

Resources of Urban Green Spaces and Sustainable Development

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1. Introduction

Urban green spaces are considered one of the most valuable natural resources in cities. Given contentious issues such as climate change, global warming, and environmental pollution in cities, the importance of green spaces has been increasing due to their natural elements. These spaces are capable of diminishing heat problems together with reducing air pollution in urban areas. One of the vital issues in recent decades is the discussion of sustainable development and livability of cities for human societies, which can be achieved through sustainable development goals.

Accordingly, the potential of urban green spaces in urban areas is an integral part of urban sustainable development. Appropriate attention and improvement of urban green spaces make them pleasant and livable, which in turn leads to improving quality of life and urban health.

Urban green resources play a very important role in sustainable cities. With the expansion of urbanization and the increase in the population of cities, the need for green and relaxing spaces for residents has become more important [1,2]. Urban green spaces including parks, gardens, boulevards and gardens allow citizens to be exposed to nature and enjoy the mental and physical benefits associated with this environment [3–5]. In various pieces of scientific research, the relationship between green space and human health has been investigated, and the results show that green space can significantly improve people's physical and mental health [6–8]. Green spaces provide facilities for sports and recreational activities. People can walk, bike, exercise and play various games in these spaces. These activities lead to strengthening the heart and blood vessels, reducing stress and increasing physical health. Green spaces have a positive effect on stress and anxiety and act as a natural relaxant [9–11].

In general, green space resources improve urban air quality, reduce environmental pollution, reduce respiratory diseases, and increase the comfort and convenience of citizens [12–14]. In addition, urban greenery has a positive effect on biodiversity. By creating green spaces and providing suitable habitats for plants and animals, biodiversity increases in cities. This helps maintain the balance between urban animals and plants, and as a result, contributes to the balance of the city's ecosystem [15,16]. Urban green space resources play an important role in protecting water resources as well. The trees and plants in these spaces, by absorbing water and storing it in the soil, help reduce sedimentation and flooding in urban areas. In addition, these spaces can help regulate the temperature of the urban environment and prevent the rise of tides in cities [17,18].

Creating urban green resources can help improve the quality of life of citizens and have positive economic effects by attracting tourists and investors to develop neighborhoods and cities. Among the methods used in the management of green space resources, it is mentioned to determine special areas for parks, gardens and public spaces, as well as maintaining and improving the existing green spaces in cities [19,20]. These measures can help improve the quality of life of citizens and have positive economic effects by attracting tourists and investors to develop neighborhoods and cities [21]. In addition, cooperation with local communities and participation of citizens in maintaining and improving the urban green space is of great importance [22]. Direct communication with citizens and



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understanding their needs in this field can facilitate the improvement and optimization of urban green space.

2. An Overview of Published Articles

As the editor of this special issue “Resources of Urban Green Spaces and Sustainable Development”, it was my great honor to receive several interesting research papers from worldwide European Asian, and South American cities in the different fields related to the Importance of green resources. These studies introduced different methods regarding green resources on small scale to large scales from home (home plants) to metropolitan (urban parks).

In the study conducted by Takahashi et al. (contribution 1), the authors evaluated the adaptation, resistance, and performance of two macrophytes, *Polygonum acuminatum* and *Ludwigia lagunae*, in greywater-fed mesocosms simulating zero-liquid discharge systems. The aim of the study was to assess the suitability of these plants for landscape harmony and green area provision. During the adaptation phase, neither species exhibited stress conditions, as indicated by their photosynthetic activity (Fv/Fm) being close to that observed in their natural habitat, the Pantanal biome. However, as the experiment progressed, the meso-cosms irrigated with greywater without nutrient supplementation showed signs of stress. Correlation analyses of photosystem PSII and physicochemical parameters revealed that *L. lagunae* experienced stress due to dissolved oxygen levels below 3 mg L⁻¹, while *P. acuminatum* faced stress from water temperatures above 27 °C. The supplementation of greywater with nutrients proved to be beneficial for the growth and performance of both species. They were able to tolerate high chemical oxygen demand (COD) loads, with *L. lagunae* averaging 34 g m⁻² day⁻¹ and *P. acuminatum* averaging 11 g m⁻² day⁻¹. Both species exhibited an average removal efficiency of 85% for COD. In terms of specific characteristics, *L. lagunae* demonstrated better evapotranspiration capacity, making it suitable for use in cooling islands. On the other hand, *P. acuminatum* exhibited a more resistant metabolism even without nutrient supplementation.

Overall, the study highlighted the importance of considering the composition of plants in green areas and nature-based solutions. The adaptation, resistance, and performance of macrophytes can be influenced by factors such as irrigation water quality and nutrient supplementation. By selecting appropriate plant species, it is possible to enhance landscape harmony and effectively manage greywater in zero-liquid discharge systems (contribution 1).

Escandón-Panchana et al. (contribution 2) proposed marine coastal spatial planning strategies using an ecosystem-based approach, specifically focusing on the allocation of a conservation area for mangroves and estuarine zones. The methodology employed in this study includes compiling information on the study area, with a particular emphasis on regulations and protected areas. Additionally, an analysis of human interactions with marine coastal ecosystems was conducted. Subsequently, mapping and zoning of the conservation area are carried out.

The results of the study presented zoning maps for the designated conservation area, encompassing mangroves and estuarine zones. The study also addressed governance strategies, conservation management measures, and the protection of marine coastal space. As a recommendation, the study proposed improvements to existing municipal ordinances to enhance the management and protection of the study area. These recommendations aim to contribute to the comprehensive development of land-use planning in the marine coastal region.

In general, this study highlighted the importance of marine coastal planning as a means to mitigate the pressures on marine coastal ecosystems and promote sustainable development (contribution 2).

In urban areas, the presence of green spaces, particularly urban parks, plays a crucial role in enhancing the livability and quality of life for residents. These parks serve as valuable public open spaces that provide economic and social benefits. The distribution

and accessibility of neighborhood parks are essential factors in improving the overall well-being of cities. The study conducted by Ramezani Mehrian et al. (contribution 3) focused on Urmia City and aimed to assess the current situation of urban parks, analyze spatial equity and accessibility using the travel cost approach and network analysis, and examine the impact of rapid urban growth on spatial inequalities.

The findings of the study revealed that approximately 18% of the residential land in Urmia city is located outside the service area of parks. Moreover, 68% of these residential areas outside the park service area have emerged due to urban growth in the past two decades. The analysis further identified that in 23 neighborhoods of Urmia City, the entire neighborhood falls within the park service area and has pedestrian access to these parks. However, other neighborhoods were categorized into three groups based on their priority levels: high, medium, and low priority. This categorization aimed to address the issue of spatial justice concerning urban parks.

The study highlighted the importance of spatial equity and accessibility in urban park planning and management. It emphasized the need to address spatial inequalities caused by rapid urban growth to ensure that all residents have equal opportunities to access and benefit from urban parks (contribution 3).

In the study conducted in Budapest, Hungary (contribution 4), the researchers aimed to assess the sustainability of urban parks based on their ratio of biologically vital areas (RBVA). Bio-logically vital areas are regions within cities that have ecological functions and help mitigate the negative impacts of built-up areas and impermeable structures on urban environments and residents.

The preliminary research focused on six randomly selected parks in Budapest, which represented examples of site rehabilitation or new designs based on a sustainable approach. The study measured the areas of different types of landcover with ecological functions, including greenery planted on the ground, green roofs, permeable pavement, and water reservoirs. These areas were then compared to the area of hard structures and the total area of each park.

The results revealed that the RBVA was below 50% in four out of the six parks studied. The RBVA ranged from 22.97% in MOM Park to 44.13% in Millenáris Park. However, in two cases, Graphisoft Park and Nehru Park, the RBVA exceeded 50%, with percentages of 51.52% and 79.31%, respectively. This variation in RBVA reflects the challenge of balancing ecological and social functions in urban parks.

The study emphasized the need to increase the implementation of sustainable solutions in the further development of urban parks. By incorporating more biologically vital areas, such as greenery and permeable surfaces, urban parks can enhance their sustainability and contribute to the well-being of city dwellers. As a matter of fact, this research provided insights into the current state of urban parks in Budapest and highlighted the importance of incorporating biologically vital areas to promote the sustainability of these green spaces (contribution 4).

In the other research conducted by Fusté-Forn and Forné (contribution 5) analyzed the connection between urban gardens and family tourism. The study contributes to the understanding of urban gardens as attractions that enhance sustainable food production and consumption within the context of family tourism experiences. The findings highlighted the importance of urban gardens in creating sustainable experiences that involve families in local food, strengthen local supply chains, and inform the future development of urban environments.

Urban gardens serve as visitor attractions that can foster the development of sustainable people, places, and products. They facilitate the integration of horticulture into tourism through participatory experiences, direct contact with the natural environment, and the exploration of food origins. By engaging families in these experiences, urban gardens contribute to the promotion of sustainable practices and the preservation of local ecosystems.

This research shed light on the potential of urban gardens to enhance the sustainability of both food production and tourism. It emphasized the significance of incorporating participatory and educational elements into family tourism experiences, allowing visitors to connect with nature and gain insights into the origins of their food.

Overall, this study underscored the value of urban gardens as a means to promote sustainable practices, support local communities, and enrich the tourism experiences of families. It highlights the potential for urban gardens to contribute to the development of more sustainable and resilient urban environments (contribution 5).

Habibi, Chitsazzadeh, and Mosavi (contribution 6) focused on the optimization of road safety through sustainable landscape design, specifically in a dangerous bend of the Teh-ran-Dizin road. The research highlighted the importance of the surrounding landscape in drivers' visual perception and its impact on road safety. Green areas within the road landscape can either screen or frame views, influencing drivers' attention and potential distractions. The study utilized cone of vision formulas to calculate measures of green landscape features that can hide visual distractions and enhance safety. The research emphasized the use of native plant species in the landscape design to improve the environment, create a sustainable landscape, and enhance the sense of place. The findings demonstrated that employing a cone of vision approach can effectively contribute to the success of a designed green landscape, particularly in situations where two-dimensional approaches are insufficient. The study provided insights into the integration of sustainable landscape design principles to optimize road safety and meet both safety and environmental requirements (contribution 6).

Considering the importance of urban green spaces and also the growth of the urban population, the importance of creating and maintaining urban green resources to improve the quality of life of citizens and the sustainability of the environment is greater than in the past, and there is a need for more attention and investment in this field.

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List of Contributions:

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