
ECOLOGICAL APPROACHES IN LANDSCAPE DESIGN AND PLANNING

Fatih Bekiryazici¹

¹Department of Landscape Architecture, Recep Tayyip Erdogan University, Rize, Türkiye.

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ABSTRACT

The process initiated by the phenomenon of rapid urbanization over time has led cities to undergo uncontrolled development and change, becoming areas where resource usage and energy consumption are most intense. As a result, the concept of sustainability has entered our lives. The concept of sustainability, which aims to utilize natural and cultural resources most efficiently, has inevitably made the concept of ecological planning an integral part of urban planning. In the realm of urban landscapes, the necessity of ecology-focused design approaches and practices has become exceedingly important. This study elucidates the importance and necessity of ecological approaches in urban landscape design from the city scale to the architectural scale in landscape architecture. Through literature reviews, the study explains approaches based on ecology and their contributions to the urban ecosystem in these design processes.

Keywords: Landscape Design, Landscape Planning, Ecological Approaches, Landscape Ecology, Sustainability, Sustainable Cities,

1. INTRODUCTION

Human-nature relationships have been in constant flux since the beginning of time, and these changes have been reflected in landscape design and practices throughout history. Initially, humans' cold attitudes towards nature and their efforts to control it led to the prominence of formal styles in garden and environmental designs. Later, with the influence of Romanticism and Naturalism movements, the evolving relationships exhibited a more positive form, resulting in the popularity of natural styles in landscape design and applications. In the 20th century, with rapid urbanization and the onset of numerous negative factors threatening the future of natural areas, human-nature relationships took on a different dimension, giving rise to nature conservation movements. Following a transitional period in landscape design and applications, this new dimension in relationships began to be embraced by the professional sector in Europe and North America. Natural styles, once again, took a forefront role in addressing environmental issues and seeking to revitalize nature within urban areas (Özgüner, 2003). The Industrial Revolution and widespread urbanization in the 19th century led to the disappearance of natural areas from cities and the diminishing presence of nature in daily life. This trend prompted the beginning of conservation movements, advocating for allocating more space for natural areas within cities. In the 20th century, the expansion of urbanization towards rural areas and the industrialization of rural areas through modern agriculture further intensified efforts to bring nature back to cities (Nicholson-Lord, 1987).

Moreover, the population growth brought about by the Industrial Revolution and urbanization, coupled with environmental threats such as global climate change, ozone layer depletion, desertification, and air pollution, increased environmental awareness among people. This heightened consciousness led to the implementation of measures for the conservation of natural landscapes and resources (McKibben, 1990).

Urban ecology is a branch of ecology that focuses on the environment and organisms in the context of settled areas where human settlement and activities dominate. In one sense, urban ecology examines how the environment, significantly altered by humans, affects plant and animal communities. In another sense, it considers urban areas as habitats for all life forms, including humans, and explores interactions between different species, including humans, and their environmental implications (Bekiryazıcı, 2023). Global climate change, the increasing urban population, and the uncontrolled and unplanned growth of urban areas lead to serious threats to the ecosystem presence of cities. In terms of the comfort of urban residents and the sustainability of life forms in urban environments, urban ecology should be one of the most important priorities in urban planning. Blue-green infrastructures in cities provide numerous ecosystem services, including reducing the urban heat island effect, supporting biodiversity, regulating climate, creating noise barriers, providing opportunities for recreational activities and social needs, storing carbon, producing oxygen, regulating air pollution, offering aesthetic value, reducing stress, controlling surface runoff, increasing infiltration, and creating habitat for wildlife (Bekiryazıcı, 2023). For cities to benefit maximally from these services, blue-green infrastructures need to be inclusively integrated into sustainable planning processes. At this point, the collaboration of professional groups such as landscape architects, urban planners, urban designers, ecologists, working collaboratively with architects and civil engineers, is crucial. They should work in partnership with local governments to have a say in urban planning, ensuring the sustainability and ecological integrity of cities.

2. SUSTAINABILITY AND SUSTAINABLE CITIES

The concept of sustainability, one of the most significant concepts of the 20th century, was initially defined by the World Commission on Environment and Development in the Brundtland Report as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs," effectively integrating it with development. In its simplest form, sustainability has become the determinant of the relationships within the triangle of environment, development, and economy (Brundtland, 1987).

Sustainability is a key concept aiming for the uninterrupted continuation of the functions of any societal, economic, or ecological system without depleting or damaging the utilized resources. The unsustainable use of resources and unplanned consumption has not only rendered the environment uninhabitable by filling it with waste but has also brought attention to the concept of sustainability due to the necessity of obtaining raw materials for production (Atıl et al., 2005).

The consideration of the sustainability concept in conjunction with the concept of the city is a relatively new phenomenon. According to the Istanbul Declaration, the outcome document of the 1996 Habitat II City Summit, the 15th article states: "As we enter the 21st century, we encourage a positive vision for sustainable human settlements, a sense of hope for our common future, and the participation in a fully rewarding and attractive challenge where everyone can live in a secure home that promises dignity, health, safety, happiness, and hope." Thus, the importance of settlements and living spaces that make sustainable living possible is emphasized at the Habitat Summit (Karakurt Tosun, 2009). This situation has brought the phenomenon of sustainable urbanization to the agenda, leading to the development of a comprehensive and holistic approach under the labels of "sustainability" and "livable environment." Consequently, the trend towards sustainability has gained increasing importance in contemporary cities (Korkut et al., 2017).

The parallelism between sustainable urban development and sustainable social development is clearly evident in the provided definitions. "Sustainable social development is the ability to make development choices by respecting the relationships among these three 'E'—economy, ecology, and equality."

Economy: Economic activities should serve common interests, be self-renewable, create local wealth, and establish a trust environment.

Ecology: Humans are part of nature; there are limits in nature, and communities are responsible for preserving and creating natural wealth.

Equality: Equality of opportunity in participation in all activities, benefits, and social decision-making processes (MACED, 2001).

When examining the goals of sustainability principles for urban areas, it can be generally said that these goals are based on the following components:

- Reducing Individual Car Usage (or promoting public transportation): Encouraging the use of public transportation over individual vehicles.
- Balancing the Production-Consumption-Waste Chain or Adopting Recycling Models in Energy Systems: Establishing equilibrium in the chain of production, consumption, and waste, or adopting recycling models in energy systems.
- Reducing Ecological Footprints: Decreasing the ecological footprints of urban areas.
- Preserving Natural Habitats: Protecting natural habitats.
- Reducing Urban Violence: Decreasing urban violence.

Ensuring Equal Benefit from Urban Social-Cultural-Economic Infrastructure Opportunities: Ensuring equal utilization of social, economic, and environmental components by the urban population under the principle of social justice (Özcan, 2007).

3. THE ROLE OF LANDSCAPE ARCHITECTURES IN SUSTAINABLE CITIES

The concept of sustainability forms the basis for ecological planning, as in all environmentally sensitive approaches. Debates that began with the concept of preventing environmental pollution in the 1970s continued with discussions on sustainable development. Especially in recent years, ecological approaches and ecologically sensitive planning concepts have found widespread use (Eraydin, 1994).

Uncontrolled population growth, migrations, industrialization, and the parallel development of environmental pollution, which will affect the lives of current and future generations, have prompted experts from various scientific disciplines, politicians, and local administrators to work towards finding solutions to these issues. Among these scientific disciplines, fields such as "Urban Planning," "Architecture," "Landscape Architecture," "Infrastructure

Engineering," "Environmental Engineering," etc., which play crucial roles in shaping cities, have also started working on the international understanding of "Continuous and Sustainable Development" (Tunçer, 1994).

Inevitable aspects of sustainable cities, such as environmental protection, analysis and management of ecosystems and resources, planning of rural and urban spaces, coordination of environmental impact assessment studies, planning and design of recreational areas, cultural areas, urban open spaces, pedestrian zones, highways, industrial and agricultural areas, and land use decisions, fall within the responsibilities of landscape architects (Atıl et al., 2005).

The fundamental goal in sustainable landscape design is to develop a self-sufficient, sustainable system that can be part of the urban ecosystem. In this context, approaches that model nature, providing systematic solutions to the structural and ecological characteristics of the area through natural processes, should be adopted (Korkut et al., 2017).

Landscape design, a sub-scale working area of landscape architecture, is the process of shaping outdoor spaces based on planning decisions. In landscape design, the use of the area is determined according to its needs. The primary goal in landscape design is to create the best spatial composition possible for the working area in the context of sustainability and design principles. The designer's vision, culture, experience, aesthetic understanding, etc., contribute to generating countless solutions in landscape design (Korkut et al., 2010).

When creating spatial compositions in landscape design, priority is given to functionality, bringing appropriate uses to the design purpose of the area, generating social solutions, and ensuring ergonomic and comfortable spaces. Since landscape design is a design process for outdoor spaces, it takes place directly in nature. Therefore, natural conditions directly influence landscape design work (Korkut et al., 2017).

4. ECOLOGICAL DESIGN

The relationship between architectural design and untouched nature has a long history. When addressing the design of the built environment, contemporary approaches that incorporate and prioritize nature in this process have been targeted. The philosophy behind these approaches offers valuable insights into the complex structure of nature and design based on nature. It is crucial to internalize the essence of the concept of ecology to understand the ecological values embedded in each nature-based design approach. Additionally, the concept of an ecosystem as part of natural systems and processes consistently emerges in discussions related to nature-based design (Bayraktaroğlu, 2013).

The theoretical foundation of ecological design can be described as a partnership between humans and nature. Conservation, revitalization, and organization form the most fundamental strategies to establish and maintain this partnership. To bring this partnership to a personal level, the visibility of nature is essential (Van der Ryn and Cowen, 1996; Orr, 2022). Orr (2002) explained the fundamental standards of ecological design by focusing on the health of soil, plants, and animals, including humans in this group. Nevertheless, the primary challenge inherent in ecological design approaches is the anthropocentric perspective that, despite recognizing humans as part of nature, creates a human-centered view regarding the continuity of nature and natural processes. Here, the principle of minimizing human activities on nature can be discussed. Furthermore, these approaches read the continuity not of all living organisms within the ecosystem but rather the parts of the existing ecosystem necessary for human life.

The basic principles related to the ecological design approach, developed from McHarg (1969), are outlined below (Akıanoğlu, 2009; Seçkin et al., 2011):

- Preservation of the existing landscape character,
- Design in accordance with ecological conditions and climatic data,
- Utilization of local resources in design,
- Water-efficient landscaping,
- Xeriscape (drought-tolerant landscaping),
- Energy-efficient landscaping,
- Sustainable agriculture (permaculture),
- Use of renewable energy sources,
- Implementation of green roofs and green walls,
- Creation of alternative green spaces.

The ecological approach necessitates the use of local resources as much as possible in the plant and structural design of an area. This allows for the use of durable materials that easily adapt to the conditions of the area while also incorporating low-cost practices that minimize natural resource consumption in the establishment and maintenance of these areas (Emery, 1986; Cranz and Boland, 2003). Ecological approaches in landscape designs emerged after the concept of sustainable urban development came to the forefront, emphasizing the need for ecological planning of urban spaces to achieve environmentally sensitive urban development.

5. ECOLOGICAL DESIGN APPROACHES IN LANDSCAPE ARCHITECTURE

Kiper et al. (2017) classified ecological design approaches in landscape architecture based on scales from urban to architectural. Some of these approaches include 'Green Belt,' 'Ecological Networks,' 'Green Wedge,' 'Green Corridor,' 'Permaculture,' 'Allotment Gardens and Urban Gardens,' 'Xeriscape (Drought-tolerant landscaping),' 'Green Roof,' and 'Vertical Gardens.'

Green Belt and Ecological Networks: These are crucial in metropolitan areas where urbanization poses a threat to the natural environment. Establishing ecological networks in urban areas helps manage water resources, preserve wildlife habitats, ensure the continuity of existing vegetation, and enhance recreational and aesthetic significance (Tokuş, 2012).

Green Wedge: Green wedges contribute to the ecological development of the city by creating a green fabric depending on the presence of linear natural environments such as rivers and valleys that extend into the city. They narrow down from rural areas towards the city center (Öztürk, 2004).

Green Corridor (Green Road): These are linear corridors along natural features like rivers, ridges, or valleys, transformed into recreational channels, scenic roads or parks, connecting natural reserve areas, cultural objects, or historical settlements to each other and urban areas (Söğüt, 2005). Green roads can reduce habitat fragmentation effects, mitigate negative impacts such as noise and air pollution, and provide alternative corridors that offer visual delight, green scenery, and comfort, contributing to people's mental well-being (Akpınar, 2014).

Permaculture: Involves the conscious design and maintenance of agricultural ecosystems, considering the diversity, stability, and resilience of natural ecosystems (Kiper et al., 2017). Suitable urban areas can be evaluated as application areas for sustainable farming or permaculture, based on the functioning of the natural ecosystem. Additionally, compost produced from organic waste can be used as natural fertilizer, contributing to urban agriculture and social interaction (Korkut et al., 2017).

Allotment Gardens and Urban Gardens: Allotment gardens are small agricultural parcels used by urban dwellers for fruit and vegetable production in their leisure time (Oğuz, 2000). Urban gardens, on the other hand, are ecological production areas created in the city, in at least a 20-25 m² area allocated as a garden or separate space, to meet a significant portion of one family's fruit and vegetable needs (Kiper et al., 2017).

Xeriscape (Drought-Tolerant Landscaping): This approach minimizes water usage, offering ecological and economic benefits such as water and time savings, cost-effectiveness, increased resistance to drought in plants, increased habitat for plants and animals, energy efficiency, low labor requirements, and promotion of the sustainability of natural resources (Korkut et al., 2017b).

Green Roofs: These are environmentally friendly spaces created by adding layers of vegetation and soil over traditional roof systems. Green roofs contribute to ecological aspects by ensuring the continuity of natural life, reducing heating-cooling expenses through insulation, providing sound insulation, capturing rainwater, reducing CO₂ emissions, and supporting biodiversity (Söğüt and Şenol, 2014).

Vertical Gardens: In urban areas, vertical gardens offer numerous contributions, such as the development of wildlife habitat and biological diversity, reduction in carbon dioxide levels through the biological activities of plants, absorption of dust and particles, increase in oxygen levels and air quality improvement, purification of rainwater from pollutants, protection against harmful effects of UV rays and extreme temperature changes, and reduction of the urban heat island effect (Aydın İpekçi and Yüksel, 2012).

6. CONCLUSION

Population growth, and consequently increasing urbanization, have led to a gradual reduction of natural areas, disruption of ecological balances, and the emergence of significant environmental issues associated with artificial living conditions in cities. Designs that prioritize the functional and functional modeling of nature, ensuring harmony with ecological and natural processes, and establishing unity in the built environment are crucial for sustainable cities. In all planning and design efforts, ranging from the largest to the smallest scale, factors such as geological-geomorphological structure, topographic features, climatic conditions, soil and drainage, landscape aesthetics and panoramas, existing vegetation, precipitation levels, groundwater, biodiversity, and the integrity of the built environment should be comprehensively considered. Landscape architects, skilled in interpreting natural resources, bear substantial responsibilities, particularly in establishing the balance between economy and ecology. However, the most significant challenge encountered is the lack of clearly defined boundaries for the tasks assigned in creating sustainable cities, coupled with inadequate support from legal obligations. As a result, effective sharing of responsibilities among professional groups becomes challenging, leading to gaps in achieving the intended goals (Atıl

et al., 2005). Just like in all nature-based design approaches, achieving sustainability in ecological design requires the collaborative efforts of various professional disciplines. To attain this goal, there should be an increase in awareness and the organization of meetings focusing on raising consciousness. Additionally, professional training seminars should be conducted. Furthermore, local governments, non-governmental organizations, and graduates entering the profession need to be informed about the significance and necessity of an ecological approach in urban design.

7. REFERENCES

- [1] Akınoğlu, F. 2009. Geleneksel Yerleşmelerin Sürdürülebilirliği ve Ekolojik Tasarım: Konya- Sille Örneği. Doktora Tezi, Ankara Üniversitesi.
- [2] Akpınar A., 2014. Kullanıcıların kentsel yeşil yolları kullanım sebepleri, algıları ve tercihlerinin Aydın-Koşuyolu örneğinde incelenmesi. Journal of the Faculty of Forestry Istanbul University; 64(2).
- [3] Atıl, A., Gülgün, B., İsmail Yörük, İ., 2005. Sürdürülebilir Kentler ve Peyzaj Mimarlığı. Ege Üniv. Ziraat Fak. Derg., 42(2):215-226.
- [4] Aydın İpekçi C. ve Yüksel E., 2012. Bitkilendirilmiş Yapı Kabuğu Sistemleri, 6. Ulusal Çatı ve Cephe Sempozyumu, Bursa.
- [5] Bayraktaroğlu, Ö., E., 2013. Mimarlıkta Ekosistem Düşüncesiyle Tasarlamak İstanbul Teknik Üniversitesi ,Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi.
- [6] Bekiryazıcı, F. 2023. Kentsel Peyzaj Altyapısının Geliştirilmesinde En Uygun Yağmur Suyu Yönetimi Stratejisinin Çok Kriterli Karar Verme Yöntemleri İle Belirlenmesi ‘Rize Örneği’, Karadeniz Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Doktora Tezi
- [7] Brundtland, G. 1987. Ortak Geleceğimiz Dünya Çevre ve Kalkınma Komisyonu, Raporu, Türkiye Çevre Sorunları Vakfı, Ankara.
- [8] Cranz, G. ve Boland, M. 2003. The Ecological Park As An Emerging Type, Places-Massachusetts, 15(3), pp 44-47, Design History Foundation, USA.
- [9] Emery, M., 1986. Promoting Nature in Cities and Towns :A Practical Guide. Croom Helm, London.
- [10] Eraydın, A 1994. Değişen Planlama Kurumları Çerçevesinde Ekolojik Yaklaşım, 5. Kentsel Tasarım ve uygulamaları Sempozyumu Bildirileri, Mimar Sinan Üniversitesi Yayınları, İstanbul.
- [11] Howett, C. 1998. Ecological values in Twentieth-Century landscape design: a story and hermeneutics. Landscape Journal, 1998, Special Issue: 80-98.
- [12] Karakurt Tosun, E. 2009. Paradoks, Ekonomi, Sosyoloji ve Politika Dergisi, (e-dergi), ISSN 1305-7979, Yıl:5 Sayı:2.
- [13] Kiper, T., Korkut, A., Üstün Topal, T., 2017. Kentsel Alanlarda Ekolojik Bahçe Tasarım Anlayışları. 5th International Symposium on Innovative Technologies in Engineering and Science 29-30September. (ISITES2017Baku - Azerbaijan)
- [14] Korkut A., Kiper T., Üstün Topal T., Gültürk P., 2017(b). Kentsel Tasarımda Kurakçıl Peyzajın Yeri ve Önemi. 2. Uluslararası Felsefe, Eğitim Sanat ve Bilim Tarihi Sempozyumu ve Sergisi, Muğla.
- [15] Korkut A., Şişman, E., Özyavuz, M. 2010. Peyzaj Mimarlığı, 419 s., Verda Yayıncılık ISBN 978-605-88381-0-9.
- [16] Korkut A., Kiper T., Üstün Topal T., (2017).Kentsel Peyzaj Tasarımda Ekolojik Yaklaşımlar. Vol. 5, No.1, 14-26.
- [17] Linehan J., Gross M., Finn J., 1995. Greenway planning: developing a landscape ecological network approach. Landscape and Urban Planning; 33:179-193.
- [18] MACED, 2001.Mountain Association for Community Economic Development; Hart Environmental Data, The regional Environmental Centre www.rec.org
- [19] Manning, O. 1982. Design for man and nature. Landscape. Design, 140: 30-32.
- [20] McKibben, B. 1990. The End of Nature. Penguin Books, London.
- [21] Nicholson-Lord, D. 1987. The Greening of the Cities. Routledge & Kegan Paul,London.
- [22] Oğuz D., 2000. Hobi bahçeleri ve Avrupa ülkelerinden örnekler. Ekin Dergisi; 14: 93- 97.
- [23] Orr, D. W. (2002). The nature of design: Ecology, culture, and human intention. Oxford University Press, New York, NY.
- [24] Özcan, A. 2007.Ekolojik Temele Dayalı Sürdürülebilir Kentsel Gelişme: Malatya Kent Örneği Üzerinden Bir Değerlendirme, 38. ICANAS (Uluslararası Asya ve Kuzey Afrika Çalışmaları Kongresi, 10-15 Eylül 2007) Bildiriler, Ankara: Atatürk Kültür, Dil ve Tarih Yüksek Kurumu.
- [25] Özgüner, H., 2003. İnsan – Doğa İlişkilerinin Gelişimi Ve Peyzajtasarımında ‘Doğal’

- [26] Stilin 20. Yüzyılda Önemkazanmasının Nedenleri. Süleyman Demirel Üniversitesi Orman Fakültesi Dergisi Seri: A, Sayı: 1. 43-54.
- [27] Öztürk B., 2004. Kentsel Açık Ve Yeşil Alan Sistemi Oluşturulması: Kayseri Kent Bütünü Örneği. Ankara Üniversitesi Fen Bilimleri Enstitüsü Peyzaj Mimarlığı Anabilim Dalı Doktora Tezi.
- [28] Seçkin, N.P., Seçkin, Y.Ç. ve Seçkin, Ö.B. 2011. Sürdürülebilir Peyzaj Tasarımı ve Uygulama İlkeleri(1. Basım), İstanbul: Literatür Yayınları: 621, 223 s., İstanbul.
- [29] Söğüt Z., 2005. Kentiçi Yeşil Yollar ve Adana Örneği, Akdeniz Üniversitesi Ziraat Fakültesi Dergisi; 18(1).
- [30] Söğüt Z. Ve Şenol D., 2014. Kentsel Çevre Kapsamında Yeşil Çatı ve Cephelerin Değerlendirilmesi. ISEM Uluslararası Çevre ve Ahlak Sempozyumu, Adıyaman.
- [31] Tokuş M., 2012. Kentsel Yeşil Ağlar: İstanbul Sarıyer Örneği. İstanbul Teknik Üniversitesi Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi. İstanbul.
- [32] Tunçer, M. 1994. Şehir Merkezler Planlamasına Ekolojik Yaklaşım 5. Kentsel Tasarım ve Uygulamalar Sempozyumu Bildirileri, Mimar Sinan Üniversitesi Yayınları, İstanbul
- [33] Van der Ryn, S., and Cowen, S. (1996). Ecological design. Island Press, Washington, DC.
- [34] Yazar, K.H. 2006. Sürdürülebilir Kentsel Gelişme Çerçevesinde Orta Ölçekli Kentlere Dönük Kent Planlama Önerisi.Doktora Tezi. A.Ü.Sosyal Bilimler Enstitüsü, Ankara.