In the area of the factory, such structures as the factory building, water tower, timber warehouse, sports facilities, kindergarten area, entrance and administration buildings, open and closed cinema areas were built. With the factory, it aims to create environments that will affect the development of urban space and bring the quality and understanding of urban space from its traditional form to the "modern" line that the Republic is trying to build (EKAİP, 2013).

Due to the social facilities in the factory, the foundations of a different social life were laid in Ereğli. In addition, the factory has become an important focal point of the district. The year 1950 was the most crowded year of the factory, with 2140 workers and 60 civil servants. In the 1980s, a mosque and a family club building were added to the area of civil servants' houses.

Since 1980, as a result of the state economic policy, the attitude towards the state economic enterprise has changed and privatization studies have started. As a result of the practices carried out within the scope of privatization, the Ereğli Sümerbank cloth factory was privatized in 1997. Some of the buildings belonging to the factory have passed into the ownership of Ereğli Municipality Treasury (EKAİP, 2013). Although the factory does not employ as many workers as before, after the privatization process, it continues to produce with an average of 600 workers, with a capacity to meet 40% of the clothing needs of the Turkish Armed Forces (Url-3). Although the stone houses, which were allocated to the associations in the process, remained idle and on the verge of demolition, restoration works have started. In the factory area; factory building, entrance and administrative buildings, water tank, wooden warehouse, sports facilities and a nursery (Figure 5).

Figure 5. *Weaving factory and nearby buildings (Kocadağ, 2022)*

Officers' Houses

The Officers' Houses between the Factory and Station Street are, as the name suggests, planned for the Factory Officers. Due to its location, it is situated between the factory and the station. The Officers' houses differ in both land layout and plan typology according to the administrative hierarchy of the factory. All the buildings in the area of the Officers' Houses are under the control of Ereğli Municipality and all the buildings are registered. During the renovation process, most of the wooden doors and windows were replaced with PVC and the exteriors were painted in different colors.

Today, the Officers' Houses have been re-functionalized with uses such as a hotel, psychological counseling and research center, some associations, youth center, women's workshop, Down Cafe, kindergarten, women and family services directorate, children's library, health center and social facilities for some professional groups. The aim was to ensure the continuity of the buildings. In addition to the buildings in the area of the Officers' Houses, this area is one of the most important landscape areas in the city center. The presence of trees planted during the construction period adds value to the area. There are many different types of trees in the area (Figure 6).

Figure 6. *Officers' houses location (Türktaş, 2023)*

Workers' Houses/Stone Houses

The stone houses located south of the factory (Figure 7), west of the station area, were, as the name suggests, built entirely with stone walls and were constructed to house the workers. The walls of the buildings in this area were constructed with rough stone on the outside and solid brick on the inside. This group of worker buildings consists of three different types. It is believed that the reason for the different types of construction is related to whether the workers are married, single, or temporary. There are a total of 8 blocks in the area (EKAİP, 2013). Although their construction started with the establishment of the factory, the date of their completion is unknown. When the municipal archives, factory archives and magazines were scanned in the research conducted in 2012, it was found that the construction of the buildings was still continuing in 1944.

After the privatization of the factory, the stone houses began to deteriorate rapidly. Survivors of the Marmara earthquake of 1999 lived here. During the factory period, the heating of the houses was provided by the factory, but due to the heating problem of the buildings that were separated from the factory after the privatization, the earthquake victims caused destruction by making various applications in the buildings. During the evacuation of the buildings, which was carried out quickly in 2002 as part of the city project, great damage was caused and elements such as wooden doors, windows and floors were taken away during transportation. Restoration is still underway.

Figure 7. *Workers' houses (Türktaş, 2023)*

Results

The field study included a survey of 389 local residents, 80 professionals (urban planners, architects, civil engineers, landscape architects, etc.), and 20 local government officials. Questions about participation in the planning process asked in the survey were excluded from the scope of this study. The responses were processed in SPSS and frequency analysis was performed. The answers to the questions asked in the questionnaire are listed below in categories.

Findings Regarding Demographic Structure

Among the participants, 67% of the local people, 81% of the expert group, and 70% of the local government participants are men. The gender distribution graph of the participants is shown in Figure 9a. Looking at the age graph of the participants (Figure 9b), it can be seen that the 26–40 age group is the

highest in all three groups.

When the educational status of the local people is examined, 6% are primary school graduates, 6% are secondary school graduates, 20% are high school graduates, 18% are associate degree graduates, 42% are undergraduate graduates, 6% are postgraduate graduates, and 1% are Ph.D. graduates. Figure 9c details the educational status of the participants.

Findings on Awareness of Conservation and Industrial Heritage

In order to understand how much the participants know about the concepts of industrial heritage and / or cultural heritage, the question "Do you know about the concepts of Industrial Heritage or Cultural Heritage?" was asked. 45% of the respondents did not know at least one of these concepts. In the group of experts, 21% did not know at least one of these concepts. In the local government dimension, 25% of respondents indicated that they did not have detailed information about at least one of these concepts (Figure 9d).

To get an idea of whether the participants have knowledge about the concept of urban conservation, "Do you have any information about Urban Conservation?" question was posed. 68% of the public, 86% of the experts and 75% of the local administrators have an idea about the concept of protection (Figure 9e).

In order to measure how much the local people value the structures in the area, the question "Should the structures in the station area, Stone Houses, Officer Houses and the structures in the factory area in Ereğli be preserved?" was asked. The answers given in all groups were determined as the need to protect the structures in the area over 90% (Figure 9f).

"Why should the buildings be protected?" was posed and answered by those who expressed the opinion that the buildings should be protected, depending on the previous question. In addition to the options such as "Aesthetic-Architectural Value, Heritage-Document Value, Identity Value, Economic Value, Memorial Value", which are the values of industrial heritage buildings, as an option to the question, the "Other" option is presented to indicate if there are other reasons they want to add. Participants could mark more than one option for this question. In response, the public group of participants found aesthetic and architectural value important, while the expert and local government groups found heritage and document value important. When all three groups of participants are considered together, the responses for aesthetic and architectural value and heritage document value come to the fore (Figure 9g). In addition to these values, two of the participants shared their different opinions by ticking the Other option. One of them stated that "the area and the structures should be protected to prevent concreting" and the other stated that "the buildings should be protected because I believe that they can provide a

cultural heritage from the past to the future and a positive appearance to the texture of the city".

As mentioned in the previous section, many of the buildings in the region have been unused for a long time, and although this was an important problem for the city, no solution could be found. In the question to determine the reasons why the buildings remain unused in the eyes of the participants, the options "economic reasons, property status, inability of the proposed projects to be applicable, the local government does not give enough value to the area, the public has no expectations from the area" were presented, and the "other option" was presented for those with different opinions.

Participants also have the right to mark more than one option in this question. The people and experts from the groups participating in the study agree that the local government is responsible for keeping the buildings unused. However, the participants from the local government argued that the region remained vacant for economic reasons.

The participants also stated that there are reasons other than those we identified in the "other" option. They say that this result occurs because "the state is responsible", "because of privatization", "people and administrators always try to save the day, and those who do not know about cultural heritage and those who know are indifferent" (Fig. 9h).

Findings Regarding the Place of Industrial Heritage Buildings in Urban Memory

Based on the fact that people who lived and spent time in this area felt that they belonged there and developed a sense of protection for the place where they lived, the participants were asked whether they lived in the area in question. From this point of view, the participants were asked: "Did you live in the Sümerbank Weaving Factory or in the structures of the station? When the answers were examined, it was found that 93% (in general) did not live in this area. The responses of the participant groups to this question are detailed in Figure 9i.

The aim is to find out how much of the factory and the station directly touched or influenced the participants and whether the structures, which are almost a century old, still interact with today's people. For this purpose, it was asked if there was anyone who worked in the Sümerbank Weaving Factory or the railway station. According to the answers given, 37% of the public, 24% of the experts and 50% of the local government participants had a relative who worked here (Figure 9j).

The question "Do you have information about the projects planned to be carried out in the region?" was asked to determine the participants' knowledge about the projects that have been done or will be done in the region

and to determine the ability or power of the local government to raise public awareness. 71% of the people answered that they are not aware of the projects that have been done or are being done in the region. As a result of the survey, it was found that 49% of the expert group and 50% of the local government participants were not informed in detail about the projects to be carried out here (Figure 9k).

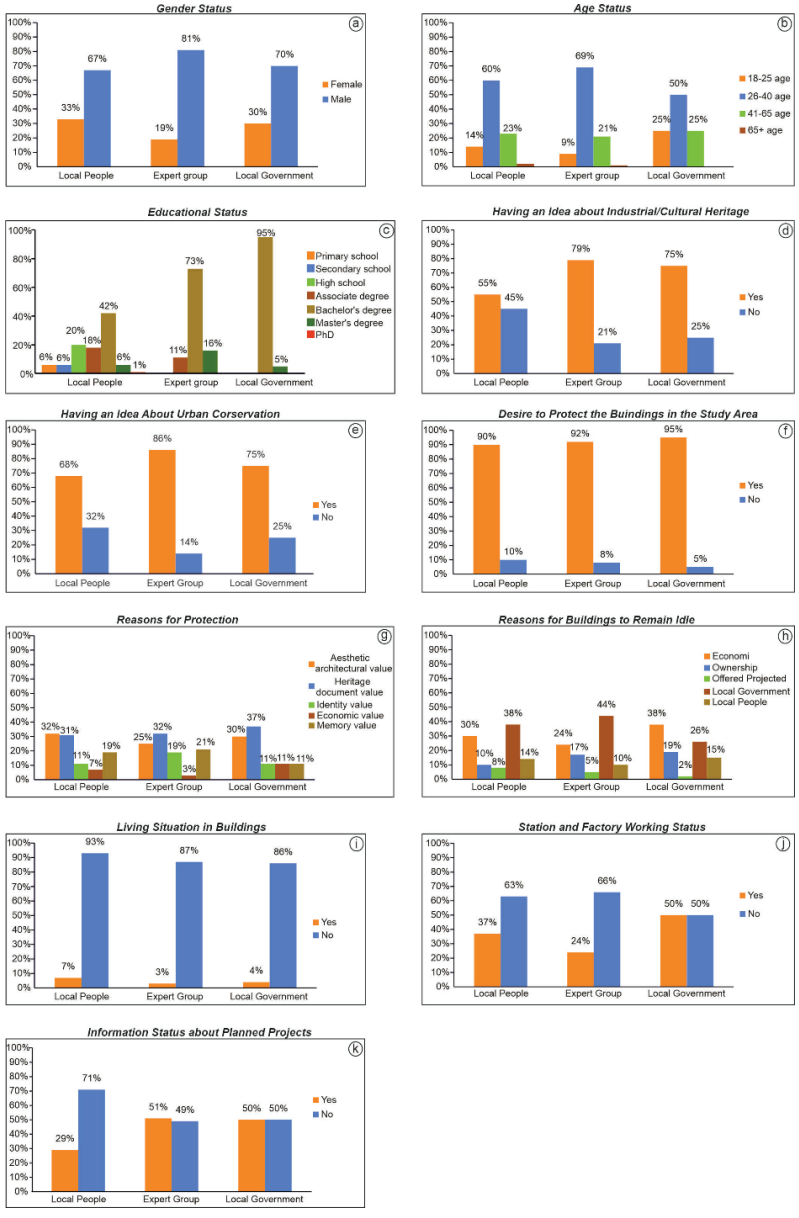


Figure 9. *Evaluation of awareness about industrial heritage area of Ereğli (Konya)*

Conclusion and Recommendations

In this article, it has been researched to measure the level of awareness of the public, experts and local governments, who are important actors in the protection of industrial heritage sites in Turkey, in the protection of these areas. In this context, the actors in question were asked for their ideas on some concepts that form the basis of the concept of conservation and measuring the places of these structures in urban memory.

The understanding of historic preservation is not to freeze the past; it means to ensure the "continuity" of the future with the past (Tekeli, 2009). In order to preserve the identity and memory of the city, it is necessary to revitalize the historical textures and consider the social-economic-physical environment holistically. The preservation of historical, cultural and environmental richness is possible through planning (Özden & Görgülü, 2006). The disappearance of industrial areas due to reasons such as abandonment, neglect and lack of protection creates a problem in terms of the continuation of cultural continuity and cultural accumulation is at risk (Kariptaş, 2019). The concept of industrial heritage, which emerged as an attitude against the demolition of industrial areas that have an important place in society's past, is based on the goal of protecting and preserving these industrial areas with different functions in order to adapt them to today's conditions (Türktaş, 2023).

In Turkey, the writing of documents and data belonging to the history of technology does not have a very long history. For this reason, the theorization and evaluation of the definition of industrial heritage as a scientific field and the determination of conservation methods and their application in many examples are important opportunities for these applications to be made scientifically in Turkey and achieve successful results (Mutlu & Yılmaz, 2018). Since the vision of local governments for industrial heritage areas is generally evaluated under "urban transformation," cities faced the danger of not being able to preserve their historical textures and features that characterized an era. The inability of urban conservation practices, which began in Turkey in the 1960s, to show the necessary sensitivity and the fact that industrial heritage areas are seen as potential rental areas have made their existing potential unusable. Recently, industrial heritage initiatives have been revived in Turkey. Examples such as the Rahmi Koç Museum, SEKA Paper Museum, Santral Istanbul appear as successful examples. These structures, which have been transformed within the framework of industrial heritage, present the daily life of the workers of the social, economic, technical and technological periods of the time and their working conditions.

In the study carried out on the sample area of Sümerbank Weaving Complex and Station Buildings in Konya Province, Ereğli District, in addition to the physical continuity, the issue of conservation awareness necessary for the

continuation of the relationship between the city and its inhabitants is discussed. The main issues related to the physical, social and economic dimensions of conservation have been identified. Suggestions have been made for the improvement of these heritage areas that will be met by all segments of society.

As stated in Kaya (2012), Aydın and Okuyucu (2009) and ICOMOS (2013), industrial heritage sites should be protected due to their aesthetic and architectural, memorial, technical, economic and folkloric values. According to the results of the research conducted in the field, it can be seen that although the majority of the participants do not live here, they have established a bond with the buildings and their protection instinct has developed. The participants stated that the buildings in this area should be preserved because of their aesthetic and architectural value and their memory value. It can be seen that as the age of the participants increases, the memorial value of the structures becomes more important.

Cities, which are the living space of society in a social, economic and cultural context, are the mirror of society, and society has the right to make all kinds of decisions about the city. Cities belong to society and are adopted by society at the level where they can meet its needs and desires. In other words, the development of the community's sense of belonging to the city is directly proportional to the extent to which the city can meet the needs of the community. Local people must be actively involved in the decision-making and implementation of the strategy to ensure that local needs and local ownership are met. In this way, locality, legitimacy and reliability can be gained in the planning studies to be developed. Social participation in conservation work at any scale can be ensured and a sense of belonging can be strengthened.

The main result of the study is to show that the actors in Ereğli have a developed awareness of conservation. However, they are not involved in the planning process. It is necessary to ensure that the protection process is not only used physically but also with a functional selection that will appeal to the city and its inhabitants. In this context, a participatory planning approach should be adopted. In the survey study, the local government was the biggest reason for the idle buildings. The demands and wishes of the people should be urgently identified and decisions should be taken in this direction before the buildings are worn out and given new functions.

A renewal scenario for the future of the region should be created in Ereğli. Re-evaluation models should be developed that aim to evaluate the industrial heritage sites in the city on the basis of their social, cultural and economic dimensions. The integration of industrial areas with their immediate surroundings, which function as spaces that support the economic, social and cultural structure of the region, is extremely important for the further development of

the settlement and the preservation of the continuity of social life. All these processes should be designed with broad participation and from the bottom up. Considering that all the structures studied in the study area are the lifestyle of the people of the region and the bridge they have built with the past and their memory, it should be aimed to develop the functions to be included in the scenarios designed for the area in a social participation dimension, in a way that meets the expectations of the public.

Eregli has an important industrial heritage area. The characteristics that make this place important are the fact that the area is in the city center and most of the area is publicly owned; it has an area and building stock that can accommodate more than one urban function; it has urban spaces; and the area has important landscape elements. In addition, the public's desire to protect the area and to participate in the planning and design process will help highlight the area's potential.

References

Aslan, H. (2019). *Endüstri mirasını belirleme ve koruma-yaşatma kriterleri: Ankara Maltepe elektrik ve havagazı fabrikası örneği* (Yüksek Lisans Tezi). Gazi Üniversitesi, Fen Bilimleri Enstitüsü .

Avsan, D., Gökmen, GP., Altınışık, İU. (2020). Endüstriyel mekân ve kentsel hafıza; Sümerbank Denizli İplik Fabrikası üzerinden bir değerlendirme. *İdealkent*, 11(Kentleşme ve Ekonomi Özel Sayısı), 997-1022.

Aydin, D., Okuyucu, ŞE. (2009). Yeniden Kullanıma Adaptasyon ve Sosyokültürel Sürdürülebilirlik Bağlamında Afyonkarahisar Millet Hamamının Değerlendirilmesi. *Megaron*, 4(2).

Büyükarslan, B., Güney, ED. (2013). Endüstriyel Miras Yapilarinin Yeniden İşlevlendirilme Süreci ve İstanbul Tuz Ambari Örneği. *Beykent Üniversitesi Fen ve Mühendislik Bilimleri Dergisi*, 6(2), 31-57.

Delice, E. (2012). *Endüstriyel miras alanlarının dönüşümü, Haydarpaşa örnek alan incelemesi* (Yüksek lisans tezi). Bahçeşehir Üniversitesi, Fen Bilimleri Enstitüsü

EKAİP Raporu (2013). Ereğli Sümerbank Dokuma Fabrikası ve TCDD Sahası Koruma Amaçlı İmar Planı Açıklama Raporu

Karayılanoğlu, G., & Çelik, C. (2021). What Are The Limits? The Role of Designers on Preserving the Identity in Adaptive Reuse of Urban Industrial Areas. *Bilim Dergisi*, 61-73.

Kariptaş, F. S. (2019). *Endüstriyel Miras Kavramı Çerçevesinde Endüstri Yapılarının Yeniden İşlevlendirilmesi ve Elektrik Santralleri Örneği Üzerinden Analizi* (Doktora tezi).Mimar Sinan Üniversitesi, Fen Bilimleri Enstitüsü.

Kaya, B. (2012). Endüstri Mirasımızın Korunmasında Planlama Yaklaşımı, Uzmanlık Tezi. Kültür ve Turizm Bakanlığı İzmir II Numaralı Kültür Varlıklarını Koruma Bölge Kurulu Müdürlüğü, İzmir, Türkiye.

Kaya, M; Yılmaz, C. (2018). Endüstriyel Miras Turizmi İçin Bir Örnek: Ayancık-Zingal Orman İşletmesi (Sinop). Erciyes Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 32(44), 121-162.

Köksal, G. (2012). Endüstri mirasını koruma ve yeniden kullanım yaklaşımı. Güney Mimarlık, 8, 18-24.

Mi, L., Chen, Y., Mei, L. (2021). Research On Industrial Heritage Protection And Regeneration Strategy Based On The Concept Of “Sharing”. *World Congress of Architects*, 842-848.

Nazik, C. (2021). *İstanbul’daki Endüstriyel Miras Kapsamındaki Yapıların Müze Yapılarına Dönüştürülmesinin Sosyo-Kültürel Sürdürülebilirliğe Katkısı*. (Yüksek Lisans Tezi), Haliç Üniversitesi.

Oevermann, H., Mieg, H. (2021). Urban Development Planning And World Cultural Heritage: Two Perspectives of Planning Practice Dealing with Industrial Heritage. *Planning Practice & Research*, 430-441.

Özden, E. Ö., Görgülü, Z. (2006). Planlama-koruma ilişkisi üzerine yeni bir sistem önerisi. *YTÜ Mimarlık Fakültesi e-Dergisi*, 1(4), 102-108.

Özüdoğru, A. A. (2010). Adana'da Dokuma Sanayi Yapılarının Endüstri Mirası Kapsamında İncelenmesi. (Yüksek lisans tezi). Çukurova Üniversitesi, Fen Bilimleri Enstitüsü.

Peng, KH., Tzeng, GH. (2019). Exploring Heritage Tourism Performance İmprovement For Making Sustainable Development Strategies Using The Hybrid-Modified Madm Model. *Current Issues In Tourism*, 921-947.

Saner, M. (2012). Endüstri mirası: kavramlar, kurumlar ve Türkiye'deki yaklaşımlar. Planlama Dergisi, 52, 53-66.

Şimşek, E. (2006). *Endüstri yapılarının kültürel miras olarak irdelenmesi ve değerlendirilmesi: İzmir Liman Arkası örneği* (Doktora tezi). DEÜ, Fen Bilimleri Enstitüsü.

Tekeli, İ. (2009). Kültür politikaları ve insan hakları bağlamında doğal ve tarihi çevreyi korumak. *Tarih Vakfı Yurt Yayınları.*

Türktaş, Ş. (2023). *Katılımcı Planlama Yaklaşımı ile Endüstriyel Miras Alanlarının Değerlendirilmesi: Ereğli Tren Garı ve Sümerbank Dokuma Fabrikası Kompleksleri Üzerinden Değerlendirme* (Yüksek lisans tezi). Konya Teknik Üniversitesi, Lisansüstü Eğitim Enstitüsü.

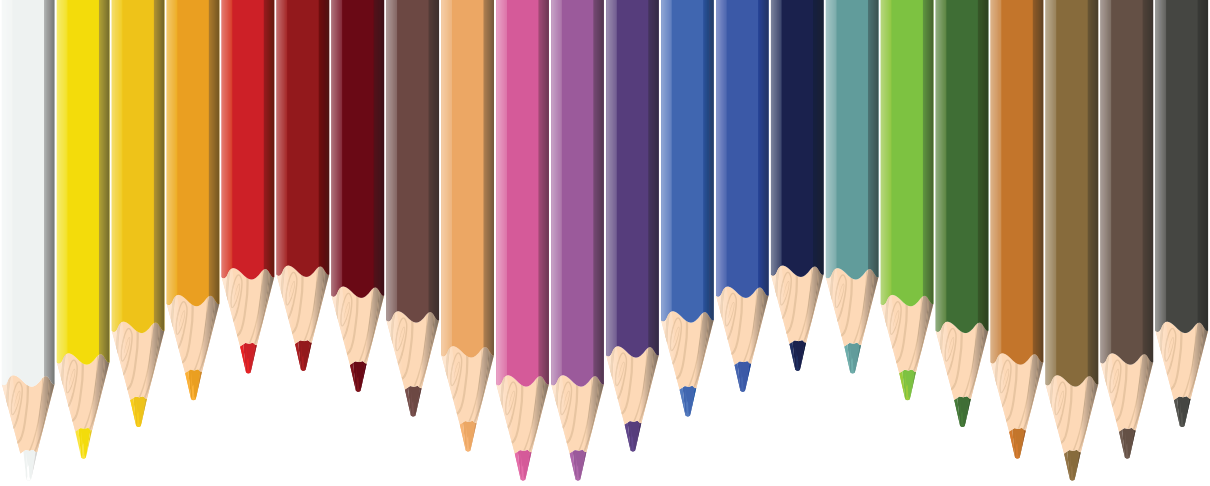
Uçar, B. (2013). *Endüstriyel miras ve yeniden işlevlendirme kavramları kapsamında Beykoz deri ve kundura fabrikası'nın irdelenmesi*. (Yüksek lisans tezi), Mimar Sinan Üniversitesi, Fen Bilimleri Enstitüsü.

Url-1: ttp://www.international.icomos.org/18thapril/2006/nizhny-tagil-charter-e.pdf Ziyaret Tarihi: 13.10.2021

Url-2: https://www.nufusu.com/ilce/eregli_konya-nufusu#mahalle-nufuslari

URL-3: https://ticcih.org/about/charter/

Uysal, M. (2018). Endüstriyel Miras ve Turizm İlişkisinin Türkiye Turizm Planlaması Kapsamında Değerlendirilmesi. 1st International Conference on Tourism and Architecture 323-338.



Chapter 2

FACTORS AFFECTING FURNITURE PREFERENCE: USAK UNIVERSITY ACADEMIC STAFF EXAMPLE

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INTRODUCTION

Consumer purchasing behavior is influenced by cultural, social, personal, psychological and economic factors. Many of these factors are uncontrollable and beyond marketers, but should be considered when trying to understand the complex behavior of consumers (Madhavan, 2015). Cultural factors are decisive in determining purchasing behavior and are part of external factors affecting consumer behavior. The decision to purchase is deeply influenced by cultural factors such as buyer culture, subculture and social class. While culture is the main reason for a person's wishes and behavior, each group or community also has a cultural impact on purchasing behavior (Tekin, 2016).

Social factors significantly affect one's purchasing behavior. There is usually someone around every consumer who affects the purchase decision (Lautiainen, 2015). Consumers have different lifestyles at different ages, and the lifestyles they adopt determine the services and products they demand (Comert and Durmaz, 2002). The professions of consumers create the need and desire for products and services specific to their situation. The need for clothing of a staff member and manager diverges. It needs different tools and clothing related to worker and teacher professions. On the other hand, as the education levels of individuals increase, their needs and demands also change (Cemalcılar, 1998).

Consumer motivation is defined as an internal situation that directs individuals to identify and purchase products or services that meet their needs and / or desires. Fulfilling these needs can motivate them to a repeated purchasing behavior or to find different goods and services to satisfy these needs (Bown-Wilson, 2017).

The furniture industry is one of the secondary sectors where products and services, production and marketing are intertwined. Although it is the basic need, it is among the durable consumer goods, it is a sector where fashion is at least as effective as ready-to-wear (Turker, 2010). Furniture, which is one of the basic tools in the arrangement of a space, is an important factor in the design and comfort of a house. The function of furniture in our lives has been an item and product that establishes and transmits its own meaning structures within every period not limited to being an object used only at home (Arpacı, 2014). Consumer awareness and awareness are constantly increasing due to changing living conditions. The consumer, who is not satisfied with the single reference or selection criteria when purchasing furniture, by accessing the social media accounts or web pages of the companies over the internet; warranty period, pricing, measure, material, It can get a positive or negative idea by reaching other information in numerous variations such as design and these and making preliminary evaluations about the products. The correct detection of consumers' requirements and possibilities will enable them to reach

the right product in need by choosing the most suitable conditions. Having knowledge of furniture types and furniture features will help him make his preferences in the most appropriate way (Arpacı and Obuz, 2013).

When the studies for the furniture preferences of the consumers are examined, it is seen that the price, quality, brand, payment conditions, functionality, easy cleaning feature of the furniture and after-sales services come to the fore. In his study of Akyuz (2006), he examined the psychological, socio-psychological and socio-cultural factors affecting consumer behavior in furniture purchase. The process of purchasing furniture is very important for consumers. The socio-cultural, psychological, demographic and situational factors of each consumer are different from one. This situation is reflected in the purchasing process and shapes consumers' preferences (Andac, 2008). In the study conducted by Arslan et al., (2009), the effects of the characteristic, social and economic characteristics of the consumer on the choice of branded furniture as a furniture user were investigated. In the case of Türker (2010) Kütahya province, he examined the effect of the factors of design from the main components of the furniture industry on consumer behavior. Dulgeroglu (2011) investigated the issue of determining consumer preferences in furniture selection. Cabuk et al., (2012) Examined the behavior and attitudes of consumers in Zonguldak province in furniture preference, customer profile was determined according to demographic factors such as educational status, age, gender, income status. Demircioglu (2012) examined the effects of the brand on consumer purchasing behavior. Obuz (2012) examined consumers' preferences for furniture, purchasing, usage behavior and furniture. As of consumers living in Ankara, Arpacı (2014) has examined problems with purchasing and using furniture and purchasing furniture. Korkut and Kaval (2015) investigated consumer preferences in the selection of furniture, and in their work they demonstrated the purchasing behavior of consumers. Kaval (2017) Quality documents in furniture consumer preferences in the case of Kocaeli province.

It has been found that the decision to purchase consumer furniture is made mostly in stores and secondly on the internet. The main challenge with a product is to attract consumers' attention, determine their preferences and buying habits (Jost et al., 2020). Consumers pay more attention to spending money over time, the products they buy, and the risks they take when choosing products. In this context, the furniture industry is one of the markets most affected by consumer behavior. (Khosro et al., 2020). Furniture is a type of product that consumers choose with great care, spend a lot of time before deciding to buy, and most people test before making a decision (Oblak et al., 2020).

The aim of the study is to reveal what are the factors that are effective in the furniture preferences and selection of Usak University academic staff. In this context, the study first included national and international studies on the subject, In the implementation section, a questionnaire was applied to aca-

demic staff at Usak University and in line with the data obtained, factors that were effective in the furniture preferences and selection of consumers were tried to be determined. In the literature review, it has been determined that many studies have been conducted on the criteria affecting consumers' furniture preferences. However, there has been no study addressing what factors may be important other than the factors in the literature, which is effective in the furniture preferences of academic staff. It is thought that the work is important in this respect, it will guide the operators operating in the furniture decoration industry and will also contribute to the researchers who will work in this regard in the future.

METHOD

The survey technique was used in obtaining data that could reveal the preferences of the consumers regarding the furniture. The universe of the research has been determined as academic staff of Usak University (UU). Its sample constitutes academic staff working on the central campus. The questionnaire was prepared using the relevant source in such a way that it can be easily understood by consumers (Donmez 2019). The questionnaire consists of two parts, demographic features for consumers and preferences of consumers for furniture, and 34 questions in total. In the first part of the survey; demographic features for consumers, in the second part; It consists of 30 Likert type expressions aimed at revealing the preferences of consumers regarding furniture and the factors affecting consumers' furniture purchasing behavior. According to the Likert scale with 5' for related questions in the second part; I totally agree (5), I agree (4), No My Idea (3), I disagree (2), Absolutely Disagree (1) 30 judgments are required to be evaluated according to '. The lowest possible score for each question is 1, the highest score is 5'.

In the spring of the 2022-2023 academic year, it is aimed to reach all academic staff on the central campus. The data collection phase in the study was limited until 01 March-01 April 2023 and a survey was conducted by reaching it over the internet. Data obtained through Google drive were combined as of May 15. After the survey implementation, there was a return from 120 academic staff.

The level of confidence for research and the sample size according to the acceptable error are calculated according to the formula below (Gurleyen2005).

Sampling size (n); $$n = \frac{Z^2 \times N \times P \times Q}{N \times D^2 + Z^2 \times P \times Q} \qquad (1)$$

Z: Value at a certain level of significance (95% confidence level) according to table t (1,96)

N: Number of people in the target audience (universe) = 726

P: Possibility of the feature desired to measure in the main mass (99% taken)

Q: 1-P Possibility of the feature desired to measure not to be in the main mass (0.05)

D: accepted sampling error (%2 taken).

$n= (1,96^2 \times 864 \times 0,99 \times 0,01) / (864\times 0,02^2 + 1,96^2 \times 0,99 \times 0,01) = 95,08 \approx 95$

Accordingly, sample size n=95 was calculated at 95.0% confidence level over 0.05 acceptable error. Since the sample count was at least 85, 120 people were sufficient for the sample. The reliability analysis of the questionnaire used in the study yielded a Cronbach Alpha value of 0.766. Considering this result, the scale appears to have reliability. Because the fact that the alphabet is less than 0.40' indicates that the scale is unreliable, low reliability between 0.40-0.60, reliable between 0.60-0.80, and high reliability between 0.80-1.0 (Ozdamar, 2002).

As a result of the evaluation of the ethical committee application made for the research; applicability of the research Scientific research was found suitable for ethics with the protocol decision of the Usak University Social and Humanities Scientific Research and Broadcasting Ethics Board dated 25.01.2023 and numbered E-89784354-050.99-125750.

Data Analysis

After the data obtained in the research was processed in MS Excel environment, statistical analyzes were made using the SPSS 25 SPSS (Statistical Packages for the Social Sciences) package program. Statistical expression of the findings is given as frequencies-percentages, arithmetic mean and standard deviation.

RESULTS

The findings of the research have been treated as demographics of employees, ergonomics of working spaces and physical environmental conditions. The gender, age, educational level and service period of the personnel included in the study are given in Table 1.

Table 1. Number and percentage distribution of demographic variables

Demographic Variables		Frequency (n)	Percent (%)
Gender	Male	78	65
	Female	42	35
Age	25-34	27	22.5
	35-44	33	27.5
	45-54	38	31.6
	54 and above	22	18.4
Educational Status	Research Assistant	15	12.5
	Lecturer	19	15.8
	Assistant Professor	48	40.0
	Associate Professor	25	20.8
	Professor	13	10.9
Income Status	15000 tl and below	11	9.2
	15001-18000 tl	25	20.8
	18001-21000 tl	28	23.3
	21001-24000 tl	22	18.3
	24001-27000 tl	19	15.9
	27001 tl and above	15	12.5

When the information in Table 1 is analyzed, it is seen that 65% of the academic staff participating in the study were male and 35% were female. It was determined that 31.6% of lecturers were between the ages of 45-54, 27.5% between the ages of 35-44, 22.5% were 25-34 years old, and 18.4% were 55 years old and above this age. 40% of the lecturers participating in the research are assistant professors, 20.8% of them are associate professors, 15.8% are lecturers, 12.5% are research assistants, 10.9 of them were found to be professors. When the income of the academic staff is investigated, 23.3% of them are between 18001-21000 tl incomes, 20.8% of them are between 15001-18000 tl incomes, 18.3% of them are between 21001-24000 tl incomes. It was determined that 12.5% was 27001 tl and above incomes and 9.2% was 15000 tl and below incomes.

The arithmetic means of the expectations of the consumers included in the research regarding the factors affecting their furniture purchasing preferences are given in Table 2.

Table 2 The arithmetic means regarding participants' expectations regarding factors affecting their preferences

	1		2		3		4		5			
Q1. When purchasing furniture. I pay attention to the advice of my close circle (family. friends. etc.).												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**$\bar{X}$**	**Ss**
Male	13	16.67	25	32.05	15	19.23	13	16.67	12	15.38	2.82	1.326
Famale	2	4.76	3	7.14	5	11.90	22	52.38	10	23.81	3.83	1.034
Q2. When buying furniture. I pay attention to its brand.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**$\bar{X}$**	**Ss**
Male	10	12.82	11	14.10	13	16.67	25	32.05	19	24.36	3.41	1.343
Famale	4	9.52	5	11.90	6	14.29	15	35.71	12	28.57	3.62	1.287
Q3. When purchasing furniture. I pay attention to the materials used.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**$\bar{X}$**	**Ss**
Male	8	10.26	11	14.10	14	17.95	23	29.49	22	28.21	3.51	1.317
Famale	2	4.76	4	9.52	7	16.67	14	33.33	15	35.71	3.86	1.160
Q4. When purchasing furniture. I make sure it is of good quality.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**$\bar{X}$**	**Ss**
Male	4	5.13	5	6.41	10	12.82	32	41.03	27	34.62	3.94	1.097
Female	1	2.38	2	4.76	4	9.52	18	42.86	17	40.48	4.14	0.952
Q5. When purchasing furniture. I pay attention to the company's warranty conditions.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**$\bar{X}$**	**Ss**
Male	8	10.26	9	11.54	11	14.10	24	30.77	26	33.33	3.65	1.327
Female	4	9.52	2	4.76	7	16.67	16	38.10	13	30.95	3.76	1.226
Q6. When purchasing furniture. I pay attention to the company's after-sales services.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**$\bar{X}$**	**Ss**
Male	5	6.41	6	7.69	8	10.26	27	34.62	32	41.03	3.96	1.189
Female	4	9.52	6	14.29	10	23.81	11	26.19	11	26.19	3.45	1.292
Q7. I pay attention to the price when buying furniture.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**$\bar{X}$**	**Ss**
Male	2	2.56	2	2.56	5	6.41	32	41.03	37	47.44	4.28	0.896
Female	8	19.05	12	28.57	8	19.05	8	19.05	6	14.29	2.81	1.348
Q8. When purchasing furniture. I pay attention to the store atmosphere and features.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**$\bar{X}$**	**Ss**
Male	16	20.51	18	23.08	21	26.92	12	15.38	11	14.10	2.79	1.355
Female	2	4.76	3	7.14	5	11.90	15	35.71	17	40.48	4.00	0.932
Q9. When buying furniture. I pay attention to its advertisements.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**$\bar{X}$**	**Ss**
Male	14	17.95	20	25.64	18	23.08	14	17.95	12	15.38	2.87	1.333
Female	3	7.14	4	9.52	4	9.52	16	38.10	15	35.71	3.86	1.221
Q10. When buying furniture. I pay attention to promotions and price campaigns.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**$\bar{X}$**	**Ss**
Male	2	2.56	4	5.13	12	15.38	32	41.03	28	35.90	4.03	0.980
Female	9	21.43	8	19.05	4	9.52	9	21.43	12	28.57	3.17	1.256

Q11. When purchasing furniture. I pay attention to the availability of product price catalogs and brochures.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	$\bar{X}$	**Ss**
Male	12	15.38	11	14.10	12	15.38	22	28.21	21	26.92	3.37	1.162
Female	2	4.76	2	4.76	5	11.90	16	38.10	17	40.48	4.05	0.932
Q12. When purchasing furniture. I pay attention to the service of the sales staff in the store.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	$\bar{X}$	**Ss**
Male	19	24.36	18	23.08	16	20.51	13	16.67	12	15.38	2.76	1.397
Female	3	7.14	3	7.14	5	11.90	16	38.10	15	35.71	3.88	1.194
Q13. When purchasing furniture. I make sure that it can solve health problems such as neck. back. waist and foot pain.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	$\bar{X}$	**Ss**
Male	6	7.69	7	8.97	12	15.38	25	32.05	28	35.90	3.79	1.242
Female	2	4.76	2	4.76	5	11.90	16	38.10	17	40.48	4.05	1.081
Q14. When purchasing furniture. I pay attention to its design. color and appearance.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	$\bar{X}$	**Ss**
Male	16	20.51	19	24.36	21	26.92	11	14.10	11	14.10	2.77	1.318
Female	1	2.38	2	4.76	4	9.52	17	40.48	18	42.86	4.17	0.961
Q15. When buying furniture. I pay attention to whether it is ergonomic-comfortable.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	$\bar{X}$	**Ss**
Male	9	11.54	8	10.26	13	16.67	22	28.21	26	33.33	3.62	1.351
Female	3	7.14	3	7.14	4	9.52	16	38.10	16	38.10	3.93	1.197

N: The number of participants. $\bar{X}$: Arithmetic mean. **Ss:** Standard deviation.
I totally agree (5), I agree (4), No My Idea (3), I disagree (2), Absolutely Disagree (1)

According to Table 2, it is determined that female do not take into account the advice of many of their close circle when purchasing furniture, while male do not take into account the opinions of their close circle. When purchasing furniture, most male and female express their opinions about the brand of the furniture, the quality of the materials used in the furniture, the company's warranty conditions and that they are not allowed to provide after-sales service. While the furniture purchasing price factor emerges as a value that gives importance to male relations, it is not considered an important factor for most female. When buying furniture, female pay attention to the atmosphere of the store, the features of the store, and most of the advertisements given. While purchasing furniture, male pay most attention to promotions and price campaigns, while female pay most attention to the presentation of product price catalogs and brochures. When purchasing furniture, attention was paid to the service of the sales staff in the store and the number of female, but it was not a factor taken into account because it was not seen in male. The same situation is found to be valid for evaluating furniture according to its design, color and appearance. In other words, design, color and number emerge as an important factor for the number of female. When purchasing furniture for male and fe-

male, it is determined that health problems such as neck, back, waist and foot pain cannot be solved, and ergonomic-comfort is a factor that should be taken into consideration.

The arithmetic means of the expectations of the consumers included in the research regarding the factors affecting their purchasing preferences are given in Table 3.

Table 3 The arithmetic means regarding participants' perceptions about factors affecting their preferences.

	1		2		3		4		5			
Q1. The advice of my close circle (family, friends, etc.) was effective in my choice of purchasing furniture.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	$\bar{X}$	**Ss**
Male	10	12,82	20	25,64	19	24,36	15	19,23	14	17,95	3,04	1,304
Female	2	4,76	2	4,76	3	7,14	20	47,62	15	35,71	4,05	1,035
Q2. Its brand has been effective in my choice of purchasing furniture.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	$\bar{X}$	**Ss**
Male	14	17,95	16	20,51	19	24,36	14	17,95	15	19,23	3,00	1,377
Female	2	4,76	3	7,14	5	11,90	16	38,10	16	38,10	3,98	1,115
Q3. The materials used influenced my choice of purchasing furniture.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	$\bar{X}$	**Ss**
Male	7	8,97	6	7,69	11	14,10	25	32,05	29	37,18	3,81	1,270
Female	2	4,76	3	7,14	4	9,52	16	38,10	17	40,48	4,02	1,115
Q4. Its high quality influenced my choice of purchasing furniture.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	$\bar{X}$	**Ss**
Male	2	2,56	7	8,97	7	8,97	32	41,03	30	38,46	4,04	1,038
Female	2	4,76	2	4,76	4	9,52	18	42,86	16	38,10	4,05	1,058
Q5. The company's warranty conditions were effective in my choice of purchasing furniture.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	$\bar{X}$	**Ss**
Male	6	7,69	9	11,54	7	8,97	27	34,62	29	37,18	3,82	1,266
Female	2	4,76	4	9,52	5	11,90	17	40,48	14	33,33	3,88	1,131
Q6. The company's after-sales services were effective in my choice of purchasing furniture.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	$\bar{X}$	**Ss**
Male	4	5,13	5	6,41	8	10,26	28	35,90	33	42,31	4,04	1,122
Female	2	4,76	3	7,14	8	19,05	15	35,71	14	33,33	3,86	1,117
Q7. The price was effective in my choice of purchasing furniture.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	$\bar{X}$	**Ss**
Male	4	5,13	6	7,69	8	10,26	27	34,62	35	44,87	4,14	1,161
Female	6	14,29	11	26,19	8	19,05	8	19,05	9	21,43	3,07	1,386
Q8. The atmosphere and features of the store were effective in my choice of purchasing furniture.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	$\bar{X}$	**Ss**
Male	16	20,51	18	23,08	17	21,79	13	16,67	14	17,95	2,88	1,396
Female	1	2,38	2	4,76	4	9,52	17	40,48	18	42,86	4,17	0,961
Q9. Its advertisement was effective in my choice of purchasing furniture.												

Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**$\bar{X}$**	**Ss**
Male	13	16,67	15	19,23	19	24,36	16	20,51	15	19,23	3,06	1,361
Female	2	4,76	3	7,14	7	16,67	16	38,10	14	33,33	3,88	1,109
Q10. Promotions and price campaigns have been effective in my choice of purchasing furniture.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**$\bar{X}$**	**Ss**
Male	8	10,26	10	12,82	12	15,38	25	32,05	23	29,49	3,58	1,314
Female	2	4,76	3	7,14	4	9,52	14	33,33	19	45,24	4,07	1,135
Q11. The presentation of product price catalogs and brochures has been effective in my choice of furniture purchasing.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**$\bar{X}$**	**Ss**
Male	9	11,54	10	12,82	13	16,67	24	30,77	22	28,21	3,51	1,336
Female	3	7,14	3	7,14	3	7,14	15	35,71	18	42,86	4,00	1,210
Q12. The service of the sales staff in the store was effective in my choice of purchasing furniture.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**$\bar{X}$**	**Ss**
Male	12	15,38	17	21,79	18	23,08	15	19,23	16	20,51	3,08	1,365
Female	2	4,76	2	4,76	5	11,90	16	38,10	17	40,48	4,05	1,081
Q13. The fact that it provides solutions to health problems such as neck, back, waist and foot pain has been effective in my choice of purchasing furniture.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**$\bar{X}$**	**Ss**
Male	6	7,69	7	8,97	12	15,38	25	32,05	28	35,90	3,79	1,242
Female	2	4,76	2	4,76	5	11,90	16	38,10	17	40,48	4,05	1,081
Q14. Design, color and appearance were effective in my choice of purchasing furniture.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**$\bar{X}$**	**Ss**
Male	4	5,13	4	5,13	14	17,95	29	37,18	27	34,62	3,91	1,095
Female	1	2,38	1	2,38	4	9,52	16	38,10	20	47,62	4,26	0,912
Q15. Its ergonomic and comfortable nature influenced my choice of purchasing furniture.												
Gender	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**$\bar{X}$**	**Ss**
Male	3	3,85	3	3,85	13	16,67	29	37,18	30	38,46	4,03	1,032
Female	3	7,14	2	4,76	4	9,52	17	40,48	16	38,10	3,98	1,158

N: The number of participants, **$\bar{X}$**: Arithmetic mean, **Ss:** Standard deviation.
I totally agree (5), I agree (4), No My Idea (3), I disagree (2), Absolutely Disagree (1)

When the arithmetic means of the consumers participating in the research regarding their perceptions of the factors affecting their furniture purchasing preferences are examined according to the gender variable; female consumers' advice from their close circle (family, friends, etc.), the impact of the brand, the materials used, the store atmosphere and features, the effectiveness of its advertising, promotions and price campaigns, presentation of product price catalogs and brochures, neck, back, waist and foot pain. The arithmetic means of factors such as being able to solve health problems, the service of the sales staff in the store, design, color and appearance were found to be higher than the arithmetic means of male consumers. On the other hand, the average scores of male consumers on factors such as the quality of the furniture, warranty conditions, product price, after sales services of the company and

ergonomic-comfortability were found to be higher than the arithmetic means of female consumers. When the arithmetic means are examined; the design, color and appearance of the furniture, store atmosphere and features, price, promotions and price campaigns, advice from close circle (family, friends, etc.) have the highest means being able to solve health problems such as neck, back, waist and foot pain respectively. While the company has the highest arithmetic means quality and after-sales services, it has been understood that the effect of the brand, advertising, warranty conditions, store atmosphere and features, presentation of product price catalogs and brochures have the lowest averages.

Examining the preferences of consumers to furniture, the price, quality, quality document, brand, service and warranty cosul, payment cosul, of furniture in the works of the enterprises, it is seen that it is useful and post-sales services are important (Burdurlu et al., 2004; Ozturk, 2006; Andac, 2008; Turedi, 2010; Dulgeroglu, 2011).

Akyuz (1998) found that the factors that consumers attach most importance to when purchasing furniture are comfort in use (66%) and durability (45%). Burdurlu et al. (2004) determined that the price of furniture comes first in the priority order of furniture product features that consumers prefer when purchasing furniture, followed by furniture quality and the presence of a quality certificate. Ozturk (2006) on consumers' product preferences; It has been determined that the brand, the price of the product, the service and warranty conditions of the product are important.

Andac (2008) stated that brand and firm are important when purchasing furniture at 50% of participants in his study examining the main reasons for purchasing furniture; It has been determined that consumers buy furniture because it is functional (70%) and because it is ergonomic (58%). These studies support the research findings. In the study of Turedi (2010), it was determined that consumers showed the quality certification of the product as (36%) as the most important factor in furniture preference. The participants stated that the effect of the brand is important in the purchase of furniture. Obuz (2012) participants %He stated that 95.9 ' made an assessment of brand and quality when purchasing furniture. Dulgeroglu (2011) according to the priority order of consumers when making their choices when purchasing furniture; It was determined that they chose the quality of the furniture, the price and payment terms, ease of use and the reliability of the brand. These studies support the research findings.

CONCLUSIONS

This study was carried out in the reveal what are the factors that are effective in the furniture preferences and selection of Uşak University academic staff.

While the participants are mostly influenced by the advice of their close circle when purchasing furniture, male participants are not influenced by the opinions of their close circle. While purchasing furniture, female participants mostly create a perception regarding the brand of the furniture, while male participants do not create a perception regarding the brand.

Female and male participants express a common opinion that they are influenced by the materials used in furniture and the quality of the material, the company's warranty conditions and after-sales service factors, and they have created a perception regarding this. While the price factor predominantly forms the perception of male participants when purchasing furniture, female participants mostly develop the perception that it is not important. It is observed that female participants have higher perceptions about the atmosphere of the store, the features of the store, and the advertising factors when purchasing furniture than male participants. Both male and female participants develop a common perception that they attach importance to promotions and price campaigns, presentation of product price catalogs and brochures when purchasing furniture, and that furniture is evaluated according to its design, color and appearance. When purchasing furniture, it is seen that the service and attitude of the sales staff in the store are a factor that female participants mostly attach importance to, while male participants are undecided.

It is observed that male and female participants have developed a common perception when purchasing furniture that it can be a solution to health problems such as neck, back, waist and foot pain, and that it is ergo-nomic and comfortable, and they pay attention to this fact. It may be suggested to conduct a similar research including the administrative staff of Usak University and compare the results, as well as the academic and administrative staff of universities in different provinces in Turkey and compare the results.

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REFERENCES

Akyuz, İ. (1998). The study of consumers behaviour on preferences of furniture in point of sex (Trabzon county center model). *Master Thesis, Karadeniz Technical University, Graduate Institute of Natural Applied Sciences*, Trabzon, Turkey.

Akyuz, İ. (2006). The effects of sociocultural and sociopsychological factors on consumer behavior during furniture purchase. *PhD Thesis, Karadeniz Technical University, Graduate Institute of Natural Applied Sciences,* Trabzon, Turkey.

Andac (2008). A research on furniture costumer preference in Kayseri. *Master Thesis, Kahramanmaraş Sutcu İmam University Institute for Graduate Studies in Science and Engineering Department of Forestry Industrial Engineering*, Kahramanmaras, Turkey.

Arpacı, F., & Obuz, K. (2013). Consumers preferences related to furniture. *Journal of Academic Perspective*, 36, 1-20.

Arpacı, F. (2014). Furniture purchasing, usage behavior and furniture purchasing problems of consumers living in Ankara. *International Refereed Journal of Marketing and Market Research*, 2(1), 2-15.

Arslan, A. R., Doruk, S., & Burdurlu, E. (2009). User characteristics and socio-economic features on branded furniture preference. *Gazi University, Journal of Polytechnic*, *12*(2), 93-100.

Bown-Wilson, D. (2017). Definition of consumer motivation. *Biz Fluent. Retrieved February*, *11*, 2018.

Burdurlu, E., Usta, I., Berker, U. O., & Altun, S. (2005). Determination of classical chair style and colour preferences of consumers with different demographic dimensions. *Gazi University, Journal of Polytechnic,* 8(4), 359-367.

Cemalcılar, İ. (1998). Marketing Concepts-Decisions (1st Edition). *Istanbul: Beta Publications.*

Comert, Y., & Durmaz, Y. (2006). Integrated approach to factors affecting consumer satisfaction and purchasing behavior and a field study in Adıyaman province. *Journal of Yasar University*, *1*(4), 351-375.

Cabuk, Y., Karayılmazlar, S., & Turedi, H. (2012). Examining consumer behavior in furniture choice in terms of demographic factors (Zonguldak country center model). *Journal of Bartın Faculty of Forestry*, (21), p.1-10.

Demircioğlu B. (2012). The Effect of Brand in Consumer Buying Behavior. *Master Thesis, Kahramanmaras Sutçu İmam University Social Sciences Institute*, Kahramanmaras, Turkey.

Donmez, L.(2019). Evaluation of Purchasing Behaviors of Consumers for The Furniture Sector Bed Product Group: An Application in Kayseri. *Master Thesis, Erciyes University, Social Sciences Institute*, Kayseri, Turkey.

Dulgeroglu, K. (2011). Determination of consumer preferences in furniture selection. *Master Thesis, Istanbul University, Institute for Graduate Studies in Science and Engineering Department of Forestry Industrial Engineering*, Istanbul, Turkey.

Jošt, M., Kaputa, V., Nosáľová, M., Pirc Barčić, A., Perić, I., & Oblak, L. (2020). Changes in customer preferences for furniture in slovenia. *Drvna industrija*, *71*(2), 149-156.

Kaval, S. (2017). Investigation of the Impact of Quality Certificates in Furniture Consumer Preference: Example Of Kocaeli Province. *Master Thesis, Duzce University, Institute for Graduate Studies in Science and Engineering Department of Forestry Industrial Engineering*, Duzce, Turkey.

Khojasteh-Khosro, S., Shalbafan, A., & Thoemen, H. (2022). Consumer behavior assessment regarding lightweight furniture as an environmentally-friendly product. *Wood Material Science & Engineering*, *17*(3), 192-201.

Korkut, S. D., & Kaval, S. (2015). Consumer preferences in furniture selection: Duzce Province Example. *Duzce University Faculty of Forestry Journal of Forestry*, 11(1), 42-51.

Lautiainen, T. (2015). Factors affecting consumers' buying decision in the selection of a coffee brand.

Oblak, L., Glavonjić, B., Pirc Barčić, A., Bizjak Govedič, T., & Grošelj, P. (2020). Preferences of different target groups of consumers in case of furniture purchase. *Drv. Ind*, *71*, 79-87.

Obuz, K. (2012). The Preference of Consumers on Furniture, Their Purchasing and Using Behaviours and Problems Concerning Furniture. *PhD Thesis, Gazi University Educational Sciences Institute, Ekonomics of the Family and Nutrition Teaching Department*, Ankara, Turkey.

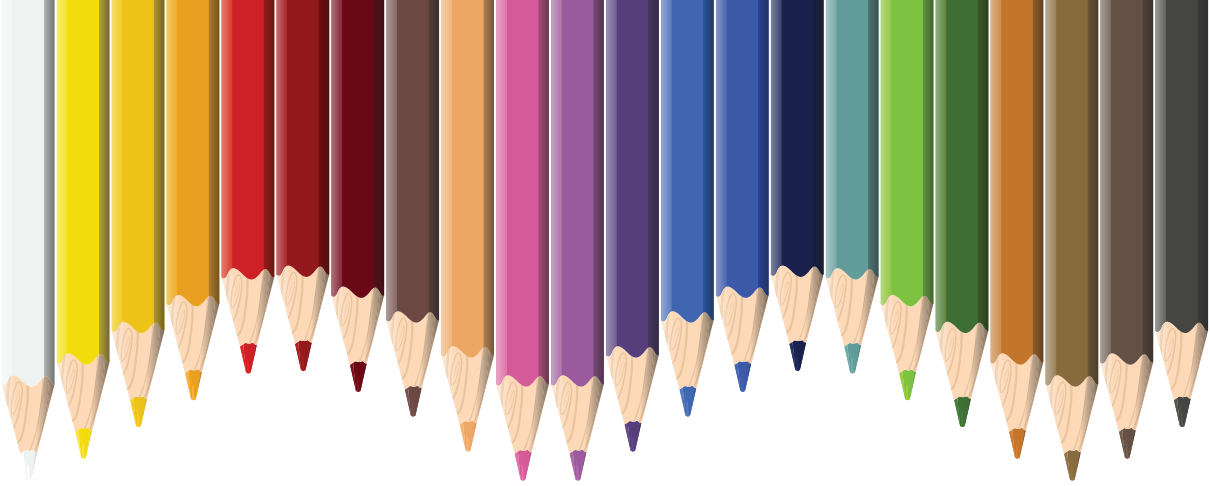
Oztürk, E. (2006). Effects And İmportance of Certificate of Quality on Customer Purchase Behavior. Master Thesis, *Marmara University, Social Sciences Institute,* Istanbul, Turkey.

Madhavan, M., & Kaliyaperumal, C. (2015). Consumer buying behavior-an overview of theory and models. *St. Theresa Journal of Humanities and Social Sciences*, *1*(1), 74-112.

Tekïn, G., Yiltay, S., & Esra, A. Y. A. Z. (2016). The effect of Brand image on consumer behaviour: case study of louiss Vuitton-Moet hennessy. *International Journal of Academic Values Studies*, (2), 1-24.

Turedi (2010). A study upon after-sales service in furniture sector in Zonguldak. *Master Thesis, Institute for Graduate Studies in Science and Engineering Department of Forestry Industrial Engineering,*, Bartın, Turkey.

Turker, A. (2010). The Effect of Design Factors, One of the Main Components of the Furniture Industry, on Consumer Behavior: A Research in Kutahya Province. *Master Thesis, Dumlupınar University, Social Sciences Institute,* Kutahya, Turkey.



Chapter 3

INTEGRATING MEDICAL KNOWLEDGE INTO INDUSTRIAL DESIGN:

CREATING DEMENTIA-FRIENDLY PRODUCTS AND ENVIRONMENTS

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Introduction

In the face of an aging global population, dementia has emerged as a significant public health concern, affecting millions worldwide. This progressive condition impacts individuals cognitively and alters their interaction with their physical environment. As such, there is an increasing need for environments and products specifically designed to accommodate the unique needs of individuals with dementia.

This paper delves into the connection between medical knowledge and industrial design, with a particular emphasis on developing products and environments that cater to the needs of dementia patients. Although prior research has thoroughly documented the medical and psychological aspects of dementia, there is an increasing acknowledgment of the potential of design to improve the quality of life for those affected by this condition. Medical insights on dementia with industrial design principles to create tailored living spaces for individuals with dementia. The aim is to address cognitive and sensory challenges and improve safety and comfort.

This paper provides actionable guidelines for designers and stakeholders in creating dementia-friendly environments through a comprehensive review of current design interventions and an in-depth analysis of dementia-related medical findings. The ultimate goal is to contribute to developing spaces and products that not only accommodate the needs of individuals with dementia but also enhance their well-being and independence.

Definition of Dementia

Dementia refers to a decline in cognitive function and related symptoms. These symptoms, which are more severe than those associated with the typical aging process, encompass memory loss, difficulty in problem-solving, and challenges in language and perception (Alzheimer's Association, 2021). Brain diseases and injuries such as Alzheimer's or stroke are known to be among the leading causes of dementia. (World Health Organization [WHO], 2020).

Stages of Dementia

The progression of dementia is typically classified into several stages, which assist in providing insights into the severity of symptoms and guiding care approaches:

No Impairment: At this stage, there is no evidence of memory problems or abnormalities during medical examinations (Jack et al., 2011).

Very Mild Cognitive Decline: Memory lapses, such as forgetting familiar words or the location of everyday objects, maybe a normal part of aging or the initial indications of Alzheimer's disease. However, medical professionals or loved ones may notice these changes infrequently. (Petersen et al., 2009).

Mild Cognitive Decline: In some cases, early-stage Alzheimer's can be identified by cognitive difficulties that friends and family notice. These difficulties may include struggling to find the right words during conversations, experiencing difficulty with organizing and planning, and forgetting recent events or new information (Bäckman et al., 2005). However, it is essential to note that not all individuals with Alzheimer's exhibit these symptoms.

Moderate Cognitive Decline: Mild or early-stage Alzheimer's disease can be detected through a careful medical interview that looks for cognitive problems. Symptoms may include forgetfulness of recent events, difficulty managing finances, decreased awareness of current events, social withdrawal, and moodiness (Gauthier et al., 2006).

Moderately Severe Cognitive Decline: As Alzheimer's disease progresses to the moderate or mid-stage, memory loss, and cognitive impairment become more noticeable. Patients may require assistance with daily activities such as dressing or bathing. They may also struggle to remember basic personal information, such as their address (Gauthier et al., 2006).

Severe Cognitive Decline: Patients with moderately severe or mid-stage Alzheimer's disease experience memory deterioration and personality changes and may require assistance with daily activities. They may also experience hallucinations, delusions, and paranoia.

Very Severe Cognitive Decline: Individuals with severe or late-stage Alzheimer's disease lose the ability to communicate, recognize loved ones, and perform daily tasks. They may also experience difficulty swallowing and require full-time care (Brookmeyer et al., 2007).

Prevalence of dementia and its impact on individuals and caregivers

Dementia is a term that refers to a range of neurodegenerative disorders, the most common of which is Alzheimer's disease. These conditions cause a gradual decline in cognitive function, memory, and the ability to perform daily tasks. Dementia is a significant public health concern worldwide, and it affects an estimated 50 million people. Due to the aging population, this number is projected to triple by 2050, making it an even more pressing issue. (WHO, 2019)

The impact of dementia extends beyond the affected individuals to caregivers, families, and communities. Individuals with dementia experience a progressive loss of cognitive functions, leading to impaired memory, reasoning, and communication skills (Alzheimer's Association, 2020). This decline often results in a loss of independence and autonomy, necessitating increasing levels of care and support. Affected individuals may also experience changes in behavior and personality, such as agitation, depression, and social withdrawal, which can further complicate care and diminish their quality of life

(Alzheimer's Association, 2020).

Caregivers, often family members, bear a significant burden when providing support and care for individuals with dementia. The progressive nature of dementia means that the caregiving role can extend over many years, requiring substantial time, emotional investment, and resources (Brodaty & Donkin, 2009). Caregivers frequently report high levels of stress, anxiety, and depressive symptoms, a phenomenon referred to as caregiver burden (Zarit, Reever, & Bach-Peterson, 1980). This burden can be exacerbated by a lack of resources, inadequate support, and the challenges of managing the complex care needs and behavioral symptoms associated with dementia.

Dementia has a significant impact on society, including direct medical expenses, long-term care expenses, and lost productivity of both patients and caregivers. With the increasing prevalence of dementia, there is a growing need for healthcare services, specialized care facilities, and support services for both patients and caregivers, as highlighted by Wimo et al. in 2017.

In conclusion, the prevalence of dementia has far-reaching implications, affecting the cognitive, emotional, and physical well-being of affected individuals and placing a substantial burden on caregivers and society at large. Addressing dementia requires a multifaceted approach, encompassing medical care, supportive services, and dementia-friendly environments and products.

Necessity of integrating medical knowledge into industrial design to create dementia-friendly environments and products.

Integrating medical knowledge into industrial design is a critical strategy for creating environments and products that are responsive to the needs of individuals with dementia. Dementia, as a cluster of neurodegenerative conditions, profoundly alters cognitive functions, necessitating modifications in the living environment and the utilization of specially designed products to promote safety, ease of use, and comfort for the affected individuals (Fleming & Purandare, 2010).

The necessity of this integration emerges from the distinctive symptomatology of dementia, which includes memory loss, decreased problem-solving abilities, and sensory impairments, all of which can lead to challenges in navigating and interacting with one's environment (Calkins, 2018). Research in gerontology and cognitive disorders has identified several environmental factors that can exacerbate the symptoms of dementia, such as poor lighting, complex spatial layouts, and non-contrasting colors (Marquardt et al., 2011). Conversely, medical research also provides evidence for environmental interventions that can mitigate cognitive deficits, such as enhanced lighting to improve circadian rhythms and color-coded paths to facilitate navigation (Calkins, 2018).

Industrial design that does not incorporate such medical insights may inadvertently contribute to a decreased quality of life for individuals with dementia, creating products and environments that are difficult to understand, use, and navigate. For example, everyday objects and appliances with complex interfaces can pose significant challenges to those with cognitive impairments, potentially leading to frustration, a sense of helplessness, and decreased autonomy (Iwarsson et al., 2007).

Moreover, integrating medical knowledge into design practices aligns with the principles of inclusive design, which advocates for creating products and environments accessible to people with various abilities and disabilities (Clarkson et al., 2013). By adopting a design approach informed by medical knowledge, designers can create preventive solutions, reducing risks and enhancing the well-being of people with dementia. The implementation of this approach is deemed ethically necessary and economically advantageous. It has the potential to significantly decrease healthcare expenses by averting accidents and enhancing the health and independence of individuals with dementia (Gitlin et al., 2001).

In summary, integrating medical knowledge into industrial design is essential for developing dementia-friendly environments and products. Such integration ensures that design decisions are underpinned by an evidence-based understanding of the needs of individuals with dementia, leading to environments and products that enhance safety, support independence, and improve quality of life.

Existing design interventions and products aimed at supporting individuals with dementia.

A systematic review of existing design interventions and products to support individuals with dementia necessitates an examination grounded in academic rigor. This entails a critical appraisal of empirical studies, design case studies, and evaluative reports on the efficacy and usability of such interventions and products. The review should address both the physical environment—comprising spaces where individuals live, receive care, and engage in daily activities—and the product designs specifically tailored to meet the unique needs of those with dementia.

Physical Environmental Interventions:

The design of physical environments can profoundly impact individuals with dementia. According to a study conducted by Fleming et al. in 2016, modifying the environment of individuals with dementia can have a significant impact on their well-being. Simple interventions like brighter lighting, uncluttered spatial layouts, and non-reflective flooring can enhance their quality of life and reduce behavioral and psychological symptoms associated with

the condition. Specific interventions, like using color and contrast to aid in navigation and the delineation of spaces, can promote independence and reduce confusion (Marquardt & Schmieg, 2009). Moreover, secured gardens and walking paths can encourage physical activity and social interaction, which are beneficial for this population (Detweiler et al., 2008).

Product Design Interventions:

Product design interventions that cater to the needs of individuals with dementia are critical in promoting autonomy, safety, and well-being. Ergonomically designed products that account for cognitive and sensory impairments can significantly enhance the daily living experiences of these individuals.

For instance, adaptive utensils and dinnerware can address the motor difficulties and sensory perception changes encountered by individuals with dementia, enabling them to eat independently and maintain nutrition. Research by Algase et al. (1996) has shown that using such adaptive devices can reduce eating difficulties and improve mealtime experiences.

Simplified communication devices have also been developed to help maintain social connections despite cognitive decline. These devices, which include picture phones and simplified remote controls, allow for ease of use and help to counteract the isolation often experienced by those with dementia (Topo, 2009).

Additionally, the design of clothing with Velcro fasteners and elastic waistbands can ease the dressing process for individuals with dementia, which can become a complex task due to impaired motor skills and cognitive function. This also extends to specially designed footwear that can reduce the risk of falls, a common hazard for this population (Tideiksaar, 1998).

In terms of cognitive aids, objects such as large-face clocks and calendars with clear, legible numbers and letters can assist individuals with dementia in maintaining awareness of time and date, which are often disoriented in this group (Cipriani, Bianchetti, & Trabucchi, 2006).

Interactive technology, including tablet applications specifically designed for dementia, can offer cognitive stimulation, reminiscence therapy, and leisure activities. Such technologies have been shown to support engagement and may reduce behavioral and psychological symptoms of dementia (Astell et al., 2010).

In summary, product design interventions offer significant potential for improving the quality of life for individuals with dementia. These designs focus on functionality, simplicity, and safety, addressing specific challenges such as disorientation, memory loss, and reduced motor skills. As the field advances, continuous user-centered research and iterative design processes are

critical to ensure that products remain effective and relevant for this diverse and growing population.

Technological Innovations:

Incorporating advanced technologies in designing products and environments for individuals with dementia is a burgeoning area of research. Technological interventions are being tailored to assist in compensating for cognitive impairments and to facilitate greater independence and safety.

Smart home technologies are one of the forefront innovations in this realm. These systems can control environmental variables such as temperature and lighting, which may be beneficial for those with dementia who have difficulty regulating their body temperature or have impaired vision. They can also provide automated reminders for medication and appointments, which can assist individuals with memory impairments (Ienca et al., 2017).

Wearable technology is another area of significant development. Devices such as activity trackers can monitor physical activity and vital signs, while GPS-enabled wearables can help locate individuals who may wander, a common and dangerous behavior associated with dementia (Landau et al., 2009). These wearables can also incorporate emergency response features, ensuring timely assistance when needed.

Cognitive assistive technologies like tablet and computer applications aim to support cognitive functions like memory, attention, and problem-solving. These technologies often include memory aids, games designed to enhance cognitive resilience, and software to facilitate communication with loved ones and caregivers (Astell et al., 2019).

Moreover, research into the use of robotics in dementia care has indicated the potential for robots to provide companionship, assist with daily tasks, and even support cognitive therapy sessions. These robots range from simple companion pets to more complex humanoid robots that can interact socially with patients (Mordoch et al., 2013).

Despite the promise of these technological innovations, it is imperative to note that technology should be designed with the user in mind, ensuring it is accessible, intuitive, and genuinely meets the needs of those with dementia. User acceptance and ethical considerations, such as privacy and autonomy, are critical factors that must be rigorously evaluated in deploying new technologies for dementia care (Robinson et al., 2013).

Evaluative Frameworks:

Evaluating the effectiveness of these interventions is critical. It is often achieved through frameworks that consider user-centered outcomes such as usability, accessibility, and satisfaction, as well as clinical outcomes such

as the progression of symptoms or incidents of harm (Lawton & Nahemow, 1973; Gitlin, 2003). Longitudinal studies and randomized controlled trials provide valuable insights into the long-term effects of design interventions on the well-being of individuals with dementia and their caregivers.

In conclusion, a detailed review of design interventions for dementia reveals a growing body of evidence supporting the potential of thoughtful design to alleviate the challenges associated with dementia. However, the complexity of dementia as a condition means that interventions must be personalized and adaptable. Ongoing research is essential to refine design strategies and to foster environments and products that can respond to the evolving needs of individuals with dementia.

Gaps and Challenges: shortcomings and challenges in current design practices for dementia care.

The field of design for dementia care, despite its advancements, faces several shortcomings and challenges that warrant critical examination. These challenges primarily stem from the complex nature of dementia, the diverse needs of individuals, and the evolving landscape of care practices.

One-Size-Fits-All Approach: A significant challenge in the design for dementia care is the tendency to adopt a one-size-fits-all approach. Dementia manifests differently in each individual, with a wide array of symptoms and progression rates (Alzheimer's Disease International, 2019).

Limited User Involvement in the Design Process: The involvement of individuals with dementia in the design process is often limited. This exclusion can lead to a lack of understanding of their unique experiences and needs, resulting in environments and products that are not fully user-centered (Kenning, 2017). Engaging individuals with dementia in the design process can provide valuable insights and lead to more effective and personalized solutions.

Balancing Safety and Autonomy: Striking a balance between ensuring safety and promoting autonomy is a persistent challenge. Overemphasis on safety can lead to overly restrictive environments that limit the independence and quality of life for individuals with dementia (Marquardt & Schmieg, 2009). Conversely, designs that focus too much on autonomy may inadvertently increase risks, such as falls or wandering.

Technological Integration and Accessibility: While technological advancements offer promising solutions, integrating technology in a way that is accessible and acceptable to older adults with dementia remains a challenge (Lauriks et al., 2007). The usability of technologically advanced products can be a barrier, especially for those who need to become more familiar with digital interfaces (Ienca et al., 2017).

Economic and Practical Constraints: Economic constraints often limit the feasibility of implementing ideal design solutions in dementia care settings. Budget limitations can restrict the use of high-quality materials and innovative designs, leading to compromises that may not fully meet the needs of individuals with dementia (Gitlin, 2003).

Evaluation and Evidence-Based Design: There is a growing need for a more rigorous and standardized evaluation of design interventions in dementia care to establish evidence-based guidelines. While informative, the existing body of research often lacks the comprehensive and systematic evaluations needed to ascertain the effectiveness of various design strategies definitively. Fleming et al., (2008) highlighted this issue, emphasizing the importance of developing and testing assessment tools for dementia-friendly environments. More recently, Marquardt, Bueter, and Motzek (2014) reiterated the need for evidence-based approaches in dementia care design, calling for more empirical studies to validate design interventions. Additionally, research by Zeisel et al. (2003) points towards the effectiveness of specific design elements in dementia care settings but notes the variability in outcomes, underlining the necessity for standardized methodologies to evaluate these interventions. These studies collectively underscore the importance of an evidence-based approach in designing for dementia care, ensuring that design interventions are effective and responsive to the unique needs of this population.

In conclusion, while significant progress has been made in the design for dementia care, these challenges highlight the need for a more nuanced, personalized, and evidence-based approach. Addressing these shortcomings requires collaborative efforts involving designers, healthcare professionals, individuals with dementia, and their caregivers to develop solutions that are effective and respectful of the diverse needs of this population.

Medical Insights for Design: medical findings and knowledge that are crucial for designing for dementia.

"Medical Insights for Design" refers to integrating medical research and knowledge into the design field, especially for creating environments and products that cater to individuals with dementia. This approach is rooted in understanding the specific challenges and needs that arise from the various stages and types of dementia, using this understanding to inform and guide design decisions.

1. Cognitive and Perceptual Changes:

Medical research indicates that dementia can cause cognitive impairments, including memory, attention, spatial awareness, and language problems (Alzheimer's Association, 2020). These changes necessitate designs that simplify navigation, reduce cognitive overload, and aid memory. For example,

clear signage, contrasting colors, and memory aids are crucial in designing for individuals with dementia (Marquardt, 2011).

2. Sensory Impairments:

Sensory changes, such as reduced visual acuity, altered depth perception, and changes in color perception, are common in individuals with dementia. These sensory impairments have significant implications for design. Adequate lighting is essential to cater to the diminished visual capabilities of dementia patients, as highlighted by Van Hoof and colleagues (2010), who emphasize the importance of proper lighting to enhance visibility and comfort. Furthermore, using colors with high contrast to aid in spatial orientation and incorporating tactile cues to navigate spaces are recommended, as per research by Alzheimer's Society (2023). These design adaptations are crucial in mitigating the sensory deficits experienced by individuals with dementia, enhancing their ability to navigate and interact with their environment more effectively and safely.

3. Behavioral and Psychological Symptoms:

Dementia is often accompanied by behavioral and psychological symptoms such as agitation, wandering, and depression (Cerejeira, Lagarto, & Mukaetova-Ladinska, 2012). Design strategies that promote a sense of calm, safety, and familiarity are beneficial. This includes using familiar objects, safe walking paths, and creating calm and quiet areas.

4. Physical Mobility and Safety:

As dementia progresses, physical mobility may decline, increasing the risk of falls and injuries (Shaw, 2002). Design interventions should focus on safety and accessibility, incorporating handrails, non-slip flooring, and wheelchair-accessible spaces.

5. Orientation and Wayfinding:

Orientation and wayfinding are significant challenges for individuals with dementia. Medical insights suggest that environmental cues, such as distinct landmarks and logically arranged spaces, can help in orientation (Namazi & Johnson, 1991). Additionally, designing smaller, homelike settings can be less disorienting than large, institutional spaces.

6. Interaction with Technology:

With the advent of technology in care settings, understanding how individuals with dementia interact with technology is essential. Research indicates that technology should be intuitive, unobtrusive, and tailored to the user's abilities and needs (Lauriks et al., 2007).

7. Social Engagement and Quality of Life:

Medical studies highlight the importance of social engagement and its impact on the quality of life for people with dementia (Finnema et al., 2000). Designs that encourage social interaction, such as communal areas and shared activities, can be beneficial.

In summary, incorporating medical insights into the design for dementia involves a deep understanding of the disease's cognitive, sensory, behavioral, physical, and social aspects. This interdisciplinary approach ensures that the design interventions are functional and safe and enhance the quality of life for individuals with dementia.

Conclusion

This research paper has examined the vital interplay between medical insights and industrial design in creating supportive environments and products for individuals with dementia. Considering this population's unique challenges, integrating medical knowledge into design practices is not just an option but a necessity. The insights drawn from the 'Medical Insights for Design' and 'Shortcomings and Challenges in Current Design Practices for Dementia Care' sections underscore the complexity and urgency of this task.

The 'Medical Insights for Design' section shows that a deep understanding of the cognitive, perceptual, and behavioral changes associated with dementia is fundamental to creating effective design solutions. The medical literature highlights the importance of addressing sensory impairments, cognitive changes, and the psychological well-being of individuals with dementia through thoughtful design interventions. This encompasses everything from using contrasting colors and adequate lighting to creating safe, navigable, and familiar environments, which are crucial for enhancing the quality of life of individuals with dementia (Marquardt, 2011; Shaw, 2002).

Conversely, the 'Shortcomings and Challenges in Current Design Practices for Dementia Care' section illuminates the gaps and limitations in current approaches. The prevalence of a one-size-fits-all philosophy, inadequate user involvement, and economic constraints are just a few of the challenges that complicate the design process (Kenning, 2017; Gitlin, 2003). These issues highlight the need for a more personalized, inclusive, and economically viable approach to designing for dementia care.

In conclusion, bridging the gap between medical research and industrial design is crucial for developing effective, empathetic, and human-centered design solutions for individuals with dementia. This requires a collaborative, interdisciplinary approach that involves designers and healthcare professionals and includes individuals with dementia and their caregivers in the

design process. Future research should focus on developing standardized, evidence-based design guidelines and exploring innovative, cost-effective solutions that address the diverse needs of this growing population. By doing so, we can hope to create environments and products that not only meet the functional requirements of individuals with dementia but also enhance their dignity, autonomy, and quality of life.

Further Research Iterations

Building upon the foundation laid by this research paper on integrating medical knowledge into industrial design for dementia care, several avenues for further research emerge. These iterations are essential for deepening our understanding and improving the effectiveness of design interventions for individuals with dementia.

Firstly, longitudinal studies tracking the effectiveness of specific design interventions over time are needed. Such studies could reveal how changes in the cognitive and physical abilities of individuals with dementia affect their interaction with the environment and inform adaptations in design solutions. Additionally, comparative research examining different design philosophies and approaches across various cultural and socioeconomic contexts can offer a broader understanding of how cultural norms and resource availability influence the efficacy of design solutions for dementia care.

Another critical area for further investigation is the development and user acceptance of new technologies, such as AI-based tools or advanced monitoring systems, in dementia care. This research should focus on ethical implications, privacy concerns, and users' personal preferences, ensuring that technological innovations align with the needs and values of individuals with dementia.

The involvement of people with dementia in the design process, known as co-design, also presents a valuable area for research. Exploring methodologies for effectively gathering input from individuals at different dementia stages and translating this input into practical design solutions can lead to more user-centered and effective designs.

Economic analysis is another vital aspect, understanding the cost-effectiveness of dementia-friendly designs. Such analysis should consider the initial investment and the long-term financial implications, including potential savings in healthcare costs. Additionally, understanding how design interventions impact the experiences and workloads of caregivers and healthcare staff can provide a more holistic view of the efficacy of these interventions.

Research to develop standardized guidelines and policies for dementia-friendly design is also needed. This research should involve collaboration with policymakers, designers, healthcare professionals, and advocacy groups

to ensure the development of practical and widely applicable standards.

Integrating biophilic design elements, which incorporate natural elements into built environments, and their impact on the well-being of individuals with dementia is a promising area. Exploring the relationship between nature, design, and mental health can offer new insights into creating therapeutic environments. Similarly, further research on the role of sensory design and creating multisensory environments catering to altered sensory perceptions in dementia could be highly beneficial.

Lastly, developing and validating assessment tools to evaluate the dementia-friendliness of environments and products can provide objective measures for designers and researchers. These tools can aid in systematically evaluating and improving design interventions, ensuring they meet the intended goals.

In conclusion, by pursuing these research iterations, we can continue to refine our understanding and approach to designing for dementia, ultimately leading to environments and products that better cater to the needs of this vulnerable population and enhance their quality of life.

CITATIONS:

1. Algase, D. L., Beck, C., Kolanowski, A., Whall, A., Berent, S., Richards, K., & Beattie, E. (1996). Need-driven dementia-compromised behavior: An alternative view of disruptive behavior. American Journal of Alzheimer's Disease, 11(6), 10-19.
2. Alzheimer's Association. (2020). Alzheimer's Disease Facts and Figures. Alzheimer's & Dementia, 16(3), 391-460.
3. Alzheimer's Association. (2021). Alzheimer's disease facts and figures. Alzheimer's & Dementia, 17(3), 327-406.
4. Alzheimer's Disease International. (2019). World Alzheimer Report 2019: Attitudes to dementia. Alzheimer's Disease International.
5. Alzheimer's Society. (2023). Dementia-friendly environments

https://www.alzheimers.org.uk/get-involved/dementia-friendly-communities/organisations/dementia-friendly-environment-checklist

6. Astell, A. J., McGrath, C., & Dove, E. (2019). "That's for old so and so's!": Does identity influence older adults' technology adoption decisions? Ageing & Society, 40(7), 1550-1576.
7. Astell, A. J., Ellis, M. P., Bernardi, L., Alm, N., Dye, R., Gowans, G., & Campbell, J. (2010). Using a touch screen computer to support relationships between people with dementia and caregivers. Interacting with Computers, 22(4), 267-275.
8. Bäckman, L., Jones, S., Berger, A. K., Laukka, E. J., & Small, B. J. (2005). Cognitive impairment in preclinical Alzheimer's disease: A meta-analysis. Neuropsychology, 19(4), 520-531.
9. Brodaty, H., & Donkin, M. (2009). Family caregivers of people with dementia. Dialogues in Clinical Neuroscience, 11(2), 217–228.
10. Brookmeyer, R., Johnson, E., Ziegler-Graham, K., & Arrighi, H. M. (2007). Forecasting the global burden of Alzheimer's disease. Alzheimer's & Dementia, 3(3), 186-191.
11. Calkins, M. P. (2018). From Research to Application: Supportive and Therapeutic Environments for People Living With Dementia. The Gerontologist. 58(1), 114-128.
12. Cerejeira, J., Lagarto, L., & Mukaetova-Ladinska, E. B. (2012). Behavioral and psychological symptoms of dementia. Frontiers in Neurology, 3, Article 73.
13. Cipriani, G., Bianchetti, A., & Trabucchi, M. (2006). Outcomes of a computer-based cognitive rehabilitation program on Alzheimer's disease patients compared with those on patients affected by mild cognitive impairment. Archives of Gerontology and Geriatrics, 43(3), 327-335.

14. Clarkson, P. J., Coleman, R., Hosking, I., & Waller, S. (2013). Inclusive Design: Design for the Whole Population. Springer.

15. Detweiler, M. B., Murphy, P. F., Myers, L. C., & Kim, K. Y. (2008). Does a wander garden influence inappropriate behaviors in dementia residents? American Journal of Alzheimer's Disease & Other Dementias, 23(1), 31-45.

16. Finnema, E., Droes, R. M., Ribbe, M., & Van Tilburg, W. (2000). The effects of emotion-oriented approaches in the care for persons suffering from dementia: a review of the literature. International Journal of Geriatric Psychiatry, 15(2), 141-161.

17. Fleming, R., Bennett, K., Preece, T., & Phillipson, L. (2017). The development and testing of the dementia friendly communities environment assessment tool (DFC EAT). International Psychogeriatrics, 29(2), 303-311.

18. Fleming, R., Goodenough, B., Low, L. F., Chenoweth, L., & Brodaty, H. (2016). The relationship between the quality of the built environment and the quality of life of people with dementia in residential care. Dementia, 15(4), 663-680.

19. Fleming, R., & Purandare, N. (2010). Long-term care for people with dementia: environmental design guidelines. International Psychogeriatrics, 22(7), 1084-1096.

20. Gauthier, S., Reisberg, B., Zaudig, M., et al. (2006). Mild cognitive impairment. Lancet, 367(9518), 1262-1270.

21. Gitlin, L. N. (2003). Conducting research on home environments: Lessons learned and new directions. The Gerontologist, 43(5), 628-637.

22. Gitlin, L. N., Corcoran, M., Winter, L., Boyce, A., & Hauck, W. W. (2001). A randomized, controlled trial of a home environment intervention: effect on efficacy and upset in caregivers and on daily function of persons with dementia. The Gerontologist, 41(1), 4-14.

23. Ienca, M., Fabrice, J., Elger, B., Caon, M., Pappagallo, A. S., Kressig, R. W., & Wangmo, T. (2017). Intelligent assistive technology for Alzheimer's disease and other dementias: A systematic review. Journal of Alzheimer's Disease, 56(4), 1301-1340.

24. Iwarsson, S., Haak, M., & Fänge, A. M. (2007). Home as a signification of independence and autonomy: Experiences among very old Swedish people. Scandinavian Journal of Occupational Therapy, 14(1), 16-24.

25. Jack, C. R., Albert, M. S., Knopman, D. S., et al. (2011). Introduction to the recommendations from the National Institute on Aging and the Alzheimer's Association workgroup on diagnostic guidelines for Alzheimer's disease. Alzheimer's & Dementia, 7(3), 257-262.

26. Kenning, G. (2017). Designing with and for people with dementia: Developing a mindful interdisciplinary co-design methodology. PhD Thesis, Northumbria University.

https://e-space.mmu.ac.uk/624522/1/IASDR_2017_Niedderer%20et%20al.corr%20v02%20 clean.pdf

27. Landau, R., Werner, S., Auslander, G. K., Shoval, N., & Heinik, J. (2009). Attitudes of family and professional care-givers towards the use of GPS for tracking patients with dementia: An exploratory study. The British Journal of Social Work, 39(4), 670-692.

28. Lauriks, S., Reinersmann, A., Van der Roest, H. G., Meiland, F. J., Davies, R. J., Moelaert, F., ... & Dröes, R. M. (2007). Review of ICT-based services for identified unmet needs in people with dementia. Ageing research reviews, 6(3), 223-246.

29. Lawton, M. P., & Nahemow, L. (1973). Ecology and the aging process. In C. Eisdorfer & M. P. Lawton (Eds.), Psychology of adult development and aging. American Psychological Association. 619-674

30. Marquardt, G. (2011). Wayfinding for people with dementia: a review of the role of architectural design. HERD: Health Environments Research & Design Journal, 4(2), 75-90.

31. Marquardt, G., Bueter, K., Motzek, T. (2014) Impact of the Design of the Built Environment on People with Dementia: An Evidence-Based Review. HERD: Health Environments Research & Design Journal. 8(1), 127-157.

32. Marquardt, G., & Schmieg, P. (2009). Dementia-friendly architecture: Environments that facilitate wayfinding in nursing homes. American Journal of Alzheimer's Disease & Other Dementias, 24(4), 333-340.

33. Marquardt, G., Johnston, D., Black, B. S., Morrison, A., Rosenblatt, A., Lyketsos, C. G., & Samus, Q. M. (2011). A descriptive study of home modifications for people with dementia and barriers to implementation. Journal of Housing for the Elderly, 25(3), 258-273.

34. Mordoch, E., Osterreicher, A., Guse, L., Roger, K., & Thompson, G. (2013). Use of social commitment robots in the care of elderly people with dementia: A literature review. Maturitas, 74(1), 14-20.

35. Namazi, K. H., Johnson, B. D. (1991). Physical environmental cues to reduce the problems of incontinence in Alzheimer's disease units. American Journal of Alzheimer's Care and Related Disorders & Research. 6(6):22-28

36. Petersen, R. C., Roberts, R. O., Knopman, D. S., et al. (2009). Mild cognitive impairment: Ten years later. Archives of Neurology, 66(12), 1447-1455.

37. Robinson, H., MacDonald, B., Kerse, N., & Broadbent, E. (2013). The psychosocial effects of a companion robot: a randomized controlled trial. Journal of the American Medical Directors Association, 14(9), 661-667.

38. Shaw, F. E. (2002). Falls in cognitive impairment and dementia. Clinics in Geriatric Medicine, 18(2), 159-173.

39. Topo, P. (2009). Technology studies to meet the needs of people with dementia and their caregivers: A literature review. Journal of Applied Gerontology,

28(1), 5-37.

40. Tideiksaar, R. (1998). Falling in old age: Prevention and management (2nd ed.). Springer Publishing Company.

41. Van Hoof J, Kort HSM, van Waarde H, Blom MM. Environmental Interventions and the Design of Homes for Older Adults With Dementia: An Overview. American Journal of Alzheimer's Disease & Other Dementias. 25(3), 202-232

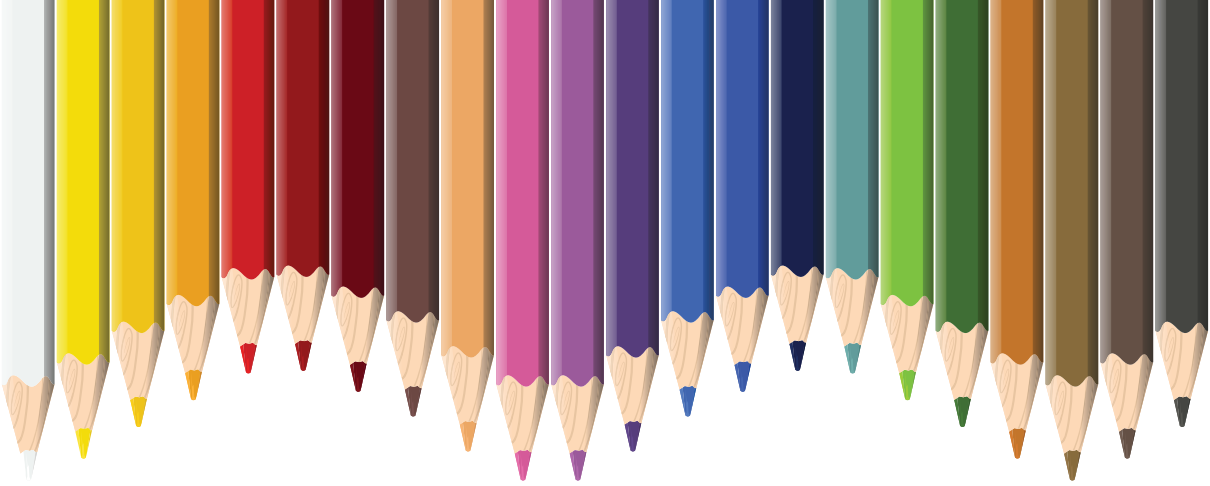
42. Wimo, A., Guerchet, M., Ali, G. C., Wu, Y. T., Prina, A. M., Winblad, B., ... & Prince, M. J. (2017). The worldwide costs of dementia 2015 and comparisons with 2010. Alzheimer's & Dementia, 13(1), 1-7.

43. World Health Organization (WHO). (2019). Risk reduction of cognitive decline and dementia: WHO guidelines. https://www.who.int/publications/i/item/9789241550543

44. World Health Organization (WHO). (2020). Dementia. https://www.who.int/news-room/fact-sheets/detail/dementia

45. Zarit, S. H., Reever, K. E., & Bach-Peterson, J. (1980). Relatives of the impaired elderly: correlates of feelings of burden. The Gerontologist, 20(6), 649-655.

46. Zeisel, J., Silverstein, N. M., Hyde, J., Levkoff, S., Lawton, M. P., & Holmes, W. (2003). Environmental Correlates to Behavioral Health Outcomes in Alzheimer's Special Care Units. The Gerontologist, 43(5), 697-711.



Chapter 4

THE ROLE OF LANDSCAPE PLANNING IN CREATING DISASTER-RESILIENT CITIES

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1. Introduction

Turkey is situated in a geography that is frequently and intensely exposed to disasters due to its geological, meteorological, topographic, and geopolitical characteristics. Facing a multitude of natural disasters such as earthquakes, landslides, floods, avalanches, and, due to its geopolitical position, human-induced disasters, Turkey stands as a country susceptible to a variety of crises. According to the Global Risk Index created to assess and rank the risks of humanitarian crises and disasters, Turkey ranks 45th among 191 countries in the Global Risk Index (Benli et al., 2018). According to the "Government at a Glance 2017" report published by the OECD, Turkey is fourth among 36 countries in the number of disasters experienced in a year (an average of 7.2 disasters per year between 1980 and 2016) and seventh in the magnitude of damage caused by disasters. The estimated economic damage caused by each disaster to the Turkish economy is $1.67 billion (OECD, 2017). Figure 1 illustrates the annual mortality rate index in disasters that occurred between 1980 and 2017. Examining disasters that occurred between 1980 and 2017, it is evident that an average of 6-25 people per million in Turkey lose their lives annually due to natural disasters (OECD, 2023).

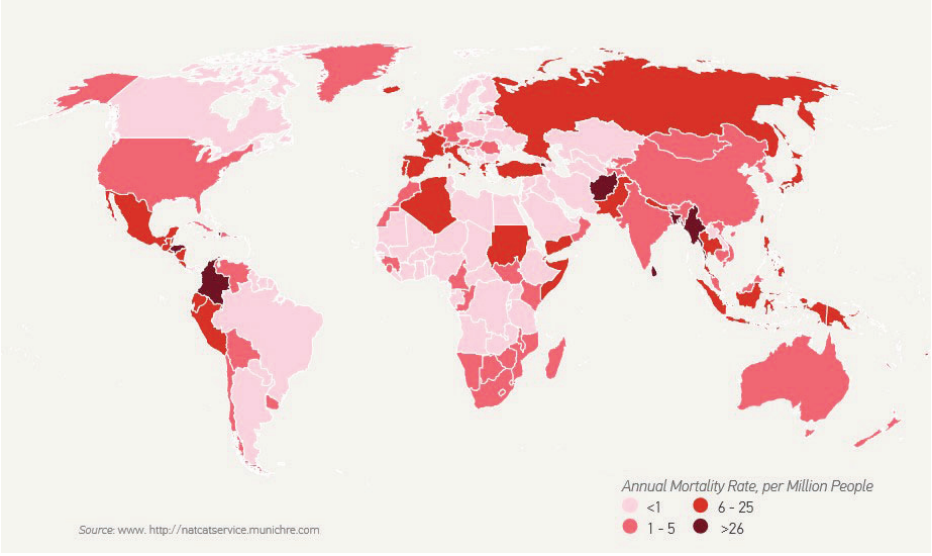


Figure 1. Annual Mortality Rate Index in Disasters Occurring Between 1980 and 2017 (OECD 2023)

Turkey, 42% of its total area is located in the first-degree earthquake zone, and 96% of the country is exposed to earthquake risk (DPM, 1997). On February 6, 2023, two major earthquakes with magnitudes of 7.6 and 7.7 struck

the central and southern regions of Turkey, as well as northern Syria (OCHA, 2023). These earthquakes affected 11 provinces in Turkey, covering an area of 110,000 km2 and a population of 14 million (16% of the country's population) (Figure 2). Subsequently, numerous aftershocks occurred, causing significant damage and casualties in the region. As of March 27, the death toll in Turkey has surpassed 48,000, and it is estimated that about 280,000 buildings have collapsed or need to be demolished (OECD, 2023). Many other buildings have suffered severe damage, leading to the displacement of 3.3 million people. Today, nearly two million people are housed in tent camps and container settlements (Ministry of Interior of the Republic of Turkey, 2023).

Figure 2. 11 Provinces Affected by the February 6th Earthquake in Turkey (OECD 2023)

Earthquakes pose significant risks for densely populated areas and settlements where urbanization has developed without proper control. In a country like Turkey, which is under such serious risk, the subject of disaster and emergency management is of vital importance and stands as one of the crucial topics that need to be accurately understood. Producing, sharing, and making accurate and useful information easily accessible in line with global criteria in this regard is essential for knowing how to act during and after a disaster (Özdikmen, 2015). In this context, the effective involvement of landscape architecture in the planning and design processes is crucial before, during, and after disasters, to be prepared for this significant ecological process.

Especially in the aftermath of recent earthquake disasters, the role of open and green spaces in cities has been emphasized as crucial during disasters

(Otuzoğlu et al., 2023). This study emphasizes the role and importance of integrating landscape planning approaches into spatial plans to minimize damage caused by disasters in urban areas. Additionally, examples of international and national practices related to the creation of disaster-resistant cities are examined. This study serves as a guide for future research in adopting urban planning approaches that need to be considered in creating disaster-resistant communities.

2. Concepts Related to Disasters and Disaster Management

The concept of a disaster is defined as an event that "causes physical, economic, and social losses for the entire society or specific segments, disrupts or halts normal life and human activities, and occurs due to natural, technological, or human-induced incidents for which the affected community's coping capacity is insufficient" (AFAD 2014). The concept of risk, on the other hand, is the probability of losses occurring if hazards become active in environments susceptible to damage (AFAD 2014). Table 1 provides a list of disaster types observed worldwide. Among these disaster types, earthquakes, floods, flash floods, landslides, rockfalls, avalanches, tornadoes, volcanoes, and wildfires are examples of rapidly occurring disasters (AFAD 2022a).

Table 1. Types of Disasters Observed Worldwide

Geological Disasters	Climatic Disasters	Biological Disasters	Social Disasters	Technological Disasters
Earthquake Landslide Rockfall Volcanic Eruptions Mudflows Tsunami	Heatwave Cold Wave Drought Hailstorm Tornado Lightning Hurricane Typhoon Flood Cyclones Tornado Blizzard Avalanche Heavy Snowfall Acid Rains Fog Freezing Rain Air Pollution Forest Fires	Erosion Forest Fires Epidemics Insect Infestation	Fires Wars Terrorist Attacks Migrations	Mining Accidents Biological Nuclear Chemical Weapons and Accidents Industrial Accidents Transportation Accidents

Disaster Risk Management is defined as the process of identifying, analyzing hazards and risks at the country, regional, urban, or settlement level, determining opportunities, resources, and priorities for risk reduction, and

preparing and implementing policies, strategic plans, and action plans to reduce risk (AFAD 2022b). The Disaster and Emergency Management Authority (AFAD) Law No. 5902 defines disaster risk management as "studies to determine the types and levels of risks at the country, regional, urban, and local levels, prevention, reduction, and sharing of risks. It includes the preparation of disaster scenarios, determination of implementation priorities, preparation, and implementation of general policies, strategic plans, and implementation plans to reduce risk."

The disaster management system consists of two main components: Risk Management and Crisis Management. Risk management aims to determine the risk level of settlements by minimizing the damages that disasters can cause and taking measures to reduce them. Crisis management, on the other hand, aims to minimize the damages that may occur when a crisis occurs with the disaster, evaluate the new conditions that arise, and improve them (Kadıoğlu, 2008; Kadıoğlu, 2011; Türer Başkaya, 2023).

Integrated Disaster Management is defined as a management process that considers all hazards to create a society capable of coping with disasters, resilient and resistant. It involves activities and measures that need to be taken in the prevention, damage reduction, preparation, intervention, and recovery stages of disaster management, using all the power and resources of society (AFAD 2022b). All phases of disaster management must be carried out integrally to prevent or minimize potential loss of life and property in the event of a disaster. Planning, supporting, organizing, making necessary legislative regulations, establishing or revising institutional structures for disaster management are crucial for the effectiveness of the practices to be carried out in the disaster management process (Şahin 2019). Table 2 outlines the stages of disaster intervention and integrated disaster management in Turkey (TAMP-Isparta 2018).

Table 2. Stages of Integrated Disaster Risk Management (TAMP-Isparta 2018)

A. Risk Management	**1. Risk Analysis and Damage Reduction:** - Legislation regulation and update - Identification of disasters and determination of occurrence risks - Early warning and control - Community education on disasters - Implementation of engineering measures to reduce disaster damages
	2. Preparedness - Preparation of emergency action plans - Development of emergency action plans outlining procedures and protocols.
B. Crisis Management	**1. Intervention:** - Implementation of emergency action plan according to the disaster: - Search and rescue operations - Evacuation - Meeting basic needs: - Coordination - Support provincial groups - Damage assessment activities
	2. Recovery - Financial Aid - Infrastructure support - Establishment of disaster-resilient settlement areas - Social rehabilitation

3. The Role of Landscape Planning in Disaster Management

Globally, especially since the late 1990s, the definition and perception of landscape have undergone significant changes with the emergence of urbanization approaches where landscape plays a decisive role as an effective environment and tool. Landscape architecture has taken on a pioneering role in the development of cities and the programming of urban spaces. The necessity of addressing universal environmental crises/problems that cannot be solved within the scope of a single professional discipline is clearly evident and requires interdisciplinary and transdisciplinary collaboration.

In this process, the active and leading participation of landscape architecture is a model adopted in examples from cities around the world. The adoption of innovative and current landscape concepts and methods holds critical importance for Turkish cities as well (Otuzoğlu et al., 2023). Table 3 lists the landscape architecture services provided in disaster management.

Table 3. Landscape Architecture Services in Disaster Management (Otuzoğlu et al., 2023)

Disaster Management Process	Landscape Architecture Services
Before Disaster	Landscape Architecture as a Discipline of Spatial Planning, Open and Green Spaces, Landscape Change Analyses and Determination of Environmental Effects Through the Use of Geographic Information Systems, Remote Sensing, and Computer-Aided Modeling Technologies, Landscape Architecture Services as a Channel for Education, Communication, and Coordination, Vision: Landscape Foundation in Earthquake Action Plans, Landscape Architecture Services for Earthquake Management in Coastal Cities and Islands.
During Disaster	Measurement of Community Behaviors to Facilitate Gathering and Evacuation Site Selection and Landscape for Temporary Housing Areas Landscape Drainage Plan (Rainwater and Sediment Management) Identification of Waste and Debris Areas
After Disaster	Landscape Planning in Site Selection for New Development Areas: Evolution from Urban Planning Concept to Landscape-Based Redevelopment Locally Appropriate and Participatory New Development Aligned with Natural and Cultural Landscape Character Landscape Designs and Implementations for Permanent Residences Psychosocial Health of Earthquake Victims in the Scope of Landscape Design Soil Rehabilitation and Plant Health Debris Management and Naturalization Disaster Cemetery and Memorial Design Landscape Architecture in Sustainable Site Development and Ecological Performance Certification Studies

Landscape Planning in Disaster Management aims to create a more resilient and sustainable environment against natural disasters. It involves the design and regulation of urban areas and environmental features, developing strategies to reduce disaster risks, mitigate impacts, and prepare communities. Before disasters strike, urban planning practices based on landscape plans, or in other words, landscape-based urban planning, serve as effective tools in creating disaster-resistant cities. Landscape planning and design efforts at relevant scales can define appropriate gathering areas during disasters, contribute to the restoration of urban fabric after disasters, and aid in improving community psychology and rebuilding cities. Landscape architects primarily consider integrated natural processes and the spatial character shaped by these processes, revealing the fragility, sensitivity, and developmental potential of landscapes. Rather than adopting a totalistic perspective on all natural processes in an area, they prioritize the key processes shaping that area, considering the holistic function (role) of landscapes as the foundational layer in landscape planning. With this

approach, landscape architects possess a distinct expertise among all disciplines and the ability to collaborate with all relevant disciplines and coordinate the process (Otuzoğlu et al., 2023). Table 4 outlines the scope and contributions of landscape planning efforts conducted within the scope of disaster management.

Table 4. Landscape Planning Studies within the Scope of Disaster Management, Scope, and Contributions

Landscape Planning Studies	**Scope**	**Contribution**
Risk Reduction	Landscape planning assesses disaster risks by evaluating the region's topographic, climatic, and geological features.	This provides better preparedness for possible types of disasters in the future.
Green Infrastructure and Water Management	Landscape planning promotes green infrastructure projects, including green spaces, parks, water basins, and other natural features.	This can assist in combating floods, preventing water inundation, and effectively managing water resources.
Community Participation and Awareness	Landscape planning encourages awareness and participation of local communities and residents in disaster preparedness.	Collaboration with communities can be done to develop and implement disaster plans.
Appropriate Land Use Plans	Landscape planning contributes to the creation of appropriate land use plans, such as limiting or regulating construction in risky areas.	This can reduce disaster risks and enhance the resilience of structures.
Post-Disaster Rehabilitation	In disaster situations, landscape planning develops post-disaster rehabilitation strategies.	This supports the rapid restoration of damaged areas and the return of communities to normal life.
Ecosystem Services	Landscape planning emphasizes the conservation and sustainable use of natural ecosystems.	This can increase natural resilience to disasters by preserving biodiversity and strengthening ecosystem services.
Infrastructure Resilience	Landscape planning develops design and management strategies to increase the resilience of infrastructure to disasters.	This can particularly help make buildings and infrastructure safer during disasters like earthquakes.

The elements of landscape planning can be integrated to ensure coherence and sustainability in disaster management processes. This way, the impacts of natural disasters are minimized, and communities are made more resilient.

4. Examples of Implementing Resilient Cities to Disasters in Turkey

Landscape Architects Chamber Preliminary Technical Report on Disaster Risk Reduction and Resilience Enhancement: This report underscores the effective role of the landscape architecture profession in improving and enhancing resilience in disaster areas at every stage of the disaster management process. Landscape architects possess the ability to provide professional services in disaster risk reduction and resilience enhancement, as well as coordinate interdisciplinary and transdisciplinary efforts. The report defines landscape planning and design efforts that contribute to disaster reduction and increased resilience in settlement areas as "Landscape-Based Urbanism" and emphasizes the scope of landscape architecture services.

Disaster Risk Management Mega City Indicator System – MegaIST: MegaIST has been established to facilitate the execution of disaster risk management and serves as an indicator system to be fundamental in all stages of disaster management and planning efforts. Particularly in disaster-prone urban areas, where priorities are diverse and not clearly defined, decision-makers find it challenging to make appropriate decisions. Therefore, decision-makers and administrators can develop accurate strategies and make suitable risk reduction decisions in disaster prevention and risk management efforts using the Mega City Indicator System for Disaster Risk Management. Simultaneously, it aids in conveying disaster risks and risk elements to all stakeholders in the disaster prevention and risk management process. MegaIST consists of three main indicators: urban seismic risk index, resilience capacity index, and performance-based managerial monitoring process (AFAD 2018).

Sustainable Performance Urban Transformation (Super City System) Project: Within the framework of the "Joint Service Application Protocol for the Transformation of Areas at Risk of Disaster" signed between the Ministry of Environment, Urbanization, and Climate Change and Istanbul Technical University, the goal is to determine the standard of the "Ecological Settlement Unit." In this context, a pilot application project is being carried out by the University in the Reserved Building Area determined by the Ministry in Kocakır, Eskişehir Province. The project aims to guide the process of transforming areas at risk of disaster in accordance with sustainability principles under the law, evaluating sustainability-themed credit opportunities from international and domestic financial institutions for urban transformation, and using urban transformation as a tool to meet our country's national obligations regarding climate change. The project aims to obtain an implementation standard and guide the process of obtaining "ecological settlement units" with pioneering perspectives from settlements with specific features (Yıldız and Şahin 2023).

Disaster Management and Decision Support System (DM-DSS): DM-DSS is a web-based application built on Geographic Information Systems (GIS) that effectively manages all resources during disasters and emergencies, providing decision support mechanisms. It constitutes the information infrastructure of the Turkish Disaster Intervention Plan (TDIP) and consists of three main components: the Event Command System, Spatial Information System, and Recovery System (AFAD 2022c).

Turkey Disaster Management Strategy Document and Action Plan (TDS): TDS covers all existing and new disaster risks, all types of disasters and emergencies, and all processes of disaster management. It presents a model based on systematic integrity, efficient resource utilization, and responsibility sharing for effective disaster management. The document considers all stakeholders in disaster management, including public institutions, academic organizations, private sector, non-governmental organizations (NGOs), media, families, individuals, and international organizations (AFAD 2022d).

Preparation of Integrated Disaster Hazard Maps: The preparation of disaster hazard maps is crucial as the "most important substructure of risk assessment studies," and similar studies are limited worldwide. Past data and today's scientific and technical infrastructure form the basis of this study (AFAD 2022e).

Social Vulnerability Analysis of Istanbul Province Against Disasters: This study focuses on the "social" dimension of the anticipated disaster risk, particularly based on a potential "Istanbul Earthquake." Social indicators encompass factors such as health issues, economic challenges, the return process to normal life, and education that earthquakes may impact on individuals and society. The study is part of the Mega City Indicator System (MegaIST). It involves determining indicators representing earthquake-focused social vulnerability, identifying required data sets, designing question forms for data acquisition through surveys, and analyzing and interpreting survey results. Statistical analyses were conducted based on survey results, sample weights were calculated, and the social vulnerability level for each administrative unit (neighborhood) was determined. The results of this analysis were transformed into density maps at the district and neighborhood levels for visualization (AFAD 2018).

Flood Early Warning System (TEUS): TEUS, developed in collaboration with ISKI and other relevant institutions in Istanbul, enables the early detection of potential floods by analyzing data from 10 Flow Observation Stations (FOS) established on five different basins using sensors for weather conditions and water quantity in rivers (AFAD 2018).

Web-Based Earthquake Loss Prediction Program (ELER) Project: ELER aims to produce maps and information for areas affected by earth-

quakes, including estimates of damaged buildings, expected casualties, and determination of emergency shelter needs. This information is communicated to relevant authorities post-disaster to contribute to immediate intervention in affected areas (AFAD 2018).

Bayrampasa Urban Transformation Project: This project involves transforming a portion of Ismetpasa Neighborhood in Bayrampasa, a district with high earthquake risk, into a resilient and high-quality living area through urban transformation models (Istanbul Metropolitan Municipality 2023).

Boğaçay, Çandır Çayı, and Göksu (Karaman) Çayı Flood Protection and Water Regulation Project: The aim of this project is to manage the flood and runoff waters in the Konyaaltı basin, formed by the confluence of Boğaçay, Çandır Çayı, and Göksu (Karaman) Çayı, by restoring them to their natural cycle (AFAD 2018).

5. Results & Recommendations

In Turkey, the disaster management plan is perceived as the first aid and intervention activities after a disaster, and success is mostly evaluated based on this. The fact that disaster management consists of risk and crisis management stages is overlooked, and in the practices in Turkey, only the crisis management stage is observed to be implemented (Şahin 2019). However, during the preparation stage of spatial plans, the adoption of landscape planning approaches allows for the consideration of potential risk factors in cities, and based on this, land-use decisions can be developed. Thus, by making necessary land-use decisions during the risk assessment stage instead of dealing with problems after a disaster, intervention to risks can be possible without issues arising, and the damage level that may occur during a risk can be minimized.

Especially in cities undergoing dynamic restructuring through urban development and transformation projects in the last 20 years, the adoption of landscape planning strategies will be a significant step in reducing the adverse effects of climate change in cities, minimizing damage due to natural disasters in cities, producing healthy urban spaces, and creating an environmentally sustainable environment spatially, socially, and economically (Otuzoğlu et al. 2023).

In 2009, the OECD developed recommendations to revitalize the local economy of the Abruzzo region, including the city of L'Aquila, which was the epicenter of a widespread earthquake, and to rebuild the city. These recommendations are important in ensuring that all regions in countries are more resilient to disasters (OECD 2023).

- Preventing short-term decisions from restricting long-term options.
- Determining the region-specific economic infrastructure and socio-economic forces to increase resilience.
- Developing an integrated strategy for post-disaster reconstruction, implementing necessary reforms, and improving the quality of decisions by strengthening dialogue among stakeholders.
- Ensuring the implementation of strategic choices by local authorities.
- Developing standards for all disaster areas in the country, taking into account experiences gained from crises.
- Encouraging public participation to assist in decision-making.
- Making the public thought process a regular component of regional development strategy.
- Building trust and improving governance capacity.

This study emphasizes the necessity and importance of landscape planning studies in various areas such as risk reduction, green infrastructure and water management, community participation and awareness, appropriate land-use plans, post-disaster rehabilitation, ecosystem services, and ensuring infrastructure resilience during the risk determination stage before a disaster in the disaster management process. This study serves as a guide for future research in adopting urban planning approaches that should be considered in creating disaster-resistant communities.

References

AFAD (2014). Glossary of Annotated Disaster Management Terms, Prime Ministry Disaster and Emergency Management Authority, 216 p. Ankara.

AFAD (2018). Examples of Disaster-Resilient Communities. Workshop on the Role of Local Governments in Building Disaster-Resilient Communities Results Report, 98, Ankara.

AFAD (2022a). Types of Disasters. Website: https://www.afad.gov.tr/en/types-of-disasters, Access Date: 05.11.2023.

AFAD (2022b). Glossary of Annotated Disaster Management Terms. Website: https://www.afad.gov.tr/en/glossary-of-annotated-disaster-management-terms, Access Date: 05.11.2023.

AFAD (2022c). Disaster Management and Decision Support System (DM-DSS). Website: https://www.afad.gov.tr/disaster-management-and-decision-support-system-dm-dss21, Access Date: 10.11.2023.

AFAD (2022d). Turkey Disaster Management Strategy Document and Action Plan (TADMAP). Website: https://www.afad.gov.tr/turkey-disaster-management-strategy-document-and-action-plan-tadmap, Access Date: 12.11.2025.

AFAD (2022e). Preparation of Integrated Disaster Hazard Maps. Website: https://www.afad.gov.tr/preparation-of-integrated-disaster-hazard-maps, Access Date: 12.11.2023.

AIGM (1997) Examination of Earthquake Regions with Geographic Information Systems, Ministry of Public Works and Settlement General Directorate of Disaster Affairs Publications, Ankara.

Benli, H., Bacanlı, M., Gündoğdu, Ş.T., Yaman, M.M., Esin, M., Gökçe, O., Karacameydan, N., Kadirioğlu, F.T., Kuterdem, N.K., Zorbozan, S., Sevim, E., İlgen, H.G. (2018). Disaster Management in Turkey and Natural Disaster Statistics. Disaster and Emergency Management Authority, 63, Ankara.

IBB. (2023). Bayrampaşa Urban Transformation Project. Website: https://www.ibb-bayrampasadonusum.istanbul/, Access Date: 15.11.2023.

Kadıoğlu, M. (2008). Basic Principles of Modern, Integrated Disaster Management. (Ed. Kadıoğlu, M. and Özdamar, E.) Basic Principles of Disaster Risk Reduction. JICA Turkey Office Publications. P.1-34.

Kadıoğlu, M., (2011). Disaster Management: Expecting the Unexpected, Managing the Worst. T.C. Union of Municipalities of Marmara Publication, Istanbul.

OCHA (2023). Flash Appeal: Türkiye Earthquake (February - May 2023), https://reliefweb.int/report/turkiye/flash-appeal-turkiye-earthquake-february-may-2023-entr (accessed on 23 March 2023).

OECD (2017). Government at a Glance 2017: Socio-Economic Impacts of Disasters in OECD Countries. Website: http://www.oecd-ilibrary.org/governance/government-at-a-glance-2017/socio-economic-impacts-of-disasters-in-oecd-countries_gov_glance-2017-73-en. Access Date: 25.11.2023.

OECD (2023). The territorial impact of the earthquakes in Türkiye. Website: https://www.oecd.org/turkiye/publicationsdocuments/reports/, Access Date: 15.11.2023.

Otuzoğlu Y., Işık B., Yerlikaya Ö., Karabay C. G., Şahin Ş., Baş B. F., Atik C., Çabuk A., Akay A., Özyavuz M., Türer Başkaya F. A., Mumcu S., Yıldız N. E. (2023). Preliminary Technical Report on Landscape Planning and Design for Disaster Risk Reduction and Resilience Enhancement (Ed: Şahin, Ş). Chamber of Landscape Architects Publications, 34, Ankara.

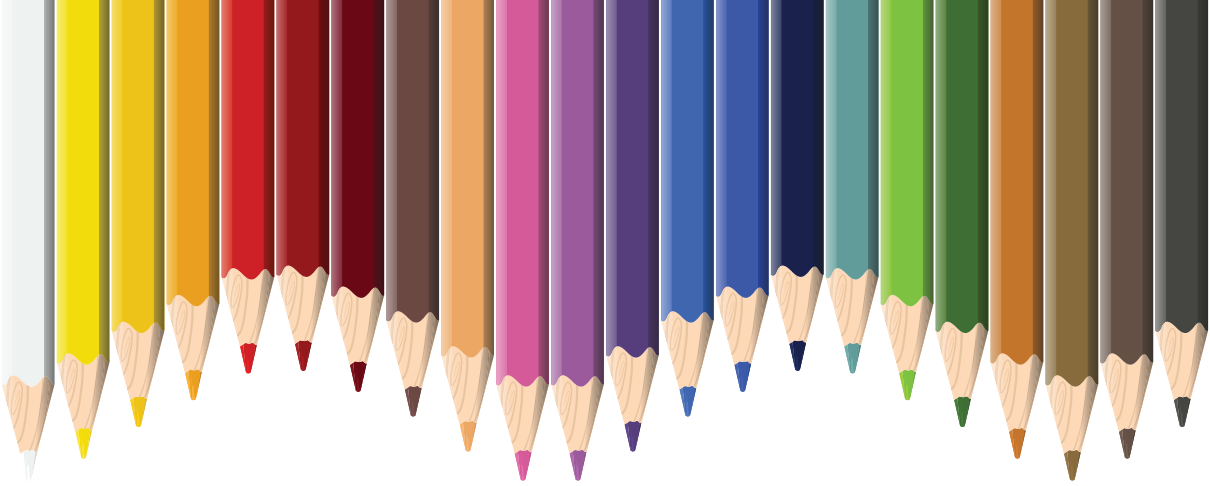
Şahin, Ş. (2019). Disaster Management in Turkey and 2023 Goals. Turkish Journal of Earthquake Research 1 (2), 180-196.

TAMP-Isparta 2018. Isparta Provincial Disaster Response Plan, Republic of Turkey Isparta Governorship, Provincial Disaster and Emergency Management Directorate, Isparta.

Ministry of Interior of Turkey (2023). Website: https://en.goc.gov.tr/, Access Date: 17.11.2023.

Türer Başkaya, F.A. (2023). Landscape Planning Sensitive to Disasters, Earthquakes, and Turkey. LANDSCAPE - Journal of Education, Science, Culture and Art, 5/1: 55-62.

Yıldız, N.E. and Şahin, Ş. (2023). Green Certification for Settlements in Turkey: Definition, Scope, and Process, Architecture and Landscape Architecture (Ed. Sandal Erzurumlu, G.). Platanus Publishing, 23-54, Ankara.



Chapter 5

BENCH PROPOSAL FOR OUTDOOR PUBLIC SPACES: YIN YANG BENCH

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INTRODUCTION

The use of bench as an outdoor public space furniture dates back to ancient times. For instance, in ancient era, benches were utilized for seating and were played an important role in social gatherings in outdoor public spaces. The design and materials used for benches have evolved over the centuries, reflecting changes in needs, style, culture, and technology. They play a crucial role in terms of increasing the usability and enjoyment of outdoor public spaces by contributing to the social life. In modern times, benches are common in outdoor public spaces, providing people with a place to sit, relax and spend leisure time. They have become an integral part of urban design and landscape. Whether it's a park, a plaza or a waterfront area, benches generate opportunities for shared experiences and enhance the quality of public space (Rubenstein, 1992). The aim of the study is to understand the role of the benches both as a single unit and its integration with outdoor public space by analyzing a proposed model-the Yin Yang bench. From this perspective, in this study, the Yin Yang bench design, which became a runner-up in an international competition named as A' Design Award and Competition held in 2018, is examined not only as a seating element but also as a process that includes the social and spatial dynamics of outdoor public space. In this respect, the Yin Yang bench aims to provide an improvement in the quality of outdoor public life. In order to understand the characteristics of the Yin Yang bench; evolution of the benches, role of the benches and physical features of the benches in outdoor public spaces are investigated. As a result, design process of the Yin Yang bench and its innovative features are highlighted.

Evolution of the Benches

The evolution of benches reflects not only changes in design and aesthetics but also shifts in societal values, technology and lifestyle preferences. From functional simplicity to artistic expression, benches continue to evolve to meet the diverse needs of users. The evolution of benches, particularly for public spaces, has been a dynamic and mesmerizing journey throughout human history (Dentay and Denis, 1988). From simple engagements of rocks and logs to the sophisticated and ergonomic designs of modern furniture, seating for public spaces has adapted to meet various cultural, social, and technological changes. Therefore, it is plausible to give a brief overview of the evolution of benches for public areas.

The concept of public spaces and seating areas can be traced back to ancient civilizations. In ancient Greece and Rome, public areas often had stone benches for people to sit and socialize. Natural elements like rocks, logs and raised surfaces were used for seating. These rudimentary forms of seating were functional and basic serving the primary purpose. In ancient Egypt, for example, stools and benches were common, often featuring intricate designs

and symbols. In ancient Greece, the *klismos* chair became popular which is characterized by its curved backrest and slender, tapering legs. Moreover, the Romans ado modified Greek benches creating new types of seating, including the *sella curulis* (curule seat), a folding stool associated with important figures (Rubenstein, 1992).

In medieval era, simple wooden benches were utilized for town squares and marketplaces where people could gather, rest, socialize and discuss politics. Thus, these units were functional and basic, whereas they were bulky and heavy. When the Renaissance unfolded, new interest in classical designs arised. Chairs with more ornate carvings and padded upholstery started to appear reflecting the changing taste of the time. In addition, public spaces such as gardens and parks became more popular in Europe. Benches were strategically placed in these green spaces to allow people to enjoy the environment and engage in leisurely (Herzog, L. A., 2006). Renaissance era saw the rise of more refined and decorative furniture, especially seating units in interior spaces as well as outdoor spaces

The Industrial Revolution brought about significant changes in manufacturing processes. Mass production allowed for the creation of more affordable and standardized benches. For instance, the bentwood chair (the No. 14 chair), made by Michael Thonet in 1859 also known as bistro chair can be given as an example of this era's innovative designs. It is made using bent wood and is the first mass-produced item of furniture and its design required years to perfect (Anderson et. al., 2022). The 18th and 19th centuries, the growth of urban areas led to the development of more designed public spaces. Benches made of cast iron or wood became common in parks, pedestrian areas and along sidewalks (Robertson, 1994). These units often had decorative elements and patterns to enhance the quality of the public space in terms of aesthetic.

In the late 19th and early 20th centuries, there was a swing towards more organic forms. Art Nouveau introduced flowing lines and nature-inspired designs, while the Arts and Crafts Movement emphasized craftsmanship and simplicity. However, in the 20th century, modernist movement in architecture and design influenced the style of street furniture including benches. Functionality and simplicity became main principles and modernist designers contributed to the creation of minimalist bench designs. This era marked a period of experimentation with form and materials with the Bauhaus school that emphasized functionality, clean lines and the use of new material such as glass and steel (Herring, 2016). The post modernism witnessed a renewed focus on urban planning and the recreation of public spaces. Benches, often made of concrete or metal, were deliberately placed in parks, plazas, and along city streets to provide seating areas for pedestrians. Designers created benches that combined form and function, often using innovative materials (Herring, 2016).

In recent decades, many modern benches are designed to be accessible with features such as armrests and backrests, and are placed at different heights to accommodate various user groups. Designers have focused on creating ergonomic seating solutions that prioritize comfort, health, and adaptability (Gehl, 1987). Materials like memory foam, mesh and adjustable components are commonly used to enhance the user experience (Anderson et. al., 2022). Trends, and societal changes, resulting in diverse styles and materials used in public seating. Today, benches are not only practical but also play a crucial role in creating inviting and accessible public spaces. With an increased awareness of environmental concerns, there has been a trend toward using sustainable materials for furniture in public spaces as well as technological integration such as solar-powered charging stations.

Role of the Benches in Outdoor Public Spaces

Street benches play a crucial role in shaping the outdoor public spaces. The relationship between street benches and outdoor public spaces is multifaceted influencing social dynamics, urban design, and the quality of life (Krier, 1979). Benches can have an effect on creating welcoming and inclusive spaces for users. Their design, placement and functionality notably impact the way people interact with each other and experience the outdoor spaces.

People often prefer benches as meeting points, places to chat with friends or to enjoy the outdoor space because benches offer people to rest and relax while spending outdoor time. Whether it's a quiet moment in a pedestrian area or a break during a walk, benches contribute to the comfort and pleasure of outdoor spaces (Rybczynski, 1989). In addition, serving as landmarks and in some cases wayfinding elements in outdoor public spaces is one of the most important aspects of benches. They help people to navigate urban environments. Thus, they act as a recognizable design element in orientation and spatial awareness (Burton and Mitchell., 2006).

Benches are crucial design elements in the process of urban design. Well-designed benches contribute to generate attractive outdoor public spaces as well as to encourage identity of the public space. They help to create gathering spaces for public events, rallies or public places where people can observe and participate in community life. For instance, in urban areas, benches are often located near cafes, food trucks, markets so as to create outdoor dining (Bentley et. al, 1985). They can also be used near restaurants or retail establishments to enhance the economic vitality of commercial areas. Moreover, during festivals, concerts or public events, benches are valuable seating options for users. They play a role in creating temporary social outdoor spaces for people to enjoy the festivities. Benches are generally located at bus stop and other transit hubs for passengers, in a sense, they support the use of public transportation (Moughtin et. al., 1995).

As a result, benches are essential components of outdoor public space design. They contribute the siluette of urban spaces with their design, particularly, when they complement the architectural and urban character of its environment (Isaacs, 2001). To sum up, their importance extends beyond only seating, benches are integral components that enhance the urban life in various ways such as social interaction, relaxation, wayfinding, temporality, vitality, public events, environmental connection.

Physical Features of the Benches in Outdoor Public Spaces

The benches should provide accessibility to accommodate people, should be durable to resist weather conditions, vandalism and heavy use, should be functional to serve their intended purpose effectively whether seating, shelter or information and should be aesthetic to contribute the identity of outdoor public space. Physical features of the benches in outdoor public spaces should supply these appropriate anthropometric considerations such as seat height, depth and width, backrest angle and height, armrests height, accessibility and material.

Seat height should be crucial to ensure that users can comfortably sit down and stand up, a seat height for a typical street bench is about 41 cm to 46 cm. Typically, a seat depth of 38 to 46 cm is comfortable for most people. The depth of the seat should allow for comfortable sitting without putting unnecessary pressure on the back of the knees and seating surface is important for providing sufficient support. The seat width for street bench is around of 102 to 152 cm is comfortable (Dentay, and Dines, 1988).

Moreover, the seat width of the bench should provide enough space for the user, in other words, the width of the seat should accommodate a range of body size because otherwise it can cause discomfort. Besides this optimum measurements, specific applications may require different height, depth and width seat for benches.

Backrest angle and height is another critical issue in bench design. If the street bench has a backrest, its height is essential for providing proper support to the back and natural curve of the spine. Backrest heights typically range from 30 cm to 46 cm. Backrest angle can change according to the design of the bench, whereas, a slightly reclined angle is more comfortable than a completely upright position (Engler, 1988). Thus, the slope and curvature should provide adequate lumbar support for users. The angle of the backrest is important for ergonomic comfort. If the bench includes armrests, their height is important for comfortable seating and support. Armrest heights typically range from 18 cm to 23 cm (Krauel, 2007).

Designing benches that can be configured in different ways allows for flexibility in urban design. Modular designs can accommodate various spatial

constraints and design preferences which creates for accessibility for users (Engler, 1988). Furthermore, considering the design for those who need assistance in standing increases the accessibility of the bench and adequate space for individuals with different body types.

Easy maintenance is also an aspect of physical features of the benches. They should be designed with materials that are easy to clean and maintain over time. Regular maintenance is crucial to ensure the longevity and safety of the benches (Moughtin et. al., 1995). Recyclable and eco-friendly materials contribute to a more sustainable public space so that environmental considerations are also crucial in terms of physical features of the benches.

Street bench design that takes anthropometry into account ensures that public seating is inclusive and comfortable for a diverse range of users. By considering the needs and dimensions of the human body, designers can create benches that enhance the overall experience of outdoor public spaces.

Design Process and the Innovative Features of Yin Yang Bench

The essence of the main rationale of the design of the Yin Yang bench is driven from the continuous evolvement of the outdoor public spaces and the negative and positive daily experiences of the users. The fact that similar habits and experiences are transmitted from one generation to the next, due to the city being a living organism, gives such street furniture an infinite nature. Yin Yang bench through transmitted the negative and positive experiences, symbolizes the continuous daily experiences of people. Thanks to its durability and to ease of maintenance, it offers an infinite eye to the outdoor public spaces of the city which will witness the daily experiences of citizens throughout the years (see Figure 1).

Figure 1. *Sketch of the YinYang bench*

Yin Yang bench has an influence on not only physical but also on social environment. It allows all the users to have access to it and make activities. The main objectives of the bench are, to increase attractiveness of walkways and silhouette of the street, to enhance quality and quantity of seating places, to separate vehicles from pedestrians, to give the opportunity for bicycle stands and to create a play area for kids. Yin Yang bench is considered not only

as the seating element but also as a whole process that involves dynamics/changes of outdoor public space in social and spatial terms. In this respect, it offers an amelioration in the quality of daily life. Moreover, it takes the advantage of the site views and provides for people from different ages a variety of options such as social interaction; gazing at people, relaxing, reading, drinking coffee, and playing (i.e. kids climbing). It can also work as a meeting point because of its sculptural character (see Figure 2).

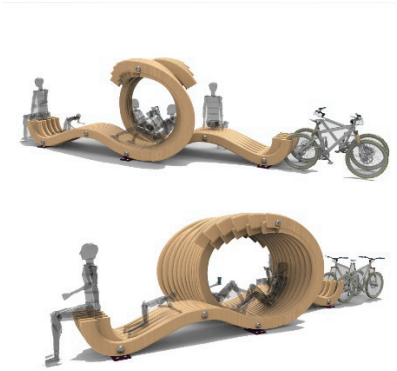


Figure 2. *Three dimensional view of Yin Yang bench*

The materials of the Yin Yang bench are chosen according to durability, sustainability, ease of maintenance and assembly. The bench consists of two modules: Module A and module B. The combination of plywood and steel is used in both modules. Each module involves following dimensions: Plywood 11 x 4 cm, steel fixing foot 4 x 15 cm, steel pipe 8 x 68 cm, steel stamp 2 x 160 cm, steel nut ∅2 x 16 cm (see Figure 3).

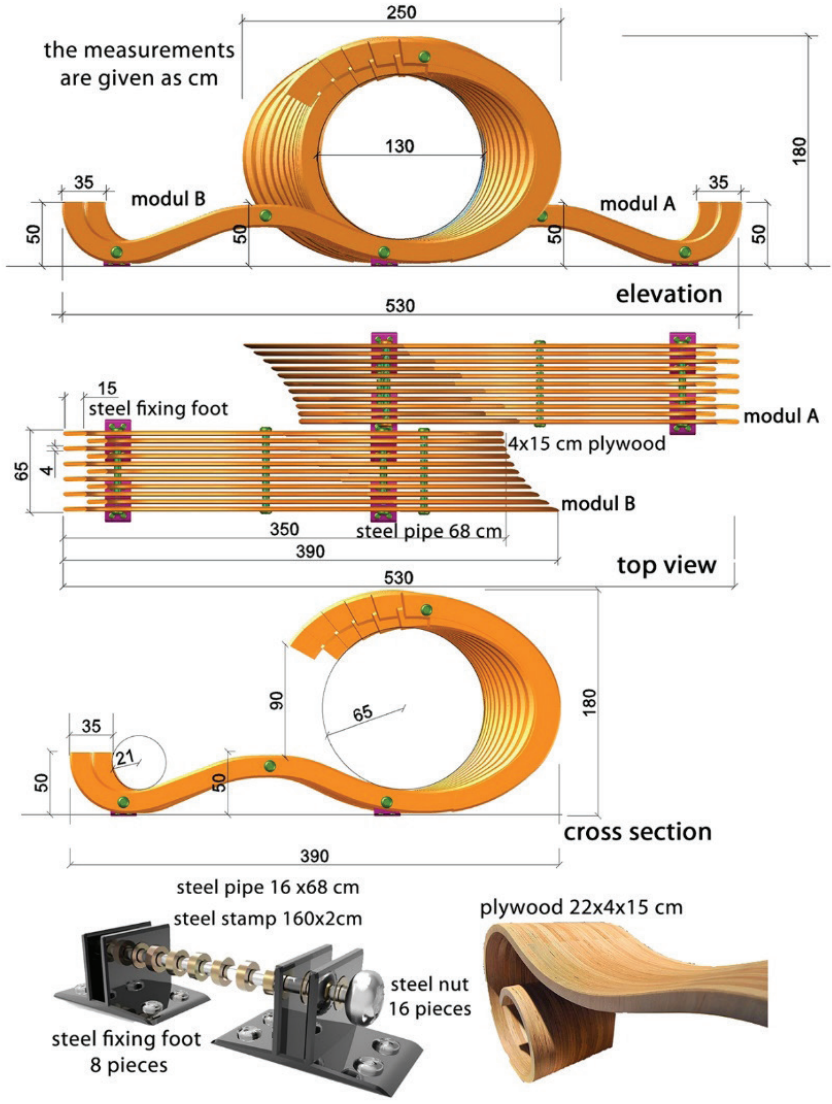


Figure 3. *Technical drawing and details of the Yin Yang bench*

Material selection, modularity, durability, comfortable seating, maintenance considerations, aesthetic integration are among the basic properties of the Yin Yang bench. It contributes not only to the functionality of outdoor public spaces but also to the overall atmosphere and user experience with its innovative design.

CONCLUSION

Modern street bench design emphasizes a combination of functionality, aesthetics and sustainability (Colquhoun, 1989). Designers often incorporate innovative materials, contemporary forms, and thoughtful features to create benches that enhance the urban environment (Resuloğlu, 2020). In this framework, the main characteristics and innovations of the Yin Yang bench can be concluded as follows (see Figure 4):

Figure 4. *Different color options of the Yin Yang bench*

Ergonomic characteristics: The Ying Yang bench is designed with user comfort in mind. Ergonomically shaped seat, backrest and organic form provide a more pleasant, enjoyable and supportive sitting experience for different ages users including children and cyclists.

Sustainable characteristics: The Ying Yang bench is designed to use recycled materials as well as its design incorporate greenery feature of outdoor spaces. It contributes to more eco-friendly outdoor public spaces.

Innovative characteristics: The design of the Ying Yang bench includes materials such as plywood and steel. These materials are chosen for their resistance to weathering and heavy use, maintenance, durability and aesthetic purposes.

Modular and flexibile characteristics: The Ying Yang bench that can be configured in different ways allows for flexibility in outdoor public spaces. Its modular design can accommodate various spatial constraints and design

preferences and uses.

Technological characteristics: The Ying Yang bench offers technological features such as Wi-Fi connectivity, enhancing the functionality of these public space. Moreover, with the advent of the digital age, there's a growing trend toward flexible and collaborative workspaces in outdoor public spaces. This has influenced the design idea of the Yin Yang bench with an emphasis on adaptability and mobility.

Public events and wayfinding characteristics: The Ying Yang bench have the potential to create temporary social spaces due to its spatial feature for people to enjoy the festivities. Furthermore, The Ying Yang bench can serve as a landmark and a wayfinding element in outdoor public spaces, helping people navigate urban environments. It can become recognizable design element that aid in orientation and spatial awareness.

Sculptural characteristics: The Ying Yang bench is not just functional but also serve as artistic installations such as a sculpture. It is also designed to contribute to the visual appeal of the outdoor public spaces (see Figure 4).

Figure 5. *Integration of outdoor public space of the Yin Yang bench*

As a result, the benches play a crucial role in urban design, contributing to the overall functionality, aesthetics, and livability of outdoor public spaces (Amidon, 2001). Their importance extends beyond mere seating; they are integral components which enhance the urban experience in different aspects. In that sense, the Yin Yang bench can be considered as an urban design element that plays a crucial role in shaping the outdoor public space. Its design, placement, aesthetic qualities and functionality significantly impact the way people interact with and experience the outdoor public spaces.

REFERENCES

Amidon, J. (2001). *Radical Landscapes: Reinventing Outdoor Spaces*. New York: Thames & Hudson.

Anderson, C. M., O'Mahony, C. I. R. and Andrianou, D. (2022). (eds.) A Cultural History of Furniture. Vol. (6). New York: Bloomsbury Academic.

Bentley, I., Alcock A., Murrain, P., Glynn, S. and Smith, G. (1985). *Responsive Environments: A Manual for Designers.* London: The Architectural Press.

Burton, E. and Mitchell, L. (2006). Inclusive Urban Design: Streets for Life. UK: Elsevier.

Colquhoun, A. (1989). *Modernity & the Classical Tradition: Architectural Essay 1980-1987.* Cambridge, MA. MIT Press.

Dentay, K. and Dines N. T. (1988). "Site Furniture and Features". *Time-Saver Standards for Landscape Architecture.* Harris, C. W. and Dines N. T. (eds.).New York: McGraw-Hill, Inc.

Engler,N. (1988). Outdoor Furniture. Los Angles: Rodale Press.

Gehl, J. (1987). *Life Between Buildings*. New York: Van Nostrand Reinhold Company.

Herring, E. (2016). *Street Furniture Design: Contesting Modernism in Post-War Britain*. London & New York: Bloomsbury Publishing.

Herzog, L. A. (2006). *Return to the Center: Culture, Public Space and City Building in a Global Era.* England: University of Texas Press.

Isaacs, R. (2001). "The Subjective Duration of Time in the Experience of Urban Places". *Journal of Urban Design,* 6, (2), pp. 109-127.

Krauel, J. (2007). *New Urban Elements. Spain: Links International.*

Krier, R. (1979). *Urban Space*. New York: Rizzoli.

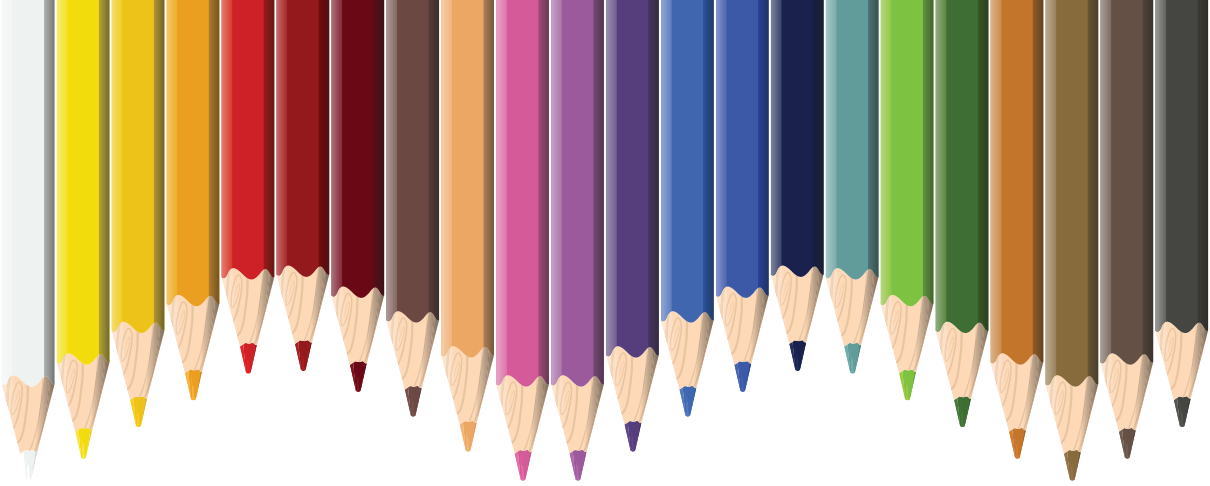
Moughtin, C., Oc, T. and Tiesdell S. (1995). *Urban Design: Ornament and Decoration.* London: Butterworth Architecture.

Resuloğlu, Ç. (2020) "An Overview of the History of Studies on Urban Theories". *Online Journal of Art and Design*, 8 (3), 51-58. ISSN: 2301-2501.

Robertson, K. A. (1994). *Pedestrian Malls and Skywalks*. England: Avebury.

Rubenstein, Harvey M. (1992). *Pedestrian Malls, Streetscapes, and Urban Spaces*. Canada: Avnone.

Rybczynski, R. (1989). *The Most Beautiful House in the World*. New York: Penguin Books.



Chapter 6

GREEN STREETS

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1.INTRODUCTION

Most of today's society lives in urban areas. Urban areas are built environments and are natural, semi-natural and modified living spaces that enable the use of humans, plants and animals (Mensah, 2014). It is estimated that the population rate will reach up to 70% as these areas begin to grow and the global population increases (Ferreira et.al., 2020).

It is seen that people develop and change themselves physically and psychologically in areas of their lives. In addition, they adapt the environment they live in to suit themselves to stay for a long time without leaving it (Alpak & Düzenli, 2018). Urban areas are one of them. Many changes, developments and progress in areas such as social, cultural, social, industry, trade, economic, ecological and education from the beginning of life to this time. Urban areas are starting to change the people who physically live in them in terms of lifestyle and livelihood (Düzenli & Alpak, 2021;Zhang et al.,2022). At this point, urban open spaces are used to ensure physical balance in today's cities, to create healthy environments, to limit the negative developments of cities, to provide microclimatic benefits, to get away from the tiring and oppressive city life, to provide the ecosystem service of the city, to ensure that people are in touch with nature, and to witness seasonal changes. It is necessary to carry out studies (Chiesura, 2004; Kısak, 2021; Düzenli & Alpak, 2022). It is one of the main areas where work can be done from the streets.

With their heterogeneous structure, streets are areas that reveal the quality of the urban areas we live in as a society with their immediate surroundings. They are areas that establish relationships between individuals using the city (Ayaz & Yamaçlı, 2019), provide connections in public and private spaces, and provide various experiences to their users. It is one of the most basic binding elements of public life in the city (Özcan et al., 2003). These are places that urbanites share in common. They are areas where individuals in society show their power, express themselves, and take place in political and social events (Köse, 1998). It creates livability in the city. It is found in open areas of cities and forms the basic skeleton of the city (Şahin Körmeçli & Elitaş, 2023).

Figure 1. Urban Streets (Url-1;Url-2)

Green streets (Figure 2) are a sustainable rainwater strategy that aims to manage rainwater in cities, reduce water flow, improve water quality and improve basin health by using the natural system approach in cities, complying with legislation and protecting resources (Im, 2019).

Figure 2. Green Streets Examples (Url-3;Url-4)

Green streets are green infrastructure systems that are associated with alleviating conditions in urban areas. It provides an alternative solution by

using natural materials to replace and improve problematic urban ecosystems. Adopting these systems increases biodiversity in cities, promotes more green space, improves well-being and increases climate resilience by treating rainwater and urban heat island effects. Thus, it can support sustainable urban ecosystems (Beery, 2018; Bayramoğlu et al.,2019; Im, 2019).

Green streets in cities; It can eliminate up to 90% of pollutants in rivers and streams, protect the quality of water, absorb carbon, renew groundwater resources, improve air quality and improve the aesthetics of the area. It provides green connections between parks and open spaces. Borders made with plants increase pedestrian and bicycle safety. It calms traffic. It can eliminate the need to install or replace expensive groundwater collection, transportation and treatment systems. It minimizes or reduces society's energy costs. Opportunities such as walking, running, cycling and public transportation also contribute to greener and healthier transportation. Using locally sourced and recycled materials whenever possible in its design minimizes the material cost and carbon footprint of its construction (Figure 3) (United States Environmental Protection Agency, 2023).

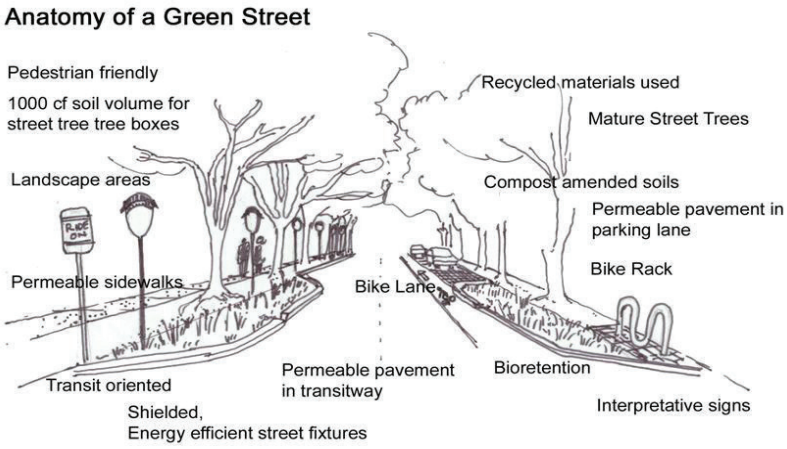


Figure 3. Anatomoy of a Green Streets(United States Environmental Protection Agency, 2023).

Green street is a green infrastructure within the city where there are three development paradigms: sustainable urban development, green infrastructure and rainwater management. Green streets in a city can include eleven green infrastructure design elements of the city. These are permeable pavements, rainwater harvesting, rainwater harvesting, rain gardens, bioswamps, plant boxes, green roofs, green parking, urban tree canopies, and land conservation (Figure 4) (Fachrudin et al., 2023).

Figure 4. Green Street Practices (Url-5;Url-6)

There may be differences in green streets in terms of design and appearance. However, the functional goals of each green street approach may be the same. They include providing source control of stormwater, limiting its transport and transport of pollutants to the collection system, restoring pre-development water to the extent possible, and providing environmentally improved roads. Successful application of the techniques promotes soil and vegetation contact, infiltration and retention of rainwater (Streets, 2008).

At this point, within the scope of this study, examples from countries in the world that have prepared projects within the scope of green streets are included and what and how the projects take the green street approach are explained.

1.1. Countries in the World that are Preparing Projects within the Framework of Green Street

1. Edmonston Green Street Project-America

Edmonston Green Street project (Figure 5), the main residential street is Decatur Street. This street is intended to be completely transformed in a way that is environmentally friendly. In this project, it is planned to benefit from the best sustainability practices across the country, from the tree cover on the hill to the rainwater system underground.

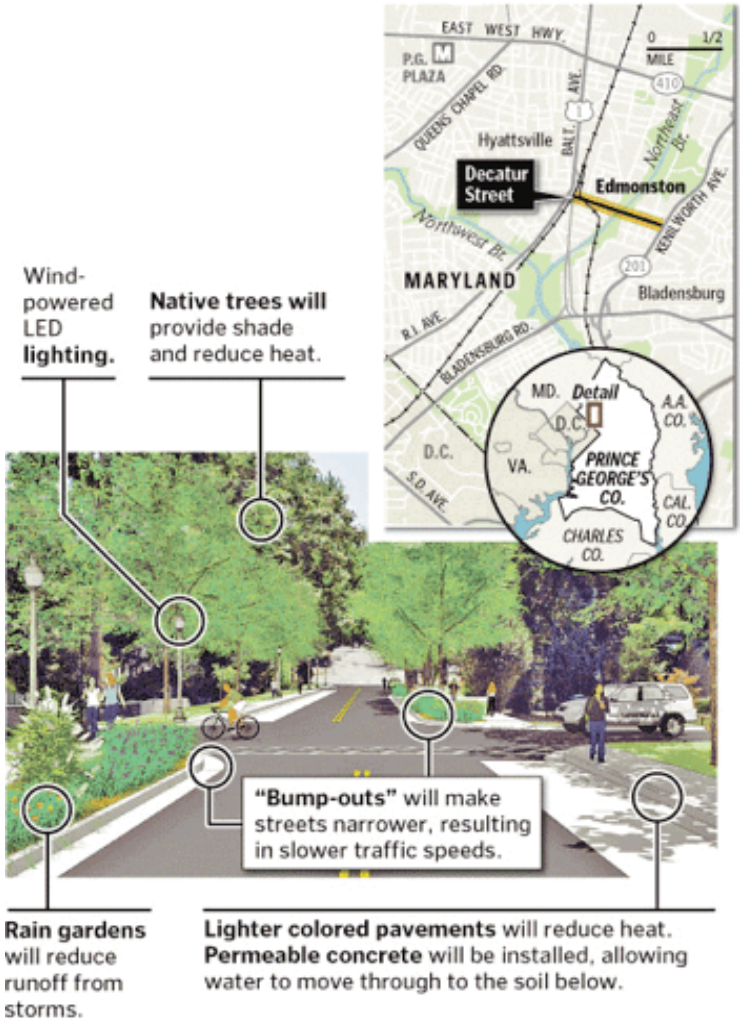


Figure 5.Edmonston Green Street Project (Url-7)

With this project, a positive contribution will be made to the regional environment and especially to rivers. Almost all of the pollution that destroys the city's lakes and rivers comes from rainwater or rain runoff. The city supports the green street project as a solution to this problem. At this point, within the scope of the project they developed;

-Street lighting with clean energy: New street lights will use efficient bulbs and ballasts and receive power from an alternative source. It evaluates sources such as wind energy, solar, kinetic and water as alternative power sources.

-Walking, Running and Cycling: Streets and sidewalks will also be made as suitable as possible for walkers, runners and cyclists.

-Recycled materials: Materials used on streets and sidewalks will consist of as many recycled materials as possible, including ground asphalt, concrete and glass.

-Rainwater Biological Retention and Filtration: This is the most critical part of the project. Rainwater or rain runoff will be directed through storm drains and the sewer system to specially landscaped areas along the street, allowing the water to naturally filter through the soil. Permeable pavement (or brick and concrete that will allow water to flow to the ground) will be used (Url-7).

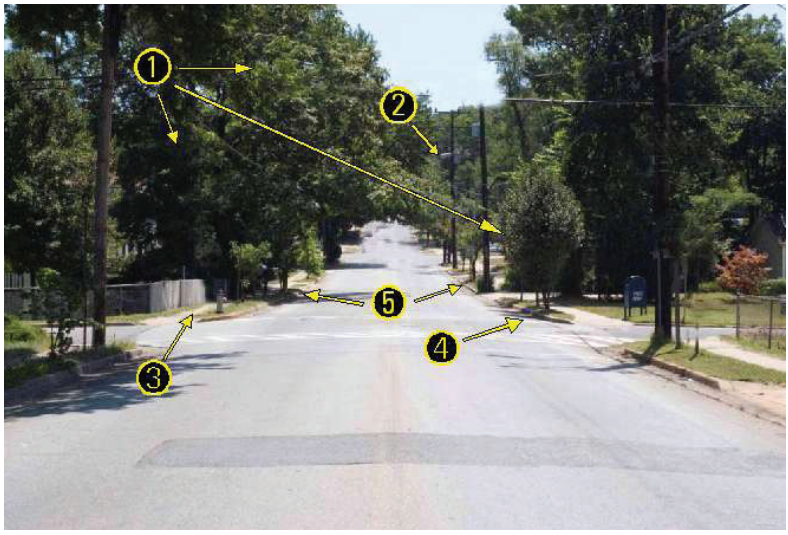


Figure 6. Pre-Project Status

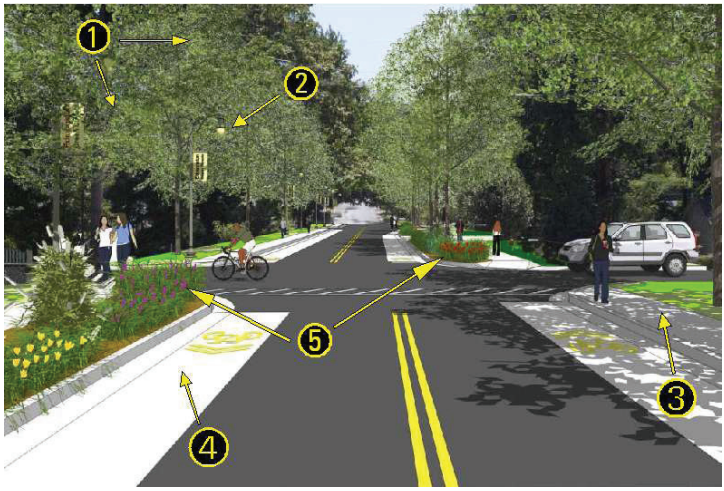


Figure 7. Post-Project Status

The pre-project situation of the Edmonston Green Street Project is shown visually in Figure 6 and the post-project situation is shown in Figure 8. The before and after situations that will occur within the scope of the project are explained in Figure 8.

	Before	After
1. Tree Canopy	Non-native and low growth trees reduce habitat and contribute to "urban heat island" effect.	Native large canopy trees increase habitat, clean air, and cool street, sidewalks and homes.
2. Street Lighting	Sodium and mercury vapor street lights are inefficient, powered by dirty coal energy that emits carbon into the atmosphere. Lights are also located above the trees, which results in less light reaching the sidewalk.	Light emitting diode (L.E.D.) streetlight fixtures are extremely efficient, and will be powered by clean wind energy. The lights will be closer to the street to maintain effectiveness to public safety.
3. Walkability and Accessability	Broken and narrow sidewalks limit access for disabled persons and strollers, and may violate the Americans with Disabilities Act. (ADA)	ADA compliant (36" wide) sidewalks promote wellness, walking and community.
4. Bike Access	Lack of dedicated bike lanes reduce safety, discourage bike use and promote cars as the only way to get around on wheels. The wide street promotes speeding, making it even less safe for bikes and pedestrians.	Clearly marked bike lanes promote safety, wellness, an alternative to cars, and offer connectivity to bike trails and transit.
5. Storm Water	The storm water drains debris and pollutants directly into local rivers through the underground sewer system. This poisons fish and other wildlife, promotes illness among people, and contributes to the death of the Chesapeake Bay.	"Bioretention" gardens and tree boxes are the destination for storm water instead of the sewer system. The water is then naturally filtered of pollutants and debris, helping restore our rivers and the Bay.
6. Traffic	no bump-out	The "bump-out" design produces a "wiggle" in the street, slowing traffic for bike and pedestrian safety.

Figure 8. Before & After Features of Decatur Street (Url-7)

2. Toronto Development and Urban Oriented Green Street Projects-Canada

Toronto is one of the cities that have completed many green street projects in various parts of the city. However, new projects are also planned. Green street projects are completed either directly by the city or through development-oriented projects (Url-8).

2.1.Stanley Greene Boulevard Project

Stanley Greene Boulevard (Figure 9) is located in a residential area south of Downsview Park. It was completed in 2020 with a development focus within the scope of the green street project.

Figure 9. Stanley Greene Boulevard

This project includes the sidewalk on the west side of the street and the multi-use path on the east side. In the project, the highway and multi-use road are separated by a rain ditch, which will provide many benefits such as reducing the amount of rainwater reaching the sewer system. Since this rain ditch allows a significant amount of rainwater to hold, it also allowed the elimination of the basins on the west side of the street. It also improved water quality through filtration. It increases pedestrian safety by creating a physical buffer between the multi-use path and the highway.

2.2. Six Points Interchange Reconfiguration

Six Points Interchange Reconfiguration (Figure 10) is one of the city-oriented green street projects. It is located on local roads in the mixed-use Etobicoke-Centre district. This project was completed in 2020.

Figure10. Six Points Interchange Reconfiguration

This project involves the realignment of west Dundas Street. The plan includes new traffic signals, widened sidewalks, bicycle facilities, new parking, the removal of two bridges, the creation of a district energy plan and new street trees. New street trees were planted in the soil ditches and rainwater tree ditches that run continuously along the street. Rainwater tree ditches allow rainwater on the road to flow into collection pools. It also directs rainwater into the soil beneath the tree through a series of perforated pipes. Stormwater tree swales provide benefits such as reducing the amount of rainwater entering the sewer system, redirecting it to the soil under trees, thus increasing overall resilience to extreme storms.

2.3. Byng Boulevard Project

The Bygn Boulevard (Figure 11) project is located on Byng Street, a local road in a residential area of Etobicoke. The construction was completed in 2019.

Figure 11. The Bygn Boulevard

This project includes the installation of two major green street components. It consists of biocontainment planters and a porous concrete pavement. These have reduced the volume of rainwater entering the sewer system. This has increased its overall resilience to extreme storms and increased water quality through filtration through bioretention media.

3. Chynoweth Avenue Green Streets Project- San Jose, California

This project was undertaken to rebuild the residential street along Chynoweth Boulevard to eliminate excess lane width. The project includes the installation of a raised median and the construction of new bioretention areas to regulate stormwater runoff. A total of approximately 5,600 square meters of biological protection rain garden was created, approximately 19,500 square meters of porous asphalt pavement was covered, and 36 large shade trees were planted. Approximately 40,000 square meters of existing impermeable pavement and barren soil median have been eliminated. Work has also been carried out on traffic and pedestrian safety improvements such as street lights, pedestrian crossings and bicycle paths (Figure 12; Figure 13) (Url-8).

Figure 12. Pre-Project Status

Figure 13. Post-Project Status

4. Bellemeade Green Street Project- Richmond, ABD

In partnership with the James River Association, City of Richmond, Groundwork RVA, Timmons Group and 3North, a green street was planned and implemented along Minefee Street between Bellemeade Park and Hillside Court in Richmond's Southside. This project is designed to improve pedestrian and cyclist safety along Minefee Street and improve local water quality in Albro Creek, a tributary of Goode Creek that flows through Bellemeade Park. Impermeable surfaces are removed in the green street implementation with the installation of planter beds, purification devices called Filterras, biological retention filters and street trees. Tree cover is expanded and rainwater runoff is actively filtered. Infrastructure and environmental improvements are progressing towards promoting a more resilient and connected neighborhood (Figure 14)(Url-9).

Figure 14. Bellemeade Green Street Project Plan

5. Lakeside Green Street Restoration Project-Oakland

Lakeside Green Streets Project(Figure 15) is a 14-acre green street project with the aim of calming traffic, facilitating pedestrian and bicycle use, increasing parking areas, improving the Snow Park and improving water quality. It was designed as part of the Lake Merritt Master Plan. The project planning and design process was funded by the Oakland Foundation for Clean Water and Safe Parks (Measure DD) (Url-10).

Şekil 15. Lakeside Green Street Restoration Project Plan- Concept Plan (Url-11)

2.CONCLUSION

The fact that the development and changes of cities continue from past to present makes life in cities difficult. At the same time, it harms the ecosystems within the city. In order to prevent this situation, it is very important to make arrangements in cities that are appropriate to the age and that can respond to the positive and negative effects of the age. Green street regulations are one of them.

Negative effects emerge in today's cities due to global population growth and climate change. Many negative factors such as extreme weather conditions, rapid developments in cities with increasing population density, increase in impermeable surfaces, accumulation of pollution in streams, and increase in temperature threaten urban people, living creatures, and our environment. The green street approach also reflects solution proposals that play an effective role in alleviating the changing and developing conditions of urban areas

and improving the urban ecosystem. At this point, all countries in the world need to adopt the green street approach and make the necessary regulations. It is very important to follow the developments in order to transform cities into sustainable ones.

REFERENCES

Alpak, E. M., & Düzenli, T. (2018). Kentsel Tasarımda Esneklik ve Adaptasyon: Kentsel Meydan Senaryolari Üretimi. International Journal Of Socıal Humanıtıes Scıences Research, 5(16), 16-22.

Ayaz, B., & Yamaçlı, R. (2019). Sokak Tasarımlarının Sürdürülebilir Kalkınma Açısından Değerlendirilmesi. Sürdürülebilir Kalkınma Rolüyle Mimarlık, 77.x

Bayramoğlu, E., Yeniçırak, P. Ö., & Kurdoğlu, B. Ç., (2019). Investıgatıon of Urban Open Areas To Permeable Ground: Example of Trabzon Cıty Centre. Journal of Socıal And Humanıtıes Scıences Research , No.6, 3868-3873.

Beery, T. (2018). Engaging The Private Homeowner: Linking Climate Change and Green Stormwater Infrastructure. Sustainability, 10(12), 4791.

Düzenli, T., & Alpak, E. M. (2021). Interpreting Urban Open Spaces As An Art Object: Trabzon Pazarkapı Envıronmental Desıgn Projects. Eurasian Academy of Sciences Social Sciences Journal, vol.36, 64-82.

Düzenli, T., & Alpak, E. M. (2022). Artistic Approaches In Urban Open Space Desıgn. Architectural and Engineering Research and Practice (pp.91-102), Livre de Lyon.

Fachrudin, H. T., Karolina, R., Fachrudin, K. A., & Faris, D. M. (2023). Green Street Design Approach to Realize Green City. Case Study: Medan City. Future Cities & Environment.

Ferreira, V., Barreira, A. P., Loures, L., Antunes, D., & Panagopoulos, T. (2020). Stakeholders' engagement on nature-based solutions: A systematic literature review. Sustainability, 12(2), 640.

Köse, E. (1998). Kentsel Alanlarda Kamu Kullanımlı Merdivenli Sokaklar: Beyoğlu İlçesi Örneği, Yüksek Lisans Tezi, İstanbul Teknik Üniversitesi, İstanbul.

Im, J. (2019). Green Streets to Serve Urban Sustainability: Benefits and Typology. Sustainability, 11(22), 6483.

Li, X., Zhang, C., Li, W., Ricard, R., Meng, Q., & Zhang, W. (2015). Assessing Street-Level Urban Greenery Using Google Street View and A Modified Green View Index. Urban Forestry & Urban Greening, 14(3), 675-685.

Mensah, C. A. (2014). Destruction of Urban Green Spaces: A Problem Beyond Urbanization in Kumasi City (Ghana). American Journal of Environmental Protection,3(1): 1-9

Özcan, Z., Bayraktar, N., Görer, N., & Tekel, A. (2003). Kente Dair Analitik Bir Çözümleme: Sokaklar 'İlk Yıl Şehir Planlama Atölyesi Deneyimi'. Gazi Üniversitesi Mühendislik Mimarlık Fakültesi Dergisi, 18(2).

Streets, G. (2008). Municipal Handbook.

Şahin Körmeçli, P. & Elitaş, İ. (2023). Yaşanabilir Sokaklar Oluşturmak İçin Tasarım Önerileri: Cep Parklar Ve Parkletler . *Turkish Online Journal Of Design Art And Communication* , 13 (4) , 1107-1122 . DOI: 10.7456/tojdac.132221

United States Environmental Protection Agency,2023. https://19january2017snapshot.epa.gov/G3/ learn-about-green-streets_.html, 20.12.2023.

Url-1.https://tr.pinterest.com/pin/618470961341848082/,20.12.2023

Url-2. https://tr.pinterest.com/pin/696650636129320306/0,20.12.2023

Url-3. https://tr.pinterest.com/pin/128845239332508413/,20.12.2023.

Url-4. https://tr.pinterest.com/pin/325455510577684625/, 20.12.2023.

Url-5.https://tr.pinterest.com/pin/12314598970588686/, 20.12.2023.

Url-6.https://tr.pinterest.com/pin/30117891250964512/,20.12.2023.

Url-7. https://edmonstonmd.gov/green-street-project/, 20.12.2023.

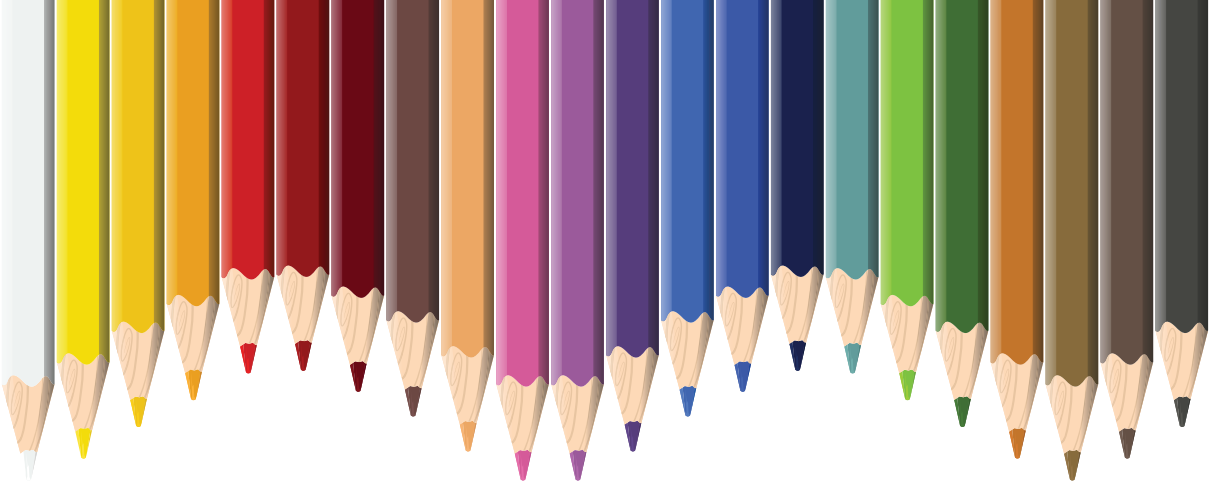
Url-8.https://www.toronto.ca/services-payments/streets-parking-transportation/enhancing-our-streets-and-public-realm/green-streets/green-streets-projects/, 22.12.2023

Url-9. https://thejamesriver.org/bellemeade-green-street-project/,22.12.2023

Url-10. https://www.oaklandca.gov/projects/lakeside-green-street-restoration-project, 22.12.2023

Url- 11. https://cao-94612.s3.us-west-2.amazonaws.com/documents/Lakeside-Green-Streets.pdf, 22.12.2023

Zhang, X., Han, L., Wei, H., Tan, X., Zhou, W., Li, W., & Qian, Y. (2022). Linking Urbanization and Air Quality Together: A Review and A Perspective on the Future Sustainable Urban Development. Journal of Cleaner Production, 346, 130988.



Chapter 7

ASSESSMENT PROPOSAL FOR SUSTAINABILITY IN INTERIOR DESIGN EDUCATION [1]

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1. INTRODUCTION

The planet has a finite amount of resources, and its population has been steadily increasing over the course of several centuries. Over the past few years, worries over climate change have significantly increased all over the world, in tandem with the accumulation of scientific information regarding the impact of greenhouse gases on the environment(Bluyssen, 2014). Throughout history, the concept of sustainability has been the subject of debate among specialists. During the year 1972, definitions placed an emphasis on the limitations placed on ecological systems. These limitations included the ability to carry out functions such as the absorption and recycling of waste from anthropogenic activities, along with the concurrent challenges of enhancing social, educational, health, and employment conditions(Hajian & Kashani, 2021). In 1987, the term "sustainable development" was defined as "development that satisfies the needs of the present without compromising the ability of future generations to satisfies their own needs" (World Commission on Environment and Development, 1987). As of the year 2019, it was described as the fulfillment of the requirements of both the present generation and the generations to come, contingent upon the suitable conditions of human, natural, and economic capital in order to provide for the wellbeing of humans(United Nations Development Programme, 2015). Within the context of human civilization in the 21st century, the idea of sustainable development has gradually evolved into a goal that is universally acknowledged. It is possible to sustain lifestyle needs, a healthy economy, reduced global warming, and lowered poisonous gas emissions via conserving natural resources (Jones, 2008). These are only some of the social, cultural, physical, and economic consequences that may be achieved through conservation of environmental resources(Tucker, 2014).

For the purpose of ensuring that interior design solutions are environmentally friendly, the research proposed the establishment of a set of guidelines that are both practical and efficient(Rashdan & Ashour, 2017). When it comes to supporting interior designers in their selection of environmentally friendly interior design solutions, the author finds these criteria quite significant. The mechanisms for selecting sustainable materials were the primary focus of these criteria. These mechanisms included recognizing and assessing the companies that produce sustainable materials, evaluating those materials based on sustainable product certificates, evaluating the life cycle of a sustainable product, and determining whether or not these materials are suitable for fulfilling health standards (Rashdan & Ashour, 2017). According to Ayalp (2012), the extent and degree of the requirement for an interior setting that is friendly to the environment, the adoption of concepts of sustainability in the process of building the interior environment, and the possibilities of achieving sustainability through the elements of interior design were all investigated and studied. Additionally, research and investigation of natural resources that

could be included in the manufacturing of the components of the interior environment, as well as strategies that would reduce energy consumption by utilizing natural light, were also investigated and studied. In another research, the objective was to first acquire a comprehensive grasp of what defines a sustainable material option, and then to proceed with an investigation into the existing supply of green, sustainable, and fair trade items for interior design practice (Hayles, 2015).

The term "interior design" has experienced significant transformations ever since the turn of the twentieth century, when it was essentially a technique for decorating interior spaces. Currently, it is a field of specialists who are qualified to detect, research, and creatively address problems of the interior environment in order to improve and safeguard the health, safety, and welfare of the general public (Council for Interior Design Qualification, 1990). The Interior Design Educators Council (IDEC) was established in 1968, and the Foundation for Interior Design Education Research (FIDER) was established in 1973 (Harwood, 1991). Since then, interior design education has also improved, and it has assumed a more prominent leadership role within the field. Due to the fact that sustainable design is a means for achieving sustainability, there are numerous ways in which sustainable design ideas and solutions can be implemented. It is therefore essential that the education of sustainable design in interior design studios begin with an exploration of the underlying concepts of sustainability in the indoor environment, rather than beginning with compartmentalized prescriptive solutions that can be found in many guidelines(Marshall-Baker, 2008). Interior designers are equipped with the core knowledge that is required for practicing in the industry through the process of education. There have been some suggestions made regarding the incorporation of sustainable design components within the curriculum for interior design.

2. METHODOLOGY

Students' ability to incorporate sustainable design principles into their work was evaluated using a grading rubric that was developed specifically for sustainable interior design. In the process of establishing the rubric, one of the goals was to create a tool that could be conveniently utilized for the purpose of evaluating student projects in the field of interior design.

Because of the nature of many interior design classes, the rubric was required to record the extent to which students participate in sustainable interior design, in addition to that the influence of user and/or course instructor expectations for sustainable design. This was necessary in order to ensure that an accurate assessment of sustainable design was made.

In light of the fact that the particulars have already been investigated, the

development of this instrument, which was completed through a two-phase approach, will be described in detail quite fast.

2.1. Phase 1: Existing Sustainability Evaluation Frameworks Research

Sustainable design solutions, in contrast to conventional design solutions, encourage the creation of healthy environments while simultaneously reducing the amount of resources and energy that are used (Yu, 2015). According to Kang and Guerin (2009), responsible interior design solutions should provide a technique that is logical and sequential for the construction of interiors that are healthy, useful, comfortable, and sustainable. This should be accomplished without compromising aesthetic aspects, and it should also be coordinated with the client's needs, budget, and design vision. Loftness et al. (2007) suggests that designers should take measures to ensure that the quality of the air inside the building is healthy by selecting materials and construction methods that prevent harmful chemical reactions, gas emissions, and pollution of the air inside the building. It is important for designers to be attentive of the opportunity to provide environmentally conscious solutions for energy efficiency. These solutions have the potential to reduce the rate of energy and water consumption while simultaneously offering a comfortable area(Ruegemer, 2010).

2.2. Phase 2: Creating an Initial Assessment Criteria Framework for Projects

During Phase 2, a preliminary sustainable design rubric was created based on the Nine Principles of Sustainable Engineering and the fundamental elements of an analytical rubric, as described by Allen & Tanner (2006). Due to the fact that many of the Nine Principles are complicated and contain several concepts, each principle has been broken down into specific design criteria to facilitate rubric application.

To aid judges in recognizing the application of criteria in project reports, a list of examples illustrating how the 18 criteria may be completed in interior design student projects has been developed.

2.2.1. Criteria for sustainability in interior design

Manufacturers' selection

1) Identify and evaluate sustainable manufacturers: Guidelines that control the specification of materials that correspond to sustainability principles are also now being applied, in addition to the standard criteria for product specification that have been in place for years to serve the interior design industry(Andras, 2008). The operations and practices of organizations that sell

their products as eco-friendly should be thoroughly monitored and analyzed by interior designers. Additionally, the efforts of these businesses to promote health and environmental concern should also be given serious consideration.

2) Sustainable product declarations: The first and most important thing that designers need to keep in mind is that sustainable materials must possess specific characteristics. These characteristics include being healthy, long-lasting, suitable, and simple to maintain, while also having minimal negative effects on the environment during their entire life cycle(Bonda & Sosnowchik, 2006). Manufacturers who give a summary of a product's environmental qualities should be actively monitored and evaluated by interior designers through active monitoring and evaluation.

3) Sustainable product certifications: It is the responsibility of interior designers to check the legitimacy of certificates that have been awarded by a number of regulatory authorities and to make certain that these certifications are maintained up to date whenever new information that is relevant becomes available.

4) Sustainable product life-cycle assessment: The life-cycle assessment takes into account environmental and health concerns across the entirety of a product's life cycle, beginning with the extraction of resources and continuing through production, transportation, on-site construction, occupation and maintenance, and ending with recycling, reuse, and disposal(Mendler et al., 2006). Discovering a reliable life cycle assessment method and selecting products that have been evaluated and certified by a third-party organization using equivalent criteria are both important steps for interior designers to take.

Health

5) Indoor air quality performance: In spite of the fact that there is a growing knowledge of the health hazards connected with air pollution, it is generally considered to be a problem that is only present outside. This is due to the widespread idea that the constraints of an indoor environment, and especially one's own home, provide protection. As a result of significant shifts in the way of life and working conditions in contemporary society, particularly in industrialized nations, persons spend approximately 90 percent of their time indoors on average (Klepeis et al., 2001). The indoor air, illumination and day lighting, connection to nature, thermal comfort and management, electromagnetic fields, and electrical fields are all important factors that interior designers should take into consideration.

6) Control chemical emission: The conventional design and construction of buildings are founded on the principles of functionality, aesthetics, and economics; yet, up until very recently, there has been a lack of consideration de-

voted to the potential health impact that is associated with the materials used within(Skov et al., 1990). Phosphates, other chemicals, organic and inorganic particles, and other materials that are used in interior décor are examples of substances that have the ability to contribute to the pollution of the air inside a building(Jaakkola et al., 1999). Some of these substances have the potential to cause adverse immunologic reactions in the airways, which can lead to an increased risk of bronchial hyperresponsiveness and asthma. In order to determine whether or not it is feasible to replace a product with one that emits less volatile organic compounds and chemical emissions, interior designers are required to conduct an evaluation.

7) Carbon footprint: If a product is recyclable, if it generates a low amount of pollution, and if it uses a little amount of resources, then it is considered to be an environmentally friendly product. Environmental consciousness is increased when environmentally friendly products are widely used. A great number of businesses have introduced green supply chain management in order to reduce the negative effects that their manufacturing processes have on the environment (Yan et al., 2016). This management practice includes internal environment management, green procurement, green collaboration, and environmental decommissioning. The use of products and materials that contribute to the reduction of carbon effects and the offsetting of emissions should be specified by interior designers.

8) Biodegradable products: This certification procedure, which acknowledges that objects must dissolve swiftly with little waste, convert to water and biomass, encourage plant development, and not bring excessive metal levels into the soil, is something that interior designers should take into consideration. Some examples of such programs are the Biodegradable Products Institute for certification.

Reduction of consumption

9) Design adaptability: This property is dependent on the physical shape in addition to its compositional and other structural properties, which means that repetition, balance, and similarity can be used for making flexible space. This means that we can use those geometrical properties in order to gain a flexible space that can be transformed and used for multiple purposes within the same plot area (Abdulpader et al., n.d.). Flexibility is one of the physical properties of materials and geometrical forms that are made use of in interior design. The ability of interior designers to create spaces that are able to fulfill the requirements of customers while utilizing the least amount of space and resources is something that should be evaluated.

10) Regional design solutions: In a conceptual sense, local wisdom and local superiority are policies that are founded on the traditional philosophy of values, ethics, morals, ways, and behaviors that have been traditionally cre-

ated. The elements of local wisdom can be applied to any medium in the building industry (Atmadi et al., 2019). This is due to the fact that local wisdom possesses a fascinating philosophy that can be applied to the design of interior design. The promotion of vernacular design techniques that encourage the utilization of area goods and resources is something that interior designers ought to do.

11) Durability: It is the durability of an object that determines its value in today's society. Practically useful objects will continue to exist for as long as the material from which they are constructed continues to exist (Loos & Opel, 1998). Items and materials that are long-lasting and require little maintenance should be specified by interior designers for their design solutions. These designers should also take into consideration the suitability of their application and the installation procedures that are efficient.

12) Reduce packaging: However, the operations of the construction industry have an impact on the wider environment in a variety of different ways, including the production of waste. Additionally, the construction sector plays a leadership role in improving the quality of the built environment (Osmani et al., 2008). The makers of the items may be asked to package them in an environmentally responsible manner with little packaging, which interior designers could request.

Sustainable design components

13) Reusable design components: An architectural strategy is utilized by the architect, whether consciously or unconsciously, in the process of constructing a new building. This strategy will determine the sequence in which the building is constructed. These strategic maneuvers are, of course, augmented by a complicated combination of numerous aspects such as the conditions of the site, the structural systems, the objectives of the program, and his or her own unique vision (Cordan, 2019). In their argument, Brooker & Stone (2019) contend that when a building is reused, the original building and the relationship between the old and the new are the most significant and significant factors in the design of the new building. Material and component specifications should be made by interior designers to ensure that they may be recycled or reused once they have served their intended function.

14) Recyclable design components: There is a widespread belief that recycling is good to the environment; yet, the disassembly, collection, sorting, and processing of materials into new products all have substantial affects on the environment(Gao et al., 2001). The collection, conversion, and remanufacturing of trash from renovation-related construction projects into new building materials is a form of recycling. Interior design waste management is one example of this approach.

Efficient design resource management

15) Selecting renewable resources: In order to function properly, buildings, which are massive energy-consuming systems, require a significant quantity of energy. In terms of lighting, heating, cooling, and air conditioning, buildings are responsible for around forty percent of the total annual energy consumption that occurs over the entire planet. Design and construction that are environmentally responsible are getting a substantial amount of traction in the building industry(Shi & Chew, 2012). It is important for interior designers to make use of renewable resources, which are materials that have a lower energy consumption during their manufacturing, can be recycled or reused at the end of their life, and release less volatile organic compounds.

16) Effective plumbing systems: At the beginning of the 21st century, a great number of professionals and academics aggressively drew attention to the rapidly dwindling water resources. This was due to the fact that many nations were experiencing increasing water scarcity or issues related to poor water quality(Wang et al., 2022). To cut down on water use, interior designers can select water-efficient sinks and faucets that are equipped with smart technology.

17) Effective energy performance: The way in which buildings are planned has been significantly altered as a result of multiple factors, including the growing number of concerns regarding the environment on a worldwide scale and the development of computational tools and procedures. The energy efficiency of the designs that building experts create is becoming an increasingly important factor in their evaluation (Montiel-Santiago et al., 2020). A multidisciplinary simulation-based optimization approach can be applied to assist designers in examining a greater number of design alternatives and making decisions that are based on accurate information in order to attain a high level of energy performance. It is important for interior designers to work closely with other members of the project team, such as electrical and mechanical engineers, in order to maximize energy utilization and decrease energy consumption while simultaneously satisfying the objectives of the customer.

18) Efficient construction methods: There is a tight connection between the activities of building construction and the issues of environmental devastation and the lack of available energy. The construction industry is responsible for around forty percent of the overall electricity consumption in society, as indicated by the respective figures(Lobaccaro et al., 2018). It is the responsibility of interior designers to specify building methods that are basic and installation procedures that are minimum.

In order to provide evaluators with assistance in assessing project reports in compliance with the 18 sustainable design principles, two different grading systems with four points each were established. It is a reflection of the degree

to which projects take into consideration each sustainable design criterion that the points scale that is provided. Evaluators assign a score of "0" to projects that do not exhibit any evidence of adopting the design criterion, and they assign a score of "3" to initiatives that exhibit a significant amount of evidence of incorporating the criterion (Table 1).

Within the context of a specific sustainable interior design project, the potential points scale demonstrates the degree to which each sustainable design guideline is available for implementation (Table 2). The score of zero is assigned by the assessors in the event that a criteria is not applicable to the project. It is possible to receive a score of three if the criterion is appropriate and requested by either the teacher or the user. The capacity to differentiate between sustainable applications that are the product of student motivation and those that are the result of external pressures is made possible by grading projects based on both the level of applicability and the depth of its study.

Table 1. Rating scale for extent of consideration of sustainable design criteria (earned points)

Earned Score	Descriptor	Dimension Description
0	Unacceptable	Criterion not at all considered in project report.
1	Developing	Criterion mentioned or discussed in the project report, but not applied in design process.
2	Competent	Project report shows evidence that the criterion was adequately applied in design process (1-2 instances of criterion application).
3	Examplary	Project report shows evidence that the criterion was extensively applied in the design process (3 or more instances of criterion application).

Table 2. The level of applicability of sustainable design criteria (potential points).

Potential Score	Descriptor	Dimension Description
0	Inapplicable	The criterion is not at all valid for the project.
1	Valid	Although the sponsor does not require application of the criterion, it is still applicable to the project.
2	Required	The user requires some application of the criterion in the project (1-2 instances of requiring criterion application).
3	Critical	The user requires extensive application of the criterion in the project (3 or more instances of requiring criterion application).

Several measures were specified for the purpose of evaluating and comparing the scores on the rubric. The raw scores for each criteria (i), which included earned (Ei) and potential (Pi) points, were utilized in order to give insights into the level of criterion application and the amount to which the criterion was considered, respectively.

The final sustainable design index (SDscore) was quantified as the difference between mean potential (Mpot) and mean earned (Mearn) scores (Figure 1).

Therefore, a score of +3 for sustainable design suggests that the project has high objectives for sustainable design but inadequate student achievement. On the other hand, a project that has no sustainable design standards and a high level of student achievement would have an index of -3. In spite of the fact that the expectations for sustainable design may have been high or low, a project that has a sustainable design index that is near to zero shows that it has largely achieved sustainable design requirements.

Figure1 *Scale for sustainable design index (SDscore = Mpot - Mearn).*

3. CONCLUSION

The only goods and materials that interior designers should propose and specify are those that are healthy and environmentally beneficial. In the end, they should strive to create interiors that are really therapeutic for both clients and the environment while spending zero energy. They should push the limits of their creative abilities, discover the essential innovative ways to achieve energy efficiency, and eventually aim for interiors that are energy efficient. It is important for interior designers and contractors to include sustainable practices into all of their interior design solutions and to guide their teams in the implementation of sustainability principles in a way that is both harmonious and consistent.

This research provides a description of a sustainability course that is offered to undergraduate students who are majoring in building-related fields. It is provided in the form of an easy-to-use Sustainability in Interior Design Education Assessment Rubric, which faculty members may use to build their own effective programs and courses for teaching students the concepts of sustainability. The rubric is presented in the form of a statement.

REFERENCES

Abdulpader, O. Q., Sabah, O. A., & Abdullah, H. S. (n.d.). Impact of Flexibility Principle on the Efficiency of Interior Design. *Applied Sciences*, *5*.

Andras, P. (2008). *Probing Interior Materials: An Examination of Sustainable Specification Procedures in Prototype Dwellings* [Master of Fine Arts Thesis]. Florida State University.

Atmadi, T., Putra, Y. M., & Ramadhan, A. (2019). Local Wisdom in Designing Interior Design, Review of Cultural Arts and Design Style. *International Humanities and Applied Science Journal*, *2*(3), 11. https://doi.org/10.22441/ihasj.2019.v2i3.02

Ayalp, N. (2012). Environmental sustainability in interior design elements. *7th WSEAS Conference on Energy and Environment, Kos Island*.

Bluyssen, P. M. (2014). *The healthy indoor environment: How to assess occupants' wellbeing in buildings*. Routledge/Taylor & Francis Group.

Bonda, P., & Sosnowchik, K. (2006). *Sustainable Commercial Interiors*. John Wiley & Sons.

Brooker, G., & Stone, S. (2019). *Re-readings: 2: Interior Architecture and the Principles of Remodelling Existing Buildings*. Routledge.

Cordan, Ö. (2019). *ADAPTIVE REUSE IN INTERIOR ARCHITECTURE: A CONCEPTUAL AND THEORETICAL FRAMEWORK*. 452–463.

Council for Interior Design Qualification. (1990). *NCIDQ Exam | Interior Design Certification | NCIDQ Certificate*. Cidq. https://www.cidq.org

Gao, W., Ariyama, T., Ojima, T., & Meier, A. (2001). Energy impacts of recycling disassembly material in residential buildings. *Energy and Buildings*, *33*(6), 553–562. https://doi.org/10.1016/S0378-7788(00)00096-7

Hajian, M., & Kashani, S. (2021). *Evolution of the concept of sustainability. From Brundtland Report to sustainable development goals* (pp. 1–24). https://doi.org/10.1016/B978-0-12-824342-8.00018-3

Harwood, B. (1991). Comparing the Standards in Interior Design and Architecture to Assess Similarities and Differences. *Journal of Interior Design Education*, *17*(1), 5–18.

Hayles, C. S. (2015). Environmentally sustainable interior design: A snapshot of current supply of and demand for green, sustainable or Fair Trade products for interior design practice. *International Journal of Sustainable Built Environment*, *4*(1), 100–108. https://doi.org/10.1016/j.ijsbe.2015.03.006

Jaakkola, J. J. K., Øie, L., Nafstad, P., Botten, G., Sammelsen, S. O., & Magnus, P. (1999). Interior Surface Materials in the Home and the Development of Bronchial Obstruction in Young Children in Oslo, Norway. *American Journal of Public Health*, *89*(2), 188–192. https://doi.org/10.2105/AJPH.89.2.188

Jones, L. (2008). *Environmentally Responsible Design: Green and Sustainable De-*

sign for Interior Designers. John Wiley & Sons.

Klepeis, N. E., Nelson, W. C., Ott, W. R., Robinson, J. P., Tsang, A. M., Switzer, P., Behar, J. V., Hern, S. C., & Engelmann, W. H. (2001). The National Human Activity Pattern Survey (NHAPS): A resource for assessing exposure to environmental pollutants. *Journal of Exposure Science & Environmental Epidemiology*, *11*(3), 231–252. https://doi.org/10.1038/sj.jea.7500165

Lobaccaro, G., Wiberg, A. H., Ceci, G., Manni, M., Lolli, N., & Berardi, U. (2018). Parametric design to minimize the embodied GHG emissions in a ZEB. *Energy and Buildings*, *167*, 106–123. https://doi.org/10.1016/j.enbuild.2018.02.025

Loos, A., & Opel, A. (1998). Ornament and education. In *Ornament and crime: Selected essays.* Ariadne Press.

Marshall-Baker, A. (2008). Nature as a Model for Design. In L. Jones (Ed.), *Environmentally Responsible Design: Green and Sustainable Design for Interior Designers.* John Wiley & Sons Inc.

Mendler, S., Odell, W., & Lazarus, M. A. (2006). *The HOK guidebook to sustainable design*. Wiley. https://cir.nii.ac.jp/crid/1130000797310626432

Montiel-Santiago, F. J., Hermoso-Orzáez, M. J., & Terrados-Cepeda, J. (2020). Sustainability and Energy Efficiency: BIM 6D. Study of the BIM Methodology Applied to Hospital Buildings. Value of Interior Lighting and Daylight in Energy Simulation. *Sustainability*, *12*(14), 5731. https://doi.org/10.3390/su12145731

Osmani, M., Glass, J., & Price, A. D. F. (2008). Architects' perspectives on construction waste reduction by design. *Waste Management*, *28*(7), 1147–1158. https://doi.org/10.1016/j.wasman.2007.05.011

Rashdan, W., & Ashour, A. F. (2017). *CRITERIA FOR SUSTAINABLE INTERIOR DESIGN SOLUTIONS*. 311–322. https://doi.org/10.2495/SC170271

Ruegemer, J. (2010). The Introduction of Sustainable Strategies and Technology to the US Housing Building Industry: Design, Construction and Performance Analysis of Energy-Efficient Residential Buildings – A Case Study. *nternational Journal of Technology, Knowledge and Society*, *6*(5). https://www.proquest.com/openview/e20d9fe7c4d7612279321fbf39332488/1?cbl=2042120&pq-origsite=gscholar&parentSessionId=7Gx49tatp86LQbQNyLYiSYtPjR5MaB%2FsdttakrTCcrs%3D

Shi, L., & Chew, M. Y. L. (2012). A review on sustainable design of renewable energy systems. *Renewable and Sustainable Energy Reviews*, *16*(1), 192–207. https://doi.org/10.1016/j.rser.2011.07.147

Skov, P., Valbjørn, O., & Pedersen, B. V. (1990). Influence of indoor climate on the sick building syndrome in an office environment. *Scandinavian Journal of Work, Environment & Health*, *16*(5), 363–371. https://www.jstor.org/stable/40965819

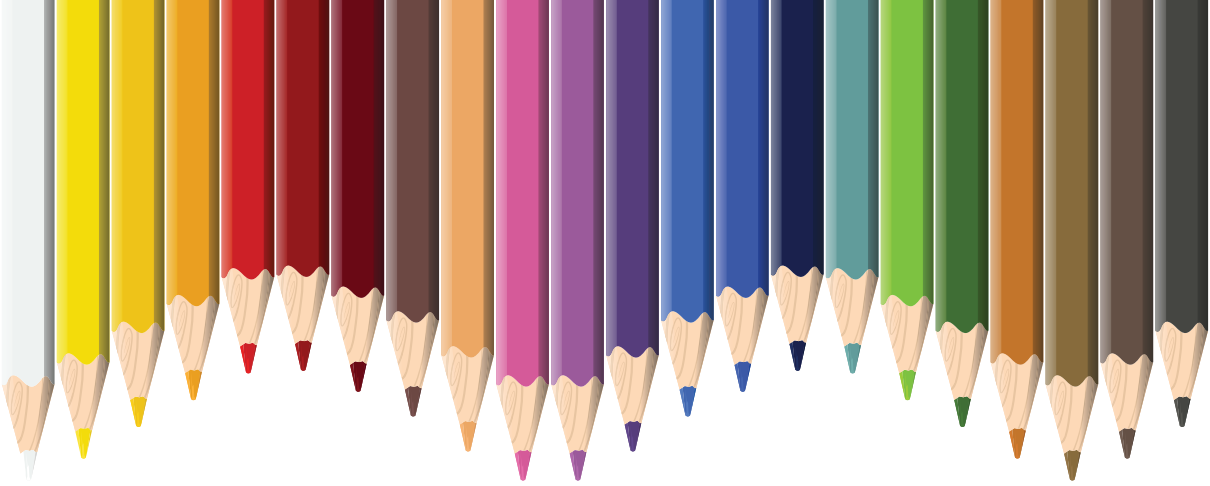
Tucker, L. M. (2014). *Designing Sustainable Residential and Commercial Interiors: Applying Concepts and Practices*. A&C Black.

United Nations Development Programme. (2015). *Sustainable Development Goals*. UNDP. https://www.undp.org/sustainable-development-goals

Wang, Y. H., Ger, T. H., Lou, J. R., & Chang Chien, C. T. (2022). Water-saving Strategies in the Face of Water Shortage Crisis: A Case Study of Science Museum in Taiwan. *IOP Conference Series: Earth and Environmental Science*, *987*(1), 012014. https://doi.org/10.1088/1755-1315/987/1/012014

World Commission on Environment and Development. (1987). *Report of the World Commission on Environment and Development: Note /: by the Secretary-General.* UN,. https://digitallibrary.un.org/record/139811

Yan, M.-R., Chien, K.-M., & Yang, T.-N. (2016). Green Component Procurement Collaboration for Improving Supply Chain Management in the High Technology Industries: A Case Study from the Systems Perspective. *Sustainability*, *8*(2), 105. https://doi.org/10.3390/su8020105



Chapter 8

EVALUATION OF URBAN LANDSCAPES AND BIODIVERSITY WITH BIBLIOMETRIC ANALYSIS

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INTRODUCTION

Landscape encompasses an array of formations, predominantly shaped by human intervention, yet also encompassing extraordinary natural vistas. Not all natural sceneries qualify as landscapes, nor does every landscape necessarily constitute a natural environment (Memlük and Yılmaz, 1999).

Urban landscape, on the other hand, is defined within the context of an urban framework, emphasizing the interrelation between structures within the urban milieu as a whole, not individually, and their connection with undeveloped urban spaces (Konuk, 2007). Urban landscape shapes the composition of landscapes within the city and signifies a conscious organization of the urban environment. It is the interrelation of structures collectively within the urban setting, rather than their individual existence or relationship with undeveloped spaces. Besides physical structures, socio-cultural factors significantly influence the formation of urban landscapes (Çelik and Yazgan, 2007).

The rapid industrialization of the 19th century led to increased demand for raw materials, prompting the quest for and utilization of natural resources. The 20th century, influenced by natural disasters and wars, saw the emergence of concepts such as biodiversity, aimed at preserving and sustaining natural resources (Tekingündüz, 2021).

When designing and planning urban open green spaces, attention to biological diversity becomes a crucial aspect from an ecosystem perspective. Biological diversity refers to the variety of living organism species within a specific area, classified as ecosystem diversity, species diversity, genetic diversity, among other ecological elements (Kılınç et al., 2006).

Cities are often perceived as spaces where human activities marginalize living organisms from the ecosystem. However, biological diversity, a significant component of natural life, should not be dissociated from urban settings. Urban parks, essential for biological diversity within urban spaces, aid in preserving it. Besides their role in biodiversity preservation, city parks are integral components of urban green infrastructure (Savard et al., 2000).

As urbanization rapidly expands, areas suppressed by human activities are on the rise. Yet, the acceptance and necessity of urban spaces that harbor innovative approaches to conserving and promoting biological diversity have gained prominence. Parks designed as various types of urban green spaces, featuring ecological conditions and plant diversity, serve as focal points in supporting and stimulating biological diversity within cities.

Apart from ecological services, urban green areas also offer benefits in terms of community health, social cohesion, economic gains (e.g., increased property and rental values due to green spaces), and reduced maintenance costs (achieved through ecologically sustainable landscapes, requiring less ir-

rigation and fertilization, among other factors). Supporting biological diversity in urban green spaces signifies enhancing ecological qualities within cities and providing urban dwellers immediate access to nature. Highlighting recreational functions, these spaces are essential for achieving a more sustainable future and are listed as the primary objective in urban management (Uslu and Shakouri, 2013).

Bibliometrics serves as a useful contemporary tool for researchers to explore their fields, assess outputs, and evaluate research outcomes. Traditionally, scientific research contributions are measured by the number and impact of scholarly articles in the literature (Grant et al., 2000).

Bibliometric analysis finds wide application in guiding research processes. This analytical approach provides crucial data to scientists regarding research tendencies, models, and impacts, assisting researchers in tracking potential collaborators and establishing future scientific alliances. Moreover, such analyses offer researchers the opportunity to identify new research avenues by keeping abreast of the latest trends in the field (Kaplan and Altay, 2023).

This study aims to conduct a bibliometric analysis of works encompassing the 'urban landscape-biodiversity' keywords within the Web of Science (WoS) database from 1992 to 2023. The objective is to unveil the contributions of professionals working in the related scientific field, identify trends in urban landscapes and biodiversity, present a comprehensive overview of research in this area, introduce various aspects, highlight less-explored areas, and identify different facets for future studies to concentrate on, thereby contributing to researchers' efforts in advancing research in this field.

MATERIAL AND METHOD

Based on the literature published in Web Of Science (WoS) between 1992 and 2023, a total of 6726 scientific studies including 5733 articles, 354 reviews, 234 papers, 126 book chapters, etc. containing the keywords 'urban landscape' and 'biodiversity' were found. With the data obtained from the bibliometric analysis; Distribution of the number of studies by years, average amount of citations by years, keywords and their relationships by country, most relevant sources, most relevant authors, most relevant affiliations, corresponding author's countries, country scientific production, most cited countries, most relevant words, the closeness of trend topic keywords status of keywords by years, links of countries in publications with keywords.

RESULTS AND DISCUSSION

Data obtained as a result of bibliometric analysis;

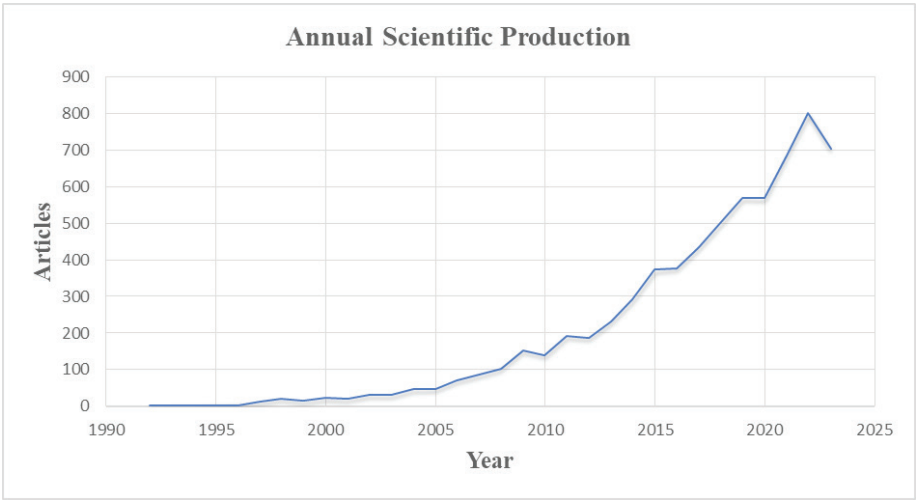


Figure 1. Annual Scientific Production

As a result of the analysis, the distribution of scientific studies conducted with the keywords 'biodiversity' and 'urban landscape' according to years is given in Figure 1. According to this, the studies started in 1992, and it is observed that the subject was more emphasised in 2022 with a maximum of 800 scientific studies based on the years 1992-2023.

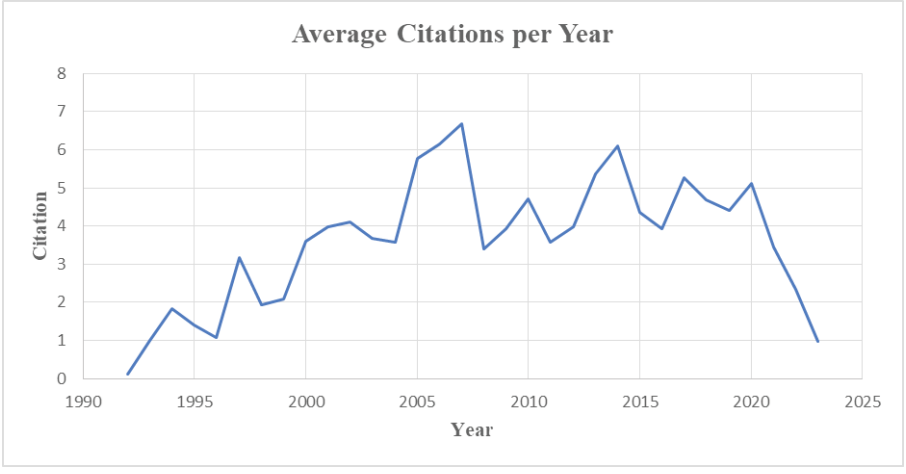


Figure 2. Average Citations per Year

According to the graph of average citation amounts according to years given in Figure 2, it is seen that the highest citation rate with 6.69 in studies using the keywords 'urban landscape' and 'biodiversity' worldwide was in 2007.

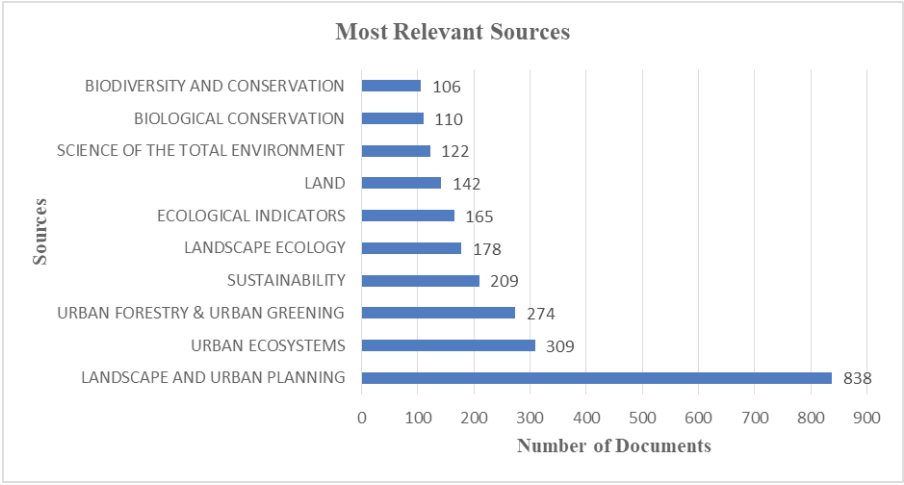


Figure 3. Most Relevant Sources

Figure 3 shows the list of the top 10 journals containing the studies in which the keywords 'urban landscape' and 'biodiversity' are used the most worldwide. According to this, it is stated that 838 scientific studies on the subject have been published in Landscape and Urban Planning journal. Therefore, a list of journals/books that authors who will work on the subject should follow has been prepared. This will contribute to the authors' easy access to resources.

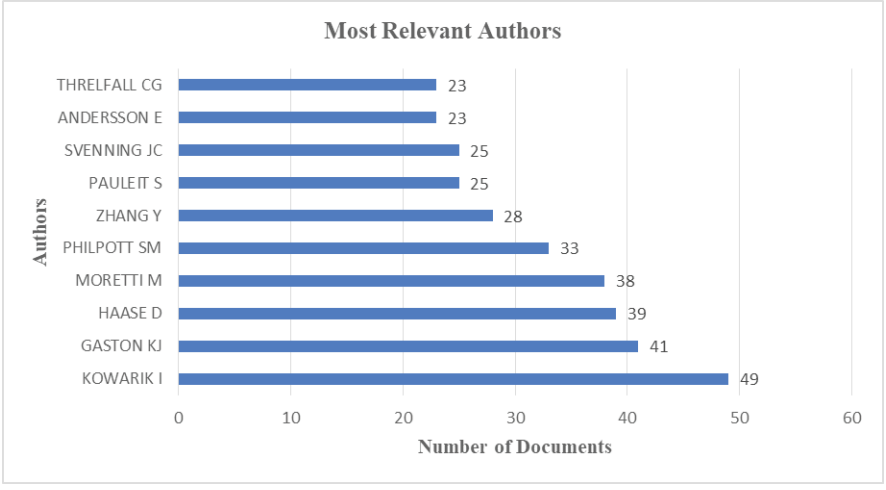


Figure 4. Most Relevant Authors

Figure 4 shows the top 10 authors who have done the most studies in this field in the world and the number of scientific studies they have done. This graph lists the authors whose scientific works will contribute to the authors who will work on the subject. This will provide convenience in literature review.

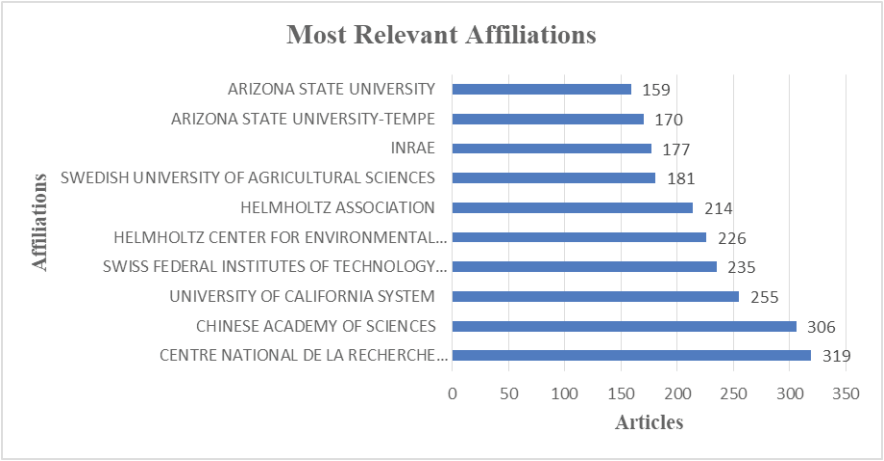


Figure 5. Most Relevant Affiliations

Figure 5 shows the names of the top 10 universities-institutes that have published the most studies using these keywords at international level. Accordingly, 'Centre National De La Recherche Scientifique' ranks first with 319 scientific studies published on urban landscape and biodiversity. This information will enable academicians who plan to work on similar topics to make easy collaborations.

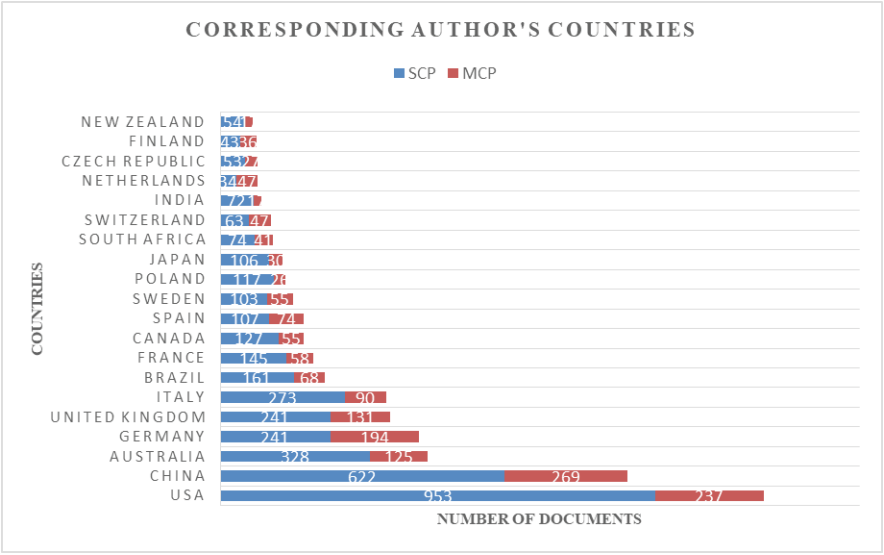


Figure 6. Corresponding Author's Countries

Figure 6 shows the in-country and out-of-country collaborations of studies published under the keywords urban landscape and biodiversity. The blue part of the graph shows the number of collaborative publications within the countries and the red part shows the collaborations with other countries. According to the graph, although the USA has a higher number of publications, it has generally made publications in which collaborations are made within the country. China, on the other hand, was found to be the country with the highest number of international collaborations with 269 scientific studies.

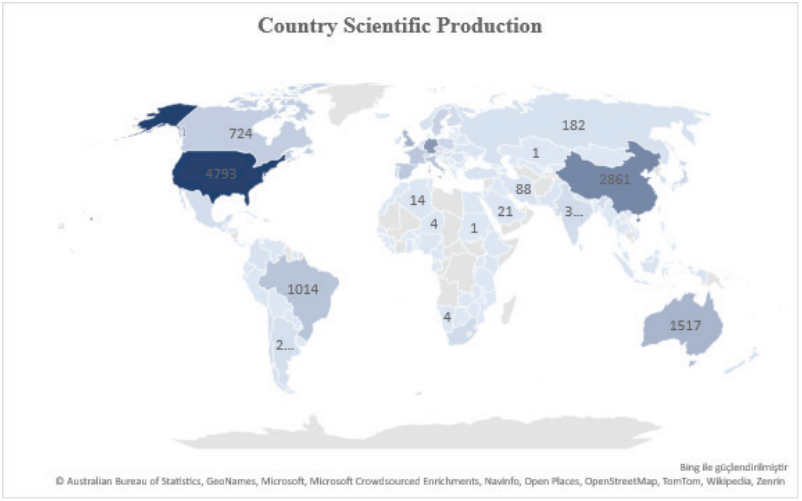


Figure 7. Country Scientific Production

The scientific production of the world countries on urban landscapes and biodiversity is shown on the map. As the colour gets darker, it is seen that there is more production. Turkey ranks 34th with 114.

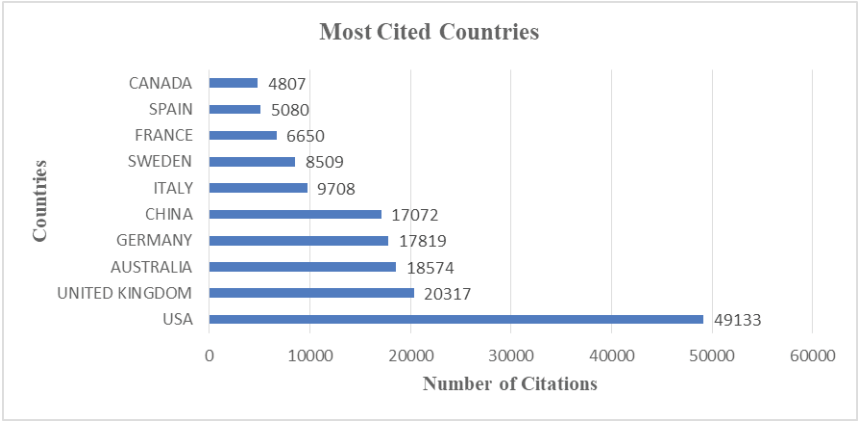


Figure 8. Most Cited Countries

Figure 8 shows the 10 countries in the world with the most cited studies on urban landscapes and biodiversity. Accordingly, USA is in the lead with 49.133 citations. Turkey ranks 34th among the world countries with a total of 457 citations.

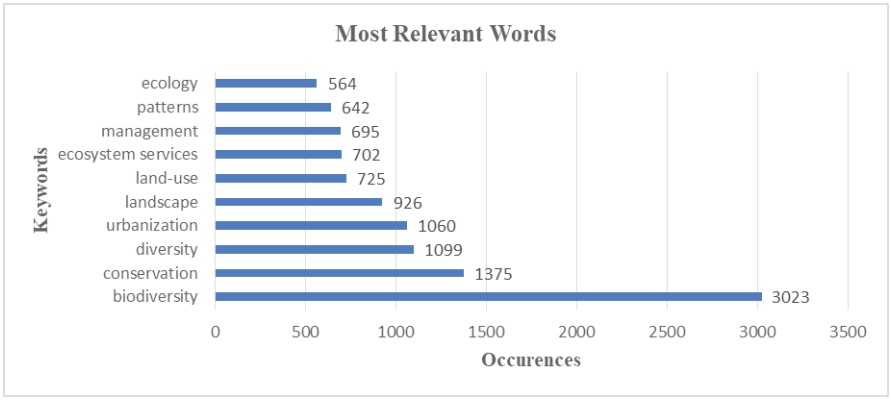


Figure 9. Most Relevant Words

In Figure 9, which shows the top 10 most used keywords in the world in the studies on the subject, the word 'biodiversity' is the most used word with 3023. Biodiversity is followed by 'conservation', 'diversity', 'urbanisation', and 'landscape'.

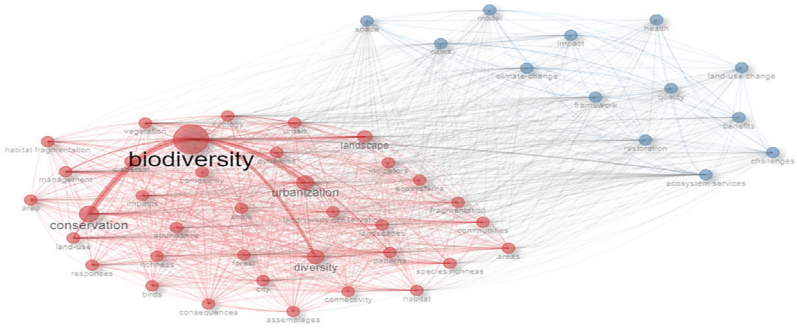


Figure 10. The closeness of trend topic keywords

The closeness of the trending topic keywords used in the studies is given in Figure 10. When the keywords used so far in this study area are evaluated, it

is seen that there are two different groups. It is seen that the keywords 'urbanisation', 'conservation', 'landscape' in the first group are close to each other in terms of relationship. In the central position of the keywords in this group is 'biodivercity', which shows a typical relationship with all keywords. The 2nd group includes keywords such as 'cities', 'ecosystem service', and the keywords in this group are distantly related to those in the 1st group.

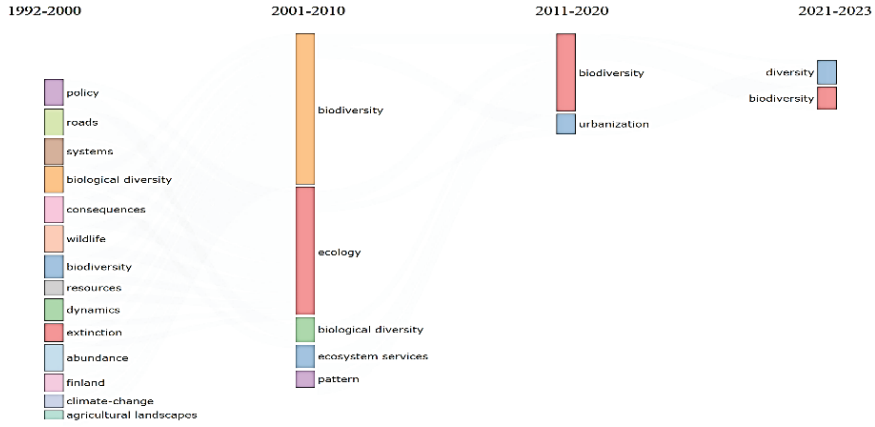


Figure 11. Status of keywords by years

The distribution of the keywords used in the studies according to years is given in Figure 11. Accordingly, the keywords 'policy', 'roads', 'systems', 'biological divercity' were mostly used between 1992-2000, 'biodivercity' and 'ecology' between 2001-2010, 'biodivercity' and 'urbanisation' between 2011-2020, and 'divercity' and 'biodivercity' between 2021-2023.

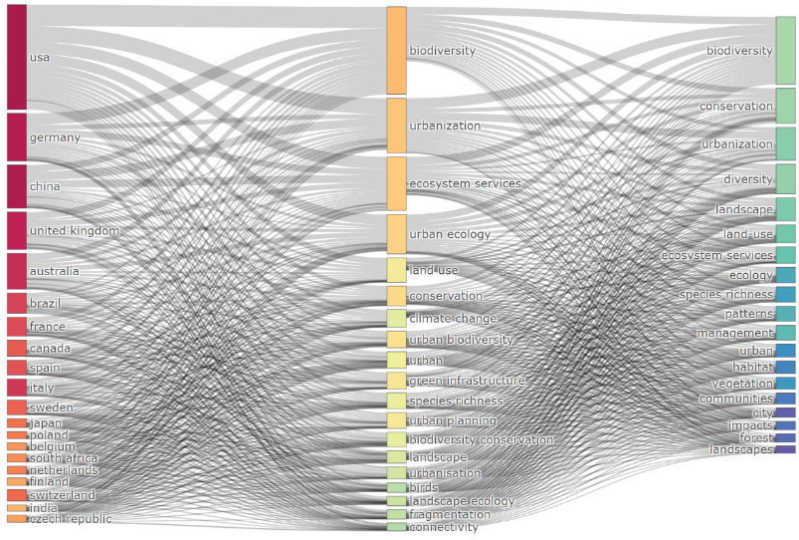


Figure 12. Keywords and their relationships by country

The graph in Figure 12 was obtained in terms of the differentiation of keywords according to countries and the relationship between them. The most used and co-used keywords according to the countries are shown with Sankey diagram. According to this, the keyword 'biodiversity' was mostly used in USA.

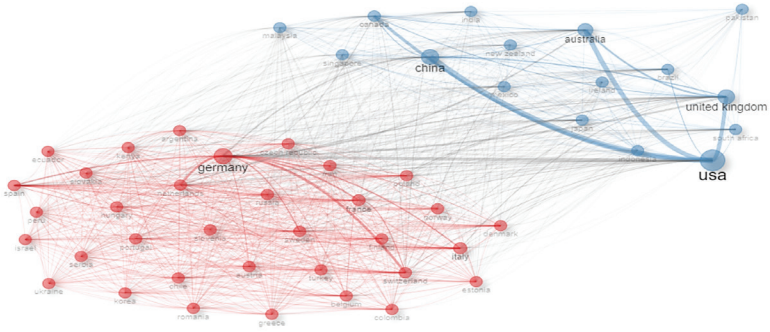


Figure 13. Links of countries in publications with keywords

When we look at Figure 13, which shows the connections between countries in publications using the keywords in question, it can be said that they are divided into 2 groups, 1. Europe, 2. USA and China, with exceptions. It is seen that Turkey generally works together with the countries in the European group.

CONCLUSION

Bibliometric analysis offers researchers an easy, reliable way to review the literature. It helps researchers to understand the development and change of important points in a particular topic in a comprehensive and systematic way. Therefore, this study is a research resource that covers all aspects of urban landscape and biodiversity studies to date. This study provides a detailed bibliometric analysis of 6726 documents from 1125 different sources worldwide between 1992 and 2023. According to the analysis, it is seen that the interest in the studies on the subject continues to increase.

This study aims to comprehensively present the research on urban landscapes' biodiversity and examine the developmental stages and potential trends of these studies. Consequently, this work will facilitate researchers in their literature reviews by providing ease of access to relevant studies and enabling them to follow peers working in similar domains. Furthermore, it will serve as a guide for potential scientific collaborations. Additionally, for researchers, closely tracking the latest trends and similar keywords in this field will provide guidance for exploring new research avenues.

As a result, this study will guide future research in this field by delineating influential journals, countries and institutions conducting research, prominent authors, collaborative efforts among them, overall trends, and significant topics, thus providing guidance for subsequent studies in this area.

RESOURCES

Aysel, U., Shakouri, N. (2013). Kentsel peyzajda yeşil altyapı ve biyolojik çeşitliliği destekleyecek olanaklar. Turkish Journal of Scientific Review, (1), 46-50.

Çelik, D., Yazgan, M. (2007). Kentsel Peyzaj Tasarımı Kapsamında Tarihi Çevre Korumaya Yönelik Yasa ve Yönetmeliklerin İrdelenmesi. Journal of ZKU Bartın Faculty of Forestry.

Grant J., Cottrel,R. Cluzeau, F., Fawcett, G. (2000). Evaluating "payback" on biomedical research from papers cited in clinical guidelines: applied bibliometric study BMJ 2000; 320 :1107

Memlük Y., Yılmaz O., (1999). Kentsel Tasarım ve Peyzaj Mimarlığı, 1st International Urban Design Congress Proceedings Book, Mimar Sinan Fine Arts University Faculty of Architecture, Department of City and Regional Planning, s.81-82, İstanbul.

Kaplan, S., Altay, Y. (2023). Bibliometric Analysis of Next-Generation Sequence Applications in Livestock. Black Sea Journal of Agriculture 6(5). DOI: 10.47115/bsagriculture.1296263

Kılınç, M., Kutbay, HG, Yalçın, E., Bilgin, A. (2006). Bitki Ekolojisi ve Bitki Sosyolojisi Uygulamaları. Palme Publishing, Ankara, 370.

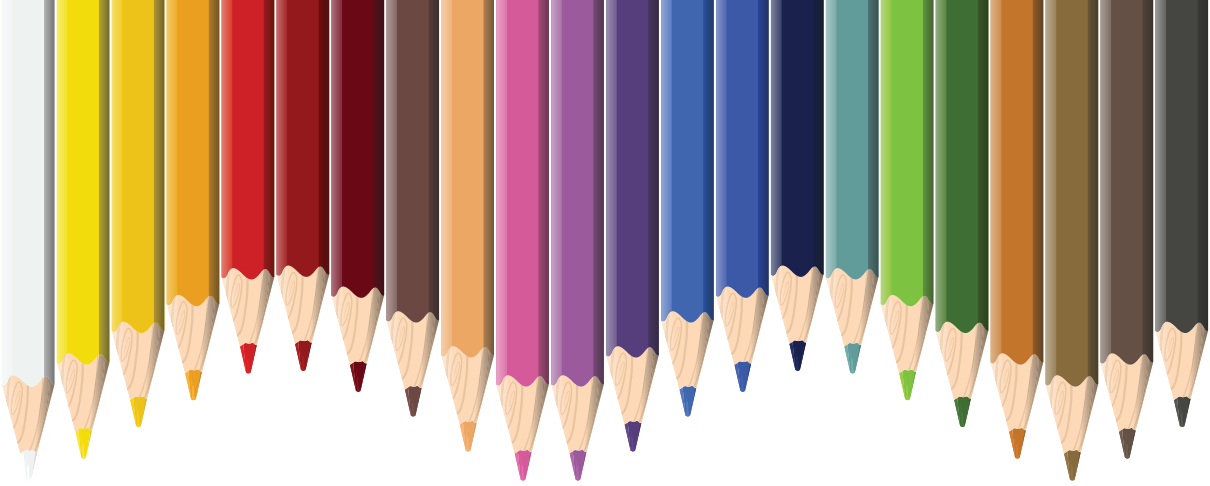
Kırzıoğolu, I. (1995). Peyzaj Kavramı ve Şehir Planlamasında Kullanımı. Erzurum: A.Ü. Faculty of Agriculture Course Publications, No:175.

Konuk, G. (2007). Kentsel Tasarım Kamu/Özel Mekân Mülkiyet Sorunsalı. Lecture Note MSGU, Department of City and Regional Planning, İstanbul.

Pamay, B. (1978). Kentsel Peyzaj Planlaması, Istanbul University, Faculty of Forestry Publications, Çağlayan Press House, İstanbul, s.76.

Savard, J. P. L., Clergeau, P., Mennechez, G. (2000). Biodiversity concepts and urban ecosystems. Landscape and urban planning, 48(3-4), 131-142.

Tekingündüz, Ö. (2021). Kentsel Yeşil Alanların Biyoçeşitlilik Açısından İncelenmesi; İstanbul Millet Bahçeleri, Master Thesis, Bolu Abant Izzet Baysal University, Bolu.



Chapter 9

ARTIFICIAL INTELLIGENCE AND LANDSCAPE ARCHITECTURE

Zekeriya Can ERBİL[1]

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INTRODUCTION

Technology is in a constant state of evolution, presenting new innovations each passing day. Among these, the foremost contender is the technology of 'Artificial Intelligence' (AI), which has made significant strides across diverse domains in contemporary times. Despite being a subject of considerable intrigue for many, the count of individuals possessing definitive knowledge on this subject remains limited. Artificial intelligence signifies the simulation of human-like intellect and cognitive faculties within machines. This concept encompasses amalgamating various facets of human intelligence, such as task execution, problem-solving, learning, language processing, perception, and decision-making, via computers and intricate systems. Artificial intelligence continually evolves and refines itself through the accumulation of data (Eğitimde Yapay Zeka Politika Belgesi, 2023).

Recent advancements in artificial intelligence have mandated nearly all nations to accord precedence to this realm. It is imperative to emphasize that artificial intelligence is not just a technology of the future but firmly entrenched in the present. Furthermore, artificial intelligence has become an indispensable component of national strategies for nations, particularly in realms like economic development. Artificial intelligence has commenced its transformative influence, pervading every facet of our existence, with its impact continuously burgeoning.

As the sphere of artificial intelligence continues to burgeon, its application has also commenced within fields such as architecture. The contribution of evolving artificial intelligence technologies to design and architectural spheres has become a subject of intense inquiry. Within architecture, the diversity inherent in a designer's imagination, societal culture, climate, and artistic approach has prompted contemplation regarding whether artificial intelligence can emulate human-like thought processes during the architectural design process. Artificial intelligence, fundamentally reliant on artificial neural networks capable of analyzing data, mirrors the ability of human brain neurons to utilize acquired knowledge when needed, drawn from lifelong experiences.

In this vein, the application of artificial intelligence technology in architecture holds the promise of facilitating the resolution of complex problems through data analysis. This technology may elevate architectural endeavors to a more sophisticated echelon. This study delves into examining the relationship between various artificial intelligence technologies employed across different domains and the profession of landscape architecture. It also discusses existing and prospective software applications that could be utilized in the field of landscape architecture. Ultimately, it provides recommendations regarding the contributions of artificial intelligence technology to the landscape design process and the profession, concluding with an assessment.

CONCEPT OF ARTIFICIAL INTELLIGENCE

Various definitions have been proposed across different scientific disciplines regarding the concept of artificial intelligence, aiming to facilitate its comprehension. Artificial intelligence is a computer system capable of emulating the functions performed by the human body (Roumate, 2023). It involves the extraction of the entirety of behavior within the emotional and mental process of the human body for its own benefit (Ezzaim vd.,2022). Human cognition possesses the ability to swiftly adapt to new situations that arise in the functioning of the human brain. Nilsson, one of the founding scholars of artificial intelligence, defines it as 'the endeavor to endow machines with intelligence' (Moreno-Guerrero vd.,2020). Apart from these definitions, artificial intelligence can be described as a cognitive system capable of executing a wide array of tasks (AI100Report_MT_10, 2021).The technology of artificial intelligence can be defined as the ability of machines to mimic living mechanisms. Machines emulate human logic by imitating cognitive abilities such as decision-making, perception, learning, experience, and analysis from human behavior.

Artificial intelligence plays a significant role in numerous sectors such as international relations, finance, health, agriculture, education, services, automotive, chemistry, transportation, advertising, insurance, energy, gaming, logistics, defense, and cybersecurity. This technology holds substantial potential for economic, political, social, and cultural implications. Hence, understanding and managing the potential impacts of artificial intelligence are crucial.

The concept of artificial intelligence is often categorized into weak and strong AI. Weak artificial intelligence refers to machines programmed to exhibit intelligent behavior, a notion widely acknowledged. Strong artificial intelligence, however, entails a debate surrounding machines being programmed to exhibit conscious, intelligent behavior. Discussions have emerged alongside strong AI, where proponents argue that machines cannot behave like humans, lack emotions, and cannot distinguish between good and bad or right and wrong. Conversely, another group argues that the human brain does not operate autonomously, amalgamating irrational functions, which machines can replicate. Advancements in this field seem to be rapidly progressing. Additionally, there is a shift away from rule-based approaches used in 'old-fashioned' artificial intelligence systems (Button, 2017).

Historical Development of Artificial Intelligence

The history of artificial intelligence spans from ancient Greece to the present day. Modern AI studies commenced with the endeavors of philosophers to comprehend the human thought system. Charles Babbage worked on an intelligent machine in 1884 but ceased his efforts upon realizing that creating a machine as intelligent as a human was not feasible. In 1950, Claude

Shannon proposed the idea that computers could play chess (Romya Bilgin and Küçükşabanoğlu, 2023). The historical development of artificial intelligence (Figure 1) has been shaped by the concept of mimicking human intelligence that emerged in the mid-20th century. Although AI has existed since the 1940s, some experts argue that much progress is still needed to achieve genuinely human-like intelligence. However, recent advancements in computer processing power and the availability of vast amounts of data have increased interest in artificial intelligence. Alan Turing's test, created in 1950, was used to determine whether a machine was intelligent. Turing's concept of the "imitation game" triggered debates on delineating boundaries between humans and machines. The term "artificial intelligence," introduced by John McCarthy, was officially defined during a conference held at Dartmouth College in 1956 (O'Regan, 2023). Alan M. Turing was the first person to conduct significant research in the field of AI, defining AI in 1956 as the science and engineering of creating intelligent machines (Yu and Y. L, 2023), (Copeland, 2004). Fundamental studies like the Information Processing Language (IPL) were conducted in the 1960s. The period between 1965 and 1970 is considered a dark period for AI, while efforts between 1970 and 1980 reignited progress in the field. In the 1990s, the term "artificial intelligence" faded from academic discourse, and phrases like "advanced information processing" began to be used. In the 2010s, access to large amounts of data and the discovery of high-performance computer graphics processors accelerated developments in artificial intelligence. Especially, the success of AlphaGo in the game of Go indicated a transition from expert systems to machine learning. Consequently, artificial intelligence has become an increasingly prevalent application in education and other sectors (Remian, 2019). With the continuous advancement and evolution of AI technology today, making further intriguing discoveries and predicting its ultimate direction has become unpredictable. However, one undeniable fact is that the concept of artificial intelligence is no longer a concept of the future but has firmly established itself as a fully tangible concept within the timeframe we currently live in.

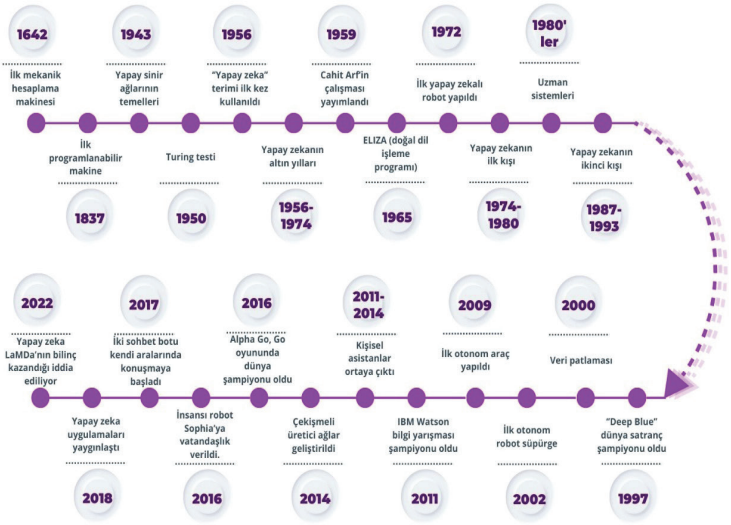


Figure 1. Historical Development of Artificial Intelligence from Past to Present

Fundamental Components of Artificial Intelligence

Artificial intelligence components, appearing in various forms across different sources, generally fall under the categories of machine learning, deep learning, computer vision, natural language processing, and artificial neural networks.

Machine Learning

Machine learning (ML) is an application of artificial intelligence that provides computers with the ability to learn and improve from experiences without explicit programming. ML algorithms possess the capability to analyze data, identify patterns, and make predictions. These algorithms are designed to continually evolve by learning from newer datasets they encounter and adapting to them. A notable example of ML application is the spam filtering algorithm in your email account.

Deep Learning

Deep learning (DL) is a subset of machine learning that uses artificial neural networks to enable machines to learn from processed data. DL aids machines in solving complex problems, even with unstructured and diverse datasets. It involves a learning process based on a continuous feedback loop, adjusting system actions. The system is rewarded for correct actions and penalized for incorrect ones, continuously striving to optimize rewards by altering actions.

Artificial Neural Networks

Artificial neural networks (ANNs) are components of artificial intelligence designed to simulate how the human brain analyzes and processes information. ANNs provide self-learning capabilities to artificial intelligence and can be considered as the foundation of the same technology. These networks are built to mimic the biological neural networks in the human brain, with perceptrons acting as artificial counterparts to neurons. ANNs comprise numerous perceptrons organized together.

Natural Language Processing (NLP)

Natural language processing (NLP) is an AI discipline that provides machines with the ability to read, understand, and generate human language. Most voice assistants utilize NLP. Computers typically communicate using low-level language or machine language consisting of ones and zeroes, which humans find challenging to decipher. Similarly, computers struggle to comprehend human languages. NLP uses intelligent algorithms to transform unstructured language data into a form understandable by computers.

Computer Vision (CV)

Computer vision (CV) is a field of computer science aiming to replicate the human visual system to enable machines to 'see' and understand the content of images and videos. With advancements in deep learning, CV has overcome previous barriers. It provides machines with image recognition capabilities to perceive and label objects. CV is a crucial component enabling technologies like autonomous vehicles, as it allows them to recognize lane markings, signs, other vehicles, and safely navigate without collisions. Another notable application of CV is the automatic tagging feature in Google Photos, organizing photos based on their content. For instance, if you capture numerous photos of your cat, the application automatically groups all these cat photos into a single album.

ARTIFICIAL INTELLIGENCE AND LANDSCAPE ARCHITECTURE

The utilization of artificial intelligence in architectural design processes holds significant importance in enhancing design diversity and the time afforded to designers (Huang, Williams, Luo, Wu, & Lin, 2018). The relationship between landscape architecture and artificial intelligence harbors the potential to integrate technology into design processes, offering novel opportunities to render landscape architecture more efficient and sustainable. AI programs utilized in landscape architecture can enhance design processes, perform analyses, generate simulations, and augment efficiency in various projects. However, specific programs in this field may evolve over time and new developments may emerge due to continuous environmental changes leading to the renewal of parameters. The relationship between landscape architecture and artificial intelligence enables the emergence of smarter, sustainable, and user-friendly designs. Nonetheless, it's crucial to balance these technological advancements

with ethical and cultural factors since landscape design should typically be sensitive to local culture, aesthetic preferences, and societal needs.

In light of this information, Artificial Intelligence in Landscape Architecture can be examined under various headings such as design, planning, modeling, simulation, sustainability and ecology, project management and optimization, smart city technologies, among others. These headings may vary depending on changing environmental conditions and the evolution of the profession.

Artificial intelligence can be employed in Landscape Architecture in tasks such as counting and analyzing quantities within the workspace, reducing errors in data storage, utilizing correct symbols, incorporating engineering details, assigning suitable plant species to appropriate land structures and weather conditions, as well as analyzing field and environmental details, and rapidly presenting multiple alternatives to clients. According to an interview with a member of the United Kingdom Landscape Institute, software programs applicable to Landscape Architecture include Vectorsworks Landmark, Land F/X, LandCADD, SiteWorks, ArchiTerra, AutoCAD Civil 3D, Autodesk's Revit, and Grahisoft ArchiCAD. However, it is likely that, with advancing technology, these programs may evolve to enhance artificial intelligence support or new programs may emerge beyond the aforementioned ones.

The Role of Artificial Intelligence in Design Processes

The concept of artificial intelligence plays a significant role in design processes, much like it does in various other fields. Primarily, it manifests itself in data analysis and collection processes, unveiling crucial information by analyzing extensive datasets for use in the design process. Moreover, its capability to offer design suggestions and multiple alternatives is evident, drawing inspiration for designers from data obtained from past projects and analyses conducted on similar designs. Artificial intelligence can propose more suitable designs in terms of energy efficiency, material usage, and aesthetics by optimizing relationships between plans and their environment. In terms of project management and optimization, AI identifies process bottlenecks, effectively manages resources, and facilitates time-saving measures.

From an environmental sensitivity and sustainability standpoint, artificial intelligence can contribute to the development of environmentally sensitive designs by considering factors such as climate data, green spaces, and energy usage. Lastly, in the early stages of design, AI enables the creation of simulations and prototypes, allowing designers to better understand and test their ideas. This feature is crucial in identifying issues before moving to the implementation phase, minimizing potential problems that may arise during implementation.

Artificial intelligence serves as a potential tool to enhance and enrich the

landscape design process from various perspectives, offering an effective resource for users. However, when combined with a designer's creativity and evaluative abilities, more effective results can be achieved.

Future Trends Between Artificial Intelligence and Landscape Architecture

The future trends between artificial intelligence (AI) and landscape architecture encompass a range of innovative approaches poised to deeply influence design processes. Firstly, AI can render landscape designs intelligent and adaptable by continually monitoring environmental variables. Through dynamic evaluations of factors like weather conditions, user behaviors, and environmental circumstances, designs can become more effective and cater better to user needs. Trends also include energy efficiency and sustainability-focused designs, where AI analyzes energy consumption data to intelligently manage lighting, irrigation systems, and other energy-consuming elements, reducing environmental impacts and enhancing sustainability. Simulation and virtual reality applications represent another prominent area where AI is used to enable designers to visualize and present their designs more effectively.

Furthermore, predictive trend analysis through big data analytics is another significant development, utilizing AI to predict future design trends based on demographic data, user preferences, and environmental variables. AI-supported maintenance and management can optimize maintenance processes by ensuring sustainable management of landscapes. Environmentally friendly designs are also crucial, where AI evaluates environmental impacts to provide solutions for water conservation, biodiversity preservation, and reducing carbon footprints.

Finally, applications enhancing user participation enable continuous updates to designs based on user feedback and preferences through AI integration into design processes. These trends signal the potential for interactions between AI and landscape architecture to create more intelligent, sustainable, and user-centered solutions. However, special attention to ethical and security concerns is crucial during the adoption of these developments.

Conclusions and Suggestions

The utilization of artificial intelligence (AI) and machine learning (ML) in landscape architecture offers significant potential to optimize processes, enhance efficiency, and create sustainable, eco-friendly designs. However, careful application and management concerning ethical, security, and sustainability aspects are crucial. Moreover, considering the aesthetics and human touch in deciding how these technologies are employed in projects is essential. Decisions embedded in AI algorithms must be clear and understandable. Especially when making design decisions, designers and stakeholders should

comprehend why AI models make specific recommendations, and clear information should be provided accordingly. AI should be utilized as a supportive tool in the design process. The creative and aesthetic aspects of a design typically fall within the designer's expertise. Therefore, maintaining a balance that harnesses the power of AI while preserving the designer's creativity and aesthetic sensibilities through human-machine collaboration is essential.

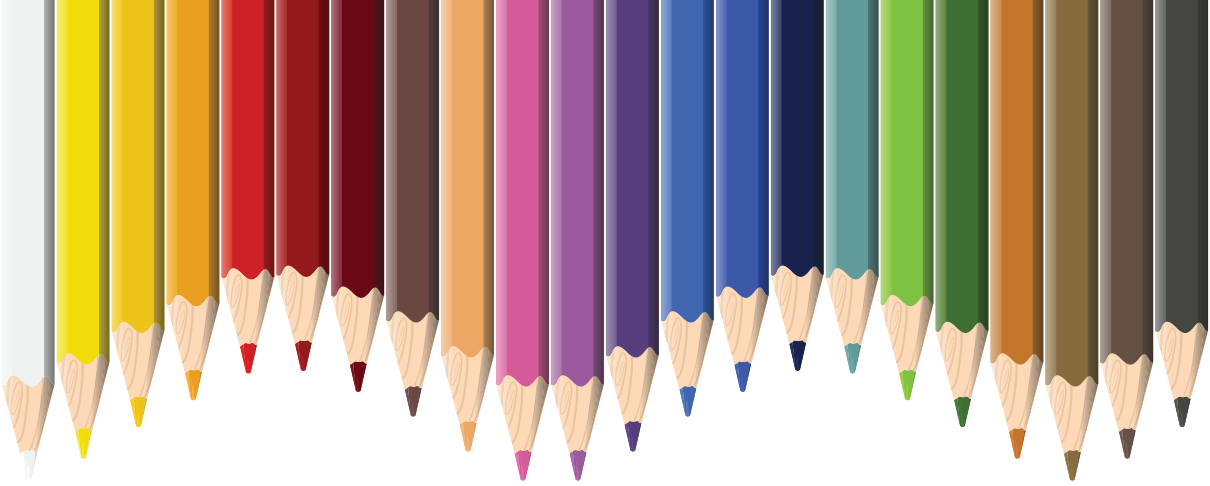
AI models should consider environmental and social impacts when evaluating various design options. Additionally, sustainable design goals and societal needs should be taken into account.

In conclusion, many software tools used in the field of landscape architecture are not yet associated with AI programs. The software used should be developed to align with the discipline of landscape architecture, and the emergence of new software should be among the likely objectives.

RESOURCES

- Alpaydın, E. (2013). Yapay öğrenme. İstanbul: Boğaziçi Üniversitesi Yayınevi.
- A. Ezzaim, F. Kharroubi, A. Dahbi, A. Aqqal, and A. Haidine, "Artificial intelligence in education-State of the art," International Journal of Computer Engineering and Data Science, vol. 2, no. 2, pp. 2737–8543, 2022, [Online]. Available: www.ijceds.com
- A. J. Moreno-Guerrero, J. López-Belmonte, J. A. Marín-Marín, and R. Soler-Costa, "Scientific development of educational artificial intelligence in web of science," Future Internet, vol. 12, no. 8. MDPI AG, Aug. 01, 2020. doi: 10.3390/FI12080124.
- B. J. Copeland, The Essential Turing: Seminal Writings in Computing, Logic, Philosophy, Artificial Intelligence, and Artificial Life: Plus The Secrets of Enigma, First published 2004. Oxford University Press, 2004.
- Button, R. W. (2017). Artificial Intelligence and the Military. RealClear Defence (Online).
- D. Remian, "Augmenting Education: Ethical Considerations for Incorporating Artificial Intelligence in Education," 2019. [Online]. Available: https://scholarworks.umb.edu/instruction_capstone
- Grace, K., Salvatier, J., Dafoe, A., Zhang, B., & Evans, O. (2018). When will AI exceed human performance? Evidence from AI experts. Journal of Artificial Intelligence Research, 62, 729-754.
- G. O'Regan, "John McCarthy," Giants of Computing, pp. 183–185, 2013, doi: 10.1007/978-1-4471-5340-5_39.
- "How can educators get started with ChatGPT? | OpenAI Help Center." Accessed: Sep. 30, 2023. [Online]. Available: https://help.openai.com/en/articles/8313929-how-can-educators-get-started-with-chatgpt
- F. Roumate, Artificial Intelligence in Higher Education and Scientific Research. in Bridging Human and Machine: Future Education with Intelligence. Singapore: Springer Nature Singapore, 2023. doi: 10.1007/978-981-19-8641-3.
- K. Romya Bilgin and Z. Küçükşabanoğlu, "ABD'nin Yeni Güç Stratejisinde Yapay Zekâ," Turkish Studies-Economics,Finance,Politics, vol. Volume 18 Issue 1, no. Volume 18 Issue 1, pp. 273–289, 2023, doi: 10.7827/turkishstudies.63490.
- McCarthy, J. (2004). What is artificial intelligence?. Erişim adresi (11 Ocak 2019): http://wwwformal.stanford.edu/jmc/whatisai/.
- Nabiyev, V. V. (2012). Yapay zeka: insan-bilgisayar etkileşimi. Ankara: Seçkin Yayıncılık.
- Nilsson, N. (1990). The mathematical foundations of learning machines. San Mateo: Morgan Kaufmann.

- Nilsson, N.J., (2019). Yapay Zekâ Geçmişi ve Geleceği. İstanbul: Boğaziçi Üniversitesi Yayınevi
- Stanford University, "AI100Report_MT_10," 2021, 2021.
- S. Yu and Y. Lu, An Introduction to Artificial Intelligence in Education. in Bridging Human and Machine: Future Education with Intelligence. Singapore: Springer Singapore, 2021. doi: 10.1007/978-981-16-2770-5.
- Eğitimde Yapay Zeka Politika Belgesi, 2023. Yapay Zeka Politikalar Derneği, Ankara
- Yıldız, B. ve Aktaş, B., (2017). Mimari Tasarım Sürecinde Karar Verme: Bulanık Mantık Tabanlı Cephe Modeli Önerisi-11. Mimarlıkta Sayısal Tasarım Ulusal Sempozyumu. Ankara, Bildiriler Kitabı, ss:172-181.
- W. Huang, M. Williams, D. Luo, Y. Wu and Y.Lin (eds.), (2018). Learning, Prototyping and Adapting, Short Paper Proceedings of the 23rd International Conference on Computer-Aided Architectural Design Research in Asia (CAADRIA).



Chapter 10

SEASONAL CHANGE OF LAND SURFACE TEMPERATURE IN SEYDIKEMER CITY CENTER AND NEAR SURROUNDINGS

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1. INTRODUCTION

Global warming, which has developed due to climate change in recent years, is one of the important environmental problems faced by the world, and the effects of this situation are becoming increasingly evident. Studies show that an annual temperature increase of up to 1°C occurs and that cities are 4°C warmer than rural areas (Hajat et al., 2007; Doğan and Tüzer, 2011; Oleson, et al., 2011; Janssen et al., 2011). , 2012; Kaya et al., 2016; Massey et al., 201; Singh and Singh, 2017; Mercan and Arpağ 2020). With people now starting to live in urban areas, it is predicted that 68% of the world's population will live in cities by 2050 (Heiling, 2012; Uysal and Polat, 2015; Anonim, 2018). The rapid urbanization process, especially in developing countries, creates impermeable surfaces and changes radiation, emission and thermal properties. The increase in impermeable surfaces causes the intensification of extreme weather events, increased consumption of natural resources, deterioration of air quality and negative effects on human health (Oke, 2002; Lee et al., 2009; Tomlinson et al., 2011). It also causes the thermal comfort conditions of people to deteriorate (Çınar et al., 2016; Karakuş and Çınar, 2022; Karakuş and Selim, 2022; Çınar et al., 2023).

The rapid increase in urban areas also causes negative effects on biodiversity (Selim and Doksöz, 2021). During construction processes, green areas and natural pasture/meadow areas are generally destroyed, water resources are used in an uncontrolled manner, and as a result, unplanned urbanizations where concrete surfaces are dominant instead of green areas are formed. While some of the light coming from the sun is reflected under normal conditions, this rate gradually decreases due to increasing concretion (Real and Türkmenoğlu Bayraktar, 2014; Akyürek, 2020).

Multi-temporal land surface temperature maps of the desired region can be created with thermal remote sensing studies. Determining land surface temperature is also an important parameter for urban planning studies. Thermal remote sensing is a subfield of remote sensing technology and is used to determine spatial heat energies by analyzing the radiation emitted by objects. In the context of climate research, thermal remote sensing is an advantageous option in terms of both cost and time compared to traditional methods. In addition, it is a method that attracts attention with its wide-scale applicability. Land surface temperature information is obtained by using thermal bands in satellite images using remote sensing techniques. (Kerr et al., 2000; Leslie, et al., 2017). Unlike air temperature, land surface temperature refers to the radiative temperature of the land surface and determines the surface air temperature by affecting the energy sharing between soil and vegetation (Copernicus, 2020). Land surface temperature (LST) is considered an important variable in the climate system and is an important parameter that affects plant growth rate and time and explains the energy and water exchange between the land surface

and the atmosphere (Zhang et al., 2006; Şekertekin, et al., 2013). ; Bian et al., 2017). Various methods have been developed to detect land surface temperature. These methods; Split window method (Sobrino et al. 1996), temperature/emissivity separation method (Gillespie et al. 1998), single channel method (Jimenez et al., 2003), single mono window algorithm (Qin et al., 2001). GIS software is used as an effective tool in the application of these methods and in generally analyzing satellite images and interpreting the data obtained as a result of the analysis (Liping et al., 2018; Selim et al., 2018; Ardahanlıoğlu et al., 2020; Olgun and Selim, 2021).

Ensuring sustainability in urban areas should be done with climate-sensitive planning, and the thermal heat variable in cities should be added to the evaluation criteria. In this context, studies on the evaluation of land surface temperature become even more important. Urbanization movements are just beginning in Seydikemer, which was separated from Fethiye and gained district status after Muğla became a metropolitan city in 2012. This study was carried out to determine the seasonal change of land surface temperature in Seydikemer city center and its immediate surroundings. In this way, suggestions have been made to include land surface temperature in creating climate-sensitive urban plans for Seydikemer, where urbanization movements have not yet been experienced intensively.

2. MATERIALS and METHODS

2.1. Material

Seydikemer, a district of Muğla province, attracts attention not only with its natural beauties and riches, but also with its historical and touristic importance. Seydikemer, Çameli in the northwest, Altınyayla in the north, Korkuteli and Elmalı in the northeast; It borders Kaş in the southeast, Akdeniz in the south and Fethiye in the west. Its geographical location is between 36º 17' - 37º 02' northern latitudes and 29º 07' - 29º 48' eastern longitudes, and it has a total surface area of 2028.37 km² (Anonymous, 2016; et al., 2018). Seydikemer left Fethiye on 02.09.2013 and gained district status. The name 'Seydikemer' was formed by combining the words "Seyyit", which means "From the Descendants of the Prophet", and "Kemer", which was inspired by the arch of the historical bridge and has been the name of this district for years (url1, 2023). With Muğla gaining Metropolitan Municipality status, the villages and town municipalities in Seydikemer were transformed into neighborhoods. Seydikemer's most important river is Eşen Stream, its highest mountain is Akdağ and its most important plain is Eşen Plain (Ardahanlıoğlu et al., 2019). Important tourist attractions such as Saklıkent Canyon and Eren Mountain Ski Center are also located within the district borders and are visited intensively (url1, 2023; Anonim, 2016). The study area is Seydikemer city center and its immediate surroundings (Figure 1).

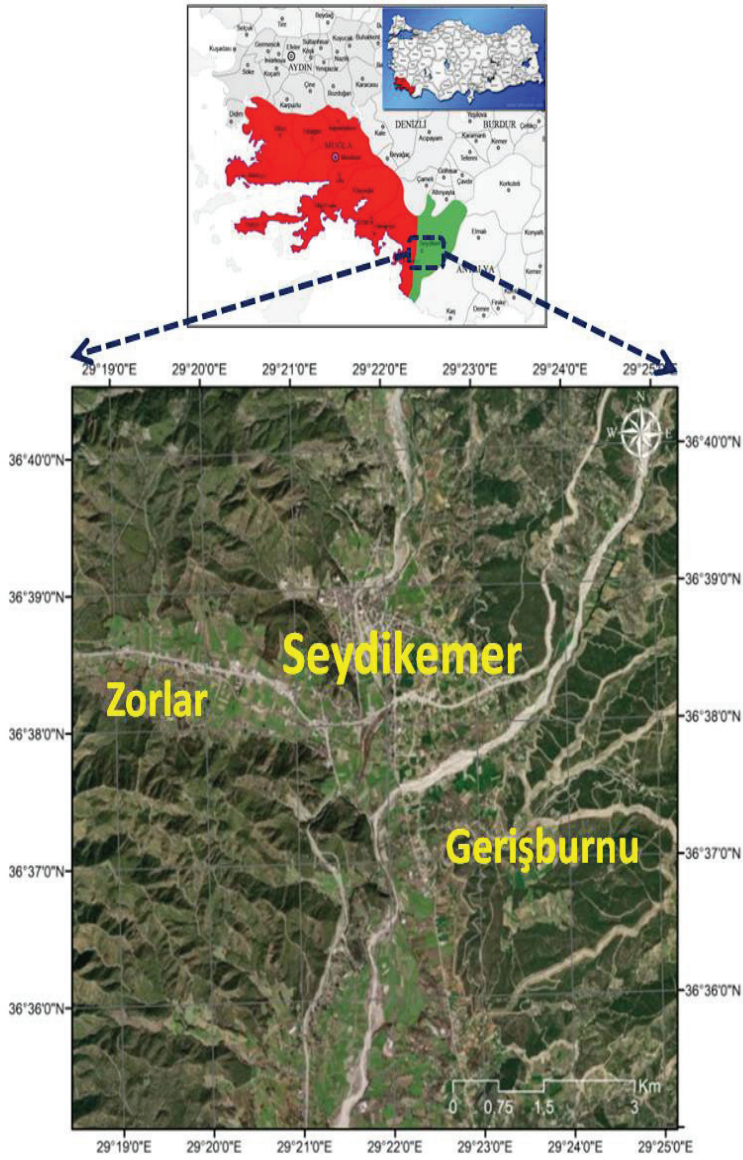


Figure 1. *Study area*

Landsat 8 satellite images used as material in this study, which was conducted to determine the seasonal change of land surface temperature in Seydikemer city center and its immediate surroundings, were downloaded free of charge from the USGS (United States Geological Survey) website (Table 1). Landsat 8 satellite provides medium resolution data from 15 meters to 100 meters, thanks to its features including nine different spectral and two thermal

bands (Çoşlu et al., 2021; USGS, 2023). This platform, which can make a full tour around the world in 98.9 minutes, is located at an altitude of 705 km and is updated in 16-day periods, has the capacity to monitor changes over time (USGS 2019). Landsat 8 satellite is a remote sensing tool that is widely used, especially in determining land surface temperature (Mercan, 2020). ID numbers and shooting dates of the Landsat 8 satellite images used in the study are shown in Table 1.

Tablo 1. *Landsat 8 satellite images used in the study*

Satellite image ID no	
LC08_L1TP_179035_20230703_20230711_02_T1	03.07.2023
LC09_L1TP_179035_20221231_20230315_02_T1	31.12.2022

2.2. Method

In this study, which was conducted to determine the seasonal change of land surface temperature in Seydikemer city center and its immediate surroundings, the study area was first determined and a literature review was conducted. Afterwards, atmospheric correction processes were applied on the Landsat 8 satellite image to determine the land surface temperature. Land surface temperature was determined by making various calculations in geographic information systems software using the Red, NIR and TIR (Thermal Infrared) bands of the satellite image. A six-step algorithm was implemented in ArcGIS 10.5 software to determine land surface temperature using Landsat 8's thermal bands. These calculations are respectively: Upper Atmosphere (TOA) spectral brightness calculation, TOA - Brightness Temperature (BT) conversion, NDVI calculation, Emissivity (ε) calculation, Vegetation rate (Pv) calculation and Land Surface Temperature (LST) calculations (Qin, 2001) .

To obtain the land surface temperature map, first the brightness value was converted to radiance value, and then the radiance value was converted to temperature value by using the thermal band of the Landsat 8 satellite image. NDVI was calculated using the 4th and 5th bands of the satellite image, vegetation rate and spread calculations were made with this data, and finally land surface temperature maps were created using temperature and emissivity data. In the study area, July, when the temperature is highest and cloudiness is least, was determined as two different months for the summer season, and December, when the temperature is lower and cloudiness is less, for the winter season. A land surface temperature change map was obtained by taking the differences of the land surface temperature maps of December and July. The cell-based difference between two maps was obtained using the 'raster calculator' tool in ArcGIS software.

3. RESEARCH FINDINGS

In this study conducted to determine the seasonal change of land surface temperature in Seydikemer city center and its immediate surroundings, on the land surface temperature map obtained from the satellite image of December 31/12/2022, the lowest temperature is 8 C, the highest temperature is 18 C and the average temperature value is 12. It was found to be C (Figure 2). December land surface temperature values were generally found to be lower in the study area. In Seydikemer city center and Zorlar neighborhood, land surface temperature values increase in areas with bare land surfaces, roads, non-cultivated agricultural areas and residential areas. On the other hand, in areas around Gerişburnu neighborhood where there is forest cover and the land surface is covered with plant material and where there are water surfaces, land surface temperature values are lower.

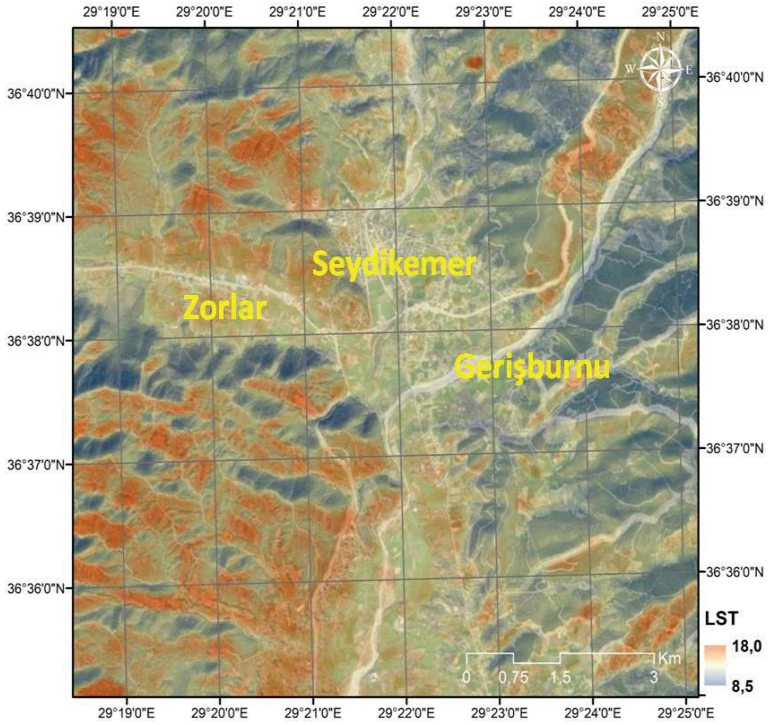


Figure 2. *December land surface temperature map*

According to the map obtained from the satellite image of the land surface temperature of Seydikemer city center and its immediate surroundings dated 03/07/2023, the lowest temperature was 33 C, the highest temperature was 46 C and the average temperature value was 39 C (Figure 3). While July

land surface temperature values were detected at higher values in Seydikemer city center and Zorlar neighborhood, land surface temperature values were determined at lower values in Gerişburnu neighborhood and its surroundings. In July, the land surface temperature, especially on water surfaces and in forest areas, was lower than other areas.

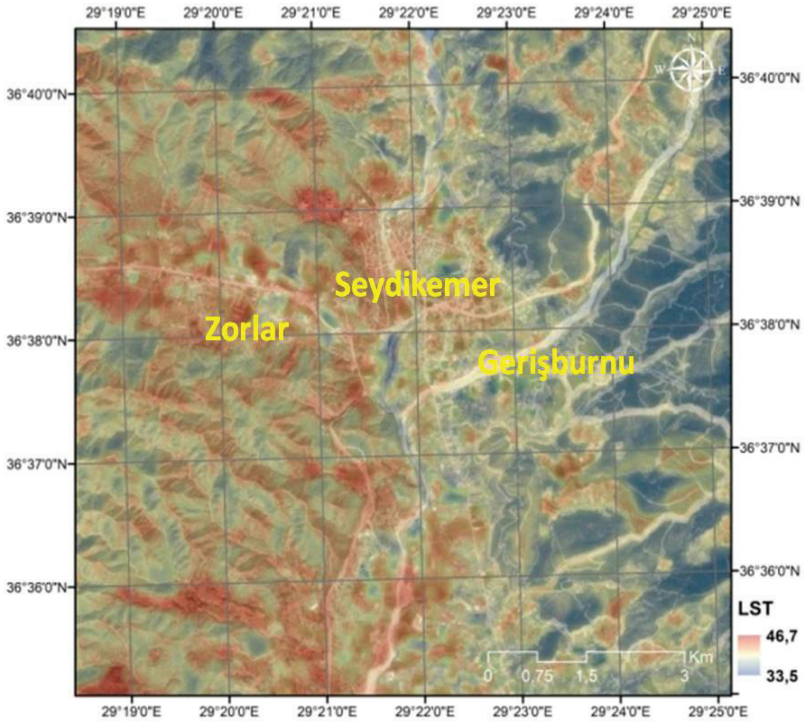


Figure 3. *Land surface temperature map in July*

In this study conducted to determine the seasonal change of land surface temperature in Seydikemer city center and its immediate surroundings, it was determined that there was a temperature difference of at least 22.4 C and at most 32.6 C between summer and winter, according to the seasonal change map between December and July. . The average temperature difference between both seasons was found to be 27.5 C. It has been observed that the interseasonal temperature difference is high in Seydikemer city center, Zorlar neighborhood and the southern slopes of the mountainous areas, and that the interseasonal temperature difference is low in the agricultural areas on the periphery of Seydikemer city center and Gerişburnu neighborhood (Figure 4).

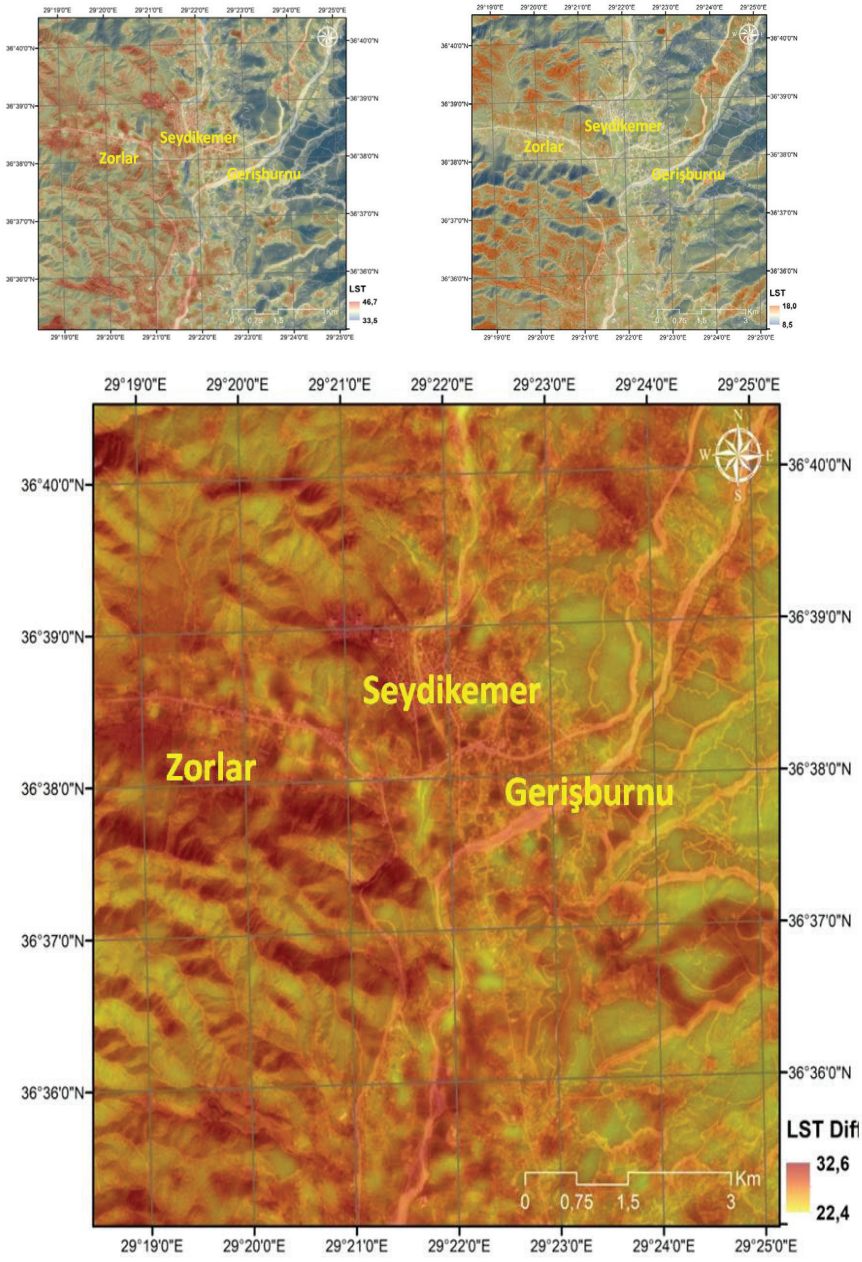


Figure 4. *Land surface temperature difference map between December and July*

4. RESULTS AND DISCUSSION

In this study, which was conducted to determine the seasonal change of land surface temperature in Seydikemer city center and its immediate surroundings, it was observed that the land surface temperature was between 8 C - 18 C in winter and the land surface temperature was between 33 C - 46 C in summer. While the average land surface temperature is observed at 12 C in winter, this value increases significantly in summer, reaching 39 C. While the temperature difference between the two seasons was at least 22.4 C and at most 32.6 C, the average temperature difference was determined to be 27.5 C.

While the land surface temperature in residential areas and areas without vegetation in Seydikemer city center and its immediate surroundings reaches higher values in the summer, it decreases in the winter. As stated in a study on the subject, temperatures are generally high in urban areas during the summer due to impermeable surfaces. Impermeable surfaces that reach high temperature values in summer have lower surface temperatures than areas with vegetation in winter (Çiçek et al., 2013). In agricultural lands located on the periphery of the city, the temperature difference between seasons cannot reach as high values as in residential areas. In the forested areas on the periphery of the city, it has been observed that while the interseasonal temperature difference does not increase much in the northern facing areas, this difference reaches higher values in the southern facing areas. In a previous study on seasonal differences, it was stated that the lowest surface temperature in winter occurs on water surfaces and forest areas, while the highest surface temperature occurs in irrigated agricultural areas. In another study, while high temperature values were detected in urbanization areas in summer, the lowest temperature values were detected in pasture areas (Yılmaz, 2015). In some studies generally conducted in summer, it has been stated that the highest temperature value is on impermeable surfaces, while the lowest temperature values are on water surfaces and areas covered with vegetation (Su, et al., 2010; Rinner and Hussain, 2011; Çoşlu et al., 2021). ; Karakuş and Eyileten, 2022; Selim et al., 2023a; Selim et al., 2023b).

The following suggestions have been made for climate-sensitive planning to be made for Seydikemer in the coming years;

✓ Seydikemer district climate map should be prepared and microclimate areas should be determined.

✓ Studies should be carried out using remote sensing and geographical information systems, and current developments and changes should be monitored.

✓ Comfort conditions should also be taken into account when planning settlements and experts in this field should participate in planning studies.

✓ Air corridors within the district should be directed correctly and wind mapping studies should be carried out.

✓ Green infrastructure should be actively established.

✓ The amount of green space should be increased by preserving open green areas.

✓ The proportion of impermeable surfaces in the city should be reduced by increasing the number of trees.

✓ Applications that increase the temperature on the facades of buildings should be avoided.

✓ Especially in public gardens, the ratio of asphalt and concrete surfaces should be lower than the ratio of green areas.

As a result, in Seydikemer, where urbanization movements have not yet been experienced much, negative changes that may occur in the coming years can be prevented by implementing plan decisions that are compatible with the natural structure and take sustainable climate parameters into consideration, while still at the planning stage. These studies can be carried out more easily by using satellite images in calculating land surface temperature values. However, by making available satellite images with more sensitive resolution, these studies can be carried out with more precise values. It is thought that this study, which was conducted by evaluating land surface temperatures seasonally in July and December, will form a basis for future studies.

REFERENCES

Akyürek, Ö. (2020). Termal uzaktan algılama görüntüleri ile yüzey sıcaklıklarının belirlenmesi: Kocaeli örneği. Doğal Afetler ve Çevre Dergisi, 6(2), 377-390.

Anonim, (2016). Muğla İli 1/25.000 Ölçekli Nazım İmar Planı Plan Açıklama Raporu.

Anonim, (2018). Unated Nations, 2018. Revision of World Urbanization Prospects. https://population.un.org/wup/.

Ardahanlıoğlu, Z.R., Karakuş, N., Selim, S. ve Çinar İ. (2018). Determining of The Natural Medium Characteristics of the Centre of Seydikemer and Its Surroundings with GIS. International Vocational Science Symposium, 15-19 Nisan 2018, Antalya, Türkiye.

Ardahanlıoğlu, Z.R., Selim, S, Karakuş, N., & Çınar, İ. (2020). GIS-based approach to determine suitable settlement areas compatible with the natural environment. Journal of Environmental Science and Management, 23, 71-82.

Bian, T., Ren, G., & Yue, Y. (2017). Effect of urbanization on land-surface temperature at an urban climate station in North China. Boundary-Layer Meteorology, 165(3), 553-567.

Çoşlu M., Karakuş N., Selim S. & Sönmez N.K. (2021). Evaluation of the relationship between land use and land surface temperature in Manavgat sub-basin. Planning, Design and Management in Landscape Architecture, Iksad International Publishers, ss.3-34.

Copernicus.(2023).Copernicuslandservice.https://land.copernicus.eu/global/products/lst#:~:text=The%20Land%20Surface%20Temperature%20(LST,direction%20of%20the%20remote%20sensor Accessed Date:15.12.2023

Çınar, İ. & Karakuş, N. (2021). Comparison of bioclimatic comfort conditions of urban, suburban and rural settlements. Planning, Design and Management in Landscape Archıtecture, Altuntaş Arzu, Editor, IKSAD International Publishing House, pp. 3-34.

Çınar, İ., Çiçek, İ., Karakuş, N. & Ardahanlıoğlu, Z. R. (2016). Thermal comfort assessment of the urban mediterranean climate in Fethiye, southwest Anatolia, Turkey. *International Journal of Advances in Science Engineering and Technology, 4*(3), 46-51.

Çınar, İ., Karakus, N., & Toy, S. (2023). Analysing daytime summer thermal comfort conditions for Turkey's third largest tourism destination. *Environmental Science and Pollution Research*, *30*(17), 50046-50056.

Çiçek, İ., Yılmaz, E., Türkoğlu, N., & Çalışkan, O. (2013). Seasonal variation of surface temperature based on land cover in Ankara Ankara şehrinde yüzey sıcaklıklarının arazi örtüsüne göre mevsimsel değişimi. Journal of Human Sciences, 10(1), 621-640.

Doğan, S., Tüzer, M. (2011). Küresel iklim değişikliği ve potansiyel etkileri. Cum-

huriyet Üniversitesi İktisadi ve İdari Bilimler Dergisi, 12(1), 21-34

Hajat, S., Kovats, R.S., Lachowycz, K. (2007). Heat-related and cold-related deaths in England and Wales: who is at risk? Occup. Environ. Med. 64 (2), 93–100. https:// doi.org/10.1136/oem.2006.029017.

Gillespie A.R., Rokugawa S., Matsunaga T., Cothern J.S., Hook S.J., Kahle A.B., (1998), A temperature and emissivity separationalgorithm for advanced space borne thermal emission and reflection radiometer (ASTER) images, IEEE Trans. Geosci. RemoteSens., 36, 1113-1126.

Heilig, G. K., (2012). World urbanization prospects: The 2011 revision. United Nations, Department of Economic and Social Affairs (DESA), Population Division, Population Estimates and Projections Section, New York.

Janssen, N.A.H., Gerlofs-Nijland, M.E., Lanki, T., Salonen, R.O., Cassee, F., Hoek, G. (2012). Health Effects of Black Carbon, the WHO European Centre for Environment and Health. World Health Organisation Regional Office for Europe, Copenhagen, Denmark. Bonn, Germany.

Jimenez-Munoz J.C., Sobrino J.A., (2003), A generalized single-channel method for retrieving land surface temperature from remotesensing data, J. Geophys. Res., 108, 4688-4694.

Karakuş, N. ve Eyileten, B. (2022). Determining The Land Surface Temperature From Landsat 8 Satellite Images And Data Evaluation In Accordance To Land Use: Antalya/Serik Case. New Trends in Architecture, Planning and Design. (Ed: Çabuk, A., Aşıkkutlu, H.S.), Duvar Publishing, ss.201-220.

Kerr, Y.H., Lagouarde, J.P. & Imbernon, J. (1992). Accurate land surface temperature retrieval from AVHRR data with use of an improved split window algorithm. Remote Sensing of Environment, 41, pp. 197-209.

Karakuş, N., & Selim, S. (2022). Dış Mekân Termal Konfor Koşullarının Zamansal ve Mekânsal Dağılımı: Konyaaltı-Antalya Örneği. *Mehmet Akif Ersoy Üniversitesi Fen Bilimleri Enstitüsü Dergisi*, *13*(2), 259-269.

Kaya, S., Basar, U. G., Karaca, M., Seker, D. Z. (2012). Assessment of Urban Heat Islands Using Remotely Sensed Data. Ekoloji, 21(84), 107– 113.

Lee, S. H., Song, C. K., Baik, J. J., & Park, S. U. (2009). Estimation of anthropogenic heat emission in the Gyeong-In region of Korea. Theoretical & Applied Climatology, 96(3/4), 13p. doi:10.1007/s00704-008-0040-6.

Liping, C., Yujun, S., & Saeed, S. (2018). Monitoring and predicting land use and land cover changes using remote sensing and GIS techniques—A case study of a hilly area, Jiangle, China. *PloS one*, *13*(7), e0200493.

Massey, D.D., Habil, M., Taneja, A. (2016). Particles in different indoor microenvironments-its implications on occupants. Build. Environ. 106, 237–244. https:// doi.org/10.1016/j.buildenv.2016.06.036

Mercan, Ç. (2020). Yer yüzey sıcaklığının termal uzaktan algılama görüntüleri ile araştırılması: Muş ili örneği. Türkiye Uzaktan Algılama Dergisi, 2(2), 42-49.

Mercan, Ç, Arpağ, S. (2020). Coğrafi Bilgi Sistem Analizleri Kullanılarak Toprak ve Arazi Özelliklerinin Değerlendirilmesi: Türkiye, Mardin İli Arazisi. Türkiye Tarımsal Araştırmalar Dergisi, 7 (1), 23-33. DOI: 10.19159/tutad.644210.

Oke, T. R. (2002). Boundary layer climates (Secon Edition ed.): Routledge.

Oleson, K. W., Bonan, G. B., Feddema, J. ve Jackson, T. (2011)"An examination of urban heat island characteristics in a global climate model", International Journal of Climatology,31(12), 1848-1865.

Olgun, R. & Selim, C. (2021). Spatial Accessibility To Urban Green Spaces Within The Scope of National Legislation; Case of Serik, Antalya. Planning, Design and Management in Landscape Architecture, (Ed. Altuntaş, A.), IKSAD International Publishing House, p.100-120, Turkey.

Patz, J. A., Campbell-Lendrum, D., Holloway, T., & Foley, J. A. (2005). Impact of regional climate change on human health. Nature, 438(7066), 310–317. https://doi.org/ 10.1038/nature04188

Qin Z., Zhang M., Amon K., Pedro B., (2001), Mono-window algorithm for retrieving land surface temperature from Landsat TM 6data, Acta Geogr. Sin., 56, 456-466.

Rinner, C. veHussain, M. (2011)"Toronto's Urban Heat Island--Exploring the Relationship between Land Use and Surface Temperature",Remote Sensing, 3(6), 15p.

Selim, S., Karakuş, N., & Eyileten, B. (2023a). Effects of cemetery ecosystems on urban heat islands. *Akdeniz University Journal of the Faculty of Architecture*, *2*(1), 1-18.

Selim, S., Eyileten, B., & Karakuş, N. (2023b). Investigation of Green Space Cooling Potential on Land Surface Temperature in Antalya City of Turkey. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, *48*, 107-114.

Selim, C. ve Doksöz, S. (2021). The Effects of Biodiversity on Landscape Perception and Preference in Urban Green Areas. Architectural Sciences and Ecology, (Ed: Çakır, M., Tuğluer, M., Fırat Örs P.), İksad Yayınevi, ss.206-231. ISBN:978-625-8213-87-4.

Singh, R. L., & Singh, P. K. (2017). Global environmental problems. In Principles and Applications of Environmental Biotechnology for a Sustainable Future (pp. 13-41). Springer, Singapore.

Sobrino J.A., Li Z.L., Stoll M.P., Becker F., (1996), Multi-channel and multi-angle algorithms for estimating sea and land surfacetemperature with ATSR data, Int. J. Remote Sens., 17, 2089-2114.

Su, W., Gu, C. veYang, G. (2010)."Assessing the Impact of Land Use/Land Cover on Urban Heat Island Pattern in Nanjing City, China",Journal of Urban Planning& Development, 136(4), 8p.

Şekertekin, A., Kutoğlu, Ş. H., & Kaya, Ş. (2013). Uzaktan Algılama Verileri

Yardımıyla Yer Yüzey Sıcaklığının Belirlenmesi. TMMOB Harita ve Kadastro Mühendisleri Odası, 14. Türkiye Harita Bilimsel ve Teknik Kurultayı, 14-17.

Tomlinson, C. J., Chapman, L., Thornes, J. E., & Baker, C. J. (2011). Including the urban heat island in spatial heat health risk assessment strategies: a case study for Birmingham, UK. International Journal of Health Geographics, 10(1), 14p. doi:10.1186/1476-072x-10-42.

USGS (2019). Landsat 8 (L8) data users handbook, Ed.Zanter, K., EROS Sioux Falls, South Dakota, USA, 114ss.

USGS.(2023).Using the USGS Landsat Level-1 Data Product. https://www.usgs.gov/core-science-systems/nli/landsat/using-usgs-landsat-level-1-data-product. Accessed Date: 20.12.2023.

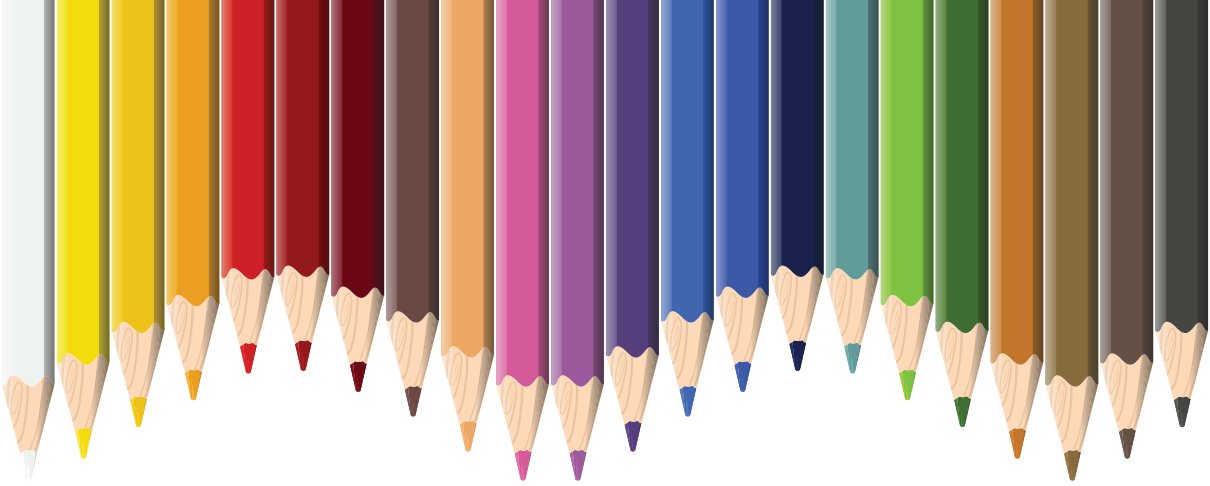
Uysal, M., and Polat, N., (2015). An Investigation of the Relationship between Land Surface Temperatures and Biophysical Indices Retrieved From Landsat Tm in Afyonkarahisar (Turkey). Tehnicki Vjesnik-Technical Gazette, vol. 22(1), ISSN 1330-3651, p. 177-181.

Ünal, M. (2022). Kentsel Yüzey Isı Adalarının Belirlenmesinde Yer Yüzey Sıcaklık Verilerinin Kullanımı. Avrupa Bilim ve Teknoloji Dergisi, (33), 213-222.

Yılmaz, E. (2015). Landsat görüntüleri ile Adana yüzey ısı adası (Adana Surface Heat Island using Landsat Images). Coğrafi Bilimler Dergisi/Turkish Journal of Geographical Sciences, 13(2), 115-138.

Zhang, J. Q., Wang, Y. P. & Li, Y. (2006). A C++ Program for retrieving land surface temperature from the data of Landsat TM/ETM+ band6. Computers & Geosciences, 32(10), 1796-1805.

url1, 2023. http://www.seydikemer.gov.tr/tarihce.



Chapter 11

LANDSCAPE DESIGN AND IMPLEMENTATION PROCESS OF SELÇUK UNIVERSITY MERVE MERCAN PARK

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Introduction

Urban areas are essential for meeting various needs of people such as providing a range of housing options, efficient transportation systems, employment opportunities, spaces for social interactions, and recreational activities (Brase, 1987; Erçevik & Önal, 2011). The increase and diversification of human needs, major changes in social and economic conditions with rapid population growth, and developing industry and technology have led to an increase in people's needs such as spending time with each other, socializing, coming together, and relieving stress with various recreational activities (Altay & Arısoy, 2023). For this reason, the world population today is concentrated in urban centers. However, people who are used to this intense urban life are moving away from nature daily. There is a need for green areas that can benefit people physically, biologically, and physiologically during their daily lives (Fuller et. al., 2007). From primary school to higher education, the spaces created for education and training have different characteristics. University campuses have the potential to be one of the most important of these areas (Yılmaz et. al., 2013). According to Matloob et al. (2014), university campuses are similar to small cities, and their unique physical characteristics distinguish them from cities and settlements. All over the world, university campuses have assumed the task of creating models on a universal, national, and regional scale with their land uses, structural, and planting designs. In campus planning, open green space planning is as important as structural planning decisions (Yılmaz & Irmak, 2012). Today, in addition to providing quality education and training, the physical facilities of the campuses have started to be effective in the preference of universities, which are more than 200 in number in our country. Universities that are easily accessible, safe, and comfortable, offer opportunities for various activities on campus and in the immediate vicinity, and have socio-cultural and recreational facilities are preferred by students and staff. Indeed, according to Dober (2000), extensive open green areas and trees in well-planned campuses are symbols of higher education. The literature review on the subject was carried out on topics such as the level of use of open green spaces on university campuses, user satisfaction, evaluation of the design and planning process from the student perspective, examination of the relationship between stress and mental health, and the positive effects of open green spaces on the quality of life of students and staff. Research shows that spending time in green and natural areas is beneficial for mental and physical health (Maas et. al. 2006; Bowler et. al. 2010; Cox et. al. 2017).

Within the scope of this study, the area between the Rectorate building, the mosque, and the museum in Alaeddin Keykubat Campus of Selçuk University was selected as the study area. The most prominent factors in the selection of the site were the presence of over 1000 plants and the lack of a uniform green area of over 40000 m² within the campus. Within the context of the study, the area was designed according to landscape design principles, and

then the implementation processes were addressed. In the landscape design phase, sketching, 2D drawing, and 3D visualization processes were completed respectively. Subsequently, the implementation processes were completed, and it was aimed to create a green area within the university campus where both administrative and academic staff and students can spend their free time, improve their social relations, and increase their motivation.

Material and Method

The main material of the study was the vacant area located between the Rectorate building, Green Areas Branch nursery, and the campus mosque within the Alaeddin Keykubat Campus of Selçuk University in Selçuklu District of Konya Province. This area is located at coordinates (latitude and longitude) 38.026438°, 32.513346°, and has an area of approximately 43 thousand m² within the borders of Akademi Neighborhood (Figure 1).

Figure 1. Konya Province, Selçuklu District, Selçuk University and Study Area Locations

As supplementary materials, literature related to the subject, the site plan of the area obtained from the relevant office, notes taken during face-to-face interviews, satellite images, visuals recorded in the research area, Autodesk Autocad 2021, Trimble SketchUp 2021, Adobe Photoshop CC, Corel Draw 2020, Lumion 10.5 and Microsoft Office software were used. In addition, a DJI Mavic Air Drone was used to take aerial images to form the basis for the project before the study and to control the process afterward.

The methodology of the study is based on the stages of the landscape design process. The preliminary interviews were conducted to obtain the demands and expectations of the Selçuk University administration before starting the study. As a result of the preliminary interviews, it was stated that there are currently over 1000 trees in the study area. With the explicit demand of the university administration, the design process was carried out based on preserving the existing trees. After the preliminary interviews were completed, the study area and its surroundings were examined. The data obtained from the environmental analysis was utilized throughout the landscape design process. Once the current condition of the study area was determined, site analysis, requirements list, functional diagram, preliminary design, structural design implementation, planting design implementation, construction details, bill of quantities, and three-dimensional modeling studies were completed (Table 1). Irrigation, drainage, lighting, and cross-sectional studies, which are among the stages of the landscape design process, were prepared by the contractor company in line with the request of the university administration.

The lack of a wide water surface within the Alaeddin Keykubat Campus of Selçuk University, as well as the lack of a green area of sufficient size where staff and students could spend their leisure time, demonstrates the importance of the project. The design process was carried out in line with the request of the authorities to include an ornamental pool, seating areas, and a circulation system to meet the needs.

Table 1. Data Collection and Landscape Design Phases

Research and Data Collection	***Design Phase***
• Demands and Requests of the Related Administration • Literature Review Related to the Subject • Provision of Site Plan • Acquisition of Visuals (images/videos)	• Environment/Site Analysis • Requirement List • Functional (Bubble) Diagram • Preliminary Design Phase • Structural Design Phase • Construction Details Phase • Planting Design Phase • Bill of Quantities • 3D Modelling/Rendering

Findings

The first phase of the landscape design process started with a meeting with the authorized persons of Selçuk University administration in line with the request to create a recreation area that students and staff can use in their free time. The required information was obtained by asking the authorities about their demands and expectations for the project, and the site plan of the area was obtained from the Directorate of Construction and Technical Works of Selçuk University (Figure 2).

Approximately 27,000 m² of Merve Mercan Park consists of grass areas, 600 m² of 50 cm deep ornamental pool, and 3,600 m² of walking paths. In the design of the park, 3 wooden bridges, 20 benches, 12 pergolas, 5 benches under trees, and 6 charging stations were used to charge electronic devices.

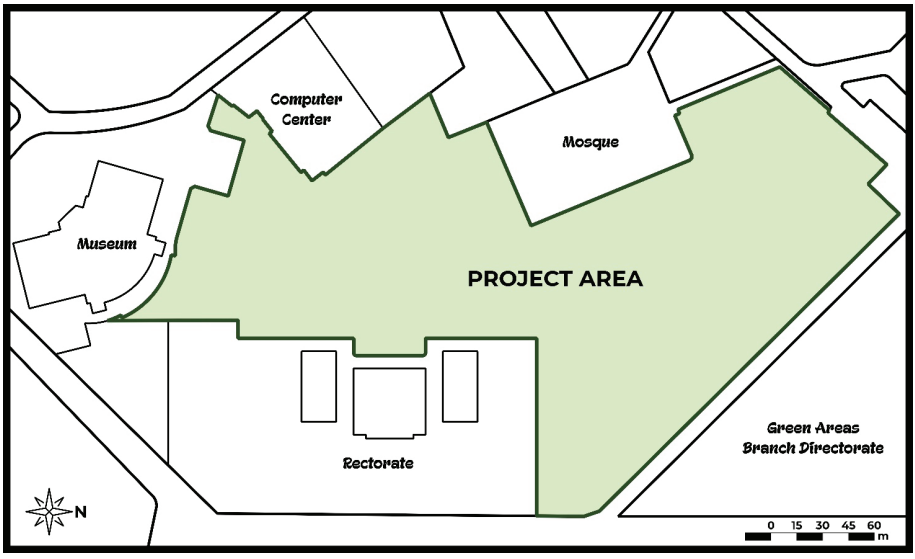

Figure 2. Site Plan

Environment/Site Analysis

As a result of the investigations carried out in the study area, it was determined that the number of existing plants consists of 21 different species over 1000 (Table 2). It is seen that coniferous trees and broad-leaved trees are spread over the area in two separate groups (Figure 3).

Table 2. The List of Existing Plants in the Study Area

LATIN NAME	TURKISH NAME
Acer platanoides 'crimson king	Kırmızı Çınar Yapraklı Akçaağaç
Betula alba	Ak Huş
Catalpa bignonioides	Sigara Ağacı
Cedrus deodora	Sedir
Cupressus arizonica 'glauca'	Mavi Servi
Fraxinus excelsior	Dişbudak
Gleditsia triancanthos	Gladiçya
Liquidambar orientalis	Sığla Ağacı
Liriodendron tulipefera	Lale Ağacı
Malus floribunda	Süs Elması
Picea pungens	Mavi Ladin
Pinus nigra	Karaçam
Platanus orientalis	Doğu Çınarı
Platanus occidentalis	Batı Çınarı
Populus nigra	Kavak
Populus alba	Ak Kavak
Prunus cerasifera	Süs Eriği
Prunus dulcis	Badem Ağacı
Prunus serrulata 'kanzan'	Süs Kirazı
Robinia pseudoacacia	Akasya
Quercus sp.	Meşe

Figure 3. Arrangement of Existing Plants in the Site Plan

The topographic structure of the area is flat and has the potential to con-

nect many places in its immediate surroundings. The project area is surrounded by a mosque, a computer center (bilmer), a museum, a library, a rectorate building, a social facility, faculties, and a nursery of the Directorate of Green Areas Branch. It is foreseen that the area will be used intensively when the places in the immediate vicinity are examined. In light of this information, the positive and negative aspects of the study area were revealed through a SWOT (Strength-Weakness-Opportunity-Threat) analysis (Table 3).

Table 3. SWOT Analysis of the Area

Strengths	***Weaknesses***
-Accessibility -The topographic structure is almost flat -Away from traffic and noise	-The large number of existing coniferous plants may adversely affect the design process
Opportunities	**Threats**
-Existence of trees with high height and wide crown -Ease of access by public transport (bus, minibus and tram)	- Transformer located near the north entrance of the site

Requirements List

Previous inventory and site analysis studies were taken into consideration at this stage. A list of needs was prepared in light of the data obtained as a result of the interviews with the university administration and the determination of the elements identified as deficient in the campus (Figure 4). At this stage of the design process, efforts were made to protect the existing trees, which the authorities emphasized the most, and the program elements were determined as an ornamental pool, seating areas, pedestrian way, entrances-exits, and charging stations. Solution strategies have been developed to create a circulation system suitable for the relationship of program elements with each other and their immediate surroundings.

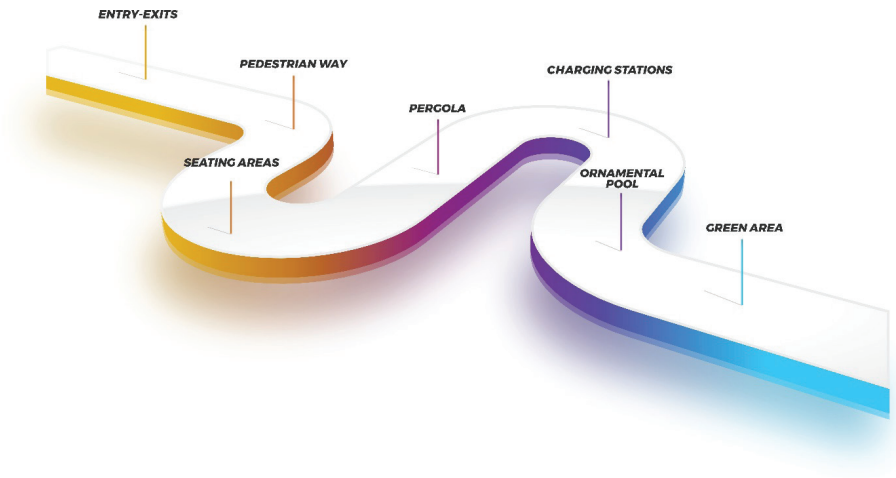

Figure 4. List of Requirements

Bubble/Functional Diagram

The elements that should be present in the study area are set out in the list of requirements. In light of this information, the entrances to the area have been planned in accordance with the accessibility of the faculties and other institutions in the vicinity. The ornamental pool and seating areas were placed in appropriate places so as not to obstruct the existing trees and to make maximum use of the shading function of the existing trees. In addition, the ornamental pool is positioned at an intersection point where there is more circulation in the area, and which will connect the surrounding spaces. The decisions taken regarding land use in the bubble diagram should guide the next stage of the design process. The studies completed in this context help to evaluate the project area with a more accurate approach in terms of being more useful and aesthetic.

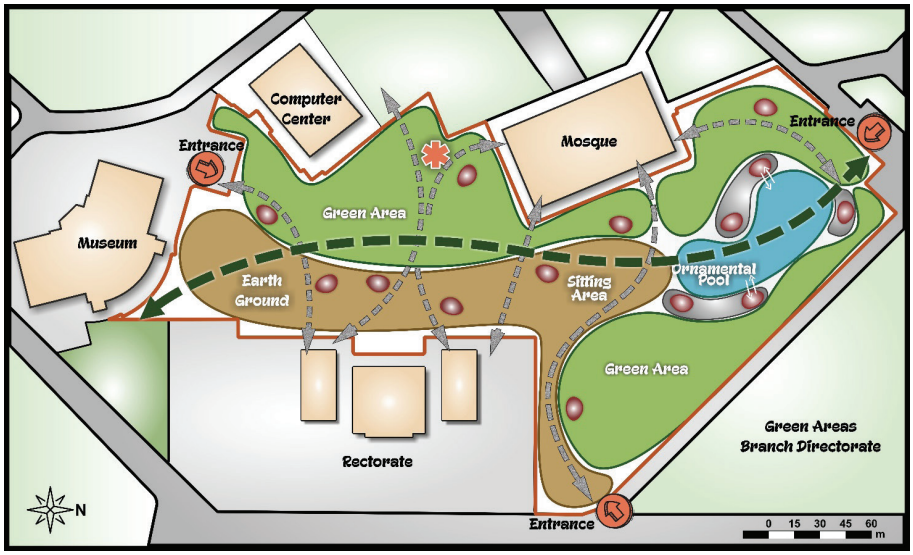

Figure 5. Functional (Bubble) Diagram of the Area

Preliminary Design Phase

By representing the uses shown as bubbles on the functional diagram, transferring them to scale on the project, and shaping them in more detail, first a draft sketch study (Figure 6) and then a "Preliminary Design Sheet" was prepared for the area (Figure 7). At this stage, the preliminary design sheet was prepared by making design decisions such as the placement of the ornamental pool and urban furniture in the most appropriate places, the connection of the spaces within the project area with each other, determining the circulation by preserving the existing trees, and the entrance-exit points.

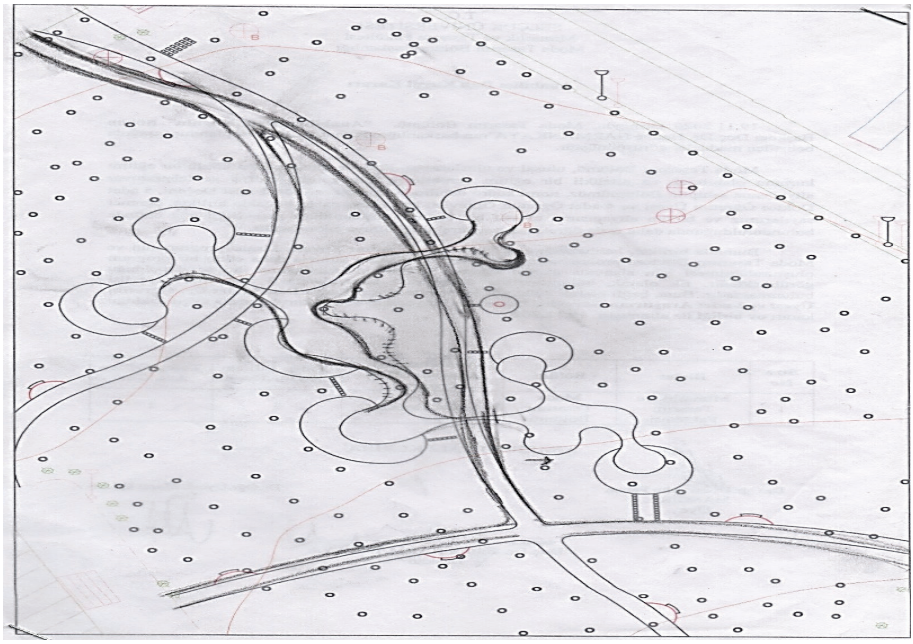

Figure 6. Sketch Study

The placement of the ornamental pool, which is decided to be the focal point of the area, and the determination of the structural elements needed around the pool were revealed with the decisions taken at this stage. In addition, while designing the form of the ornamental pool, sharp edges were avoided, and informal lines were used to have a design in harmony with nature. In this way, it is aimed to give the users the feeling of being in a natural area. To ensure consistency, the materials for the hardscape and the urban furniture in the area were chosen to match the ornamental pool's design. After the spatial forms were clarified, a circulation network was prepared to provide aesthetic and easy access between these spaces.

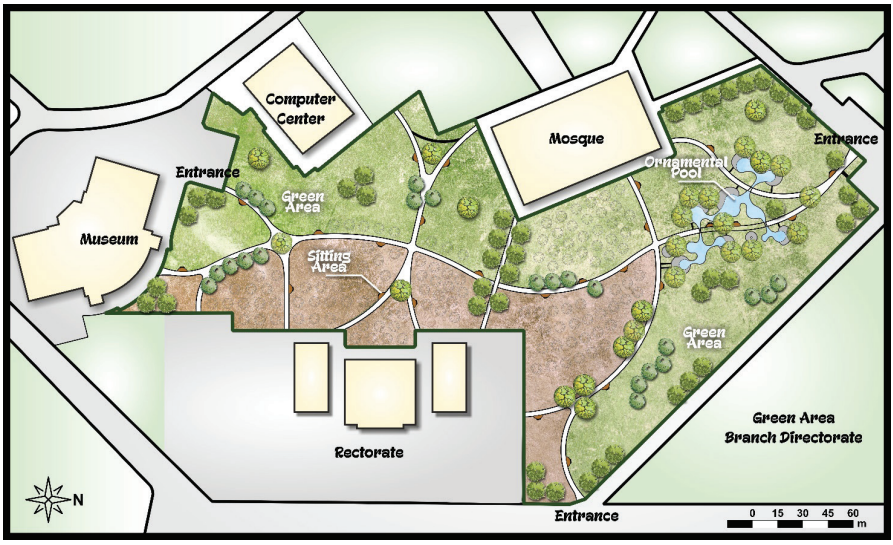

Figure 7. Preliminary Design of the Area

Structural Design Phase

This stage consists of the detailing of the preliminary design of the spaces for implementation. Sub-sheets of the structural application plan (Figure 8) include lighting, irrigation, drainage, dimensioning, elevation plan, and detail. Nevertheless, since these phases (lighting, irrigation, drainage, and dimensioning works) will be completed by the contractor company, no work has been carried out on the mentioned phases within the scope of this study.

In the structural application sheet, the number of urban furniture, types of structural materials, detailed dimensions, detail labels, and elements such as stairs, ramps, slopes, and elevation solutions should be carefully specified. This makes the plan easier to understand and implement. The locations and boundaries of the spaces determined in the preliminary design phase were finalized and the next phase was started by determining the materials and required structural elements. In order for the contractor to create the spaces in accordance with the design during the implementation phase, the construction details were prepared as a separate sheet. (Figure 9).

Concrete basalt antique parquet and bougainite stone were preferred for the pedestrian ways in the project area in order to increase durability and strength and to minimize the risk of slipping on the ground. In the selection of urban furniture, care was taken to ensure that they are resistant to extreme weather conditions, ergonomic, and in harmony with nature. In the selection of the paint for the ornamental pool, materials that require low maintenance, are sustainable, and suitable for water contact were prioritized.

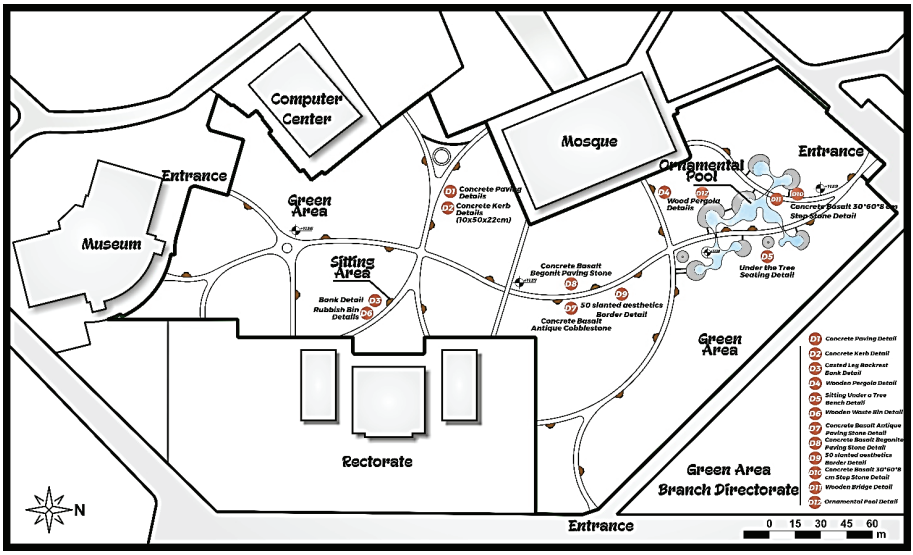

Figure 8. Structural Design of the Area

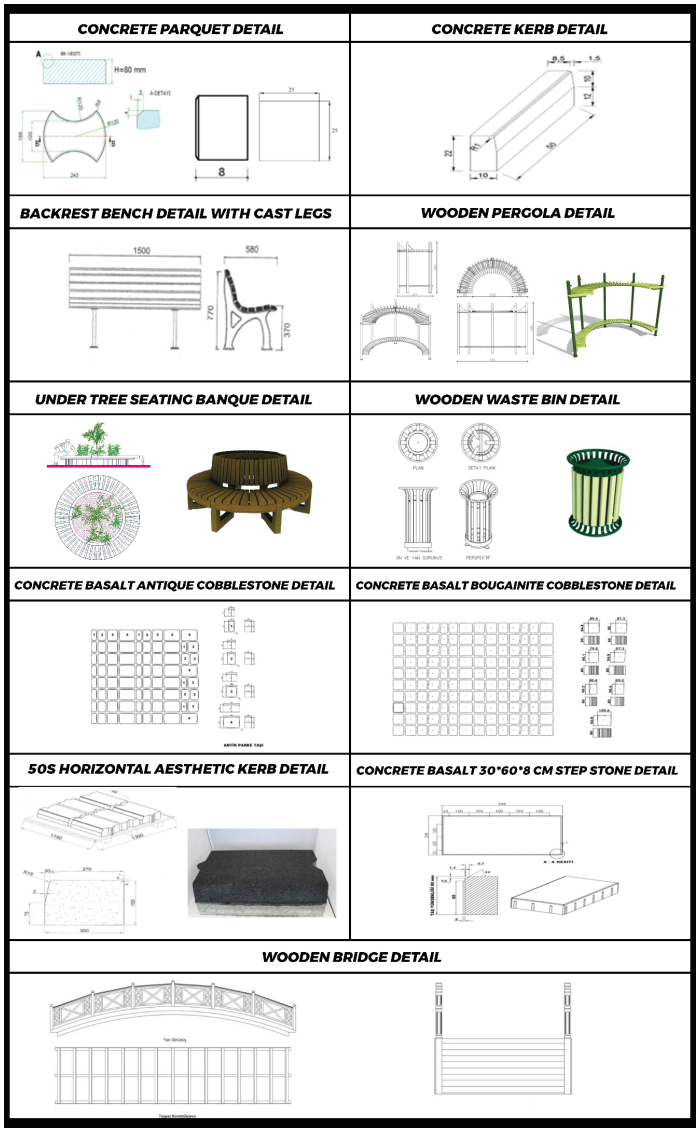

Figure 9. Construction Details

Planting Design Phase

The planting design implementation sheet not only displays the placement and layout of the plants used in a particular area but also includes important details such as the Latin and Turkish names of the plants, their stem circumferences, heights, planting forms, and quantity. Since a sufficient number of trees were already present in the study area, no further plantings were made for tree/small tree species. Instead, only the plantings specified in Table

4 were carried out, as shown in Figure 10.

Approximately 27,000 m² of grass area has been applied within the project area. Nevertheless, since it is not suitable to install grass under coniferous species and in order to save water, it was considered appropriate to use soil, especially in areas where these species are dense.

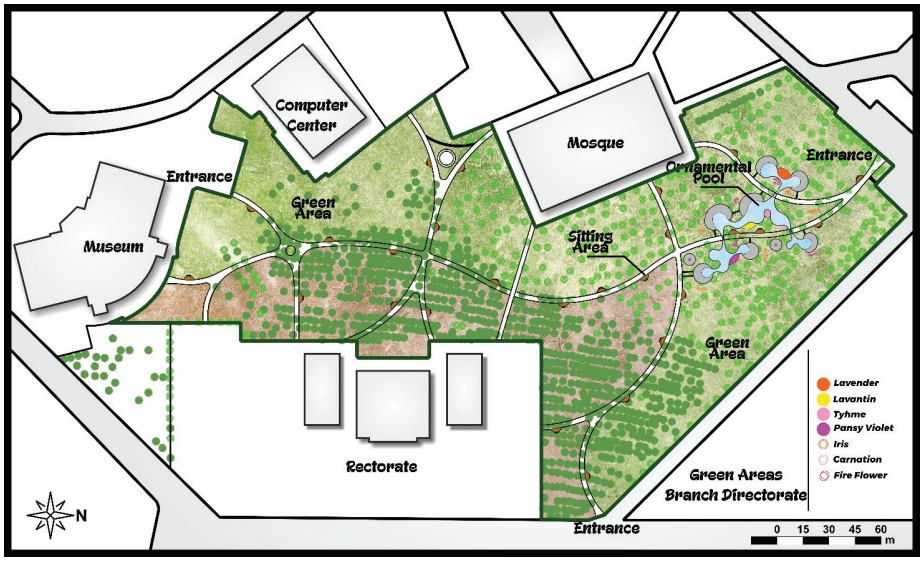

Figure 10. Planting Design of the Area

In addition to the existing plants, plant species from the ground cover and seasonal flower group specified in Table 4 were placed around the ornamental pool, pedestrian ways, and seating areas in accordance with the design principles.

Table 4. Plant Species Used in the Area

LATIN NAME	TURKISH NAME
Lavandula angustifolia	Lavanta
Santolina chamaecyparissus	Lavantin
Thymus vulgare	Kekik
Viola tricolor	Hercai Menekşe
İris germenica	Süsen
Dianthus caryophyllus	Karanfil
Salvia splendens	Ateş Çiçeği

Bill of Quantities

In the "Quantity/Surveying" stage of the landscape design process, the quantities of the materials to be used in the work area and the approximate costs received from the companies are revealed. The bill of quantities prepared within the scope of the project is given in Table 5. The table provides information such as pose numbers, names and short descriptions, units of measurement, and quantities for each item of work. Since the project will go out to tender, the survey phase is not specified in this table.

Tablo 5. Quantity List

Page N.	Work Item Number	Name and Short Description of the Work Item	Unit of Measure	Amount
1	10.300.2155	Epoxy-based (two-component) adhesive and repair mortar (ts en 1504-3)	kilogram	700
2	10.480.1012	8 cm high. normal grass and concrete paving stones in all colors and sizes (TS 2824 EN 1338)	square meter	200
3	15.120.1101	Excavation of soft and hard soil of any depth and any width by machine (deep excavation)	cubic meters	5.000
4	151501005	Pouring of C 25/30 compressive strength class, gray-colored, normal ready-mixed concrete produced or purchased at the concrete batching plant and pressed with a concrete pump (including concrete transportation)	cubic meters	250
5	15.160.1002	Replacement of ribbed steel mesh 3,001-10,000 kg/m2 (including 10,000 kg/m2)	tone	8
6	15.180.1004	Making curved surface concrete and reinforced concrete formwork with sheet metal	square meter	700
9	15.415.1604	3 cm thick dark-colored travertine slab with a capstone (3cmx30-40-50cmxfree length) (with all kinds of surface treatment except honed and polished)	square meter	350
10	15.435.1203	Laying 50 x 20 x 10 cm normal cement steam-cured concrete curbs (beveled, any color)	meter	4.300
26	MM.ÖBF-01	0-25MM FOUNDATION MATERIAL SUPPLY, TRANSPORTATION, PAVING AND COMPACTION	tone	1.500
27	MM.ÖBF-02	0-5MM FILLER MATERIAL SUPPLY, TRANSPORTATION, LAYING AND COMPACTING WORK	tone	300

28	MM.ÖBF-03	SUPPLY, TRANSPORTATION, AND ASSEMBLY OF CAST IRON LEGGED BENCH WITH BACKREST	quantity	20
29	MM.ÖBF-04	ACRYLIC FLOOR COVERING CONSTRUCTION	square meter	6.250
30	MM.ÖBF-05	2.5 METER WOODEN BRIDGE, SUPPLY, TRANSPORTATION AND INSTALLATION WORK	quantity	3
31	MM.ÖBF-06	WOODEN PERGOLA SUPPLY, TRANSPORTATION AND INSTALLATION WORK	quantity	12
32	MM.ÖBF-07	UNDER-TREE SEATING, SUPPLY, TRANSPORTATION AND INSTALLATION WORK	quantity	5
33	MM.ÖBF-08	SUPPLY, TRANSPORTATION, AND INSTALLATION OF WOODEN CITY-TYPE WASTEBASKET	quantity	20
34	MM.ÖBF-09	SUPPLY AND TRANSPORTATION OF TUMBLED DOLOMITE STONE	tone	30
35	MM.ÖBF-10	SUPPLY, TRANSPORTATION AND CONSTRUCTION OF CONCRETE BASALT (MINERAL SURFACE) ANTIQUE PAVING STONES (WASHED)	square meter	500
36	MM.ÖBF-11	SUPPLY, TRANSPORTATION AND CONSTRUCTION OF CONCRETE BASALT (MINERAL SURFACE) BEGONITE PAVING STONES (WASHED)	square meter	2.800
37	MM.ÖBF-12	BASALT (MINERAL SURFACE) 50 CM HORIZONTAL AESTHETIC CURB (SPECIFICATIONS 50*30*15) SUPPLY, TRANSPORTATION AND CONSTRUCTION WORK	linear meter	100
38	MM.ÖBF-13	SUPPLY, TRANSPORTATION AND CONSTRUCTION OF CONCRETE BASALT (MINERAL SURFACE) 30*60*8 CM STEPPINGSTONES (WASHING-SANDBLASTING-COLOR MIX)	square meter	85
39	MM.ÖBF-14	SUPPLY, TRANSPORTATION AND LAYING OF VEGETABLE SOIL	tone	3.000
40	MM.ÖBF-15	4-MIX GRASS SEED SUPPLY, TRANSPORTATION AND PLANTING	kilogram	2.000
41	MM.ÖBF-16	SUPPLY, TRANSPORTATION AND SPREADING OF SIFTED, BURNT CATTLE MANURE	cubic meters	550

43	MM.ÖBF-18	POOL CIRCULATION AND WATER ELEMENTS WATER TRANSPORT SYSTEM COMPLETE SET SUPPLY, TRANSPORTATION AND INSTALLATION WORK	set	1
53	MM.ÖBF-28	INSTALLATION OF PHONE CHARGING STATION ON SITE WITH ANCHORS, ARMATURES, ETC. EQUIPMENT	quantity	6

3D Modelling

3D modelling refers to the process of creating an object by combining multiple surfaces in a computer environment. The 3D modeling process generally includes elements such as drawing (design), rendering, textures/layers, use of camera and lighting, etc. Once the three-dimensional objects are created, various colors, materials, and facings need to be applied to give the design a more realistic appearance. Three-dimensional computer software includes a variety of tools that enable the creation of new materials and facings, as well as a library of materials and facings. The realism of the materials and facings applied to the models depends on the form of the structure to which they are applied and the success of the facing model used. In the study, the project area was modeled together with its immediate surroundings (Figure 11). The modeling process is important for recognizing the area and presenting it realistically. Facings applied to surfaces and material scales are important factors in increasing realism. After the 3D modeling of the area was completed, photo and video renderings were taken in line with the request of the authorities. The animation was then presented through video editing software.

Figure 11. 3D Modelling Renderings

Project Composition and Visualization

Project Composition

The existing trees in the project area and the green areas, hardscapes, and ornamental pool created as a result of the design are shown in Figure 12.

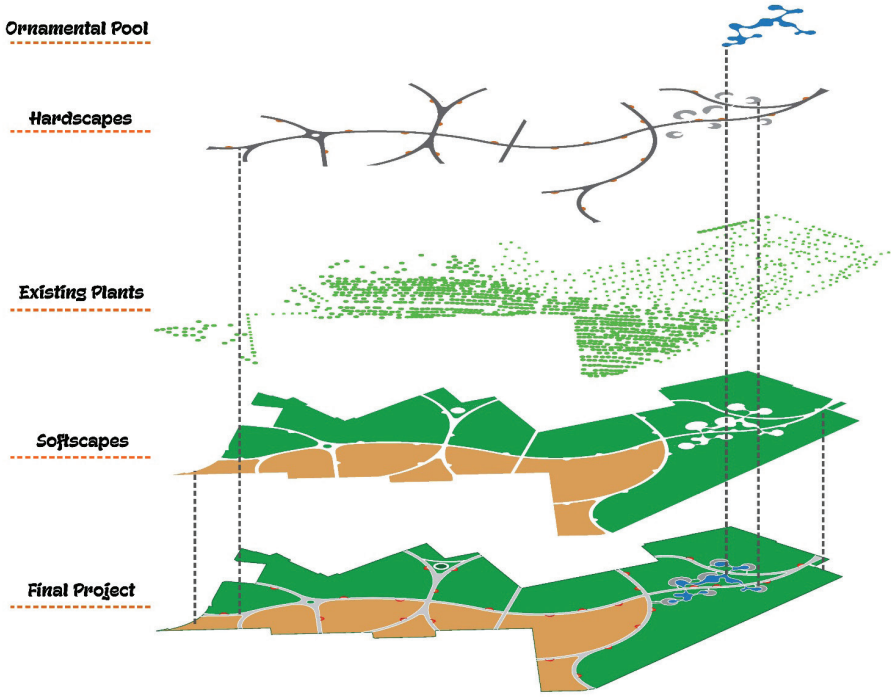

Figure 12. Project Composition

Visualization (Rendering/Animation)

In order to avoid any potential dissatisfaction, it's crucial to show users the post-application images of the spaces in the project area, along with their structural and planting elements, before the implementation phase. To this end, various visuals were created from the 3D model of the project and presented to the university administration as depicted in Figure 13.

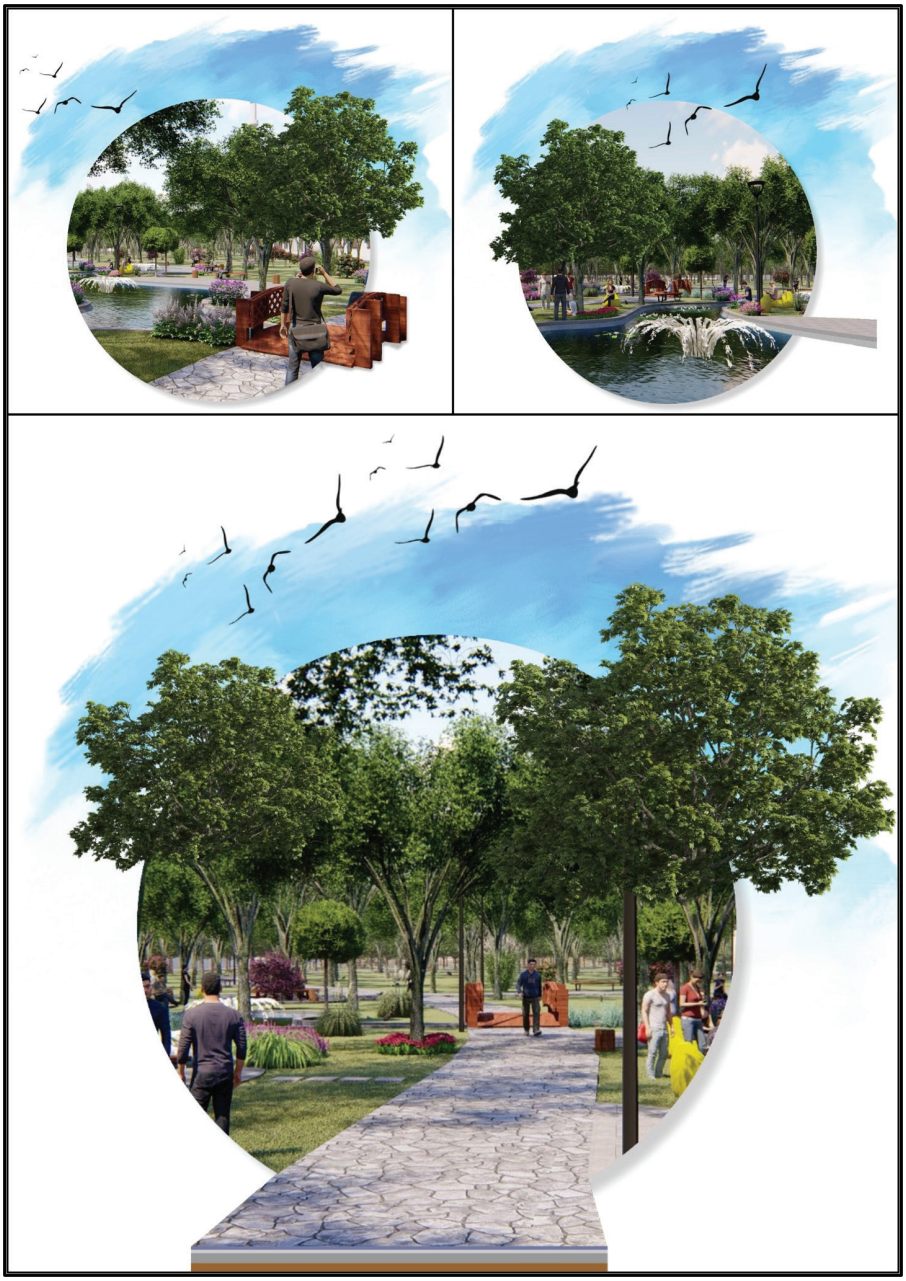

Figure 13. 3D Renderings of some spaces of the project

Implementation Phases

Following the preparation of the landscape design project of the study area, the tender for the project was made by Konya-Selçuklu Municipality and the implementation phase was carried out by the municipality. Infrastructure works were carried out by the contractor company and Selçuk University Green Areas Branch Directorate. For the implementation of the project, appropriate coordinates were determined on the implementation project and the project was applied to the area. According to the condition of the area, cut/fill works were carried out where needed, and the ornamental pool and hardscapes were applied according to the work schedule processes.

Ornamental Pool Implementation Phase

Excavation work was first carried out in the area during the ornamental pool implementation, (Figure 14). Then the ground was compacted, and the formwork installation was completed for concrete casting. Afterward, the form of the pool was revealed by iron reinforcement preparation and casting concrete. After the concrete had reached the desired strength, the formwork was removed, and the recirculation system was installed. Next, the lighting system was installed, the isolation was implemented, and the capstone and painting were completed.

Figure 14. Ornamental Pool Implementation Phases

Hardscape and Urban Furniture Implementation Phase

While creating hardscapes for the pedestrian ways, seating areas, and terraces around the pool, stone paving operations were completed in accordance with the design after excavation operations. At this stage, it is very important to compact the soil in the area before paving. After the curbing and stone paving, the installation of urban furniture such as garbage cans, benches, and pergolas was completed (Figure 15). After the implementation phase for the structural elements was completed, the areas where the plants would be planted were prepared.

Figure 15. Implementation Phases of Hardscape and Urban Furniture

A certain period of time is needed for the spaces in the project to be sustainable and to achieve the purpose determined during the spatial planning phase. Even if planting implementations are made with tall saplings in landscape design projects, it takes time for the area to establish its ecosystem. Therefore, a long period is often needed for the designed area to fully fulfill its function. The presence of mature trees in the study area can be considered an important opportunity in this context. In the evaluations made after the implementation (Figure 16), it was determined that the area was intensively used by both university staff and students in line with positive user feedback.

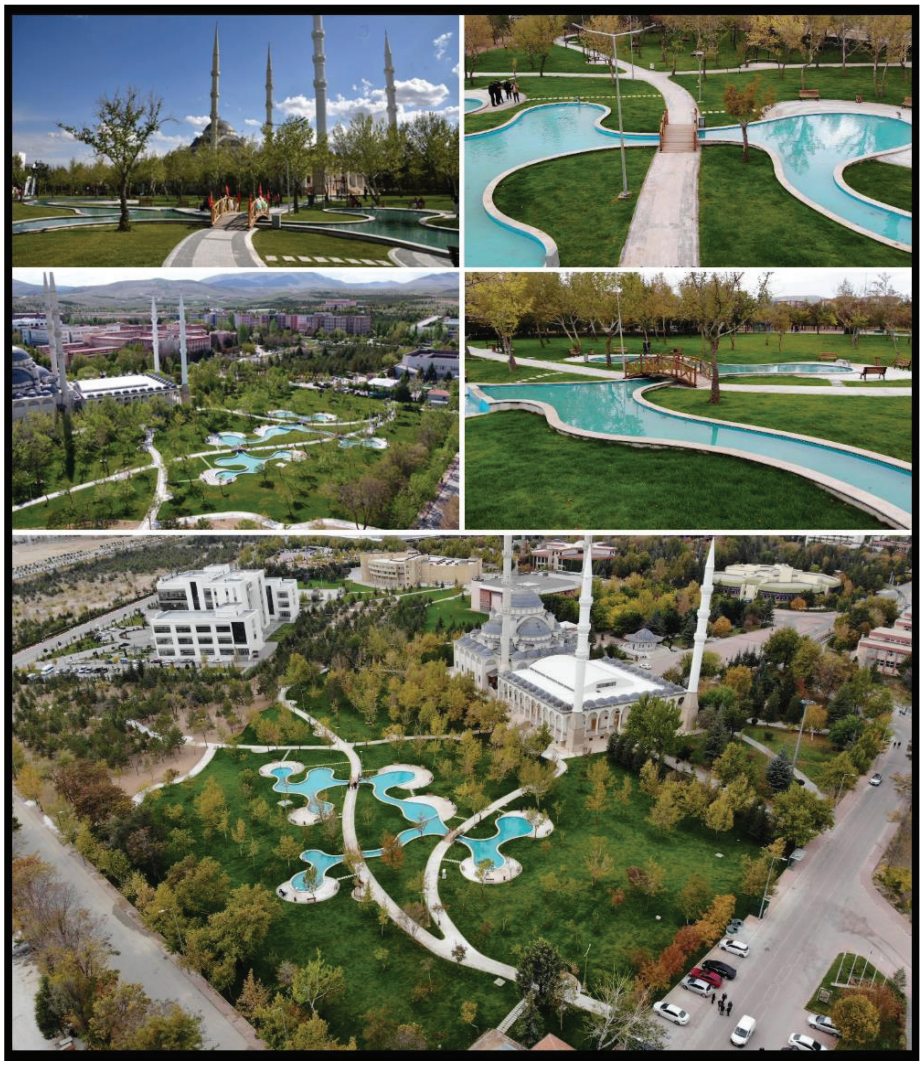

Figure 16. Post-Implementation Images of Merve Mercan Park

It is expected that the spaces on university campuses, where plant materials come to the forefront, will provide various contributions to the students using these areas (Hipp et al., 2016.). This area, which has become one of the most valuable open-green areas of the campus, has been protected from possible physical construction with the completed landscape design and implementation (Figure 17). General maintenance (pruning, mowing, cleaning, irrigation, etc.), repair, and control of the area are provided by the teams assigned by the Selçuk University Green Areas Branch Directorate.

Figure 17. Pre- (on the left) and post- (on the right) Implementation Images of Merve Mercan Park

Conclusion and Recommendations

In this study, the landscape design phases of "Merve Mercan Park" located in the central campus of Selçuk University, one of the old and well-established universities of our country, are discussed. The campus is recognized as one of the most important university campuses with its size, unique planning, location in harmony with the city, and the socio-economic opportunities it offers to students and academic staff. The study deals with the landscape design and implementation process and includes the design of the "Merve Mercan Park Landscape Project". The project was completed, and the park was brought into use within a year. Each phase of this work was supervised by the relevant units of the rectorate and completed by the contractor company that undertook the work as a result of the tender made by Selçuklu Municipality.

In a study conducted with university students, the presence of green spaces on campus was found to help reduce students' cognitive fatigue (Holt, et.al., 2019). Environmental educators state that natural environments such as campus gardens also provide opportunities for integrated forms of learning that link environmental awareness with other subjects (Young, 2016). It has been observed that children who participate in activities in school gardens have positive improvements in academic achievement, physical, social, and emotional health, and school and community benefits (Yaşar, 2022).

Especially in a province like Konya, where winters are harsh and long, the physical planning and design of the buildings within the campus should be designed to provide more recreational opportunities for students, academic and administrative staff, and guests visiting the campus. This study addresses the addition of a new function to the space in order to create a sustainable, comfortable, safe, and aesthetic design solution that is in harmony with the environment, where students and academic/administrative staff can spend their leisure time. This study includes the results obtained from a successful design and implementation work carried out under the supervision of university administrators and related units by following the landscape design process. In addition, special attention has been paid to creating spaces that reflect the

university's identity and prestige, are in harmony with the surrounding environment, contribute to the educational process, and are usable at all periods of the day. A similar process should be followed in all open green space planning and design throughout the university campuses.

Acknowledgments

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References

Altay, B., & Arısoy, N. (2023). *Analytical Hierarchy Process for the Selection of A Square: the Case Study of Konya City*. Turkish Journal of Agriculture-Food Science and Technology, 11(10), 1942-1946.

Bowler, D. E., Buyung-Ali, L. M., Knight, T. M., & Pullin, A. S. (2010). A systematic review of evidence for the added benefits to health of exposure to natural environments.

Brase, W. (1988). Integrating Physical Planning with Academic Planning. Planning for Higher Education, 16(4), 41-52.

Cox, D. T., Shanahan, D. F., Hudson, H. L., Plummer, K. E., Siriwardena, G. M., Fuller, R. A., ... & Gaston, K. J. (2017). Doses of neighborhood nature: the benefits for mental health of living with nature. *AIBS Bulletin*, *67*(2), 147-155.

De Young, R., Scheuer, K., Roush, J., & Kozeleski, K. (2016*). Student interest in campus community gardens: sowing the seeds for direct engagement with sustainability.* The contribution of social sciences to sustainable development at universities, 161-175.

Dober, R. P. (2000). *Campus landscape: Functions, forms, features*. John Wiley & Sons.

Erçevik, B., & Önal, F. (2011). *Üniversite Kampüs Sistemlerinde Sosyal Mekân Kullanımları*. Megaron, *6*(3).

Fuller, R. A., Irvine, K. N., Devine-Wright, P., Warren, P. H., & Gaston, K. J. (2007). *Psychological benefits of greenspace increase with biodiversity*. Biology letters, *3*(4), 390-394.

Hipp, J. A., Gulwadi, G. B., Alves, S., & Sequeira, S. (2016). *The relationship between perceived greenness and perceived restorativeness of university campuses and student-reported quality of life*. Environment and Behavior, 48(10), 1292-1308.

Holt, E. W., Lombard, Q. K., Best, N., Smiley-Smith, S., & Quinn, J. E. (2019). *Active and passive use of green space, health, and well-being amongst university students.*

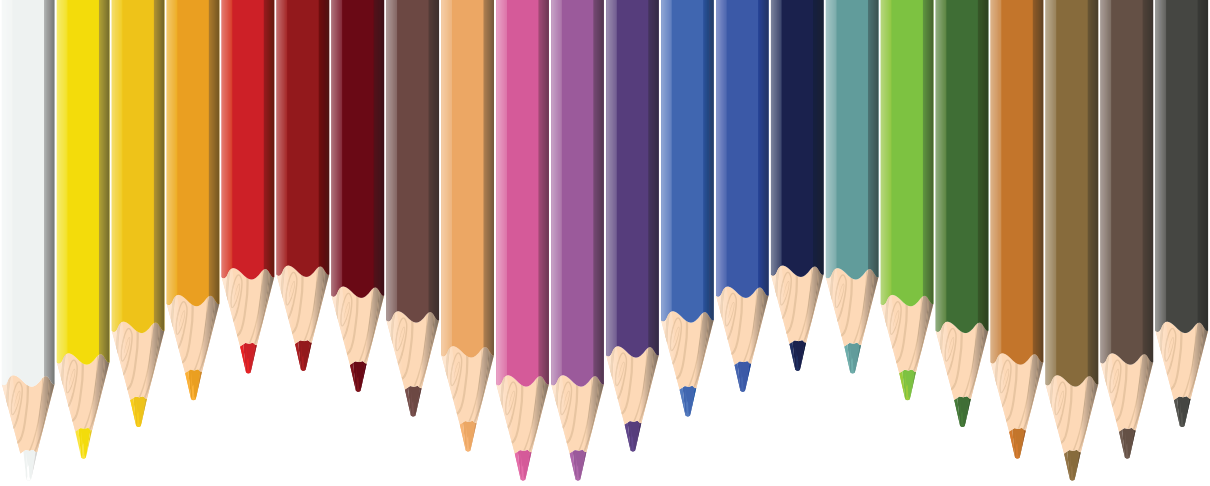
Maas, J., Verheij, R. A., Groenewegen, P. P., De Vries, S., & Spreeuwenberg, P. (2006). *Green space, urbanity, and health: how strong is the relation?*. Journal of epidemiology and community health, *60*(7), 587.

Matloob, F. A., Sulaiman, A. B., Ali, T. H., Shamsuddin, S., & Mardyya, W. N. (2014). *Sustaining campuses through physical character–the role of landscape*. Procedia-Social and Behavioral Sciences, 140, 282-290.

Yaşar, A. (2022). *Kullanıcı katılımlı tasarım yaklaşımı ile üniversite kampüslerinde topluluk bahçesi tasarımı 'FMV Işık Üniversitesi Şile Kampüsü*. Master's thesis, Işık Üniversitesi. İstanbul.

Yılmaz, H., & Irmak, M. A. (2012). *Yerleşke planlamasında bitkisel tasarım ilkeleri: Atatürk Üniversitesi yerleşkesi örneği*. Atatürk Üniv. Yayın No:1011,192s.

Yılmaz, T., Zırhlıoğlu, B., Olgun, R. (2013). *Üniversite yerleşke alanlarında su kullanımlarının incelenmesi: Akdeniz üniversitesi örneği*. İnönü Üniversitesi Sanat ve Tasarım Dergisi, 3(7).



Chapter 12

AFFORDANCE FOR USER-PRODUCT INTERACTION INTRODUCTION

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While advances in technology provide convenience to designers in the product design process, they also cause designers to encounter difficulties (You et al., 2007). In order for a product to fulfill its function and interact correctly with its user, design elements such as material, texture, color and form are used as a tool to convey information to the user. Developing technologies have led to the simplification of products, and the tangible components of the product, such as material, texture, color and form, which provide communication between the user and the product, have begun to become intangible. As these tools used by the designer to ensure communication and interaction between the product and the user disappear, it has become difficult to ensure communication between the product and the user. Today, mechanical interactive products are being replaced by digital or smart interactive products. Opening a door in a hotel room is not done through mechanical interaction with a lock key, but through digital and remote technologies. The way of interaction between the product and the user has evolved from muscle-oriented to brain-oriented.

Throughout civilizations, products were first mechanically based and then continued to develop successively with electrical, electronic, software and connection technologies. Each development has paved the way for the next change. Changes take a long time, but with the 3rd industrial revolution, these changes between technologies have accelerated with the developments in information and communication technologies. The first industrial revolution and subsequent period were based on steam-powered mechanical production and ended with the emergence of the second industrial revolution based on electrically powered mass production in the early twentieth century. The third Industrial revolution began with computer technologies and electronic-based production automation. Developments in computers ushered in a software era. (Bloem et al. 2014). The software age has also enabled the transition of these processes to accelerate. Industry 4.0, where connection and network technologies are used, can be said to be more pregnant with new technologies than ever before.

In a design industry where product markings are diminishing, the designer always uses the science of perception to discover how to convey information to the user. The designer aims for the individual to take action upon perceiving the product. Therefore, designers must have the ability to use new technology applications in affordance design. This study discusses the change in affordance in user-product interaction in the context of developing and changing technology.

1.AFFORDANCE

Perceptual psychologist Gibson (1979) was the first to introduce the term affordance, which he defines as what the environment provides to the animal

(human), good or bad. Gibson (1979) states that the same environment can provide different opportunities according to people's different needs. Psychologist Norman used the term affordance, coined by Gibson in 1988, for design. According to Norman (1988), affordance is the user taking action. Anderson et al. (2002) state that looking at an object is enough for a person to take action.

Gibson (1979) and Norman (1988) discussed the term affordance from a perception perspective. Norman (1988) defines 'the term affordance refers to the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used. [...] Affordances provide strong clues to the operations of things'. According to Gibson, Affordance is the user's possibility of taking action depending on their physical condition, while according to Norman, it is the user's taking action with the information perceived according to their mental and perceptual abilities (You et al., 2007; Hou et al., 2017).

Perceived Information

The human brain interprets perceived information by bringing it together. 'Every sensation brings a perception and meaning (Erhan, 1978). Perception can be defined as the set of sensory information received regarding abstract and concrete objects in the outside world.

Everything that is seen actually has elements that enable and facilitate information exchange and communication. Signs and symbols are visual elements that are frequently used in daily life and facilitate communication and information exchange. Humans obtain information about an object's color, form, shape, material, texture and size from the environment through their senses. The information, features and qualities carried by design elements such as color, form, shape, material, texture, and size used in products from past to present have changed with industrial revolutions and technologies. Technology has simplified information and created clusters that are satisfied with less information. Technology has changed and simplified taste and pleasure (Güvenç, 1984). It has led to the emergence of products consisting of the simplest geometric forms that can perform many tasks simultaneously, are easy to understand and use, and are fully automated. Perception is a phenomenon linked to culture. Not only sensations but also experience, aesthetic values, society and culture have an impact on the interpretation or definition of sensations coming from the environment (Kaptan, 2003). In the past, people used visual expressions and signs to communicate. The smoke created by the burning fire and a white handkerchief held by a woman in her hand had a meaning. However, some knowledge is needed to understand the meaning of this silent language.

Designers who construct the designed product as a set of information

exchanges often confuse the concept of affordance with signs. The etymology of design comes from the Latin 'de' and 'signare' and means to do something with a sign, to distinguish it, to give meaning to something with a sign, and to determine the relationship of that thing with other things (Buchanan and Margolin, 1995). It uses icons and metaphors to implement the concept of Affordance and give meaning to products. Most products can tell you what they are by name; however, for the physical and social functions of the product, the user defines, perceives, and interprets the sensory codes of the product. Design directs and facilitates this identification, perception, and interpretation.

2.AFFORDANCE TYPES

Hartson and Pyla (2018) examined the term affordance in design in 5 groups as cognitive, physical, sensory, functional emotional affordance. Hartson and Pyla (2018) conveyed cognitive affordance with the actions of thinking, learning, understanding and knowing and stated that the design aims to realize these actions. In this context, cognitive affordance is similar to Normal (1988)'s definition of 'knowing what to do'. The act of learning, knowing and understanding is divided into forward and feedback (Hartson and Pyla (2018). In feedback, the user knows, understands and learns what happens after acting. The design elements that provide this notification to the user may or may not be real objects. The user hears a voice. You can also receive feedback using the button or a notification can be provided with the feedback of a button.

Physical affordance is the ability to act with a product's supportive and facilitating features (Hartson and Pyla, 2018). While physical affordance includes actions such as pressing, dragging, touching, swiping, and sitting on a tangible object, they are tangible product parts that enable computer interfaces to be operated. Because they are real physical objects, they are related to physical ergonomics. It is important to have the necessary size and shape for easy grasping by the user. In this context, physical affordance and cognitive affordance are intertwined; physical existence has its cognitive affordance (Hartson and Pyla 2018). Physical affordance involves a physical interaction.

Sensory affordance is the design's ability to help, support and facilitate the user's perception of an action. The difference between sensory affordance and physical and cognitive affordance is that sensory affordance is the ability to perceive with one or more of the five sense organs without involving knowing, learning or mechanical interaction. Norman states that in a screen-based product, a circular design element positioned by the designer to define the place that needs to be touched on the screen is a sign, not an affordance. However, when Hartson and Pyla (2018) affordance types table (Table 1) is examined, this circle can be interpreted as a sensory affordance.

Functional affordance is the performance of the task as a result of physical

user actions. Physical affordance is a design feature that helps users get work done by connecting user actions to system or backend functionality (Hartson and Pyla 2018). Emotional affordance is a tool that companies use to influence users. Emotional affordance is abstract, it is the emotion that occurs in the user after perception and action.

With the study conducted by Hartson and Pyla (2018), affordance was made more understandable in the context of product design. It is useful to eliminate confusion between signs, symbols, and affordance. The design of products and objects affected by changes in technology also affects the affordances used in design. The actual product parts that will be used to transfer the information that the user will obtain from the product with affordance for the perception process between the user and the product and for the user to take action are decreasing.

Table 1. Summary of affordance types (Hartson and Pyla, 2018)

Affordance Type	**Description**	**Example**
Cognitive affordance	Design feature that helps users with their cognitive actions: Thinking, deciding, learning, remembering, and knowing about things	A button label that helps users know what will happen if they click on it
Physical affordance	Design feature that helps users with their physical actions: Clicking, touching, pointing, gesturing, and moving things	A button that is large enough so that users can click on it accurately
Sensory affordance	Design feature that helps users with their sensory actions: Seeing, hearing, and feeling (and tasting and smelling) things	A label font size large enough to be discerned
Functional affordance	Design feature that helps users employ a product or system to accomplish work (i.e., usefulness of a system function)	The internal system ability to sort a series of numbers (invoked by users clicking on the Sort button)
Emotional affordance	Design feature that adds emotional impact to the user experience and helps users appreciate and enjoy the interaction	Beautiful aesthetics on a webpage, something that makes interaction fun

3.AFFORDANCE IN PRODUCT DESIGN

Engineering Design, Human-Computer Interaction and Industrial Design disciplines immediately adopted the term and became a design principle for design (Norman, 2013; Chen et al., 2023). Affordance was used by designers as a systematic and complementary tool when designing a product (Maier and Fadel, 2003).

According to Norman (1988), affordance is a clue that shows the user how the object of a product will be used. The affordance groupings made by Hartson and Pyla (2018) show that the term affordance is not just about how a product will be used. Sensory affordance when a button is perceived by the sense organs, cognitive affordance to understand that it is intended to be turned on and off, cognitive affordance to understand what action needs to be taken to interact with the button, and physical affordance to take action and turn the button, functional affordance to understand that the action can also be performed by the object and turn the device on. The experience and emotion that occurs in a person after use can be defined as an emotional affordance. If the sign is confused with affordance, the subtitle of affordance can be said to be sensory affordance. Signs are visual clues that indicate the existence of an opportunity (Nolan, 2023).

In products where the physical properties of objects decrease, affordance and sign are more confused. The classification made by Hartson and Pyla (2018) provides descriptive information to designers about how affordance design should be for products, surfaces, and forms that are moving away from being real entities due to developing technologies.

Normal (1988) states that there is ample affordance in physical products. For example, a glass, which is a physical product, contains information that can be easily perceived by the user. Mobile phones, which were in use at the end of the 20th century and were first encountered, had affordances on them so that users could easily understand their use. However, learning the working processes of products whose design and appearance have become simpler with developing technology can become complicated at first use. Even though the user has become accustomed to its use over time, he may have difficulty taking action when he first encounters the product. Figure 1 shows the changing technologies in the context of industrial revolutions. In Figure 1, researchers describe product evolution in the projection of new technologies with differing capabilities (Guérineau vd., 2022).The technologies used in design affected by these changes have changed the interaction between the user and the product. Interactions between the user and the product are provided by affordances. Table 2 shows the change in affordance types explained by Hartson and Pyla (2018) according to industrial revolutions.

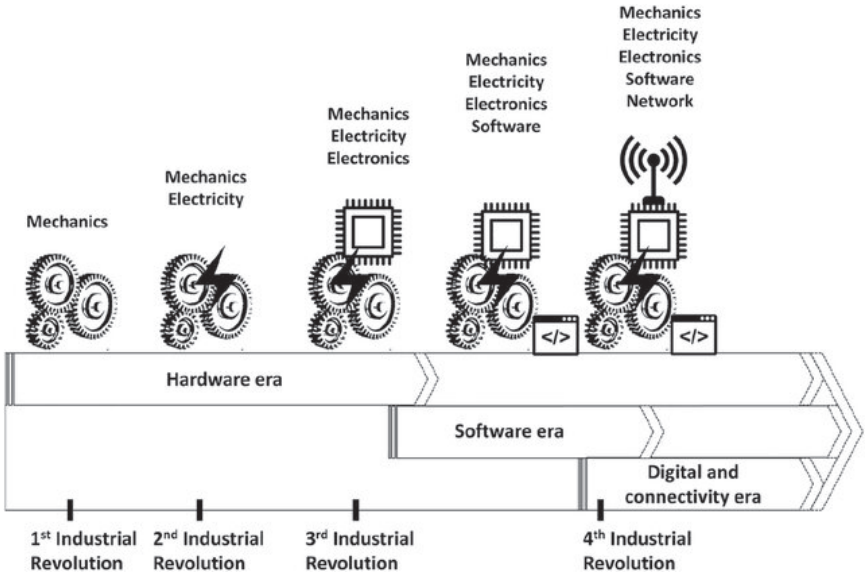


Figure 1 Product evolution and industrial revolutions share similar technological advances (Guérineau vd., 2022)

The application of production techniques that change and develop with the industrial revolutions to products create technological products. The main difference between hunting society, agricultural society, industrial society and information society from past to present is the changing technology throughout all civilizations. In other words, it is the application of science to industry. Products are not only affected by these changes in terms of production methods. Products have also been affected in terms of conveying the information they carry or user-product interaction. The product, which in the past carried the information that the opening action would be realized by pressing a button, now carries the information that this action would be realized by simply touching it. The change in affordance types of white goods group buttons according to industrial revolutions is shown in Table 2.

According to Table 2, with the technologies developing with the industrial revolutions, products are evolving towards interface designs equipped with light. In Industry 1.0, when water and steam power technologies were common, user-product interaction was manual and mechanical. The cognitive affordance design of the products included formats that accommodate manual or pressing actions. Therefore, physical buttons dominated for physical affordance. Sensory affordance was provided by physical signs. In Industry 2.0, the use of electrical energy has become widespread. User-product interaction was affected by this change and was provided with electromechanical and electronic interface designs. Cognitive affordance design was provided with elec-

tromechanical dial buttons. Unlike Industry 1.0, physical buttons provided physical affordance. Buttons using physical graphical expressions began to be used for sensory affordance. The design for sensory affordance aimed to provide cheaper but quality product information. With the development of computer and communication technologies along with Industry 3.0, the interaction between the user and the product was also provided through digital interfaces. Cognitive affordance in digital interfaces was provided by digital dial buttons. Physical and luminous surfaces were developed for physical affordance. Graphical and luminous signs were used for sensory affordance. Design for sensory affordance aimed to convey brand and technology knowledge to its users through products. Industry 4.0 technology consists of cyber-physical systems. The interaction between the user and the product has become simpler and started to be achieved through touch. Therefore, cognitive affordance was provided with touch surfaces or remote access tools. Physical affordance was provided by surfaces containing lights and signs. The signs used here must have universal meanings and convey information correctly to all users, regardless of their culture. It can be said that the design elements used to convey the information they carry in physical affordance and sensory affordance Industry 4.0 are similar. The emotional affordance conveyed to the user is the user experience, which is the effect the product leaves on the user after use.

Table 2. Evolution of parameters in button design

Parameters	Industry 1.0	Industry 2.0	Industry 3.0	Industry 4.0
Technology	Water and Steam Power	Electrical power	Computer (ICT)	Cyber Physical Systems (IoT)
User-Product Interaction	Manuel-Mechanical	Electromechanical- Electronic	Digital	Touch-Remote
Cognitive Affordance	Manuel-press	Electromechanical- turning	Digital turning	Touch-Remote
Physical Affordance	Physical Button	Physical Button	Physical-Illuminated Surface	Illuminated Surface
Sensory Affordance	Physical Signs	Physical Graphical Signs	Graphical-Illuminated - Signs	Graphical-Illuminated- Sound - Signs
Functional Affordance	Products	Products	Products	Services, Systems
Emotional Affordance		Cheaper, Quality	Brand,Technology	User Experience

Throughout this process, products developed and designed for functional affordance purposes turn into services. In other words, we can talk about an evolution from physical products to cyber products. For this reason, sensory affordance, called user experience, has become more important than ever and designs are being developed for emotional design purposes. The number of academic studies on emotional design in the field of design is also significantly high. It can be said that the decrease in physical design components that designers can organize leads designers to emotional design. It can be said that user experience design and user interface design issues, such as emotional design, have become popular for the same reasons. However, it can still be said

that in these areas, the designer has not been able to create standards that will enable him to obtain scientific data in the fields of experience and interface, such as physical ergonomics standards.

In this evolution process, the design element that can be used for affordance, which the designer uses as a means of information transmission, decreases and the designer's job becomes more difficult. The main difference between traditional mechanical products and electronic products is the lack of physical features that help affordability, and therefore the difference in perception between users and products increases (Norman, 2002).

DISCUSSION

Norman (1988) states that the term affordance, which describes the relationship between user interaction and the product's material properties, has become a way to increase the visibility and usability of a product. Affordance forms the basis of the behavior required to perform the function of the product (You et al., 2007). Affordance is a term that has gained even more importance in the 21st century. However, developing technologies have reduced the visibility of the product, that is, the design elements such as form, material, color, texture and form used in the design. For this reason, usage difficulties increase due to interactions between the user and the product.

Throughout the history of civilizations, as the method of information transfer between the user and the product to operate a product has changed, the interaction between the user and the product has also changed. In other words, as the interaction between the user and the product changes with technological developments, the affordance components that provide information transfer in the products have also changed. Real and physical components such as sound, light, and surface have the feature of a simpler and more universal language. Today, the perception abilities of individuals are more important than their anthropometric characteristics. Affordance components that enable the user to take action and transfer information between the user and the product are becoming increasingly important for designers, and at the same time, it is becoming increasingly difficult for designers to provide effective affordance.

It is not an easy-to-understand field that can be perceived as an Affordance sign. A product consists of the whole of its cognitive, physical, emotional, sensory and functional affordances. Their relationships with each other reveal actions. Affordance design is generally discussed through buttons for products. To make Affordance design more understandable and clear for designers, different product designs should also be examined from their projection.

REFERENCES

Anderson, S. J., Yamagishi, N., & Karavia, V. (2002). Attentional processes link perception and action. *Proceedings of the Royal Society of London. Series B: Biological Sciences*, *269*(1497), 1225-1232.

Bloem, J., Van Doorn, M., Duivestein, S., Excoffier, D., Maas, R., & Van Ommeren, E. (2014). The fourth industrial revolution. *Things Tighten*, *8*(1), 11-15.

Buchanan, R., & Margolin, V. (Eds.). (1995). *Discovering design: explorations in design studies*. University of Chicago Press.

Chen, M., Fadel, G., & Mata, I. (2022). Applications of affordance and cognitive ergonomics in virtual design: A digital camera as an illustrative case. *Concurrent Engineering*, *30*(1), 5-20.

Erhan, lhan (1978), *Endüstri Tasarımında Kullanıcı-Araç _liskileri Açısından*

Görsel Bildirisim, _stanbul Devlet Güzel Sanatlar Akademisi Endüstri

Sanatları Fakültesi, _stanbul

Gibson, J. J. (2014). The theory of affordances:(1979). In *The people, place, and space reader* (pp. 56-60). Routledge.

Guérineau, J., Bricogne, M., Rivest, L., & Durupt, A. (2022). Organizing the fragmented landscape of multidisciplinary product development: a mapping of approaches, processes, methods and tools from the scientific literature. *Research in Engineering Design*, *33*(3), 307-349.

Güvenç, Bozkurt (1984), İnsan ve Kültür, Remzi Kitabevi, İstanbul

Hartson, R., & Pyla, P. S. (2018). *The UX book: Agile UX design for a quality user experience*. Morgan Kaufmann.

Hou, T., Yannou, B., Leroy, Y., Poirson, E., Mata, I., & Fadel, G. (2017, August). Identifying affordances from online product reviews. In *International Conference on Engineering Design (ICED)*.

İnternet: Nolan, R. (2023). 'Affordances Vs. Signifiers: The importance of affordances and signifiers in user experience'. https://bootcamp.uxdesign.cc/affordances-vs-signifiers-the-importance-of-affordances-and-signifiers-in-user-experience-27aa7dface9e. Retrived on 26.12.2023

Kaptan, B. B. (2003). 20. yüzyıldaki toplumsal değişimler paralelinde iç mekan tasarımı eğitiminin gelişimi.

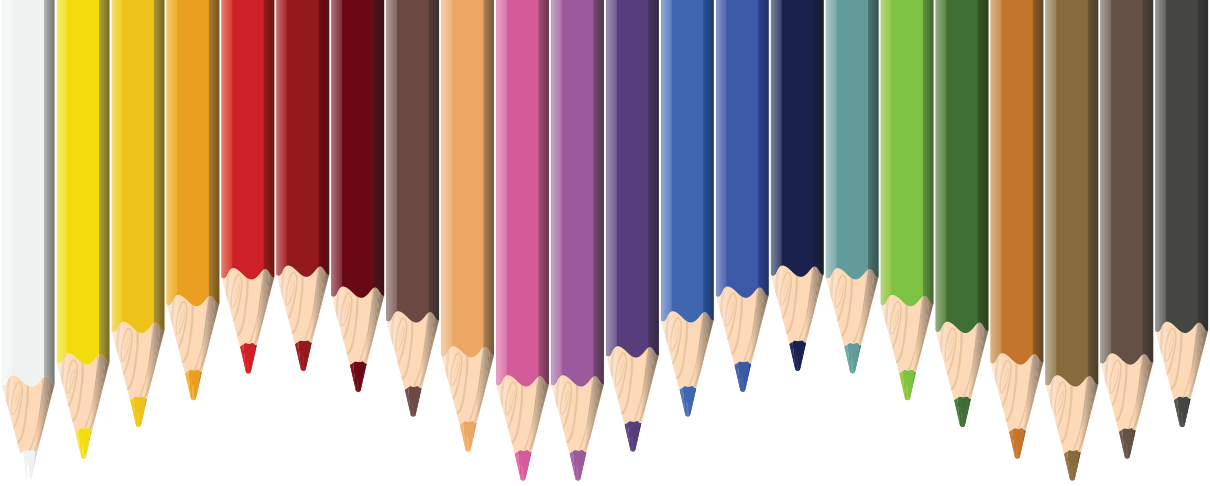
Maier, J. R., & Fadel, G. M. (2003, January). Affordance-based methods for design. In *International Design Engineering Technical Conferences and Computers and Information in Engineering Conference* (Vol. 37017, pp. 785-794).

Norman, D. A. (1988). *The psychology of everyday things*. Basic books.

Norman, D. (2002). Emotion & design: attractive things work better. *interactions*, *9*(4), 36-42.

Norman, D. A. (Ed.). (2013). *Models of human memory*. Elsevier.

You, H. C., & Chen, K. (2007). Applications of affordance and semantics in product design. *Design studies*, *28*(1), 23-38.



Chapter 13

PERMACULTURE DESIGN PRINCIPLES IN CITIES

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INTRODUCTION

Rapid urbanization leads to an increase in the urban population and the replacement of agricultural areas with construction sites. As urbanization accelerates the loss of farmland (Çelik, 2017), the spillover effect has destroyed the surrounding farmlands and small villages (Ling et al., 2018). The land and biological resources around the cities tend to be consumed, which reveals the importance of planning for the conservation of urban nature and conscious use (Evrendilek, 2003). "Habitat III" was held on 17-20 October 2016, based on the fact that the difficulties in recognizing unsustainable urban developments such as emerging urban poverty and related discrimination and increasing urban sprawl continue. The output of the conference was the New City Agenda, which mobilizes cities and human settlements as a critical tool for eradicating poverty, promoting inclusive growth and ensuring development within a sustainable understanding (Aras, 2019). As a result of these efforts, urban sustainability efforts have proliferated all over the world and for the last 30 years the concept of urban ecology has become more understandable as a basis for urban planning (Breuste, 2004 ; Pedersen et al., 2004).

Rapid urbanization has become a demand for food supply and security in the urban system (Ling et al., 2018). Increasing urban poverty has revealed malnutrition and food insecurity (Dubbeling et al., 2010). With the growing demand for safe food, city dwellers have had and continue to rely on processed food or food transported over long distances. This has resulted in and continues to result in nutrient loss and high food prices (FAO, 2008). However, in recent years, it has been observed that the risks arising from climate change and the usual practices in the planning and management of urban systems have begun to be overhauled in some developed and developing countries. Options such as the agricultural alternative to meet the need for urban centers, increasing green infrastructure and edible landscaping have begun to be considered as a possible solution to the urban landscape and food production stability for urban residents (Cengiz and Tekdamar, 2022; Ling et al., 2018).

Especially in developing countries, subsistence agriculture in urban areas has been adopted as a strategy to increase food and nutrition security due to easy access to food (Obeng-Odoom, 2013; Eigenbrod and Gruda, 2014; Mok et al., 2014). Edible elements such as vegetables, fruits, herbs and crops have been introduced into urban public spaces in many countries (Taylor and Lovell 2014; Drake and Lawson, 2015). This situation has created a new landscape, defined as edible landscape, which characterizes both an aesthetic effect and food production (Mattsson et al., 2015). The integration of edible plants with ornamental plants has increased species diversity in urban areas. It has started to help maintain the stability of the urban ecosystem and has started to promote sustainable urban development (Clarke and Jenerette, 2015; Klepacki and Kujawska, 2018). In addition, it also provided carbon

sequestration, rainwater retention and heat island reduction (Gittleman et al., 2017). Differently, it has provided advantages such as mitigating the food security crisis, strengthening social cohesion, and enriching urban species diversity (Sima et al., 2010; Medeiros et al., 2019).

Today, urban gardening has become the main source of daily food and nutrition for low-income residents (Hamilton et al., 2014). These gardens provide a way for retired people and housewives to integrate into society (Tei et al., 2010; Olivier et al., 2017), alleviate social conflicts and stabilize social relations (He et al. Zhu, 2018). Urban residents can feel close to nature by participating in cultivation activities that deepen their understanding of the urban ecosystem (Fischer et al., 2018) .

As a result, urbanization is one of the undeniable phenomena of today (Haberman et al., 2014). While performing urbanization and urban design, nature and natural elements should be treated with respect. Permaculture should be considered as one of the important applications that realize this. Expansion of cities towards the gradient areas located on the rural-urban fringe around their metropolitan centers, and to achieve this in a sustainable manner by establishing the right structural and social infrastructure, integrated with practices such as ecological landscape design and permaculture, using smart and green technologies, within the framework of nature-based ethical principles. is ideal. However, although it does not result in a radical change, it is possible to produce sustainability-based local solutions in city centers (Parlak, 2018).

PERMACULTURE

✓ Definition of permaculture

Permaculture; It can be defined as a design system based on ethical rules and applicable to land use, food production and social affairs. It is a system that combines human life, ecology, landscape and organic growth, aiming at sustainability and efficiency. In this system, all kinds of designs that place natural products and live in human life and support sustainability are part of the permacultural design system (Bulut and Yılmaz, 2008). Permaculture is a design process that supports nature-based cycles that reduce negative environmental impacts, increase biodiversity and meet human needs while promoting social justice (Sartison and Artmann, 2020).

According to Bill Mollison, the father of the concept of permaculture, permaculture; It is the conscious design and maintenance of agriculturally productive ecosystems that have the diversity, stability and resilience of natural ecosystems (Mollison, 2011). Mustafa F. Bakır, Selen Akhuy, Güneşin Aydemir defined permaculture in their book titled “Permaculture Handbook and the Example of Marmariç” as follows: “Permaculture: Permanent

Agriculture or culture is a science of design and maintenance that enables people to meet their material and non-material needs by taking the functioning of natural ecosystems as an example, not by harming the nature of which they are a part and the world they live on, but by providing benefits. Permaculture is an approach where we look at the solution rather than the problem, what we want rather than what we do not want, the positive rather than the negative" (Bakır et al., 2011).

Permaculture, a system of both permanent and agricultural design principles, was first proposed in 1974 by Bill Mollison and David Holmgren as an ecological design method in Australia by Bill Mollison and his graduate student David Holmgren in the 1970s. This concept has become sustainable food production self-sufficient ecosystems (Liu et al., 2017). Mollison and Holmgren published their book "Permaculture One" in 1978. Mollison and Holmgren defined the scope and importance of permaculture as follows: "permaculture has a deeper meaning than providing food for the home. Self-sufficiency in food means nothing if people do not have access to land, information and financial resources. Therefore, in recent years, permaculture has included land access, commercial structures and financial strategies, thus becoming a holistic human system" (Mollison, 2011).

The concept of permaculture in the world is sometimes described as ecological agriculture in terms of its design system. But permaculture; Sustainable landscape based on natural principles is a method for establishing relations between various social, economic and environmental disciplines such as biology, anthropology, economy, architecture, geography, agriculture, and botany (Güleryüz, 2013).

Caring for the world means caring for the soil, its species and diversity, the atmosphere, forests, micro-habitats, animals, water, in short, all living and non-living beings. This thinking includes harmless and curative activities, active protection, sparing use of resources. Taking care of people is important in terms of people having decisive effects on nature. The permaculture system is a system based on creating self-sufficient sustainable living spaces and using permaculture designs while preserving and developing nature for this purpose (Ar and Uğuz, 2014).

Permaculture design is a system that brings together conceptual, material and strategic components in a model that works for the benefit of all living things. The view behind Permaculture; working with nature rather than going against it, making long-term careful observation rather than acting thoughtlessly for a long time, looking at systems in all their functions rather than chasing only one product, and allowing systems to evolve themselves (Mollison, 2011).

Permaculture is the use of building, pond, wall, surface arrangement,

afforestation, tools and equipment, machinery, energy sources, etc. in a certain area. tangible assets (material cultural elements) created with all the techniques used by human beings, such as plants, animals, precipitation regime, climate, sun, wind, etc. seeks the harmony of all elements of natural life, such as The main purpose here is to create systems that are self-sufficient, do not harm the environment, do not exploit material and human resources, are sustainable in the long term, are ecologically healthy and economically valuable (Mollison, 2011). Permaculture is also a philosophy that supports the protection and restoration of nature, natural values, planning, design and management in these values. This philosophy is also reflected in the fields of landscape architecture. Permaculture reveals techniques and principles that will help open and green spaces to be healthier, creative and sustainable (Üsküplü and Polat, 2019).

Permaculture gardens are generally small in size; however, every part of the available space is used. Raised beds with a variety of plants are common in the permaculture garden. Vegetables, herbs, edible flowers, fruit-bearing small trees, and sister plants often grow together. Raised beds take up less space, are more accessible, easily drained, and attractive (Phipps, 2013). Nothing is wasted in a permaculture garden. Compost is made from garden waste, and the compost produced is then used for soil improvement and fertilization, respectively. Water is another important element of permaculture gardens. Water not only keeps the soil and plants hydrated, it also attracts wildlife to permaculture gardens. Many permaculture gardens are even developing recycling practices for irrigation. There is no need for pesticides in a permaculture garden. Because wetlands often attract insects, birds, frogs and other small wildlife creatures, many of them feed on insects in the permaculture garden. Sister plants also help keep insects and other pest problems to a minimum (Phipps, 2013).

Permaculture is a localized, sustainable and permanent approach to building multidimensional relationships with nature, which is reflected in urban and regional planning, architecture, and landscape design studies (Wallace and Carruthers, 2018). Permaculture is designed landscapes with patterns found in nature while providing ample food, fiber and energy to meet local needs (Sager, 2019). Permaculture is self-sufficient, sustainable system design. In permaculture, imitating nature, harmony with nature and minimal interference with nature are essential. Reconnecting with nature and placing ourselves in nature is fundamental (Stark, 2009). Permaculture; It is a holistic design system that treats the natural environment as diverse, balanced and resilient, and aims to create healthy and productive living spaces to meet food, energy, shelter and other needs. The aim of permaculture is to provide a fertile and sustainable system by feeding nature better and regaining the yield taken from nature (Najafidashtapeh, 2017).

✓ **Permaculture Ethics**

Permaculture ethics encompasses all aspects of environmental, community, economic and societal systems. In permaculture ethics, the issue that should be preferred is cooperation, not competition. Here are the ways we can apply the ethic of caring for the world to our own lives (URL-1, 2023).

- Considering the long-term results of our actions, making plans in a way that ensures sustainability,
- Using natural species that are possible local or beneficial in the field,
- The thoughtless use of species that are likely to invade the region may disrupt the natural balance in the area we live in,
- Cultivating the smallest possible piece of land,
- Planning the use of small-scale, energy-efficient, concentrated systems instead of large-scale, energy-consuming comprehensive systems,
- Being versatile and polycultural,
- Rather than growing a single type of product in the field, growing different products together,
- Such planning not only brings stability to the area but also prepares for environmental or social changes.
- Increasing the total product return,
- It is necessary to look at the total return of the system from annual and perennial plants, grains, trees and animals. Energy saving should be seen as a plus parameter,
- Low-energy environmental (solar, wind, water) and biological (plant, animal) systems should be used to store and convert energy,
- Reintroducing food cultivation in cities, which has always existed in sustainable societies,
- Supporting people in self-sufficiency and promoting community responsibility,
- Restoring soil fertility by reforestation,
- Optimum use of everything and recycling of all waste,
- Seeing solutions, not problems
- Working in a useful place and helping those who want to learn the right place,
- Such as planting the tree according to the climate and area conditions, the appropriate aspect and soil conditions.

Bill Mollison lists the ethical principles of permaculture as follows (Mollison, 2011; Parlak, 2018):

- **Earth care:** to provide the necessary conditions for the continuation and reproduction of all living systems, animate and inanimate beings.
- **People care:** ensuring that people have access to the resources they need for a healthy existence, with shelter, food, satisfactory work, education, and enjoyable human relationships.
- **Fair share:** we can allocate resources to support the above principles by controlling our own needs.

Permaculture Design Principles

It is essential to create systems that are ecologically sound and economically viable, that meet their own needs, that do not exploit or pollute, and that are therefore sustainable. At this point, the permaculture design system is considered as a land use form that provides maximum efficiency and minimal damage to the ground without exploitation or pollution, for both untouched and damaged lands (Mollison, 2009).

According to Mollison (2011) there are two basic steps for a good permaculture design: The essence of permaculture is the right design and the right application of the right design. Correct design is the logical establishment of the connection between the elements. Elements should not be considered alone, the connection between the functions of each should be reflected in the design. Permaculture makes these connections and optimizes design. In other words, permaculture is a method that meets the need of one item with another item. The first relates to rules and principles that can be applied to all climatic and cultural situations, while the second is more closely linked to practical techniques that vary in different climates and cultures.

If we bring together the design principles of Holmgren (2004) and Mollison (2011) and extract the design principles of permaculture from their common aspects;

- First of all, a good observation should be made. Observation provides good planning and saves unnecessary labor.
- Resource Analysis: Accumulating the energy that supports the product purchase means maximizing the useful energy accumulation.
- Ensuring recycling: Every object must provide the object to be replaced. It ensures the continuity of these cycles, that is, being sustainable.
- Energy recycling: The expenses of a system must be designed to meet the needs of that system.
- Biological resources: Holistic insect control should be done by

including all living things in the area.

• Regarding the use of resources in the area, first the resources should be determined, then which resources naturally entered the system should be determined, and a design should be made that ensures maximum use of them. The use of solar, wind, human and biological resources should be maximized.

• Diversity is the most important factor in self-sufficiency. Here's an example: Economically, having salable products at different times of the year protects a family from financial collapse and damage to a product by pests or bad weather.

• Positioning the items by associating them with each other is possible by observing the connections well. Rather than perceiving the components in a system independently of each other, it is necessary to evaluate each of them in relation to each other.

• Collaborating with nature's cycles means using borders in the most favorable way.

• Build small-scale dense systems: start small and create a highly efficient, manageable system.

• Focusing on the local: Acting with the philosophy of "think globally, act locally" supports the local economy.

• Appropriate technology: The most suitable technologies should be selected for cooking, lighting, transportation, heating, waste management, water and other energy needs.

The permaculture principles, consisting of a total of 12 items, are explained in the order indicated in figure 1.

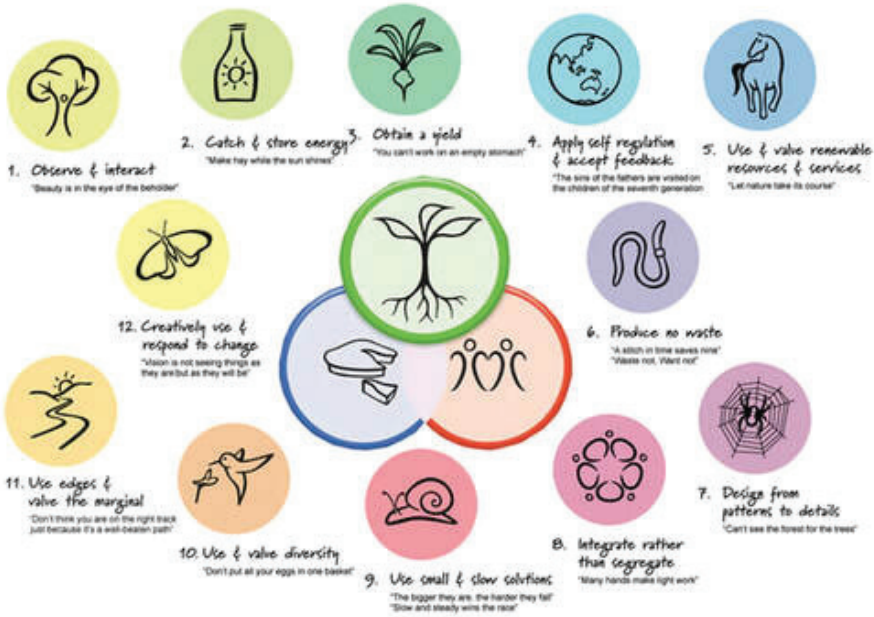

Figure 1. Permaculture principles (Lockyer and veteto, 2013)

EXAMPLES OF PERMACULTURE FROM THE WORLD

✓ La Loma Viva Permaculture Farm - SPAIN

La Loma Viva is a working farm, Permaculture Center and educational space. We research and apply Permaculture techniques in the Mediterranean climate environment. We also run courses on many aspects of Permaculture to inspire and empower people (URL-2, 2023).

Figure 2. View from La Loma Viva farm (URL-1, 2023)

✓ Paradise Lot Permaculture Farm- USA

Paradise Lot Permaculture Farm has been developed by the Jonathan and Eric families since 1990 as a 0.1 hectare farm in the Holyoke area of the city

of Massachusetts, which has a humid climate. Plant breeding, aquaculture and Implementation of Food Production Systems activities are implemented in this farm (URL-3, 2023).

Figure 3. View from Paradise Lot Permaculture Farm (URL-3, 2023).

✓ **Umass Amherst Permaculture Practice- USA**

This app is located at the University of Massachusetts Amherst in the Mediterranean city of Umass Amherst. The permaculture practice in this area began in 2009 as a result of preventing an attempt to convert an existing well-maintained lawn into a car park (URL-4, 2023).

Figure 3. View of the Umass Amherst Permaculture Field (URL-4, 2023).

✓ **Ri dgedale Permaculture Practice-Sweden**

The Ridgedale Permaculture Farm, which began development in 2004, is located in Sweden's cold and humid Värmland region. Ridgedale Farm is focused on curative growth of nutritious food and seeds for the health and well-being of the next generation (URL-5, 2023).

Figure 4. View from the Ridgedale Permaculture area (URL-5, 2023).

✓ **Beykoz Permaculture Ecological Park - Turkey**

In 2021, the first ecological park was established by the municipality of Beykoz on an area of 24 decares within the Kanuni Urban Forest. How the land and nature were revived in this sample area; On the one hand, it will be examined how it can reduce the effects of climate change by storing carbon in the soil and plant bodies, while obtaining various products with completely natural methods (URL-6, 2023).

Figure 5. Beykoz Permaculture Ecological Park (URL-6, 2023).

CONCLUSION

Today, the pollution and excessive use of natural resources, the increase in ecological and environmental problems, unhealthy living habits and excessive energy consumption have started to confront cities with a series of large-scale problems. The importance in the sustainability of urban open green spaces, which is important in terms of clearing the cities from these problems, is increasing day by day. In other words, the interaction between nature and human is deteriorating gradually. In this process, the most important factor in balancing and improving the connection is the cities and therefore the green spaces in the cities (Cengiz et. al. 2012; Cengiz et al. 2014). Today's large grass areas and urban open and green areas covered with dysfunctional vegetation have become unable to meet the needs of people. This means that people have come to expect more from urban open and green spaces. These expectations are; It includes the formation of systems that are more humane in terms of social relations, healthier and cleaner systems in terms of meeting food and energy needs. For this reason, it is essential and important that urban open and green spaces, which are important for the development of new generations, increasing environmental awareness and meeting other basic needs of people in cities alienated from nature, are sustainable and intertwined with nature. Reinforcing the cities in terms of self-sufficiency can be achieved as a result of the development of open and green areas, which constitute the important infrastructure of the cities, with the right and nature-integrated methods (Cengiz, 2013). As a matter of fact, the development of healthy designs such as permaculture for cities that have problems in terms of energy and food consumption are important issues today.

The rapidly developing permaculture design today; It can reveal a sustainable and holistic perspective for urban open and green spaces with the design principles it includes in the use of energy, food and natural resources. The development of this design method has accelerated in recent years with environmental problems and increasing awareness in this context. The issue advocated by permaculture is the initiation of the principle of sustainability from cities. In this context, it should be noted that permaculture is not just an approach to growing food with natural methods. Permaculture is also important for the development of designs that can be beneficial for the protection of ecosystems. permaculture ensures that the needs of people are met in a sustainable way and that nature and resources are protected. Permaculture; It advocates the use of renewable energies with the right technologies in energy, keeping unhealthy energies away, reducing the need for technology and using the local resources in the field in the most efficient way. In addition, permaculture makes the correct use of solar and wind energy important for urban open and green spaces to be self-sufficient in energy.

RESOURCES

Abiral, B. (2019). Permaculture and Ecological Lifestyle: A Restricted Radicalism? 1. In *Routledge handbook of radical politics* (pp. 477-491). Routledge.

Akhtar, F., Lodhi, S. A., and Shah Khan, S. (2015). Permaculture approach: linking ecological sustainability to businesses strategies. *Management of Environmental Quality: An International Journal*, *26*(6), 795-809.

Akhtar, F., Lodhi, S. A., Khan, S. S., and Sarwar, F. (2016). Incorporating permaculture and strategic management for sustainable ecological resource management. *Journal of environmental management*, *179*, 31-37.

Ar, H. ve Uğuz, S. Ç. (2014). Sürdürülebilir Turizm Çerçevesinde Gönüllü Turizmi ve Permakültür İlişkisi: Permakültür Çiftik ve Köy Uygulamaları. VII. Lisansüstü Turizm Öğrencileri Araştırma Kongresi: 222-232, Aydın.

Aras, B. B. (2019). "Kentsel Sürdürülebilirlik Kapsamında Yeşil Çatı Uygulamaları", Manas Sosyal Araştırmalar Dergisi, 8 (1): 469-504.

Bakır, M., Akhuy, S., ve Aydemir, G. (2011). Permakültür El Kitabı Marmariç Örneği. *Mengi Basım Yayım*.

Bilici, Z., ve Babahanoğlu, V. (2018). Akıllı kent uygulamaları ve Konya örneği. *Akademik Yaklaşımlar Dergisi*, 9 (2), 124-139.

Breuste, J. H. (2004). Decision making, planning and design for the conservation of indigenous vegetation within urban development. *Landscape and urban Planning*, 68 (4): 439-452.

Brown, J. (2012). Permaculture design. *Natural Life*, 148 :14-17.

Bulut, Z., ve Yılmaz, S. (2008). Permaculture Playgrounds as a New Design Approach for Sustainable Society. *International Journal of Natural & Engineering Sciences*, 2 (2): 35-40.

Cengiz, C. (2013). ''Urban Ecology''. Advances in Landscape Architecture, (Ed. M. Ozyavuz), *InTech Open Access Publisher*, ISBN 978-953-51-1167-2, pp. 677-696. Croatia.

Cengiz, C., Bekci, B., Cengiz, B. (2014). "A Comparative Study of Public Green Spaces in the Changing Urban Texture in terms of Preferences for Ornamental Plants and Visual Quality: The Case of Bartın (Turkey)". *Fresenius Environmental Bulletin*. 23 (9a), 2326-2342.

Cengiz, C., Cengiz, B., Bekci, B. (2012). ''Environmental Quality Analysis for Sustainable Urban Public Green Spaces Management in Bartın, Turkey''. *Journal of Food, Agriculture & Environment.* 10 (3&4), 938-946

Cengiz, C. and Tekdamar, K. (2022). Sürdürülebilir Kentsel Gelişimde Planlama Ve Tasarım Aracı Olarak Kentsel Tarım Uygulamaları Ve Gıda Güvenliği Üzerine Etkileri. Mimarlık, Planlama ve Tasarım Alanında Uluslararası Araştırmalar (Ed. Seval Özgel Felek). *Serüven Yayınevi.*

Çelik, F. (2017). The importance of edible landscape in the cities. *Turkish Journal of Agriculture-Food Science and Technology*, 5 (2): 118-124.

Dewi, E. P., Trikariastoto, S., Kabul, E. R., and Swartane, I. G. A. (2023). Integrated Urban Farming Park: Implementing Permaculture Design Concept for Child Education of Agriculture in Jakarta. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1169, No. 1, p. 012057). IOP Publishing.

Drake, L. ve Lawson, L.J. (2015). Results of a US and Canada community garden survey: Shared challenges in garden management amid diverse geographical and organizational contexts. *Agric. Hum. Values* , 32: 241–254.

Dubbeling, M, de Zeeuw, H., and van Veenhuizen, R. (2010). Cities, poverty and food—multi-stakeholder policy and planning in urban agriculture. *RUAF Foundation*, Rugby, p 173

Eigenbrod, C., ve Gruda, N. (2015). Urban vegetable for food security in cities. A review. *Agronomy for Sustainable Development*, 35 (2): 483-498.

Evrendilek, F. (2003). Identification of ecologically significant habitats for urban nature conservation: a case study in Turkey. *Journal of environmental biology*, 24 (3): 241-251.

FAO (2008). *Climate Change and Food Security: A framework Document*; Food and Agriculture Organization of the United Nations: Rome, Italy, The Food and Agriculture Organization. http://www.fao.org/forestry/15538- 079b31d-45081fe9c3dbc6ff34de4807e4.pdf (Erişim Tarihi 10 Mart 2021).

Fischer, L.K., Brinkmeyer, D., Karle, S.J., Cremer, K., Huttner, E., Seebauer, M., Nowikow, U., Schütze, B., and Voigt, P. (2018). Biodiverse edible schools: Linking healthy food, school gardens and local urban biodiversity. *Urban For. Urban Green*. 40: 35–43.

Gittleman, M., Farmer, C. J., Kremer, P., and McPhearson, T. (2017). Estimating stormwater runoff for community gardens in New York City. *Urban ecosystems*, *20*, 129-139.

Güleryüz, M., (2013). Bir Ütopya Hareketi Olarak Eko-Köyler: Türkiye'deki Örnekler Üzerine Bir İnceleme. *İstanbul Kültür Üniversitesi, Fen Bilimleri Enstitüsü, Mimarlık Anabilim Dalı, Mimari Tasarım Programı,* İstanbul. 219 s.

Haberman, D., Gillies, L., Canter, A., Rinner, V., Pancrazi, L., and Martellozzo, F., (2014). The potential of urban agriculture in montréal: a quantitative assessment. ISPRS Int. J. Geo- Gittleman, M., Farmer, C.J.Q., Kremer, P., ve McPhearson, T. (2017). Estimating stormwater runoff for community gardens in New York City. *Urban. Ecosyst.* 20: 129–139.

Hamilton, A.J.; Burry, K.; Mok, H.F.; Barker, S.F.; Grove, J.R. and Williamson, V.G. (2014). Give peas a chance? Urban agriculture in developing countries. *A review. Agron. Sustain. Dev.,* 34: 45–73.

He, B.J. ve Zhu, J. (2018). Constructing community gardens? Residents' attitude and behaviour towards edible landscapes in emerging urban communities of Chi-

na. *Urban Forestry Urban Green*. 34: 156–165.

Hemenway, T. (2009). Gaia's garden: A guide to home-scale permaculture. Chelsea Green Publishing Co.

Henao, R. (2022). Urban Permaculture: Envisioning Sustainable, Nature Informed Communities. *Unpublished Essay. Sofia University*.

Holmgren, D., **(**2004). *Permaculture: Principles and Pathways Beyond Sustainability*, 1. Basım, Holmgren Design Press, Hepburn Victoria Australia. 320 s.

Ismail, N. A., and Affendi, S. M. (2015). Awareness and acceptability of permaculture in a residential landscape design: A case study of Denai Alam community. *Res J Fish Hydrobiol*, *10*(14), 6-10.

Klepacki, P., and Kujawska, M. (2018). Urban allotment gardens in Poland: Implications for botanical and landscape diversity. *Journal of Ethnobiology*, 38 (1): 123-137.

Leahy, T. (2020). A degrowth scenario: Can permaculture feed Melbourne?. *Food for Degrowth*, 198-212.

Ling, T. Y., Wu, G. Z., and Lin, J. S. (2018). Landscape dimension in the built environment: The spatial operative of an integrated micro agriculture unit. *Journal of environmental management*, 226:145-155.

Liu, Y., Fan, H., Wei, M., Yin, K., and Yan, J. (2017). From edible landscape to vital communities: clover nature school community gardens in Shanghai. *Landscape Architecture Frontiers*, 5(3): 72-84.

Lockyer, J., and Veteto, J. R. (Eds.). (2013). *Environmental anthropology engaging ecotopia: bioregionalism, permaculture, and ecovillages* (Vol. 17). Berghahn Books.

Luchkina, C. M. (2016). Online Permaculture Resources: An Evaluation of a Selected Sample. *Inquiry: The University of Arkansas Undergraduate Research Journal*, *20*(1), 7.

Mattsson, E., Ostwald, M., Nissanka, S. P., and Pushpakumara, D. K. N. G. (2015). Quantification of carbon stock and tree diversity of homegardens in a dry zone area of Moneragala district, Sri Lanka. *Agroforestry systems*, 89 (3): 435-445.

Medeiros, N.A., Carmo, D.L., Priore, S.E., Santos, R.H.S. and Pinto, C.A. (2019). Food security and edible plant cultivation in the urban gardens of socially disadvantaged families in the municipality of Viçosa, Minas Gerais, Brazil. *Environment, Development and Sustainability,* 21 (3): 1171-1184.

Mollison, B. (2011). *Permakültüre Giriş.* Çeviren Egemen Özkan. İstanbul: Sinek Sekiz Yayınevi,. http://permaculturetureturkey.org/nedir/

Najafidashtapeh, A. (2018). Kentsel Açık Ve Yeşil Alanların Permakültür Tasarım İlkeleri Bağlamında Değerlendirilmesi: Yedikule Bostanları Örneği. *Doktora tezi Yıldız Teknik Üniversitesi Fen Bilimleri Enstitüsü. Şehir Ve Bölge Planlama Anabilim Dalı.İstanbul. 171 s.*

Nanni, A., Venturi, M., and Paiter, L. (2021). Permaculture MESMIS—A Methodology to Evaluate Ecological Well-Being on Permaculture Farms. *Int. Res. J. Biol. Sci*, *10*, 47-57.

Obeng-Odoom, F. (2013). Underwriting food security the urban way: Lessons from African countries. *Agroecology and Sustainable Food Systems*, 37 (5): 614-628.

Olivier, D. W., and Heinecken, L. (2017). Beyond food security: women's experiences of urban agriculture in Cape Town. *Agriculture and Human Values*, 34 (3): 743-755.

Ökde, F. (2022). Kentlerde Yaşanabilir ve Sürdürülebilir Konut Çevreleri için Açık ve Yeşil Alanların Önemi. *Proceeding Book*, 11. Uluslararası Sosyal Araştırmalar Ve Davranış Bilimleri Konferansı.233-245.

Parlak, N. N. (2018). Ekolojik Peyzaj Tasarımı Ve Permakültür Yaklaşımı. *Yüksek Lisans Tezi. İstanbul Üniversitesi Fen Bilimleri Enstitüsü. Peyzaj Mimarlığı Anabilim Dalı. İstanbul. 143 s.*

Pedersen, Å. Ø., Nyhuus, S., Blindheim, T., and Krog, O. M. W. (2004). Implementation of a GIS-based management tool for conservation of biodiversity within the municipality of Oslo, Norway. *Landscape and urban planning*, 68 (4): 429-438.

Phipps, N. (2013). Permakültür Bahçeciliğinin Temelleri. Permakültür Platformu. Çeviri Başak Üner Koç. http://permakulturplatformu.org/2013/05/11/permakultur-bahceciliginin-temelleri/ (07 Haziran 2021 tarihinde erişilmiştir).

Pierce, K. (2020). *From Brownfield to Permaculture City: Converting a Brownfield Site by Creating a New Community Through Increased Density and Sustainable Permaculture* (Doctoral dissertation, North Dakota State University).

Raimbekova, L., and Amuzu, S. (2019). The Call to Nature Permaculture project. Nurturing nature and the environment with young children: Children, elders, earth, 73-79.

Rajabi, A. (2021). Analysis Policy-making of permaculture approach in urban planning. *Urban Environmental Planning and Development*, *1*(4), 89-106.

Sager M, (2019). Permaculture basıcs for home gardeners. OSU Extension Service, Wasco County. Oregon State Unıversıty.1-10. https://marioncomga.org/wp-content/uploads/2019/01/2019-Permaculture-Basics.pdf

Sartison, K. and Artmann, M. (2020). Edible cities–An innovative nature-based solution for urban sustainability transformation? An explorative study of urban food production in German cities. *Urban Forestry & Urban Greening*, 49: 126604.

Sima, R., Micu, I., Maniutiu, D., Sima, N., and Lazar, V. (2010). Edible landscaping-integration of vegetable garden in the landscape of a private property. *Bulletin UASVM Horticulture*, 67 (1): 278–283.

Stark PL (2009). Penny Livingston Stark ile Permakültür Çalıştayı. *Regenerative De-*

sign Institute, Bolinas, California.

Taylor, J. R., and Lovell, S. T. (2014). Urban home food gardens in the Global North: research traditions and future directions. *Agriculture and human values*, 31 (2): 285-305.

Tei, F., Benincasa, P., Farneselli, M., and Caprai, M. (2009). Allotment gardens for senior citizens in Italy: current status and technical proposals. In *II International Conference on Landscape and Urban Horticulture,* 881 : 91-96.

URL-1 (2023). https://www.ruhsalyasam.com/permakultur-etigi/ Erişim tarihi 04.09.2022

URL-2 (2023). http://www.lalomaviva.com/about-permaculture-farm/ Erişim tarihi 04.02.2023

URL-3 (2023) https://paradiselot.com/photo-gallery/ Erişim tarihi 04.02.2023.

URL-4 (2023) https://www.localumass.com/permaculture.html Erişim tarihi 04.02.2023.

URL-5 (2023) https://www.ridgedalepermaculture.com/ Erişim tarihi 04.02.2023.

URL-6 (2023) https://www.permaturk.org/beykozekopark Erişim tarihi 04.02.2023.

Üsküplü, E. M., ve Polat, Z. (2019). Permakültür Çocuk Oyun Alanları. *Adnan Menderes Üniversitesi Ziraat Fakültesi Dergisi*, *16*(2), 245-252.

Wallace M and Carruthers D (Eds.) (2018). Perma/culture: Imagining Alternatives in an Age of Crisis. Routledge Taylor and Francis Group, New York, 238.

Yap, C., and Castroviejo, X. (2017). Learning from Nature: New forms of urban permaculture in Seville. *Urban Agriculture Magazine*, *33*, 29-30.