EDITOR
Doç. Dr. Erdal AĞLAR

Research and
Evaluations in the Field of

LANDSCAPE ARCHITECTURE

June 2025

Privilege Holder • Yaşar Hız
Editor-in-chief • Eda Altunel
Prepared for Publication • Gece Kitaplığı
Editor • Doç. Dr. Erdal AĞLAR

First Edition • June 2025 / ANKARA

ISBN • 978-625-388-423-9

Gece Kitaplığı
Adress: Kızılay Mah. Fevzi Çakmak 1. Sokak Ümit Apt
No: 22/A Çankaya/ANKARA Tel: 0312 384 80 40

www.gecekitapligi.com
gecekitapligi@gmail.com

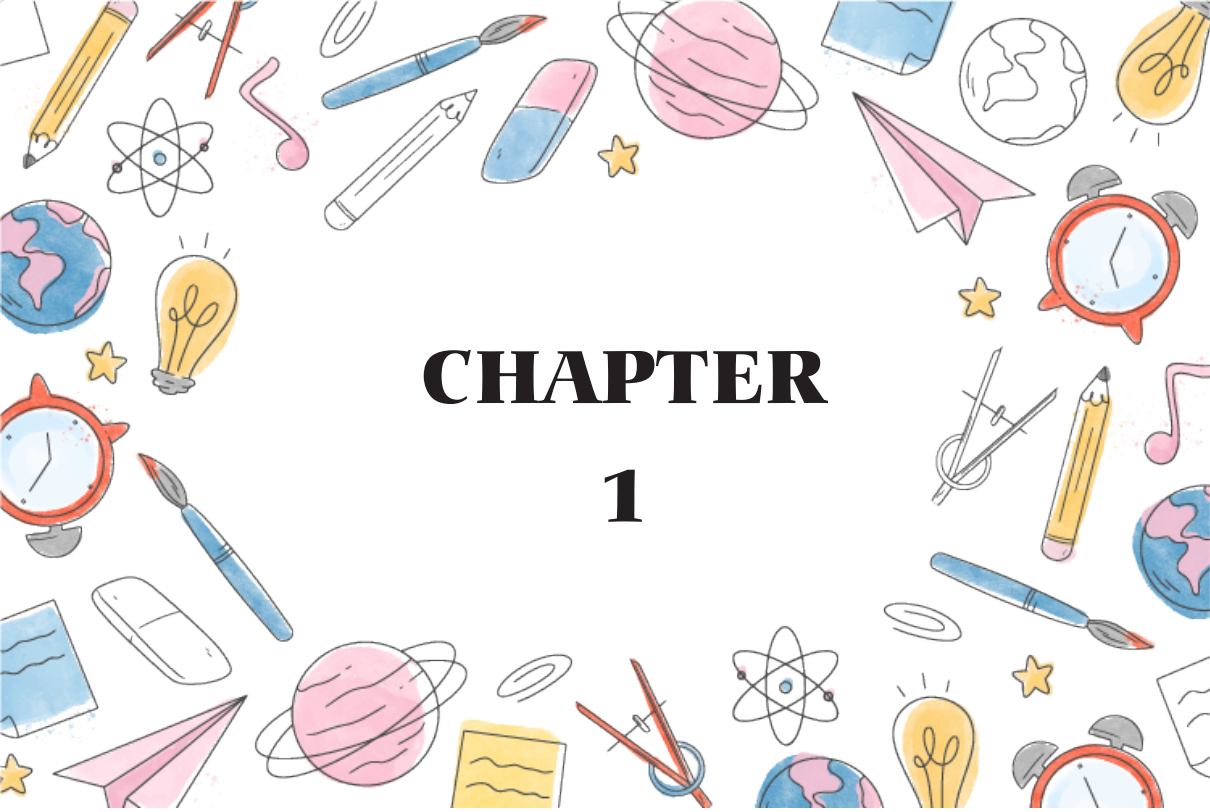
Printing and Binding
Bizim Buro
Certificate No: 42488

Research And Evaluations In The Field Of Landscape Architecture

June 2025

Editor:
Doç. Dr. Erdal AĞLAR

CONTENTS



CHAPTER 1

NATURE-INSPIRED DESIGNS FOR USER NEEDS IN THE ZOO EXHIBIT

Serap YILMAZ[1]

Tuğba DÜZENLİ[2]

1 Prof. Dr., Karadeniz Teknik Üniversitesi, Orman Fakültesi, Peyzaj Mimarlığı Bölümü, Trabzon/Türkiye, E-mail: serapyilmaz@ktu.edu.tr, ORCID: 0000- 0002-0088-3769

2 Prof. Dr., Karadeniz Teknik Üniversitesi, Orman Fakültesi, Peyzaj Mimarlığı Bölümü, Trabzon/Türkiye, E-mail: tugbaduzenli@gmail.com, ORCID: 0000-0001-6957-3921

1. Introduction

Design is an activity that focuses on adding aesthetic value to the environment, involves creativity and creates functional spaces (Bonnardel, 2000). Design requires detailed thinking, therefore, it is an activity in which the data collected about the design problem and the user needs are synthesized together with the creativity of the designer, and there are many solutions to the design problem (Alpak et al., 2020; Yavuz, 2014). Achieving the most successful of this solution is related to being able to produce the right ideas. Therefore, in order to reach creative solutions in departments focused on spatial design such as landscape architecture, the designer should deviate from known acceptances, feed on analogies and abstractions, and create formal approaches while also structuring the needs of the users well. Landscape designers ensure harmony between the users of the space and the environment (Eren ve Yılmaz, 2022; Eren et al., 2022; Yavuz, 2015). Thus, they produce spaces that give the user a sense of satisfaction and provide accurate information about the environment.

Zoos are special landscape areas that include two different users. While zoos are places that are observed, perceived and contain educational messages by their visitors, they are also places that allow animals to live in environments similar to their natural habitats (Yılmaz et al., 2010; Yılmaz and Özbilen, 2011). For this reason, being able to design spaces for different users of the zoo can only be achieved if the needs of the users and the spatial organization are well designed. Because visitors want to see and animals want to be unseen; visitors want comfort and animals want natural areas. Therefore, the most important problem that zoo designers have to solve is the obligation to provide the most appropriate balance between the needs of animals (providing natural richness) and the needs of visitors (visibility of the exhibited animals). Cherfas (1984) defines this task of designers as “like a double-edged sword”. Because the needs of animals and humans are not complementary, designers should determine user needs and design the space in a way that meets their needs. The activities carried out by visitors in the zoo, the ways in which the spaces are used and the characteristics of the animals’ natural habitats are important issues that need to be researched by designers. As a result, user needs, activities carried out to meet these needs and the spatial features that enable these activities should be revealed. Spatial organization; It addresses the need-activity-space relationship and this organization is based on the development of spatial components and elements (Düzenli et al., 2010). In this context, spatial organization has formed the basis of the study. Spatial organization focuses on how to define “spaces” where “activities” will be carried out to meet the “needs” of humans and animals.

1.1. Spatial Organization in Zoos

Animal exhibition areas:

The concept of the zoo took shape in London at the end of the 18th century and the beginning of the 19th century, and animal exhibition underwent a change. Animals began to live in cages in larger areas with open view, rather than pits surrounded by high walls. Initially, zoos were areas where wild animals were exhibited and their freedom was restricted so that they could be observed closely. In these areas, the focus was only on feeding animals to survive, whereas it was not thought that animals needed much else. These zoos included exhibition methods that only allowed the animals to survive. By the middle of the 19th century, a beginning was made to adopt an exhibition method where animals could feed, shelter and establish social relationships. However, in zoos, animals were only allowed to survive in areas that somewhat resembled their natural habitats, but the focus on the successful reproduction of animals, which is an indicator of adequate living conditions, did not occur until the second half of the 20th century (Stroud, 2007). With the exhibition method developed by Karl Hagenbeck in the 1940s, the "quality of the area" offered to animals began to be discussed; attention began to be drawn to the complexity of the area in terms of how these areas occupied the animal, whether they encouraged physical and mental activity, and the needs of the animals. Hediger supported these developments with his statement, "The standard life that a zoo provides to the animal should be the living conditions that the animal maintains under natural conditions. Wild animals loaned to us from nature should be kept in their most original form" (Hediger, 1969). This view of Hediger has influenced the development of zoos until today. Today, zoos with immersion exhibition areas are the areas that best respond to the needs of animals. Such zoos include ecosystem-related themes that define the relationships of animal species with each other and the environment they live in. The plants in the exhibition areas of the animals describe the habitat of the exhibited animal with their topographic structure; texture and form. In addition, all data related to the species should be examined and the needs of the animals should be fully defined and this should be included in the design of the exhibition area (Yılmaz and Alpak, 2019; Smart et al., 2021). In order to ensure spatial organization of animal exhibition areas, the needs of the animals in the exhibition area should be determined first:

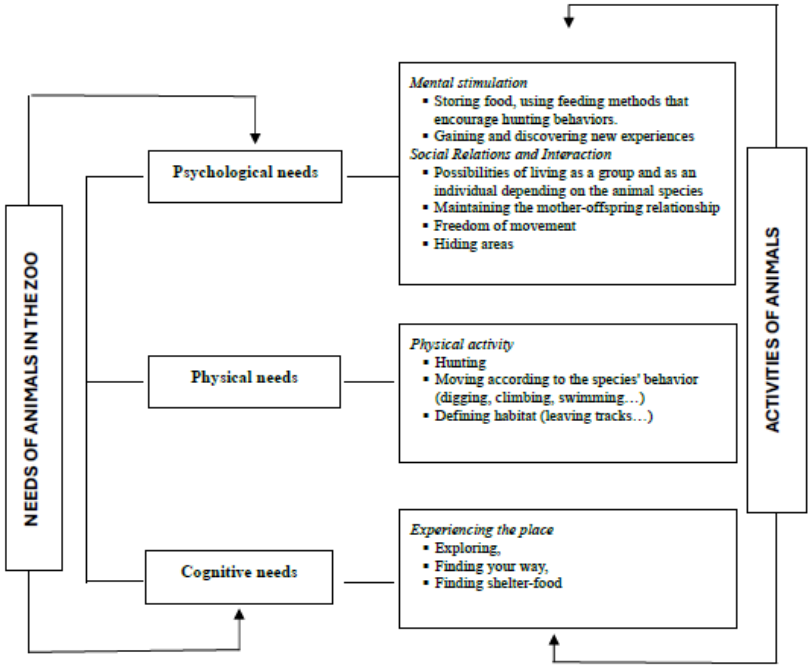


Figure 1. Needs of animals in the zoo

Exhibition areas designed by considering the needs of animals contribute to the establishment of the need-activity-space relationship. These areas have layered structures like in nature; animals can be alone when necessary, and can perform active or passive activities when necessary. In order to increase animal welfare, areas should be arranged as follows (Ross and Gillespie, 2009; Moss et al., 2010; Thomas, 2013; Yılmaz et al., 2017):

- ***Large and Naturally Appropriate Areas:*** Designs that resemble natural habitats should be created that support the physical and psychological needs of animals; areas that provide opportunities such as free movement, hiding, playing, and finding food.
- ***Areas Suitable for Social Behavior:*** Social animals should be kept in groups, and isolated areas should be created for species that live alone. Animals should be able to maintain the mother-offspring relationship.
- ***Immersive exhibition areas:*** Use of topographic formations, water features, and vegetation to mimic natural habitats. Deep spaces should be created that will allow animals to hide and explore. Hidden or natural barriers (such as ditches, glass, water, etc.) should be used to create a perfect viewing experience.

- ***Supervision and Care Areas:*** Veterinary facilities, feeding areas and quarantine sections where the health of animals can be checked should be established.

Visitor areas:

Zoo visitors aim to benefit from the animal exhibition areas, aesthetic qualities, comfort and recreational activities at the maximum level. For this reason, various arrangements are made for visitors; viewing areas, entrance section and circulation routes.

Viewing Areas: These are places that include the viewing range where animals can be seen in the best way and allow visitors to watch the exhibition from a wide perspective (Tygielski, 2005).

Entrance Section: The entrance of the zoo is designed as an inviting space that attracts people (Yılmaz and Özbilen, 201). The entrance is the area that dominates the entire zoo, guides the visitor, includes information boards and equipment that will meet people's daily needs. The entrance should be planted in a way that it will remain colorful throughout the four seasons, thus creating an effective landscape in every period of the year (Baele, 1989).

Circulation: In the zoo, pedestrian paths that take people around should be visible from all exhibition areas (Wylson, 1994). These paths should take people to the most interesting points of the exhibition areas but should not disturb the animals. Immersion exhibition areas are the exhibition areas that meet the expectations of the visitors the most. Immersion exhibition areas; include the viewer physically and psychologically in that habitat. The person is first involved in that space with his/her emotions and secondly mentally (Coe, 1985).

The inclusion of the visitor in that space in an exhibition area is related to the naturalness of the exhibition area and the excitement that the visitors feel. This excitement is also related to the degree of similarity of the physical environment surrounding the visitor to the animal's natural habitat and the presence of many senses (sound, touch, etc.) (Bitgood, 1990). Immersion exhibition areas allow visitors to establish a more meaningful bond with animals and are important tools that make learning more effective and permanent. These exhibitions have a great potential, especially in creating awareness of nature conservation and increasing environmental awareness. This is extremely important in order to meet the expectations of visitors to the zoo regarding recreational activities, while also meeting one of their most important needs, namely their cognitive needs. For the spatial

organization of the zoo, the needs of the visitors should also be determined in detail. The needs specified in Figure 2 should guide the zoo design.

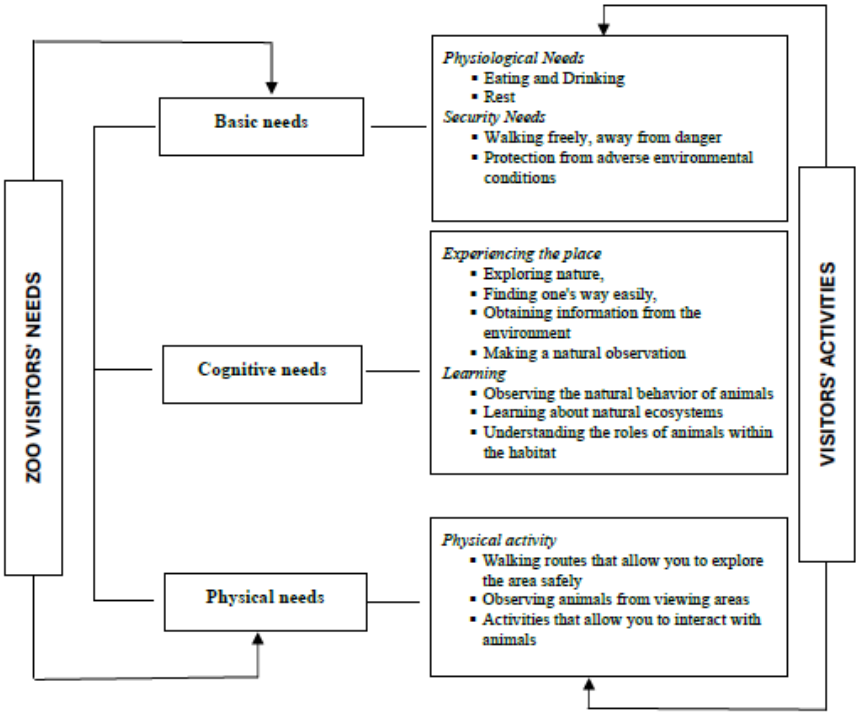


Figure 2. Visitor needs at the zoo

2. Nature-Inspired Exhibition Area Design: Immersion Exhibition Areas

Immersion exhibition areas in zoos are these areas that mimic natural habitats and offer visitors a more realistic experience. Immersion exhibition areas are important tools that enable visitors to establish a more meaningful bond with animals, while making learning more effective and permanent. These exhibitions have great potential, especially in creating awareness of nature conservation and increasing environmental awareness, and the effects of immersion exhibitions on visitors can be listed as follows (Kenneth, 1987; Hancocks, 2001; Thomas, 2013; Yılmaz and Alpak, 2019; Bisgrove, 2022; Mouledous, 2024):

1. Strong emotional bond and empathy

- Immersion exhibition areas allow visitors to interact with animals in a closer and more natural environment. This further strengthens the development of empathy towards animals.

- Visitors can better understand the behavior of animals by observing their natural habitats and develop a stronger awareness that they need to be protected.

2. More effective and permanent learning

- Instead of traditional cage systems, it is possible for animals to exhibit their natural behaviors in immersion exhibitions. This allows visitors to gain more realistic and permanent information about biology, ecosystems and conservation efforts.
- Elements such as environmental arrangements, vegetation and interactive panels encourage active learning instead of just observation.

3. Curiosity and desire to explore

- Realistic designs increase visitors' curiosity and arouse a desire to explore more.
- Learning is made more fun by combining these areas with interaction techniques, which are especially effective for children.

4. Environmental awareness and conservation behaviors

- Visitors can increase their environmental awareness by experiencing the natural habitats of animals and the threats they may face in immersion exhibitions.
- Exhibitions, especially those supported by awareness programs, can make individuals more sensitive about sustainability and nature conservation.

5. Multi-sensory experience and interaction

- The most important feature of immersion exhibition areas is that they appeal to more than one sense of the visitors. These exhibitions are supported by visual, auditory and tactile elements, making the learning process more effective. For example, realistic sound effects, plants, appropriate temperature and humidity levels can be used in a rainforest exhibit to make visitors feel like they are in that environment.

6. Visitor satisfaction and participation

- Immersion exhibit areas increase visitors' experience and positive perception of the zoo.
- Such areas can affect visitors more than traditional zoos and increase the likelihood of repeat visits.

In zoos with immersion exhibit areas, spatial organization aims to optimize both the animal welfare and the visitor experience. The physical characteristics of these exhibit areas can be addressed as follows:

1. Areas that improve the visitor experience

- Thematic Walking Routes: Thematic paths should be created for visitors to wander around comfortably (such as Rainforest Discovery or Savanna Path…).
- Education and Interaction Areas: Information boards, interactive exhibitions, demonstration areas and guided tours should be organized.
- Sensory areas: Tactile and auditory experiences including petting zoos and areas activated by birdsong.
- Rest and social interaction areas: Sitting-resting areas, picnic areas, child-friendly and educational playgrounds.
- Accessibility for the Disabled: Accessibility solutions such as wheelchair paths, resting areas and directional signs should be provided.

2. Green areas and sustainability

- Natural vegetation: Areas should be supported with plants suitable for the natural ecosystem of the region.
- Water use and energy efficiency: Sustainable water management, rainwater storage and energy-efficient lighting should be used.
- Waste management: Recycling systems, compost areas and waste separation units should be available.

3. Natural habitats

- Immersive environments: Use of rock formations, water features, vegetation and artificial landscapes to mimic natural habitats.
- Boundary elements: Use of hidden or natural barriers (ditches, glass, elevation differences) to create an uninterrupted and natural viewing experience.

4. Viewing areas

- Creating viewing opportunities from different heights.
- Viewing areas consisting of natural elements.

2.1. Nature-inspired exhibition space design examples

In these designs, first of all, modern zoo design principles were used as a starting point. Inspired by the natural habitats of animals, the designs aimed to provide animal welfare and a natural observation experience for visitors. Thus, a design approach that is integrated with the natural landscape, does not stress the animals and increases ecological awareness was adopted.

Table 1. Flamingo exhibition area

FLAMINGO EXHIBITION AREA   	**1. Animal Welfare and Habitat** ***Natural habitat simulation:*** - Aquatic ecosystem: Wetlands where flamingos live in nature have been created here. - Vegetation: An environment similar to the plant diversity in flamingos' natural habitats has been created by using reeds, waterside plants and trees in the environment. - Rocky areas: Designed for the resting and nesting needs of flamingos in rocky areas around the lake. ***Stress reduction and animal safety:*** - Surrounding the habitat with vegetation provides hiding places where animals can be isolated from humans. - In nature, bird watchers usually observe nature from high viewing platforms. For this reason, viewing areas are positioned at a certain height from the animals. In this way, direct disturbing interaction is minimized. **2. Visitor Experience and Integration with Nature** ***Observation opportunity from different perspectives:*** - The elevated walking path allows visitors to observe the flamingos from different angles. - Visitors are given the opportunity to observe the animals without disturbing their natural habitat. ***Education and nature awareness:*** - With an emphasis on natural ecosystem design, visitors are given the opportunity to understand the behavior of animals and their roles within the habitat. - This educational experience is further strengthened for visitors with information panels. **3. Landscape and Spatial Design Principles** ***Natural landscape ıntegration:*** - The plant arrangement with soft transitions naturalizes the boundaries between animal areas and visitor paths. - Water elements, rocks and trees increase the ecological harmony of the space. ***Use of natural materials:*** - Wooden walkways and glass railings support the design integrity by preserving both natural aesthetics and ensuring safety. **4. Accessibility and Safety** ***Disabled-friendly design:*** - The sloping structure of the walkways and bridges increases accessibility. Railings and circulation that facilitates navigation allow visitors to explore the area safely.. ***Visitor-animal ınteraction balance:*** - A restriction was used to prevent visitors from getting too close, thus reducing the stress level of the flamingos. However, a natural observation process was preserved thanks to the design that does not block the view.

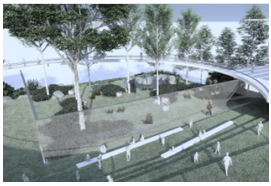
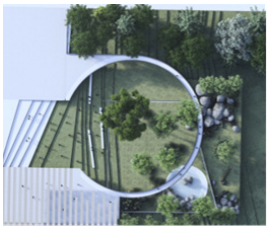
Table 2. Panda exhibition area

PANDA EXHIBITION AREA	**1. Animal Welfare and Natural Habitat**
  	***Simulation of natural habitat:*** • The panda habitat is designed to resemble their natural habitat with abundant green areas, water features, rocks and vegetation. • Bamboo plants are the natural food sources of pandas. Therefore, they were specifically used to make the habitat more realistic. ***Reducing stress and animal safety:*** • Surrounding the area with natural barriers helps animals and visitors feel safe. • Direct physical contact between visitors and animals is prevented, which increases animal welfare. • The size of the area is suitable for visitors to see the animal and for the pandas to roam and exhibit their natural behaviors. **2. Visitor Experience and Integration with Nature** ***Observation opportunity from different perspectives:*** • Viewing platforms rising from the ground level allow visitors to observe the pandas without disturbing them. • Glass partitions provide visitors with a clearer view of the panda habitat, creating the opportunity to see the animals as closely as possible. ***Education and nature awareness:*** • Visitors' awareness can be increased with information boards or interactive learning areas about pandas. • An exhibition area that resembles natural habitats allows visitors to learn about pandas' lifestyles and their roles in the ecosystem. This can strengthen the sense of protection in visitors. **3. Landscape and Spatial Design Principles** ***Natural landscape integration:*** • Green areas, natural stones and water elements increase the naturalness of the space. • Borders created with plant elements protect the naturalness of the habitat. ***Use of natural materials:*** • Wooden platforms and glass railings ensure that the design has a modern and natural balance. **4. Accessibility and safety** ***Disabled-Friendly Design:*** • Walkways are wide and barrier-free, providing accessible exhibition areas for everyone. ***Visitor-Animal Interaction Balance:*** • Instead of direct contact, visual and spatial separations that do not disrupt the unity between animal and human are used. This increases both the safety of the animals and the comfort of the visitors.

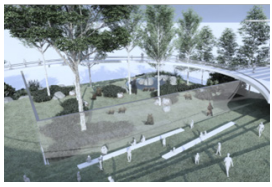
The transparent barrier used in this design allows visitors to get close enough to make eye contact with the animals. This close contact provides an educational and enjoyable experience for visitors and increases ecological awareness. The layering created with plants is a natural approach that reduces the stress of the animals by creating hiding places when the animals want it.

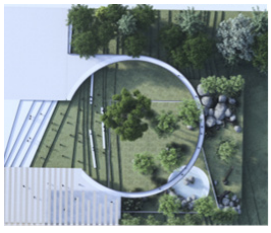
In general, this exhibition area can be evaluated as an example of a modern, nature-friendly zoo design that prioritizes animal welfare.

Table 3. Bear exhibition area

BEAR EXHIBITION AREA    	**1. Animal Welfare and Natural Habitat** ***Simulation of natural habitat:*** - An environment where animals can move more freely and exhibit their natural behaviors has been created by using forest areas, rock formations, water features and natural slopes. - By using artificial elements to a minimum, the natural feature has been strengthened. - The water feature provides drinking water for the bears while also meeting their swimming and cooling needs. ***Reducing stress and animal safety:*** - Animal welfare should be at the forefront of modern zoo designs. Direct contact with humans is prevented to prevent animals from experiencing stress. - Raised walkways allow visitors to observe animals without putting pressure on them. - The area is kept wide so that animals can determine their own territory. - Natural barriers (trees, bushes) are used to protect animals from disturbing external stimuli. **2. Visitor Experience and Integration with Nature** ***Observation opportunity from different perspectives:*** - Thanks to the elevated walkways and platforms and the paths that allow observation from different heights, visitors can observe the animals both from above and at eye level. In this way, the "cage" perception in traditional zoos is broken and visitors gain the feeling of walking in nature. - Glass barriers reduce visual interruption, allowing visitors to observe the animals directly and unobstructed. This creates the opportunity to watch the animals more closely as they move in their natural habitat. - The gradual design of the area in accordance with the topography allows visitors to make both wide panoramic and close-up detailed observations from different angles. ***Education and nature awareness:*** - Since an environment similar to natural habitats is provided, the opportunity to watch animals in their natural behaviors is provided. - Observing animals' feeding, playing, resting and social interactions can give visitors a better idea of their role in the ecosystem. - Walking paths surrounded by vegetation allow visitors to feel like they are part of nature. This type of design increases ecological and biological awareness and raises awareness about the zoo's conservation mission.

BEAR EXHIBITION AREA





3. Landscape and Spatial Design Principles

Natural landscape integration:

- The design has created a structure that is compatible with the existing topography instead of replacing the landscape with artificial elements by preserving the natural slope of the land. Different levels have been used to ensure that the area feels in a natural flow.
- The trees, bushes and water elements used contribute to the simulation of a natural habitat. Creating an environment rich in biodiversity both increases animal welfare and gives visitors a sense of integration with nature.
- Drinking water and cooling opportunities have been provided for animals by using natural ponds and water channels within the area. In addition, the use of water as both an ecological and aesthetic element supports the naturalness of the landscape design.*Use of natural materials:*
- Wooden platforms and glass railings ensure that the design has a modern and natural balance.

4. Accessibility and safety

Disabled-friendly design:

- Appropriate walking paths and ramp systems seem to be provided for disabled individuals.
- A comfortable experience may be provided for families with children and elderly visitors thanks to wide and barrier-free paths.

Visitor-animal ınteraction balance:

- Instead of direct contact, height differences and transparent barriers that do not disrupt the integrity between animal and human are used. The view is naturalized.

3.Conclusion

Zoos receive approximately 700 million visitors annually worldwide (Smart et al., 2021), and these visitors come to the zoo for various purposes and are people with different social backgrounds and knowledge levels (Roe and McConney 2015; Smart et al., 2021). Therefore, it is very important for zoos to provide visitors with environmental awareness and a sense of protection in terms of ensuring ecological continuity and carrying out conservation education. In this context, zoos are places that are constantly evolving in order to improve both animal welfare and visitor experience. While traditional designs usually include cages, concrete floors and artificial landscaping, modern designs have become areas that depict animals' natural habitats thanks to their designs inspired by the ecological structure of nature. Exhibition areas in such zoos are of great importance both in supporting the natural behavior of animals and in creating sustainable and

low-energy systems. Exhibition areas, in particular, are the areas where education takes place in zoos. Therefore, they should be designed considering them as learning environments (Moss et al. 2010). Packer (2006) determined the four basic conditions that encourage learning in exhibition areas as follows:

1. Creating a sense of discovery,
2. Gaining multi-sensory experience,
3. Providing easy and effortless experience opportunities, and
4. Giving the visitor the right to choose.

Modern zoo exhibitions generally consist of immersive exhibitions designed by taking inspiration from the natural habitats of species. Thus, they aim to provide conditions that encourage learning. In this design approach, exhibits depict natural habitat features and focus on removing visual boundaries between visitors and animals. A zoo consisting of immersive exhibits prioritizes animal welfare by providing hiding places, spacious living spaces, and physical distance from visitors, while transforming the visitor experience into a natural observation environment. This modern design approach should include the following principles:

1. Habitats that support the natural behaviors of animals,
2. Educational areas that increase visitors' interaction with nature,
3. Sustainable energy and water management practices,
4. Disabled-friendly and accessible walking paths, and
5. Landscape design that protects biodiversity and is inspired by nature

Thus, zoos are not just places where you see animals; they offer visitors the opportunity to feel, learn, and become aware of nature, and provide animals with the most suitable environments for their natural living conditions. As a result, the following model has been proposed for zoo design based on nature:

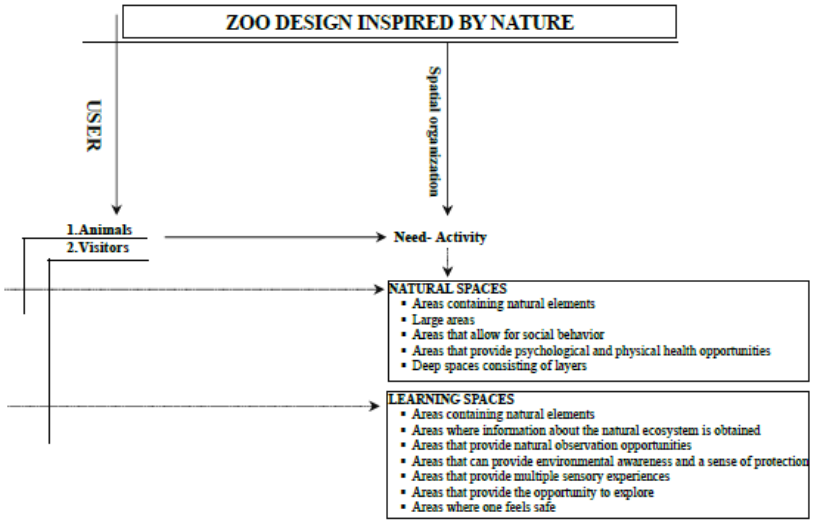


Figure 3. Zoo design model inspired by nature

REFERENCES

Alpak, E. M., Düzenli, T., & Mumcu, S. (2020). Raising awareness of seating furniture design in landscape architecture education: physical, activity-use and meaning dimensions. *International Journal of Technology and Design Education*, *30*(3), 587-611.Baele, N., 1989. Metro Toronto Zoo, Landscape Architecture, 79,1 88-89.

Bisgrove, D. (2022). Zooscape ecology: a conceptual analysis of zoos and landscape ecology. *Landscape Ecology*, *37*(7), 1733-1745.

Bitgood, S., 1990. Toward An Objective Description of The Visitor Immersion Experience, Visitor Behavior, 5:2 11-14.

Bonnardel, N. (2000). Towards understanding and supporting creativity in design: analogies in a constrained cognitive environment. Knowledge-Based Systems, 13, 505-513.Wallis, B. (1998). Land and environmental art (pp. 257-58). J. Kastner (Ed.). London: Phaidon Press.

Cherfas, J. (1984). Zoo 2000. London: British Broadcasting Corporation.

Coe, J., 1985. Design and Perception: Making The Zoo Experience Real, Zoo Biology, 46, 197–208.

Düzenli T., Bayramoğlu E., Özbilen A., (2010). Needs and preferences of adolescents in open urban spaces. *Scıentıfic Research And Essays*, 5, 201-216.

Eren, E. T., & Yılmaz, S. (2022). The student attitudes towards digital and conventional drawing methods in environmental design studios and the impact of these techniques on academic achievement in the course. *International Journal of Technology and Design Education*, *32*(1), 617-644.

Eren, E. T., Alpak, E. M., & Düzenli, T. (2022). Color associations in landscape design and subscription levels to these associations. Environmental Science and Pollution Research, 29(47), 70842-70861.

Hancocks, D. (2001). *A different nature: The paradoxical world of zoos and their uncertain future*. Univ of California Press.

Hediger, H., Vevers, G., & Reade, W. (1970). Man and animal in the zoo: zoo biology.

Kenneth, J.P., (1987). Zoo Design: The Reality of Wild Illusions, The University of Michigan School of Natural Resources, Washington, pp. 193.

Moss, A. G., & Pavitt, B. (2019). Assessing the effect of zoo exhibit design on visitor engagement and attitudes towards conservation. *Journal of Zoo and Aquarium Research*, *7*(4), 186-194.

Moss, A., Esson, M., & Francis, D. (2010). Evaluation of a third-generation zoo exhibit in relation to visitor behavior and interpretation use. *Journal of Interpretation Research*, *15*(2), 11-28.

Mouledous, J. (2024). *Mitigating Feelings of Displacement: Exploring Zoological Design Principles in Captivity & Beyond* (Doctoral dissertation, University of Oregon).

Packer, J. (2006). Learning for fun: The unique contribution of educational leisure experiences. *Curator: The Museum Journal*, *49*(3), 329-344.

Roe, K., & McConney, A. (2015). Do zoo visitors come to learn? An internationally comparative, mixed-methods study. *Environmental Education Research*, *21*(6), 865-884.

Ross, S. R., & Gillespie, K. L. (2009). Influences on visitor behavior at a modern immersive zoo exhibit. *Zoo Biology: Published in affiliation with the American Zoo and Aquarium Association*, *28*(5), 462-472.

Smart, T., Counsell, G., & Quinnell, R. J. (2021). The impact of immersive exhibit design on visitor behaviour and learning at Chester Zoo, UK. *Journal of Zoo and Aquarium Research*, *9*(3), 139-149.

Stroud, P. (2007). Defining issues of space in zoos. *Journal of Veterinary Behavior*, *2*(6), 219-222.

Thomas, P. R. (2013). Exhibit design. *Zookeeping: An introduction to the science and technology*, 236-243.

Wylson, A., 1994. Theme Parks, Leisure Centres, Zoos and Aquaria, Longman Harlow, New York, pp.183.

Yavuz, A. (2014). As an approach to improving creativity in design education; Art of painting. *Procedia-Social and Behavioral Sciences*, *141*, 741-747.

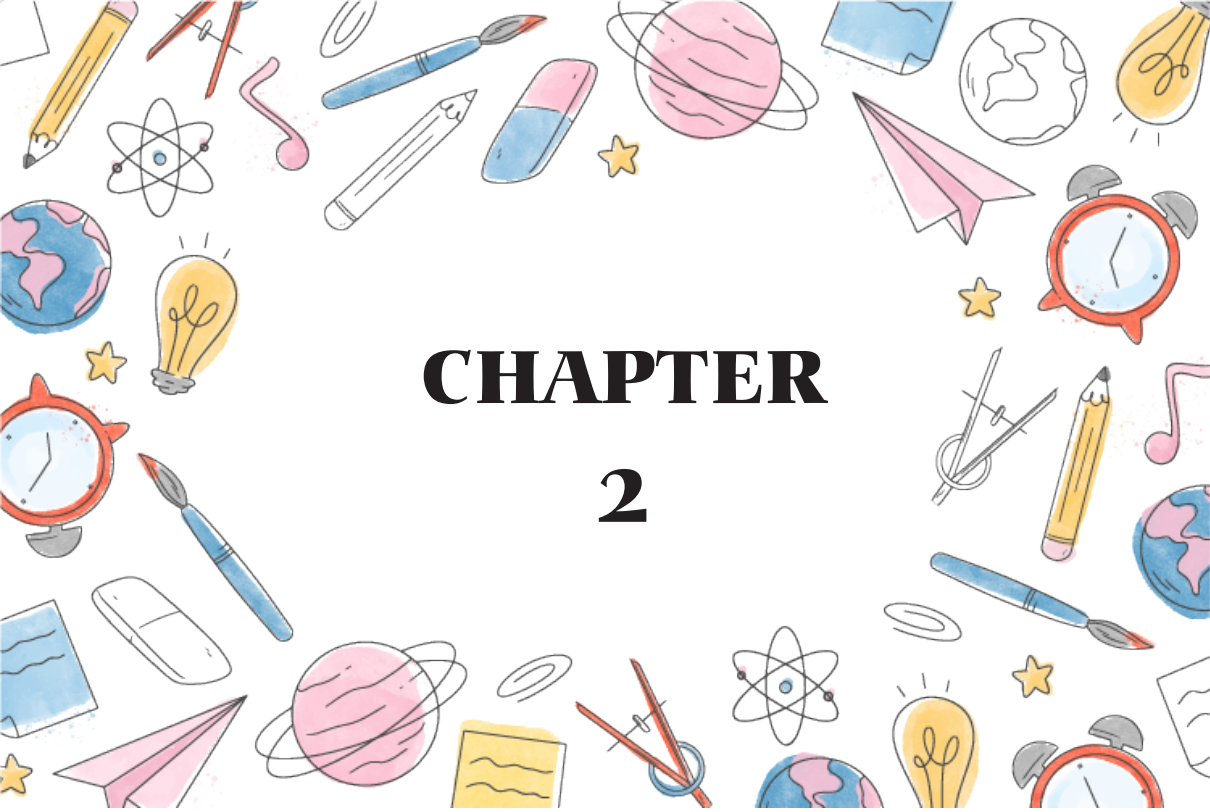
Yavuz, A. (2015). Landscape Structures Course Training Process in Landscape Architecture with The Three-Dimensional Technique of Expression. *Global Journal on Humanites & Social Sciences*, *1*, 01-11.

Yılmaz, S., & Alpak, E. M. (2019). Visitor experiences in a naturalistic zoo exhibit. *Fresenius Environmental Bulletin*, *28*(1), 44-52.

Yılmaz, S., & Özbilen, A. (2011). Hayvanat bahçeleri tasarım ilkeleri ve tipolojileri. *SDÜ Orman Fakültesi Dergisi*, *12*, 47-56.

Yılmaz, S., Düzenli, T., & Çiğdem, A. (2017). Visitors experiences in different zoo exhibits. *Current World Environ*, *12*, 17-27.

Yılmaz, S., Mumcu, S., & Özbilen, A. (2010). Effects of spatial differences on visitor perceptions at zoo exhibits. *Scientific Research and Essays*, *5*(16), 2327-2340.



CHAPTER 2

ICONIC LANDMARKS OF THE CITY

Aysel YAVUZ[1]

1 Dr. Öğr. Üyesi Aysel Yavuz, Karadeniz Teknik Üniversitesi, Orman Fakültesi, Peyzaj Mimarlığı Bölümü, Trabzon/Türkiye, E-mail: ayavuz75@hotmail.com,

ORCID: 0000-0001-9425-2054

1. Introduction

Norberg Schulz defines the city as a "place of encounter" where people come together and a "microcosm" that surrounds and brings people closer (Acar et all., 2021). Lynch, on the other hand, describes the city as a place of communication with open and closed symbols, religious symbols, signs and signs, towers, columns, entrances and rural areas (Lynch, 1960 ; Acar et all., 2021). Therefore, cities are recognized by the artifacts that reflect their historical and cultural accumulation. In addition, coastal cities, in particular, have an important potential in terms of architectural and landscape design due to their geographical location and natural beauty. These cities reveal their differences with their natural beauty and unique landscapes as they are intertwined with the sea.

Iconic buildings, on the other hand, are buildings that contain the characteristics of iconic objects, depict or refer to the iconic object (Jencks, 2005). An architectural icon is an object that embodies symbolic meaning. The element that creates the icon is the combination of fame with the aesthetic and symbolic (Sklair, 2006). In order for an architectural structure to be an icon, it must be in a form that expresses symbolic meaning with a different image and be as different as possible from the texture it is located in. In this way, it can be easily distinguished from its surroundings, create associations in people and create permanent objects in memory (Yargıç, 2009). Iconic buildings in coastal cities also have a special importance due to their relationship with the sea. For example, the Sydney Opera House is the symbol of the city and a globally recognized building. Similarly, the Christ the Redeemer statue in Rio de Janeiro has become a symbol of the city and has a great potential for tourism. For this reason, iconic buildings and landscape practices in cities play important roles in the formation of urban identity. Efforts to become a brand or to strengthen the image stand out as important elements that enable cities to be recognized. It is clear that iconic buildings become symbols of cities, directing global tourism and creating a competitive environment. The Sagrada Familia in Barcelona can be given as an example as an important iconic building that forms the identity of the city with its architectural style and aesthetic value.

According to Sklair (2006a), iconicity cannot be explained solely by the symbolic/aesthetic qualities of a building or place. Rather, it relates to how buildings, places and architecture increasingly come to define the times, places and audiences that make them iconic. An iconic building stands out from the city with a distinctive form and style, sometimes in high contrast with its surroundings (Davarpanah, 2012). The concept of icon literally means figure, image or depiction. Over time, symbol and representation meanings have been added to the meaning of the concept of

icon (Yargıç, 2009). Iconic buildings and landscape designs, as an integral part of the urban fabric, reflect the character and spirit of the city.

Iconic places can also be an effective focal point for several reasons. First, they can provoke a sense of place identity, that is, the incorporation of place into one's self-concept. Importantly, place identity is not limited to local places, but can also develop across geographical scales or through symbolic connections. It is a potentially useful concept for exploring ways in which people can connect with and respond to iconic places (Waters et all., 2024). In many studies focusing on the use of the city, it has been emphasized that some features of the environment determine the quality of the place, are effective in the construction of identity and image, and directly affect human behavior and the use of the place (Alpak et all., 2018). Identity is an important concept that can be associated with place and can also be a structure that changes with the change of people over time. Uncontrolled transformations in today's cities cause the loss of place identity and alienation of people from places. The loss of place identity is an important urban problem, leading to a loss of social cohesion and the emergence of a fragmented society (Alpak et all., 2023).

Therefore, it is worth examining the impact of urban iconography and landscape designs on urban identity. In this study, iconic buildings and landscape practices selected as examples were examined and their physical, social and cultural impacts on the identity of cities were analyzed. These buildings and landscape designs, which exist with their historical, sociocultural and aesthetic dimensions, are important components of social memory that increase the symbolic values and tourism potential of cities.

City, Architecture And Iconic Buidings

In architecture, iconicity is defined by the fame and special symbolic/aesthetic significance attached to buildings, spaces or regions. However, iconicity is perceived as one of the well-known forms of mutual influences between architecture and its surrounding context and human life. Iconic buildings have the ability to define their unique characteristics and express some special character of their surroundings. This is because they have the potential to establish a special relationship with the place and its inhabitants. The most relevant example is the "Guggenheim Museum" in Bilbao, which brought urban redevelopment and economic stability to an unpopular city of Bilbao. This phenomenon is widely known as the "Bilbao effect" (Elhagla, et all., 2020; Canbakal Ataoğlu, 2017). Therefore, iconic buildings occupy an important place in contemporary architectural practices.

In architecture, buildings are formed by individual architectural concepts that constitute specific architectural styles with different aesthetic

qualities. Accordingly, the diversity of architectural styles can have different associative scales that can influence metaphors in architecture. In this context, iconic buildings can be a special case (Uluğ, 2020). In many different parts of the world, there are buildings that express different iconic symbols. These iconic buildings are the symbol of the country or city where they are located, and also contribute to the recognition of the place where they are located.

Iconic structures evoke metaphors and this shapes the architectural perception of the society (Uluğ, 2020). Schulz defines perception as "the human being has to recognize and understand the environment in order to benefit from the environment in which he lives, to adapt to it or to adapt it to himself". This develops spontaneously and is acquired through receiving information from the environment. It is perception that interprets and evaluates this information in a way that helps us to act appropriately and correctly (Schulz, 1968). Schön (1993) stated that metaphors can even change the conceptual system and this can lead to the formation of a new perception. In this sense, associating iconic buildings with connotative metaphors emphasizes the communicative quality of architecture (Uluğ, 2020).

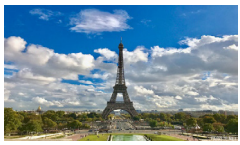
However, the presence of an iconic building initiates an endless cycle of interaction and influence in its location. The location of an iconic building has always been carefully chosen, often for strategic purposes (Davarpanah, 2012). Iconic buildings represent the most tangible examples of architectural innovation. They offer creative and original designs that go beyond traditional architectural conceptions. For example, the Guggenheim Museum designed by Frank Gehry is one of the most successful examples of architectural innovation. Similarly, the Heydar Aliyev Cultural Center designed by Zaha Hadid is an important example of architectural innovation. Canbakal Ataoğlu (2017) stated that one of the effective methods of making a city a center of attraction is to bring an iconic building that attracts attention with its sculptural form designed by star architects to the city. Baku Heydar Aliyev Center, another iconic building designed by Zaha Hadid, contrasts with the sand-colored Baku Stone with its white color rising from the ground. Likened to the waves of the Caspian Sea or the frozen image of a carpet being shaken out, it is Baku's global and modern urban image.

In his book "The Iconic Building" (2005), architectural historian Jencks, who has extensive studies on iconic architecture, expresses the common criteria that constitute iconic buildings. According to Jencks, these criteria are unusually interesting forms, the desire to be big and noticeable, the blessing of everything new, branding, symbolism and fame. The most important phenomenon that places iconic structures in the memory of so-

ciety is the references and codifications made by the forms of these structures. In order to gain a place in the public mind, these structures can evoke ordinary forms from everyday life. A successful iconic building always allows for exciting comparisons (Işıkoğlu, 2020).There are also studies claiming that iconic buildings make more associations than any other type of building (Uluğ, 2020).

Iconic buildings differ from monuments in that they symbolize the place where they were built on a city or country scale. In general, they differ in design, size, visual appeal, urban texture or architectural style, etc. The greatest opportunities for creating iconic buildings can be shown in the different effects, starting from the building itself and ending with how it affects the environment and society (Elhagla, et all., 2020). Architecture has been a reflection of cultural, social and technological developments throughout human history. Iconic buildings represent the most tangible examples of these developments and shape the identity of the cities and even countries in which they are located (Table 1). Iconic buildings are not only architecturally significant, but also culturally, economically and socially significant. These buildings stand out for their architectural design and aesthetic value. For example, the Eiffel Tower in Paris has become the symbol of the city. Similarly, the Sydney Opera House is an important iconic building that forms the identity of the city. These buildings also attract tourists and make a major contribution to the economy of the cities in which they are located. The Colosseum in Rome has become a symbol of the city and a major tourist attraction. Similarly, the Burj Khalifa in Dubai is an important iconic building that forms the identity of the city. The Statue of Liberty in New York has become a symbol of the city and a major tourist attraction. Big Ben in London is also an important iconic structure that forms the identity of the city.

Table 1. Iconic buildings in the position of city identity

	PROJECT IDENTITY	ICONIC LANDSCAPE EXAMPLES	CHARACTERISTICS
Historical Buildings	Eiffel Tower Paris, France (Ore, 2014)		Built for the 1889 World's Fair, the tower has become one of the most important symbols of Paris.
	Colosseum Rome, Italy (Keçeci, 2024)		This ancient Roman amphitheater is an important part of Rome's historical landscape.
	Pompidou Cultural Center, Paris, France (Ataoğlu et all., 2023)		The Pompidou Art Center is a square for urban life and everyday life and is designed for official cultural events, but it is much more than a traditional museum.
Modern Buildings	Burj Khalifa, Dubai, UAE (Besix Watpac, 2025)		As the tallest building in the world, Burj Khalifa is considered a symbol of architectural achievement and technological progress.
	Sydney Opera House, Sydney, Australia (Küpeli, 2023)		Designed by Jørn Utzon, this building is a striking example of modern architecture. Included on the UNESCO World Heritage List in 2007

2. Iconic Landscape Applications And Cities Of The Future

As urban density increases, people will need more green spaces. Iconic landscapes will have vital value not only as places of rest, but also as spaces for breathing, escaping and socializing. They will become urban micro-nature experience zones, such as vertical gardens, rooftop parks and linear green corridors located between high-rise residential buildings. Iconic landscapes not only transform the cities of today, but also hold powerful clues to what the cities of the future will look like. Iconic landscapes will be defined by their connection to nature, quality of public space and aesthetics as visions of future cities. The answer to the question "What does this city value?" will be seen in the iconic landscapes of that city. Landscapes that appeal to multiple senses such as sound, touch, smell and interaction as well as visuality will rise. We will no longer just walk in the park; we will witness digital art experiences, soundscapes, atmospheres

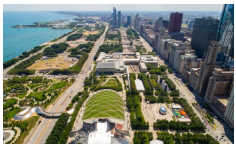
shaped according to seasonal plant changes. Cities of the future will be defined not by "buildings" but by how they utilize the spaces between them. Landscape-based cities that will shape the future by turning spaces into transformative, connective and inspiring spaces will be iconic landscape designs.

The characteristics of spaces designed in relation to place give them an identity, while their functional characteristics give them distinctiveness and uniqueness. Often, iconic projects that are known for their site characteristics and the value they add to the place are appreciated by communities. The Sydney Opera House stands out for its strategic location and grandeur in the middle of Sydney harbor. The building blends perfectly with the landscape and setting, giving the city its identity and uniqueness (Davarpanah, 2012). Iconic buildings are also of great importance for the preservation and transmission of cultural heritage to future generations. These buildings reflect historical and cultural values and keep social memory alive. For example, the Hagia Sophia in Istanbul has become a symbol of the city and is of great importance in terms of cultural heritage. Similarly, the Taj Mahal in India is an important iconic building that forms the identity of the country.

2.1. Physical Transformation: Redefining Space

Landscape areas in cities play an important role in the formation of urban identity. These practices enhance the aesthetic value of cities by preserving natural beauty. For example, by combining four important features of the urban landscape into a mosaic, Singapore's by the Bay has contributed to Singapore's well-established global image, identity building and a major tourist attraction. It is known that "scarcity" (land, potable water, energy resources, etc.) was a factor in the formation and development of Singapore's urban and landscape identity (Acar&Acar, 2020). Similarly, Superkilen Park in Copenhagen is an important landscape project that forms the identity of the city (Table 2).

Table 2. Iconic landscape projects as identity elements

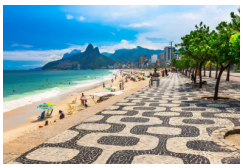
PROJECT IDENTITY	ICONIC LANDSCAPE EXAMPLES	CHARACTERISTICS
Park Güell, Barcelona, Spain **Designer:** Antoni Gaudí		A colorful and organic design by Gaudí, the pioneer of the Modernism movement, this park is adorned with mosaics, curvilinear forms and natural materials. A symbol of Barcelona's artistic and cultural identity.
Millennium Park, (Chicago, USA) **Designer:** Frank Gehry, Kathryn Gustafson, Anish Kapoor (McGowan, 2023)		Featuring iconic structures such as Anish Kapoor's "Cloud Gate" sculpture and Frank Gehry's Jay Pritzker Pavilion, this park offers a fusion of art and nature. It has become a landmark that reinforces Chicago's cultural and artistic identity.
Superkilen Park, Copenhagen, Denmark **Designer:** BIG (Bjarke Ingels Group), Topotek1, Superflex (Frearson, 2012)		Filled with design elements inspired by different cultures, this park emphasizes diversity and inclusion. It stands out with its colorful floor coverings, playgrounds and seating. It is an area that reflects Copenhagen's multicultural identity.

2.2. Social Transformation: Social Integration and Access

Designers have a responsibility in terms of their ability to create and transform symbols that contribute to the identity of people and communities. Place identity can be influenced by the physical or spatial characteristics of a location (such as structure, spatial characteristics, built form, landscape, and amenities, etc.) (Düzenli et all., 2019). At this point, iconic landscape architecture refers to landscape designs that shape the identity of a city or region, stand out aesthetically and functionally, and reflect social and cultural values. Such practices are not only visually striking, but also enrich users' experiences and enhance the quality of urban life.

Iconic landscapes often strike a critical balance between local identity, the natural environment and human needs. They also include approaches that embrace harmony with nature, with landscapes representing the extraordinary fusion of nature and human creativity. Moreover, as in the case of Gardens by the Bay in Singapore, these areas are not just botanical gardens; they are the international showcase of Singapore's "green and smart city" vision (Table 3). As an important landscape practice that forms the identity of the city, it has become a symbol of the city and has a great attraction potential.

Table 3. Iconic landscape projects in the context of harmony with the natural landscape

PROJECT IDENTITY	ICONIC LANDSCAPE EXAMPLES	CHARACTERISTICS
Central Park, New York, USA **Designer**: Frederick E. Olmsted (Central Park Conservancy, 2024)		Designed by Frederick Law Olmsted and Calvert Vaux, this park offers a breathing space in the dense urban fabric.
Rio de Janeiro Coast, Brazil **Designer:** Roberto Burle Marx (Fonseca, 2024)		It is one of the most well-known beaches in the world, about 4 kilometers long. Along the beach are hotels, restaurants, bars, nightclubs and residences. The Copacabana coastal road is characterized by its use of texture and color.
Garden by the Bay, Singapore **Designer:** Grant Associates, Wilkinson Eyre (Halpern, 2025)		This sustainability-orientated landscape design is one of the pioneering examples of modern landscape architecture with its huge 'Super Trees' and climate-controlled biospheres. It stands out with its plant diversity, technological and innovative design.
Butchart Gardens, Vancouver, Canada **Designer**: Jennie Butchart and her family (Staff, 2022)		This garden, which was created after the depletion of the resources of an old limestone quarry and created by transformation, is a landscape wonder where natural beauty is preserved.

2.3. Cultural Transformation: Reconstruction of the City's Memory and Identity

The representation of cultural diversity can be considered as a cultural bridge between the past and the present. In this context, iconic landscape projects with this transformation have the objectives of preserving the old industrial heritage, emphasising cultural traces, making urban memory visible, rebranding the city and increasing its global competitiveness. As in the case of Duisburg-Nord Park, Germany, the transformation of a former iron and steel factory reproduced industrial heritage as both landscape and cultural event space.

Iconic landscapes and their transformation are realised as part of strategic planning. While transforming the physical structure of the city, it also

brings people together, strengthens social ties, revitalises and renews cultural memory. For this reason; iconic urban landscape projects have an important place in today's landscape architecture practices. For example, Shenzhen Bao'an Waterfront Cultural Park, Bao'an district was a production and logistics centre for many years during Shenzhen's industrialisation process. However, over time, these areas became outdated, lost their function and caused environmental pollution. With the transformation, it became not only a green space but also a cultural platform. With its open-air activity areas, walking paths, and sections dedicated to art and cultural programmes, the park has become an inclusive public space that brings together people of all ages and social groups. The park acts as an ecological corridor, reducing the urban heat island effect, improving stormwater management and contributing to biodiversity. It opened space for art and artists, creative industries and community-based artistic productions. With events reflecting cultural diversity, the park brought the city back to the sea. The opening of the coastline to public use has strengthened people's relationship with the water and enabled the public to meet the harbour and industrial areas that were closed in the past (Table 4).

Table 4. Iconic landscape projects in the context of urban regeneration and revitalisation

PROJECT IDENTITY	ICONIC LANDSCAPE EXAMPLES	CHARACTERISTICS
High Line, New York, USA **Designer:** James Corner Field Operations, Diller Scofidio + Renfro, Piet Oudolf (Dreith, 2024)		This walkway, created by transforming an abandoned railway line, reveals the role of landscape architecture in urban transformation. It stands out with its sustainable landscape applications. It offers a unique experience to users with its walkways, seating areas and plant texture.
Promenade Plantée, Paris, France **Designer**: Jacques Vergely and Philippe Mathieux (Brunton, 2017)		The transformation of a former railway line into a green space is one of the successful examples of urban regeneration. In 1993, a long-abandoned viaduct from the mid-19th century was transformed into the world's first elevated park walkway, a promenade that makes skilful use of natural elements.
Cheonggyecheon, Seoul, South Korea **Designer**: SeoAhn Total Landscape (Carrasco, 2024)		The removal of a motorway and the re-exposure of the riverbed has restored the natural balance in the city.
Shenzhen Bao'an Waterfront Cultural Park, Hong Kong **Designer:** SWA Group, AUBE Concept (Bulut, 2021)		It is an important park for both spatial transformation and social life in Shenzhen, especially in Bao'an district. As an example of the process of transforming post-industrial areas into public spaces, it is part of the city's green infrastructure policies and quality of life improvement vision.

3. Conclusions and Suggestions

This article highlights the importance of iconic buildings, their impact on urban identity, tourism, economy, cultural heritage, architectural innovation and sustainability, and their place in contemporary architectural and landscape architecture practices. Iconic landscapes are not only aesthetically striking, but also strategic interventions that play a key role in the physical, social and cultural

transformation of contemporary cities. These areas are not just ‘parks’ or ‘green spaces’; they are key areas that determine how a city will be lived, remembered and represented. Iconic landscapes are high quality public spaces that go beyond ordinary parks, bringing people together and encouraging socialisation and relaxation. These spaces make urban life more livable and meaningful.

Iconic landscapes should be planned not only for their visual but also for their ecological and functional values. They should be able to contribute to the fight against climate change through multi-layered ecological functions such as stormwater management, reducing the urban heat island effect, and providing habitat for local flora and fauna. In addition to these, it should create areas where contemporary architecture and art are directly involved in urban life with creative design and innovative solutions. They should be a human-oriented tool of urban transformation with the right interventions, such as landscape projects that have become iconic in the revitalisation of abandoned areas, especially in post-industrial areas. Iconic buildings and landscapes should shape not only the physical appearance of cities, but also their social and cultural fabric. These elements are key for meaningful places for locals and tourists while increasing the recognition of cities.

In summary, iconic landscapes are important elements that shape the identity of cities, create a major centre of attraction for tourism and improve the quality of urban life. Such practices offer sustainable and aesthetically striking designs by establishing a balance between local identity, natural environment and human needs. By acting in line with these principles, designers can create iconic examples of landscape architecture and contribute to the identity of cities.

REFERENCES

Acar, C., & Acar, H., (2020). Kentsel Mekanlarda Biyofilik Peyzaj Yaklaşımları ve Yeşil Altyapı: Singapur Örneği. *Peyzaj; Eğitim, Bilim, Kültür ve Sanat Dergisi* , vol.2, no.1, 33-45.

Acar, H., Yavuz, A., Eroğlu, E., Acar, C., Sancar, C., & Değermenci, A. S. (2021). Analysis of activity, space and user relations in urban squares. *Indoor and Built Environment*, *30*(9), 1466-1485.

Alpak, E., Düzenli, T., & Yılmaz, S. (2018). Kamusal açık mekânların kalitesi ve sosyal etkileşim üzerindeki etkileri. *Journal of History Culture and Art Research*, *7*(2), 624-638.

Alpak, E. M., Düzenli, T., & Eren, E. T. (2023). Does "Place Identity" Support Sustainability of Community at the Urban Parks. *Online Journal of Art and Design*, *11*(1), 243-263.

Besix Watpac. (2025, February 25). *Building the world's tallest skyscraper*. https://besix-watpac.com/projects/residential-hotels/burj-khalifa

Bulut, Ş.(2021, December 20). *ASLA* ödüllü *peyzaj tasarımı: Waterfront Kültür Parkı.* https://www.gzt.com/arkitekt/asla-odullu-peyzaj-tasarimi-waterfront-kultur-parki-3600125

Brunton, (2017, June 7). *A magical, green walk along Paris's Promenade Plantée* . https://www.theguardian.com/travel/2017/jun/07/paris-promenade-plantee-free-elevated-park-walkway-bastille-bois-de-vincennes

Canbakal Ataoğlu, N. (2017). Bakü kent kimliği, ikon yapılar ve küreselleşme. *Karadeniz Araştırmaları*, (55), 29-46.

Canbakal Ataoğlu, N., Yavuz, A., & Acar, H. (2023). Design Approaches to Museum Open Spaces with User Evaluations. *ICONARP International Journal of Architecture and Planning*. 11(1), 397–427.

Carrasco, M. (2024, September,12). *Re-Naturalization of Urban Waterways: The Case Study of Cheonggye Stream in Seoul, South Korea*. https://www.archdaily.com/1020945/re-naturalization-of-urban-waterways-the-case-study-of-cheonggye-stream-in-seoul-south-korea?ad_medium=widget&ad_name=navigation-prev

Central Park Conservancy. (2024, March 10). *Ziyaretinizi Planlayın*. https://www.centralparknyc.org/visit

Davarpanah, S. (2012). *A Query on the Impact of Place on the Formation of Iconic Buildings in Architecture* (Doctoral dissertation, Eastern Mediterranean University (EMU)).

Dreith, B.(2024, September 4). *High Line "under threat" from proposed skyscrapers and casino say Friends of the High Line founders. https://www.dezeen.com/2024/09/04/new-yorks-high-line-under-threat/*

Düzenli, T., Mumcu, S., & Yılmaz, S. (2019). Kent kimliğine simgesel peyzajın etkileri. *Turkish Online Journal of Design Art and Communication*, *9*(3), 438-448.

Elhagla, K., Nassar, D. M., & Ragheb, M. A. (2020). Iconic buildings' contribution toward urbanism. *Alexandria Engineering Journal*, *59*(2), 803-813.

Frearson, A. (2012, October 24). *Superkilen by BIG, Topotek1 and Superflex. https://www.dezeen.com/2012/10/24/superkilen-park-by-big-topotek1-and-superflex/*

Fonseca, I. (2024, February 16). *Ipanema Beach Ranks Second in World's Most Beautiful Beaches*. https://www.riotimesonline.com/ipanema-beach-ranks-second-in-worlds-most-beautiful-beaches/

Halpern, A.(2025, March 18). *Gardens By the Bay.* https://www.cntraveler.com/activities/singapore/gardens-by-the-bay

Işıkoğlu, B. O. (2020). Gösterge-Mimarlık İlişkisi Bağlamında" İkonik" ve" Kitsch" Kavramlarını Yeniden Düşünmek. *Online Journal of Art & Design*, *8*(4).

Jencks, C. (2005). The Iconic Building. New York: Rizzoli.

Jencks, C. (2006). The iconic building is here to stay. *City*, *10*(1), 3-20.

Keçeci, K.(2024, June 4). *Secrets and History of the Colosseum*. https://dokmimarlik.com/en/secrets-and-history-of-the-colosseum/

Küpeli, İ. (2023, August16). *Sidney Opera Binası 50 Yaşında: Yapımdan Sonrası.* https://www.arkitera.com/haber/sidney-opera-binasi-50-yasinda-yapimdan-sonrasi/

Lynch, K. (1960). *The Image of the City.* MIT Press.

McGowan, E. (2023, April 10). *Millennium Park Has Been Named In The Top 10 Tourist Attractions In The United States*. https://secretchicago.com/millennium-park-top-attractions-united-states/

Norberg-Schulz, C. (1968). *Intentions in architecture* (No. 74). MIT press.

Ore, A. (2014, January 3). *Anıtsal yapılar: Eyfel Kulesi – La Tour Eiffel*. https://www.pariste.net/eyfel-kulesi-la-tour-eiffel/

Sklair, L. (2011). Iconic architecture and urban, national, and global identities. *Cities and sovereignty: Identity politics in urban spaces*, 179-95.

Sklair, L. (2006), Iconic Architecture and Urban, National, and Global Identities, in Cities and Sovereignty: Identity Politics in Urban Spaces, Ed. Davis, D. E. ve Duren N. L., Indiana University Press., Bloomington, Indiana, USA.

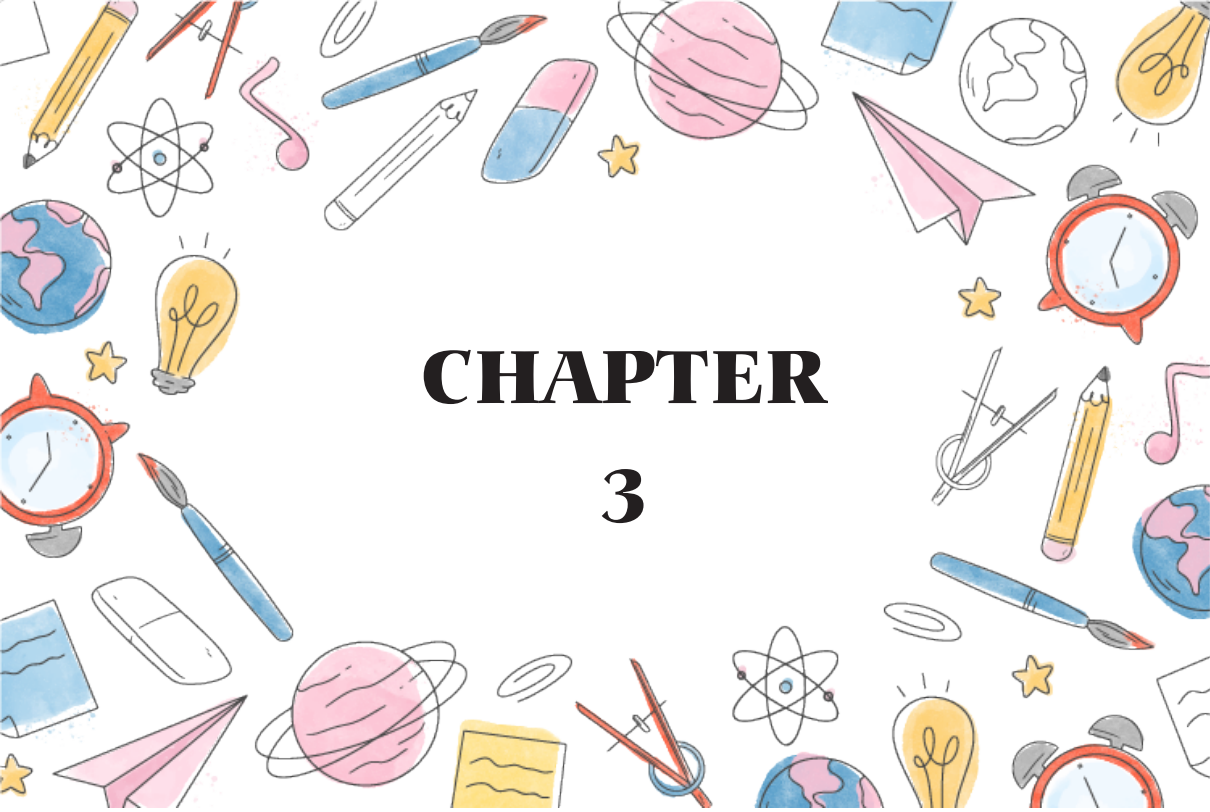
Sklair, L. (2006 a). Iconic architecture and capitalist globalization. *City*, *10*(1), 21–47. https://doi.org/10.1080/13604810600594613

Staff, V.B. (2022, April 6). *Butchart Gardens ranked one of the most beautiful gardens in the World*. https://victoriabuzz.com/2022/04/butchart-gardens-ranked-one-of-the-most-beautiful-gardens-in-the-world/

Uluğ, E. (2020). An investigation into the connotations of iconic buildings by using a semiotic model of architecture. *Social Semiotics*, *32*(2), 279–300. https://doi.org/10.1080/10350330.2020.1756590

Waters, Y. L., Wilson, K. A., & Dean, A. J. (2024). The role of iconic places, collective efficacy, and negative emotions in climate change communication. *Environmental Science & Policy*, *151*, 103635.

Yargıç, S. (2009). Küreselleşen kentlerde ikonik yapıların kentsel kimlik oluşumuna etkileri üzerine irdeleme. Yıldız Teknik Üniversitesi. *Fen Bilimleri Enstitüsü, Mimarlık Anabilim Dalı, Yüksek Lisans Tezi. İstanbul*.



CHAPTER 3

THE SIGNIFICANCE OF BICYCLES IN SUSTAINABLE TRANSPORTATION: STATUS OF BICYCLE USE IN THE WORLD

Özlem YILMAZ ŞENGÜL[1]

Elif BAYRAMOĞLU[2]

Banu Çiçek KURDOĞLU[3]

1 (Master Landscape Architect) Karadeniz Technical University, Trabzon, Turkey

e-mail: o.ylmzzz1@gmail.com

ORCID: 0009-0003-0662-8472

2 (Prof. Dr.) Karadeniz Technical University, Trabzon, Turkey

e-mail: ebayramoglu@ktu.edu.tr

ORCID: 000-0002-6757-7766

3 (Prof. Dr.) Karadeniz Technical University, Trabzon, Turkey

e-mail: banukurdoglu@ktu.edu.tr

ORCID: 0000-0003-4683-8581

1. Introduction

Transportation is considered one of the most important problems of cities today. Especially with rapid urbanization, cities have increasingly emerged as a result. spreading over a larger area, increasing travel distances and, depending on this situation, initiating pedestrian and bicycle transportation. Pedestrian and bicycle transportation is being left to motor vehicles for the transportation of urban residents (Mert and Öcalır, 2010; Düzenli et al., 2018).

The increase in the number of motor vehicles creates social, economic and many negative effects. Relationships with motor vehicles cause an increase in transportation costs. Problems such as air bans, noise restrictions, delays and traffic congestion do not reduce the livability level of cities. Solutions have been produced to reduce these negative effects. One of these is the application rules for moving away from motor vehicle-focused transportation plans and popularizing bicycles within the scope of sustainable transportation (Bayramoğlu and Kurdoğlu, 2018).

In recent years, global warming and climate change have become widespread worldwide. The current situation is rapidly showing and this situation is emerging with the growth aimed at reducing greenhouse gas emissions (Alpak et al., 2019). With the uncontrolled growth of cities, the number of environmentally friendly transportation vehicles is gradually decreasing. In order to reduce the negative effects of this situation, it is aimed to increase the use of bicycles and to encourage their use. In addition to the processes carried out to be effective in powerful transportation, alternative transportation solutions are also developed (Dağ, 2022).

Bicycles are widely used in sustainable transportation and livable cities. Being environmentally friendly, energy efficient, low transportation cost, being able to be divided by public transportation, taking up less space when parked and taking into account the benefits to health are accepted within the importance of transportation types (Mert and Öcalır, 2010). By encouraging the use of bicycles and doing more activities outside, it provides an effective connection between people and the environment. The widespread use of bicycles plays an important role in the expansion towards the reduction of motor vehicles. The increase in bicycle use, the regulation of motor vehicles, and the expansion of open green spaces are opportunities. Thus, bicycle use directly supports recreational changes in people's open green spaces.

2. Concept of Transportation

Transportation, in its most basic sense, can be defined as the movement of a person, animal or object from one place to another. When people settled down and started to establish cities, transportation became increasingly important (Kös, 2015). Cities began to grow in order to meet the increasing housing needs. Growing urban spots caused travel distances to increase (Karagöz, 2019). The transportation sector is a factor that shapes the social and economic structure. Therefore, it is the main component of the spatial, economic and social development of cities (Büyüknalbant, 2010). Along with technological developments, there have been changes in the social, cultural and economic structure of society. This situation has also played a role in the formation of transportation systems. Due to the developing social structure, people have started to travel outside of basic activities (culture, entertainment, etc.) (Aktuğlu Aktan, 2006). Diversified socio-economic activities cause the demands on the urban transportation system to increase.

The increasing distances of travel throughout history have led to the preference for motor vehicles instead of pedestrian and bicycle transportation systems. Journeys made with motor vehicles make cities more accessible. It allows cities to open up to larger areas and thus increase the dependence on motor vehicles. (Candan, 2003).

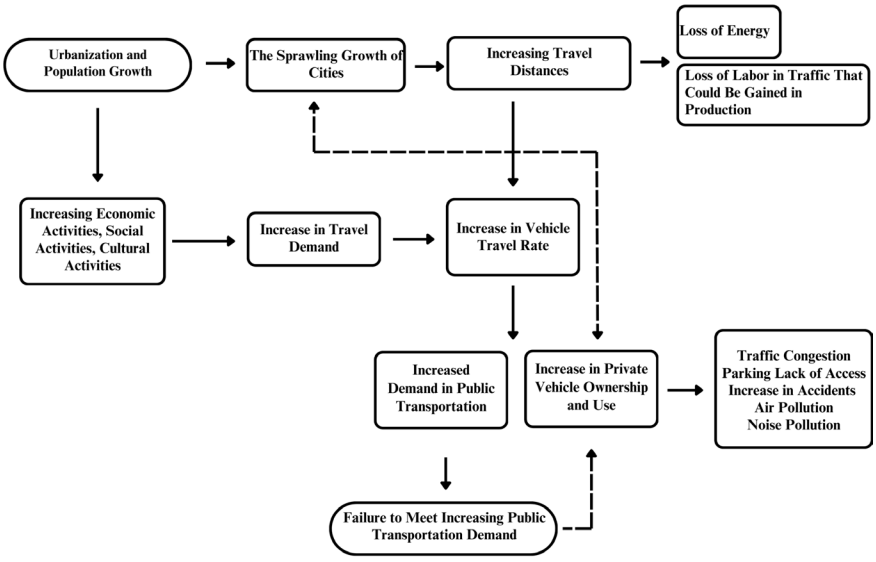


Figure 1. Developments in urbanization and transportation system (Candan, 2003)

In recent years, the density of urban areas has been growing rapidly and transportation demands are increasing due to the impact of car ownership. Urban transportation systems are inadequate in the face of developments experienced with the growth of transportation needs. Transportation and traffic problems continue to increase in cities (Kös, 2015). Today, it is aimed to reduce the negative effects caused by motor vehicles. In order to increase the livability level of cities, methods aimed at using motor vehicles have been abandoned. It is necessary to turn to sustainable transportation systems (Yılmaz, 2024).

Transportation is seen as the basis of development. In order to ensure social and economic development, there must be mobility and infrastructure must be established in this direction. Sustainable transportation provides individuals with more economical and safe access to transportation services. It also contributes to the reduction of environmental problems caused by transportation and the negative effects on public health. Sustainable transportation is sensitive to the environment by providing economic and social benefits. It is a type of transportation such as pedestrian and bicycle transportation and public transportation systems. Especially in large cities with high mobility and where transportation problems are felt more, sustainable transportation-oriented approaches should be supported (Eryiğit, 2012). While the spread of cities causes problems in transportation systems, sustainable transportation offers effective methods to solve the problems that occur.

3. Sustainable Transportation

Sustainable transportation can be defined as the resources used to meet transportation needs do not endanger public health and ecosystems. It can be defined as ensuring sustainable consumption of renewable resources at a rate lower than the renewal rate and ensuring that renewable alternatives of non-renewable resources are developed and used (OECD, 1999). Sustainability in the urban transportation system; There is social equality of opportunity. It provides transportation opportunities to everyone under equal conditions. It prioritizes non-motorized transportation types. An integrated urban transportation structure that encourages the use of public transportation vehicles, contributes to the reduction of greenhouse gas emissions, provides savings in fuel consumption, and is compatible with other transportation types should be planned (Cirit, 2014).

In plans created with the traditional approach, it is assumed that newer, faster systems replace linear and slow systems in transportation. In such approaches, there is a tendency for old systems to be less important. Therefore, it is not seen as a harm that the traffic created by the increased

use of automobiles negatively affects the use of public transportation or creates an obstacle to pedestrian transportation (Litman & Burwell, 2006).

It is assumed that every mode of transportation can be beneficial in sustainable transportation approaches. It reflects a parallel model that tries to create balanced transportation systems that use the best features of each mode of transportation. Therefore, progress in transportation includes the improvement of all useful systems, not just new systems. In many cities, the most beneficial transportation strategies are the development of walking and cycling. It includes the support of public transportation and the restriction of automobile travel in congested urban areas. Improved transportation systems can increase comfort and safety instead of faster travel or greater distance. It can provide cost savings and reduce the total need for travel (Litman & Burwell, 2006). Measures taken with transportation policies, encouraging walking and cycling and developing transportation hierarchies can reduce vehicle use rates (Banister, 2007).

Street designs are among the factors that affect people's transportation preferences. In order to encourage sustainable transportation modes, streets should be allocated with large areas and special lanes for pedestrians, cyclists and public transportation systems. Streets that offer transportation diversity allow for the creation of quality infrastructure that supports spatial efficiency and sustainability. When the areas covered by transportation systems are examined, the advantages of planning streets focused on public transportation, cycling and walking are seen. The preference of more efficient transportation systems in urban areas increases the total capacity of the used area. Streets that accommodate transportation types such as public transportation systems, cycling and walking support more people to use the area. Multi-modal streets allow more people to travel with fewer vehicles, thus causing lower emissions compared to motor vehicle-centered street designs. In addition, a street with multiple transportation systems allows people to travel according to their own preferred system (Global Designing Cities Initiative, 2016; URL-1, 2025).

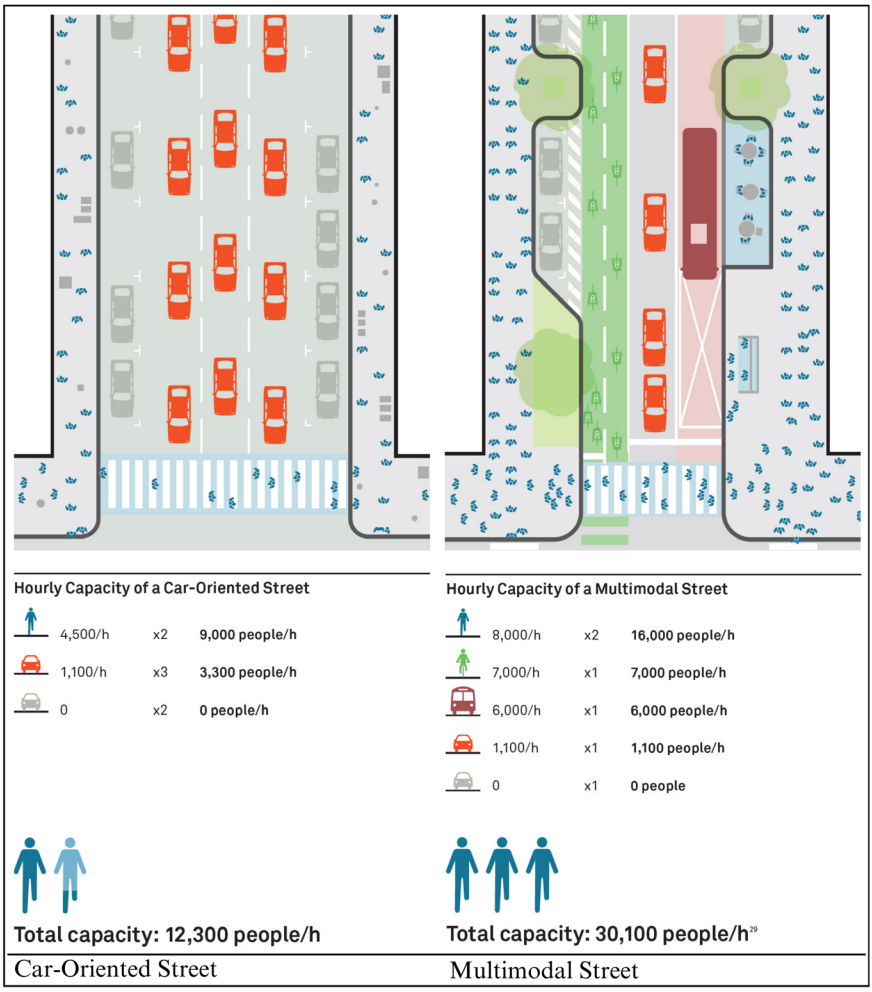


Figure 2. Vehicle-oriented street and multimodal street capacity (Global Designing Cities Initiative, 2016)

Developing urban transportation types with sustainable approaches plays an important role in reducing the environmental impacts of transportation systems. Increasing and making bicycle and walking paths safer, improving public transportation systems, and ensuring the integration of transportation systems with each other constitute important factors for cities to adopt sustainable transportation.

In order to make urban transportation types sustainable, they need to include certain concepts. These concepts are as follows (Öztaş, 2023);

- ***Accessibility and Inclusiveness***: Transportation types are made accessible to every individual in society regardless of age, income

status, etc. It also includes the planning of transportation systems that provide equal access to work, education, health services and other basic services.

- ***Security:*** With the improved infrastructure system and the revisions made, the safety of pedestrians, cyclists and vehicle drivers should be prioritized.
- ***Efficiency and Integration:*** Transportation resources and services can be used more effectively with the planning made for transportation systems to work in connection and in harmony. Designs that support transportation types that reduce heavy traffic and can be effective in reducing transportation times should be created.
- ***Durability:*** The aim should be to create transportation systems that adapt to all types of climatic conditions and do not lose their functions against adverse situations such as disasters and pandemics.
- ***Affordability:*** Sustainable transportation types that all users can access at affordable prices should be preferred. Thus, the cost of travel for work and education decreases.

The development and spread of sustainable transportation systems are based on the effective implementation of these concepts. These factors provide significant contributions to cities becoming greener and healthier by ensuring that sustainable transportation systems develop more permanently.

Figure 3. Buffalo Bayou Promenade, Houston (URL-1, 2025)

3.1. The Place and Importance of Bicycles in Sustainable Transportation

It is important to plan walkable areas in cities. It is necessary to increase the potential for bicycle use, to create recreational areas where urban residents can rest, and to take climatological variables into account at every stage of the planning. It plays an important role in combating climate change (Yılmaz, 2024).

Among urban transportation types, bicycle transportation is the least damaging to the environment. It is the most efficient form of transportation in terms of energy use. Therefore, interest in cycling is increasing. Bicycle transportation has many beneficial effects for individuals in terms of ecological, economic, physical and psychological aspects compared to other types of transportation (Dağ, 2022).

A city that values bicycle use is a city with less noise, cleaner air, healthier individuals, more space and a better economy. It means a city with a high livability level and a higher quality of life for individuals. It is preferred more in places where accessibility is high and the distance to go to the desired place is short. It is much easier to go out into nature and participate in cultural and sporting activities. For this reason, bicycle travel is not used for a single purpose. It is an effective tool that can be used in creating a diverse, development-friendly, livable city. Increasing bicycle use in urban use meets the needs of individuals with lower traffic congestion, healthier individuals, and longer life expectancies. It provides benefits such as reduced wear and tear on roads and less pollution. In addition, investments in bicycle transportation are more economical than other modes of transportation (The City of Copenhagen Technical and Environmental Administration, 2011).

A statement published by the US Department of Transportation in 2010 mentioned that establishing well-connected walking and cycling networks is an important component of livable communities. It emphasized that it contributes to reducing vehicle emissions and fuel use (USDOT, 2010).

A bicycle does not require much space both when stationary and when moving. 16 bicycles can be parked in the space used by one car. It occupies less space in cities compared to motor vehicles and allows for more efficient use of road surfaces. It reduces parking problems. Thus, it contributes to the creation of more green areas and social spaces (Lorasokkay, 2007).

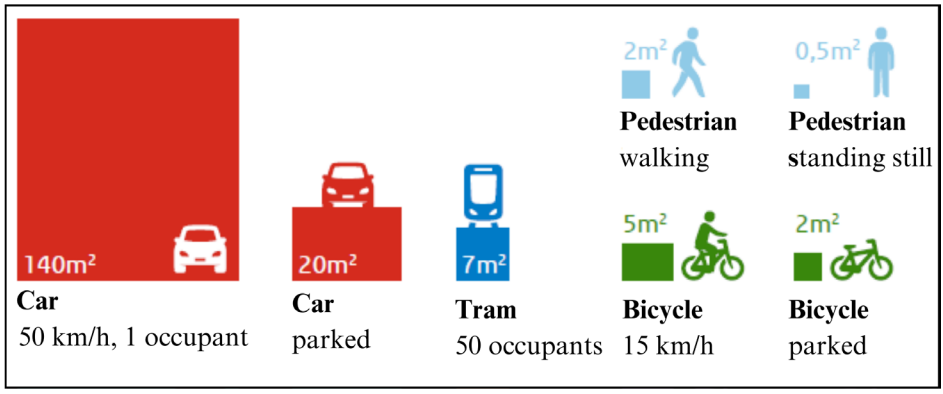


Figure 4. The area covered by transport systems (Harms & Kansen, 2018)

The preference of motor vehicle users for bicycles in transportation has reduced the number of cars in traffic. It has directly reduced traffic congestion and ensured the integration of public transport and cycling. In this way, it has increased the tendency for commuters to use public transport. In this case, it provides an indirect reduction in traffic congestion (and therefore makes public transport investments profitable) (EU Commission, 1999). The fact that people prefer walking or cycling more has led to the emergence of more traffic-free areas. It affects the increase in green areas. Trees and other plants in green areas reduce our carbon emission levels by taking some of the carbon dioxide in the air. This situation provides us with better air quality. It is also important for both environmental health and our physical and mental health (Sustrans, 2020).

Climate change greatly affects the amount of biodiversity we have on earth. Making our transportation choice from walking or cycling helps preserve biodiversity. Emphasizing the importance of green areas for plants and wildlife and taking precautions for the use of these areas for motor vehicles also contributes to the protection of biodiversity (Sustrans, 2020). Cycling provides the opportunity to do physical exercise outdoors, allowing us to discover new viewpoints and helps improve our mood. A study on this subject reveals that individuals who adopt a physically active lifestyle have a 32% higher well-being than inactive individuals (Cyclingweekly, 2022).

3.2. Bicycle Use in the World

In many cities around the world, especially the number of motor vehicles has increased significantly. This situation has caused the effects of climate change to be felt more and more in big cities and the increase in environmental pollution caused by transportation problems. As a result,

sustainable transportation-oriented approaches have started to come to the agenda more frequently. It is planned to reduce the number of motor vehicles by turning to bicycle transportation. In this context, plans are being made especially in Europe for bicycle transportation. It is seen that importance is given to practices aimed at developing bicycle infrastructure and encouraging the use of bicycles. When we look at the residential areas where bicycle transportation is widely used in the world, it is seen that traffic problems due to bicycle use have decreased (Yılmaz, 2024). In many European cities, traffic in residential areas is significantly calmed and large parts of city centers are completely vehicle-free (Pucher & Buhler, 2006). Amsterdam and Copenhagen, which were among the first cities to adopt bicycles in urban transportation systems, provide 40% of transportation by bicycle (Dağ, 2022).

There are 23 million bicycles in the Netherlands, which has a population of 17 million. Of the 23 million bicycles, 2 million are electric bicycles (Harms & Kansen, 2018). The percentage of bicycle use in the Netherlands has been around 26% in recent years. The rate in cities with the highest bicycle use is between 35% and 40%. In places with the lowest bicycle use, this rate is between 15% and 20% (Fietsberaad, 2010). The Netherlands is known for its bicycles, bicycle paths and multi-storey bicycle parking areas. When looking at the types of transportation used to commute to work, walking is 5% and cycling is 24% (ÇŞB, 2019).

Figure 5. A special and illuminated roundabout for cyclists, the "Hovenring" - Netherlands (ÇŞB, 2019)

In the evaluation of the types of transportation used to go to work and educational institutions in the city of Copenhagen, bicycles have a rate of 36%. In the same study, the rate of public transportation is 28%, the

rate of walking is 7% and the rate of transportation by car is 29% (The City of Copenhagen Technical and Environmental Administration, 2011). In Denmark, the percentage of bicycle use is generally between 15% and 20%. Bicycle use is quite common in cities. The percentage of bicycle use in Odense and Copenhagen is approximately 32%, and in Odense it is approximately 26% (Fietsberaad, 2010).

One of the countries with a high rate of bicycle use in the world is Germany. There are bicycle paths reserved for bicycle users in many cities here. In order to support bicycle use in transportation in Germany, it is aimed to ensure that bicycles can be used comfortably in all seasons. Studies are being carried out on the redesign of trams and buses. At the same time, the public has been included in the applications made on this subject. Renovation studies are also being carried out for vehicles that offer a variety of use (ÇŞB, 2019). When looking at the average preferred means of transportation in Germany, 10% is made by bicycle. The state of Nordrhein-Westfalen has a high rate of bicycle use, especially. The bicycle rate in Münster and Freiburg is between 20% and 30%. The bicycle percentage in Berlin is approximately 10% (Fietsberaad, 2010).

Another universal dimension of bicycle use in the Netherlands, Denmark and Germany is that every age group is represented. In almost many countries, children and young people have the highest rates of bicycle use. However, in the Netherlands, Denmark and Germany, bicycle use rates are high even among older individuals. While the rate of bicycle trips in Germany is 7% in the 18-24 age group, this rate increases to 12% in the 65 and older age group. In Denmark, the rate of bicycle trips decreases with age. However, bicycle trips are made by individuals in the 70-74 age group. The trips made constitute 12% of all trips made by individuals in this age group. This rate is the same among Germans aged 65 and over. Elderly individuals in the Netherlands make 24% of all their journeys by bicycle (Pucher & Buehler, 2009).

3.2.1. EUROVELO (The European Cycle Route Network)

EuroVelo is an international cycle path network consisting of 17 long-distance cycle routes connecting Europe. In order for a route to be included in the EuroVelo network, it must be approved by the European Cycling Federation (ECF). The routes can be used for daily journeys by cyclists traveling long distances and by local people in the regions where the cycle route passes (URL-2, 2024).

The objectives of EuroVelo are stated as follows (URL-2, 2024);

- To ensure the operation of high-quality, integrated European standards cycle paths in European countries, to carry Europe's best cycle path practices to the international level and to put them into operation throughout Europe;
- To inform decision-makers and potential participants about the existence of these routes, to promote the routes and encourage their use, and to become a central point for information on cycling in Europe;
- To direct many European citizens to cycling with this method and to ensure the transition to cycling, a healthier and more sustainable means of transport, in daily activities and tourism purposes.

EuroVelo consists of over 90,000 km of bicycle routes. More than 45,000 km of these routes are developed bicycle paths and low-traffic roads (URL-3, 2024).

Potential users on EuroVelo routes (URL-4, 2024);

- Cyclists traveling for vacation purposes,
- Those who do not plan a bicycle-based holiday but use bicycles on vacation,
- Those who use bicycles for transportation to and from work and for daily activities,
- Those who use bicycles for sports purposes are considered.EuroVelo,

4. Results

Climate change is increasing its impact even more and is becoming a significant problem today. This situation causes negative effects in terms of environment, social, economy and health. The increase in the number of motor vehicles causes greenhouse gas emissions to increase and causes the effects of climate change to be felt more. The increase in the number of motor vehicles needs to be brought under control. Because adopting sustainable transportation-oriented approaches plays an important role in combating climate change.

Sustainable transportation needs to be supported in order to create more livable cities. Sustainable transportation-oriented approaches, unlike traditional approaches, also include environmental concerns and include the development of walking and cycling and their support with the public transportation system. Thus, it reduces traffic density and contributes to

public health by encouraging the increase of physical activity (Yılmaz, 2024).

Cities established by giving importance to bicycle infrastructure make significant progress towards sustainability. The development and dissemination of bicycle transportation, which is an important part of sustainable transportation, reduces vehicle density. This contributes to the reduction of environmental problems. Preferring bicycle use instead of motor vehicles has positive effects on reducing greenhouse gas emissions. Preferring bicycle transportation over motor vehicles creates more social activity opportunities. It supports the increase of green space potential in cities. At the same time, it is seen that air quality improves in cities that support bicycle use (Yılmaz, 2024). In recent years, it has been seen that bicycles have become more preferred in many countries, considering the benefits they provide to the environment and society. The increase in bicycle use worldwide is an effective step in terms of sustainable transportation in the fight against climate change. In addition, it is expected that bicycle use will increase in the coming years.

References

Alpak, E. M., Düzenli, T., & Tarakçı, E. E. (2019). Quality of Open Space and User Satisfaction: Ecological Approach. Social Science I, 31-48.

AB-Komisyonu. (1999). *Cycling: The Way Ahead for Towns and Cities.*: https://op.europa.eu/en/publication-detail/-/publication/da358b26-2c94-4130-b473-328eb7bb0c52/language-en

Aktuğlu Aktan, E. Ö. (2006). *Kent Biçimi-Ulaşım Etkileşimine İlişkin (Tarihsel ve Güncel) Yaklaşımlar ve İstanbul Örneği*. Yıldız Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Doktora Tezi, İstanbul.

Banister, D. (2007). The Sustainable Mobility Paradigm. *Transport Policy*, 15(2008), 73–80, Elsevier, Transport Studies Unit, Oxford University Centre for the Environment, Oxford, UK.

Bayramoğlu, E., & Kurdoğlu, B. Ç. (2018). Bisiklet Yolu İçin Sürdürülebilir Donatı Tasarımı Süreci: KTÜ Kampüsü Örneği. *Akademik Sosyal Araştırmalar Dergisi*, 65, 152-163.

Büyüknalbant, S. (2010). *Kayseri Kentinde Ulaşım Altyapısının Yolculuk Davranışı Üzerine Etkilerinin Araştırılması*. Gazi Üniversitesi, Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi, Ankara.

Candan, S. (2003). *Ulaşım Sistemlerinin Bütünleştirilmesi Açısından Ankara Uygulamalarının Değerlendirilmesi ve Gelişme Önerileri*. Gazi Üniversitesi, Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi, Ankara.

Cirit, F. (2014). *Sürdürülebilir Kentiçi Ulaşım Politikaları ve Toplu Taşıma Sistemlerinin Karşılaştırılması.* T.C. Kalkınma Bakanlığı, Uzmanlık Tezi, 9-103.

Cyclingweekly. (2022). *15 Benefits of Cycling: Why Cycling is Great for Fitness, Legs and Mind*.: https://www.cyclingweekly.com/news/latest-news/benefits-of-cycling-334144

ÇŞB. (2019). Şehir İçi Bisiklet Yolları Kılavuzu. Ankara.

Dağ, V. (2022). *Sürdürülebilir Ulaşımda Bisiklet Yolu Ağı Oluşturulması İçin Bir Yöntem Önerisi: Denizli Kenti Örneği*. Akdeniz Üniversitesi, Fen Bilimleri Enstitüsü, Doktora Tezi, Antalya.

Düzenli, T., Alpak, E. M., & Eren, T. E. (2018). Open Space in the Context of Spatial Organization. *International Journal of Eurasia Social Sciences*, *9*(32), 1188-1201.

Elbeyli, Ş. (2012). *Kent içi Ulaşımda Bisikletin Konumu ve Şehirler İçin Bisiklet Ulaşımı Planlaması: Sakarya Örneği.* İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi, İstanbul.

Eryiğit, S. (2012). *Sürdürülebilir Ulaşımın Sosyal Boyutunda Bisikletin Yeri.* Selçuk Üniversitesi, Fen Bilimleri Enstitüsü, Doktora Tezi, Konya.

Fietsberaad. (2010). *The Bicycle Capitals of the World: Amsterdam and Copenhagen*. (*7a*, 1–52).: https://silo.tips/download/the-bicycle-capitals-of-the-world-amsterdam-and-copenhagen

Global Designing Cities Initiative. (2016). *Global Street Design Guide*. National Association of City Transportation Officials.

Harms, L., & Kansen, M. (2018). *Cycling Facts*: Netherlands Institute for Transport Policy Analysis, Ministry of Infrastructure and Water Management.: https://english.kimnet.nl/publications/publications/2018/04/ 06/cycling-facts

Karagöz, B. (2019). *Yerel Yöneticilerin Bisiklet Ulaşımına Bakış Açısı: Konya Örneği*. Konya Teknik Üniversitesi, Lisansüstü Eğitim Enstitüsü, Yüksek Lisans Tezi, Konya.

Kös, M. (2015). *Kent İçi Ulaşım Problemlerine Alternatif Entegre Bisiklet Ulaşımı Planlaması*. İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi, İstanbul.

Lorasokkay, M. A. (2007). *Konya Kent İçi Ulaşım Sorunları ve Çözüm Önerileri*. Selçuk Üniversitesi, Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi, Konya.

Lorasokkay, M. A., & Ağırdır, M. L. (2011). Konya Kent İçi Ulaşımda Bisiklet. *e-Journal of New World Sciences Academy*, 6(4), 870-881.

Lundberg, B., & Weber, J. (2014). Non-motorized Transport and University Populations: an Analysis of Connectivity and Network Perceptions. *Journal of Transport Geography*, 39, 165–178.

Mason, J., Fulton, L., & McDonald, Z. (2015). *A Global High Shift Cycling Scenario: The Potential for Dramatically Increasing Bicycle and E-Bike Use in Cities Around the World, with Estimated Energy, CO2, and Cost Impacts*. Institute for Transportation & Development Policy and the University of California.: https://itdpdotorg.wpengine.com/wp-content/uploads/2015/11/A-Global-High- Shift-Cycling-Scenario_Nov-2015.pdf

Mansuroğlu, S., & Dağ, V. (2021). Kent İçi Ulaşımda Bisiklet Kullanımı ve Bisiklet Yolları Konusunda Kullanıcı Yaklaşımları: Antalya Örneği. *Kent Akademisi*, 14(44), 90-101.

Mert, K., & Öcalır, E. V. (2010). Konya'da Bisiklet Ulaşımı: Planlama ve Uygulama Süreçlerinin Karşılaştırılması. *ODTÜ Mimarlık Fakültesi Dergisi*, 27(1), 223-240.

OECD. (1999). *Environment and Transport, Synthesis of OECD Work on Environment and Transport and Survey of related OECD, IEA and ECMT Activities.* OECD Publishing.

Öztaş, Ç. (2023). *Türkiye Sürdürülebilir Kent İçi Ulaşım Kılavuzu*.: https://wrisehirler.org/icerik/turkiye-surdurulebilir-kent-ici-ulasim-kilavuzu

Pucher, J., & Buehler, R. (2006). Why Canadians Cycle More Than Americans: A Comparative Analysis of Bicycling Trends and Policies. *Transport Policy*, 13, 265-279.

Pucher, J., & Buehler, R. (2009). Sustainable Transport That Works: Lessons from Germany. *World Transport Policy & Practice*, 15(1), 44-56.

Sustrans. (2020). *How Does Walking and Cycling Help to Protect the Environment.*: https://www.sustrans.org.uk/our-blog/get-active/2020/in-your-community/how-does-walking-and-cycling-help-to-protect-the-environment/

The City of Copenhagen Technical and Environmental Administration Traffic Department. (2011). *The City of Copenhagen's Bicycle Strategy 2011-2025*.: https://handshakecycling.eu/resources/city-copenhagen%E2%80 %99s-bicycle-strategy-2011-2025

Transportgeography. (2018). *Transportation, Sustainability and Decarbonization.* : https://transportgeography.org/contents/chapter4/ transportation-sustainability-decarbonization/

URL-1. (2025, Mart 7). https://www.asla.org/ContentDetail.aspx?id=53811

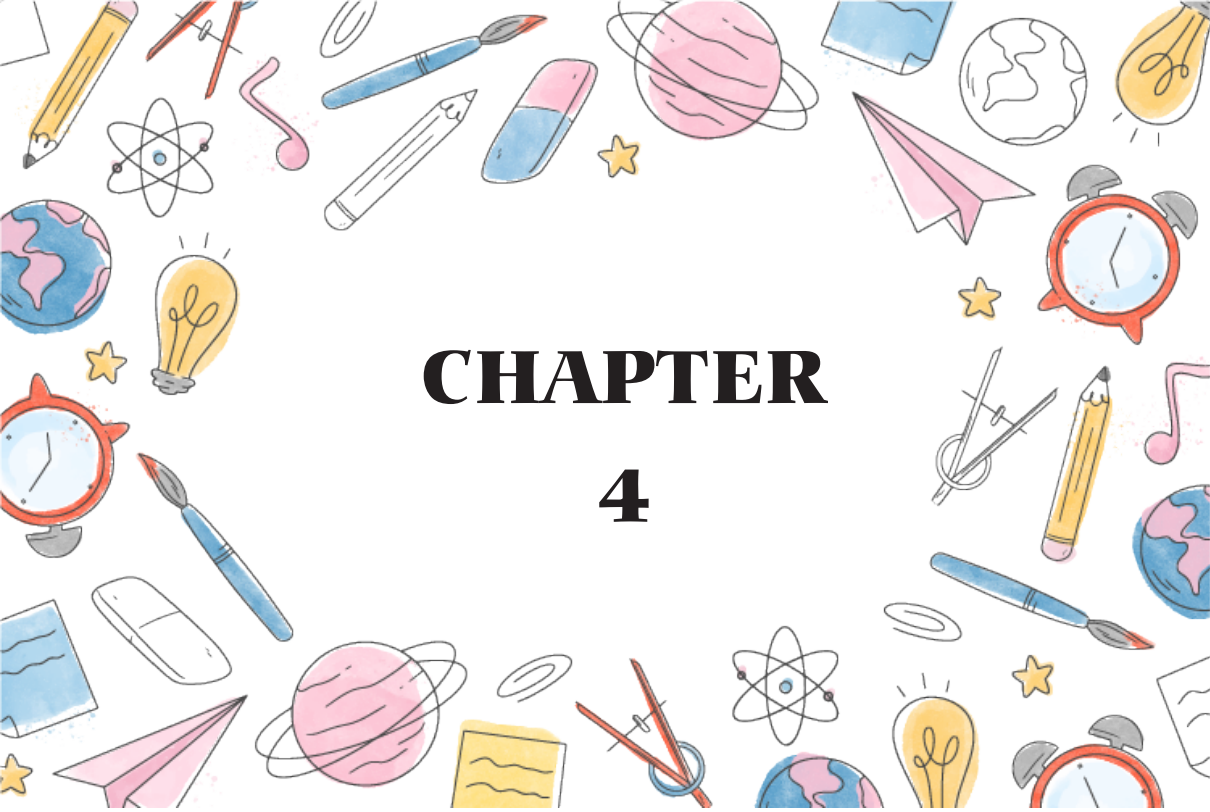
URL-2. (2024, Ocak 16). EuroVelo: https://en.eurovelo.com/about-us

URL-3. (2024, Ocak 18). EuroVelo: https://pro.eurovelo.com/organisation/about

URL-4. (2024, Ağustos 28). EuroVelo: https://pro.eurovelo.com/download/document/ Guidance-on-the-Route-Development-Process.pdf

USDOT. (2010). *Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations.* Washington, DC.: http://www.dot.gov/affairs/2010/bicycle-ped.html

Yılmaz, Ö. (2024). *Sürdürülebilir Ulaşımda Bisikletin Yeri ve Bisiklet Yollarının Olanaklılığının İncelenmesi; Konya Kenti Örneği*. Karadeniz Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi, Trabzon.



CHAPTER 4

TRANSFORMATION OF URBAN VOIDS: THE CASE OF TABAKHANE VALLEY URBAN RECREATION AREA IN TRABZON

Tuğba DÜZENLİ[1]

1 Prof. Dr., Karadeniz Teknik Üniversitesi, Orman Fakültesi, Peyzaj Mimarlığı Bölümü, Trabzon/Türkiye, E-mail: tugbaduzenli@gmail.com, ORCID: 0000-0002-2306-4299

1. Introduction

Global urbanization processes have led to the emergence of urban voids, driven by factors such as irregular spatial planning, functional obsolescence, and social disintegration. These voids manifest in various forms—abandoned areas, spaces surrounding derelict structures, underutilized public spaces, and transitional zones. Although often labeled as "voids" within the urban fabric, these spaces represent latent areas of transformation with considerable potential. This study examines the process of reimagining and transforming urban voids into spaces with permanent identities through temporary uses, from the perspective of landscape architecture. The research first explores the concept of urban voids through definitions and classifications found in the literature. It then discusses the impact of temporary spatial interventions—such as pop-up parks, art installations, and temporary markets—on these spaces. In this context, the study emphasizes the importance of concepts such as user participation, spatial flexibility, revitalization, and continuity.

To that end, the research focuses on student projects developed within the Environmental Design Studio course at Karadeniz Technical University's Department of Landscape Architecture. The site selected for design intervention was Trabzon's Tabakhane Valley, envisioned as an urban recreation area. The projects were evaluated in terms of the interaction between temporality and permanence, and the relationship between user experience and spatial appropriation. Ultimately, the transformation of urban voids through landscape architecture is conceptualized not merely as a process of physical re-functionalization, but as the creation of new urban identities within social, cultural, and ecological contexts. This approach is proposed as a flexible and inclusive mode of spatial production that aligns with the goals of sustainable urban development.

2. The Concept of Urban Voids

Urban voids emerge as an inevitable outcome of modern urbanization processes, shaped by dynamics such as spatial disorder, functional loss, and social disintegration (Özbilen & Kalın, 2001). These voids appear in the urban fabric as abandoned areas, spaces surrounding obsolete structures, derelict public zones, or transitional in-between spaces. Although they are often labeled as "voids" within the city, these areas possess latent potential for transformation. In academic literature, the concept is expressed through various terms including terrain vague (Solà-Morales, 1995), void spaces (Madanipour, 2003), urban interstices (Loukaitou-Sideris, 1996), and urban leftover spaces (Trancik, 1986). These are often undefined, ambiguous, and underutilized areas situated between developed zones, yet

they hold significant transformative capacity (Alpak et al., 2019; Alpak et al., 2023; Doğan et al., 2018).

Solà-Morales's concept of terrain vague refers not only to a physical emptiness but also to a state of social and cultural uncertainty. Trancik (1986) describes these places as "lost spaces," emphasizing their dysfunction in terms of environmental aesthetics and user experience. Madanipour (2003), on the other hand, views urban voids as products of socio-economic processes, noting that they arise due to unplanned urban growth, ownership issues, and infrastructural deficiencies. These perspectives collectively underscore the need to analyze urban voids not merely as physical gaps but as phenomena embedded in social, cultural, and economic contexts.Table 1. Iconic buildings in the position of city identity

3. Classification of Urban Voids

Urban voids can be classified in various ways based on their function, form, location, and ownership characteristics. The most commonly accepted classifications in the literature include:

- Functional Voids: Surroundings of disused buildings, abandoned industrial areas, vacant lots.
- Transitional Voids: Temporarily or discontinuously used areas such as pedestrian underpasses, parking lot edges.
- Negative Spaces: Areas that have been left out of design considerations, lacking contextual integration and often visually disturbing (e.g., highway edges, wall bases).
- Structural Voids: Parcels left empty due to gaps in urban planning or construction processes.

From the perspective of landscape architecture, these classifications serve as crucial parameters for both analysis and design. Each void type requires a distinct form of intervention and carries unique functional potential.

4. Temporary Spatial Interventions and Their Transformative Effects

In recent years, new approaches have emerged in urban planning and landscape architecture aimed at reactivating urban voids (Kurdoğlu et al., 2022; Bayramoğlu & Seyhan, 2021). Among these, temporary urbanism has gained prominence as a key strategy for catalyzing the spatial and social transformation of such areas (Özkan et al., 2017; Düzenli et al., 2018;

Yılmaz et al., 2020). Interventions such as pop-up parks, temporary markets, open-air cinemas, art installations, and mobile urban furniture temporarily reinstate functionality to underutilized spaces.

Temporary interventions are often evaluated through three core impacts:

- Social Revitalization: Temporary uses allow communities to rediscover neglected spaces, enhance social interaction, and reinforce a sense of place and ownership among local residents.
- Design Flexibility: These interventions are typically low-cost, easy to implement, and reversible—enabling the testing of ideas prior to permanent development.
- Cultural and Artistic Contribution: Creative interventions, such as art installations, enhance spatial perception, enrich aesthetic value, and contribute to cultural identity.

For instance, the Times Square Pedestrian Plaza in New York was initially designed as a temporary intervention but was later made permanent due to high user satisfaction and proven functionality. Similarly, Berlin's Tempelhofer Feld, a former airport transformed temporarily into an open space, eventually evolved into a widely used public park.

Although urban voids were traditionally viewed as problematic zones within conventional planning paradigms, they are now increasingly seen as experimental design laboratories and platforms for social interaction through temporary interventions (Bayramoğlu & Yurdakul, 2020; Düzenli et al., 2019). The field of landscape architecture plays a vital role in this transformation, offering both physical reinterpretation and user engagement. Temporary interventions go beyond their provisional nature; they hold the potential to foster spatial continuity and social permanence. Accordingly, with accurate analysis and creative design strategies, urban voids can be reimagined as integral components of sustainable urban life.

5. The Impacts of Temporary Spatial Interventions on Urban Voids

Urban voids are defined as areas within the urban fabric that have lost their function, are underutilized, or have been neglected. Transforming these spaces through conventional planning approaches typically involves time-consuming, costly, and bureaucratic processes (Yavuz et al., 2020). However, temporary spatial interventions—referred to as temporary urbanism or tactical urbanism—offer an alternative strategy for urban regeneration (Oswald et al., 2013). These interventions, characterized by low-cost,

quickly implementable, and community-oriented solutions, contribute to the physical and social revitalization of urban voids (Loukaitou-Sideris, 1996).

The effects of these interventions can be categorized under five main themes:

1. Enhancing Social Interaction and Community Bonds

Temporary spatial interventions create platforms for people to gather, socialize, and interact (Yavuz & Kuloğlu, 2012). Initiatives such as pop-up parks or temporary market spaces support a sense of ownership among local residents and promote shared-use cultures. At the neighborhood scale, such interventions strengthen neighborly relations and foster social cohesion. As time spent in these spaces increases, emotional bonds form among users, contributing to the development of a sense of social belonging (Bishop, 2012).

Example: Actions like "Park(ing) Day," which temporarily convert parking spaces into public areas, create new opportunities for social interaction in cities with limited public space.

2. Enabling Experimental Use of Space

Temporary practices allow for the testing of a site's potential before making permanent design decisions. They help identify the functions a space can accommodate, understand user needs, and explore the most effective spatial configurations (Koca, 2020; Yavuz, 2024). This process enables design decisions to be informed by data and shaped through participatory engagement.

Example: A temporary open-air exhibition may pave the way for the development of a permanent cultural space.

3. Creating Opportunities for Economic and Creative Initiatives

Interventions such as temporary markets, mobile cafés, or design booths offer low-cost opportunities for entrepreneurs to test ideas. These initiatives support the local economy and enhance visibility for small-scale producers. Simultaneously, they provide public platforms for creative sectors—artists, designers, and artisans—to express themselves.

Example: Berlin's Markthalle Neun began as a temporary market and, due to popular demand, evolved into a permanent space, establishing a sustained local economy.

4. Shaping Perceptions and Aesthetic Transformation

Transforming vacant spaces with art installations or temporary landscape designs can positively alter perceptions of both the site and the surrounding urban environment. Previously abandoned or unsafe areas can be reimagined into attractive, functional focal points through creative interventions (Gürer, 2015). Consequently, user perceptions, behaviors, and emotional responses toward the space are transformed.

Example: In San Francisco, a blank wall turned into an art gallery increased both tourist attention and neighborhood engagement.

5. Fostering Participation in Urban Transformation and Raising Awareness

Temporary interventions often emerge from community-driven ideas and encourage voluntary involvement during implementation. In doing so, residents become directly involved in shaping their environments (Çevik, 2017). This engagement not only fosters a sense of ownership and promotes sustainable maintenance but also acts as a preparatory and awareness-raising phase for broader transformation projects.

Example: In Istanbul, youth participation in the creation of seating areas as part of "Temporary Intervention Workshops" revealed user needs while enhancing participatory design practices.

Temporary spatial interventions are not merely aesthetic enhancements; they are strategic tools with multilayered impacts at social, economic, psychological, and spatial levels (Altıok, 2006). By making urban voids spaces that can be experienced, appropriated, and transformed, they pave the way for a more sustainable, participatory, and flexible urban life (Lydon & Garcia, 2015). From the perspective of landscape architecture, such interventions serve both as creative expressions and as preliminary phases for more permanent transformations. The next section will examine the design process in student projects developed at Karadeniz Technical University's Department of Landscape Architecture, focusing on the transformation of urban voids in the context of Trabzon's Tabakhane Valley.

6. Analysis of Student Projects

The project site is located within the boundaries of Cumhuriyet Neighborhood in the Tabakhane Valley of Ortahisar District, Trabzon, Turkey. The area is bordered by the Tabakhane Valley Bridge to the north, the Trabzon Teachers' Guesthouse (Trabzon Öğretmenevi) and Cudibey Middle School to the east, a sports/game hall situated within the valley

to the south, and the historic city walls to the west. The designated site is envisioned to be designed as an urban recreational area.

The main objective of the project is to design the designated site, as described above, into an urban recreational space that addresses the needs and expectations of the city's residents. This design is to be developed with consideration for both the immediate surroundings and the broader urban context of Trabzon's city center. Accordingly, in relation to adjacent institutions such as the Trabzon Teachers' Guesthouse and Cudibey Middle School, the proposed designs are expected to include facilities for education, workshops, food and beverage services, as well as spaces for cultural and social activities accessible to the general public.

The five enclosed buildings located along the eastern boundary of the site are to be assigned new functions that align with the proposed usage scenarios, and corresponding open space uses should also be considered. Additionally, in the northwest part of the site, there is an existing structure and open area previously used by the Department of Parks and Gardens of the Trabzon Metropolitan Municipality for plant cultivation and sales. This section is proposed to be repurposed for similar activities.

The historic city walls present within the site must be preserved in their original character. Furthermore, the pedestrian connection that runs parallel to the walls on the northwest side—providing access from Mimar Sinan Street to the Tabakhane Bridge—should be revised in line with the overall design approach.

From this perspective, the resulting designs must serve future users of the site and be aligned with the principles of landscape architecture, offering both functional and aesthetic value. The plans and spatial designs to be developed should aim to maximize the usability of the site while transforming this urban void into a revitalized public space.Within this context, three selected student projects have been reviewed and analyzed (see Tables 1, 2, and 3).

Table 1. Detailed Analysis of Project 1

PROJECT 1: Yağmur Pinazoğlu Project


Interpretation in Terms of Urban Void Transformation

Definition and Challenges of the Urban Void

The project area can be characterized as an urban void that had previously been underutilized, left idle, and largely undefined. It is a space likely to foster issues such as social isolation and perceived insecurity. Structural remnants along the valley, abandoned plots, and weak pedestrian connections have prevented the site from being effectively integrated into the surrounding urban fabric.

Spatial Integration and Transformation Strategies

The project employs a multi-layered transformation strategy to reintegrate this void into the city. Through analyses such as contextual synthesis, green space integration, and transportation connectivity, both physical and functional integration of the site has been achieved. The incorporation of uses such as education, food and beverage services, and cultural events aims to transform the area into a lively, continuously used public space.

New Functions and Active Spatial Design

Key decisions in the re-functionalization of the void include the introduction of open-air workshops, event scenarios, and cafeteria spaces tailored for daily use. The project aspires to become an accessible attraction not only for nearby residents but for the entire city. By considering nighttime usage, the design also aims to ensure continuous activity and improved safety.

Preservation of Historical and Ecological Context

The historical city walls within the site have been preserved, and new functions have been thoughtfully placed around this cultural heritage to

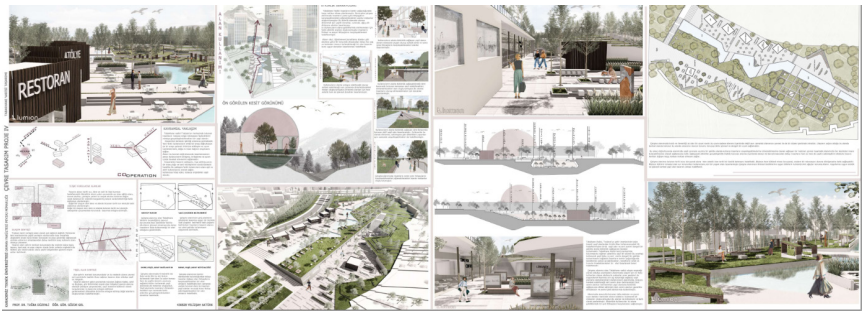
keep the memory of the place alive. The project demonstrates ecological and sustainable approaches such as maintaining green continuity, applying terraced designs that follow the natural topography, and using environmentally sensitive materials.

Social Gains from the Transformation of the Urban Void

A previously overlooked urban void has been transformed into a space that generates social, cultural, and economic value. Scenarios designed for a diverse range of users—students, neighborhood residents, teachers, and children—are envisioned with the goal of fostering a sense of community and belonging.

This project exemplifies a successful model of delivering multifunctional, user-oriented, and sustainable solutions for the transformation of urban voids. Sites with historical, natural, and social potential—such as Tabakhane Valley—can, with the right interventions, be revitalized to enhance the quality of urban life. Moreover, the project embodies an approach that reflects the transition from temporary use to a permanent public space.

Table 2. Detailed Analysis of Project 2

PROJECT 2: Yelizşah Aktürk Project


Interpretation from the Perspective of Urban Void Transformation

Definition and Issues of the Urban Void

The project area is a largely undefined and previously neglected valley space. Despite its close proximity to the city center, its prolonged underuse has rendered it a latent but untapped urban void. Core issues associated with such spaces include safety concerns, social exclusion, and limited accessibility.

Transformation Strategy and Conceptual Approach

The project is structured around the concept of "Cooperation," with spatial scenarios designed to foster interaction among diverse age groups and user profiles. The valley has been reimagined as a mixed-use public space, where functions such as workshops, restaurants, libraries, and rest areas—integrated with daily urban life—support continuous and vibrant use of the site.

Public Uses and Social Activation

Elements such as water features, seating arrangements, and open event areas encourage both passive and active engagement from users. The project not only considers user needs but also supports broader values such as social belonging, public interaction, and urban memory.

Integration of Landscape and Architecture, and Accessibility

The site's sloped topography has been handled with sensitivity. Gradual transitions and soft connections have resulted in a user-friendly design. Section drawings illustrate that the natural structure of the site has been preserved and harmoniously transformed through modern interventions.

Utilization of Historical and Ecological Layers

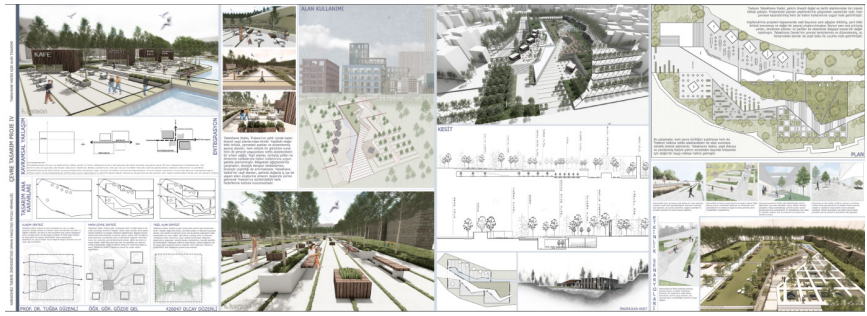
Existing natural elements and historical references have been integrated into the design, resulting in a context-sensitive transformation strategy. Proposed planting schemes and the use of natural materials contribute to the ecological as well as the social rehabilitation of the urban void.

Urban Connectivity

Pedestrian routes, interactive zones, and visual focal points have been designed to strengthen connections with the city center and ensure spatial continuity. The project aims to re-functionalize the area not only for the immediate surroundings but also as a space that addresses the wider urban fabric.

This study offers a strong example of user-centered, ecologically sensitive, and multifunctional public space design in the transformation of urban voids. Spatially rich areas like Tabakhane Valley, when approached with appropriate planning, participatory design scenarios, and an integrated landscape-architecture strategy, can be transformed into places that enhance urban quality of life.

Table 3. Detailed Analysis of Project 3

PROJECT 3: Olcay Düzenli Project


Interpretation from the Perspective of Urban Void Transformation

Definition of the Urban Void and Associated Challenges

This project aims to transform a largely undefined natural valley located within the urban fabric of Trabzon. Despite serving as a significant ecological corridor, the valley has previously offered limited public functions. Its lack of accessibility and functional integration has led to social disconnection and the formation of a spatial void within the city.

Design Decisions and Conceptual Approach

The design is grounded in the concept of "Integration," which seeks to establish a multi-layered relationship between green infrastructure, social life, and spatial continuity. The design strategy is supported by transportation analysis, contextual synthesis, and green space integration, ensuring both environmental and functional cohesion. The conceptual approach is guided by the convergence of natural topography and urban form.

Functional Distribution and Structuring of Public Life

The site includes everyday uses such as cafés, workshops, a bookstore, and exhibition spaces, targeting both active and passive users. Water elements and linear axes help define orientation and experiential routes across the space. Flexible zones shaped by event scenarios have been designed to appeal to various age groups and user profiles.

Ecological and Aesthetic Transformation

The preservation of tree cover, continuity of green infrastructure, and plant-based design strategies lend the space an ecological identity while

remaining faithful to the character of the natural valley. The project envisions the site as a "natural escape point" within the urban core, offering a green refuge for city dwellers.

Social Layer and Urban Memory

The project does not only address physical transformation but also aims to reinforce cultural memory through its spatial configuration. This scenario supports participatory public life and acts as a practice of urban memory revitalization.

This project presents a successful example of urban void transformation by reimagining Tabakhane Valley—a natural void—into a multifunctional, accessible, sustainable, and aesthetically engaging recreational space. By combining ecological sensitivity with spatial analysis, the project contributes to urban life while fostering a sense of social belonging.

7. Conclusion and Recommendations

This study examined the transformation of urban voids through landscape architecture, using the case of Tabakhane Valley in Trabzon, and revealed the potential of temporary spatial interventions to evolve into spaces with lasting identities. Based on the analyses and student projects, the following key conclusions were drawn:

Although urban voids may appear as problematic areas due to their lack of functionality, they actually represent potential spaces for revitalizing urban life through appropriate planning and design interventions. Temporary uses—such as open-air exhibitions, workshops, pop-up cafés, and green infrastructure elements—not only enriched user experience but also played a role in fostering a sense of social ownership.

The student projects highlighted principles such as flexibility, accessibility, multifunctionality, and harmony with nature, demonstrating the creation of an inclusive recreational framework responsive to the diverse needs of different user groups. The preservation of the historical and ecological context contributed to the redefinition of the site's local identity. This approach enabled temporary interventions to serve as a foundation for long-term urban memory formation.

In light of these findings, the following recommendations are proposed:

Temporary interventions should be integrated into strategic urban planning and considered as effective tools for the sustainable transformation of urban voids.

Urban transformation processes should be enriched through participatory design studios and collaborations with local stakeholders, in order to enhance spatial appropriation and community ownership.

In areas such as Tabakhane Valley—where historical and natural contexts are intertwined—design approaches should go beyond aesthetic concerns to also embrace cultural continuity and ecological balance.

In the adaptive reuse of urban voids, educational design practices (e.g., design studios, university-city collaborations) should be encouraged. These initiatives should be incorporated into local governance mechanisms to actively contribute to planning processes.

In conclusion, the transformation of urban voids through temporary and flexible design interventions should be understood not only as a spatial strategy but also as a practice that forges social connections, sustains cultural memory, and fosters urban belonging in harmony with nature.

REFERENCES

Alpak, E. M., Duzenli, T.., & Cigdem, A. (2019). Sustainability of urban identity: The case of Trabzon city. Journal of Environmental Protection and Ecology, 20(3), 1243-1254.

Alpak, E. M., Düzenli, T., & Eren, E. T. (2023). Does "Place Identity" Support Sustainability of Community at the Urban Parks. Online Journal of Art and Design, 11(1), 243-263.

Altıok, S. (2006). Kentsel kamusal açık mekânlarda bellek oluşturma sürecinde sanatın rolü. Sanat ve Tasarım Dergisi, 1(1), 45–60.

Bayramoğlu, E., & Seyhan, S. (2021). Peyzaj Mimarlığı Eğitiminde Çevre Tasarım Projelerinin Senaryo-Etkinlik Çeşitliliği Bakımından Değerlendirilmesi. Journal of Academıc Socıal Resources, 6, 751-755.

Bayramoğlu, E., & Yurdakul, N. M. (2020). Trabzon 100. Yıl Parkı ve Çevresinin Rekreasyon Potansiyelinin Saptanması. Bartın Orman Fakültesi Dergisi, 22(1), 38-46.

Bishop, P., & Williams, L. (2012). The temporary city. Routledge.

Çevik, H. (2017). Kentsel boşlukların değerlendirilmesinde geçici kullanım uygulamaları: Ankara kenti örneği. Planlama, (2), 131–143.

Dogan, F., Kalin, A., & Ozbilen, A. L. İ. (2018). A study on cultural change in places towards the past and the present: the case study of Trabzon city square. Megaron, 13(4).

Düzenli, T., Alpak, E. M., & Eren, T. E. (2018). Open Space in the Context of Spatial Organization. International Journal of Eurasia Social Sciences, 9(32), 1188-1201.

Düzenli, T., Mumcu, S., & Yılmaz, S. (2019). Kent Kimliğine Simgesel Peyzajın Etkileri. Turkish Online Journal of Design Art and Communication, 9(3), 438-448.

Gürer, E. (2015). Kentsel boşlukların mekânsal karakteristikleri: İzmir tarihi kent merkezi örneği. MEGARON / Yıldız Teknik Üniversitesi Mimarlık Fakültesi E-Dergisi, 10(3), 356–368.

Koca, T. (2020). Kentsel boşlukların dönüşümünde peyzaj mimarlığının rolü: Geçici kullanım pratikleri üzerine bir değerlendirme. Peyzaj Mimarlığı Dergisi, 47(1), 25–34.

Kurdoğlu, B. Ç., Seyhan, S., & Bayramoğlu, E. (2022). The evaluation of the national garden concept in environmental design projects with scenarios. Artvin Çoruh Üniversitesi Orman Fakültesi Dergisi, 23(2), 13-24.

Loukaitou-Sideris, A. (1996). Cracks in the city: Addressing the constraints and potentials of urban design. Journal of Urban Design, 1(1), 91–104.

Lydon, M., & Garcia, A. (2015). Tactical urbanism: Short-term action for long-term change. Island Press.

Madanipour, A. (2003). Public and private spaces of the city. Routledge.

Oswalt, P., Overmeyer, K., & Misselwitz, P. (2013). Urban catalyst: The power of temporary use. DOM Publishers.

Özbılen, A., & Kalin, A. (2001). The semantic value of plants in the perception of space. Building and Environment, 36(2), 257-279.

Özkan, D. G., Alpak, E. M., & Var, M. (2017). Design and construction process in campus open spaces: A case study of Karadeniz Technical University. Urban Design International, 22, 236-252.

Solà-Morales, I. (1995). Terrain vague. In C. Davidson (Ed.), Anyplace (pp. 118–123). MIT Press.

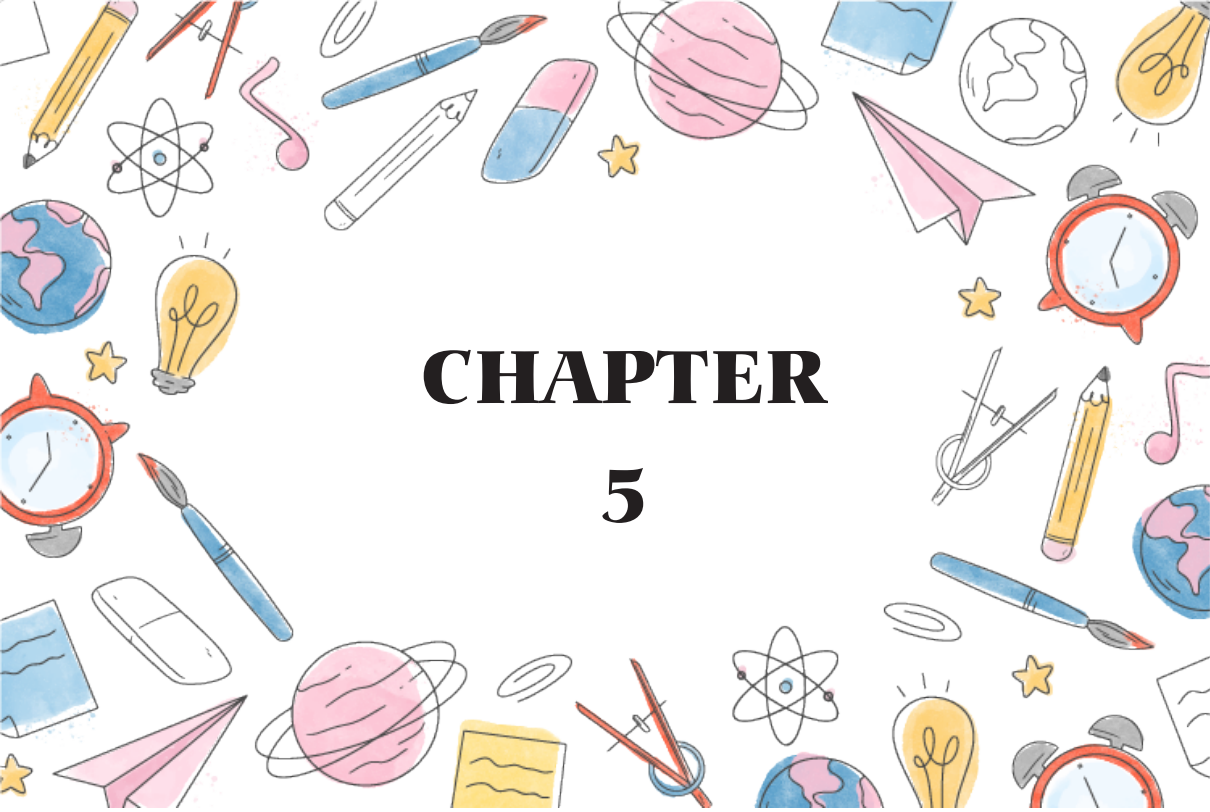
Trancik, R. (1986). Finding lost space: Theories of urban design. Van Nostrand Reinhold.

Yavuz A. (2024) Public Spaces, Cultural Life, And Public Art: İnteraction And Transformation. Sustaınable Approaches In Archıtecture And Urban Desıgn, Uşma Gökhan, Editör, Livre De Lyon, Lyon, Ss.171-190.

Yavuz, A., & Kuloğlu, N. (2012). A research on permeability concept at an urban pedestrian shopping street: a case of Trabzon Kunduracilar Street. Artvin Çoruh Üniversitesi Orman Fakültesi Dergisi, 13(1), 25-39.

Yavuz, A., Ataoğlu, N. C., & Acar, H. (2020). The identification of the city on the legibility and wayfinding concepts: a case of trabzon. Journal of Contemporary Urban Affairs, 4(2), 1-12.

Yılmaz, S., Düzenli, T., & Çiğdem, A. (2020). Residential environmental design with nature inspired forms. A| Z ITU Journal of Faculty of Architecture, 17(3), 211-223.



CHAPTER 5

EVALUATION OF LANDSCAPE RESTORATION PRACTICES IN RIVER ECOSYSTEMS IN TERMS OF ECOSYSTEM SERVICES[1]

İpek GÜLER[2]

Osman UZUN[3]

1 This study is derived from the doctoral dissertation titled "Determination of Ecosystem Services of the Büyüksu River Basin and Evaluation in Terms of Landscape Restoration," conducted under the supervision of Prof. Dr. Osman UZUN.

2 PhD Student, Düzce University, Institute of Graduate Studies, Department of Landscape Architecture, Düzce, Turkey, ORCID: 0000-0001-9009-9101

3 Prof. Dr., Düzce University, Faculty of Forestry, Department of Landscape Architecture, Düzce, Turkey,

ORCID: 0000-0002-7588-9524

1. INTRODUCTION

Water is one of the most vital substances for life on earth and the use of its resources is a fundamental component for the growth of human civilization and economic development. Over time, a scientific and engineering perspective has dominated the management of water and waterways (Åberg & Tapsell, 2013). With this perspective, it is seen that situations such as decreasing water quality, pollution, salinity, eutrophication, mucilage due to various anthropogenic factors, especially in urban environments, have emerged as difficult environmental problems in recent years (Eşbah Tuncay, 2021). This situation has severed people's cultural and physical ties with river landscapes. River networks have been blocked, restricted, re-routed and culverted to such an extent that natural river systems are rarely seen today. All these developments have had a major degrading impact on rivers and the ecosystem services they provide, particularly in urban environments (Åberg & Tapsell, 2013).

From ancient times to the present day, river banks have played an important role in determining the location of the establishment of cities and civilizations have started to develop in river valleys (Kılınçaslan & Özkan, 2005; Şimşek, 2011). There are five main urban centers in the world where urbanization originated; Mesopotamia (developed in the flood plains of the Tigris and Euphrates rivers), Egypt (developed along the narrow flood zone of the Nile), China (developed in the Huang or Yellow river valleys and alluvial fans), Pakistan (developed along the Indus River Valley) and Mesoamerica (Central America). Over time, these early civilizations were followed by Hellenic, Roman, Byzantine, Asian Minor and Islamic cultures. Rivers provide important uses such as water circulation, transportation, agricultural activities, recreational activities, raw material sources and drinking water supply. People have built and continue to build facilities and buildings on the banks of rivers, which are privileged places with favorable microclimate, topographic structure, unique plant and animal life, where they will shelter and benefit from energy. As a result, the riparian environment shaped by the society has emerged (Kılınçaslan & Özkan, 2005; Şimşek, 2011).

By the late 19th century, improvements in land transportation reduced the attractiveness of river banks and growing industries caused damage to rivers (Vermaat et al., 2016)we quantified provisioning (agricultural products, wood, reed for thatching, infiltrated drinking water. Throughout the 20th century, the culverting of small rivers, their subsequent closure and transformation into a sewer line became common throughout the world (Özden, 2020). With the increase in industrialization and migration to cities, degradation of urban and surrounding river ecosystems has emerged (Başaran et al., 2018). The advent of the industrial age has aggravated

the situation of urban rivers . Since the technical infrastructure was still not well developed, new industries could not afford to move away from transportation and energy systems, water sources and waste collection systems, so they were located close to water sources, damaging the ecosystem of rivers and settlements (Şimşek, 2011). With the development of human civilization, a wide range of ecosystem services provided by fluvial ecosystems were also significantly negatively affected by rivers (Basak et al., 2021; Grill et al., 2019).

Towards the end of the 20th century, with the growing interest in resource sustainability, urban rivers have regained importance as a source of life for both people and cities. After decades of neglect, urban rivers have started to be rehabilitated to solve the problems (Şimşek, 2011). In the 21st century, the fact that ecological events such as global warming, climate change and resource depletion, which have begun to be felt in the 21st century, have risen to alarming levels, has made it clearer that resources should be used in a sustainable way. The reopening of rivers that were later turned into a sewer line by being taken into canals within the city and covered over has been implemented in various metropolises of the world. These projects serve purposes such as flood prevention, transition to a separate sewage system, efficient use of treatment facilities, increasing human-nature interaction and biodiversity (Özden, 2020). Over the past decades, rivers have also been restored to reduce flood risk, increase habitat and biodiversity, and improve water quality (Jähnig et al., 2011; Vermaat et al., 2016)we quantified provisioning (agricultural products, wood, reed for thatching, infiltrated drinking water.

The rivers, which manifested themselves as the most decisive element of site selection in the emergence of the first cities, have a fundamental role in today's cities at least as much as in the past.Many rivers within the city have been heavily regulated, transformed and completely removed from their natural structures (Özalp, 2020). A significant number of large cities have been built along river corridors (Şahin et al., 2014). With their many services such as easy access to clean drinking water, fertile land for agricultural use, natural transportation routes, renewable energy, river corridors continue to be an important natural resource that today's cities benefit from (Özalp, 2020). However, many cities still use these water corridors for transportation or waste disposal purposes, and therefore the natural features of the river/valley landscape have been lost in many of them (Şahin et al., 2014). Considering the contributions of rivers to the environment we live in, studies to be carried out for the protection and management of the buffer areas formed by rivers and their surroundings will provide very important and valuable recycling. Protecting a relatively narrow strip of land along rivers will help maintain good water quality, provide habitat

for wildlife, protect people and buildings from floods, and extend the life of water resources (Yıldırım et al., 2013). We also need rivers, their naturalfeatures to solve urban problems such as controlling floods, improving and managing water quality, providing flora and fauna diversity (Şimşek, 2011).

Pollution from rivers and the accompanying negative impacts have changed the relationship betweenurban rivers and cities over time. In Table 1, the change of rivers from ancient times to 1990 and beyond is shown in general with their functions (Şimşek, 2011). Considering the increasing urbanization and climate change, sustainable planning, design and management of urban rivers has become an important issue all over the world. The occupation of areas within the floodplain by building islands has caused most urban rivers to be ignored due to the improvement of rail, road and highway infrastructure. As a result, cultural heritage river corridors, which are a centuries-old accumulation of local ecologies and traditional life activities, have been transformed into concrete channels suffering from pollution and lacking ecological and aesthetic integrity (Eşbah Tuncay, 2021).

Table 1. Changing functions of rivers in time perspective (Şimşek, 2011).

Function	**Ancient times**	**Until the 1850s**	**1850 to 1950**	**1950 to 1990**	**1990 and later**
Drinking water	X	X			
Domestic water	X	X		X	X
Water for industrial use			X	X	X
Sewage discharge area			X	X	
Conversion to concrete channels			X	X	
Closing of rivers			X	X	
Use as an ırrigation source	X	X	X	X	X
Rehabilitation				X	X
Transportation	X	X	X	X	X
Excursion	X	X	X	X	X
Boating, canoeing etc.		X	X	X	X
Fishing	X	X			X
Recreation	X	X		X	X
Washing dishes, laundry, etc. along rivers. washing	X	X			
New approaches for urban rivers					X
Waterfront design innovations					X

Environmental problems					X
Green infrastructure					X

Throughout history, there has been an interaction between humans and nature, and while natural conditions have shaped the lifestyles of societies, humans have played a direct role in the use and consumption of nature's resources. This rapid consumption continues to increase today, and as ecosystems are destroyed, the quantity and quality of the services they provide are negatively affected. In changing ecosystems, biodiversity loss occurs and ecological and social vulnerabilities are created. When the trends of changing ecosystems, especially in recent years, are examined under the influence of direct factors (climate change, pollution and eutrophication, land use changes, diseases and the spread of invasive species) and indirect factors (economic, socio-political, demographic, cultural, science and technology), most of which are human-induced, it is clearly understood that social development depends on the continuity of the services provided by ecosystems (Albayrak, 2012). Many ecosystem services are essential to support life and human well-being, especially water andfood-related ecosystem services such as water yield, water purification, soil conservation and crop production (Gao et al., 2017; Kremen, 2005; Qi et al., 2019). They also play a critical role inmaintaining and improving human well-being, which is essential for regional landscape sustainability (MEA, 2005; Zhang et al., 2016). Healthy, self-sustaining river systems are also one of the key ecosystem services on which human life depends (Palmer et al., 2005; Postel & Richter, 2012) and degraded rivers fail to provide ecosystem services (Grimm et al., 2008; Sarvilinna et al., 2017).

In this context, the combination of ecosystem services and river landscape restoration works has emerged as an important issue in recent years. The aim of this study is to reveal the impact of river ecosystem restoration works on ecosystem services by utilizing national and international literature. With the information obtained, the factors affecting the river ecosystem and ecosystem services, ecosystem services provided by the river, restoration of the river ecosystem, the importance of ecosystem services in human welfare and life were explained.

2. MATERIALS AND METHODS

The basic material of the study consists of all studies such as articles, books, projects, web pages, etc. conducted within the scope of ecosystem services and river rehabilitation/restoration.

The methodology of the study was developed based on the literature review and was conducted in three stages.

- First, the relationship between ecosystem services and river restoration was defined,
- Secondly, a literature review was conducted on ecosystem services and river restoration, separately and together, and the current situation was revealed,
- In the third stage, river restoration studies were examined and some determinations and recommendations were made regarding the factors affecting the river ecosystem and ecosystem services, ecosystem services provided by the river, restoration of the river ecosystem, and the importance of ecosystem services in human welfare and life.

3. RESEARCH RESULTS

3.1. ECOSYSTEM SERVICES and RIVER/RIVER RESTORATION

Ecosystem services is the name given to all the products and services provided by ecosystems around the world to humans and other living things. They ensure the continuity of life on earth. According to

the 1997 article by Costanza and colleagues, which is considered a milestone in this field, all ecosystems in the world, that is, all the services provided by nature, directly support the lives of more than 1 billion people (Costanza et al., 1997; The World Bank, 2006). After this study, the importance given to the subject has increased significantly (Çağlayan et al., 2020). Today, the concept of ecosystem services is widely used among scientists and policy makers to emphasize the importance of the environment in sustaining human well-being (Tokgöz, 2018).

Ecosystem services have been classified from different perspectives with different groups (CICES, 2022; Costanza et al., 1997; G. G. Daily, 1997; de Groot et al., 2010; MEA, 2005; TEEB, 2012)both directly and indirectly, and therefore represent part of the total economic value of the planet. We have estimated the current economic value of 17 ecosystem services for 16 biomes, based on published studies and a few original calculations. For the entire biosphere, the value (most of which is outside the market. The classifications proposed in Daily (1997) and Costanza et al., (1997) have been used as references in many studies. However, the MEA's classification is considered to be more directive in terms of studies on site management (MEA, 2005; Tokgöz, 2018). Differences in classifications are due to the complex structure of the ecosystem (Yılmaz Kaya, 2019). Daily and Constanza's classifications contribute to the identification of research and application areas related to ESs, but are insufficient to exp-

ress all the services provided by ecosystems (Albayrak, 2012; Costanza et al., 1997; G. G. Daily, 1997). The most widely used classification in the literature is the classification prepared by MEA, (2005) which groups ecosystem services into four categories. According to this classification, ecosystem services are resource providing, regulatory, supportive and cultural services (Pamukçu, 2015).

The Millennium Ecosystem Assessment MEA, (2005) defines ecosystem services as the benefits that people derive from ecosystems to achieve overall human well-being. MEA classifies ES as provisioning services (products derived from ecosystems, e.g. food, fiber and water), regulating services (benefits derived from the regulation of ecosystem processes, e.g. climate regulation, flood regulation), cultural services (non-material benefits that people derive from ecosystems, e.g. recreational, aesthetic and spiritual benefits) and supporting services (services that are essential for the production of all other ecosystem services, e.g. soil formation and retention, nutrient cycling, water cycling and habitat provision) (Basak et al., 2021; Esse et al., 2019). When the main headings used in the classification are examined; it is observed that supplier services include the products provided from ecosystems, regulatory services include the benefits obtained from the functioning of ecosystem processes, supporting services include the services necessary for the production of all other services, and cultural services consist of intangible (spiritual) benefits (Yılmaz, 2021).

One of the ecosystem services that provides many benefits to people and human well-being is river systems, which are unique (Hanna et al., 2018; Kaiser et al., 2020; MEA, 2005; Palmer, Filoso, et al., 2014). Table 2 categorizes some of these ecosystem services (Bergstrom & Loomis, 2017; Çağlayan et al., 2020; Delibaş, 2012; Lewis et al., 2008; MEA, 2005; Provencher et al., 2008; Speed, Tickner, et al., 2016; TEEB, 2012; Yaacovi et al., 2021)as are the valuation methods used. More than two-thirds of the 38 river restorations reviewed sought to restore and protect fish populations, including in many cases threatened or endangered species. River restorations were also frequently undertaken to improve wildlife habitat, and water quality for boating. In terms of the use of non-market valuations in decision making, six of 38 restorations reviewed involved benefit-cost analyses or environmental assessments or equivalent decision documents. While both revealed preference and stated preference methods were used for valuing river restorations, the majority of restoration valuations (27 out of 38, about 70%.

Table 2. Ecosystem services provided by river systems (Bergstrom & Loomis, 2017; Çağlayan et al., 2020; Delibaş, 2012; Lewis et al., 2008; MEA, 2005; Provencher et al., 2008; Speed, Tickner, et al., 2016; TEEB, 2012; Yaacovi et al., 2021)as are the valuation methods used. More than two-thirds of the 38 river restorations reviewed sought to restore and protect fish populations, including in many cases threatened or endangered species. River restorations were also frequently undertaken to improve wildlife habitat, and water quality for boating. In terms of the use of non-market valuations in decision making, six of 38 restorations reviewed involved benefit-cost analyses or environmental assessments or equivalent decision documents. While both revealed preference and stated preference methods were used for valuing river restorations, the majority of restoration valuations (27 out of 38, about 70%.

Provisioning Services	**Regulating Services**	Cultural **Services**	**Supporting Services**
Products obtained from ecosystems	Benefits derived from ecosystem processes	Intangible benefits derived from ecosystems	Ecological functions underlying the production of ecosystem services
• Fish production • Biodiversity • Fresh water	• Climate regulation • Water quality • Erosion control • Water treatment and water retention • Carbon storage • Water and waste water treatment	• Ecotourism • Recreation • Education value	• Flood control

Riparian areas in many regions are subject to degradation due to natural processes such as flooding, fire and overuse (Fernández et al., 2014; Ivits et al., 2009; Xia et al., 2021). River ecosystems are threatened by anthropogenic impacts, including organic and inorganic pollution from point and nonpoint sources, geomorphological changes, land use changes, water withdrawal, invasive species (Figure 1). Many rivers around the world are severely degraded, jeopardizing their service supply. River restoration aims to reverse this situation (Kaiser et al., 2020). Successful river restoration results in improved water quality, increased biodiversity, reduced flood risk, increased water treatment capacity and increased recreational areas (Garcia et al., 2016).

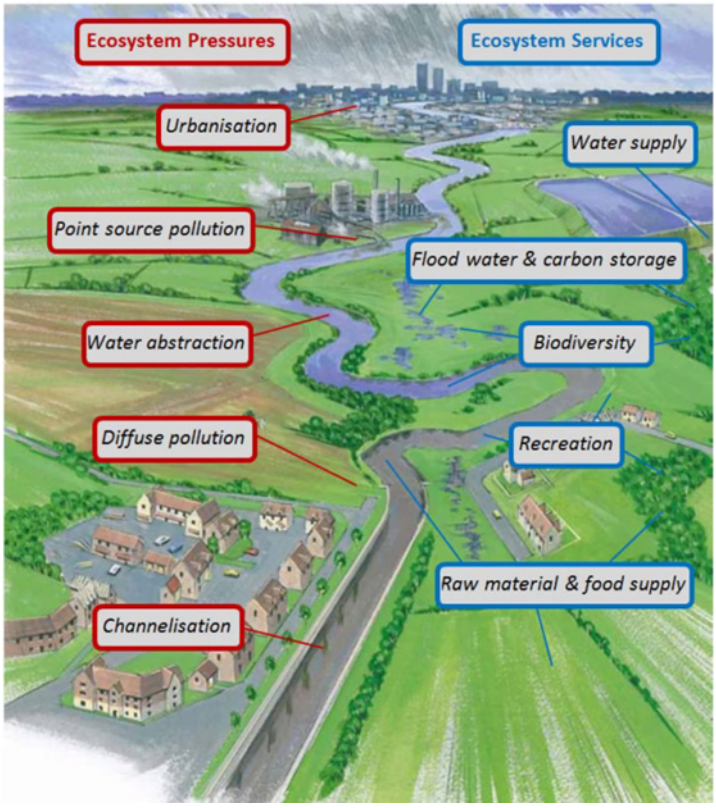


Figure 1. Ecosystem services and pressures in a river basin (RRC, 2022).

As mentioned above, ecosystem services provided by rivers fall into four main categories: supporting, regulating, provisioning and cultural services (MEA, 2005). Supporting services include processes such as nutrient cycling and habitat provision, while regulating services provide benefits such as water quality improvement, flood control and climate regulation (Giller, 2005). River restoration projects aim to restore riverbeds to their former natural state in order to ensure the continuity of these services. For example, planting improves water filtration, while protecting natural floodplains reduces flood risk (Palmer, Hondula, et al., 2014). Supplying services include water, fisheries and other biological resources provided by rivers. However, overuse and pollution threaten these services (Postel & Richter, 2012). Restoration efforts promote the sustainable use of water and ensure the continuity of local ecosystems. Cultural services include the recreational, aesthetic and spiritual values offered by rivers. Protecting and enhancing natural riparian landscapes offers social benefits by increasing people's interaction with nature (Everard & Powell, 2002).

According to Brauman vd. (2007) hydrological ecosystem services are; improving the supply of natural source water (urban, agricultural, commercial, industrial, thermoelectric power use), improving the supply of water in its natural state (hydroelectric power generation, water sports, freshwater fishing), reducing water damages/damages, providing water-related cultural services, supporting water-related services (Uygur, 2016). Therefore, carrying out some landscape restoration works that reduce and eliminate the ecosystem pressures in Figure 1 will directly contribute to the hydrological ecosystem services resulting from the river.

In the following literature review on the importance of the subject and its evaluation together, it is clearly understood that the subject interacts with each other.

3.2. LITERATURE ON ECOSYSTEM SERVICES AND RIVER/RIVER RESTORATION

When the international literature was examined, studies conducted in the last 20 years (2005-2025) were searched using the SCOPUS database. As a result of a systematic search of the database, 247 studies were identified using the keywords river restoration and ecosystem services; 20 studies were identified using the keywords river rehabilitation and ecosystem services. In addition, 145 studies were identified using the keyword "river rehabilitation"; 1247 studies were identified using the keyword "river restoration"; and 20711 studies were identified using the keywords "ecosystem services" (Figure 2) (Scopus, 2025). It was determined that studies on river rehabilitation started to increase especially after 2001. There was an increase in the number of studies on river restoration in 1998, but it was determined that the real increase occurred after 2004. It was determined that the number of studies on ecosystem services started to increase in 2005, and after 2011, the annual number of studies was 1000 or more. When the fields of study of these subjects were examined, it was determined that the highest number of studies were conducted in the field of environmental sciences.

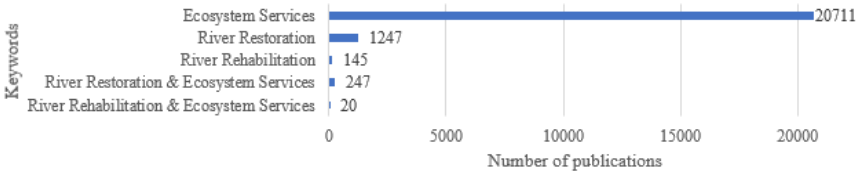


Figure 2. Number of publications by keywords in SCOPUS database search (Scopus, 2025).

As a result of scanning the SCOPUS database according to the keywords river restoration and ecosystem services, it was determined that the number of studies in which the two topics were studied together increased especially after 2013 and the highest number of studies was conducted in 2021 (Figure 3). When the studies conducted in 2013 were analyzed, it was determined that studies were conducted on the integration of ecosystem services into environmental impact assessment and thenecessity of river landscape restoration work as a result of flooding in California. In 2021, studies were conducted on the difficulties of urban river restoration, the quality and quantity of ecosystem services in the river corridor. With the increase in the world population and urbanization, the unconscious use of natural resources and agricultural lands has started to increase. It is thought that these two issues have started to be studied together due to the increasing problems such as decreasing resources, increasing natural disasters, climate change, decreasing water quality, decreasing biodiversity, as a result of the damage of rivers and ecosystem services that provide numerous benefits.

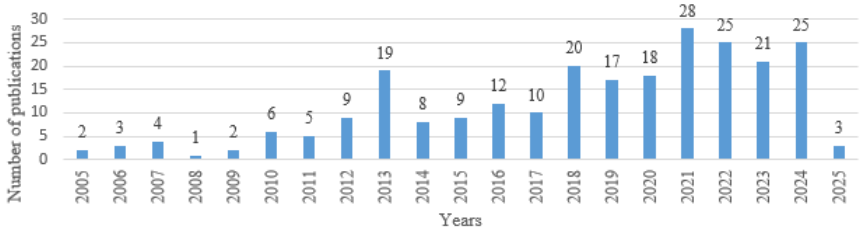


Figure 3. Distribution of river restoration and ecosystem services study by years (Scopus, 2025).

It was determined that researchers in the USA and China studied the issue of river restoration and ecosystem services with the highest number of publications. When the studies in the USA are examined, issues such as whether restoration work can solve problems and whether it makes economic sense to restore rivers to improve ecosystem services are investigated. When the studies in China were examined, it was determined that studies such as improving ecosystem services with ecological restoration, identifying problems in and around the river corridor and taking measures, and the value of ecosystem services were carried out. It is thought that the reason why most of the research is carried out in these countries is due to the decrease in resources due to high urbanization and dense population. When Turkey was analyzed, it was determined that 1 study was conducted. Among these, it was determined that the subject of the study conducted in Istanbul in 2017 was on the renaturalization of river systems by unearthing the rivers undergrounded in urban areas (Figure 4).

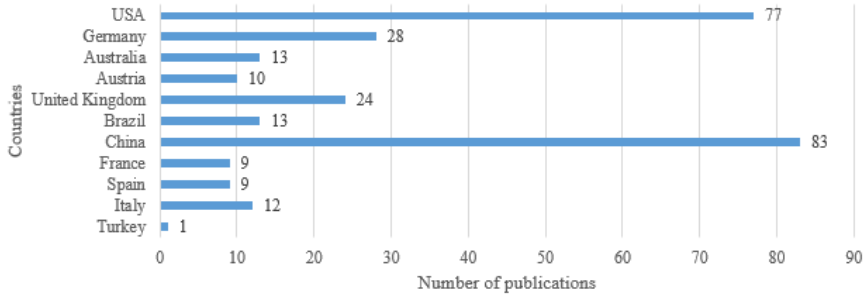


Figure 4. Countries and number of publications river restoration and ecosystem services (Scopus, 2025).

When the subjects of 247 studies identified according to the keywords "river restoration and ecosystem services" were analyzed, it was found that most studies were conducted in the field of environmental sciences. In studies in the field of environmental sciences, topics such as urban river restoration, ecosystem services provided by rivers, benefits of restoration works, restoration techniques were studied. In the second place, studies in the field of agricultural and biological sciences; the effect of environmental policy practices on river quality, restoration of areas where living species live, evaluation of the restoration of ecosystems in areas between urban and rural areas (Figure 5).

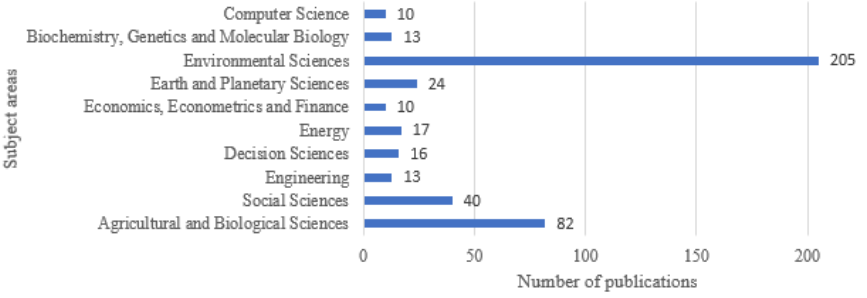


Figure 5. Distribution of river restoration and ecosystem services by subject area (Scopus, 2025).

As a result of the SCOPUS database search according to the keywords of river rehabilitation and ecosystem services, it was determined that the two subjects started to be studied together in 2011 and the number of studies was the highest in 2015 (Figure 6). In 2015, the reason for the highest number of studies is thought to be due to the damage to areas as a result of floods, hurricanes, droughts and terrorist attacks in various parts of the world.

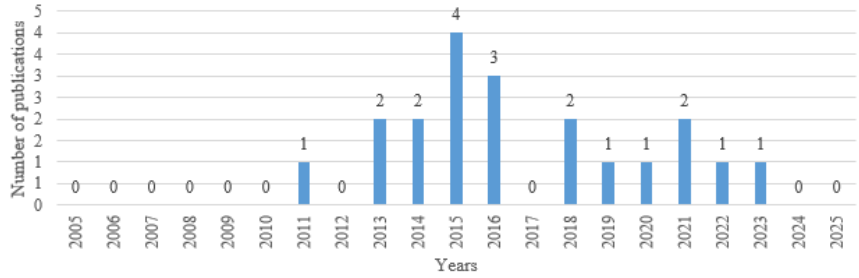


Figure 6. Distribution of river rehabilitation and ecosystem services work by years (Scopus, 2025).

The highest number of publications on river rehabilitation and ecosystem services was found to be by researchers in Australia and China (Figure 7). In Australia, topics such as managing threats in the watershed and restoring wetlands, analyzing river rehabilitation success, nature-based solutions to improve ecosystem services, and cost-effective river restoration planning were studied. It is thought that Australia's location between the Indian and Pacific oceans and the constant cyclones and severe droughts along the coast have led to the study of these issues. In China, issues such as water quality and quantity, changes in ecosystems, river basin management, and nature-based solutions have been addressed. It is thought that these issues are prioritized due to the negative impact of climate change and overpopulation on ecosystem services.

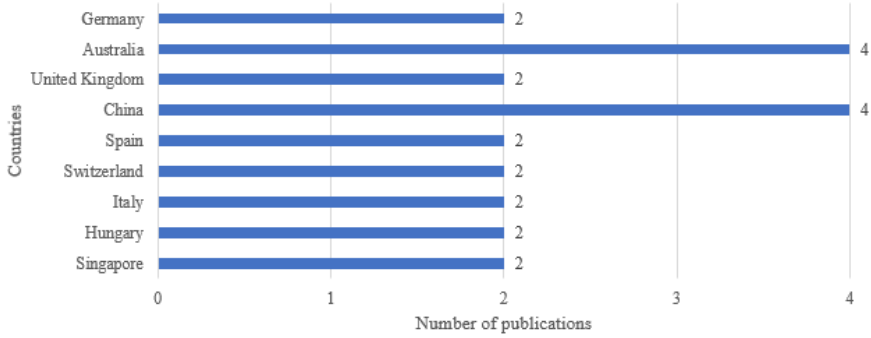


Figure 7. Countries and number of publications river rehabilitation and ecosystem services (Scopus, 2025).

When the study topics determined according to the keywords "river rehabilitation and ecosystem services" are analyzed, it is found that most of the studies were conducted in the field of environmental sciences. When the studies were examined, it was determined that studies such as water quality, when rehabilitation works should be carried out on rivers in ur-

ban areas, protection of floodplains, applicability of river rehabilitation in rivers with low water quantity, and the effect of rehabilitation works on ecosystem services were carried out (Figure 8).

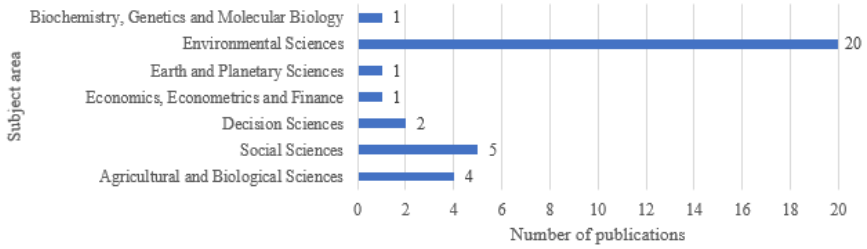


Figure 8. Distribution of the topic of river rehabilitation and ecosystem services according to subject areas (Scopus, 2025).

When the national literature was examined, when the terms river restoration, river rehabilitation, river corridor, landscape restoration, basin, river, repair, restoration, rehabilitation were searched in the search section of the National Thesis Center in the field of landscape architecture, 122 studies (2005-2025) that may be related to the research were identified (YÖK, 2025). There were 36 studies related to ecosystem services. 21 studies were found to be conducted in the field of landscape architecture. It was determined that the concepts of river landscape restoration and ecosystem services were mostly studied in the disciplines of landscape architecture and urban and regional planning. Later on, it was determined that studies on different subjects were also carried out in professional disciplines such as environmental engineering, çivil engineering and biology. When the studies were examined, it was determined that subjects such as the creation of a watershed management model based on ecosystem services, ecosystem servicesoriented urban model planning, determination and management of landscape features of the watershed or river corridor, creation of landscape restoration plans, integration of ecosystem services into landscape planning, the importance of ecosystem services in cities, the effects of land use changes on ecosystem services or river corridors , and the naturalization of river corridors by re-discovering them.

3.3. RIVER LANDSCAPE RESTORATION

A river is a body of water that flows continuously or periodically along a certain bed and slope direction, from the smallest river restoration to a river. According to the size or small size of the water body, small rivers are called creeks, tea, water or essence, and large rivers are called rivers or river (Hattapoğlu, 2004; Tarcan Bütün, 2018).

The river is one of the most important elements of the landscape. It has corridor and ecosystem features at landscape scale (Yıldırım et al., 2013). It provides important uses such as providing water cycle, transportation, agricultural activities, enabling recreational activities, being a source of raw materials, being used as drinking water, providing habitat for threatened and endangered species, providing resources for wildlife (Bergstrom & Loomis, 2017; Bliem & Getzner, 2012; Kılınçaslan & Özkan, 2005; Şahin vd., 2014; Şimşek, 2011). Rivers and their associated wetlands contribute significantly to the character and quality of the landscape in rural and urban areas. They can be sensitive ecosystems due to their special geological, hydrogeological and geomorphological structures. Rivers have a corridor function for the flow of living and non-living matter on the one hand and for the connectivity between habitats on the other (Şahin et al., 2014).

Despite playing a critical role in human development and the world's major ecosystems, river ecosystems have been over-exploited for human needs (Basak et al., 2021; Sinha & Kannan, 2014; WWF, 2025). Engineering, flood control, land use change, reservoir construction, irrigation, organic and heavy metal pollution, climate change, land misuse in agriculture, urbanization, interventions in river beds, flood control, land use change, dam construction, realignment of flow routes and beds, pollution, destruction of vegetation, erosion, replacement of natural species in the habitat, urban and industrial wastes, reduction of aquatic biodiversity, mining and sand quarrying activities, improper drainage and irrigation systems (Başaran et al., 2018; Langhans et al., 2013, 2014; Paillex et al., 2017; Pan et al., 2016; Yıldırım et al., 2013). As a result of these damages, major threats have emerged in river ecosystems. Dudgeon et al. (2006) stated these threats as flow change, water pollution, change of river habitat, proliferation of different species in the area (Başaran et al., 2018).

River landscape restoration is defined as helping to restore ecological structure and function in a degraded river ecosystem by replacing lost, damaged or compromised elements and re-establishing the processes necessary to support the natural ecosystem and improve the ecosystem services it provides. It includes reducing point source pollution (e.g. through improved wastewater treatment), reducing diffuse pollution (e.g. through revegetation or better management of the watershed), restoring ecologically important rivers (e.g. through dam operation rules), removing barriers to movement along a watercourse (e.g. by removing dams or levees or building fishways), protecting biota or reshaping the watercourse through engineering works (Speed, Li, et al., 2016). Over the past decades, rivers have also been restored to reduce flood risk, increase habitat and biodiver-

sity, and improve water quality (Bernhardt et al., 2005; Jähnig et al., 2011; Rey Benayas et al., 2009; Vermaat et al., 2016).

The main objectives of restoration have shifted from water quality in the 1950s and 1960s to enforcement in the 1970s, to landscape and amenities in the 1980s, to nature and ecosystem in the 1990s, and finally to improving the relationship between rivers and people in the 2000s. Table 3 below summarizes this transition over time (Şimşek, 2011).

Table 3. Topics of river landscape restoration in time (Eşbah Tuncay, 2021; Şimşek, 2011).

Period	**Topics**
Before the 1850s	-Natural river
1860s-1960s	-Sewage systems
1970s	-Drainage/Flood protection -Recreation & Aesthetics
1980s	-Aquatic parks -Water quality
1990s	-Ecological river improvement techniques -Flow regime restoration
2000s	-The relationship between river and human, nature and community -Rainwater as a source -Ecology of water harvesting -Microclimat

Riparian landscape restoration, including improving water quality and restoring ecological losses, has become an international priority in the era of sustainability (Langhans et al., 2013; Paillex et al., 2017; Pan et al., 2016; Tedford & Ellison, 2018)identify deficits, and provide preliminary indication of how to improve them. But, they are limited in delivering comparable assessment results across national or transnational borders, aggregating site-specific assessments into broader scale assessments, and supporting river management decisions. We present a multi-criteria decision analysis approach for improving the comparability of ecological assessment methods of different origin and for combining these assessments into a joint procedure. The approach consists of seven consecutive steps. The most central ones concern the hierarchical allocation of ecological assessment endpoints, and the harmonization of the scoring procedure of attributes (ecological indicators or assets. There are different examples of landscape restoration projects around the world that have gained importan-

ce due to environmental problems. River landscape restoration activities are generally referred to as restoration and are carried out in a wide range and scale (Başaran et al., 2018). Targets focusing on ecosystem services are also defined in international conventions and legal processes (Çağlayan et al., 2020). Initiatives related to these studies have started to increase since the early 1990s. At the 1992 Rio Summit, the need to take measures against the unsustainable use of water resources was expressed. The World Water Forum, the first of which was held in Morocco in 1997, is held every three years with different agenda topics. Since 2003, World Water Development Reports have been published regularly every year (Eşbah Tuncay, 2021). Environmental policies such as the EU Water Framework Directive play a critical role in protecting river ecosystems (Steele et al., 2008). The European Union (EU) pioneered the protection of water resources by publishing the "Water Framework Directive (WFD)" (2000/60/EC) in 2000 (Eşbah Tuncay, 2021). In 2015, international policies such as the Paris Agreement on Climate Change and the 2030 Sustainable Development Goals also help to make these projects more feasible and easily supportable (Guimarães et al., 2021). Many ecosystem services have been degraded in Europe, largely as a result of land fragmentation (European Commission, 2011). The EU 2030 Biodiversity Strategy, an important approach to restore Europe's ecosystems, states that "Further efforts are needed to restore the natural functions of freshwater ecosystems and rivers in order to achieve the objectives of the Water Framework Directive. This can be achieved by removing or restoring barriers that impede the passage of migratory fish and improving the flow of water and bottom sediments. To achieve this, at least 25,000 km of rivers will be converted into free-flowing rivers by 2030 by removing primary barriers that are no longer in use and restoring floodplains and wetlands."(European Commission, 2020). This approach aims to achieve "good" ecological and chemical status of surface waters (rivers, lakes, rivers, reservoirs, coastal and transitional waters) and "good" quantity and chemical status of groundwater in Europe (Eşbah Tuncay, 2021).

In line with these goals, the restoration of the section of the Isar River passing through the city of Munich in Germany, which used to be enclosed in a canal; the restoration of the Cheonggyecheon River in Seoul, the capital of South Korea, which was covered by a double-decker highway; the rehabilitation of the Kallang River concrete drainage channel passing through Bishan Park, one of the most important parks of Singapore (Başaran et al., 2018; Özalp, 2020); renaturization of the Aire River near Geneva, Switzerland; restoration of the San Antonio River in San Antonio, Texas, United States of America (Özalp, 2020); The restoration of the Blackstone and Tennessee Rivers in the USA, which is the center of industrial development and has become the most polluted river over time (Cengiz, 2007);

the restoration of the Yangtze River in Shangaii, China and the restoration of the Mayes Brook River in London, England can be given as examples (Başaran et al., 2018)

4. CONCLUSION

In this study, the concepts of river ecosystem, landscape restoration, ecosystem services and the relationship between them were tried to bring a perspective by analyzing national and international studies. When the changes from the past to the present regarding the river ecosystem and ecosystem services in the world and in our country are analyzed, it is seen that there are some negative management approaches. The approaches in both the European Union and the United States have clearly demonstrated that the negative impacts of the river ecosystem and the ecosystem services it supports should be ended and that landscape restoration plans and practices are needed in this context. The increase in ecosystem services after restoration works is partially confirmed in the literatüre studies. It is expected that more studies will be conducted to investigate the impact on ecosystemservices in areas where riparian landscape restoration has been carried out. In particular, long-term observations focusing on changes in ecosystem services after the completion of restoration works are recommended. This is especially important given the lack of post-implementation monitoring programs in Turkey and other countries.

River ecosystems are of great importance for the conservation of biodiversity and the continuity of ecosystem services. However, these ecosystems are under serious threat due to human activities. Factors such as agricultural activities, industrial pollution, urbanization and dam construction disrupt the natural structure of rivers and negatively affect their ecological functions (Allan, 2004). Therefore, river restoration/rehabilitation studies are becoming increasingly important. Restoration projects improve water quality and restore biodiversity by improving river habitats (Palmer et al., 2010).

River ecosystems provide many ecosystem services such as water supply, flood risk reduction, water purification and recreation (Daily, 1997). However, these services are gradually declining due to environmental degradation. For example, the regulation of waterways and lining with concrete channels disrupts the natural flow regime of rivers, leading to habitat loss (Beechie et al., 2008)“How should I prioritize restoration actions?” is often the unstated question, “What should I restore?” Distinguishing between these questions helps clarify the restoration planning process, which has four distinct steps: (1. By restoring the natural flow

regime, river restoration efforts regulate sediment transport and help aquatic organisms such as fish species regain their habitat (Wohl et al., 2015).

Ecosystem services play a critical role in human well-being and quality of life. Access to clean water, the opportunity to live in a healthy environment and the presence of recreational areas positively affect the physical and mental health of individuals (Tzoulas et al., 2007). River restoration supports the sustainable management of water resources by improving water quality and thus contributes directly to human health (Palmer, Hondula, et al., 2014). Furthermore, the protection of green spaces and natural waterways improves the overall well-being of the community by reducing stress levels (Kaplan & Kaplan, 1989).

In addition, river restoration projects also provide economic benefits. Restored ecosystems contribute to the local economy by stimulating sectors such as ecotourism and fisheries (Holmes et al., 2004)water clarity, wildlife habitat, allowable water uses, and ecosystem naturalness. A sequence of dichotomous choice contingent valuation questions were presented to local residents to assess household willingness to pay increased county sales taxes for differing amounts of riparian restoration. Results showed that the benefits of ecosystem restoration were a non-linear function of restoration scale and the benefits of full restoration were super-additive. We estimated the costs of riparian restoration activities by collecting and analyzing data from 35 projects in the study area. After adjusting our estimated valuation function for socio-economic characteristics of the local population, the benefit/cost ratio for riparian restoration ranged from 4.03 (for 2 miles of restoration. Furthermore, services such as flood prevention and water treatment provide economically sustainable solutions by reducing infrastructure costs (Postel & Carpenter, 1997). Therefore, the protection and restoration of river ecosystems is important for both environmental and socio-economic sustainability.

River restoration also provides long-term benefits in terms of sustainability of ecosystem services. For example, river bank vegetation improves water quality by preventing erosion, while restoring natural flood plains plays a critical role in flood control (Bernhardt et al., 2005). However, the success of restoration projects depends on accurate analysis of local ecological conditions and community involvement (Roni et al., 2008) including studies on road improvement, riparian rehabilitation, floodplain connectivity and rehabilitation, instream habitat improvement, nutrient addition, and other, less-common techniques. We summarize current knowledge about the effectiveness of these techniques for improving physical habitat and water quality and increasing fish and biotic production. Despite locating 345 studies on effectiveness of stream rehabilitation, firm conclusions about many specific techniques were difficult to make because of

the limited information provided on physical habitat, water quality, and biota and because of the short duration and limited scope of most published evaluations. Reconnection of isolated habitats, floodplain rehabilitation, and instream habitat improvement have, however, proven effective for improving habitat and increasing local fish abundance under many circumstances. Techniques such as riparian rehabilitation, road improvements (sediment reduction. Therefore, river restoration efforts require a comprehensive approach from both a scientific and governance perspective.

At this point, some recommendations are made below in terms of Integrated Management of River Restoration and Ecosystem Services.

Reducing Pressures on River Ecosystems: Industrial and agricultural activities negatively affect the water quality and ecosystem functionality of rivers. In order to reduce this impact, wastewater treatment systems should be developed and practices to optimize water consumption in industrial facilities and agricultural enterprises should be encouraged (Giller, 2005). Furthermore, the adoption of basin-based management approaches will help to protect water resources more effectively and sustainably (Wohl et al., 2015).

Management of Aquatic Ecosystems in Rural and Urban Areas: In rural areas, aquatic ecosystems can be severely damaged by agricultural activities. Therefore, sustainable agricultural techniques should be promoted and overuse of water resources should be prevented (Postel & Carpenter, 1997). In urban areas, the pressure of water on river ecosystems can be reduced by developing stormwater management strategies (Fletcher et al., 2013).

Spatial Planning and River Ecosystems: Spatial planning processes need to be integrated with nature-based solutions to sustainably manage river restoration and ecosystem services. Urban planning and land use decisions should be organized to reduce pressures on river ecosystems (Ahern, 2013). For example, flood plain protection and ecological restoration of urban waterways can minimize flood risks by contributing to the natural cycling of water (Palmer, Hondula, et al., 2014).

Urban Ecology and Green Infrastructure Practices: The pressures of urbanization pose a major threat to river ecosystems. Therefore, green infrastructure practices should be emphasized with an urban ecology perspective (Benedict & Mcmahon, 2006). Green corridors for urban river systems will improve water quality and ensure the continuity of habitats that support biodiversity (Tzoulas et al., 2007).

In conclusion, river restoration and management of ecosystem services require a multi-sectoral and interdisciplinary approach. Urbanization,

agriculture, industry and spatial planning processes should be integrated with strategies that prioritize the protection of river ecosystems. In this context, the implementation of integrated methods such as nature-based solutions, green infrastructure projects and watershed management is of great importance.

REFERENCES

Åberg, E. U., & Tapsell, S. (2013). Revisiting the River Skerne: The long-term social benefits of river rehabilitation. *Landscape and Urban Planning*, *113*, 94–103. https://doi.org/10.1016/J.LANDURBPLAN.2013.01.009

Ahern, J. (2013). Urban landscape sustainability and resilience: The promise and challenges of integrating ecology with urban planning and design. *Landscape Ecology*, *28*(6), 1203–1212. https://doi.org/10.1007/S10980-012-9799-Z/METRICS

Albayrak, İ. (2012). *Ekosistem Servislerine Dayalı Havza Yönetim Modelinin İstanbul - Ömerli Havzası Örneğinde Uygulanabilirliği*. Doktora Tezi, İstanbul Teknik Üniversitesi Fen Bilimleri Enstitüsü.

Allan, J. D. (2004). Landscapes and riverscapes: The influence of land use on stream ecosystems. *Annual Review of Ecology, Evolution, and Systematics*, *35*(Volume 35, 2004), 257–284. https://doi.org/10.1146/ANNUREV.ECOLSYS.35.120202.110122/CITE/REFWORKS

Basak, S. M., Hossain, M. S., Tusznio, J., & Grodzińska-Jurczak, M. (2021). Social benefits of river restoration from ecosystem services perspective: A systematic review. *Environmental Science and Policy*, *124*, 90–100. https://doi.org/10.1016/J.ENVSCI.2021.06.005

Başaran, N., Uzun, O., & Eroğlu, E. (2018). Kent ve Yakın Çevresi Akarsu Peyzajları Onarım Planlarının Hazırlanması. *ISUEP2018 Uluslararası Kentleşme ve Çevre Sorunları Sempozyumu: Değişim/Dönüşüm/Özgünlük28-30 Haziran 2018 Anadolu Üniversitesi – ESKİŞEHİR*, 490–498.

Beechie, T., Pess, G., Roni, P., & Giannico, G. (2008). Setting River Restoration Priorities: A Review of Approaches and a General Protocol for Identifying and Prioritizing Actions. *North American Journal of Fisheries Management*, *28*(3), 891–905. https://doi.org/10.1577/M06-174.1

Benedict, M. A., & Mcmahon, E. T. (2006). *Green Infrastructure: Linking Landscapes and Communities - Mark A. Benedict, Edward T. McMahon, Mark A. The Conservation Fund - Google Kitaplar* (Island Press). https://books.google.com.tr/books?hl=tr&lr=&id=2xTJvYqzFNkC&oi=fnd&pg=PR5&dq=Green+infrastructure:+Linking+landscapes+and+communities.+Island+Press.&ots=3qVcgJSTRv&sig=luDlJZ_oA0VK6sHM_Q12cPx0FrY&redir_esc=y#v=onepage&q=Green infrastructure%3A Linking landscapes and communities. Island Press.&f=false

Bergstrom, J. C., & Loomis, J. B. (2017). Economic valuation of river restoration: An analysis of the valuation literature and its uses in decision-making. *Water Resources and Economics*, *17*, 9–19. https://doi.org/10.1016/J.WRE.2016.12.001

Bernhardt, E. S., Palmer, M. A., Allan, J. D., Alexander, G., Barnas, K., Brooks, S., Carr, J., Clayton, S., Dahm, C., Follstad-Shah, J., Galat, D., Gloss, S., Goodwin, P., Hart, D., Hassett, B., Jenkinson, R., Katz, S., Kondolf, G.

M., Lake, P. S., … Sudduth, O. (2005). Synthesizing U.S. river restoration efforts. *Science*, *308*(5722), 636–637. https://doi.org/10.1126/SCIENCE.1109769/SUPPL_FILE/PFBERNHARDT.SOM.PDF

Bliem, M., & Getzner, M. (2012). Willingness-to-pay for river restoration: Differences across time and scenarios. *Environmental Economics and Policy Studies*, *14*(3), 241–260. https://doi.org/10.1007/S10018-012-0029-3/TABLES/7

Brauman, K. A., Daily, G. C., Duarte, T. K. eo, & Mooney, H. A. (2007). The nature and value of ecosystem services: An overview highlighting hydrologic services. *Annual Review of Environment and Resources*, *32*, 67–98. https://doi.org/10.1146/ANNUREV.ENERGY.32.031306.102758

Çağlayan, S. D., Balkız, Ö., Arslantaş, F., Ceviz Sanalan, K., Lise, Y., & Zeydanlı, U. (2020). *Şehir Planlama Aracı Olarak Ekosistem Hizmetleri: Çankaya İlçesi Örneği* (Vol. 1). Doğa Koruma Merkezi.

Cengiz, B. (2007). *Bartın Çayı Peyzaj Özelliklerinin Saptanması ve Değerlendirilmesi Üzerinde Bir Araştırma*. Doktora Tezi, Ankara Üniversitesi, Fen Bilimleri Enstitüsü.

CICES. (2022). *Common International Classification of Ecosystem Services*. Towards a Common Classification of Ecosystem Services. https://cices.eu/

Costanza, R., D'Arge, R., De Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R. V., Paruelo, J., Raskin, R. G., Sutton, P., & Van Den Belt, M. (1997). The value of the world's ecosystem services and natural capital. *Nature 1997 387:6630*, *387*(6630), 253–260. https://doi.org/10.1038/387253a0

Daily, G. C. (1997). *Nature's services: societal dependence on natural ecosystems*. Island Press. https://www.cabidigitallibrary.org/doi/full/10.5555/19991804067

Daily, G. G. (1997). *Nature's services: Societal dependence on natural ecosystems* (Vol. 1). Island Press.

de Groot, R. S., Alkemade, R., Braat, L., Hein, L., & Willemen, L. (2010). Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making. *Ecological Complexity*, *7*(3), 260–272. https://doi.org/10.1016/J.ECOCOM.2009.10.006

Delibaş, M. (2012). *Critical assessment of `stream daylighting' as an approach for renaturalization of riverine systems in urban areas case study on: Ayamama stream*. ksek Lisans Tezi, İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü.

Dudgeon, D., Arthington, A. H., Gessner, M. O., Kawabata, Z. I., Knowler, D. J., Lévêque, C., Naiman, R. J., Prieur-Richard, A. H., Soto, D., Stiassny, M. L. J., & Sullivan, C. A. (2006). Freshwater biodiversity: importance, threats, status and conservation challenges. *Biological Reviews*, *81*(2), 163–182. https://doi.org/10.1017/S1464793105006950

Eşbah Tuncay, H. (2021). *Suya Duyarlı Şehirler*. Türkiye Su Enstitüsü.

Esse, C., Santander-Massa, R., Encina-Montoya, F., De los Ríos, P., Fonseca, D., & Saavedra, P. (2019). Multicriteria spatial analysis applied to identifying ecosystem services in mixed-use river catchment areas in south central chile. *Forest Ecosystems*, *6*(1), 1–13. https://doi.org/10.1186/S40663-019-0183-1/FIGURES/5

European Commission. (2011). *The eu Biodiversity Strategy to 2020*. http://www.eea.europa.eu/publications/eu-2010-biodiversity-baseline/.

European Commission. (2020). *EU Biodiversity Strategy for 2030*. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52020DC0380

Everard, M., & Powell, A. (2002). Rivers as living systems. *Aquatic Conservation: Marine and Freshwater Ecosystems*, *12*(4), 329–337. https://doi.org/10.1002/AQC.533

Fernández, D., Barquín, J., Álvarez-Cabria, M., & Peñas, F. J. (2014). Land-use coverage as an indicator of riparian quality. *Ecological Indicators*, *41*, 165–174. https://doi.org/10.1016/J.ECOLIND.2014.02.008

Fletcher, T. D., Andrieu, H., & Hamel, P. (2013). Understanding, management and modelling of urban hydrology and its consequences for receiving waters: A state of the art. *Advances in Water Resources*, *51*, 261–279. https://doi.org/10.1016/J.ADVWATRES.2012.09.001

Gao, J., Li, F., Gao, H., Zhou, C., & Zhang, X. (2017). The impact of land-use change on water-related ecosystem services: a study of the Guishui River Basin, Beijing, China. *Journal of Cleaner Production*, *163*, S148–S155. https://doi.org/10.1016/J.JCLEPRO.2016.01.049

Garcia, X., Corominas, L., Pargament, D., & Acuña, V. (2016). Is river rehabilitation economically viable in water-scarce basins? *Environmental Science and Policy*, *61*, 154–164. https://doi.org/10.1016/J.ENVSCI.2016.04.011

Giller, P. S. (2005). River restoration: seeking ecological standards. Editor's introduction. *Journal of Applied Ecology*, *42*(2), 201–207. https://doi.org/10.1111/J.1365-2664.2005.01020.X

Grill, G., Lehner, B., Thieme, M., Geenen, B., Tickner, D., Antonelli, F., Babu, S., Borrelli, P., Cheng, L., Crochetiere, H., Ehalt Macedo, H., Filgueiras, R., Goichot, M., Higgins, J., Hogan, Z., Lip, B., McClain, M. E., Meng, J., Mulligan, M., … Zarfl, C. (2019). Mapping the world's free-flowing rivers. *Nature 2019 569:7755*, *569*(7755), 215–221. https://doi.org/10.1038/s41586-019-1111-9

Grimm, N. B., Faeth, S. H., Golubiewski, N. E., Redman, C. L., Wu, J., Bai, X., & Briggs, J. M. (2008). Global change and the ecology of cities. *Science*, *319*(5864), 756–760. https://doi.org/10.1126/SCIENCE.1150195/SUPPL_FILE/GRIMM.SOM.REV.PDF

Guimarães, L. F., Teixeira, F. C., Pereira, J. N., Becker, B. R., Oliveira, A. K. B., Lima, A. F., Veról, A. P., & Miguez, M. G. (2021). The challenges of urban river restoration and the proposition of a framework towards river restoration goals. *Journal of Cleaner Production*, *316*, 128330. https://doi.org/10.1016/J.JCLEPRO.2021.128330

Hanna, D. E. L., Tomscha, S. A., Dallaire, C. O., Bennett, E. M., Emily, D., & Hanna, L. (2018). A review of riverine ecosystem service quantification: Research gaps and recommendations. *Journal Applied Ecology*, *55*(3), 1311. https://doi.org/10.1111/1365-2664.13045

Hattapoğlu, M. Z. (2004). *Su Olgusunun Yerleşmeler Evrimindeki Yeri ve Günümüzde Bir Kentsel Tasarım Elemanı Olarak Yeniden Yorumlanması*. Yüksek Lisans Tezi, Mimar Sinan Güzel Sanatlar Üniversitesi, Fen Bilimleri Enstitüsü.

Holmes, T. P., Bergstrom, J. C., Huszar, E., Kask, S. B., & Orr, F. (2004). Contingent valuation, net marginal benefits, and the scale of riparian ecosystem restoration. *Ecological Economics*, *49*(1), 19–30. https://doi.org/10.1016/J.ECOLECON.2003.10.015

Ivits, E., Cherlet, M., Mehl, W., & Sommer, S. (2009). Estimating the ecological status and change of riparian zones in Andalusia assessed by multi-temporal AVHHR datasets. *Ecological Indicators*, *9*(3), 422–431. https://doi.org/10.1016/J.ECOLIND.2008.05.013

Jähnig, S. C., Lorenz, A. W., Hering, D., Antons, C., Sundermann, A., Jedicke, E., & Haase, P. (2011). River restoration success: a question of perception. *Ecological Applications*, *21*(6), 2007–2015. https://doi.org/10.1890/10-0618.1

Kaiser, N. N., Feld, C. K., & Stoll, S. (2020). Does river restoration increase ecosystem services? *Ecosystem Services*, *46*, 2212–0416. https://doi.org/10.1016/j.ecoser.2020.101206

Kaplan, R., & Kaplan, S. (1989). *The Experience of Nature: A Psychological Perspective - Rachel Kaplan, Stephen Kaplan - Google Kitaplar*. Cambridge university press.

Kılınçaslan, Ç., & Özkan, M. B. (2005). Akarsuların Kentsel Gelişme-Dönüşüm Süreci İçinde Çeşitli Kullanımlar Yönünden Etkileşimlerinin İzmir Kenti Örneğinde Ortaya Konulması. *Ege Üniversitesi Ziraat Fakültesi Dergisi*, *42*(2), 179–190.

Kremen, C. (2005). Managing ecosystem services: what do we need to know about their ecology? *Ecology Letters*, *8*(5), 468–479. https://doi.org/10.1111/J.1461-0248.2005.00751.X

Langhans, S. D., Hermoso, V., Linke, S., Bunn, S. E., & Possingham, H. P. (2014). Cost-effective river rehabilitation planning: Optimizing for morphological benefits at large spatial scales. *Journal of Environmental Management*, *132*, 296–303. https://doi.org/10.1016/J.JENVMAN.2013.11.021

Langhans, S. D., Lienert, J., Schuwirth, N., & Reichert, P. (2013). How to make river assessments comparable: A demonstration for hydromorphology. *Ecological Indicators*, *32*, 264–275. https://doi.org/10.1016/J.ECOLIND.2013.03.027

Lewis, L. Y., Bohlen, C., & Wilson, S. (2008). DAMS, DAM REMOVAL, AND RIVER RESTORATION: A HEDONIC PROPERTY VALUE ANALYSIS. *Contemporary Economic Policy*, *26*(2), 175–186. https://doi.org/10.1111/J.1465-7287.2008.00100.X

MEA. (2005). *Ecosystems and human well-being: Synthesis*.

Özalp, G. (2020). *Akarsu Koridorlarında Tasarım ve Planlama Stratejilerinin Belirlenmesi: Bir Model Önerisi*. İstanbul Teknik Üniversitesi.

Özden, Ö. İ. (2020). *Stream daylighting: An operative landscape infrastructure for Ankara*. Yüksek Lisans Tezi, Orta Doğu Teknik Üniversitesi, Fen Bilimleri Enstitüsü.

Paillex, A., Schuwirth, N., Lorenz, A. W., Januschke, K., Peter, A., & Reichert, P. (2017). Integrating and extending ecological river assessment: Concept and test with two restoration projects. *Ecological Indicators*, *72*, 131–141. https://doi.org/10.1016/J.ECOLIND.2016.07.048

Palmer, M. A., Bernhardt, E. S., Allan, J. D., Lake, P. S., Alexander, G., Brooks, S., Carr, J., Clayton, S., Dahm, C. N., Follstad Shah, J., Galat, D. L., Loss, S. G., Goodwin, P., Hart, D. D., Hassett, B., Jenkinson, R., Kondolf, G. M., Lave, R., Meyer, J. L., … Sudduth, E. (2005). Standards for ecologically successful river restoration. *Journal of Applied Ecology*, *42*(2), 208–217.

Palmer, M. A., Filoso, S., & Fanelli, R. M. (2014). From ecosystems to ecosystem services: Stream restoration as ecological engineering. *Ecological Engineering*, *65*, 62–70. https://doi.org/10.1016/j.ecoleng.2013.07.059

Palmer, M. A., Hondula, K. L., & Koch, B. J. (2014). Ecological restoration of streams and rivers: Shifting strategies and shifting goals. *Annual Review of Ecology, Evolution, and Systematics*, *45*(Volume 45, 2014), 247–269. https://doi.org/10.1146/ANNUREV-ECOLSYS-120213-091935/1

Palmer, M. A., Menninger, H. L., & Bernhardt, E. (2010). River restoration, habitat heterogeneity and biodiversity: a failure of theory or practice? *Freshwater Biology*, *55*(SUPPL. 1), 205–222. https://doi.org/10.1111/J.1365-2427.2009.02372.X

Pamukçu, P. (2015). *Ekosistem Hizmetlerinin Peyzaj Planlama Sürecine Entegrasyonu*. Doktora Tezi, İstanbul Üniversitesi Fen Bilimleri Enstitüsü.

Pan, B., Yuan, J., Zhang, X., Wang, Z., Chen, J., Lu, J., Yang, W., Li, Z., Zhao, N., & Xu, M. (2016). A review of ecological restoration techniques in fluvial rivers. *International Journal of Sediment Research*, *31*(2), 110–119. https://doi.org/10.1016/J.IJSRC.2016.03.001

Postel, S., & Carpenter, S. (1997). Freshwater ecosystem services. In *Nature's services: Societal dependence on natural ecosystems* (p. 195).

Postel, S., & Richter, B. (2012). *Rivers for life: managing water for people and nature* (Island press).

Provencher, B., Sarakinos, H., & Meyer, T. (2008). Does Small Dam Removal Affect Local Property Values? An Empırıcal Analysıs. *Contemporary Economic Policy*, *26*(2), 187–197. https://doi.org/10.1111/J.1465-7287.2008.00107.X

Qi, W., Li, H., Zhang, Q., & Zhang, K. (2019). Forest restoration efforts drive changes in land-use/land-cover and water-related ecosystem services in China's Han River basin. *Ecological Engineering*, *126*, 64–73. https://doi.org/10.1016/J.ECOLENG.2018.11.001

Rey Benayas, J. M., Newton, A. C., Diaz, A., & Bullock, J. M. (2009). Enhancement of biodiversity and ecosystem services by ecological restoration: A meta-analysis. *Science*, *325*(5944), 1121–1124. https://doi.org/10.1126/SCIENCE.1172460/SUPPL_FILE/REY_BENAYAS.SOM.PDF

Roni, P., Hanson, K., & Beechie, T. (2008). Global Review of the Physical and Biological Effectiveness of Stream Habitat Rehabilitation Techniques. *North American Journal of Fisheries Management*, *28*(3), 856–890. https://doi.org/10.1577/M06-169.1

RRC. (2022). *What is river restoration?*

Şahin, Ş., Kurum, E., Perçin, H., & Memlük, Y. (2014). *Akarsu Koridorlarında Peyzaj Onarımı ve Doğaya Yeniden Kazandırma Teknik Kılavuzu*.

Sarvilinna, A., Lehtoranta, V., & Hjerppe, T. (2017). Are Urban Stream Restoration Plans Worth Implementing? *Environmental Management*, *59*(1), 10–20. https://doi.org/10.1007/S00267-016-0778-Z/TABLES/4

Scopus. (2025). *Scopus preview*. https://www.scopus.com/standard/marketing.uri#basic

Şimşek, G. (2011). *Akarsu ve Kentin Birlikte Varoluşu Üzerine Kentsel Akarsu Rehabilitasyonuna Bir Yaklaşım: Porsuk Çayı ve Eskişehir Kenti Örneği*. Doktora Tezi, Orta Doğu Teknik Üniversitesi, Fen Bilimleri Enstitüsü.

Sinha, R. K., & Kannan, K. (2014). Ganges River Dolphin: An Overview of Biology, Ecology, and Conservation Status in India. *Ambio*, *43*(8), 1029–1046. https://doi.org/10.1007/S13280-014-0534-7/FIGURES/4

Speed, R., Li, Y., Tickner, D., Huang, H., Naiman, R. J., Cao, J., Lei, G., Yu, L., Sayers, P., Zhao, Z., & Wei, Y. (2016). A framework for strategic river restoration in China. *Water International*, *41*(7), 998–1015. https://doi.org/10.1080/02508060.2016.1247311

Speed, R., Tickner, D., Naiman, R., Gang, L., Sayers, P., Yu, W., Yuanyuan, L., Houjian, H., Jianting, C., Lili, Y., & Zhongnan, Z. (2016). River Restoration: A Strategic Approach to Planning and Management. In

Modern Water Resources Engineering. http://link.springer.com/chapter/10.1007/978-1-62703-595-8_4

Steele, T. D., Kralisch, S., Klein, D., & Flügel, W.-A. (2008). Steele, T. D., Kralisch, S., Klein, D., & Flügel, W. A. (2008). A comparative evaluation of selected aspects of the EU's Water Framework Directive versus the US Clean Water Act. *13th IWRA World Water Congress*. www.epa.gov/watershed/watertrain/watershedmgt

Tarcan Bütün, Z. (2018). *Kentsel Akarsu Kıyılarının Kamusal Mekan Yaratma Potansiyelinin Belirlenmesi: Kağıthane Deresi Ve Kurbağalıdere Örneği*. Yüksek Lisans Tezi, İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü.

Tedford, M., & Ellison, J. C. (2018). Analysis of river rehabilitation success, Pipers River, Tasmania. *Ecological Indicators*, *91*, 350–358. https://doi.org/10.1016/J.ECOLIND.2018.03.090

TEEB. (2012). The economics of ecosystems and biodiversity: Ecological and economic foundations. *The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations*, 1–411. https://doi.org/10.4324/9781849775489

The World Bank. (2006). *Strengthening Forest Law Enforcement and Governance Addressing a Systemic Constraint to Sustainable Development Environment and Agriculture and Rural Development Departments THE WORLD BANK*. www.worldbank.org

Tokgöz, G. (2018). *Ekosistem Hizmetlerine Dayalı Kent Planlamasının Adana-Karaisalı Örneğinde Değerlendirilmesi*.

Tzoulas, K., Korpela, K., Venn, S., Yli-Pelkonen, V., Kaźmierczak, A., Niemela, J., & James, P. (2007). Promoting ecosystem and human health in urban areas using Green Infrastructure: A literature review. *Landscape and Urban Planning*, *81*(3), 167–178. https://doi.org/10.1016/J.LANDURBPLAN.2007.02.001

Uygur, B. (2016). *Hidrolojik Ekosistem Hizmetlerinin Havza Planlamaya Uyarlanması*. Doktora Tezi, İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü.

Vermaat, J. E., Wagtendonk, A. J., Brouwer, R., Sheremet, O., Ansink, E., Brockhoff, T., Plug, M., Hellsten, S., Aroviita, J., Tylec, L., Giełczewski, M., Kohut, L., Brabec, K., Haverkamp, J., Poppe, M., Böck, K., Coerssen, M., Segersten, J., & Hering, D. (2016). Assessing the societal benefits of river restoration using the ecosystem services approach. *Hydrobiologia*, *769*(1), 121–135. https://doi.org/10.1007/S10750-015-2482-Z/FIGURES/7

Wohl, E., Lane, S. N., & Wilcox, A. C. (2015). The science and practice of river restoration. *Water Resources Research*, *51*(8), 5974–5997. https://doi.org/10.1002/2014WR016874

WWF. (2025). *WWF and the Sustainable Development Goals*. https://wwf.panda.org/discover/knowledge_hub/sustainable_development_goals/?

Xia, H., Kong, W., Zhou, G., & Sun, O. J. (2021). Impacts of landscape patterns on water-related ecosystem services under natural restoration in Liaohe River Reserve, China. *Science of The Total Environment*, *792*, 148290. https://doi.org/10.1016/J.SCITOTENV.2021.148290

Yaacovi, Y., Gasith, A., & Becker, N. (2021). How much is an urban stream worth? Using land senses and economic assessment of an urban stream restoration. *International Journal of Sustainable Development & World Ecology*, *28*(7), 602–611. https://doi.org/10.1080/13504509.2021.1929546

Yıldırım, E., Yıldırım, T., & Benliay, A. (2013). Peyzaj Planlamada Akarsu Ekolojisinin Önemi. *Türk Bilimsel Derlemeler Dergisi, 6(1), 51-54.*, *6*(1), 51–54. http://derleme.gen.tr/index.php/derleme/article/download/180/178

Yılmaz, F. Ç. (2021). *Ekosistem hizmetleri odaklı kent modeli tasarımı*. Doktora Tezi, Ankara Üniversitesi Fen Bilimleri Enstitüsü.

Yılmaz Kaya, M. (2019). *Peyzaj planlamada ekosistem hizmetleri yaklaşımı: Düzce ili örneği*. Yüksek Lisans Tezi, Düzce Üniversitesi, Fen Bilimleri Enstitüsü.

YÖK. (2025). *Ulusal Tez Merkezi*.

Zhang, X., Niu, J., Buyantuev, A., Zhang, Q., Dong, J., Kang, S., & Zhang, J. (2016). Understanding Grassland Degradation and Restoration from the Perspective of Ecosystem Services: A Case Study of the Xilin River Basin in Inner Mongolia, China. *Sustainability* , *8*(7), 594. https://doi.org/10.3390/SU8070594