INTERNATIONAL STUDIES IN THE FIELD OF

LANDSCAPE ARCHITECTURE

JUNE 2026

EDITOR

Prof. Dr. Özlem ATALAN

Prof. Dr. Sertaç GÜNGÖR

gece kitaplığı

İmtiyaz Sahibi / Yaşar Hız
Yayına Hazırlayan / Gece Kitaplığı

Birinci Basım / Haziran 2026 - Ankara
ISBN / 978-625-321-148-6

Gece Kitaplığı
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CHAPTER 1

ECONOMIC IMPACT VALUE OF NATURE-BASED SOLUTIONS IN CITIES

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1.Introduction

As the negative impacts of rising global temperatures become more evident, countries and cities are becoming more willing to reduce greenhouse gas emissions and strengthen their adaptation capacity. Significant regional differences are emerging in mitigation and adaptation capacity and actions (Gunfaus & Waisman, 2021). Microclimate regulation is among the primary ecosystem services.

Climate change, urbanization, biodiversity loss, and environmental degradation are among the most significant challenges facing contemporary cities. The need to develop sustainable and resilient urban models in the face of these challenges has brought nature-based solutions (NBS) to the forefront. This has led to the increasing importance of a new approach in recent years. Nature-based solutions involve the protection, restoration, or restoration of natural ecosystems. These are multifunctional interventions that aim to provide environmental, social, and economic benefits (European Commission: Directorate-General for Research and Innovation, 2015). Nature-based solutions are aimed at adapting to climate change in urban areas and mitigating its effects. It has emerged as an overarching term encompassing many concepts. The concept is to manage natural systems in a way that balances benefits for both nature and society. It emerged from the search for innovative solutions and was conceptualized to meet global biodiversity and climate change targets (Warren, 2020). Nature-based solutions are being adopted as a design approach in cities. The main purpose of these applications is to enable society to achieve its development and progress goals.Their aims are to protect human well-being and enhance the resilience of ecosystems, reflecting cultural and societal values in their capacity for regeneration and service delivery while safeguarding human well-being (International Union for Conservation of Nature-IUCN, 2016). Another goal is to protect naturally occurring and modified ecosystems, as well as to manage and restore ecosystems sustainably. These actions address societal challenges (e.g., climate change, natural disasters, food and water securit) effectively and harmoniously while also providing benefits for human well-being and biodiversity (Cohen-Shacham et al., 2019). Nature-based solutions aim for sustainable development by increasing the resilience and regenerative capacity of ecosystems and the effectiveness of ecosystem services for a better living environment.

In cities, nature-based solutions are embodied in practices such as green infrastructure systems, rain gardens, permeable surfaces, green roofs, urban forests, and ecological corridors. These practices include: They offer many ecological benefits, such as reducing the urban heat island effect, improving water managemen and air quality, creating carbon sinks, and preserving biodiversity (Kabisch et al., 2017). NBS have lower lifecycle costs compared to classic “grey infrastructure” investments. They stand out for providing multifunctional benefits. For example, green roofs and permeable surfaces can retain up to 60% of rainwater on-site. This reduces the risk of flooding and the burden on sewer infrastructure in cities (Raymond et al., 2017). As a result, municipalities achieve significant savings in infrastructure renovation and maintenance costs in the long term.

From an economic perspective, nature-based solutions produce both direct and indirect impacts. Direct impacts include economic activity in investment, care, and employment. Indirect impacts include increased real estate values, reduced healthcare costs, and reduced energy consumption (OECD, 2020). For example, an average increase of 8–15% in market values has been observed for residences within 300 meters of parks and green spaces (Gómez-Baggethun & Barton, 2013). Similarly, the positive effects of urban forests on air quality reduce healthcare costs and increase the productivity of city residents.

2.What is a Nature-Based Solution?

This approach aims to protect urban resilience and ecosystem services, encompassing all related developmental practices. In other words, the nature-based solution concept includes all ecosystem services related to ecosystem approaches. It is closely related to concepts such as ecosystem support-based adaptation/mitigation and green-blue infrastructure. It builds on and supports other concepts. All concepts emphasize the importance of the natural environment. They are based on the structure and functioning of ecosystems. They emphasize a systematic approach to environmental change (Kaçmaz, 2021).

According to WWF (2020), it manages the expected climate risks to nature that can mitigate the long-term impacts of climate change. It has the potential to mitigate measurable positive climate adaptation that has co-benefits for humans and biodiversity. It is defined as ecosystem protection, management, and/or restoration interventions.

Figure 1. The general framework of Nature-Based Solutions (IUCN, 2019)

Today, zero carbon aims to minimize the risks arising from climate change. It focuses on solutions that aim to create more resilient societies. This concept underpins natural resources and all urban systems. It also seeks solutions to increase nature's climate resilience by raising awareness. Ecosystems act as a natural barrier against the effects of climate change. By increasing resilience, they mitigate the effects of climate change and significantly reduce disaster (Coşkun Hepcan, 2022). For a solution to be defined as a nature-based solution, it must benefit ecological processes and biodiversity. Therefore, it is not possible to define all components of blue-green infrastructures as nature-based solutions.

In its global standard guide for NBS (2020), IUCN advocates that an intervention must meet the following eight criteria for being considered a NBS. ***According to this, nature-based solutions must:*** Ensure they are designed as a response to societal challenges identified as priorities by those directly affected or likely to be affected. Interventions ***Should Have a Design Scale:*** It is important to encourage the design of NBS that recognize the complexity

and uncertainty inherent in living, dynamic land/seascapes. ***Nature-based solutions should provide a net gain for biodiversity and ecosystem integrity:*** NBS encompass all services derived from ecosystems; therefore, they ensure the positive development of the ecosystem. Biodiversity loss and ecosystem changes can occur within ecosystems, which have significant consequences for the functioning and integrity of the system.. ***Economic effectiveness (nature-based solutions should be economically viable):*** Return on investment, intervention e efficiency, effectiveness, and equitable distribution of benefits and costs are key determinants of success for implementing a nature-based solution. ***Nature-based solutions should be based on inclusive, transparent, and empowering governance processes:*** This criterion highlights that nature-based solutions should be designed and implemented through processes that recognize and address the perspectives and needs of a wide range of stakeholders, particularly rights holders, ensuring their concerns are actively considered and incorporated. ***Nature-based solutions should equitably balance the trade-offs between achieving their primary objective(s) and the sustained provision of multiple benefits:*** Trade-offs are inevitable in land and natural resource management. Ecosystems provide a multitude of different benefits and value each equally. While trade-offs cannot be avoided, they can be managed effectively and equitably. ***Nature-based solutions are sustainable and should be scaled up within an appropriate jurisdiction:*** Nature-based solutions require interventions to be designed and managed with a long-term sustainability perspective, and to work together and be compatible with sectoral, nationa, taking into account (IUCN, 2020; Yaman and Yenigül, 2022).

Nature-based solutions aim to enhance the functionality, resilience, and urban systems by leveraging ecosystem services. Practices such as vegetated green roofs, permeable surfaces, rain gardens, urban forests, wetlands, and green corridors offer multifaceted benefits that support both nature and human well-being (Kabisch et al., 2017).

Ecological Benefits: NBS strengthen ecological sustainability by restoring ecosystem services in cities. First, they mitigate the impacts of climate change by creating carbon sinks and help offset greenhouse gas emissions (IUCN, 2020). Furthermore, they reduce surface runoff by improving rainwater management, lower flood risk, and support groundwater recharge (Cohen-Shacham et al., 2016).

Figure 2. NBS with ecological benefit (URL-1)

Urban green spaces and afforestation reduce the heat island effect, improve air quality, and improve microclimate conditions. In terms of biodiversity, nature-based solutions strengthen habitat connections for flora and fauna in cities, thus ensuring the continuity of urban ecology. Green corridors support the ecological continuity between nature and the city by providing passageways for birds and pollinator species (Frantzeskaki et al., 2019).

Increasing concrete and asphalt surfaces in urban areas can create a heat island effect, increasing the temperature difference by up to 4–8°C compared to rural areas. Nature-based solutions are most effective tools to mitigate this effect. Afforestation, green roofs, green wall systems, in particular, reduce ambient temperature through evapotranspiration and reduce solar radiation through shading (Oke, 1987; Bowler et al., 2010). They function as carbon sinks. Afforested parks, urban forests, green roofs, and wetland restorations enable the storage of atmospheric CO_2 in biomass and soil. Nature-based solutions allow the hydrological cycle to function naturally within cities. In cities with dense impermeable surfaces, rainwater quickly passes into surface runoff, causing floods. Rain gardens, permeable pavements, bioswales, and green roofs slow this process, facilitating water absorption by the soil. They provide habitat continuity in urban ecology, creating habitats for wildlife. Establishing connections between parks, greenways, urban forests, and wetlands facilitates species migration and preserves genetic diversity (Elmqvist et al., 2015).

Social Benefits(Figure2) : Nature-based solutions provide not only environmental but also strong social benefits. They support healthy lifestyles by providing opportunities for physical activity, socialization, and psychological relaxation for urban residents. Access to natural green spaces reduces stress levels and improves mental health (Hartig et al., 2014; Düzenli & Alpak, 2017). Furthermore, their implementation fosters social solidarity and local participation. For example, community gardens and green infrastructure projects strengthen

participatory governance by involving citizens in decision-making processes (Raymond et al., 2017). Spatial justice is strengthened by facilitating access to public spaces for vulnerable groups such as women, the elderly, and children.

Figure 3. Social Benefits of nature-based solutions (URL-2, URL 3)

Access to the natural environment has positive effects on human health at both physiological and psychological levels (Alpak et al., 2018). According to the World Health Organization (WHO, 2017), individuals living close to green spaces in cities have lower risks of cardiovascular disease, obesity, and depression. Green spaces; They support active lifestyles by encouraging physical activities such as walking, cycling, gardening, and outdoor sports. Nature-based solutions allow individuals to take a more active and participatory role in urban life. Community gardens, neighborhood orchards, shared green spaces, and ecological park projects enable people to come together and participate in production, care, and sharing activities.

This form of participation strengthens social ties, revitalizes "neighborhood relations," and increases social capital in the city (Okvat & Zautra, 2011). It contributes to the strengthening of cultural identity by enriching the urban landscape. The combined use of local plant species, landscape designs in keeping with historical patterns, and public art elements enhances the aesthetic value of the city (Lennon, 2015).

3.Economic Impacts of Nature-Based Solutions

NBS impact urban systems through high temperatures and extreme weather events. They help prevent the economic consequences of potential damage to urban residents and their livelihoods. They support the local economy by enabling the development of new job opportunities in various sectors and contribute to poverty reduction (Toksoy et al., 2010;

Bayramoğlu & Toksoy, 2015; UN, 2019). Nature-based solutions reduce surface temperature by 1-5°C in their environment through microclimate creation and cooling effects. This reduces the energy consumed for heating and cooling buildings and, in some cases, transportation vehicles in cities. It also reduces the vulnerability of urban infrastructure to high temperatures, thus reducing maintenance and repair costs (Coşkun Hepcan, 2022).

Nature-based solutions stand out as **cost-effective** investments in the long term. Natural water management systems reduce flood control and infrastructure maintenance costs; green roofs reduce building energy consumption; and urban forests and parks increase real estate values. Nature-based solutions stand out as cost-effective and sustainable investments that offer multifaceted contributions to the urban economy in the long term. Traditional gray infrastructure systems (concrete sewers, flood dams, etc.) generally have high installation and maintenance costs; in contrast, nature-based solutions utilize natural processes to perform similar functions at lower economic costs (OECD, 2020). For example, green infrastructure systems permeable surfaces, and bioswales support the natural water cycle in cities, providing long-term savings in flood control and infrastructure maintenance costs (Kazmierczak & Carter, 2010).

Green roofs and vertical gardens can reduce energy consumption by 15–25% by improving thermal insulation in buildings, thus generating a direct economic benefit to both household and municipal energy budgets. Furthermore, properties near urban forests and parks are known to have 5–20% higher market values (Kabisch et al., 2016), demonstrating that green infrastructure creates a significant positive externality on real estate values. Nature-based solutions also create **green employment** opportunities; It contributes to the creation of new business lines in fields such as landscape architecture, ecological restoration, urban forestry, carbon management and environmental monitoring.

Rotterdam (Netherlands) has developed a Multi-Purpose Water Management and Green Roofs Program. The City of Rotterdam's green roof and water garden incentive program, implemented as part of its "Climate Proof Rotterdam" strategy, has reduced flood risk and increased energy efficiency. More than 600,000 m² of green roofs have been installed across the city, and the municipality has provided subsidies of €30–€50 per m² per building. The program has saved approximately €10 million annually on infrastructure maintenance and significantly reduced flood insurance costs (OECD, 2020). Additionally, new jobs have been created in the local plant production, landscaping, and maintenance sectors.

Figure 4. Rotterdam (Netherlands) Multi-Purpose Water Management and Green Roofs Program (URL-4, URL-5)

A Cloudburst Management Plan has been implemented in Copenhagen, Denmark. Following the heavy rainfall experienced in 2011, Copenhagen adopted a nature-based flood management system. The plan includes 300 separate NBS projects (rain parks, green boulevards, and underground water reservoirs). This approach could protect the city from approximately €800 million in flood damage if the catastrophic rainfall of 2011 were to reoccur (European Environment Agency, 2021). Furthermore, the implementation of green boulevards has resulted in increases in property prices in the surrounding area of up to 10%.

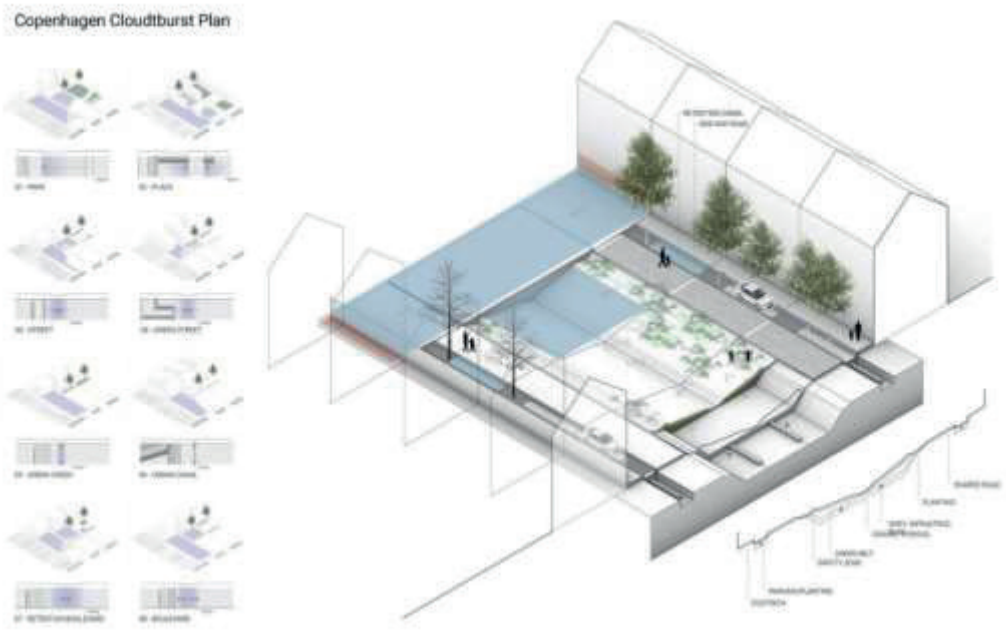

Figure 5. Cloud Storm Management in Copenhagen (Denmark) (Cloudburst Management Plan) (URL-6)

New York City (ABD) – The New York City Green Infrastructure Prog. significantly reduced costs by replacing traditional concrete drainage systems with green infrastructure solutions. The program saved approximately $1.5 billion compared to gray infrastructure (EPA, 2018). Permeable pavements, rain gardens, and green streets reduced flood risk and energy costs in the city. The project directly created more than 3,000 jobs (Figure 5).

Figure 6. New York City (ABD) – "Green Infrastructure Program (URL-7, URL-8)

Results

Urbanization is one of the primary processes exacerbating global problems, biodiversity loss, and environmental degradation. Increasing populations, dense urban development, shrinking natural areas, and increasing resource consumption make cities vulnerable from both an environmental and social perspective. In this context, (NBS), which have emerged in recent years, have gained importance as an innovative approach that increases cities' capacity to adapt and mitigate climate change while also enhancing human well-being. NBS in cities has become a cornerstone of an urban development model compatible with ecological processes. This approach not only offers an alternative engineering solution to environmental problems but also represents a holistic strategy that increases social well-being, strengthens economic resilience, and supports a sustainable urban vision.

From an ecological standpoint, establishing carbon sinks offers multiple benefits, including supporting natural water cycle regulation and enhancing biodiversity. In this way, urban ecosystems can recover their functionality and improve their resilience to the impacts of

climate change. From a social perspective, nature-based solutions enhance the quality of urban life, improve the physical and mental health of individuals, strengthen social ties and community participation, and contribute to spatial justice. Community gardens, greenways, and park systems reconnect city residents with nature, enabling the development of a participatory, inclusive, and collaborative urban culture.

From an economic perspective, nature-based solutions stand out as a cost-effective investment opportunity. Green infrastructure systems reduce flood risks, lower infrastructure maintenance costs, contribute to household budgets by reducing energy consumption, and increase real estate values. Furthermore, the development of nature-based sectors creates jobs and accelerates the green economy transition. Nature-based solutions can be considered an economic tool for sustainable development in cities. These approaches go beyond simply providing environmental benefits; they also build economic resilience, employment, quality of life, and competitiveness. Supported by appropriate economic analysis methods, nature-based solutions increase both the resilience of cities to climate change and their long-term financial sustainability (UNEP, 2023).

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CHAPTER 2

RECONCEPTUALIZING URBAN AGRICULTURE THROUGH THE LENS OF BIOPHILIC URBANISM

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1. Introduction

Due to the challenges associated with rapid urbanization, natural areas have diminished, ecosystem balances have been altered, and adverse impacts related to climate change have intensified. Collectively, these processes have reduced the ecological resilience capacities of cities and have consequently weakened the relationship between humans and nature.

The challenges associated with climate change and the disruption of ecological balance faced by countries, industries, and societies have made environmental sustainability one of the foremost global priorities of our time (Rockström et al., 2009; Batoon et al., 2026). Climate change, recognized as one of the most significant environmental challenges confronting humanity (Tekingündüz & Şendağlı, 2025), has necessitated the development of various approaches aimed at mitigating these adverse impacts in recent years. In this context, Nature-Based Solutions (NbS), which provide multifaceted environmental, social, and economic benefits, have emerged as a prominent approach (United Nations Environment Programme, 2020). However, despite their considerable potential, the implementation of these solutions remains limited and fragmented, and their application has not yet reached an equitable level both within and among cities (McCormick, 2020).

In line with the growing recognition that contact with nature plays a vital role in sustaining productive and fulfilling lives, the biophilic design approach has gained increasing prominence in recent years as a nature-based strategy. Acknowledging the profound influence of nature on human well-being, this approach emphasizes that attention should be directed not only toward the building scale but also toward the urban scale, highlighting the necessity of a planning paradigm referred to as “biophilic cities”. Biophilic cities are defined as urban environments that provide opportunities for regular and close interaction with nature and nearby natural areas, while fostering environmental awareness and conservation consciousness among their inhabitants. Furthermore, this urban planning and design approach has been identified as an important step toward achieving sustainable and resilient urbanization (Beatley & Newman, 2013).

Rapid and intensive urbanization has been reported to cause significant environmental problems, particularly in developing cities, thereby increasing the importance of environmental sustainability, food security, and urban resilience in contemporary urban agendas. In this context, the biophilic urbanism approach has emerged in recent years as an innovative urban planning model that seeks to strengthen human-nature interactions while placing sustainability at its core. Urban agriculture, considered one of the key components of biophilic cities, is recognized for its potential to generate substantial ecological, social, and economic benefits in

the short term (Roy, 2021). On the other hand, limited access to healthy and affordable food remains a major global challenge in both developed and developing countries (Bedore, 2010; Lang & Miao, 2013; Vieira et al., 2018; Russo & Cirella, 2019). Accordingly, the integration of urban agriculture with sustainable food production systems and supply chains is considered to offer a strategic approach for enhancing environmental sustainability, local food security, and urban resilience (Dinçtürk & Açıksöz, 2026).

The paper addresses the concept of urban agriculture as one of the biophilic approaches that allow the production of food in urban areas and their immediate surroundings. This paper explores the role of urban agriculture in the making of biophilic urban morphology in the context of achieving urban food sovereignty and more sustainable cities. In addition, the study proposes a conceptual redefinition of urban agriculture from the perspective of biophilic urbanism. In this context, the concept of biophilic cities, the practices of urban agriculture and their biophilic characteristics are examined, and examples of urban agriculture initiatives implemented in cities that are members of the Biophilic Cities Network are presented.

2. The Concept of Biophilic Cities

The biophilia hypothesis proposes that humans possess an innate affinity for life and life-like processes (Wilson, 1993; Liu & Green, 2026). This concept is founded on the notion that human survival and personal fulfillment are rooted in an evolutionary dependence on nature (Kellert, 1993; Zhong et al., 2022). In response to increasing environmental challenges, the concepts of nature-oriented and biophilic design have attracted growing attention within the field of architecture, particularly over the past decade (Zhong et al., 2022).

Beatley and Newman (2013) emphasized that, in an era characterized by accelerating urbanization, greater attention should be directed toward the urban scale and that settlements referred to as biophilic cities should be planned appropriately. In this context, biophilic cities are defined as urban environments that provide opportunities for close interaction with nature and regular contact with natural elements in everyday life, while simultaneously fostering environmental awareness and a culture of conservation. Experiences and characteristics associated with biophilic design processes are presented in Table 1. The principal characteristics of biophilic cities are listed below (Beatley, 2008; Milliken et al., 2023):

- Providing opportunities for living in close connection with nature,
- Supporting biodiversity conservation and enhancement,
- Offering rich and immersive sensory experiences,
- Integrating green and blue infrastructure systems,

- Encouraging outdoor living and recreational activities,
- Fostering environmental awareness and a sense of responsibility toward nature among residents,
- Investing in nature conservation,
- Promoting equitable access to nature for all members of society.

Table 1. Experiences and Attributes of Biophilic Design (Kellert & Calabrese, 2015; Cabanek et al., 2020)

Direct Experience of Nature	Indirect Experience of Nature	Experience of Space and Place
• Light • Air • Water • Plants • Animals • Weather • Natural landscape characters/ ecosystems • Fire	• Images of nature • Natural colors • Simulation of natural light and air • Natural shapes and forms • Evocation of nature • Information richness • Age, change and the patina time • Biomimicry	• Prospect of refuge • Organized complexity • Integration of parts to wholes • Transitional spaces • Mobility and wayfinding • Cultural and ecological attachment to place

The Biophilic Cities Project, initiated by Timothy Beatley in 2011, aimed to extend the principles of biophilic design to the urban scale. Subsequently, the Biophilic Cities Network was established in 2012, creating a global platform that brings together cities and organizations committed to a nature-centered urban vision. International initiatives and applications carried out within this framework have made significant contributions to the dissemination and advancement of the biophilic city approach (Söderlund, 2019; Milliken et al., 2023).

According to the website of the Biophilic Cities Network, numerous cities from different regions of the world have adopted the biophilic city approach (Biophilic Cities, n.d.). It is further stated that every city possesses biophilic characteristics to a certain extent. Cities that are members of the Biophilic Cities Network are presented in Table 2. An examination of the common characteristics of these cities reveals a shared emphasis on increasing daily contact with nature, conserving biodiversity, developing green corridors, promoting sustainable transportation systems, expanding the use of permeable infrastructure, and implementing nature-based solutions.

An examination of the continental distribution of cities included in the Biophilic Cities Network (Table 2) indicates that the network is predominantly concentrated in North America. Of the 34 partner cities, 19 are located in North America, while 6 are situated in Europe, 4 in

Asia, and 2 in Oceania. In addition, two cities located in Costa Rica and Panama represent Central America. From Türkiye, Karşıyaka (İzmir) is the only settlement included in the Biophilic Cities Network (Biophilic Cities, n.d.). This distribution suggests that the biophilic city approach has been more widely adopted, particularly in developed countries and in cities with strong local governance capacities.

Table 2. Cities Included in the Biophilic Cities Network (Biophilic Cities, n.d.)

North America	Europe	Asia-Pacific	Oceania	Central America	Europe-Asia Transition Zone
1. Arlington 2. Austin 3. Charlottesville 4. Edmonton 5. Kansas City 6. Los Angeles 7. Miami-Dade 8. Milwaukee 9. Norfolk 10. Phoenix 11. Pittsburgh 12. Portland 13. Raleigh 14. Reston 15. Richmond 16. San Francisco 17. St. Louis 18. Toronto 19. Washington DC	20. Barcelona 21. Birmingham 22. Edinburgh 23. Swansea 24. Verona 25. Vitoria-Gasteiz	26. Busan 27. Colombo 28. Singapore 29. Visakhapatnam	30. Fremantle 31. Wellington	32. Curridabat (Costa Rica) 33. Panama City (Panama)	34. Karşıyaka (İzmir)

3. Urban Agriculture

This section of the study presents the definitions, classifications, and applications developed in relation to urban agriculture.

3.1. Definition and Redefinition of Urban Agriculture

The concept of urban agriculture, for which no common consensus exists regarding its scale, boundaries, or even its definition, can be described in its most fundamental form as “all production activities carried out within urban areas and their immediate surroundings”. In this context, definitions of urban agriculture proposed by various researchers are presented in Table 3.

Table 3. Definitions of Urban Agriculture Proposed by Different Researchers

Definition of Urban Agriculture	Researcher(s)
Urban agriculture is defined as a large and rapidly growing sector that utilizes urban wastewater and solid waste as inputs while making productive use of open and vacant land and water resources.	Smit & Nasr, 1992
Urban agriculture is a production activity located within or on the fringe of a town, city, or metropolis that cultivates, processes, and distributes food and non-food products; utilizes human and material resources, products, and services largely available within the urban area; and, in turn, supplies human and material resources, products, and services to that same urban area.	Mougeot, 2000
Urban agriculture is defined as the cultivation of food within cities.	Ackerman, 2012
The term urban agriculture was introduced to describe crop production and livestock-raising activities undertaken in cities for both household consumption and income generation.	Orsini et al., 2013
Urban agriculture is a broad concept encompassing food production and livestock-rearing activities carried out in urban and peri-urban areas.	Tornaghi, 2014
Urban agriculture is defined as the production of plant-based food in urban areas of cities and towns located in industrialized countries.	Douziech et al., 2024

In a study conducted by Dinçtürk (2025), a hierarchical approach was adopted to define both the concept and spatial extent of urban agriculture. Within this framework, high-density urban areas identified through land cover data were classified as primary urban agriculture areas, while the municipal service boundary was considered a secondary urban agriculture area. The contiguous municipal boundary was, in turn, designated as a tertiary urban agriculture area. Considering the conceptual ambiguities and differing perspectives found in the literature, urban agriculture may be redefined as follows:

"*Urban agriculture is a set of production activities that take place in the spatial continuum from the urban core to the contiguous municipal boundary, reconnecting urban life with the culture of production, both traditional and innovative practices, biophilic characteristics, and urban food sovereignty."*

3.2. Classification and Applications of Urban Agriculture

Various classification approaches have been proposed for urban agriculture; however, these approaches are generally considered to address only specific aspects of the concept (Douziech et al., 2024). Areas in which urban agriculture can be practiced include green belts surrounding cities, agricultural activities in peri-urban areas, vegetable plots within community gardens, food production initiatives on vacant urban land, fish farms, municipal composting

facilities, livestock husbandry in residential developments, backyard orchards, rooftop gardens, beekeeping activities, and window gardens, among many other applications (Brown & Carter, 2003).

According to Ackerman (2012), urban agriculture is regarded as a multidimensional system encompassing a wide range of activities, including soil-based cultivation, rooftop farming, hydroponic systems, greenhouse production, aquaculture, beekeeping, mushroom cultivation, and the production of non-food crops such as flowers, bamboo, and biofuel plants. According to Mendes et al. (2008), urban agriculture includes community and private gardens, edible landscapes, fruit trees, food-producing green roofs, aquaculture, farmers' markets, small-scale farming, hobby beekeeping, and food composting. Table 4 presents the categories of urban agriculture practices implemented at different spatial scales in the Diggable City project, an urban agriculture inventory and planning initiative conducted in Portland, USA, together with their corresponding surface areas and land-use types. These values vary according to the scale, context, and cultural characteristics of each city.

Table 4. Urban Agriculture Practices Implemented at Different Spatial Scales: The Diggable City Project Example (Mendes et al., 2008)

Category	Permeable Surface Area	Type of Use
Community gardens	Minimum 7,500 ft²*	Shared gardens consisting of plots allocated to individual users.
Small-scale production activities	Less than 10,890 ft²*	Farmers' sales outlets, educational gardening activities, composting, food bank gardening, plant cultivation, beekeeping, pocket gardens, floriculture, and market gardens.
Large-scale production activities	Greater than 10,890 ft²*	Community-supported agriculture, urban orchards, horticultural production, native plant production, seedling and sapling cultivation, and beekeeping.
Production on impervious surfaces or poor soils	Minimum 5,000 ft²*	Vertical gardening, indoor food production, greenhouses, farmers' sales outlets, community processing facilities, farmers' markets, and hydroponic systems.

*Note: 1 ft² (square foot) = 0.092903 m²

The classification of urban agriculture practices according to their scale and ownership characteristics is presented in Table 5.

Table 5. Classification of Urban Agriculture Practices According to Scale and Ownership Structure (Pearson et al., 2010)

Scale	Examples of Scale	Land and Production Ownership Categories
Micro	Green roofs, green walls, and courtyards	Private, institutional
	Backyard gardens	Private
	Road verges	Public
Meso	Community gardens	Private use on public land
	Individual allotment gardens	Private
	Urban parks	Public
Macro	Commercial-scale farms (turf production, dairy farms, orchards, etc.)	Private, public
	Nurseries	Private, public
	Greenhouse cultivation, floriculture, and vegetable production	Private, public

4. Biophilic Dimensions of Urban Agriculture

Biophilic cities, which are regarded as sustainable and resilient urban settlements, have been identified as making significant contributions to strengthening both social and landscape resilience against climate change, natural disasters, economic crises, and other adverse conditions that may arise in the future (Beatley & Newman, 2013). Urban agriculture practices are also regarded as interventions with significant positive effects on the provision of ecosystem services, offering multidimensional contributions to urban resilience (Dinçtürk & Açıksöz, 2026). Within the scope of this study, the biophilic dimensions of urban agriculture were evaluated under four main themes: its role in strengthening human-nature interactions, its contributions to ecosystem services, its support for climate change adaptation processes, and its benefits in terms of social cohesion and community well-being.

4.1. Strengthening Human-Nature Interactions

Continuous productive urban landscapes have been described as approaches that enable urban residents to closely observe activities and processes traditionally associated with rural environments, thereby contributing to the re-establishment of connections among the stages necessary for the continuity of human life and natural processes. Productive urban landscape approaches are considered to support the development of dynamic urban landscapes that strengthen relationships between people and nature by facilitating direct engagement with soil, plants, seasonal cycles, and food production processes (Viljoen et al., 2005). These considerations are highly significant from the perspective of human-nature relationships. In this context, the authors argue that urban agriculture enables individuals to re-experience how food

is produced, observe seasonal cycles, engage with soil cultivation, witness plant growth, and better understand ecological processes. In doing so, it helps restore the human-nature connection that has gradually weakened in modern urban life. Accordingly, urban agriculture practices can be regarded as effective means of facilitating direct interactions between individuals and nature. In particular, urban allotments and community gardens may be characterized as practices that enhance participation in food production processes while contributing to the development of environmental awareness and a stronger appreciation of natural systems.

4.2. Contributions to Ecosystem Services

In the intensive urban agriculture scenario developed by Clinton et al. (2018), urban agriculture practices were found to provide high levels of ecosystem services, including food production, nitrogen fixation, energy conservation, pollination, climate regulation, soil formation, and biological pest control. In this context, urban agriculture areas are recognized as contributing to a wide range of ecosystem services, such as carbon sequestration, microclimate regulation, stormwater management, habitat provision, reduction of air pollution and particulate matter, and support for pollinator species. From this perspective, urban agriculture practices are considered to strengthen the ecological infrastructure of biophilic cities.

4.3. Climate Change Adaptation

Urban agriculture has been reported to contribute to the mitigation of urban heat island effects by improving urban microclimatic conditions through various environmental mechanisms (Shaji, 2023). Green roofs, including those used for urban agriculture practices, are identified as effective strategies for reducing urban temperatures. Such applications have been reported to provide cooling effects ranging from 0.24°C to 4.9°C in ambient air temperature and from 0.8°C to 60.0°C in roof surface temperature. In this context, increasing evapotranspiration through vegetation cover, urban agriculture practices, and urban water bodies is considered an effective approach for mitigating the adverse effects of the urban heat island phenomenon in cities (Qiu et al., 2013). Based on these findings and the regulating ecosystem services provided by urban agriculture, the potential contributions of urban agriculture practices to climate change adaptation can be summarized as follows:

- They can mitigate the urban heat island effect.
- They can increase the extent of permeable surfaces within urban areas.
- They can reduce carbon emissions by supporting local food production.

4.4. Social Cohesion and Community Well-Being

According to Okvat and Zautra (2011), community gardens should not be regarded solely as spaces for food production; rather, they function as socio-ecological resilience tools that provide multiple benefits related to individual health and psychological well-being, while also fostering social cohesion, social capital, ecological awareness, and climate change adaptation. In this context, the contributions of community gardens and shared production spaces incorporating urban agriculture practices to social cohesion and community well-being can be summarized as follows:

- They enhance social interaction.
- They strengthen residents' sense of place and urban belonging.
- They create opportunities for social learning, particularly for children and older adults.
- They promote environmental awareness.

From this perspective, urban agriculture practices are considered to contribute to the social sustainability dimension of biophilic cities.

5. Urban Agriculture Practices in Biophilic Cities

In evaluating urban agriculture practices implemented in biophilic cities, examples of cities adopting the biophilic city approach were examined through the website of the Biophilic Cities Network (Biophilic Cities, n.d.). Particular attention was given to urban agriculture practices implemented within these cities. In this context, urban agriculture examples reflecting the approaches and practices presented on the platform were reviewed. Accordingly, examples from Singapore, Portland (Oregon), Charlottesville (Virginia), Fremantle (Australia), Vitoria-Gasteiz (Spain), and Milwaukee (Wisconsin) were examined.

5.1. The Case of Singapore

A member of the Biophilic Cities Network since 2013, Singapore is home to a population of approximately 5.4 million. Despite its high population density, efforts to integrate nature into urban life are reported to have begun under the "Singapore Garden City" vision. The city is characterized by highly connected pedestrian and transportation networks linking parks and green spaces, while various initiatives have been implemented to integrate nature into vertical urban environments. In this context, the National Parks Board undertakes a range of activities aimed at strengthening the city's green infrastructure. In addition, the Singapore Botanic Gardens occupy an area of 82 ha and were designated as a UNESCO World Heritage Site in 2015. Gardens by the Bay provides visitors with immersive experiences and educational

programs while serving as a model for sustainable development and environmental conservation (Biophilic Cities, n.d.). Examples from Singapore are presented in Figure 1.

Figure 1. Examples of biophilic city practices in Singapore: a vertically vegetated building facade (left) and an urban agriculture production area (right) (Biophilic Cities, n.d.)

5.2. The Case of Portland (Oregon)

A member of the Biophilic Cities Network since 2013, Portland is widely recognized as one of the world's most environmentally conscious cities due to its high walkability, extensive cycling community, farm-to-table food culture, and more than 4,000 ha of public parkland. The city is regarded as one of the greenest cities in the world, supported by forward-thinking initiatives and regulatory frameworks, including green street programs and the implementation of an urban growth boundary. Portland is also reported to have one of the highest per capita park area ratios in the country. More than 2,000 green streets have been designed to manage urban stormwater runoff, while approximately 700 eco-roofs have been established in high-density urban areas. Furthermore, under the Portland Plan 2035, the incorporation of eco-roofs has been made mandatory for large-scale new developments (Biophilic Cities, n.d.). Representative examples from the city are presented in Figure 2.

Figure 2. Examples of green infrastructure for sustainable stormwater management in Portland (left) and a community garden (right) (Biophilic Cities, n.d.)

5.3. The Case of Charlottesville (Virginia)

Charlottesville, which joined the Biophilic Cities Network in 2025, has been recognized for its long-standing commitment to sustainability, environmental stewardship, climate action, and community well-being. The city's comprehensive plan includes dedicated sections on environmental protection, climate resilience, and food equity, with the aim of ensuring that natural assets, forests, rivers, community gardens, and walking and cycling trails remain integral components of everyday urban life. In this context, a variety of initiatives have been implemented, including the Climate Action Plan, Urban River Corridor Plan, Climate Action and Sustainability Dashboard Tool, Water Resources Protection Program, and Urban Forest Management Plan (Biophilic Cities, n.d.). Representative examples from Charlottesville are presented in Figure 3.

Figure 3. A community-based nature awareness activity implemented within the framework of the biophilic city approach in Charlottesville (left) and an ecological landscape design application (right) (Biophilic Cities, n.d.)

5.4. The Case of Fremantle (Australia)

A member of the Biophilic Cities Network since 2018, the City of Fremantle embraces the view that natural and urban environments are not mutually exclusive and that successful cities can harmoniously integrate both. Fremantle has been recognized as an official leader in sustainability, becoming the second city in the world to achieve international One Planet certification in 2015. In September 2017, the City Council approved both the Verge Garden Policy and the Reserve Tree Planting Policy. Past and ongoing initiatives contributing to Fremantle's biophilic city vision include support for community groups, community planting days, revegetation activities, implementation of coastal management plans, and continued support for three community gardens. In addition, initiatives such as the Greening Strategy and the Urban Forest Plan are among the city's most prominent sustainability programs (Biophilic Cities, n.d.). Images of Fremantle obtained from the Biophilic Cities Network are presented in Figure 4.

Figure 4. Examples of biophilic city practices in Fremantle: verge gardening (left) and a community garden application (right) (Biophilic Cities, n.d.)

5.5. The Case of Vitoria-Gasteiz (Spain)

A member of the Biophilic Cities Network since 2013, Vitoria-Gasteiz experienced rapid spatial expansion during the 1980s as a result of significant population growth and consequently faced various challenges related to stormwater management. The city has been identified as having one of the highest biodiversity indices among European cities. In recognition of its environmental achievements, Vitoria-Gasteiz was awarded the title of European Green Capital in 2012. The city has implemented a variety of biophilic initiatives, including the Green Belt project, activities coordinated by the Centre for Environmental Studies, and urban ecological garden practices (Figure 5) (Biophilic Cities, n.d.).

Figure 5. An urban ecological garden application in Vitoria-Gasteiz (left) and the Green Corridor approach (right) (Biophilic Cities, n.d.)

5.6. The Case of Milwaukee (Wisconsin)

A member of the Biophilic Cities Network since 2013, Milwaukee has been positioned as the "Freshwater Research Capital of the World." The city is recognized for having made significant progress in the field of sustainability. In this context, the *ReFresh MKE* Sustainability Plan aims to implement initiatives that simultaneously prioritize people, the environment, and economic development, while numerous non-governmental organizations actively support green initiatives. Through these efforts, Milwaukee is reported to be evolving into a greener, bluer, and more accessible city. Examples of prominent initiatives include the Greenseams Program, an innovative approach to flood management; the Urban Ecology Center, which seeks to inspire neighborhood-scale transformation by fostering ecological awareness; and Alice's Garden Urban Farm, a two-acre community-based urban farm located in Milwaukee, Wisconsin (Figure 6). These initiatives are reported to support families and organizations in revitalizing cultural and family traditions associated with land stewardship and food production (Biophilic Cities, n.d.). Within the framework of the HOME GR/OWN Program, a local food production and neighborhood revitalization initiative, the following urban agriculture-related activities have been implemented:

- Increasing access to healthy food and promoting green space development by concentrating municipal and partner resources within targeted neighborhoods, thereby supporting economic development.
- Facilitating local food production and access while repurposing vacant municipally owned land.
- Supporting healthy food production, distribution, and food-based enterprises through the simplification of licensing, permitting, and regulatory processes.

- Transforming vacant land into parks, orchards, and healthy green spaces.
- Supporting the establishment of new urban farms and increasing the number of healthy food vendors.

Figure 6. Urban agriculture and community activities conducted at Alice's Garden Urban Farm (Alice's Garden Urban Farm, n.d.)

6. Conclusion

Urbanization processes, climate change, and the associated loss of biodiversity and increasing vulnerabilities within food systems demonstrate that considering cities solely as spaces of consumption is no longer a sufficient approach. In response to these challenges, biophilic city approaches have emerged as an important planning framework aimed at re-establishing and strengthening the multiple relationships between humans and nature. Although the literature provides numerous definitions of urban agriculture, which is widely recognized as a key component of biophilic urbanism, there is still no common consensus regarding its spatial scope and conceptual boundaries. Within the scope of this study, urban agriculture was defined as follows: "*Urban agriculture is a set of production activities that take place in the spatial continuum from the urban core to the contiguous municipal boundary, reconnecting urban life with the culture of production, both traditional and innovative practices, biophilic characteristics, and urban food sovereignty.*" This definition enables urban agriculture to be evaluated not only in terms of specific production techniques or cultivation spaces, but also within the broader context of urban-nature interactions, local food systems, and biophilic planning principles.

Within the scope of the study, all 34 cities included in the Biophilic Cities Network were reviewed, and urban agriculture practices were examined through examples from Singapore, Portland (Oregon), Charlottesville (Virginia), Fremantle (Australia), Vitoria-Gasteiz (Spain),

and Milwaukee (Wisconsin). The cases investigated demonstrate that urban agriculture in biophilic cities is not considered solely as a food production activity; rather, it is approached as a planning tool that supports integration with nature, strengthens community participation, and contributes to sustainable urban development objectives. In this context, urban agriculture may be regarded not merely as a complementary element of biophilic urbanism, but as a strategic approach that contributes to the formation of biophilic urban morphology. Accordingly, the stronger integration of urban agriculture practices into planning, design, and local government policies can be considered an important and necessary approach for promoting the development of sustainable and resilient cities in Türkiye.

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CHAPTER 3

ANIMAL-FRIENDLY LANDSCAPE DESIGN IN CITIES

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1.Introduction

For a long time, cities were spaces planned and designed solely based on human needs. However, cities are rapidly changing both socially and physically. Some of these changes are a result of human activities. Social changes in cities have been the subject of much research. One of the reasons for the rapid change in urban space is the ability to meet human needs. The activities that people have undertaken to change the environment for centuries have transformed it into an urban environment. With the modern process of globalization and urbanization, cities have begun to become less friendly to their users (Alpak et al., 2018; Alekseevaa et al., 2020). Over time, cities become unable to meet the needs of people. The main reason for this is the destruction of nature and its unconscious use as a natural resource. In fact, a city is a large system. If properly organized, it can provide healthy living environments for all living beings within it (Alpak & Düzenli, 2018; Kızılarsan, 2023). As is known, natural areas have gradually decreased due to industrialization and urbanization. As a result, the need for urban dwellers to be in harmony with nature is now being sought in urban green spaces (Özgüner, 2003, Oğurlu, 2014). For this reason, people's interest and sensitivity towards nature and natural green spaces in cities are increasing. Negative developments in cities have necessitated a rethinking of urban planning criteria. In particular, the climate crisis, rapid urbanization, and the destruction of nature in cities make it necessary to address urban open spaces with a more inclusive approach. In this context, the human-animal relationship in cities has become an important issue for planners and animal lovers. Animal-friendly landscape design in cities has reminded us that not only people but also domestic animals live in cities. It has taken into account the living needs not only of domestic animals but also of stray animals and other urban fauna. Animal-friendly landscape design is not limited only to dog parks or feeding areas. This approach; This includes issues such as habitat continuity, safe movement, access to water, shade, shelter, biodiversity, human-animal interaction, and interspecies coexistence. The World Health Organization's "One Health" approach also emphasizes the interconnectedness of human, animal, and ecosystem health. Therefore, animal-friendly landscape design in cities is not only an ethical responsibility. It is also important for human health, environmental health, and ecological sustainability (URL-1).

In contemporary landscape architecture literature, animal-friendly spaces are associated with concepts such as "multi-type city," "wildlife-friendly urban design," and "Animal-Aided Design." The Animal-Aided Design approach does not define pets as elements added later to the design process. On the contrary, it advocates for viewing them as urban

users who should be considered from the very beginning of the design. This approach creates an interface between landscape architecture, urban planning, ecology, and nature conservation disciplines. Similarly, the "wildlife-inclusive urban design" approach targets the built-up areas of cities. It aims to incorporate the needs of pets into the planning and design process. In this way, biodiversity, ecosystem services, and nature experiences can be supported in cities (Apfelbeck et. al., 2020).

2.City-Animal-Landscape Relationship

Although cities are created by humans, over time they become unable to meet human needs and provide living spaces for other living beings. The main reason for this is the destruction of nature. A city is a large system. Although cities are created by humans, over time they become unable to meet human needs and provide living spaces for other living beings. The main reason for this is the destruction of nature and its unconscious use as a resource. However, a city is a large system and should be properly organized. It can provide healthy living environments for all living beings within it. Considering the intensity of urban space use, the need for efficient use of urban space is actually more of a necessity than a choice. Humans are not the only inhabitants of cities; animals are also users of cities (Tarsitaro, 2006).

Animals are also a part of the city. However, their habitats within the city are being destroyed. The increasing scarcity and destruction of habitats for stray animals in today's cities has reached alarming levels, disturbing urban dwellers. In particular, the lack of shelter and feeding areas for stray animals within the city is seen as a problem by many city dwellers. Human activities form the basis of these problems, as people, while creating spaces for themselves, destroy natural areas and interfere with the habitats of other living beings. The decrease in green spaces, especially near city centers, and the replacement of these with built environments, destroys the living environment of animals. Yet, cities are more meaningful with the green spaces they contain. The balance between green spaces and paved areas also creates a balance between human and animal living spaces.

Figure 1. City- Animal-Landscape (URL-2; URL-3).

In Turkey, the Animal Protection Law No. 5199 states that ensuring the comfortable lives of animals, their good and appropriate treatment, and their protection from pain and suffering are the fundamental aims. It also emphasizes the importance of domestic animals having the freedom to live in conditions specific to their species. It is stated that stray animals should also have their lives supported in the same way as owned animals. The implementing regulation published in 2024 introduced detailed regulations on issues such as local governments, animal shelters, natural habitats, rehabilitation and adoption of stray animals. This shows that landscape design is not only an aesthetic and recreational area, but also a legal, ethical and administrative responsibility (Republic of Turkey Ministry of Agriculture and Forestry, 2004).

Urban landscape design plays a critical role in this regard. Because the ability of animals to live in the city does not depend solely on the existence of natural areas. It depends on how these areas are connected to each other, the intensity of human use, and the maintenance and management processes. for this purpose, nature-based solutions are ıncluded ın the plannıng crıterıa of urban desıgn.

3.Pets and the Use of Public Open Spaces

In urban life, pets (dogs and cats) are not considered within the context of personal care relationships. Today, pets are urban users with whom people interact socially in their daily lives. Therefore, in urban landscape design, pets are not merely "living beings that accompany humans." They are also living beings that use and experience public spaces in cities together with humans.

The pet-human relationship has emotional, social, and spatial dimensions. The importance of pets in human life is not only physical. People form emotional bonds with their pets. In some cases, this emotional bond with pets creates psychological results similar to human relationships (McNicholas, 2005). In this context, public open spaces are not only places where pet owners walk their animals. They are also areas where the human-animal relationship is visible, social relationships develop, and the daily rhythm of urban life is established. Dogs, in particular, are directly associated with city parks, coastal areas, walking paths, neighborhood parks, and dog parks due to their need for regular walks, play, and socialization.

Dogs are the most visible group among pets in terms of their use of public open spaces. The main reason for this is that dogs' daily needs for exercise, movement, play, and socialization are directly related to open spaces. Therefore, the relationship between pets and public spaces is mostly examined in the literature through dog walking, dog parks, and the physical activity of dog owners. Dog walking is a regular and repetitive urban open-space activity. While people often use parks only for leisure activities, dog owners use them because of their pets' daily needs. Dog walking is an important source of physical activity. It is stated that urban parks offer an important spatial environment for dog walking. The same research shows that adults who come to the park with their dogs are able to engage in more moderate-intensity physical activity than those who come without dogs (Veitch, 2019).

Figure 2. Pets and public space (URL- 4; URL-5)

Pet ownership and access to open spaces are challenging in densely populated cities. Apartment living, small residences, limited green spaces, narrow sidewalks, heavy traffic,

public transportation, and crowded public areas directly affect dog walking behavior; the built environment in dense cities can hinder dog ownership and dog walking. In particular, the lack of public open spaces, narrow sidewalks, and overcrowding are significant design problems (Koohsari, et al., 2022). This situation is also important for Turkish cities. In metropolitan areas, many residents live in apartments. The daily need for open spaces for pets is mostly met through neighborhood parks, side streets, coastal areas, and small green spaces. Therefore, it is important to have accessible, safe, and well-maintained pet-friendly open spaces in every neighborhood. In densely populated cities, not only large dog parks but also small-scale solutions are gaining importance. Walking routes and short-term dog exercise areas should be available at the neighborhood level. This can support the daily use of pets. Such small interventions can have an impact on large-scale urban projects.

4.Conceptual Framework of Pet-Friendly Landscape Design

Animals are living beings with a right to live in the city, whether owned or unowned. Creating spaces where owned animals can spend time with their owners is a great necessity in cities. Pet-friendly landscape design, created for this purpose, does not only consider living beings in the city as "beings to be protected." It is based on considering them as active users of urban space. In this approach, animals are not included in the design later in cities. They are not auxiliary elements added at the end of the design process. They are living participants who influence design decisions from the beginning. The increasing decrease in living spaces for street animals in today's cities has reached disturbing levels for city dwellers. Therefore, people are producing solutions with their own means. In pet-friendly landscape design, parks should be considered not only as recreation areas but also as parts of the wider city. These parks should be supported not only as green areas but also with water, sand, and plant textures. The following principles should be considered in landscape design in the context of pets and the use of public open spaces:

• Pet-friendly designs should be accessible from a landscape design perspective. Pet owners should be able to access safe open spaces within a short walking distance in their living environment. Furthermore, the distance to green spaces in the immediate vicinity of residences should be adequate to meet the daily needs of animals.

• Neighborhood parks and walking routes are particularly important in this regard. Security is also crucial. Dog use areas should be safely separated from vehicle roads, busy bike paths, and children's playgrounds. Entry and exit should be controlled. Design solutions

that reduce the risk of escape should be used. Although the safety of animals is important, the safety of people in the surrounding area is also important. A functional separation should be established between areas where pets can roam freely and children's playgrounds and quiet resting areas. Shared spaces should not be disruptive to anyone. Because when planning, users who are afraid of animals or do not want to come into contact with animals should be considered as well as pet owners.

• The comfort of use of green areas should also be appropriate. Access to water is important for animals. Especially in the summer months, there should be shaded areas or vegetation. Resting areas and walking paths should be suitable for owners, which is important for both animals and owners.

Figure 3. Pet-Friendly Landscape Design (URL- 6; URL-7)

The presence of pets in public open spaces is not always problem-free. Parks, squares, coastal areas, and neighborhood open spaces are shared by different user groups. Children, the elderly, people with disabilities, athletes, those wishing to relax, pet owners, and individuals who are wary of animals may all be in the same space. Therefore, pet-friendly landscape design should be developed not only according to the expectations of pet owners but also according to the safety and comfort requirements of all users. When applying these design criteria, it is undesirable for pets to be uncontrolled within the city. In urban open spaces, there should be green areas between children's playgrounds, sports areas, picnic areas, and

active use areas, as well as animal walking routes. This green area separates users. Thus, it is a proper plan for both pet owners and users who do not want to come into contact with animals.

5.Pet Owners and Pets' Activities in Outdoor Spaces

In cities, outdoor spaces are not just transit or circulation areas for pet owners and pets. City parks, walking paths, coastal areas, and open spaces around residential areas are important public spaces for both humans and pets. Dog owners, in particular, regularly use outdoor spaces due to their pets' needs for walks, play, exercise, and socialization. This situation reveals that open green spaces should be designed not only for people but also for pets that live with people.

The most basic outdoor activity for pet owners is walking their pets. Daily dog walks meet the animal's need for physical movement. It also allows the owner to spend time outdoors. This is actually a recreational activity for pet owners. Walking with pets often takes place around residential areas, on park paths, or in green corridors. Thus, the pet's frequency of outdoor space use directly affects the owner's movements within the city. Because the pet owner uses the outdoor space more regularly not only of their own free will but also in accordance with the daily needs of their animal.

Another important activity that takes place in outdoor spaces is play and exercise. For dogs, running, playing with a ball, free movement, scenting, exploring, and interacting with other dogs are fundamental behaviors. Therefore, dog parks and large green spaces are important places for pets to expend their energy. Pet owners also use these spaces to play with their animals, observe them, and spend time together. Such activities strengthen the bond between humans and animals while contributing to the animal's physical and psychological health.

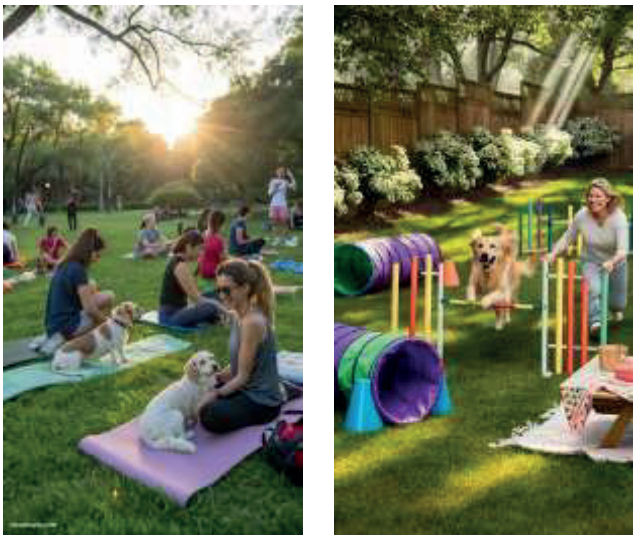

Figure 4. Pets' Activities in Outdoor Spaces 1 (URL-8; URL- 9)

Another function of outdoor spaces for pet owners and pets is that they offer opportunities for socialization. During dog walks, pet owners encounter other people using similar routes. They have short conversations and may routinely meet again at other times. This creates opportunities for other activities in the long term. Pets initiate communication between people. Dog parks, in particular, are public spaces where not only dogs but also their owners socialize. One of the activities pets engage in in outdoor spaces is exploring their environment and sensory experiences. Animals follow scents in open spaces.

They come into contact with different surfaces and react to sounds. In fact, this is how they perceive other living things in their environment. Therefore, pet-friendly landscape design is not designed as large empty spaces. Like children, it is surrounded by natural elements that offer different sensory experiences. Lawns, tree shade, shrub groups, soil surfaces, water features, and varying levels can enrich the outdoor experience for animals.

Figure 5. Pets' Activities in Outdoor Spaces 2 (URL-9; URL-10)

Pet owners' outdoor activities aren't limited to active movement. Resting, eating, and lying down are important aspects of outdoor use. Pet owners need seating areas in dog parks or while walking or watching their pets. Therefore, pet-friendly outdoor spaces should consider the comfort of both the animals and their owners. Design elements in these areas include seating, shade elements, lighting units, and safe flooring. Furthermore, pet owners have care and responsibility responsibilities in outdoor spaces. This includes controlling the pet with a leash, collecting waste, and ensuring their water needs are met. Maintaining a safe distance from other users and adhering to area rules are also necessary. Pet-friendly landscape design should facilitate the fulfillment of these responsibilities.

Pets' outdoor activities are also related to different user groups. Children, the elderly, athletes, those wanting to relax, and individuals who are wary of animals may share the same public space. Therefore, the activities of pet owners and their pets should be planned in a way that does not negatively impact the safety and comfort of other users. Dog play areas should be separated from children's play areas. Ensuring controlled access along busy pedestrian axes, limiting free movement areas, and using buffer vegetation are important in this regard.

6.Results

Pets and the use of public open spaces are very important issues in today's cities. This is because landscape design is not solely human-centered. It also encompasses other living beings that coexist with humans. Pets, especially dogs, are the most frequent users of cities in this sense. Dogs, in particular, use city parks and walking paths with their owners. Public open spaces are also important because they regularly use green areas and coastal areas in the vicinity of their homes. This situation increases the role of pets in urban spaces.

Pet ownership directly affects individuals' open space usage habits. Dog owners use public open spaces more regularly due to their animals' daily walks, exercise, and socialization needs. This usage pattern increases people's physical activity levels. It supports walking habits and contributes to a stronger connection with open green spaces. Therefore, pet-friendly landscape design contributes not only to animal welfare but also to human health and an active lifestyle culture.

Public open spaces also create social interaction areas for pet owners. Encounters, acquaintances, and neighborhood-scale social relationships can develop among users during dog walks. This situation demonstrates that pets are an element that facilitates social bonding

among people. Therefore, pet-friendly parks and walking routes meet the animals' need for movement.

They support social communication and neighborhood relations. However, the use of public open spaces by pets can also bring some problems. The overlap of children's playgrounds with pet use areas, fear of animals, and safety concerns are among these problems. Therefore, in pet-friendly landscape design, it is not enough to simply create a usage area. The areas need to be correctly positioned, regularly maintained, user rules must be determined, and a balance must be established between different user groups.

Urban open spaces for pets are an important need in cities. However, for these areas to be successful, they must be considered as functional areas planned in accordance with design principles. Pet-friendly landscape design also requires the expansion of an inclusive design approach. The need for pet-friendly open spaces becomes even more pronounced in densely populated cities. Apartment living, limited green spaces, heavy traffic, and crowded public spaces make it difficult for pet owners to use open spaces. Therefore, it is important to create accessible, safe, and well-maintained open spaces at the neighborhood level.

In conclusion, pets and the use of public open spaces necessitate a holistic approach to landscape design that considers the relationship between humans, animals, and the environment together. Pet-friendly public spaces enhance animal welfare while also supporting people's physical activity, social interaction, and use of open spaces. Therefore, when designing parks, walkways, neighborhood green spaces, and dog parks in cities, the needs of pets and their owners should be taken into account. This will make it possible to create healthier, more inclusive, safer, and more livable urban landscapes.

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