# URBAN DESIGN AND SPATIAL PLANNING

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# NATURE-BASED DESIGN SOLUTIONS AND URBAN POLICIES' SUPPORT: THE CASE OF TURKEY

## ROZWIĄZANIA PROJEKTOWE BAZUJĄCE NA NATURZE I WSPARCIE POLITYK MIEJSKICH, PRZYPADEK TURCJI

ABSTRACT

Urban areas worldwide face mounting challenges from high population densities, environmental pollution, climate change, and public health concerns, while traditional top-down planning methods prove increasingly inadequate to address these complex issues within a human rights framework. In response, urban leaders and local decision-makers have been compelled to develop innovative solutions that harness nature's potential, leading to the emergence of nature-based tactics as sustainable solutions to urban problems. These environment-based strategies have gained recognition as ideal responses from sustainability perspectives, particularly given that legal frameworks significantly influence citizen behaviour in urban contexts. When environmental regulations are properly designed and implemented, they can positively shape public behaviour and enhance overall well-being in urban areas, raising important questions about whether existing laws adequately support environment-based policies and obligations.

This research addresses these questions by systematically investigating Turkey's legal and policy framework support for nature-based solutions through comprehensive qualitative document analysis of national legislation, climate strategies, and municipal implementations. The study's primary objective extends beyond merely describing Turkish legal regulations to critically evaluate how effectively this framework aligns with internationally recognized nature-based solutions criteria, particularly those established by leading global standards. Through this analysis, the research reveals significant disparities between Turkey's comprehensive legislative architecture and practical nature-based solutions deployment, examining the critical transition from regulatory frameworks to actual implementation. The findings provide valuable insights that transcend national boundaries, offering broader implications for global governance approaches and contributing to our understanding of policy coherence and implementation effectiveness in urban sustainability contexts.

**Keywords:** sustainability, environment, nature-based solutions, urban policies, Turkey

STRESZCZENIE

Obszary miejskie na całym świecie stoją w obliczu narastających wyzwań związanych z wysoką gęstością zaludnienia, zanieczyszczeniem środowiska, zmianami klimatu i problemami zdrowia publicznego, a tradycyjne, odgórne metody planowania okazują się coraz bardziej niewystarczające do rozwiązania tych złożonych problemów w kontekście praw człowieka. W odpowiedzi na tę sytuację liderzy miejscy i lokalni decydenci

zostali zmuszeni do opracowania innowacyjnych rozwiązań wykorzystujących potencjał natury, co doprowadziło do powstania taktyk opartych na naturze jako zrównoważonych rozwiązań problemów miejskich. Te strategie środowiskowe zyskały uznanie jako idealne odpowiedzi z perspektywy zrównoważonego rozwoju, zwłaszcza biorąc pod uwagę fakt, że ramy prawne znacząco wpływają na zachowania obywateli w kontekście miejskim. Prawidłowo opracowane i wdrożone przepisy środowiskowe mogą pozytywnie wpływać na zachowania społeczne i poprawiać ogólny dobrobyt na obszarach miejskich, co rodzi istotne pytania o to, czy istniejące prawo odpowiednio wspiera polityki i zobowiązania środowiskowe.

Niniejsze badania odpowiadają na te pytania poprzez systematyczną analizę tureckich ram prawnych i politycznych wspierających rozwiązania oparte na przyrodzie, poprzez kompleksową jakościową analizę dokumentów krajowych, strategii klimatycznych i wdrożeń w miastach. Głównym celem badania jest nie tylko opisanie tureckich przepisów prawnych, ale także krytyczna ocena, na ile te ramy są zgodne z uznanymi na arenie międzynarodowej kryteriami rozwiązań opartych na przyrodzie, w szczególności tymi ustanowionymi przez wiodące światowe standardy. Analiza ta ujawnia istotne rozbieżności między kompleksową architekturą legislacyjną Turcji a praktycznym wdrażaniem rozwiązań opartych na przyrodzie, analizując kluczowy etap przejścia od ram regulacyjnych do faktycznego wdrożenia. Odkrycia te dostarczają cennych spostrzeżeń, wykraczających poza granice państwowe, oferując szersze implikacje dla globalnych podejść do zarządzania i przyczyniając się do naszego zrozumienia spójności polityki i skuteczności wdrażania w kontekście zrównoważonego rozwoju miast.

**Słowa kluczowe:** zrównoważony rozwój, środowisko, rozwiązania oparte na naturze, polityki miejskie, Turcja

## 1. INTRODUCTION

Cities represent complex systems where natural ecosystems intersect with predominantly human-built environments (Smith et al., 2018). As centres of political, economic, and physical activities, cities have become the primary habitat choice for populations worldwide (Pandey et al., 2021). Currently, 55% of the global population resides in urban areas, with projections indicating this figure will reach 68% by 2050 (Kasznar et al., 2021; UN, 2018). This rapid urbanization trend has significant implications for sustainability, as reflected in the United Nations' Sustainable Development Goal 11, which calls for cities to become resilient, safe, inclusive, and sustainable by 2030 (UN, 2022; Russo and Escobedo, 2022; Ziyafati Bafarasat, 2023).

The relationship between humans and the natural environment is fundamental to urban well-being, supporting cognitive resources (Kaplan and Kaplan, 1989), aesthetic experiences (Appleton, 1996), and evolutionary fitness (Wilson, 1993). However, contemporary urbanization in the Anthropocene era presents unprecedented challenges, including resource depletion, pollution, climate change, rising energy costs, ecosystem destruction, biodiversity loss, increasing inequality, and deteriorating microclimatic conditions (Crutzen and Steffen, 2003). These complex, non-linear urban systems cannot be effectively managed through conventional planning approaches and centralized policies alone. The concept of the city as the centre of its territory has been transformed by Habitat III, moving beyond the traditional conflict between city and countryside to embrace more integrated approaches to urban and rural development (Couret, 2022). Additionally, strict regulations governing urban planning have started to loosen, allowing for greater flexibility in urban planning approaches (Tasan-Kok, 2008; Schaller, 1999; Steele and Ruming, 2012; Chan and Yung, 2004). In response to these challenges, new urban planning techniques inspired by nature have emerged as innovative solutions. The European Union's Horizon 2020 program exemplified this shift by funding large-scale demonstration projects focused on 'Nature-Based Solutions for Smart and Sustainable Cities' to explore creative solutions to problems confronting European cities (Somarakis et al., 2019). This paradigmatic approach has developed under the umbrella of sustainability, climate change mitigation and adaptation, resilience, well-being, and public welfare. Planning with nature enables cities to create more fulfilling, productive, and liveable environments for their inhabitants (Beatley and Newman, 2013; UNEP, 2021; Cardinali et al., 2021). For a city to be considered sustainable, it must be participatory and holistically planned, creating stronger dialogue for designing sustainable cities that can adapt to future challenges (Carmona, 2021).

Understanding the legal and regulatory foundation for nature-based solutions is crucial for effective urban governance. If legal frameworks significantly influence citizen behaviour in urban contexts, then properly designed environmental regulations can positively shape public behaviour and enhance overall well-being in urban areas. The degree to which urban governing systems enhance the standard of living for their citizens is a defining characteristic of effective governance. These processes involve consultation and participation from all urban stakeholders and are structured around pathways for vertical and horizontal coordination between various

territorial levels, including municipal, metropolitan, regional, and national scales, which can advance human rights (UN-HABITAT, 2020).

This study systematically analyses Turkey's legislative framework for nature-based solutions implementation against internationally recognized standards, particularly the IUCN Global Standard for Nature-based Solutions. Rather than merely describing Turkish legal regulations, this research evaluates how effectively Turkey's legislative architecture aligns with established nature-based solutions criteria, providing critical insights into policy coherence and implementation effectiveness (Cohen-Shacham et al., 2016; Raymond et al., 2017).

## 2. LITERATURE BACKGROUND

### 2.1. Nature-based urban design solutions: theoretical framework

In urban areas today, due to the many climate crises we experience, there is a need for more balance between the dichotomies of nature and humankind. At the same time, the idea of urban resilience has become increasingly popular as cities worldwide deal with growing environmental, social, and economic issues. Using nature-based solutions, which harness the strength of natural ecosystems to support a city's capacity to adapt and thrive in the face of shifting conditions, is a crucial part of this resilience (Davis and Uffer, 2013; Bush and Doyon, 2019; UNEP, 2021). In other words, in recent years, the significance of integrating nature into urban planning and architecture has drawn more attention, especially in light of the pressing issues of environmental deterioration and urbanization. Due to problems like pollution, poor environmental conditions, and the need for resilient and sustainable growth, cities are at the forefront of this agenda (Eid et al., 2021). Inventing new ways, such as nature-based, human-based (Seddon et al., 2020), and urban-rural approaches, is important to maintaining spatial quality and equality for reducing the negative externalities resulting from urbanization. In this scope, urban nature is progressively regarded as a viable alternative for sustainability in urban design and development. The increasing diversity of worldwide, national, regional, and municipal policy measures for the conservation and sustainable utilization of the natural environment demonstrates policymakers' recognition of nature's significance to society (European Commission, 2015). Ecosystem-Based Adaptation (EBA) and Green Infrastructure (GI) are two concepts that are currently utilized in the urban greening lexicon. The most recent addition is Nature-Based Solutions (Dorst et al., 2019). The gradual influence of nature-based design ideas in urban planning is summarized in the figure below (Figure 1).

To improve interactions between humans and nature in urban settings and lessen the adverse effects of urbanization on the environment, the idea of a biophilic city, which has Greek origins and signifies 'love of life', a city with an abundance of natural resources, was born as the other approaches in urban areas. A city that has a lot of natural spaces and easily accessible natural systems for its residents is considered to be biophilic (Radha, 2021). Integrating nature into human living spaces, biophilic urbanism seeks to strengthen and restore the bond between people and the natural world. Additionally, biophilic urbanism highlights that this relationship is a necessary component of creating sustainable cities and one way to lessen contemporary urban problems (Lee and Kim, 2021).

As the world becomes more urbanized, it is more crucial than ever to incorporate nature-based solutions into urban planning and policy. To create resilient, inclusive, and ecologically friendly urban settings, cities, which are at the forefront of sustainable development, have a critical role to play in putting these nature-based ideas into practice. Nature-based urban planning and design is a holistic approach to creating sustainable and liveable cities that integrate natural elements into the built environment. This idea expands on a lengthy history of investigating the significance of nature in urban development, including the use of green belts and garden cities (Dorst et al., 2019; Scott et al., 2016). Three interconnected ideas are urban nature, green infrastructure, and nature-based solutions (Ignatieva et al., 2023). According to Lafortezza et al. (2018) and Snep et al. (2020), the concept of Nature-Based Solutions is closely related to other concepts like sustainability, resilience, ecosystem services, integrated human-environment, and green (blue) infrastructure. However, it offers a more economical and efficient approach to development than traditional methods and can effectively promote climate resilience in urban areas. Enhancing public health is one of the main advantages of nature-based urban planning and architecture. Parks, green spaces, and waterfronts are examples of urban natural settings that can offer a variety of health advantages, such as better air quality, more physical activity, and lower stress levels. Furthermore, nature-based solutions have been used globally, mostly in Western contexts, to address issues related to urban water management, such as the health of waterways and the effects of flooding brought on by urbanization and increasing runoff from impermeable surfaces

(Figure 2). Nature-based solutions are divided into three categories according to the degree of intervention in nature. The first type is no or little ecosystem intervention; the second type is managed ecosystems' sustainability and multi-functionality; and the last type is the creation and administration of new ecosystems (Somarakis, 2019). In this scope, ecosystem and multifunctionality intervention on the urban scale are provided with clever technical adjustments like vertical gardens, city, and urban farming, wetland vegetation, green roof barriers and corridors, sustainable drainage systems, and so on (Somarakis, 2019). The most commonly assumed benefits of designing and planning based on nature (Figure 2) in different scales of urban planning and design, with academic research outcomes, are summarized in Table 1. However, in many cities, environmental protection planning and urban design regulations frequently function in parallel without being completely linked. Ad hoc and inefficient application of nature-based solutions may arise from this disconnect (Kuller et al., 2022). Many cities worldwide have started implementing nature-based urban laws and regulations to address this issue.

So, integrating these ideas into urban laws and regulations can improve quality of life, human behaviour, sustainability, and resilience in urban settings. Some countries include nature-based solutions in their urban laws and regulations by enacting laws requiring the construction and maintenance of green infrastructure, conservation of open spaces, green belts, and corridors, protecting and restoring wetlands, and mandating the use of reflective roofing materials can help reduce the impact of the urban heat island and so on.

### 2.2. International best practices and legislative framework

As mentioned before, the gradual influence of nature-based design ideas in urban planning demonstrates a global shift toward sustainable urban development. Ecosystem-Based Adaptation (EBA) and Green Infrastructure (GI) are two concepts that are currently utilized in the urban greening lexicon. The most recent addition is Nature-Based Solutions (Dorst et al., 2019).

International examples provide valuable baselines for comparison and demonstrate various approaches to integrating nature-based solutions into urban legislation:

**New York City, United States**

New York City represents a comprehensive approach to mandatory green infrastructure implementation. Local laws (NYC Local Laws 92 and 94 of 2019) mandate that almost all newly built structures, roof

Tab. 1.

| **Scales of Benefits** | | **City / Municipality Scale** | **Regional Scale** | **National Scale** |
|---|---|---|---|---|
| **Assumed Multi-functionality benefits** | **Environmental Benefits** (Climate resilience, Biodiversity enhancement, Air and water purification, Flood mitigation) | Improve air quality / carbon sequestration/ decrease of heat island. | Creating ecological zones. | Creating ecological zones. |
| | | Reduce of disaster risk. | Reduce of disaster risk (flood). | Reduce of disaster risk. |
| | | Increase resilience. | Increase resilience. | Increase resilience. |
| | | Carbon sequestration and decrease of heat island effect. Reducing erosion. | Sustainable ocean and marine resource management. Decrease of heat island effect. | Sustainable ocean and marine resource management. Decrease of heat island effect. |
| | | Protection of the coast from the consequences of climate change. Filtering toxins. | Protection of the coast from the consequences of climate change. Filtering toxins. | Protection of the coast from the consequences of climate change. Filtering toxins. |
| | | **Application Field** | | |
| | | Green Roofs, Parks, Vertical Gardens, Green Walls, Tree-Lined Streets, Urban Wetlands, Green Corridors, Native Plantings, Permeable Pavements, Rain Gardens, and Community gardens. | | |

| Scales of Benefits | | City / Municipality Scale | Regional Scale | National Scale |
|---|---|---|---|---|
| Assumed Multi-functionality benefits | **Social and Health Benefits** (Improved mental and physical health, Enhanced community cohesion, Cooling urban spaces) | Decline in illnesses linked to air pollution, Promotes physical activity, Reduces stress, and improves mental well-being. Interaction and create gathering places for communities, fostering a sense of belonging and shared responsibility. | Interaction and create gathering places for communities, fostering a sense of belonging and shared responsibility. | Contaminants in waste streams. |
| | | Treat contaminants in surface water. Making cities more comfortable during heatwaves | Treat contaminants in surface water. Making cities more comfortable during heatwaves | Providing comfortable areas during heatwaves |
| | | Guaranteeing better nutrition and food security. | Guaranteeing better nutrition and food security. | Guaranteeing better nutrition and food security. |
| | | **Application Field** | | |
| | | Parks, Urban Gardens, Green infrastructure, and Communal Green Spaces. Health parks (farms, gardens, and ranches) are intended for ecotherapy, zootherapy, hypnotherapy, meditation gardens, psychotherapy, aromatherapy, and rehabilitation, Children playgrounds with greenery and nature-friendly constructions and elements (Kopperoinen et al., 2015). | | |
| | **Economic Benefits** (Cost savings Increased property values, Tourism and recreation) | Saving healthcare. Increases property values. | Enhance the appeal of cities for tourists. | Enhance the appeal of cities for tourists. |
| | | Providing economic development | Contributing to local economies through recreation, hospitality, and related services. | Providing economic development |
| | | Sustainable consumption of resources | Sustainable consumption of resources | Sustainable consumption of resources |
| | | Eco-friendly energy | Eco-friendly energy | Eco-friendly energy |
| | | Sustainable economic growth | Sustainable economic growth | Sustainable economic growth |
| | | Promoting Job Creation. | | |
| | | **Application Field** | | |
| | | Green Roofs, Urban Trees, Parks, Greenways. Planting vegetation wind barriers, such as tree belts and windbreaks, particularly in windy areas | | |

| Scales of Benefits | | City / Municipality Scale | Regional Scale | National Scale |
|---|---|---|---|---|
| Assumed Multi-functionality benefits | **Cultural and Aesthetic Benefits** (Improved aesthetics, Cultural significance) | Ensuring Social cohesion, Enhances the beauty of urban environments, creating visually appealing landscapes. | Celebrate local heritage | Raise awareness about environmental stewardship. |
| | | Sustainable communities | Sustainable communities | Sustainable communities, raise awareness about environmental stewardship. |
| | | High-quality, inclusive, and egalitarian education that encourages lifelong learning about nature based solutions. | Creating visually appealing landscapes that blend built structures with natural elements. | Raise awareness about environmental stewardship. |
| | | Tackling poverty | Tackling poverty | Tackling poverty |
| | | **Application Field** | | |
| | | All natural elements in urban spaces, such as Community fishing areas, Plots for productive and instructive farming in urban voids, such as fields, meadows, pastures, and orchards, Urban forests and other recreational woodlands with little economic use. | | |
| | **Resilience and Adaptability** (Disaster resilience, Flexible and adaptive infrastructure) | Providing natural barriers. Protecting urban areas from extreme weather events such as floods and hurricanes. | Providing natural barriers. | Providing natural barriers. |
| | | Offering cities dynamic and long-term resilience, such changing weather patterns and increasing sea levels. | long-term resilience, such changing weather patterns and increasing sea levels. | long-term resilience, such changing weather patterns and increasing sea levels. |
| | | **Application Field** | | |
| | | Restoring wetlands and mangroves. | | |

Source: The authors adapted this table based on the Nature-Based Solutions Handbook (Somarakis et al., 2019).

replacements, and buildings undergoing significant expansion must have green roofs or solar panels installed. This regulatory framework represents a significant shift toward larger initiatives to increase the number of green roofs, which can contribute to urban sustainability goals (Treglia et al., 2022). The legislation demonstrates how cities can use regulatory mechanisms to drive widespread adoption of nature-based solutions.

**Barcelona, Spain**

Barcelona's approach emphasizes long-term strategic planning for urban nature. The Master Plan for Barcelona's Trees 2017–2037 views the city's trees as a tree population, or urban canopy, which takes into consideration the ecological, environmental, social, and landscaping functions that these living beings offer the city (Trees for Life, 2017). This comprehensive approach recognizes trees not merely as decorative elements but as integral components of urban infrastructure that provide multiple ecosystem services.

**Copenhagen, Denmark**

Copenhagen's Cloudburst Management Plan exemplifies how cities can prioritize Nature-based solutions for specific urban challenges. The municipality had the wish to improve liveability in the city by bringing in more nature and adopted laws that prioritize Nature-based solutions for flood risk reduction through comprehensive 'cloudburst' master plans (Veerkamp et al., 2021). This approach demonstrates how nature-based solutions can be integrated into

disaster risk reduction strategies while simultaneously enhancing urban liveability.

These international examples illustrate diverse approaches to implementing nature-based solutions through legislative frameworks, ranging from mandatory requirements to strategic planning initiatives and specialized risk management programs. They provide valuable insights into how different regulatory mechanisms can be employed to achieve urban sustainability goals.

## 3. METHODOLOGY

Like many other nations, Turkey, a country renowned for its rich biodiversity and varied landscapes, has been battling the negative effects of growing urbanization and the necessity of implementing sustainable measures to lessen such effects. Turkey presents a particularly relevant case study for examining nature-based solutions implementation due to its unique position as a rapidly urbanizing middle-income country with complex multi-level governance structures. The country's urbanization rate increased dramatically from 44% in 1980 to 77% in 2020, creating significant environmental and social challenges that require innovative policy responses (Turkish Statistical Institute, 2021).

Historically, it is possible to trace the legislative practices related to the environment back to the regulations regarding the cleaning and control of the Golden Horn and the protection of green areas during the Ottoman period (Algan, 2000:222–224). The historical development of environmental legislation since the Republic dates back to the 1930s when the first Municipality Law was enacted. Environmental policies were evaluated within the scope of health policies in Turkey until the early 1980s. The environment, referred to as the 'Right to Health' in the 1961 Constitution, was directly addressed in the 1982 Constitution (Keleş et al., 2012).

This rapid urban transformation, combined with Turkey's comprehensive legal framework that encompasses multiple administrative levels and regulatory instruments, makes it an ideal context for examining how nature-based solutions can be effectively embedded across different governance scales. Turkey's regulatory system provides four distinct types of legal tools for urban intervention: Administrative Laws, Special Purpose Laws, Reconstruction Laws and Regulations, and Other Legal Instruments (Rezafar, 2019). Building on this foundation, previous research has identified institutional capacity, multi-level governance coordination, and stakeholder engagement as critical enablers for successful nature-based solutions policy integration (Frantzeskaki et al., 2019). Furthermore, the presence of specific regulatory mechanisms — including environmental impact assessments, zoning regulations, and incentive structures — significantly influences the effectiveness of nature-based solutions implementation (Ferreira et al., 2020).

To systematically examine the integration of nature-based solutions in Turkish urban policies framework, this study employs a qualitative document analysis methodology examining Turkish legislation through four categories of legal and policy instruments that reflect Turkey's multi-level governance structure: National Climate Change Strategies, Urban Development Legislation, Environmental Regulations, and Municipal Implementation Cases (Climate Change Adaptation Strategy and Action Plan 2024–2030). The legislative review covers the period from 1930 to 2024, with particular emphasis on contemporary legislation from 2010 onwards, reflecting Turkey's increased focus on climate change adaptation and sustainable urban development (Çelikyay, 2021). This temporal scope was strategically selected because the period from 2010 onward marked a significant shift in Turkish urban policy, when Turkey introduced comprehensive climate change adaptation strategies and established the Ministry of Environment and Urbanization, creating a new institutional framework for addressing environmental challenges in urban contexts.

The analysis was conducted based on the legislative status as of December 2024, acknowledging that environmental legislation is subject to continuous revision and updates (Keleş et al., 2012). The types of legal instruments analysed include primary legislation (laws passed by Parliament), secondary legislation (regulations and bylaws issued by ministries), strategic policy documents (national strategies and action plans), municipal ordinances (local-level regulations), and implementation guidelines (technical instructions for law enforcement).

### 3.1. Establishing the analytical framework

Based on the comprehensive literature review, this study establishes a systematic analytical framework for evaluating nature-based solutions in urban legislation. The framework addresses the identified gap in systematic evaluation criteria and provides a structured approach for assessing legislative effectiveness across multiple dimensions. Drawing from critical components identified in the literature, the analytical framework is constructed around three primary dimensions that are essential for effective nature-based urban legislation.

**Environmental integration**
Forming the first dimension, evaluating the extent to which legislation addresses key environmental challenges and opportunities identified in the literature. This dimension encompasses climate resilience through assessment of how legislation addresses climate adaptation and mitigation strategies via nature-based solutions. It includes biodiversity enhancement by evaluating provisions for protecting and enhancing urban biodiversity, as well as ecosystem services analysis that examines how legislation recognizes and integrates ecosystem services into urban planning processes.

**Implementation mechanisms**
Constitute the second dimension, focusing on the practical aspects of legislative implementation while drawing from the literature's emphasis on clear regulatory tools and enforcement mechanisms. This dimension assesses regulatory tools by evaluating the clarity and comprehensiveness of regulatory instruments, examines enforcement mechanisms through monitoring, compliance, and penalty systems, and analyses institutional responsibilities to determine the clarity of roles across different governmental levels and agencies.

**Multi-scale coordination**
Represents the third dimension, addressing the literature's emphasis on integrated approaches across different spatial and administrative scales. This dimension evaluates national level integration by assessing how national policies provide framework conditions for nature-based solutions, examines regional level coordination through planning mechanisms and their integration with national and local levels, and analyses municipal level implementation mechanisms and their alignment with higher-level frameworks.

This analytical framework serves as the baseline against which Turkish legislation will be assessed, directly addressing the need for systematic evaluation criteria identified in the literature. The framework provides a structured approach for identifying strengths, gaps, and opportunities in existing legislative frameworks while enabling comparative analysis with international best practices. The framework's multi-dimensional approach recognizes that effective nature-based urban legislation requires not only strong environmental provisions but also robust implementation mechanisms and coordinated action across multiple scales of governance, ensuring that the evaluation captures both substantive legislative content and practical implementation potential.

### 3.2. Policy analysis framework
Building on this analytical foundation, the analysis encompasses four categories of legal and policy instruments that reflect Turkey's multi-level governance structure. First, National Climate Change Strategies include the National Climate Change Action Plan (2011–2023) and the National Adaptation Strategy and Action Plan (2011–2023). Second, Urban Development Legislation encompasses the Integrated Urban Development Strategy (KENTGES), Metropolitan Municipality Law (No. 5216), and Municipality Law (No. 5393). Third, Environmental Regulations include the Environmental Law (No. 2872), Environmental Impact Assessment Regulation, and sectoral environmental regulations. Finally, Municipal Implementation Cases involve policy documents and strategic plans from Istanbul and Ankara Metropolitan Municipalities, which were selected as representative cases due to their size, governance complexity, and existing nature-based solutions implementation experiences.

The document analysis employs a structured content analysis approach based on the IUCN Global Standard for Nature-based Solutions. Each legislative document is systematically coded according to eight IUCN criteria, with particular attention given to four key analytical dimensions. Policy coherence examines the extent to which different regulatory instruments support the consistent nature-based solutions. Multi-level integration assesses how nature-based solutions principles are embedded across national, regional, and local governance levels. Implementation mechanisms identify the presence of specific tools, incentives, and procedures that facilitate nature-based solutions. Finally, stakeholder engagement provisions evaluate requirements for participatory processes in nature-based solutions planning and implementation.

### 3.3. Analytical Process
The analysis follows a systematic three-stage process that ensures a comprehensive evaluation of policy documents. The first stage involves descriptive coding to identify nature-based solutions-related content within legislative documents. This initial identification provides the foundation for deeper analysis by cataloguing all relevant policy provisions and mechanisms. The second stage employs thematic analysis that groups identified codes into coherent themes aligned with the IUCN nature-based solutions criteria. This thematic organization enables systematic comparison across different policy domains and governance levels.

The final stage involves comparative evaluation that assesses Turkish policy provisions against

international nature-based solutions standards and best practices. This comparative approach enables not only the description of existing policies but also a critical analysis of policy effectiveness and compliance with internationally recognized standards. Through this methodological approach, the study provides a systematic evaluation of how Turkish urban policies either support or constrain nature-based solutions implementation.

## 4. NATURE-BASED SOLUTIONS INSIDE THE TURKISH URBAN LEGISLATIONS

This section provides a systematic analysis of Turkish legislation through the lens of NbS compliance with international standards, moving beyond mere description to critical evaluation. The analysis employs a three-dimensional analytical framework encompassing Environmental Integration, Implementation Mechanisms, and Multi-scale Coordination, derived from the IUCN Global Standard's eight criteria to assess policy coherence, implementation mechanisms, and multi-scale coordination (IUCN, 2020). Each legislative instrument is evaluated against these criteria to determine the extent to which Turkey's legal and policy framework supports effective NbS implementation, revealing significant disconnects between policy intent and practical application that undermine the achievement of internationally recognized NbS objectives (Seddon et al., 2020; Chausson et al., 2020).

### 4.1. Systematic Analysis Framework Application

Following the established analytical framework, the analysis encompasses three primary dimensions essential for effective nature-based urban legislation:

**Environmental Integration Analysis**

Climate Resilience Assessment: The analysis reveals that Turkey's climate change strategies demonstrate strong policy intent regarding climate adaptation through nature-based solutions. The Climate Change Adaptation Strategy and Action Plan 2024–2030 explicitly promotes urban regions to adopt nature-based solutions, recommending green infrastructures resistant to natural disasters and nature-based designs in urban planning. However, the evaluation against IUCN criteria reveals gaps in specific measurable targets and performance indicators for climate resilience outcomes.

Biodiversity Enhancement Evaluation: The Environmental Law (Article 9) mandates the preservation of biological diversity and ecosystem support, while the Regulation on the Protection of Biodiversity and Sustainable Development promotes the preservation of natural ecosystems and sustainable utilization of biodiversity. Yet, the analysis identifies insufficient integration of biodiversity enhancement provisions into urban development legislation, creating implementation gaps at the municipal level.

Ecosystem Services Analysis**:** Turkish legislation shows limited explicit recognition of ecosystem services in urban planning processes. The systematic evaluation reveals that while wetland protection and green space requirements exist, comprehensive ecosystem services valuation mechanisms are absent from the regulatory framework.

### 4.2. Implementation Mechanisms Evaluation

Regulatory Tools Assessment**:** The analysis identifies several regulatory instruments across different governance levels:

Tab. 2. Turkish legislation based on climate change issues. Evaluated against Implementation Mechanisms.

| Legislations | Responsible body | Year | Regulatory tool effectiveness | Enforcement mechanisms |
|---|---|---|---|---|
| Climate Change Mitigation Strategy and Action Plan 2024–2030 | Ministry of Environment, Urbanization and Climate Change | 2024 | Strong sectoral coverage but lacks specific NbS implementation guidelines Limited monitoring and compliance mechanisms identified | Limited monitoring and compliance mechanisms identified |
| Climate Change Adaptation Strategy and Action Plan 2024–2030 | Ministry of Environment, Urbanization and Climate Change | 2024 | Evidence-based principles established but implementation pathways unclear Participatory procedures mentioned but enforcement unclear | Participatory procedures mentioned but enforcement unclear |

| Legislations | Responsible body | Year | Regulatory tool effectiveness | Enforcement mechanisms |
|---|---|---|---|---|
| Integrated Urban Development Strategy and Action Plan KENTGES | Ministry of Environment, and Urbanization | 2010–2023 | Promotes ecological planning but lacks binding requirements Relies on voluntary municipal implementation | Relies on voluntary municipal implementation |

Source:

**Enforcement Mechanisms Analysis**
The systematic evaluation reveals significant weaknesses in monitoring, compliance, and penalty systems. While regulatory frameworks exist, enforcement mechanisms lack clarity and binding obligations, particularly at the municipal implementation level.

**Institutional responsibilities assessment**
The analysis identifies unclear role distribution between the Ministry of Environment, Urbanization, and Climate Change (MUCDC) and municipalities, creating coordination challenges and implementation gaps.

### 4.3. Multi-scale coordination analysis

**National level integration**
The evaluation reveals that national policies provide general framework conditions for nature-based solutions but lack specific integration mechanisms that translate national objectives into actionable local strategies.

**Regional level coordination**
Analysis indicates insufficient planning mechanisms for regional coordination, with limited integration between national frameworks and local implementation requirements.

**Municipal level implementation**
Turkish municipalities demonstrate varying approaches to nature-based solutions:

- Istanbul Metropolitan Municipality's 'Green Corridor' Project (Figure 3)**:** With a green corridor of 6 million 872 thousand 710 $m^2$ and 20 km in length, uninterrupted access will be provided for pedestrians and bicycles. With this project, it is planned to add 5 million 158 thousand 787 $m^2$ of green space to Istanbul. Systematic evaluation reveals this project operates independently of national NbS frameworks, indicating coordination gaps.
- Ankara Metropolitan Municipality's 'Green Belt' Project**:** In this project, which aims to create a large ecosystem, park renovation, and tree planting are carried out, and green areas are brought to the city. 18 million square meters of Green areas were brought to Ankara between 2019–2023. Analysis shows limited alignment with national adaptation strategies and insufficient integration with broader ecosystem services planning (Kagithane Istanbul, 2024; 100. Yılda 100 Proje, 2024).

**Another relative legislative framework**
Besides these laws and regulations, other laws and regulations contain articles related to climate change indirectly. Among these laws, the 'soil Conservation and Land Use Law', 'Cadastre Law', 'National Parks Law', 'Cultural and Natural Heritage Protection Law', 2 Laws on Wetlands and Water Resources', 'Coastal Law', 'Protection Against Flood Water and Inundation Law', 'Building Inspection Law' and 'Law on Transformation of Areas at Disaster Risk' stands out (Climate Change Adaptation Strategy and Action Plan 2024–2030, 15). But because these legislations are based on dichotomies of obligations and interests, their application has been inadequate so far, and there is a need for a more inclusive governing structure.

### 4.4. Comparative assessment against international standards

The comparative evaluation against international nature-based solutions standards reveals that while Turkey has established comprehensive environmental legislation, significant gaps exist in:

- Systematic integration of ecosystem services valuation
- Clear implementation pathways from national to local levels
- Measurable performance indicators for NbS effectiveness
- Coordinated governance mechanisms across administrative scales
- Binding enforcement mechanisms for NbS implementation

Table 3. Turkish legal sources and related articles based on nature-based solutions.

| Legal Source | Related Articles | Content |
|---|---|---|
| Regulation on Making Spatial Plans | Article 21, 15(b), Article 23 (5), Article 24 (3) | The connections between district or neighbourhood centres and the main centre must be provided through the continuity of open and green spaces. Together with the centres, open and green spaces, as well as other areas of technological and social infrastructure, should be planned in an accessible way. In the implementation of reconstruction plans, functions requiring small areas such as children's playgrounds, green areas, and technical infrastructure areas can be separated according to the needs of the region, and the inclusion of these functions does not constitute a violation of the zoning plan. |
| Reconstruction Law | Article 4 | The purpose of this law is to guarantee that the constructions and settlements in these areas are designed to meet the requirements of science, planning, health, and the environment. Floor garden: Garden arrangements on the floors of the building, at least two floors high and at least 3.00 meters wide, connected to at least one exterior facade of the building and belonging to the common area, to ensure that the building is lived in harmony with the green texture. |
| Instruction Concerning to the Preparation and Evaluation of Urban Design Project that Has Been Approved by the Ministry of Environment and Urban Planning | Article 4 (2) | The projects should include sustainable and ecological approaches. |
| Environmental Law | Article 9 | The biological diversity that makes up the natural environment and the ecosystem that supports it must be preserved. The views of local governments, academic institutions, non-governmental organizations, and other pertinent groups are taken into consideration while determining the principles for preserving and utilizing biological diversity. Wetlands' natural structures and biological balance must be preserved. In keeping with the ideas of sustainable development and the environment, this law seeks to protect the environment, which is the shared home of all living creatures. |
| Regulation on the Protection of Biodiversity and Sustainable Development | Article 1 | Within this context, the law promotes the preservation of natural ecosystems, the sustainable utilization of biodiversity, and the incorporation of nature-based solutions in urban architecture. Urban planning should take ecological benefits and biodiversity preservation into account. |
| Environmental Impact Assessment Regulation | Under the all Regulation | This regulation, which evaluates the environmental impact of large projects in urban areas, encourages nature-based design and sustainability. Environmental impacts in project planning must be designed in a way that does not harm natural areas. |
| Municipality Law | Article 14 | The municipality carries out or has built construction, water and sewage, environment and environmental health, cleaning and solid waste, afforestation, parks, and green areas. |
| Metropolitan Municipality Law | Article 7 | In line with the principles of sustainable development and afforestation, the Metropolitan Municipality can take action to guarantee the preservation of the environment, agricultural regions, and water basins. |

Source:

This analytical framework assessment demonstrates that regulatory tools, while typically legally enforceable, remain insufficient where implementation gaps persist, highlighting the need for strengthened governance frameworks that facilitate co-design, execution, and oversight of nature-based solutions initiatives (Longato et al., 2024; Mell et al., 2023).

### 4.5. Study limitations

Several important limitations must be acknowledged when interpreting the study's findings. First, the analysis focuses exclusively on formal policy documents and does not examine actual implementation practices or field outcomes, which may reveal gaps between policy intentions and real-world results. Second, the research is limited to Turkish-language documents, potentially excluding some international cooperation agreements that could provide additional context for understanding Turkey's policy development processes. Third, while the study period from 2010 to 2024 is comprehensive, it may not capture very recent policy developments that occurred after the data collection period concluded.

Despite these limitations, the insights obtained from Turkey's experience provide valuable lessons for other countries confronting similar urbanization challenges and multi-level governance complexities. These observations can inform evidence-based recommendations for incorporating nature-based solutions into urban planning frameworks, ultimately contributing to the development of more resilient and sustainable urban communities globally.

## 5. DISCUSSION

Turkey's nature-based solutions legislative framework represents a significant achievement in environmental governance, demonstrating the evolution from Ottoman-era environmental regulations to contemporary climate adaptation strategies spanning nearly a century of policy development. When evaluated against the analytical framework established in the literature- encompassing environmental integration, implementation mechanisms, and multi-scale coordination — Turkey's approach shows remarkable comprehensiveness. The environmental integration dimension reveals strong provisions for climate resilience through the 2024 Climate Change Adaptation Strategy, biodiversity enhancement through the Environmental Law's ecosystem protection requirements, and ecosystem services recognition through spatial planning regulations mandating green space continuity. The comprehensive multi-tiered structure, encompassing national legislation, ministerial regulations, strategic action plans, and municipal ordinances, provides a robust foundation for NBS implementation that addresses both strategic vision and local adaptation needs, aligning with international best practices observed in New York City's mandatory green infrastructure laws and Barcelona's strategic tree canopy planning. The dual institutional responsibility between the Ministry of Environment, Urbanization, and Climate Change and municipalities creates clear lines of authority while enabling vertical integration crucial for effective NBS deployment, demonstrating the multi-scale coordination essential for successful nature-based urban design solutions. Notable strengths include the constitutional recognition of environmental rights since 1982, the practical integration of NBS principles into spatial planning regulations requiring green space continuity, and successful large-scale municipal implementations such as Istanbul's 6.87 million m² Green Corridor and Ankara's 18 million m² Green Belt projects, which deliver the multi-functionality benefits identified in the literature across environmental, social, economic, cultural, and resilience dimensions. These achievements position Turkey among the leaders in NBS policy development and demonstrate that effective implementation is possible within the current legislative framework when adequate resources and political commitment are available.

However, the analysis reveals a fundamental implementation paradox that undermines the effectiveness of Turkey's otherwise comprehensive legislative architecture, reflecting broader challenges in translating biophilic urbanism principles into practical outcomes. Despite the legal enforceability of regulatory tools and mandatory prescriptions, significant gaps persist between policy formulation and practical application, reflecting what scholars term 'implementation deficit' in environmental governance — a challenge that contrasts sharply with the mandatory enforcement mechanisms successfully employed in cities like New York and Copenhagen's cloudburst management approach.

### 5.1. Critical gaps and implementation challenges

The systematic analysis against the IUCN Global Standard reveals several critical disconnects that compound these implementation challenges:

– Policy Coherence Gaps**:** While multiple regulatory instruments address environmental protection**,** the analysis identifies inconsistent nature-based solutions across different policy domains, undermining coherent implementation. This fragmentation is particularly evident in the tension between rapid urbanization pressures prioritizing econom-

ic development and environmental protection goals, exemplifying broader challenges facing middle-income countries where strong legislative frameworks often fail to translate into meaningful environmental outcomes due to competing interests and insufficient enforcement mechanisms.

- Multi-level Integration Deficits**:** The evaluation reveals weak integration mechanisms between national, regional, and local governance levels, with municipalities implementing NbS projects independently of national frameworks. This governance fragmentation prevents effective cross-sectoral coordination and stakeholder engagement, contradicting the integrated human-environment approach essential for successful nature-based urban planning and undermining the achievement of nature-based solutions' three intervention categories from minimal ecosystem intervention to managed multifunctionality.
- Implementation Mechanism Weaknesses**:** Despite comprehensive regulatory coverage, the analysis identifies insufficient specific tools, incentives, and procedures that facilitate effective nature-based solutions implementation. The study's identification of 'dichotomies of obligations and interests' and the need for 'more inclusive governing structures' highlights critical governance challenges that prevent the translation of policy intent into tangible outcomes.
- Stakeholder Engagement Limitations**:** The systematic evaluation reveals limited requirements for participatory processes in nature-based solutions planning, particularly at the municipal level. This implementation gap becomes particularly problematic when considering the literature's emphasis on the need for dynamic and adaptive infrastructure that can respond to changing climate conditions, as Turkey's current framework struggles to deliver the resilience and adaptability benefits that nature-based solutions are designed to provide.

### 5.2. Comparative assessment against international standards

The comparative evaluation against international nature-based solutions standards reveals that while Turkey has established comprehensive environmental legislation, significant gaps exist in:

- Systematic integration of ecosystem services valuation
- Clear implementation pathways from national to local levels
- Measurable performance indicators for NbS effectiveness
- Coordinated governance mechanisms across administrative scales
- Binding enforcement mechanisms for NbS implementation

This analytical framework assessment demonstrates that regulatory tools, while typically legally enforceable, remain insufficient where implementation gaps persist, highlighting the need for strengthened governance frameworks that facilitate co-design, execution, and oversight of nature-based solutions initiatives (Longato et al., 2024; Mell et al., 2023).

Future success in NBS implementation will require addressing these systemic challenges through enhanced enforcement mechanisms similar to those observed in international best practices, adaptive governance frameworks that can respond to local conditions while maintaining national coherence, capacity building for both national and municipal institutions, and the development of mechanisms for cross-sectoral integration and conflict resolution that can effectively bridge the documented disconnect between environmental protection planning and urban design regulations.

Turkey's experience offers valuable lessons for other countries pursuing similar environmental policies, demonstrating both the potential of comprehensive legislative approaches and the critical importance of bridging the gap between policy intent and implementation outcomes in complex urban environments where the theoretical benefits of nature-based solutions across multiple scales must be translated into tangible improvements in urban resilience, sustainability, and quality of life.

## 6. CONCLUSION

This study's systematic analysis reveals a fundamental paradox in Turkey's nature-based solutions governance: while the country has developed one of the most comprehensive legislative frameworks for environmental protection — spanning from the Ottoman-era Forest Regulation of 1869 to the contemporary 2024 Climate Change Adaptation Strategy — critical implementation deficits prevent the achievement of NbS objectives as defined by international standards. The research demonstrates that legal enforceability alone is insufficient where systemic barriers undermine policy-practice translation.

Turkey's multi-tiered legislative architecture, encompassing constitutional environmental rights, national climate strategies, and successful municipal implementations such as Istanbul's Green Corridor, positions the country as a leader in NbS policy development. The dual institutional responsibility between

the Ministry of Environment, Urbanization, and Climate Change and municipalities creates robust foundations for multi-scale coordination, aligning with international best practices observed in New York City and Barcelona.

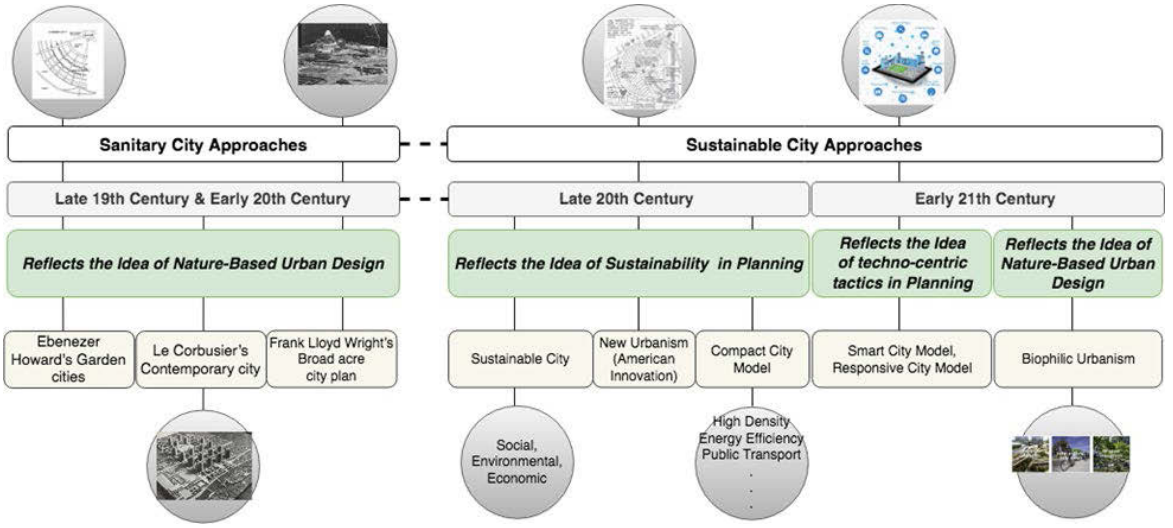
However, the analysis against IUCN Global Standards reveals significant governance fragmentation that prevents effective cross-sectoral coordination and stakeholder engagement. The tension between rapid urbanization pressures and environmental protection goals exemplifies broader challenges facing middle-income countries, where strong legislative frameworks struggle against competing economic interests and insufficient enforcement mechanisms. Critical gaps persist in ecosystem services valuation, clear implementation pathways, measurable performance indicators, and binding enforcement mechanisms.

The study's identification of 'dichotomies of obligations and interests' highlights how policy coherence gaps, multi-level integration deficits, and limited participatory processes systematically undermine the integrated human-environment approach essential for successful nature-based urban planning. Despite comprehensive regulatory coverage, the disconnect between environmental protection planning and urban design regulations results in ad hoc NbS application, contradicting the adaptive infrastructure requirements for climate resilience.

This research contributes to the broader discourse on sustainable urban development by systematically examining how national legislative frameworks can either support or hinder the adoption of nature-based solutions in urban contexts. The findings have significant implications for policymakers, urban planners, and researchers working to create more sustainable and resilient urban environments through innovative approaches that harness natural processes and systems.

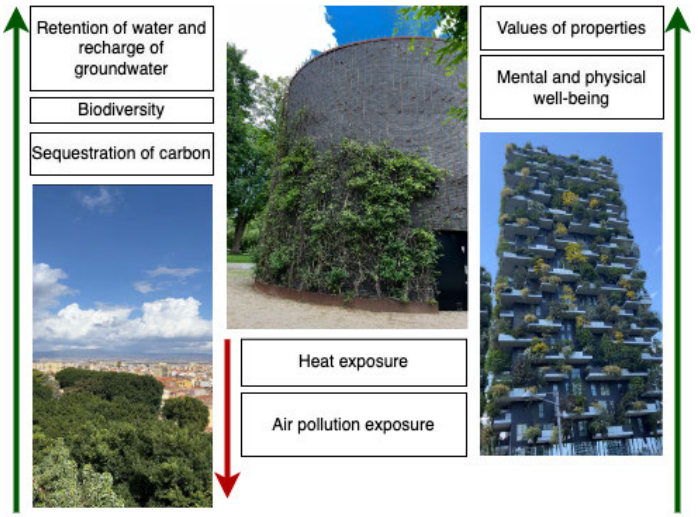
Future success requires addressing these systemic challenges through enhanced enforcement mechanisms, adaptive governance frameworks that respond to local conditions while maintaining national coherence, and capacity building for institutional coordination. Turkey's experience offers valuable lessons for countries pursuing comprehensive environmental policies, demonstrating both the potential of legislative approaches and the critical importance of bridging implementation gaps in complex urban environments.

The theoretical benefits of nature-based solutions across multiple scales must be translated into tangible improvements in urban resilience and sustainability through strengthened governance frameworks that facilitate co-design, execution, and oversight of NbS initiatives. While Turkey's rich biodiversity and varied landscapes provide strong foundations for biophilic urbanism, more inclusive governing structures and effective cross-sectoral integration mechanisms remain essential for achieving meaningful environmental outcomes in the face of accelerating urbanization pressures.




Ill. 1. The gradual influence of nature-based design ideas on urban planning issues. Source: original work.

Il. 1. Stopniowy wpływ koncepcji projektowych opartych na naturze na kwestie planowania urbanistycznego. Źródło: opracowanie własne.




Ill. 2. Among the advantages that cities experience when they invest in urban green spaces. Source: figure adapted by authors based on Bechauf, 2022, photos by authors.

Il. 2. Korzyści, jakie miasta odnoszą inwestując w miejskie tereny zielone. Źródło: rysunek opracowany przez autorów na podstawie Bechauf, 2022, fot. autorzy.

Ill. 3. Green Corridor in Istanbul (Kagithane, Istanbul, 2024).

Il. 3. Zielony Korytarz w Stambule (Kagithane, Stambuł, 2024).

## REFRENCES


Algan, N. (2000), 'Türkiye'de Devlet Politikaları Bağlamında Çevre ve Çevre Korumanın Tarihine Kısa Bir Bakış', *Türkiye Ekonomik ve Toplumsal Tarih Vakfı Yay*, Türkiye'de Çevre ve Çevre Korumanın Tarihi Sempozyumu, 5–8 Nisan 2000, İstanbul, pp. 221–234.

Appleton, J. (1996), *The experience of landscape*, London, New York: John Wiley.

Beatley, T., Newman, P. (2013), 'Biophilic Cities Are Sustainable, Resilient Cities', *Sustainability*, 5, pp. 3328–3345. Available at: https://doi.org/10.3390/su5083328 (accessed: 9.10.2025).

Bechauf, R., (2022), *The Value of Incorporating Nature in Urban Infrastructure Planning*. Available at: https://www.iisd.org/articles/insight/value-incorporating-nature-urban-infrastructure-planning (accessed:

Bush, J., Doyon, A. (2019), 'Building urban resilience with natüre-based solutions: how can urban planning contribute?', *Cities*, 95. Available at: https://doi.org/10.1016/j.cities.2019.102483 (accessed: 9.10.2025).

Cardinali, M. et al. (2021), *Evaluating The Impact Of nature-Based Solutions, A Summary For Policy Makers*, EU Publications Office. Available at: https://doi.org/10.2777/2219 (accessed: 9.10.2025).

Carmona, M. (2021), *Public Places Urban Spaces: The Dimensions of Urban Design*, 3rd ed., New York: Routledge. Available at:https://doi.org/10.4324/9781315158457 (accessed: 9.10.2025).

Çelikyay, H.H. (2021), 'Environmental Policies in Turkey: A Review of Development Plans', *Journal of Economics Business And Political* Researches, 6(15), pp. 185–205. Availablea at: https://doi.org/10.25204/iktisad.839408 (accessed: 9.10.2025).

Chan, E.H.W., Yung, H.K. (2004), 'Is the development control legal framework conducive to a sustainable dense urban development in Hong Kong?', *Habitat International*, 28, pp. 409–426. Available at: https://doi.org/10.1016/S0197-3975(03)00040-7 (accessed: 9.10.2025).

Chausson, A. et al. (2020), 'Mapping the effectiveness of nature-based solutions for climate change adaptation', *Global Change Biology*, 26(11), pp. 6134–6155. Available at: https://doi.org/10.1111/gcb.15310 (accessed: 9.10.2025).

Couret, D.G. (2022), 'Sustainable urban development. Cuban challenges', *International Journal of Urban Sustainable Development*, 14(1), pp. 409–411. Available at: https://doi.org/10.1080/19463138.2022.2059487 (accessed: 9.10.2025).

Crutzen, P., Steffen, W. (2003), 'How Long Have We Been in the Anthropocene Era?', *Climatic Change*, 61, pp. 251–257. Available at: https://doi.org/10.1023/B:CLIM.0000004708.74871.62 (accessed: 9.10.2025).

Climate Change Adoptation Strategy and Action Plan (2024–2030). Available at: https://iklim.gov.tr/db/turkce/icerikler/files/Uyum.pdf (accessed: 9.10.2025).

Davis, J., Uffer, S. (2013), *Governance of resilient urban form-cases from London and New York*, Online Research @Cardiff.

Dorst, H. et al. (2019), 'Urban greening through nature-based solutions – Key characteristics of an emerging concept', *Sustainable Cities and Society*, 49. Available at: https://doi.org/10.1016/j.scs.2019.101620 (accessed: 9.10.2025).

Eid, S., Khalifa, M., Abd El-Rahman, A. (2021), 'Biophilic perceptions in the urban waterfront: analytical study of Nile waterfront in Central Cairo', *HBRC Journal*, 17(1), pp. 19–39. Available at: https://doi.org/10.1080/16874048.2021.1872052 (accessed: 9.10.2025).

European Commission, Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and The Committee of the Regions, *Forging a climate-resilient Europe – the new EU Strategy on Adaptation to Climate Change*. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021DC0082&from=EN (accessed: 9.10.2025).

*Towards an EU Research and Innovation policy agenda for Nature-Based Solutions & Re-Naturing Cities* (2015), EU Publications Office. Available at: https://doi.org/10.2777/765301 (accessed: 9.10.2025).

Frantzeskaki, N. et al. (2019), 'Examining the policy needs for implementing nature-based solutions in cities: Findings from city-wide transdisciplinary experiences in Glasgow (UK), Genk (Belgium) and Poznań (Poland)', *Land Use Policy*, 96. Available at: https://doi.org/10.1016/j.landusepol.2020.104688 (accessed: 9.10.2025).

Ferreira, V. et al. (2020), 'Stakeholders' Engagement on Nature-Based Solutions: A Systematic Literature Review', *Sustainability*, 12(2), pp. 1–27. Available at: https://doi.org/10.3390/su12020640 (accessed: 9.10.2025).

Ignatieva, M. et al. (2023), 'From One to Many Natures: Integrating Divergent Urban Nature Visions to Support Nature-Based Solutions in Australia and Europe', *Sustainability*, 15, 5. Available at: https://doi.org/10.3390/su15054640 (accessed: 9.10.2025).

*Global Standard for Nature-based Solutions. A user-friendly framework for the verification, design and scaling up of NbS* (2020), First edition, IUCN.

*Green corridor* (2024). Available at:https://www.kagithane.istanbul/projeler/detail/Yesil-Koridor/636/7334/0 (accessed: 9.10.2025).

Kabisch, N. et al. (2016), 'Nature-based solutions to climate change mitigation and adaptation in urban areas: Perspectives on indicators, knowledge gaps, barriers, and opportunities for action', *Ecology and Society*, 21(2), 39. Available at: https://doi.org/10.5751/ES-08373-210239 (accessed: 9.10.2025).

Kaplan, R., Kaplan, S. (1989), *The experience of nature: A psychological perspective*, Cambridge: Cambridge University Press.

Kasznar, A.P.P. et al. (2021), 'Multiple Dimensions of Smart Cities' Infrastructure: A Review', *Buildings*, 11(73). Available at: https://doi.org/10.3390/buildings11020073 (accessed: 9.10.2025).

Keleş, R., Hamamcı, C., Çoban, A. (2012), *Çevre Politikası / Environmental Policy*, Ankara: İmge.

Kopperoinen, L. et al. (2015), 'Integrating nature-based solutions in urban planning', *OpenNESS brief no. 03*. Available at: http://issuu.com/ecnc.org/docs/brief03_nbs_xl/1

Kuller, M. et al. (2022), 'Planning support systems for strategic implementation of nature-based solutions in the global south: Current role and future potential in Indonesia', *Cities*,126, pp. 1–11. Available at: https://doi.org/10.1016/j.cities.2022.103693 (accessed: 9.10.2025).

Lee, S., Kim, Y. (2021), 'A framework of biophilic urbanism for improving climate change adaptability in urban environments', *Urban Forestry and Urban Greening*, 61, pp. 1–10. Available at: https://doi.org/10.1016/j.ufug.2021.127104 (accessed: 9.10.2025).

Lafortezza, R. et al. (2018), 'Nature-based solutions for resilient landscapes and cities', *Environmental Research*, 165, pp. 431–441. Available at: https://doi.org/10.1016/j.envres.2017.11.038 (accessed: 9,10,2025).

Longato, D. et al. (2024), 'Identifying suitable policy instruments to promote nature-based solutions in urban plans', *Cities*, 154. Available at: https://doi.org/10.1016/j.cities.2024.105348 (accessed: 9.10.2025).

Mell, L., Clement, S., O'Sullivan F., (2023), 'Mainstreaming Nature-Based Solutions in City Planning: Examining Scale, Focus, and Visibility as Drivers of Intervention Success in Liverpool, UK', *Land*, 12(7). Available at: https://doi.org/10.3390/land12071371 (accessed: 9.10.2025).

BAŞKENTİMİZİN 100. YILINA 100 PROJE (2024). Available at: https://www.mansuryavas.com.tr/wp-content/uploads/100-Proje.pdf (accessed: 9.10.2025).

*Nature-based solutions to address global societal challenges* (2016), Cohen-Shacham, E. et al. (eds.), IUCN.

Nesshöver, C. (2017), 'The science, policy and practice of nature-based solutions: An interdisciplinary perspective', *Science of the Total Environment*, 579, pp. 1215–1227. Available at: https://doi.org/10.1016/j.scitotenv.2016.11.106 (accessed: 10.10.2025).

Pandey, R., Mitra, T., Wadwekar, M. (2021), 'Green Infrastructure as a Tool for Improving Livability of Area Based Development Projects Under Smart City Mission' [in:] *Geospatial Technology and Smart Cities, ICT, Geoscience Modeling, GIS and Remote Sensing*, Sharma, P. (ed.), pp. 447–468.

Radha, Ch.H. (2021), 'Biophilic Design As A New Approach In Urban Sustainability', *Pollack Perodica*, pp. 1–20. Available at: https://doi.org/10.1556/606.2021.00424 (accessed: 10.10.2025).

Raymond, C. M. et al. (2017), *An impact evaluation framework to support planning and evaluation of nature-based solutions projects*, Report prepared by the EKLIPSE Expert Working Group on Nature-based Solutions to Promote Climate Resilience in Urban Areas.

*Revisiting Frank Lloyd Wright's Vision for "Broadacre City"*. Available at: https://franklloydwright.org/revisiting-frank-lloyd-wrights-vision-broadacre-city/ (accessed: 11.10.2025).

Rezafar, A. (2019), *Urban aesthetic control management*, Phd Thesis, Istanbul Technical University.

Russo, A., Escobedo, F.J. (2022), 'From Smart Urban Forests to Edible Cities: New Approaches in Urban Planning and Design', *Urban Planning*, 7(2), pp. 131–134. Available at: https://doi.org/10.17645/up.v7i2.5804 (accessed: 11.10.2025).

Schaller, C. (1999), 'Aesthetic control management in the German planning process', *Urban Design International*, 4(1–2), pp. 39–45.

Scott, M. et al. (2016), 'Nature-based solutions for the contemporary city/Re-naturing the city/Reflections on urban landscapes, ecosystems services and nature-based solutions in cities/Multifunctional green infrastructure and climate change adaptation: brownfield greening as an adaptation strategy for vulnerable communities?/Delivering green infrastructure through planning: insights from practice in Fingal, Ireland/Planning for biophilic cities: from theory to practice', *Planning Theory & Practice*, 17, pp. 267–300. Available at: https://doi.org/10.1080/14649357.2016.1158907 (accessed: 11.10.2025).

Seddon, N. et al. (2020), 'Understanding the Value and Limits of Nature-based Solutions to Climate Change and Other Global Challenges', *Philosophical Transactions of the Royal Society B: Biological Sciences*, 375(1794), 20190120. Available at: https://doi.org/10.1098/rstb.2019.0120 (accessed: 11.10.2025).

Smith, W.S. et al. (2018), 'Urban biodiversity: how the city can do its management?', *Biodiversity International Journal*, 2(3), pp. 246–251. Available at: https://doi.org/10.15406/bij.2018.02.00068 (accessed: ).

Snep, R.P.H. et al. (2020), 'Nature Based Solutions for Urban Resilience: A Distinction Between No-Tech, Low-Tech and High-Tech Solutions', *Frontiers in Environmental Science*, 8, pp. 1–10. Available at: https://doi.org/10.3389/fenvs.2020.599060 (accessed: 11.10.2025).

Steele, W., Ruming, K. (2012), 'Flexibility versus certainty: unsetting the land-use planning shibboleth in Australia', *Planning Practice and Research*, 27(2), pp. 155–176.

Tasan-Kok, T. (2008), 'Changing interpretations of 'flexibility' in the planning literature: from opportunism to creativity?', *International Planning Studies*, 13(3), pp. 183–195.

*ThinkNature Nature-Based Solutions Handbook* (2019), Somarakis, G., Stagakis, S., Chrysoulakis, N. (eds.), ThinkNature project funded by the EU Horizon 2020 research and innovation program under grant agreement, No. 730338. Available at: https://doi.org/10.26225/jerv-w202 (accessed:

*Trees for Life. Master Plan for Barcelona's Trees 2017–2037* (2017). Available at: https://ajuntament.barcelona.cat/ecologiaurbana/sites/default/files/Pla-director-arbrat-barcelona-ENG.pdf (accessed: 11.10.2025).

Treglia, M.L. et al. (2022), 'Examining the distribution of green roofs in New York City through a lens of social, ecological, and technological filters', *Ecology and Society*, 27(3):20. Available at: https://doi.org/10.5751/ES-13303-270320 (accessed: 11.10.2025).

Turkish Statistical Institution, 2021, https://www.tuik.gov.tr/Home/Index (accessed: 11.10.2025).

UNEP (2021), *Smart, Sustainable and Resilient cities: the Power of Nature-based Solutions*. Available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/36586/SSRC.pdf?sequence=1&isAllowed=y (accessed: 11.10.2025).

United Nations (UN) (2018), *68% of the world population projected to live in urban areas by 2050, says UN*. Ava-

ilable at: https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization--prospects.html (accessed: 11.10.2025)

United Nations (UN) (2022), *Goal 11. Make cities inclusive, safe, resilient and sustainable*. Available at: https://www.un.org/sustainabledevelopment/cities/ (accessed: 11.10.2025).

UN Habitat, (2020), *Human Rights, Rule of Law And The New Urban Agenda, Urban Legal Case Studies*. Available at: https://unhabitat.org/sites/default/files/2020/07/human_rights_rule_of_law_and_new_urban_agenda_un-habitat_2020.pdf (accessed: 11.10.20259.

Veerkamp, C. et al. (2021), *Assessment frameworks of nature-based solutions for climate change adaptation and disaster risk reduction*, ETC/CCA Technical Paper, 3, European Environemnt Agency, European Topic Center on Climate Change Impacts, Vulnerability and adaptation.

Wilson, E.O. (1993), 'Biophilia and the conservation ethic' [in:] Kellert, S.R., Wilson, E.O. (eds.), *The biophilia hypothesis*, Island Press, pp. 31–41.

Ziyafati Bafarasat, A. (2023), 'Strategic urban design for sustainable development: A framework for studio and practice', *Sustainable Development*. Available at: https://doi.org/10.1002/sd.2489 (accessed: 11.10.2025).

Urbanutopias, *Le Corbusier: From the Contemporary City to the Radiant City*. Available at: https://urbanutopias.net/2019/06/01/le-corbusier/ (accessed: 11.10.20250.