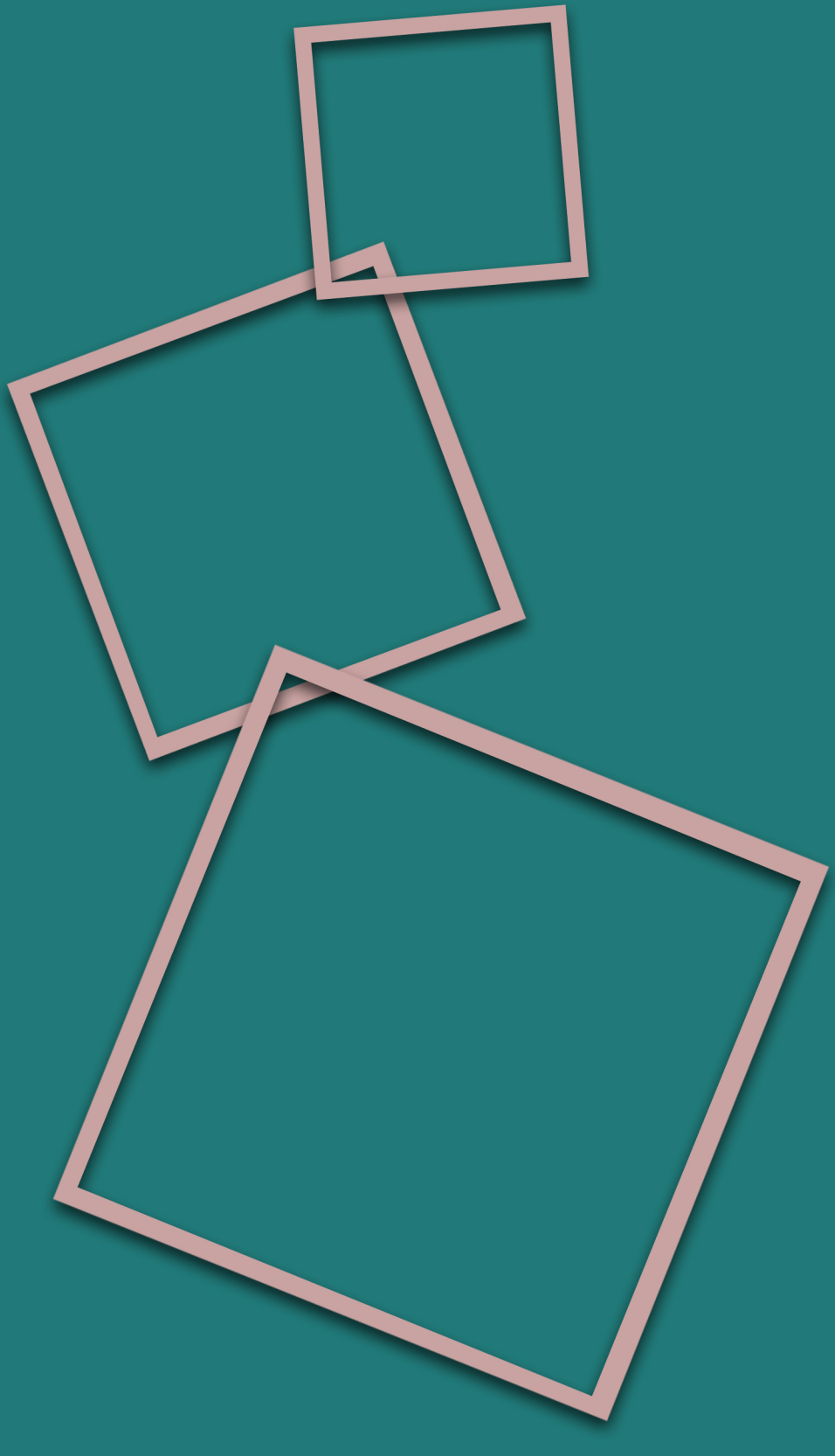
JOLARP

Journal of Landscape Research and Practices

Peyzaj Araştırmaları ve Uygulamaları Dergisi

e-ISSN: 2687 - 2366

Year / Yıl: 2025
Volume / Cilt: 7
Issue / Sayı: 1



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Published by the Turkish Association for Landscape Architecture Education and Science

JOURNAL OF LANDSCAPE RESEARCH AND PRACTICES Volume:7, No:1
Peyzaj Araştırmaları ve Uygulamaları Dergisi

Owner : Turkish Association for Landscape Architecture Education and Science (PEMDER).
Editor in Chief :Prof.Dr.Tahsin YILMAZ

Editorial Office
Akdeniz University, Faculty of Architecture, Department of Landscape Architecture-Antalya/Türkiye

This journal is published semi annually

Instructions to Authors" and "Abstracts" can be found at https://dergipark.org.tr/en/pub/paud

JOURNAL OF LANDSCAPE RESEARCH AND PRACTICES 7/1 (2025)
Peyzaj Araştırmaları ve Uygulamaları Dergisi

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E-ISSN: *2687-2366*

Research article

DOI: 10.56629/paud.1656672

OUTDOOR FURNITURE DESIGN WITH AN ECOLOGICAL APPROACH TO IMPROVE AIR QUALITY

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Abstract

As the significance of environmental sustainability continues to grow, outdoor furniture designs are now focusing not only on aesthetics, functionality, and ergonomics but also on ecological compatibility. The primary objective of this study is to evaluate the impact of plant-integrated furniture designs on CO_2, CO, $PM_{2.5}$, and PM_{10} emissions while also assessing the particulate matter (PM) retention capacity of the materials used. Additionally, the effects of furniture shape and material selection on environmental sustainability are scientifically analyzed. By comparing the findings of different furniture samples, the most environmentally sustainable design combinations for outdoor furniture have been proposed. This study aims to provide a scientific foundation for sustainable furniture design and the reduction of environmental impacts, offering valuable insights for designs that achieve both aesthetic and environmental benefits. The findings reveal the potential of plants in absorbing PM_{10}, $PM_{2.5}$, CO, and CO_2 while improving air quality. Plant-integrated furniture designs have demonstrated significantly greater absorption of harmful emissions compared to non-plant designs, thereby contributing positively to air quality. Furthermore, the use of natural stone and wood materials in furniture has shown notable differences in particulate matter retention capacity.

Keywords: Outdoor furniture design, eco-furniture design, air quality & furniture

HAVA KALİTESİNİ İYİLEŞTİRMEK İÇİN EKOLOJİK YAKLAŞIMLA DIŞ MEKAN MOBİLYA TASARIMI

Özet

Çevresel sürdürülebilirliğin önemi arttıkça, dış mekan mobilya tasarımları estetik, fonksiyonellik ve ergonominin yanı sıra ekolojik uyumluluğa da odaklanmaktadır. Çalışmanın temel hedefi, bitki entegreli mobilya tasarımlarının CO_2, CO, $PM_{2.5}$, PM_{10} emisyon salınımını ve aynı zamanda kullanılan malzemelerin partikül madde (PM) tutma kapasitesini değerlendirmektir. Ayrıca, mobilya biçimi ve kullanılan malzeme seçiminin çevresel sürdürülebilirlik üzerindeki etkileri bilimsel verilerle analiz edilmiştir. Mobilyalardan elde edilen sonuçlar karşılaştırılmış, açık alan mobilyaları için çevresel sürdürülebilirlik açısından en uygun tasarım kombinasyonları önerilmiştir. Bu çalışma, sürdürülebilir mobilya tasarımı ve çevresel etkilerin azaltılması konusunda bilimsel bir temel oluşturarak, hem estetik hem de çevresel fayda sağlayan tasarımlar için önemli bir kaynak sunmayı hedeflemektedir. Çalışma bulguları, bitkilerin PM_{10}, $PM_{2.5}$, CO ve *CO_2 emilimi ve hava kalitesini iyileştirme potansiyelini ortaya koymaktadır. Bitkili mobilya tasarımları, bitkisiz tasarımlara göre belirgin bir şekilde daha fazla zararlı emisyonları absorbe etmiş ve bu sayede hava kalitesine olumlu katkıda bulunmuştur. Ayrıca, mobilyalarda kullanılan doğal taş ve ahşap malzemeler partikül madde tutulumu açısından önemli farklılıklar göstermiştir.*

***Anahtar kelimeler**: Dışmekan mobilya tasarımı, eko-mobilya tasarımı, hava kalitesi ve mobilya*

Received: 12.03.2025 ***Acceptance:*** 24.06.2025 ***Online publication:*** 30.06.2025

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Research article
DOI: 10.56629/paud.1656672

1. Introduction

Designers continue to make new discoveries in furniture design every day. In this process, environmentally friendly materials play a crucial role (Saad, 2016; Yang and Vezzoli, 2024). Today, designers are increasingly interested in new concepts and creative applications. Furniture developed with sustainable design approaches has become an integral part of this process (Elessawy et al., 2024). These approaches not only provide aesthetic benefits but also prioritize ecological factors, adding value to contemporary living spaces. Typical examples of such applications include reducing material usage, preferring recyclable or renewable materials, implementing energy-efficient production processes, and using recycled alternatives instead of raw materials. Additionally, replacing hazardous or toxic materials with environmentally friendly and safe alternatives is a key aspect of this process (Yang and Vezzoli, 2024). Minimizing environmental impact is one of the fundamental objectives of furniture design. Maximizing material efficiency and maintaining both functionality and visual appeal at every stage of a product's life cycle—design, production, use, waste management, and recycling—is an essential part of the sustainability concept (Zhu et al., 2023). Sustainable furniture design is gaining increasing importance and has become the subject of numerous academic studies (Li, Xiong and Qu, 2023). One key concept that emerges in this process is eco-design. Eco-design is an approach that aims to minimize the environmental impact of products throughout their entire life cycle. This approach involves a product development process that focuses on reducing environmental effects at every stage of a product's life cycle (Lindahl and Ekermann, 2013). The eco-design philosophy requires evaluating products not only in terms of aesthetics and functionality but also in terms of environmental sustainability (Bianco et al., 2021).

Today, designers are developing environmentally conscious furniture through sustainable material choices and production processes, offering innovative solutions in terms of both aesthetics and functionality. In this context, eco-design has gone beyond being a temporary trend and has become a fundamental principle shaping the living spaces of the future.

One of the most pressing environmental threats today is air pollution. Furniture design is among the key factors influencing air pollution. A study conducted by Tarín-Carrasco et al. (2019) highlighted that pollution-related deaths in Europe cost approximately 158 billion euros annually, making it one of the most significant environmental challenges. The relationship between consumption and air pollution has become a global issue, prompting various policy proposals worldwide to address the problem. To combat this issue, furniture designers and manufacturers are actively engaged in research and development efforts (Bianco et al., 2021). Indoor air quality is influenced by multiple factors, including the airflow created by furniture arrangement (Tikul et al., 2022). According to the World Health Organization's "Turkey's Future Project Final Report," the annual average temperature in Turkey is projected to rise by 2.5°C to 4°C in the coming years, with an accelerated increase after 2030, leading to a hotter and drier climate (WWF, 2011). Due to these changing environmental conditions, sustainability and ecological compatibility have become critical design requirements in modern furniture design. In previous years, aesthetics, functionality, and ergonomics were the primary considerations, but today, the rapid depletion of natural resources, global efforts to reduce carbon footprints, and increased environmental awareness have made eco-friendly approaches essential in the furniture industry. As a result, sustainable design practices are becoming increasingly widespread, including: The use of recyclable materials in design processes, The adoption of low-energy manufacturing methods,

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DOI: 10.56629/paud.1656672

The development of durable and long-lasting furniture solutions. These sustainable strategies are shaping the future of furniture design, contributing to both environmental protection and enhanced indoor air quality.

This study aims to examine the impact of specially designed outdoor furniture on air quality. The research will evaluate the role of plant-integrated furniture designs in absorbing CO_2, CO, $PM_{2.5}$, and PM_{10} and regulating airflow. The influence of furniture form and material selection will be assessed based on scientific data to analyze the environmental sustainability effects of design decisions. By doing so, the study seeks to establish a scientific foundation for furniture designs that can be utilized in urban open spaces, offering both aesthetic and environmental benefits. The ultimate goal is to demonstrate the potential of such designs in improving urban air quality. Additionally, the PM retention capacities of different materials used in furniture design will be measured to identify which materials are more effective in reducing air pollution. The study's findings will contribute to the development of sustainable urban furniture solutions, promoting healthier and more eco-friendly outdoor spaces.

• Assessing the Impact of Furniture Form: The study will identify how the shape and structure of furniture influence air quality and pollutant dispersion.

• Determining the Absorption Capacity of Plants: The CO, CO_2, $PM_{2.5}$, and PM_{10} absorption capacities of plants will be measured, quantifying the contribution of green-integrated outdoor furniture to air quality improvement.

• Proposing Environmentally Sustainable Design Combinations: By comparing the results, the study will recommend the most effective furniture design configurations for enhancing environmental sustainability in open spaces.

2. Material and Methods

2.1. Study area

Expo 2020 Dubai has been developed within the framework of sustainable design principles and has been selected as the primary study material for this research. Located in the southern part of the Emirate of Dubai, near the Jebel Ali region (25.95° N, 55.14° E), this area provides a collaborative environment based on innovation, cooperation, and sustainable development principles. One of the main reasons for choosing Expo 2020 Dubai is its environmentally friendly buildings, energy-efficient systems, and the use of sustainable materials (Figure 1). The site offers an ecosystem that encourages professionals from various sectors to come together, share knowledge, develop projects, and collaborate on a global scale. In this context, the site's alignment with sustainable design approaches has made it an ideal testing ground for examining the relationship between air quality and furniture design.

Figure 1. Study area (Google Map Pro)

2.2. Methods

In this study, the methodology has been examined in three stages (Figure 3). In the first stage, the selection of furniture in the study area was carried out. During the selection process, attention was paid to ensuring that the furniture differed in terms of design, materials, form, and shape (Figure 2).

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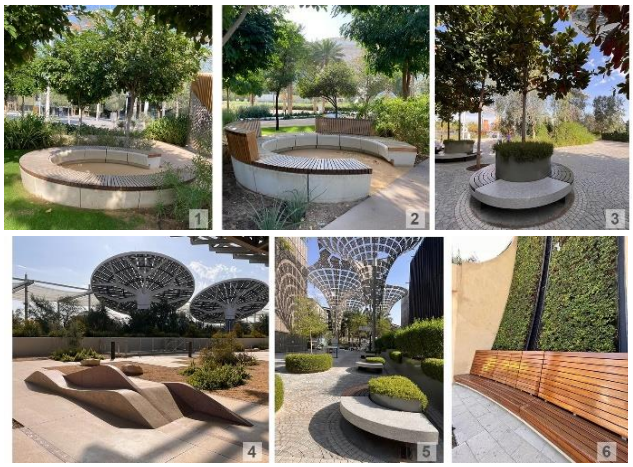

Figure 2. 6 furniture designs selected within the scope of the study

In the second phase of the study, emission measurements were conducted for all furniture over a six-month period. The emissions were measured using a device capable of infrared micro-scale measurements. The device is a handheld manual device capable of detecting emissions on a micro scale. Technically, it can measure and detect all emissions simultaneously.

The measured emissions included CO, CO_2, $PM_{2.5}$, and PM_{10}. Due to the micro-scale nature of the measurements, readings were taken at 1-meter intervals around the furniture. As a result of the measurement analyses, average values were determined.

In the final phase of the study, measurements of the materials used in the furniture were conducted, and the quantity of each material was determined. The numerical data of the materials were compared with the emission measurement results (CO, CO_2, $PM_{2.5}$, PM_{10}). This comparison will allow for a more comprehensive evaluation of the environmental impact of the design and clearly reveal its contribution to air quality.

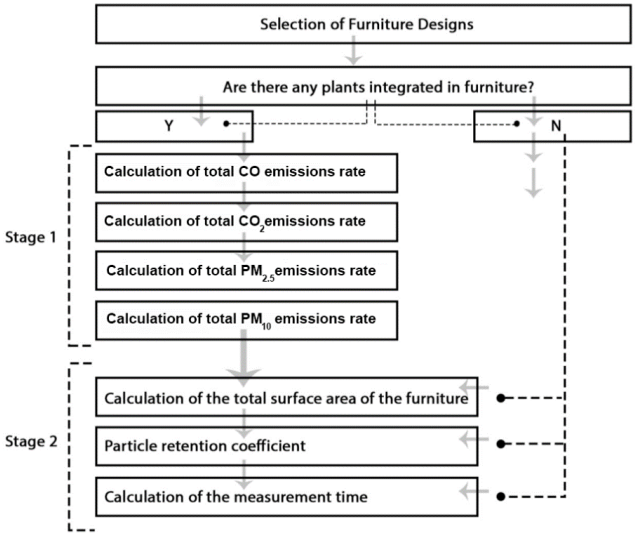

Figure 3. Research diagram

3. Findings

3.1. Making Emission Measurements

For each area where the furniture designs were located, measurement grids of 1 meter by 1 meter were created to ensure the highest level of accuracy and precision. These measurement areas were specifically designated and positioned to collect emission data in the most reliable manner. Each measurement was conducted at these carefully selected points to analyze the emission release effects of the chosen furniture designs in the finest detail, thereby maximizing the accuracy and scientific validity of the obtained data. After conducting measurements from the grid network surrounding the furniture, additional measurements were taken separately from the section where the plant was located. Measurements were conducted separately from all four corners of the plant (Figure 4).

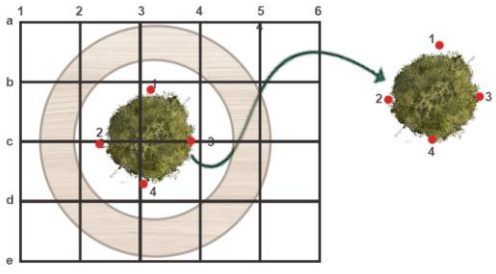

Figure 4. Measurement points created for measurements

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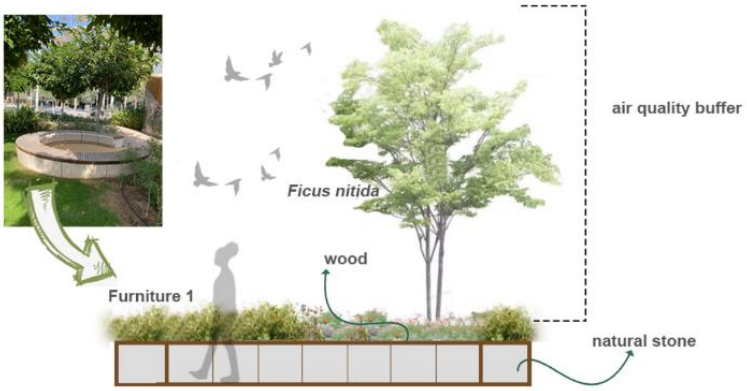
Upon analyzing the obtained measurement data, the average $PM_{2.5}$ level was found to be 97 µg/m³, while the PM_{10} level was measured at 91 µg/m³. Although these levels have the potential to negatively impact environmental health, they can be controlled through measures aimed at improving air quality in the area. Strategies implemented to optimize $PM_{2.5}$ and PM_{10} levels could be a significant step toward enhancing air quality. The levels of CO and CO_2 were measured at 1 mg/m³ and 278.52 ppm, respectively, indicating that the air quality in the area does not pose a major risk to respiratory health. The CO level is quite low, reflecting healthy air conditions, while the CO_2 level can be attributed to environmental factors. Balancing these values suggests that necessary measures can be taken to ensure sustainable air quality. The average Air Quality Index (AQI) value was recorded at 94 µg/m³, indicating that the air quality is within a healthy range and can be further improved through specific regulations. Monitoring AQI levels and optimizing them through environmental regulations presents a valuable opportunity to enhance air quality in the region. These findings provide valuable insights for environmental policies and sustainable urban planning, highlighting the potential for significant steps toward creating healthier living environments (Table 1).

Table 1. Average index findings for furniture design 1

Particulate Matter	
Furniture 1	
$PM_{2.5}$	97.16 µg/m³
PM_{10}	91.74 µg/m³
CO	1 mg/m³
CO_2	278.52 ppm
AQIndex	94.37 µg/m³

Plan



The obtained measurement data indicate that the air quality in the area where this furniture design is located is at a highly favorable level and that the environmental conditions are suitable for healthy living. The $PM_{2.5}$ level was recorded at 84 µg/m³, generally indicating that the air quality is within a healthy range. $PM_{2.5}$ is a critical parameter in air pollution, and at this level, it does not pose any significant risk to respiratory health. The PM_{10} level was measured at 73 µg/m³, further confirming that air quality remains healthy and that the concentration of particulate matter is within acceptable limits. This value suggests that the presence of large airborne particles is low, which positively impacts overall air quality. The CO level was found to be 1 µg/m³, indicating that air pollutants are at minimal levels and that the air quality is excellent. The CO_2 level was measured at 135.21 ppm, which is within normal levels but should be monitored in cases where indoor air renewal is necessary. However, overall, the air quality can be considered to be within a healthy range. Finally, the average AQI was determined to be 75.1 µg/m³, signifying good air quality that does not pose any health risks. This value suggests that the air quality can be continuously maintained and improved through ongoing environmental management measures (Table 2).

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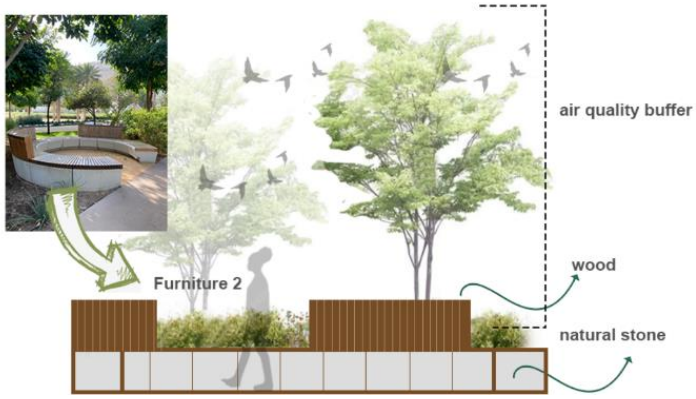
Table 2. Average index findings for furniture design 2

Particulate Matter	
Furniture 2	
$PM_{2.5}$	84.27 µg/m³
PM_{10}	73.37 µg/m³
CO	1 mg/m³
CO_2	135.21 ppm
AQIndex	75.11 µg/m³

Plan

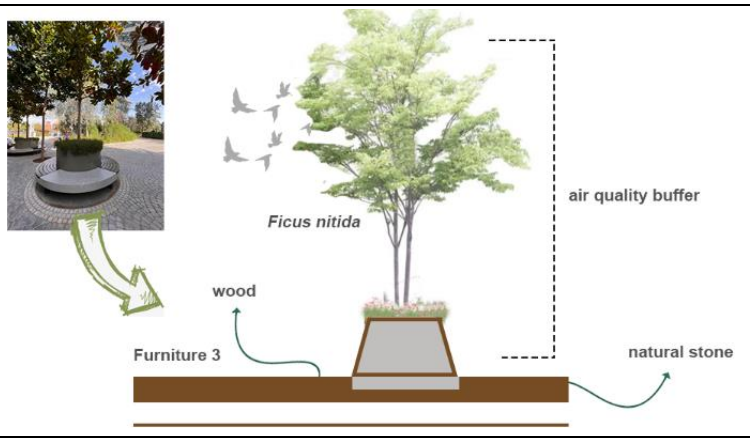


According to the measurement results for the third piece of furniture, the $PM_{2.5}$ level was recorded at 101.14 µg/m³, the PM_{10} level at 96.17 µg/m³, the CO level at 1 µg/m³, and the CO_2 level at 102.14 µg/m³. The $PM_{2.5}$ level of 101.14 µg/m³ indicates a certain concentration of fine particulate matter in the environment. The PM_{10} level was measured at 96.17 µg/m³. In outdoor environments, PM_{10} levels are typically influenced by road dust, construction activities, or natural sources such as pollen and soil particles. The elevated level suggests the presence of such particulate sources in the vicinity. However, in an open workspace, PM_{10} remains suspended in the air for a shorter duration, making the overall result more favorable. The CO level was recorded at 1 µg/m³, which is quite low for an outdoor environment, indicating no significant risk in terms of regional air pollution. The CO_2 level was measured at 102.14 µg/m³, which is relatively low in outdoor conditions and does not pose any negative impact on air quality. Finally, the average AQI was calculated as 99.11 µg/m³ (Table 3).

Table 3. Average index findings for furniture design 3

Particulate Matter	
Furniture 3	
$PM_{2.5}$	101.14 µg/m³
PM_{10}	96.17 µg/m³
CO	1 mg/m³
CO_2	102.14 ppm
AQIndex	99.11 µg/m³

Plan



For the fourth furniture design, the $PM_{2.5}$ level was recorded at 109.74 µg/m³, while the PM_{10} level was measured at 105.74 µg/m³. The CO level was found to be 1 mg/m³, which is within an acceptable range for outdoor conditions and well below the World Health Organization's (WHO) recommended short-term limit of 30 mg/m³. This indicates that combustion-

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related air pollutants in the environment are not significantly high. The CO_2 level was measured at 125.17 ppm, which is a normal level for outdoor air. The typical background concentration of CO_2 in the atmosphere is around 400 ppm, meaning this lower reading could be attributed to factors such as air circulation during the measurement, the effects of plant photosynthesis, or local emission sources. Finally, the average AQI was determined to be 109.54 µg/m³ (Table 4).

Table 4. Average index findings for furniture design 4

Particulate Matter	
Furniture 4	
$PM_{2.5}$	109.74 µg/m³
PM_{10}	105.74µg/m³
CO	1 mg/m³
CO_2	125.17 ppm
AQIndex	109.54 µg/m³

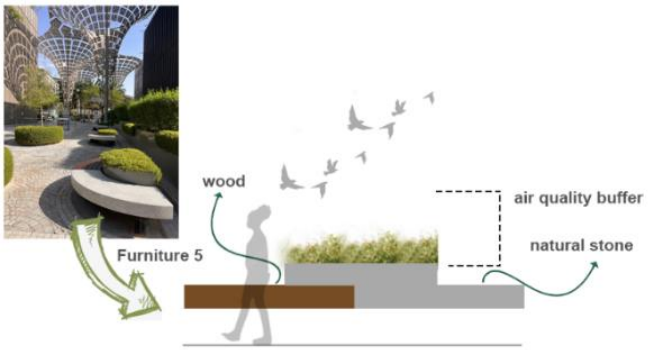
Plan

Upon analyzing the obtained measurement data, the $PM_{2.5}$ level was recorded at 84 µg/m³, while the PM_{10} level was measured at 82 µg/m³. Implementing measures to reduce $PM_{2.5}$ and PM_{10} particle levels plays a crucial role in improving air quality. The CO level was measured at 1 mg/m³, indicating that outdoor air quality remains at a healthy level. Low CO levels suggest that airborne pollutants do not pose a significant threat and that environmental risks are minimal. Additionally, the CO_2 level was recorded at 105.45 ppm, which aligns with the environmental conditions of the area and can be associated with normal air exchange processes. The AQI was measured at 84.11 µg/m³. This value indicates a moderate air quality level that does not pose a significant risk to healthy individuals (Table 5).

Table 5. Average index findings for furniture design 5

Particulate Matter	
Furniture 5	
$PM_{2.5}$	84 µg/m³
PM_{10}	82 µg/m³
CO	1 mg/m³
CO_2	105.45ppm
AQIndex	84.11µg/m³

Plan



According to the obtained measurement data, the $PM_{2.5}$ level was recorded at 76.45 µg/m³, while the PM_{10} level was measured at 78.11 µg/m³. The CO level was found to be 1 mg/m³, indicating a safe and healthy level for outdoor environments. The low CO

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concentration suggests that air pollution is not a concern and that the overall ambient air quality remains stable. The CO_2 level was recorded at 106.74 ppm, which is a common and normal level for outdoor air conditions. Finally, the AQI was measured at 80.47 µg/m³. According to the World Health Organization's (WHO) measurement classification; this value indicates a "moderate" air quality level that does not pose a significant risk, particularly for healthy individuals (Table 6).

Table 6. Average index findings for furniture design 6

Particulate Matter	
Furniture 6	
$PM_{2.5}$	76.45µg/m³
PM_{10}	78.11µg/m³
CO	1 mg/m³
CO_2	106.74ppm
AQIndex	80.47µg/m³
Plan	

3.2. Particulate Matter (PM) Holding Capacity of the Material

The materials used in furniture can influence air quality by either trapping or emitting fine particulate pollutants. The choice of materials in furniture production directly and indirectly affects air quality (Uhde and Salthammer 2007, Wang et al., 2021). Material selection is a crucial factor in terms of environmental emissions, both during the manufacturing process and throughout the product's lifespan. Different urban furniture materials, such as wood, metal, concrete, recycled plastic, and composite materials, have varying impacts on air pollutants. While wood is a natural and sustainable option, its processing can lead to increased emissions. The impact of urban furniture on air quality is also influenced by factors such as surface temperature and airflow. For instance, urban furniture incorporating plant-based materials has the potential to improve air quality. Therefore, material selection plays a significant role in sustainable urban furniture design by contributing to the reduction of air pollution.

In the scope of the study, two different types of materials were used in all selected furniture designs: natural stone and wood. Neither of these materials contains toxic substances such as formaldehyde, lead, radon, PVC, particulates, dust, or fibers (Zorlu and Tıkansak Karadayı, 2020). To determine the impact of material differences and their interaction with plants, calculations were conducted for six different furniture designs. In the first furniture design, the total area of natural stone was 3.5 m², and the measurement duration was completed in 2 hours. Similarly, the total area of the wooden material was 3.5 m², with a total measurement duration of 2 hours (Figure 5).

In the second furniture design, the natural stone surface area is also 3.5 m². Similarly, the wooden part of the furniture has a surface area of 1.75 m². The total measurement duration for all furniture designs was conducted over 2 hours (Figure 6). In the third furniture design, a total of 4.75 m² of natural stone and 2.9 m² of wooden material were used. The measurement duration, as with all other furniture pieces, was recorded as 2 hours (Figure 7). In the fourth furniture design, only wooden materials were used. The wooden material was designed in a total of three sections. The first section consists of 4.55 m²,

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the second section 2.75 m², and the third section 1.95 m² of wood (Figure 8). The fourth furniture design has a circular form. The materials used in the design are natural stone and wood. Within this form, there are 5.48 m² of natural stone and 2.6 m² of wooden material (Figure 9). The final furniture design consists solely of wooden material. Behind it, there is a vertical garden made of plants. It was designed with a total of 6.5 m² of wood (Figure 10).

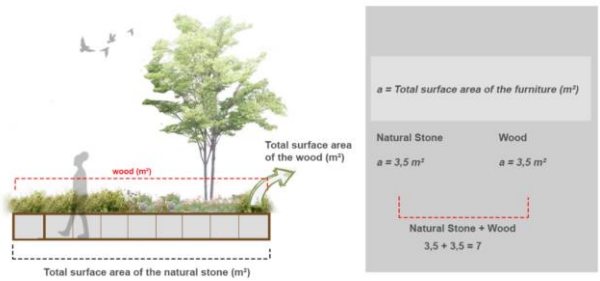

Figure 5. Furniture design 1

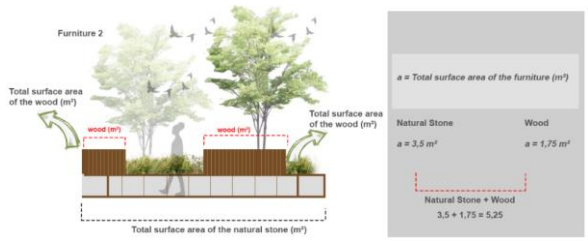

Figure 6. Furniture design 2

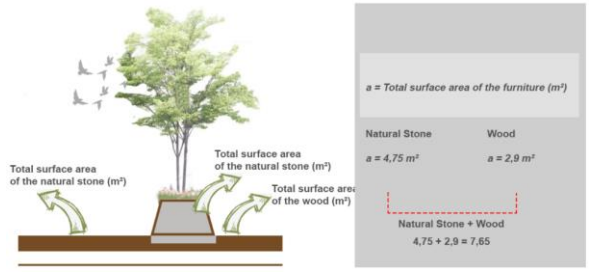

Figure 7. Furniture design 3

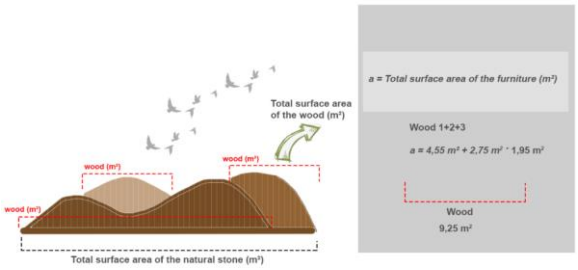

Figure 8. Furniture design 4

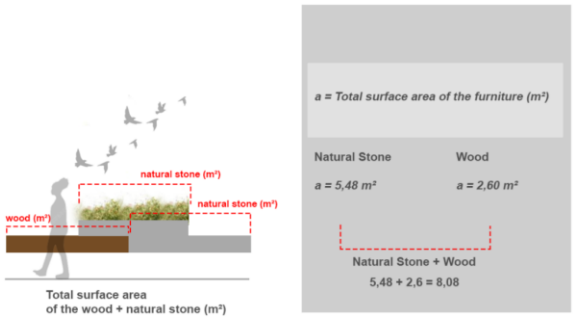

Figure 9. Furniture design 5

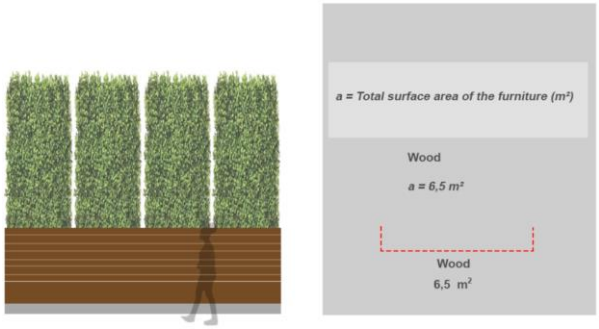

Figure 10. Furniture design 6

4. Conclusion and Discussion

This study investigated the effect of plant-integrated furniture designs on air quality by measuring harmful emissions such as CO, CO_2, $PM_{2.5}$, PM_{10} and by evaluating the relationship between these measurements and the materials used in the furniture. The findings indicate that the study's results provide important data supporting the positive effects of ecological furniture on sustainable urbanization and human health. According to these results;

The lowest $PM_{2.5}$ value was observed in the 6th furniture (76.45 µg/m³), while the highest

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value was recorded in the 4th furniture (109.74 µg/m³). The lowest PM_{10} value was found in the 2nd furniture (73.37 µg/m³), and the highest in the 4th furniture (105.74 µg/m³). The 4th furniture exhibits the worst air quality in terms of both $PM_{2.5}$ and PM_{10}. Regarding CO_2, the lowest level was detected in the 3rd furniture (102.14 ppm), and the highest in the 1st furniture (278.52 ppm). The lowest air pollution index was recorded in the 2nd furniture (75.11 µg/m³), while the highest was in the 4th furniture (109.54 µg/m³). Notably, the 4th furniture does not include any plants, and its air quality is the worst, which may indicate the potential of plants to improve air quality. Although no natural materials were used in the 3rd and 4th furniture, the 3rd furniture still exhibits a relatively lower CO_2 level. Plant usage might improve air quality because the 4th furniture—lacking any plants—shows the poorest air quality. This result is supported by the effect of material differences on air quality as stated in the study of Jung et al. (2024). The use of natural materials might also affect CO_2 emissions. For instance, even though the 3rd furniture does not contain natural materials, it has the lowest CO_2 level, whereas the highest CO_2 emissions occur in the 1st furniture, which incorporates both natural and wooden materials. The 3rd furniture, which has a high proportion of wood, shows the lowest CO_2 level. However, as the amount of wood increases, particulate matter levels ($PM_{2.5}$ and PM_{10}) tend to rise. Particularly, in the 3rd furniture, where 9.25 m² of wood is used, the PM levels are high (Table 7).

Table 7. Emission results and materials used

Variables	Furnitures					
	1.	**2.**	**3.**	**4.**	**5.**	**6.**
$PM_{2.5}$	97.16 µg/m³	84.27 µg/m³	101.14 µg/m³	109.74 µg/m³	84 µg/m³	76.45µg/m³
PM_{10}	91.74 µg/m³	73.37 µg/m³	96.17 µg/m³	105.74µg/m³	82 µg/m³	78.11µg/m³
CO	1 mg/m³	1 mg/m³	1 mg/m³	1 mg/m³	1 mg/m³	1 mg/m³
CO_2	278.52 ppm	135.21 ppm	102.14 ppm	125.17 ppm	105.45ppm	106.74ppm
AQIndex	94.37 µg/m³	75,11 µg/m³	99.11 µg/m³	109.54 µg/m³	84.11µg/m³	80.47µg/m³
Plant	●	●	●	-	●	●
Wood	3.5 m²		4.75 m²	9.25	2.6 m²	6.5 m²
Natural	3.5 m²		2.9 m²	-	5.48 m²	-

Ecological furniture not only offers aesthetic and ergonomic benefits, but also contributes to environmental sustainability. Integrated with natural materials and plants, this furniture harmonises with the urban texture and makes an aesthetic contribution to modern design (Bianco et al., 2021; Fekry Gamal, 2022).

Such furniture improves the quality of life of individuals by improving the air quality in the city (Tikul et al., 2022). Planted furniture increases oxygen production by absorbing carbon dioxide in the air, while at the same time filtering harmful particles, making the air cleaner. Furthermore, the use of certain plants that absorb toxic gases can contribute to the reduction of air pollution in cities. Furthermore, ecological furniture has a strong link with urban identity. The integration of green design approach into urban furniture contributes to the development of an aesthetic in harmony with nature and the development of urban culture. This situation both increases the sensitivity of city dwellers to the environment and supports sustainable urban policies. This study highlights the positive effects of plant furniture designs on air quality and emphasises the need to increase the use of ecological designs in urban areas. Future research can offer more comprehensive solutions for sustainable urban furniture by examining the long-term effects of different plant species and materials on air quality. In addition, these studies can also address the psychological

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and social effects of ecological furniture and strengthen individuals' perception of green spaces in the city.

In addition, it may be possible to monitor the air quality instantly and make appropriate arrangements accordingly thanks to ecological furniture to be integrated with smart sensor systems. For example, air purifying plant systems that are automatically activated by sensors when air quality falls below certain thresholds can be effective in reducing particulate matter, especially $PM_{2.5}$ and PM_{10}. However, such applications are mostly applicable in closed or controlled semi-open areas; their effectiveness may be limited due to environmental variables such as wind in outdoor conditions. Since gases such as CO and CO_2 cannot be removed from the atmosphere instantly and remain in the carbon cycle for a long time, these systems are not applicable for these gases. Thus, while protecting the respiratory health of individuals living in the city, it can also contribute to the reduction of air pollution. In conclusion, the use of plant-integrated furniture should be considered within the scope of sustainable urbanisation policies and should be expanded to improve urban air quality. Such designs not only provide environmental benefits but also add value to the visual identity of cities and create a modern, green urban aesthetic. With the right design and material choices, ecological furniture has the potential to make the urban environment healthier and more livable. Especially when used in dense traffic and industrial areas, such furniture has the effect of reducing air pollution and helps city dwellers to live in a cleaner environment. In this direction, designers and decision makers should take steps for a sustainable future by adopting environmentally friendly approaches. While ecological designs become an important element shaping the cities of the future, urban furniture in harmony with nature will contribute to both individual and social welfare.

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Journal of Landscape Research and Practices (JOLARP), 7(1):13-20
Peyzaj Araştırmaları ve Uygulamaları Dergisi
E-ISSN: *2687-2366*

Research article

DOI: 10.56629/paud.1660584

SMART CITY APPLICATIONS AND THE ROLE OF LANDSCAPE DESIGN IN MASS HOUSING: THE FUTURE OF URBAN LIFE

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Abstract

The rapid technological advancements of the 21st century have significantly transformed urban governance. Smart city frameworks have introduced innovative solutions in urban planning, mobility, energy management, and sustainability. Beyond technological infrastructure, smart cities also require ecological integration, inclusive design, and sustainable landscape strategies. This study investigates the role of landscape architecture in smart city applications within the context of mass housing developments. Through a comparative case study analysis of the Schoonschip Project in Amsterdam and the Kepez-Santral Urban Transformation Project in Antalya, the research explores how different ecological and technological strategies contribute to environmental performance, livability, and social cohesion. The findings reveal that landscape design plays a central role in the success of smart city initiatives by facilitating rainwater management, climate regulation, and inclusive public space creation. While Schoonschip exemplifies micro-scale, water-based smart systems, Kepez-Santral demonstrates the macro-scale integration of green infrastructure in rapidly urbanizing regions. The study concludes that hybrid approaches combining circular resource management with large-scale ecological planning are essential for the future of mass housing in Türkiye.

Keywords: Smart cities, Smart urban planning, Mass housing, Sustainable landscape design, Green infrastructure

AKILLI ŞEHİR UYGULAMALARI VE TOPLU KONUTLARDA PEYZAJ TASARIMININ ROLÜ: KENT YAŞAMININ GELECEĞİ

Özet

21. Yüzyılda hızlı teknolojik gelişmeler, kentsel yönetim biçimlerini önemli ölçüde dönüştürmüştür. Akıllı şehir çerçeveleri; kentsel planlama, ulaşım, enerji yönetimi ve sürdürülebilirlik alanlarında yenilikçi çözümler sunmaktadır. Ancak akıllı şehirler yalnızca teknolojik altyapıyla sınırlı kalmamalı; ekolojik bütünlük, kapsayıcı tasarım ve sürdürülebilir peyzaj stratejilerini de içermelidir. Bu çalışma, toplu konut gelişmeleri bağlamında akıllı şehir uygulamalarında peyzaj mimarlığının rolünü araştırmaktadır. Amsterdam'daki Schoonschip Projesi ile Antalya'daki Kepez-Santral Kentsel Dönüşüm Projesi'nin karşılaştırmalı vaka çalışması yoluyla analiz edildiği araştırmada, farklı ekolojik ve teknolojik stratejilerin çevresel performans, yaşanabilirlik ve toplumsal bütünleşmeye katkısı ele alınmıştır. Bulgular, yağmur suyu yönetimi, iklim düzenlemesi ve kapsayıcı kamusal alanların oluşturulması gibi unsurlarda peyzaj tasarımının akıllı şehir projelerinin başarısında merkezi bir rol oynadığını ortaya koymaktadır. Schoonschip mikro ölçekte, su temelli akıllı sistemleriyle öne çıkarken; Kepez-Santral, hızla kentleşen bölgelerde yeşil altyapının makro düzeyde entegrasyonuna örnek teşkil etmektedir. Çalışma, Türkiye'deki geleceğin toplu konut projeleri için döngüsel kaynak yönetimiyle büyük ölçekli ekolojik planlamayı birleştiren hibrit yaklaşımların gerekliliğini vurgulamaktadır.

Anahtar sözcükler: *Akıllı kentler, Akıllı kentsel planlama, Toplu konut, Sürdürülebilir Peyzaj tasarımı, Yeşil altyapı*

Received: 18.03.2025 ***Acceptance:*** 27.06.2025 ***Online publication:*** 30.06.2025

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DOI: 10.56629/paud.1660584

1. Introduction

The increase in population has led to the rapid growth and development of today's cities. At this stage, with the increase in resource use, new, contemporary cities emerge using technological innovations to ensure environmental sustainability. The concept of a smart city arises from this; data analytics, the Internet of Things (IoT), Web3, artificial intelligence (AI), 5G communication technologies, and smart infrastructures are restructuring the city administration by increasing sustainability and general livability. These projects now require not only the provision of adequate housing infrastructure but also the creation of supportive social and ecological environments.

In these transformations, the role of landscape architecture increases even more, and it further increases ecological resilience with the environmental impacts of sustainable, well-designed green infrastructure beyond aesthetics in landscape designs within the scope of the city. Although urban designs are concepts that include spatial designs, each has its own components, emotions and aesthetics (Uzunali and Acar, 2023).

The ability of the urban landscape to adapt to the changing human culture is extremely important for its continuity (Zeybek, 2019). A smart city is an urban area that leverages information and communication technology (ICT) to improve the quality of life of its residents while promoting sustainability and efficient resource use. This concept encompasses innovative activities aimed at improving urban infrastructure, public services, and environmental sustainability through the integration of advanced technologies, especially artificial intelligence (AI) (Waheeb and Wheib, 2025; Suryawanshi et al., 2025; Ruíz-Vanoye et al., 2024).

The integration of smart city concepts with green infrastructure, especially blue-green infrastructure (BGI), is crucial for sustainable urban development. BGI improves the livability of cities by helping to reduce excess heat generated by urban flooding and construction (Pradyumna and Hegde, 2024). It combines water management and vegetation to increase urban resilience and biodiversity, while smart technologies, including machine learning, optimize these systems for better decision-making and resource management. This integration not only addresses environmental challenges but also aims to optimize the conditions of urban life.

Web 3.0 and artificial intelligence (AI) are important technologies that work integrated into the smart urbanization process. Web 3.0 technology provides data security while providing a centralized internet infrastructure. Artificial intelligence technology, on the contrary, connects them to a system for big data analysis and automated decision-making, which can raise concerns about data security. With Web 3.0, the Internet of Things has become possible. The Internet of Things (IoT) is an ecosystem of technologies that enables physical devices to collect and share data by connecting to the internet. IoT sensors in smart cities have a wide range of uses, from smart lighting that increases energy efficiency to sensor-supported systems that reduce traffic density. Management systems can be developed by combining the data obtained. For this, data must be processed, analyzed, and interpreted. Artificial neural networks (ANN) are the most important technologies in the field of data management of smart cities. With big data analysis and machine learning, it analyzes the behavior of users and produces solutions to adapt to environmental conditions, and these systems are used for solutions in many areas such as energy consumption optimizations and environmental analysis. (Chen and Xiao, 2024).

In this context, the purpose of the study and the research questions determined according to the relevant literature are given below:

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1. What role do smart city applications play in mass housing projects?
2. How do green infrastructure and sustainable landscape design make a difference in smart city applications?
3. How do the landscape design strategies implemented in these projects affect the quality of urban life?
4. What innovative approaches can be adopted for landscape design in mass housing projects in Türkiye?

2. Material and Methods

2.1. Material

The material of the research consists of two selected mass housing projects, the Schoonschip Project in Amsterdam, the Netherlands, and the Kepez-Santral Urban Transformation Project in Antalya, Türkiye. These projects were selected because they are related to smart city strategies and sustainable landscape design. Project websites and peer-reviewed academic publications related to both projects were used as primary information sources in the study. To examine how smart city applications are integrated with landscape architecture in mass housing projects and in this context, the landscape design approaches in both projects were evaluated in the context of sustainability applications and smart city technologies.

2.2. Methods

The study adopts a qualitative, comparative case study approach to examine the integration of smart city applications with landscape architecture in mass housing projects. As defined by the Landscape Architecture Foundation (1999), the case study method allows for an in-depth study of implemented projects through contextual analysis and provides insights into the planning, design and implementation processes.

The data collection process was carried out through a review of publicly available sources, including official project websites and peer-reviewed academic publications. The two selected cases Schoonschip in Amsterdam and Kepez-Santral in Antalya are examined within the scope of the established criteria regarding smart city strategies, green infrastructure, ecological resilience, spatial inclusiveness and sustainability-oriented landscape design.

The analysis follows a thematic content analysis framework focusing on three main dimensions:

Technological integration: The extent to which smart systems (e.g. energy management, mobility solutions) are embedded in projects.

Sustainability and ecological performance: The role of landscape design in promoting environmental quality, water management and climate sensitivity.

Social and spatial impact: The contribution of public open spaces and inclusive design to community well-being and urban livability.

Through cross-case comparison, the study identifies recurring patterns, design principles and challenges associated with the implementation of smart urban strategies in landscape-based public housing projects. This methodological approach supports a critical understanding of how landscape architecture can shape future-proof, resilient urban environments.

These methods were designed in alignment with the main research questions posed in the study. Each analytical dimension, technological integration, ecological performance, and spatial impact corresponds to one or more of the research questions. This structure enables a coherent evaluation of how smart city principles intersect with sustainable landscape design in mass housing projects, particularly within the contexts of the Schoonschip and Kepez-Santral cases.

3. Findings

The Schoonschip Project, one of the mass housing areas designated as the research area, is located on the Johan van Hasselt Canal in the northern region of Amsterdam, the capital of the

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Netherlands. It is one of Amsterdam's pioneering initiatives towards sustainable living solutions on water (Figure 1).

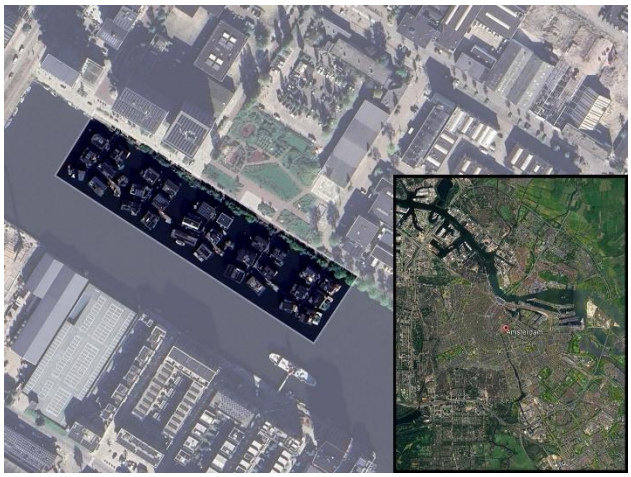

Figure 1. Schoonschip Project location (Google Earth, 2025)

Schoonschip is a public housing project located in the northern area of Amsterdam and consists of sustainable, floating housing. The project emphasizes the use of renewable energy, smart water management, and ecological landscape design. It is particularly notable for its innovative architectural approach, which integrates renewable energy systems, promotes the efficient use of water resources, and supports the creation of ecological habitats, and is also designed to minimize the carbon footprint and offers an environmentally friendly living space as an alternative to dense construction in the city (Chen, 2022) (Figure 2).

Figure 2. Schoonschip Project (schoonschipamsterdam.org, 2020)

Schoonschip is considered an innovative project due to its integration of floating housing units with decentralized renewable energy systems, closed-loop water management strategies, and landscape interventions that reconnect urban form with natural hydrological processes. It consists of a harmonious sequence of water bodies that enhances the spatial character of the landscape by emphasizing the relationship between boezem and polder waters. At the same time, it allows water forms to be integrated into the urban fabric both functionally and aesthetically. The design promotes biodiversity by combining existing ecosystems and paving the way for new nature developments, in line with the principles of a holistic smart city that values both social and ecological processes, as well as encouraging community participation through flexible and open designs, conducive to a variety of uses within the landscape (Bobbink, 2016).

Schoonschip uses solar panels, heat pumps, and smart energy management systems to meet the region's energy needs entirely from renewable sources. In addition, water collection and treatment systems contribute to sustainable water management by ensuring the reuse of rainwater and greywater. The project also plays a key role within the scope of sustainability with green roofs that support biodiversity, materials that do not harm the aquatic ecosystem, and landscape designs in harmony with nature (Malnoury, 2023).

It is in the Mediterranean Region of Türkiye, which is another area examined by the study, in the Kepez district of Antalya province. The area, which includes the Kepez and Santral neighborhoods, is located northwest of the center of Antalya (Figure 3).

Journal of Landscape Research and Practices (JOLARP), 7(1):13-20
Peyzaj Araştırmaları ve Uygulamaları Dergisi
E-ISSN: *2687-2366*

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DOI: 10.56629/paud.1660584

Figure 3. Antalya Kepez-Santral Urban Transformation Project location (Google Earth, 2025)

The Kepez-Santral Urban Transformation Project is one of the largest urban transformation projects in Türkiye and has been designed in accordance with sustainable and smart city principles. At the same time, it aimed to ensure environmental sustainability, improve the quality of urban life, and create modern mass housing areas. Green infrastructure solutions are distinguished from existing constructions with energy-efficient building designs and smart city technologies.

When the transformation project is examined, an area has been created where city residents can live together without breaking away from nature, with large parks, green corridors, and pedestrian-friendly recreation areas. Within the scope of sustainability, the resource use of the region has been brought under control thanks to solar energy panels, smart irrigation systems, and water management applications. In addition, plant selections make significant contributions to sustainability thanks to landscape designs that ensure the preservation of ecological balance and green areas that improve the urban microclimate (Mansuroğlu et al., 2018) (Figure 4).

Figure 4. Antalya Kepez-Power Plant Urban Transformation Project (ankahaber.net, 2024)

3.1. What Role Do Smart City Applications Play in Mass Housing Projects?

Smart city applications increase sustainability and quality of life by combining innovative technologies and problem-oriented solutions in mass housing projects. A sustainable quality of life can be targeted by adapting innovative technologies to cities. The Schoonschip project uses smart city technologies on a small scale with high impact. Solar panels in every household create a circular system by optimizing water and waste management while providing energy efficiency with smart grid systems. In the Kepez-Santral project, it shows large-scale effects with smart technologies. With the sensors in the buildings, it saves water and energy and controls the use of resources. While using technology in a community-oriented and alternating manner, Schoonschip focused on large-scale infrastructure solutions in the Kepez power plant project. Both projects use smart city technologies efficiently at different scales.

3.2. How Do Green Infrastructure and Sustainable Landscape Design Make a Difference in Smart City Applications?

In the Schoonschip project, the system is based on water, and with the green roofs and floating gardens in the buildings, it also supports biodiversity while using rainwater, thus reducing the risk of flooding and flooding, while reducing the heat island effect. While providing efficiency

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in resources with water source heat pumps and wastewater management, it also reduces its carbon footprint to low levels. In the Kepez-Santral project, thanks to the green corridors and large parks in the terrestrial context, it contributes to the ecological balance with the plant selections used while increasing the air quality. It limits water consumption with smart irrigation systems. While Schoonschip aims to increase environmental benefit by integrating green infrastructure with the water ecosystem, it creates green areas with a more traditional approach in the Kepez-Santral project, but the circular approach of the Schoonschip project is more innovative.

3.3. How Do the Landscape Design Strategies Implemented in These Projects Affect the Quality of Urban Life?

Thanks to the green roofs and smart scaffolds that are commonly used in the Schoonschip project, the interaction between residents increases and strengthens harmony with nature. While it provides economic and psychological benefits for residents with food production in roof gardens, it increases thermal comfort and quality of life with well-insulated structures on the water. While the recreation and socialization needs of the population are met with the large-scale green areas, walking paths, and social areas in the Kepez-Santral project, it also reduces air pollution with sustainable, nature-friendly landscape designs and encourages the physical activities of individuals. Schoonschip emphasizes individual well-being while adopting a community-oriented lifestyle, while in the Kepez-Santral project, it focused on designs whose landscape appeals to the crowded population.

3.4. What Innovative Approaches to Landscape Design Can Be Adopted in Mass Housing Projects in Türkiye?

When examined in two projects, innovative approaches can be developed for Türkiye's mass housing projects; the circular water system created by using the gray water used in the Schoonschip project in irrigation and collecting rainwater can be an effective solution to water scarcity in our country. At the same time, rooftop gardens and vertical greening can contribute to food sources while increasing thermal comfort. While the wide green corridors in the Kepez-Santral project can be enriched with local plant species and improve the urban texture, they can serve as a bridge between the city and nature thanks to the correct use of green areas. Efficiency can be increased with smart irrigation and monitoring systems, which are a part of smart cities, as well as the preservation of cultural identity can be ensured by combining traditional Turkish garden style with modern innovative techniques.

4. Conclusion and Discussion

This study sets out to examine how smart city principles are integrated into mass housing developments through sustainable landscape design. By analyzing the Schoonschip Project in Amsterdam and the Kepez-Santral Urban Transformation Project in Antalya, it addressed four central research questions concerning the role of smart technologies, the function of green infrastructure, impacts on urban quality of life, and innovative landscape strategies suitable for Türkiye.

The analysis confirmed that both projects, despite differing in scale and ecological focus (water-based versus land-based), demonstrate how landscape architecture is essential in realizing the core objectives of smart cities, namely sustainability, livability, and ecological resilience. This aligns with recent literature asserting that smart urban development must include nature-based solutions to enhance climate adaptation and social inclusion (Pradyumna and Hegde, 2024; Waheeb and Wheib, 2025).

In terms of the first research question, both projects illustrate that smart city applications play a pivotal role in improving resource efficiency and environmental performance in mass

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housing. Schoonschip's decentralized energy systems and circular water reuse mechanisms exemplify high-impact micro-scale smart technologies (Chen, 2022). Meanwhile, Kepez-Santral demonstrates how macro-scale smart systems such as smart irrigation and building-integrated sensors can address the needs of rapidly urbanizing regions while fostering social equity.

For the second question, the findings support that green infrastructure, when integrated with smart technologies, significantly enhances ecological performance. In Schoonschip, green roofs and floating gardens contribute to flood mitigation, biodiversity, and thermal regulation, while Kepez-Santral's wide green corridors and vegetation strategies mitigate heat island effects and improve air quality. These insights are consistent with Bobbink (2016), who emphasizes the importance of hydrological integration in urban landscapes.

Regarding the third question on urban life quality, the projects indicate that landscape design influences both individual well-being and community cohesion. In Schoonschip, shared open spaces, rooftop gardens, and energy autonomy strengthen social ties and local identity. In contrast, Kepez-Santral enhances accessibility, public health, and recreational opportunities at a larger scale fulfilling the need for inclusivity and livable public space in dense urban environments (Mansuroğlu et al., 2018).

Addressing the fourth question, the study suggests that a hybrid design approach could be highly effective in future Turkish housing projects. Türkiye's climatic diversity and seismic conditions require flexible, context-specific design strategies. Combining Schoonschip's circular ecological systems with Kepez-Santral's broad-scale green infrastructure can yield smart housing models that are both technologically advanced and socially grounded.

However, several challenges must be acknowledged. The implementation of smart systems, including Web 3.0, IoT, and AI, often requires substantial financial resources and robust data infrastructures. These requirements can be prohibitive, particularly for smaller municipalities. Additionally, concerns about data privacy and security remain unresolved, particularly in centralized data architectures (Chen and Xiao, 2024). Ensuring that technological innovation does not compromise user anonymity or civil liberties is a critical future task, especially as digital literacy increases and more citizens engage in participatory urban governance.

In conclusion, the integration of landscape architecture with smart city technologies is not only beneficial but essential for the creation of resilient, inclusive, and sustainable mass housing developments. Future planning efforts in Türkiye should prioritize hybrid models that blend ecological intelligence with digital innovation, thereby positioning landscape architects as strategic actors in smart urban transformation.

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Journal of Landscape Research and Practices (JOLARP), 7(1):21-26
Peyzaj Araştırmaları ve Uygulamaları Dergisi
E-ISSN: *2687-2366*

Research article

DOI: 10.56629/paud.1694327

OBSERVATIONAL RESEARCH BASED ON SOCIAL MESSAGING DATA TOWARDS QUALITY CLASSIFICATION IN LANDSCAPE PLANTS

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Abstract

This study is based on the analysis of 2,077 messages shared within the first four months of 2025 in a large WhatsApp group comprising landscape plant producers and marketers across Türkiye. The participants include stakeholders from various regions, including growers, contractors, and sellers. The aim of this study is to observe how producers present plant quality in digital communication platforms and to extract a data structure that can inform the QPlantScore quality classification system. Plant names, size, pot volume, and quality-related expressions in the messages were coded through content analysis. Repetitive listings and regional information were also examined for representational distribution. The most frequently mentioned species included Leylandii, Cypress, Laurel, and Thuja. Quality descriptors such as "dense form", "first-class", and "premium" appeared frequently, indicating a lack of standard terminology. The findings highlight the need for a standardized classification system and demonstrate the potential of social messaging data for market-oriented horticultural research.

Anahtar sözcükler / Keywords: Landscape plants, Quality classification, QPlantScore, Outdoor Ornamental Plants, Plant Material

PEYZAJ BİTKİLERİNDE KALİTE SINIFLANDIRMASINA YÖNELİK SOSYAL MESAJLAŞMA VERİLERİNE DAYALI GÖZLEMSEL BİR ARAŞTIRMA

Özet

Bu çalışma, Türkiye'deki peyzaj bitkisi üreticileri ve pazarlamacılarının yer aldığı büyük bir WhatsApp grubunda 2025 yılının ilk dört ayında paylaşılan 2077 mesajın analizine dayanmaktadır. Gruptaki katılımcılar Türkiye'nin farklı bölgelerinden üretici, uygulamacı ve satıcılardan oluşmaktadır. Çalışmada amaç, üreticilerin dijital iletişim ortamlarında kaliteyi nasıl sunduğunu gözlemlemek ve bu gözlemlerden elde edilen bulgularla QPlantScore adlı kalite sınıflandırma sistemine altlık oluşturabilecek bir veri yapısı ortaya koymaktır. Mesajlarda yer alan bitki adları, boyut, saksı hacmi ve kaliteye ilişkin ifadeler içerik analizi ile kodlanmış; ayrıca tekrar eden ilanlar ve lokasyon bilgileri üzerinden temsiliyet değerlendirmesi yapılmıştır. En çok paylaşılan türler arasında Leylandi, Selvi, Taflan ve Mazı öne çıkmaktadır. Kalite tanımlarında ise sık formlu, A kalite, 1. sınıf gibi subjektif ifadelerin yoğunluğu dikkat çekicidir. Bulgular, üretici iletişiminde kalite sınıflandırmasının yaygın olmadığını ve standardizasyona duyulan ihtiyacın yüksek olduğunu göstermektedir. Çalışma, sosyal medya verilerinin sektörel analizlerde kullanılabilirliğini göstermesi açısından da önem taşımaktadır.

Keywords / Anahtar sözcükler*: Peyzaj Bitkileri, Kalite Sınıflandırması, QPlantScore, Dışmekan Süs Bitkileri, Bitki Materyali*

Received:12.05.2025 ***Acceptance:*** 26.06.2025 ***Online publication:*** 30.06.2025

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Research article
DOI: 10.56629/paud.1694327

1. Introduction

The landscape plant sector plays a fundamental role in various areas ranging from urban aesthetics and climate regulation to biodiversity enhancement and environmental sustainability. One of the most critical components of this sector is outdoor ornamental plants, which are preferred in both public and private projects depending on their quality characteristics. However, the definition of quality in these plants varies among producers, with criteria such as height, form, health status, and cultivation method expressed in diverse and inconsistent ways.

While several guidelines and classification frameworks adopted by producer associations exist in European countries (BdB, 2022), there is no widely implemented or standardized system in Turkey. This lack of a national quality standard contributes to ambiguity in quality perception in the domestic market and undermines the competitiveness of Turkish products in international trade (TAGEM, 2019).

In many European countries, nursery stock producers are organized under national associations that define technical and quality standards, ensuring consistency in plant production and trade. For example, the Bund deutscher Baumschulen (BdB) in Germany has established comprehensive guidelines that cover parameters such as plant height, root system, age, form, and health status. These standards are widely accepted by German producers and serve as a reference in both domestic and export markets (BdB, 2022). Similarly, the European Nurserystock Association (ENA) published the European Technical and Quality Standards for Nurserystock in 2010, aiming to harmonize quality terminology and classification across Europe. The ENA guidelines provide a shared vocabulary and clear grading criteria that facilitate transparent communication between producers and buyers (ENA, 2010).

In contrast, Turkey currently lacks a nationally adopted or legally binding quality classification system for ornamental plants. Although some producers may informally reference European practices, the absence of an institutional standard leads to inconsistencies and weakens export potential. Therefore, the development of the QPlantScore system draws from these established European frameworks while adapting them to the local context. By aligning its structure with internationally recognized standards and terminology, QPlantScore aims to support transparency, comparability, and traceability in landscape plant trade

In response to this gap, the QPlantScore model has been developed to classify landscape plants based on objective, quantifiable, and comparable criteria. QPlantScore proposes a system in which plants are graded from A to E according to their height, crown diameter, form, density, health status, age, and root or pot characteristics. However, the applicability of such a structure depends on a deeper understanding of current quality presentation practices in the sector (QPlantScore, 2025).

In this context, social messaging platforms—particularly WhatsApp—have become digital marketplaces where producers in Turkey communicate directly, promote their products, and provide pricing. In recent years, social media data have increasingly been used as information sources in agriculture and horticulture, offering a strong foundation for observing producer behavior and market trends (Kara, 2018).

Despite this growing relevance, there has been no concrete research in Turkey that employs social data analysis to observe plant quality classification practices. The present study was thus designed to address this gap.

This research is based on a content analysis of 2,077 messages sent during the first four months of 2025 within a large social messaging group composed of 1,024 producers

Research article
DOI: 10.56629/paud.1694327

from various regions across Turkey. The messages were examined to identify plant names, size and pot volume details, quality expressions, location data, and repeated listings. These insights were then used to reveal existing practices in quality presentation and to propose improvements contributing to the QPlantScore classification model.

2. Material and Methods

2.1. Material

The material for this study consists of a digital dataset derived from 2,077 messages shared between January 1 and April 30, 2025, in a large WhatsApp group composed of 1,024 verified users engaged in landscape plant production from various cities in Turkey. The participants include small-, medium-, and large-scale producers, as well as practitioners and product marketers. The group is not closed to producers only; rather, it functions as an open communication platform aimed at facilitating direct sales and procurement. For this reason, the content of the group can be considered a representative digital reflection of Turkey's landscape plant market.

The dataset comprises written content related to plant production, including plant names, plant sizes, pot volumes, quality descriptors, and self-reported location information provided by users. All data were anonymized and processed without any personally identifiable user information. No images were included in this study; only textual content was analyzed.

2.2. Methods

A qualitative data analysis and descriptive content analysis approach was adopted in this study. WhatsApp chat data were first transferred into Excel format and subsequently coded under six categories: "sender", "plant name", "plant height", "pot volume", "quality-related descriptions", and "location". The coding process was conducted manually by the researcher. When possible, plant names in Turkish were matched with their corresponding Latin genus names. Each message was also analyzed to determine whether it included a plant name, whether species-level detail was provided, and whether duplicate listings for the same plant were made by the same user.

Messages containing location information were filtered, and a city-based frequency analysis was conducted. The frequency of plant names mentioned in the messages was also calculated to provide preliminary insights into production and marketing intensity in the sector. The data obtained were then linked to criteria that could serve as a foundation for the QPlantScore system in presenting plant quality.

As no direct survey or interview methods requiring ethical approval were employed, no ethics committee application was necessary. All data were obtained from a publicly accessible digital group of producers, and only publicly shared content was analyzed.

3. Findings

The dataset analyzed in this study consists of 2,077 textual messages shared between January 1 and April 30, 2025, within a publicly accessible WhatsApp group comprising 1,024 producers, sellers, and practitioners operating across Türkiye. This group functions as an open platform for direct plant sales and producer–consumer communication. All messages included in the study were qualitatively coded using content analysis and systematically classified based on plant name, plant size, pot volume, quality-related descriptors, location information, and repeated listings.

3.1. General Distribution

Out of the total 2,077 messages, 574 (27.6%) contained a direct mention of a plant name. The number of messages specifying plant size was 153 (7.4%), while 242 messages (11.6%) included pot volume information. Only 23 messages (1.1%) contained any form of quality-related expression. Messages providing location data were limited to 97 (4.6%). These

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DOI: 10.56629/paud.1694327

findings reveal that the majority of producers tend to share posts by referencing only the plant name, and that standardized, criterion-based product descriptions are considerably limited.

3.2. Distribution by Species

Among the plant species mentioned in the shared posts, the most frequently encountered ones were × Cupressocyparis leylandii (Leyland cypress), Viburnum tinus (Laurustinus), Prunus laurocerasus (Cherry laurel), Thuja occidentalis (Arborvitae), and Cupressus sempervirens (Italian cypress). These five species account for approximately 40% of all messages containing plant names and represent plant types with a high production volume in the Turkish landscape sector. Functionally, these species are dense, fast-growing, evergreen plants commonly used as hedge elements.

3.3. Visibility of Quality Descriptions

Among the only 23 messages containing quality-related expressions, producers frequently used subjective terms such as "A quality", "first class", "compact form", "single trunk", "dense", and "well-shaped". The most frequently mentioned species in these messages included Viburnum tinus (Laurustinus / Kartopu, 3 messages), Nerium oleander (Oleander / Zakkum, 2), Laurus nobilis (Bay Laurel / Defne, 2), Photinia × fraseri (Red Tip Photinia / Alev çalısı, 2), Grevillea robusta (Silky Oak / Grevilya, 2), and Euonymus japonicus (Japanese Euonymus / Taflan, 2). This finding suggests that the perception of visual quality is emphasized more strongly for species with decorative foliage.

3.4. Container Volume and Pot Size

In species cultivated in dwarf forms—such as Lavender (Lavandula), Lantana (Lantana camara), and Japanese Euonymus (Euonymus japonicus)—producers were more likely to specify pot volume. Although the overall rate of messages mentioning pot volume was 11.6%, this figure increased to around 30% when these specific species were examined. Similarly, in hedge plants such as Leyland cypress (× Cupressocyparis leylandii), Arborvitae (Thuja occidentalis), and Italian cypress (Cupressus sempervirens), it was more common for producers to provide size measurements, often indicating heights such as 30-40 cm, 40-60 cm, 80-100cm, 150-200 cm or minimum 175 cm etc. to emphasize transplant maturity.

3.5. Locations

Among the 97 messages in which location information was explicitly stated, the most frequently mentioned cities were Yalova (25 messages), Bursa (25), Sakarya (16), İzmir (8), Istanbul (7), and Mersin (6). This distribution indicates that outdoor ornamental plant production in Türkiye is geographically concentrated in the Marmara and Aegean regions, and that the participants of the WhatsApp group reflect these production centers. The group content analyzed in this study provides a representative snapshot of the geographical structure of Türkiye’s ornamental plant production sector.

3.6. Repeated Posts

An examination of the dataset revealed that the same users repeatedly posted listings for the same species on different days. These repetitions are likely due to factors such as unsold inventory, low demand, or strategies to increase visibility. The species most frequently associated with repeated posts were typically those with high market competition, such as Leyland cypress (× *Cupressocyparis leylandii*), Arborvitae (*Thuja occidentalis*), and Japanese Euonymus (*Euonymus japonicus*).

4. Conclusion and Discussion

This study presents a content-based evaluation of current quality presentation practices by analyzing the communication behaviors of landscape plant producers in Türkiye through social messaging platforms, particularly WhatsApp. The main findings indicate that quality-related expressions are rarely included in plant sales posts, and that

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DOI: 10.56629/paud.1694327

technical details such as plant size and pot volume are also used to a limited extent. The fact that only 1.1% of the 2,077 analyzed messages contained explicit references to plant quality suggests that systematic classification is not widely practiced within the sector.

The quality terms that are used tend to be highly subjective, relying on qualitative expressions such as “A quality,” “first class,” or “compact form.” This lack of standardization complicates objective quality assessment, limiting comparability in the domestic market and diminishing competitiveness in international trade. In contrast, many European countries have addressed these issues through standardized frameworks developed by producer associations (European Nurserystock Association, 2010).

Inconsistencies in plant nomenclature also emerged as a significant issue. The interchangeable use of multiple Turkish names for the same species, along with frequent errors or omissions in Latin names, presents a barrier to accurate communication across the supply chain. These inconsistencies not only confuse buyers but can also lead to mismatches between project designs and plant deliveries, resulting in inefficiencies and losses.

These findings point to an urgent need for a shared language of plant quality and taxonomy among producers, sellers, and designers. Especially for landscape architects, incorrect species identification during the procurement process can undermine design intent and site performance. Addressing this requires sector-wide efforts in botanical literacy, species identification, and the adoption of standardized quality descriptors.

The analysis also revealed a strong tendency among producers to rely on a narrow set of familiar species, despite Türkiye’s rich native and exotic plant diversity. This limited palette may contribute to monotonous urban landscapes and increase susceptibility to pests and diseases. Promoting species diversity in design and production is essential for long-term ecological resilience and aesthetic quality.

Another noteworthy pattern was the repeated posting of identical listings by the same users. While this likely reflects actual marketing behavior—such as attempts to sell unsold inventory or maintain visibility—it can bias data interpretation, particularly in frequency-based analyses. The overrepresentation of certain species or descriptors should be considered when generalizing findings.

One of the main aims of this study is to inform the development of the QPlantScore quality classification model. By analyzing how producers currently communicate plant features, this research contributes concrete and measurable input to the design of objective criteria. The frequent use of vague descriptors highlights the need for structured terminology and reference tools. Inconsistent and repetitive messaging patterns point to the value of user-friendly reporting formats—such as digital checklists or AI-supported classifiers—that align with actual producer behavior and promote adoption in practice.

This study also fills a gap in the landscape plant and horticultural literature by demonstrating how informal digital communication reflects real-world practices in the absence of regulation. It further shows that social messaging data can be a valuable resource for understanding sectoral dynamics and identifying areas for improvement in standardization and communication.

From a practical standpoint, the study identifies structural challenges—such as subjective terminology, inconsistent naming, and limited species use—that affect all parts of the landscape supply chain. Addressing these issues through shared terminology, training programs, and digital tools will improve procurement efficiency and support overall sector development.

Despite the richness of the dataset and the number of participants, the study has certain

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DOI: 10.56629/paud.1694327

limitations regarding representativeness. The data were collected from a single WhatsApp group, and while the group includes over one thousand users from various cities, most messages originated from the Marmara and Aegean regions. Therefore, the findings may not fully reflect practices in other regions such as Central Anatolia, the Mediterranean, or Eastern Türkiye. Caution should be exercised in generalizing the results, and future research should incorporate additional networks to compare regional patterns and gain broader insights.

In conclusion, this study offers a timely and original contribution to both research and practice in the landscape plant sector. The insights derived from social messaging platforms provide a basis for developing a more structured, standardized, and transparent system of plant quality classification in Türkiye. The refinement and adoption of the QPlantScore system, supported by real-world communication data, have the potential to improve market coordination, enhance international competitiveness, and elevate quality assurance practices across the sector.

Acknowledgements

This study was supported by the TÜBİTAK 2219 International Postdoctoral Research Fellowship Program and was conducted in coordination with the QPlantScore project at Osnabrück University of Applied Sciences in Germany. We extend our sincere thanks to all academics and staff members at the affiliated institutions who supported this work. We also gratefully acknowledge the indirect contributions of all producers and practitioners participating in the analyzed WhatsApp group.

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Journal of Landscape Research and Practices (JOLARP), 7(1):27-35
Peyzaj Araştırmaları ve Uygulamaları Dergisi
E-ISSN: *2687-2366*

Research article

DOI: 10.56629/paud.1699744

THE ROLE of GREEN SPACES in POST-DISASTER RECOVERY: AN EXPLORATORY STUDY AMONG MIGRANT SURVIVORS of the 6 FEBRUARY EARTHQUAKES in EDIRNE, TURKIYE

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Abstract

Post-disaster migration detaches individuals not only from their homes but also from their surrounding environments and the social bonds established within these spaces. In this context, green spaces can provide psychosocially restorative contributions during the post-earthquake migration process through their functions that support social and spatial attachment for displaced survivors in their new living environments. This study aims to explore the potential effects of green space experiences on the psychosocial recovery processes of a group of earthquake survivors who migrated to Edirne following the February 6, 2023 Kahramanmaraş earthquakes. Within the scope of the study, an exploratory exploratory survey was conducted with 22 earthquake survivors residing in Edirne to assess their levels of green space experience, place attachment, and social resilience. 77% percent of the participants reported using parks and green areas as reference points for establishing a connection with place and navigating within the city, while 68% stated that they had access to areas in Edirne where they could experience contact with nature. Furthermore, positive and moderate correlations were identified between green space experience and both place attachment (~0.50) and social resilience (~0.54). These findings suggest that green spaces should be considered not only as spatial or ecological assets but also as potential psychosocial resources.

Keywords: Place attachment, social resilience, aftermath of disaster, earthquake, green spaces

AFET SONRASI GÖÇ EDEN BİREYLERİN İYİLEŞME SÜRECİNDE YEŞİL ALANLARIN İŞLEVİ: EDİRNE'DEKİ 6 ŞUBAT DEPREMZEDELERİNE YÖNELİK ÖNCÜ BİR ÇALIŞMA

Özet

Afet sonrası göç, bireyleri yalnızca konutlarından değil, aynı zamanda yaşadıkları çevreden ve bu çevrede kurdukları sosyal bağlardan da koparmaktadır. Bu bağlamda, yeşil alanlar göç eden afetzedelerin yeni yaşam alanlarında sosyal ve mekânsal bağ kurmalarını destekleyen işlevleriyle, deprem sonrasındaki göç sürecinde psikososyal açıdan onarıcı katkılar sağlayabilir. Bu çalışma, 6 Şubat 2023 Kahramanmaraş depremleri sonrasında Edirne'ye göç eden bir grup depremzedenin yeşil alan deneyimlerinin afet sonrası psikososyal toparlanma süreçlerine olası etkilerini incelemeyi amaçlamaktadır. Çalışma kapsamında, Edirne'de ikamet eden 22 depremzede ile gerçekleştirilen keşif amaçlı öncü bir anket uygulaması aracılığıyla, yeşil alan deneyimi, yere bağlılık ve sosyal dirençlilik düzeyleri değerlendirilmiştir. Katılımcıların %77'si, yeşil alanları yerle ilişki kurma ve şehirde yön bulma açısından bir referans noktası olarak kullandığını belirtmiş; %68'i ise Edirne'de doğayla temas kurabildikleri bir alanın bulunduğunu ifade etmiştir. Ayrıca, yeşil alan deneyimi ile yere bağlılık (~0.50) ve sosyal dirençlilik (~0.54) arasında pozitif yönlü, orta düzeyde ilişkiler tespit edilmiştir. Elde edilen bulgular, yeşil alanların yalnızca mekânsal ya da ekolojik değil, aynı zamanda psikososyal destek unsuru olarak değerlendirilmesi gerektiğine dair önemli ipuçları sunmaktadır

Anahtar sözcükler*: Yer bağlılığı, sosyal direnclilik, afet sonrası, deprem, yeşil alanlar*

Received:15.05.2025 ***Acceptance:*** 30.06.2025 ***Online publication****:* 30.06.2025

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Research article
DOI: 10.56629/paud.1699744

1. Introduction

Disasters are not only events that cause physical destruction but also crises that profoundly disrupt individuals' economic, psychological, and social well-being. Their impacts extend far beyond the moment they occur, often requiring long-term social and spatial restructuring. According to the Internal Displacement Monitoring Centre (IDMC, 2023), over 32 million people worldwide were displaced by disasters in 2022 alone, underscoring the scale of forced migration.

Post-disaster relocation compels individuals to leave familiar environments and rebuild their lives in new and often unfamiliar settings. This process challenges survivors not only to recover and heal but also to adapt socially and spatially. These difficulties highlight the importance of social resilience and place attachment as key components of recovery and integration.

Social resilience refers to a community's capacity to resist, recover, and adapt in the face of disruption. It involves elements such as social support, collective efficacy, and learning from adversity, which enable groups to reorganize and sustain social functions after crises (Maguire and Hagan, 2007; Norris et al., 2008). Place attachment, defined as the emotional and cognitive bonds to one's environment, also plays a critical role in adaptation (Scannell and Gifford, 2010). Although displacement often disrupts these bonds (Fried, 1963), it may sometimes lead to new forms of connection and identification with place (Anton and Lawrence, 2014).

Green spaces have been recognized for supporting psychosocial well-being and adaptation. They help people adapt and cope with crises, provide opportunities for stress relief, social interaction, and a renewed sense of belonging (Albers et al., 2021; Stedman, 2003, Mahmoudi et al., 2022). Studies show that contact with natural environments can restore emotional balance and strengthen social ties, particularly in the aftermath of trauma (Charles-Rodriguez et al., 2023; Tidball et al., 2010).

On February 6, 2023, the Kahramanmaraş earthquakes displaced approximately 3.5 million people across Türkiye. Many survivors settled in cities such as Edirne, which differ significantly from the affected regions in cultural and environmental characteristics. Despite growing research on disasters, green spaces, place attachment, and resilience in Türkiye (e.g., Baylan et al., 2018; Arslan and Unlu, 2011, İnâl-Çekiç et al., 2023), empirical studies focusing on disaster survivors' place attachment, social adaptation, and the role of green spaces in fostering resilience within host communities remain limited—particularly in small to medium-sized cities that exhibit both urban and rural characteristics.

Based on these considerations, this study adopts an exploratory approach to examine the potential role of green spaces in supporting adaptation among earthquake survivors who migrated to Edirne. Rather than seeking to establish definitive causal relationships, it aims to generate preliminary insights into how interactions with these environments may relate to psychosocial recovery, place attachment, and social resilience in a post-disaster context.

Accordingly, the study addresses the following guiding research questions:

- What is the scope and nature of survivors' experiences with green and open spaces in Edirne, and in what ways do these experiences appear to have contributed to their recovery processes?
- How do green spaces potentially influence survivors' perceptions of attachment and belonging within the host community?
- What indications, if any, suggest that green spaces play a role in supporting elements of social resilience among displaced individuals?

Research article
DOI: 10.56629/paud.1699744

2. Literature Background

The contribution of green spaces to psychosocial well-being has been well documented in environmental psychology and disaster studies. Kaplan and Kaplan (1989) demonstrated that contact with nature reduces stress and improves mood, while Ulrich (1984) showed that visual exposure to greenery can accelerate psychological recovery. Bell et al. (2014) highlighted that green space research could usefully consider how well-being priorities change over time. Additionally, Fei et al. (2020) proposes a comprehensive methodological framework for organizing, planning, and managing the functions that different types of urban green spaces can assume during disasters, and recommends that future research further examine the feasibility of transforming spatial configurations and infrastructure to create new models of urban green space systems. Collectively, these foundational studies illustrate how natural environments function as restorative resources during periods of disruption.

Displacement often disrupts daily routines, social networks, and individuals' sense of place. Brown and Perkins (1992) described forced migration as a rupture of place attachment, which can intensify feelings of loss and disorientation. Place attachment- encompassing emotional, cognitive, and behavioral bonds to physical environments- is widely recognized as an important factor supporting recovery (Scannell and Gifford, 2010). Baylan et al. (2018) referred that "place attachment," which constitutes the affective dimension of sense of place, is defined as a positive emotional bond that develops as a result of the interaction between the physical and social characteristics of a place and individuals' lived experiences. Some research suggests that adversity can also foster renewed attachments and stronger identification with new places (Anton and Lawrence, 2014; Twigger-Ross and Uzzell, 1996).

Social resilience has emerged as a key concept in disaster recovery, referring to the capacity of communities to adapt and maintain social ties amid disruption (Magis, 2010; Kwok et al., 2016). Maguire and Hagan (2007) describe social resilience as involving resistance, recovery, and creativity, while Norris et al. (2008) emphasize dynamic capacities such as social support, collective efficacy, and community networks. These capacities help individuals cope with uncertainty, sustain well-being, and rebuild social systems after crises. Green spaces can facilitate these processes by providing inclusive environments where people form connections, exchange support, and cultivate shared meanings that contribute to adaptation and long-term recovery (Tidball et al., 2010).

Empirical studies have showed that the perceived quality of residential environments, including access to green spaces, is associated with higher levels of neighborhood attachment and well-being (Albers et al., 2021). Other research emphasizes that natural settings help reduce feelings of isolation, foster a sense of security, and encourage participation in community life following displacement (Charles-Rodriguez et al., 2023). Douglas et al. (2017) further highlight that urban green spaces are valued not only for their recreational functions but also as environments that support psychological recovery, social cohesion, and place-based belonging.

However, studies focusing specifically on small and medium-sized host cities and interactions among place experiences, green spaces, and social resilience remain limited. Edirne represents one such city facing this research gap. While not unique in this respect, Edirne offers a distinctive case due to its considerable distance from the earthquake zone, its border location, and its markedly different socio-cultural and demographic profile compared to the affected regions. These research gaps and geographical features make

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DOI: 10.56629/paud.1699744

it a valuable context for exploring how green spaces may support post-disaster social integration and resilience through facilitating psychosocial recovery and place attachment among displaced populations in host communities. Such work can inform planning strategies that recognize green spaces not only as aesthetic amenities but also as resources for social and emotional healing.

3. Material and Methods

3.1. Material

This study adopts an exploratory and quantitative research design. Its primary objective is to analyze emerging trends, thematic patterns, and relationships between variables within a defined sample group. The main data source consists of survey responses collected from individuals who migrated to Edirne following the February 6, 2023, Kahramanmaraş earthquakes. The questionnaire form, developed in line with the research objectives, is structured into four main sections designed to assess participants' (i) demographic characteristics; (ii) experiences with green spaces; (iii) levels of place attachment, and (iv) potential for social resilience.

Survey Instrument and Structure

The survey instrument is not based on a single, statistically validated standard scale. Instead, it was developed by adapting items and expressions from various established scales and empirical studies in the relevant literature. The questionnaire consists primarily of close-ended, 5-point Likert-type items, which were categorized into three thematic dimensions:

Green Space Experience (6 items): This dimension explores participants' access to and frequency of use of green and open spaces in the post-disaster environment; the role of these spaces in psychological and spatial adaptation; subjective contact with nature (e.g., "feeling immersed in nature"); participation in social or cultural activities in green areas; and the use of green spaces as cognitive map elements (e.g., "using a park as a reference point for directions").

Place Attachment (7 items): Based on conceptualizations from Stedman (2003), Scannell & Gifford (2010), and Mihaylov and Perkins (2014), this dimension examines aspects of place identity, place dependence, and emotional bonds with the environment. Social Resilience (16 items): This dimension assesses individuals' perceived coping capacity during and after crises, their access to social support, trust and safety perceptions, availability of resources and facilities, skills and adaptability, community participation, and shared values. Items were adapted from works such as Magis (2010), Khalili et al. (2015), Kwok et al. (2016), and Alizadeh and Sharifi (2022).

In addition to Likert-type items, the questionnaire also included binary (yes/no) and open-ended questions designed to explore in greater depth participants' perceptions of and, interactions with their post-disaster living environments. The internal consistency of the full questionnaire, calculated with all respondents and items, was high (Cronbach's alpha = 0.81). This comprehensive structure allows for both quantitative analysis and qualitative interpretation, supporting a multidimensional assessment of participant experiences.

3. 2. Methods

Conducted with a limited and non-homogeneous sample, this study does not aim to produce generalizable results. Rather, it adopts a descriptive and exploratory approach, focusing on quantitative comparisons and the examination of potential relationships between thematic patterns and variables. Although approximately 3,605 individuals were residing in Edirne after the disaster, the sample size was limited to 30 invitations and 22 valid responses due to constraints in reaching out the disaster victims in the Edirne city center, acceptance to voluntary participation in the survey and resources. This limitation is acknowledged, and

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DOI: 10.56629/paud.1699744

the findings should not be generalized beyond the studied sample. The study is therefore presented as an exploratory research.

In this context, the data were scored based on three distinct thematic (experiential) dimensions, derived through content analysis, and the following analyses were conducted based on these scores:

- Descriptive Statistics: Arithmetic mean and standard deviation values were calculated to reveal general trends in participants' experiences.
- Pearson Correlation Analysis: This was employed to examine the relationships between participants' green space usage scores and their levels of place attachment and social resilience.

The survey was administered to participants selected through purposive sampling from among individuals who migrated to the province of Edirne following the February 6, 2023 Kahramanmaraş centered earthquakes. The questionnaire was distributed to a total of 30 individuals, and complete and valid data were obtained from 22 participants. Among the participants, 8 were male and 14 were female; their ages ranged from 19 to 60, and the majority (n=17) were university graduates. The data collection process was carried out in 2024 via online platforms, based on voluntary participation.

With its limited respondent number, this methodological framework provides an exploratory approach and a preliminary study to examine the role of green spaces in post-disaster living environments on earthquake survivors' psychological recovery, reconnection with their new environment, and development of social resilience. The purpose of using this method is not to produce generalizable quantitative results, but rather to identify meaningful patterns, spatial experience tendencies, and inter-variable relationships, thereby laying a conceptual foundation for more comprehensive future studies in this field. In line with existing recommendations on pilot and exploratory studies, the sample size in this research is considered acceptable for preliminary investigation purposes. Johanson and Brooks (2010) highlighted that "samples with N's between 10 and 30 have many practical advantages," particularly when the purpose is to test instrument clarity, feasibility, and initial reliability rather than to produce generalizable results. Accordingly, the sample size of 22 participants falls within this recommended range for exploratory studies.

4. Findings

4.1.Migration background and place experiences

The primary reasons for participants' relocation to another city following the earthquake were the severe structural damage or total destruction of their homes (n=16) and the inability to sustain economic activities, including loss of employment or significant financial hardship (n=12). Key factors influencing participants' decision to migrate specifically to Edirne included the availability of education and healthcare services (n=12), the city's low seismic risk (n=9), and the presence of family members or acquaintances residing in the area (n=6). When asked about the most favorable aspects of Edirne, participants frequently cited the city's natural environment, religious structures, landscape characteristics, and its small-scale, accessible urban form. The most frequently visited green spaces among earthquake survivors included 15 Temmuz Park, Gölet and Peace Park, and the Özgür Çocuklar Park. These spaces were primarily preferred due to their suitability for spending time with children, providing opportunities for social interaction, being easily accessible, and their proximity to residential areas. A substantial proportion of participants reported visiting these spaces once or twice per week.

In terms of usage patterns, participants most commonly reported using green spaces for purposes such as resting, socializing, and

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DOI: 10.56629/paud.1699744

walking. Many also indicated that these areas provided opportunities to connect with other earthquake survivors, suggesting that green spaces serve not only as physical environments but also as socially restorative settings. Descriptive statistical analysis of participants' responses regarding their green space experiences revealed the following:

A significant majority (77.27%) reported using parks or green areas as spatial reference points in their daily routines. Responses to questions about interaction with nature in Edirne indicated that approximately 68% of participants acknowledged the presence of a place where they could experience contact with nature. A relatively high mean score (M = 4.05) was recorded for the statement: "Spending time in parks, gardens, and natural or historical areas in Edirne helped me adapt to the city." This suggests a strong contribution of green spaces to post-disaster urban adaptation.

The item "I participate in events organized in green, natural, or cultural areas in my living environment" received an average score of M = 3.27, indicating a limited level of participation. The relatively high standard deviation (SD = 1.12) reflects considerable variation in participation levels among individuals. The perceived contribution of time spent in parks and natural areas to post-disaster psychological recovery and adjustment yielded a moderate average score (M = 3.32; SD = 0.99). This implies that the restorative effects of natural and cultural landscapes in and around Edirne varied significantly across participants. While many participants (M = 3.50) reported having green spaces they appreciated in their living environment, the high standard deviation (SD = 1.19) suggests the existence of spatial disparities or variations in individual experiences with these areas.

The overall mean score for responses to six Likert-type items measuring the level of engagement with green spaces was calculated as M = 3.53 (on a 5-point scale). This indicates that earthquake victims in Edirne had a moderately high level of interaction with green spaces. However, the elevated standard deviation suggests notable inter-individual differences in these experiences. This variation likely reflects the influence of factors such as spatial accessibility, personal preferences, and socio-cultural context. In other words, a significant portion of participants experience varied and differentiated interactions with green and open spaces in terms of access and usage.

Concerning social resilience, the most prominent component was found to be social integration, support, and participation (M= 23.9). This was followed by access to resources and facilities (M=14.2), skills and self-sufficiency (M=10.8), and social networks and sense of community (M=10.5). The overall mean score for the social resilience experience (M=3.5) was above average, suggesting that participants had developed a certain level of adaptive capacity in the aftermath of the disaster. Nevertheless, the high standard deviation indicates heterogeneity among individuals, with some demonstrating strong resilience while others may remain socially vulnerable.

The mean score for place attachment was M = 3.05, indicating a moderate level of attachment. The high standard deviation observed implies that while some participants had developed a strong sense of belonging, others continued to experience feelings of alienation in Edirne. This divergence may be associated with factors such as personal history, level of social integration, or variations in green space experiences. Table 1 provides a summary of earthquake survivors' level of engagement with green spaces in the city and surroundings, levels of social resilience, and sense of place (place attachment) level following their migration to Edirne after the Kahramanmaraş earthquakes. These descriptive findings offer a general overview of participants' post-disaster urban adaptation experiences in Edirne

Journal of Landscape Research and Practices (JOLARP), 7(1):27-35
Peyzaj Araştırmaları ve Uygulamaları Dergisi
E-ISSN: *2687-2366*
Research article
DOI: 10.56629/paud.1699744

Table 1. Arithmetic Means and Standard Deviations of Earthquake Survivors' Green Space Experience, Social Resilience, and Sense of Place in Edirne

	N	Mean (M)	Standart Deviation (Sd)
Green Space Experience	22	3.53	1.05
Social resilience	22	3.50	1.07
Place attachment	22	3.05	1.27

4.2.Relationships between earthquake survivors' green space experience, sense of place, and social resilience

Table 2 presents the Pearson correlation coefficients among green space experience, social resilience, and place attachment. As shown, survey participants' green space experience is moderately and positively correlated with both social resilience (r = 0.54) and place attachment (r = 0.50). Similarly, social resilience shows a positive relationship with place attachment (r = 0.40). These findings suggest that individuals with more positive green space experiences tend to report higher levels of social resilience and stronger attachment to place.

Table 2. Pearson Correlation Analysis of Green Space Experience, Place Attachment, and Social Resilience

	Green space experience	Social resilience	Place attachment
Green space experience	1.00	.54**	.50**
Social resilience	.54**	1.00	.40*
Place attachment	.50**	.40*	1.00

Note: All coefficients are Pearson's r values. Approximate values (~) have been rounded to two decimal points for clarity. p < .05 (*), p < .01 (**)

5. Discussion and Conclusion

The findings of this study indicate that individuals who settled in Edirne following the February 6 earthquakes developed a moderately high level of interaction with urban green spaces in their post-disaster environments, and that this interaction showed a moderate positive relationship with social resilience, highlighting the importance of nature-based environments in post-disaster recovery processes. Green spaces are not only physically restorative elements but can also function as "social buffer zones" that help individuals cope with feelings of loneliness, uncertainty, and loss (Kaplan & Kaplan, 1989; Ulrich, 1984). In their study, Mahmoudi et al. (2022) similarly demonstrated that the park's contributions to social resilience were perceived primarily through different aspects such as enhanced spiritual understanding, social connections, and human and religious values. At the same time, the results of the present study indicate that participants reported moderate levels of place attachment and social resilience overall.

Additionally, the moderate positive relationship identified between green space experience and place attachment provides further insight into how these environments may support individuals' adaptation, sense of belonging, and recovery processes after displacement. In this regard, Baylan et al. (2018), in their research on post-disaster housing environments, emphasized that such environments should have the architectural, spatial, infrastructural, and landscape qualities necessary to help different groups of residents feel at home and perceive their surroundings as

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DOI: 10.56629/paud.1699744

appropriate places to live. Furthermore, Yalcin and Oguz (2015), in their study focusing on university campuses, found that landscape characteristics associated with naturalness and green space were positively correlated factors contributing to sense of place, supporting the idea that green environments play a role, albeit to varying degrees, in fostering place attachment.

However, the high standard deviation observed in participants' responses indicates notable variability in individual experiences for the green experience social resilience and place attachment. It should also be noted that the relatively high standard deviations observed in this study may partly reflect sampling variability inherent to small exploratory samples rather than solely genuine heterogeneity (Hertzog, 2008).

This study aimed to explore the possible role of green spaces in post-disaster recovery, adaptation, and social resilience among individuals displaced to Edirne following the February 6 earthquakes. The findings point to the possibility that urban green spaces contributed meaningfully to adaptation processes in the new settlement environment. Participants demonstrated a measurable degree of interaction with green spaces in their post-disaster lives, suggesting that these environments are not only ecological infrastructures but also function as emotional and social interfaces. The study also revealed substantial differences in green space engagement across individuals, which are likely shaped by spatial access, personal preferences, social ties, and previous trauma exposure. These findings call for inclusive, user-sensitive planning strategies.

The results demonstrate that green spaces serve functions beyond rest, recreation, or emergency shelter. They also play active roles in fostering social support, meaning-making, and place-belonging. This multi-layered functionality positions green spaces as not only physical but also emotional and social healing environments in post-disaster contexts. Therefore, their consideration as psychosocial resources within spatial planning frameworks is critical.

Moreover, the positive correlations found between green space experience and both social resilience and place attachment reinforce the idea that nature-based interactions contribute to more than just physical recovery—they support the reconstruction of social bonds and community identity. This insight emphasizes the strategic importance of green spaces in recovery-oriented urban design.

Future research should expand sample sizes and include more diverse socio-demographic groups to better understand variations in green space engagement. Such efforts would support the development of more flexible, responsive, and user-centered spatial strategies to strengthen resilience in post-disaster urban environments.

Ethical Statement

Prior to administration, the questionnaire has been approved by the Trakya University Ethics Committee with the document number, dated on 07/06/ 2024.

Note: This study is an extended and revised version of the paper presentation titled "*Place Attachment and Social Integration of Earthquake Survivors Displaced After the 2023 Kahramanmaraş Earthquakes*", originally presented at the 48th World Urbanism Day Colloquium held on November 7–9, 2024, under the theme "Destruction–Life–Urbanism".

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DOI: 10.56629/paud.1699744

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Journal of Landscape Research and Practices (JOLARP), 7(1):36-50
Peyzaj Araştırmaları ve Uygulamaları Dergisi
E-ISSN: *2687-2366*

Review article

DOI: 10.56629/paud.1686552

IS HISTORICAL LANDSCAPE ASSESSMENT FOCUSED ON THE LANDSCAPE ITSELF OR THE HISTORY OF LANDSCAPE?

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Abstrac

Under the European Landscape Convention (ELC), each country is required to identify, classify, plan, protect, and manage its landscapes while analyzing the pressures causing changes. Landscape assessment studies have primarily focused on existing natural and cultural landscapes. However, evaluations that reveal historical identity, historical value, and trace their development and transformation processes have been under represented and often insufficient. Specifically, the historical and heritage dimensions of landscapes are often inadequately addressed in landscape planning. In this context, the Historical Landscape Assessment (HLA), which analyzes long-term interactions between human activities and natural processes, and examines the traces left by human influence, has gained significant importance. According to the ELC, landscape is an area perceived by people, shaped by the interaction of natural and/or human factors, and is closely related to HLA. The aim of this study is to highlight common misunderstandings about HLA. By discussing landscape assessment methods focused on the past, present, and future, this study emphasizes the importance of HLA, which defines the biography of historical landscapes that have endured over time, possess temporal depth, and demonstrated resilience to change. HLA evaluates the temporal depth of landscapes that have survived to the present day, focusing on more than just their history. Addressing the similarities and differences between HLA and landscape character assessment, this study proposes an integrated and holistic approach to landscape evaluation. By contributing to the correction of misunderstandings, this study can set an example approach for promoting a different perspective on HLA.

Keyword: Landscape historical assessment, landscape biography, temporal depth

TARİHİ PEYZAJ DEĞERLENDİRMESİ PEYZAJIN KENDİSİNE Mİ YOKSA PEYZAJIN TARİHİNE Mİ ODAKLANIR?

Özet

Avrupa Peyzaj Sözleşmesi (APS) kapsamında her ülke, peyzajlarını tanımlamalı, sınıflamalı, planlamalı, korumalı, yönetmeli ve değişime yol açan baskıları analiz ederek değerlendirmelidir. Peyzaj değerlendirme çalışmalarında genellikle mevcut doğal ve kültürel peyzajlar ele alınırken, peyzajların tarihi kimliği ve değerini ortaya koyan, tarihsel gelişimlerini izleyen değerlendirmeler eksiktir. Özellikle peyzaj planlama süreçlerinde, peyzajların miras yönetimi ve tarihi boyutları yeterince dikkate alınmamaktadır. Bu bağlamda, insan faaliyetleri ile doğal süreçlerin etkileşimlerini inceleyen ve peyzaj üzerindeki insan etkilerini analiz eden Tarihi Peyzaj Değerlendirmesi (TPD) önem kazanmaktadır. APS'e göre; peyzaj, doğal ve/veya insan faaliyetlerinin etkileşimleri sonucu şekillenen ve insanlar tarafından algılanan bir alan olarak tanımlanır ve TPD ile doğrudan ilişkilidir. Bu çalışma, TPD hakkındaki yanlış algıların düzeltilmesini amaçlamaktadır. Dün, bugün ve geleceğe yönelik peyzaj değerlendirme yöntemleri ele alınarak, zamansal derinliği olan ve değişimlere direnç göstermiş tarihi peyzajların biyografisini tanımlayan TPD'nin önemi vurgulanmaktadır. TPD, peyzajların tarihini değil, günümüze ulaşabilen peyzajların derinliğini değerlendirir. Bu çalışma, mevcut yanlış algıların düzeltilmesine katkı sağlayarak, TPD'ye farklı bir bakış açısı getirmeyi amaçlamaktadır.

Anahtar sözcükler*: Tarihi peyzaj değerlendirmesi, peyzaj biyografisi, zamansal derinlik*

Received: 29.04.2025 ***Acceptance:*** 30.06.2025 ***Online publication:*** 30.06.2025

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Review article
DOI: 10.56629/paud.1686552

1. Introduction

In 1995, the International Union for Conservation of Nature (IUCN), with the support of several European countries, published the report *"Parks for Life."* This report emphasized the necessity of conserving natural and cultural landscapes and highlighted the importance of establishing an international convention to ensure the sustainable management of rural landscapes (Herlin, 2007; Ortaçeşme, 2007). In this context, various initiatives were undertaken by the Council of Europe with the aim of establishing a comprehensive legal framework for the protection, management, and planning of landscapes (Herlin, 2007; Demir and Demirel, 2018). As a result of these efforts, the European Landscape Convention (ELC) was signed on October 20, 2000, at the Council of Europe Landscape Protection Conference held in Florence. The ELC is highly significant as it represents the first international treaty to bring landscape issues onto the global agenda. The Convention serves as an international instrument that seeks not only the protection of natural landscapes but also the sustainable management of all types of landscapes, including rural and urban landscapes. It conceptualizes landscape as an integrated entity comprising natural, cultural, and historical components, and underscores that landscape protection should not be limited to areas of exceptional beauty, but should encompass landscapes of all scales and qualities (Herlin, 2007).

The natural, cultural, aesthetic, tourism, and recreational values of landscapes are adversely affected by unsustainable human uses. This situation leads to a decline in the intrinsic values of landscapes (Uzun et al., 2018; Atik et al., 2021). In order to prevent unsustainable uses and to develop appropriate solutions, the European Landscape Convention (ELC) requires each country to identify, protect, manage, and enhance its landscape values (Ortaçeşme, 2007; Eetvelde and Antrop, 2009). Within this framework, the ELC aims to establish a common language at local, regional, and international levels (Uzun et al., 2018). The protection and management of landscapes should be addressed not only in terms of aesthetic values but also within cultural and societal contexts (Demir and Demirel, 2018; Erdoğan et al., 2020). In this regard, the ELC promotes the participation of diverse stakeholders to ensure sustainable landscape management (Atik, 2009). In accordance with the ELC, signatory countries are required to define their national landscape policies and to integrate these policies with national economic, agricultural, tourism, nature conservation, industrial, cultural heritage, and environmental strategies (Herlin, 2007; Ortaçeşme, 2007; Olwig et al., 2016).

Turkey has signed the European Landscape Convention (ELC). Officially entering into force in 2003, the Convention provides a legal framework for the protection, management, and planning of landscapes in Turkey. As with all signatory countries, Turkey has committed to identifying the landscapes within its territory, determining their characteristic features, and analyzing the pressures causing changes upon these landscapes (Demir and Demirel, 2018; Balta and Atik, 2022). Within this scope, the identification and assessment of Turkey's natural and cultural landscape values are addressed through landscape character analysis and evaluation processes (Uzun et al., 2018; Atik et al., 2021; Belen and Şahin, 2021). Turkey possesses a rich heritage of historic landscapes; however, studies aimed at identifying historic landscape values and the processes of their transformation over time are still in their early stages (Belen and Şahin, 2021; Şengür and Nurlu, 2021). In this context, the scope of Turkey's landscape assessment (TLA) studies should be further expanded to include historic landscape components. Nevertheless, it has been indicated that the existing studies exhibit significant shortcomings, particularly in terms of

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DOI: 10.56629/paud.1686552

methodologies for historic landscape assessment, and that a more systematic approach is required (Demir and Demirel, 2018; Belen and Şahin, 2021; Şengür and Nurlu, 2021).

The assessment of historic landscapes is not limited to the preservation of individual structures or natural elements; it also involves multidimensional analyses, such as the evaluation of historic spatial organizations, the historical transformations of land use, and the temporal changes in human–landscape interactions (Fairclough and Macinnes, 2003). In this regard, it differs from the classification of historic landscapes typically addressed by archaeologists. Within this context, interdisciplinary approaches aimed at identifying landscape history are of great importance, requiring the integration of Geographic Information Systems (GIS)-supported analyses, the digitization of historical maps, and the incorporation of archaeological and historical data that reveal the cultural continuity of the landscape (Harrison, 2010; Demir and Demirel, 2018; Fairclough et al., 2018). Harmonizing landscape character assessment and historic landscape assessment studies in Turkey with international standards and integrating them within the holistic framework envisaged by the ELC are of critical importance for future landscape planning processes.

According to the ELC, research and projects conducted in Turkey have not been integrated into the legal process and have primarily focused on landscape character assessment studies. However, there are small-scale studies within the scope of historic landscape character assessment. These studies, however, lack an integrated approach to landscape character assessment. This study, which questions the perspective of historic landscape assessment, focuses on what historic landscape character assessment is and what it is not. In this context, the study discusses an assessment process that examines the traces and changes of the landscape from the past to the present, revealing the temporal depth of these traces. Historic landscape assessment does not focus on the history of landscapes, but rather on the reflections of the temporal process of the landscape. The similarities and differences with the often-confused landscape character assessment process are also explained. As a result, historic landscape assessment requires the evaluation of resilient landscapes that have persisted to the present, rather than examining the history of landscapes. This study, which addresses the biography of landscapes through historic landscape assessment, may serve as an exemplary approach for considering historic landscape character assessment from a different perspective.

2. Landscape Assessment of Past, Today and Future

Landscape assessment studies are conducted across different temporal scales and levels, including local, regional, national, and international contexts. These studies aim to analyze the processes of change extending from the past to the present and to develop projections for the future (Figure 1).

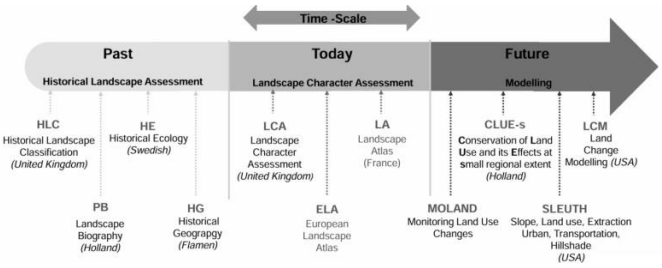

Figure 1: The methods of Landscape assessments (Nurlu and Turner, 2019).

Historical landscape analyses are referred to using different terminologies in various countries, but similar approaches are adopted methodologically. Historical landscape evaluation studies include identifying the landscape patterns preserved from the past to the present and their classification and analysis. For instance, the method known as "Historic

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Landscape Characterisation (HLC)" in Europe is an important approach for determining and preserving historic landscape character (Turner and Crow, 2010; Nurlu and Turner, 2019).

The evaluation of contemporary landscapes, on the other hand, is carried out within the framework of landscape character analysis and evaluation methods. In this context, although different terminologies exist in various countries, landscape character analyses are conducted based on similar methodological foundations (Winterburn, 2008; Ņitavska, 2011; Long, 2013; Tudor, 2014; Balta and Atik, 2022). In this context, the method known as "Landscape Character Assessment (LCA)" in the United Kingdom aims to define specific character areas by analyzing the natural and cultural elements of the landscape.

Landscape evaluation studies aimed at the future are based on modeling approaches developed with consideration of land use dynamics and environmental variables. In this context, spatial analyses and scenario-based modeling techniques are utilized to predict landscape change processes and develop sustainable planning strategies (Olwig et al., 2016; Nurlu and Turner, 2019; Erdoğan et al., 200). Specifically, ecological modeling and Geographic Information System (GIS) based simulation techniques are commonly applied in landscape management for future planning.

Landscape evaluation studies conducted across various temporal scales and levels must be approached with an interdisciplinary perspective and executed within a holistic methodological framework. These studies necessitate the integration of data and analytical methods from diverse disciplines such as ecology, geography, history, landscape architecture, urban, and regional planning. An interdisciplinary perspective enables a more comprehensive assessment of landscape dynamics, revealing the interactions between components such as ecosystem services, biodiversity, cultural landscape elements, and land use changes.

3. Historical Landscape Assessment (HLA)

Landscape studies require a holistic approach that encompasses various disciplines such as social sciences, geography, ecology, environmental sciences, and history. In this context, heritage management and archaeology significantly contribute to understanding the impacts of historical processes on landscapes and shaping conservation policies (Lambrick et al., 2013; Fairclough et al., 2018; Nurlu and Turner, 2019).

Landscape studies require an interdisciplinary approach, integrating diverse fields such as social sciences, geography, ecology, environmental sciences, and history (Figure 2). In this regard, heritage management and archaeology play crucial roles in understanding the effects of historical processes on landscapes and shaping conservation strategies (Demir and Demirel, 2018). Particularly, landscape planning encompasses not only aesthetic and functional dimensions but also the social, ecological, historical, and geographical aspects of the area. An interdisciplinary approach aids in better comprehending the complex structure of landscapes (Crow and Turner, 2009; Scazzosi, 2010). Specifically, the effects of historical processes on landscapes play a critical role in determining the evolutionary structure and cultural identity of a landscape (Fairclough and Macinnes, 2003; Winterburn, 2008; Kolen et al., 2015). In this context, heritage management and archaeology provide fundamental reference points for understanding the historical and cultural layers of a landscape. Heritage management is essential for achieving the conservation and sustainability goals of landscapes as it protects values passed on to future generations by addressing both cultural and natural heritage (Harrison, 2010; Demir and Demirel, 2018). Archaeology, on the other hand, allows us to uncover the traces of past human

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settlements and activities on landscapes, thus facilitating a better understanding of the characteristics of historical landscapes (Fairclough and Macinnes, 2003; Kolen et al., 2015). Therefore, the interaction between these disciplines is critical in developing conservation strategies that consider not only the natural but also the cultural values of landscapes.

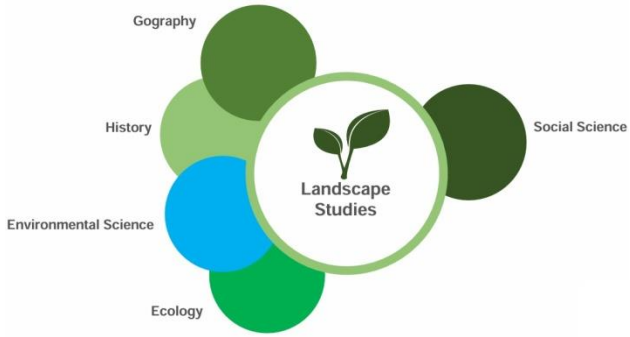

Figure 2: Landscape studies (Fairclough and Macinnes, 2003)

Historical landscapes encompass cultural landscapes that have undergone change due to human use or intervention, characterized by distinct spatial patterns. These landscapes have been shaped over time through the interaction of human activities and environmental processes, and they require special consideration in landscape planning and conservation efforts (Fairclough and Macinnes, 2003; Turner, 2006).

Historical landscape character, on the other hand, can be defined as the entirety of historical, cultural, mythological, and archaeological elements that distinguish one landscape from another (Turner, 2006; HeriScape, 2017). This character includes elements such as land use passed down through history, structural components, spatial organizations, and traditional knowledge systems. Historical landscape character is a concept used to identify and define traces of human influence within a landscape. These traces encompass enduring impacts of human activities, represented through elements such as land parcels, settlements, land boundaries, land patterns, buildings, monuments, planted forests, wetlands, roads, quarries, mines, and factories (Turner, 2006; Winterburn, 2008; Belen and Şahin, 2021). These traces are visible in every part of the landscape and often reflect a structure shaped over temporal depth.

The analyses conducted within the framework of Historical Landscape Assessment (HLA) have revealed that many landscape forms have been shaped by human influence over time, and these changes play a significant role in defining the identity of historical landscapes. Historical landscape assessment analyzes the long-term impacts of human activity on the environment, identifying land use changes, spatial organizations, and cultural heritage elements (Turner, 2006; Harrison, 2010; Olwig et al., 2016). This approach provides a comprehensive understanding of the historical development of a landscape by tracking its temporal depth, the changes that have occurred from the past to the present. In the definition of historical landscape character, the historical source value, interest, and unique historical character of urban, rural, and maritime landscapes are determined. This process yields crucial data on the evolution of the landscape (Demir and Demirel, 2018).

In this context, historical landscape analyses offer a holistic approach to understanding past land use patterns, cultural continuity, and ecological changes, thereby contributing to the shaping of landscape planning and conservation policies. The concept of "human perception" within the landscape definition in the ELC is directly related to historical landscape assessment. The way in which people perceive a particular landscape and how this perception has evolved over time plays a critical role in the process of landscape character analysis and assessment. This process adopts a human-centered approach, allowing for a deeper analysis of the historical dimension of the landscape. Ultimately, this assessment provides valuable insights into the historical and cultural values of the landscape, contributing significantly to the development of

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conservation strategies (Demir and Demirel, 2018; Fairclough and Herring, 2016).

The assessment of historical landscapes is not limited to the examination of the physical environment but also requires the analysis of socio-economic and cultural dynamics. As defined in the APS, historical landscape assessment is closely related to areas shaped by the reciprocal interaction of human and natural processes. This assessment reveals the historical and cultural layers of the landscape, adding a deeper historical dimension to landscape character analysis and evaluation processes (Turner and Crow, 2010; Demir and Demirel, 2018; Fairclough and Herring, 2016). In this context, methods such as historical documents, maps, archaeological excavations, and local oral history studies are of critical importance in understanding the formation processes and spatial organization of historical landscapes. Adopting an interdisciplinary approach in landscape studies allows for the integrated consideration of the landscape's natural, cultural, and historical components, facilitating the development of sustainable management strategies. This ensures the protection of both ecosystem services and the comprehensive evaluation of historical landscapes.

In accordance with the APS, each country is undertaking efforts to identify the natural and cultural landscape values within its borders. However, it has been determined that the elements that reveal the historical identity of landscapes and the cultural traces carried from the past to the present have not been adequately assessed during this process. To address this gap, the classification and assessment of historical landscapes have been developed. This method analyzes the landscape structure and usage patterns of a region extending from the past to the present (Winterburn, 2008; Şengür and Nurlu, 2021). In this way, the historical landscape character is defined, and the historical layers of existing landscapes, historical land uses, present-day landscape patterns, and the unique features of these areas are revealed. This assessment method, also referred to as the temporal depth of the landscape, aims to identify historical traces on the landscape and analyze spatial changes. Typically applied to large-scale areas, these studies contribute to the development of conservation policies and the creation of sustainable landscape management strategies, with applications across various scales, such as national parks, rural landscapes, and settlement areas (Crow et al., 2011; Fairclough et al., 2018). By conducting historical analysis of landscapes, these studies reveal how landscapes have evolved from the past to the present and the types of human activities associated with this evolution. Such studies provide valuable data and methods for landscape planning and conservation.

3.1. What is historical landscape assessment? what is not?

HLC emphasizes that landscapes are living and dynamic entities. It allows for an understanding of the current landscape and the unveiling of the evolutionary process it has undergone over time. In this context, it traces a significant portion of the historical traces that are present in the landscape today. Historical landscape assessment focuses not on the history of landscapes, but on the impact of the temporal process on the landscape. This can be explained by the concept of "temporal depth." Temporal depth refers to the extended period of time required to better understand the historical development processes of landscapes and the effects of human activities on these processes. This concept aims to identify the complex processes that have shaped the landscape and the changes in the historical context. HLC does not only examine historical elements, but also the transformations these elements have undergone over time and their relationships with functional and social changes. Therefore, unlike other assessment methods, HLC is not simply a

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static inventory (Fairclough and Macinnes, 2003; Crow et al., 2011; Şengür and Nurlu, 2021).

In order to properly understand and interpret temporal depth, it is necessary to define the various and complex landscapes shaped by human activities in the past. The changes that landscape components have undergone over time or the continuity of the current landscapes form the essential elements of this process. HLC not only reveals the evolution of landscape components over the historical process but also aims to establish a connection between the current presence of these components and their historical context. Existing landscapes carrying traces of the past should be evaluated by grasping the depth of time. This approach focuses on the analysis of landscapes that still bear traces of the past today, rather than landscapes that existed in the past. It examines the changes in the landscape over time and their reflection in the present, helping us to understand the continuity of the landscape (Crow et al., 2011; Fairclough and Herring, 2016; Fairclough et al., 2018). As a result, the concept of temporal depth is considered a fundamental component in landscape character assessments and sustainable landscape management, bridging the past and future of landscapes through these elements. Monitoring landscape changes provides guidance in both conservation and development processes.

HLA should not be limited to specific areas, protected regions, cultural heritage sites, or conservation areas (Harrison, 2010; Demir and Demirel, 2018; Belen and Şahin, 2021). Instead, all landscapes should be considered, with the historical and cultural dimensions of each landscape being revealed. This holistic approach allows for the examination of the various characteristics of landscapes at different scales. Historic Landscape Characterization (HLC) not only facilitates the understanding of traditional structures but also makes significant contributions to the development and preservation of landscapes at local, regional, and national scales (Turner and Crow, 2010; Tudor, 2014; Fairclough and Herring, 2016). Through efforts that highlight the historical character, HLC ensures the integration of the cultural and natural values from the past into contemporary landscape planning (Winterburn, 2008; Lambrick et al., 2013; Fairclough et al., 2018). In this way, the historical quality of natural and cultural landscapes is enhanced, steering them towards a more sustainable and preservable future.

Historical landscape assessment typically covers large areas such as national parks and regions at the provincial and district levels. These areas hold significant importance as landscapes formed by the combination of both human activities and natural processes. This assessment is not limited to conservation areas or monuments. By evaluating the historical landscape characters identified through HLC, it contributes to our understanding of the changes and resilience of landscapes that have survived from the past to the present (Kolen et al., 2015; Fairclough and Herring, 2016).

In cultural landscape assessment, not only landscapes shaped by humans but also human activities on natural and semi-natural landscapes are taken into account. The impacts of human activities on landscapes are examined in conjunction with natural processes, allowing for a more comprehensive analysis. In this context, the changes in landscapes, both past and present, should be analyzed not only for conservation purposes but also to understand and define the reasons behind these changes (Scazzosi, 2010; HeriScape, 2017; Nurlu and Turner, 2019; Erdoğan et al., 2020).

In historical landscape assessment, it is essential to emphasize the importance of the perspectives of both experts and local communities. Local communities serve as a valuable source in understanding the historical significance of landscapes and how historical characters have been carried into the present. Local knowledge and experience regarding the

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ongoing pressures of change from the past to the present are necessary for more accurately analyzing the processes of landscape change (Crow et al., 2011; Erdoğan et al., 2020; Şengür and Nurlu, 2021).

The transparency and accessibility of historical landscape assessment processes also play a critical role. Landscape assessments should follow a clear and understandable process, making the results easily usable by others. This allows the data obtained to be effectively utilized by various stakeholders and researchers. Historical landscape assessment should be conducted not from a single perspective, but through a multidisciplinary approach (Fairclough and Herring, 2016; Demir and Demirel, 2018). Such studies should be designed in a way that they can be easily integrated with other planning processes and databases. These studies should be usable not only in the academic field but also in practical planning processes.

Historical landscape assessment aims to influence decisions regarding future landscape development and management. This method has strong potential for application in various fields, including spatial planning, land management, agriculture-environmental policies, landscape policies, local differences, and community-based initiatives (Fairclough and Herring, 2016; Nurlu and Turner, 2019). Furthermore, landscape research also has a significant impact on education and communication fields. In other words, the HLC process adopts an approach in which human interaction is dominant. In this process, the human factor influencing the shaping of landscapes is typically evaluated through elements such as settlements, agricultural activities, and transportation networks. The information provided by historical landscape assessment contributes not only to understanding contemporary landscapes but also to shaping future landscape management strategies.

Historical landscape assessment (HLA) studies are typically interpretive and provide evaluations on the characteristic features of landscapes both past and present, rather than offering definitive conclusions (Fairclough and Herring, 2016; Belen and Şahin, 2021; Şengür and Nurlu, 2021). Therefore, these studies adopt a flexible and dynamic approach, rather than relying on sharp and definitive statements. The research contributes to other planning and evaluation processes by offering strategic insights to decision-makers regarding the potential future of landscapes (Demir and Demirel, 2018; Nurlu and Turner, 2019; Erdoğan et al., 2020). However, rather than providing a set of absolute recommendations, these studies offer general guidance on the evolutionary processes of landscapes. In this process, landscape character types that are adaptable to change, resilient to threats, and responsive to opportunities are classified and assessed. These character types are analyzed based on their capacity to adapt to environmental, cultural, and social changes, providing guiding information for sustainable landscape management.

3.2. The importance of historical landscape assessment

Historical landscape assessment (HLA) is an important tool for enhancing the historical quality of natural and cultural landscapes at national, regional, and local scales. The two key criteria of HLC are the perception-based assessment of landscapes and the presence of landscape changes over time. By considering these two elements, the HLC approach enables a more comprehensive understanding of the historical evolution of landscapes and the impacts of this evolution (Scazzosi, 2010; Kolen et al., 2015). Furthermore, it is observed that landscape character types show varying levels of resilience to changes over time. Some landscape character types are more resilient to changes, while others may be more vulnerable (Nitavska, 2011; Uzun et al., 2018). This allows

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for the analysis of the continuity and fragility of landscape characters in temporal processes, thereby aiding in the strategic decision-making for landscape management and conservation.

One of the primary objectives of HLA is to understand the changes in landscapes and land use decisions caused by human influence over time. In this context, Lambrick and others (2013) and Kolen et al. (2015) have highlighted the role of the human factor in the evolution of landscapes and its significance in this process. HLC provides insights into how landscapes have shaped over time by examining the balance between continuity and change, and the impacts of decision-making processes over the years on landscapes. Identifying the traces of past landscapes that have survived to the present plays a crucial role in understanding the evolution of landscapes in historical and cultural contexts. In this sense, historical landscapes do not merely reflect the history of a specific period but also carry the traces of the evolutionary processes they have undergone. HLC enhances and complements landscape studies by adding a historical dimension to landscape analysis. This approach contributes to the preservation of not only the natural values of landscapes but also their historical, cultural, and archaeological values (Fairclough and Herring, 2016; Nurlu and Turner, 2019). Historical Landscape Assessment stands out as a critical tool in enhancing the effectiveness of landscape management and land use decisions, providing practical inputs at the local level, and ensuring these processes are more sustainable and suited to local conditions.

The elements that define historical character can vary across different landscapes, but all of these elements contribute to environmental databases, leveraging existing resources rather than creating new databases (Fairclough and Macinnes, 2003; Demir and Demirel, 2018). This facilitates the integration of HLA with other landscape evaluation studies. The data used in HLC studies is typically based on GIS, which allows for easy correlation with other spatial data. Such data is adaptable at national, regional, and local levels and can be integrated with different datasets. This feature enables various analyses, allowing connections to be made between historical development and environmental data, such as biodiversity (Fairclough and Macinnes, 2003). In this context, the effects of historical landscapes on the natural environment can be analyzed by comparing them with data on biodiversity, land use, land cover, pastures, agriculture, mining, and other relevant environmental factors. Compared to archaeological techniques, HLC stands out as one of the most effective methods in explaining the historical character of landscapes. This approach, through large-scale studies, reflects the historical values of landscapes, clearly outlining changes and characteristics during specific historical periods. Notably, monuments, heritage sites, and national architectural heritage are significant components of historical environmental records. These areas are analyzed through a temporal depth framework, detailing the changes from the past to the present and their effects on the landscape (Fairclough and Macinnes, 2003; Demir and Demirel, 2018). This assessment process allows for a broader understanding of the historical character of landscapes, placing them in a wider cultural and ecological context.

HLA is a crucial component of the Landscape Character Assessment process and plays a critical role in general landscape character evaluations. This assessment not only aids in understanding the aesthetic value of a landscape but also its cultural and historical significance. Historic landscapes play a pivotal role in the formation of a sense of place and identity among individuals, and their evaluation fosters increased public awareness (Fairclough and Herring, 2016; Demir and Demirel, 2018).

The contribution of historic landscapes to regional and local development plans, as well as the strategic environmental assessments tied to

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these plans, is substantial. In this context, HLA serves as a fundamental guide for the preservation of heritage values (Scazzosi, 2010; Turner and Ceow Belen and Şahin, 2021; Şengür and Nurlu, 2021). Furthermore, the integration of cultural and natural landscape values during the Environmental Impact Assessment (EIA) process is essential (Demir and Demirel, 2018). This process aims to maintain ecological and cultural balances by considering the various components of the landscape.

HLA is a significant tool that helps local communities understand the historical origins of the landscapes in which they reside and enhances their sense of belonging to these landscapes. This process aims to deeply examine the relationship between local communities and their environment, their interest in their origins, and their perceptions of historic landscapes (Olwing et al., 2016; Fairclough et al., 2018). Specifically, by providing information about these landscapes in a way that strengthens local cultural and historical ties, it contributes to reinforcing social belonging.

The revitalization of rural settlements also benefits significantly from HLA, especially in the design of small towns and villages. Historic landscape assessments guide the sustainable reconstruction of such settlements. Moreover, they make important contributions to sustainable landscape management issues such as the renewal of rural areas, the development of wooded areas, and the diversification of agriculture (Nurlu and Turner, 2019). HLA also provides guidance in the design of traditional rural settlements, windmill fields, and green infrastructure systems. The sustainability of such settlements and infrastructures must be developed in harmony with the historical landscape values. Additionally, HLA can serve as a crucial tool in the development of heritage and tourism strategies (Kolen et al., 2015; Belen and Şahin, 2021). These strategies provide the necessary data for the development of local action plans and coastal area management. By offering information on natural and archaeological heritage sites, architectural conservation areas, and natural conservation areas, HLA creates an effective roadmap for the management and preservation of these sites.

The significance of HLA lies in its addressing a situation where information related to cultural identity and landscape character remains limited, and these deficiencies have not been fully addressed in current landscape character analysis studies. In this context, objectives such as the recording of changes and the analysis of the forces and pressures that transform landscapes are often not fully met. According to Fairclough and Herring (2016), HLA, which addresses these gaps, has been defined as the cultural biography of the landscape. This definition allows for a deeper understanding of the evolution of the landscape over time and the impacts of this evolution within a cultural context.

Finally, HLA facilitates the preservation of both functional and symbolic landscape values by relating landscape character types that are economically and socially significant (Demir and Demirel, 2018; Fairclough et al (2018). This approach opens the way for landscapes to be valuable both ecologically and culturally, providing a meaningful landscape experience for both local communities and visitors. In this context, the contributions of HLA to research and projects provide significant direction for landscape planning and management processes at the national, regional, and local scales, serving as an effective tool.

3.3. The general stages of historical landscape assessment

The character assessment of historic landscapes is a comprehensive process consisting of several stages. These stages are determined through a method that is based on scientific foundations while considering local features and cultural contexts. The stages of the

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character assessment of historic landscapes include the collection and analysis of data related to the study area, the mapping and description of historic landscape characters, followed by their evaluation, and the creation of a technical report containing management and conservation recommendations in line with the objectives. Finally, the process concludes with monitoring stages (Fairclough and Macinnes, 2003; Fairclough and Herring, 2016; Demir and Demirel, 2018).

3.3.1. Data collection and analysis stages

The first stage of the character assessment of historic landscapes is the collection of data related to the study area. These data encompass both natural and cultural components and are typically derived from sources such as historical documents, archaeological data, local knowledge, and existing landscape features. Additionally, spatial data about the landscape can be collected using Geographic Information Systems (GIS) and remote sensing data. These data are then subjected to detailed analyses for landscape assessment research.

3.3.2. Character mapping and description stages

Following the data collection phase, the subsequent stage entails the mapping and detailed description of the characteristic features of the historic landscape. This stage involves the visual representation of the elements that define the historical and cultural attributes of the landscape. Within this framework, the processes undergone by the landscape throughout its history are analyzed, and the specific historical periods from which the landscape has evolved are identified, thus establishing its temporal depth. The boundaries of the landscape, significant architectural structures, natural areas, and anthropogenic elements are delineated on the maps. The mapping process serves to visually represent the diverse characteristic features of the landscape and their spatial distributions, thereby facilitating a clearer understanding of the landscape both for specialists and the general public. Furthermore, this process contributes to the monitoring and analysis of landscape changes over time, from historical to contemporary contexts.

3.3.3. Evaulation stages

Upon the completion of character mapping and description, the collected data and maps undergo an evaluation process. This evaluation constitutes an analytical procedure aimed at determining the value of the historic landscape. The assessment takes into account the cultural, historical, ecological, and aesthetic values of the landscape, considering its heritage and continuity from past to present. The evaluation is generally conducted according to national and international conservation standards, ensuring a comprehensive understanding of the landscape's significance. This stage facilitates the identification of elements of the landscape that require protection and those areas that may require further enhancement.

3.3.4. Management and conservation recommendations

Following the evaluation stage, recommendations for the conservation and management of the historic landscape are developed based on the findings. These recommendations may include improvements aimed at ensuring the sustainable management of the landscape, protection strategies, as well as the necessary legal frameworks and regulations. Public participation plays a critical role in the conservation of historic landscapes; thus, the recommendations are designed to promote local community involvement and raise awareness about the importance of preserving the landscape. Additionally, conservation plans are focused on maintaining the biological diversity, ecosystem services, and cultural values of the landscape in a sustainable manner.

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3.3.5. Monitoring stages

The final stage involves the monitoring and continuous updating of the evaluation and management strategies of the historic landscapes. Monitoring aims to track changes within the landscape, evaluate the effectiveness of the proposed management strategies, and update future conservation plans accordingly. This stage plays a vital role in ensuring the long-term preservation and sustainability of the landscape. Monitoring is typically conducted through short, medium, and long-term programs, which involve regular site visits, data collection, and comparisons with prior analyses. Furthermore, the monitoring data is made accessible to public authorities, local governments, and other stakeholders to ensure transparency and encourage societal participation in the preservation process.

4. The Relationship Between Historical Landcape Assessment and Landscape Character Assessment

Historic Landscape Assessment (HLA) and Landscape Character Assessment (LCA) are vital tools in understanding the characteristic features and evolutionary processes of contemporary landscapes. These studies reveal how historic landscapes have differentiated and evolved over time, analyzing the transformation of landscapes from the past to the present (Fairclough and Macinnes, 2003; Nurlu and Turner, 2019; Balta and Atik, 2022). While LCA typically reflects contemporary and recent landscapes, with geographical and geomorphological features being key determinants, HLA spans a broader temporal range, tracing the evolution of landscapes from the past to the present, thus emphasizing the temporal depth of the landscape.

The HLA approach has been adapted from LCA studies, and both share numerous similarities. These similarities are especially evident in spatial and map-based approaches, with both methods relying on Geographic Information Systems (GIS) technologies. HLA studies complement the elements of LCA, establishing a significant connection between the two approaches. The similarities in classification and evaluation strategies demonstrate that both methods provide a robust foundation for landscape analysis and management. However, HLA, unlike LCA, has a broader field of application, making it both an integrative approach and one that can be used independently. Whereas LCA is typically employed in rural and semi-rural areas, HLA is more commonly applied in urban and peri-urban contexts, where human activities are more prominent (Fairclough and Macinnes, 2003; Erdogan et al., 2020).

The integration of Historic Landscape Assessment (HLA) into Landscape Character Assessment (LCA) plays a crucial role in identifying the forces that drive changes in landscapes and in defining landscape management policies. Both approaches utilize spatial definitions and comprehensive analyses to determine the characteristic features of landscapes, highlighting the presence of a historical landscape character in every place. However, in LCA studies, landscape character areas and landscape character types are classified and evaluated (Tudor, 2014; Balta and Atik, 2022). The data obtained from HLA studies are typological, and when evaluated in terms of scale, integrating them into landscape character areas produces more effective solutions. Furthermore, both approaches initially analyze the data, followed by an evaluation stage. This stage provides a more detailed understanding of the processes of landscape change and the factors influencing these processes (Fairclough and Macinnes, 2003; Demir and Demirel, 2018). Consequently, both approaches offer practical and effective tools in areas such as landscape analysis, environmental policies, heritage management, and planning.

It has been suggested that combining HLA with LCA yields more effective results (Fairclough and Herring, 2016). Understanding

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the temporal depth of landscapes and the forms of change that have occurred from the past to the present, along with the perception of these changes, is essential for accurately defining the character of a landscape. This understanding plays a critical role in landscape analysis. These two assessments complement each other, thereby enabling more comprehensive and in-depth landscape analyses (Fairclough and Herring, 2016).

5. Conclusion and Recommendations

Within the framework of temporal depth, Historic Landscape Assessment (HLA) studies, which aim to define the historical character of landscapes bearing traces of human influence, focus not on identifying past landscapes or determining the historical narrative of the landscape but rather on evaluating those landscapes that have survived from the past to the present and are therefore resilient. These studies utilize GIS and provide a complementary contribution to general landscape character assessment works.

The integration of HLA with landscape character analysis ensures the comprehensive definition of all landscape features and facilitates the creation of shared databases at national, regional, and local levels. By evaluating the values and changes of landscapes that have endured from the past to the present, it contributes to the development of an updated, dynamic, and flexible landscape planning approach. HLA data enable the definition of landscape character areas, making it possible to plan landscapes according to the characteristics of these areas. This, in turn, allows for the easy integration of outputs into other planning processes, enabling the adoption of effective and sustainable planning decisions through a multidisciplinary approach.

The accurate assessment of historic landscapes, both increases local communities' awareness of cultural heritage and enables more informed shaping of local development and tourism strategies. Proper processing of such data will lay the foundations for a planning process that will strengthen both the conservation of the landscape and the community's connection with its past. In Turkey, in addition to geographical features, the identification of historical landscape identities in defining landscape character areas is of critical importance for both achieving a deeper understanding of the current landscape and ensuring the future sustainability of these areas. In this regard, landscape character assessment and historic landscape assessment play a significant role, particularly in the development of conservation and management strategies. As a result, when historic landscape assessment and landscape character assessment are used together, they establish a solid scientific foundation for landscape planning by creating a shared database at national, regional, and local levels.

In Turkey, within the scope of APS, it is of great importance to identify not only the distinct geographical features but also the historical landscape identities of these areas when defining landscape character areas. APS processes require the evaluation of the findings obtained from historical landscape assessment studies, considering national and international legal frameworks. The results obtained should be transferred to the relevant authorities in accordance with national legal procedures and regulations. For healthy and sustainable landscape assessment studies, the integration of their outputs into the Landscape Character Assessment process is crucial. This integration plays a critical role in determining landscape character types, their protection, and the development of tourism strategies. Additionally, it is essential to ensure the integration of HLC and LCA outputs into spatial planning processes. In this context, it is recommended that historical landscape assessment studies be included in the landscape atlas work to be carried out in 26 basins. A multidisciplinary and holistic approach must be adopted. This involves

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forming a team from various professional disciplines such as history, geography, architecture, forestry and agricultural engineering, planning, landscape architecture, sociology, anthropology, ecology, biology, and archaeology to create a database on historical landscape character. Archiving data and documents bearing traces of human influence from past periods and updating existing historical landscape character types as long as these data are available is important. In addition to natural and cultural landscape values, increasing awareness of historical landscape characters will not only raise the consciousness of the local community regarding the areas in which they reside but also contribute to the protection and promotion of the region they live in.

Acknowledgements

I sincerely thank Prof. Dr. Öner DEMİREL, Prof. Dr. Şükran ŞAHİN, Prof. Dr. Osman UZUN, and Prof. Dr. Engin NURLU for their valuable scientific contributions to the HLA topic.

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