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An Ecological Perspective on Cities: the Benefit of Urban Vegetation and Parks in Prishtina City, Kosovo

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Abstract. Urban vegetation and green spaces are considered as indicators of both quality of life and urban sustainability. The purpose of this paper is to present how quality of public spaces and urban vegetation contribute positively to people's quality of life. Green space quantity is measured by the ratio of green space, while quality consists of plant community structure (deciduous, evergreen, annual plants, flowering shrubs and perennials plants). The study was conducted in four urban parks (Germia Park, City Park, Tauk bashçe Park and Dardania Park) in Prishtina City, Republic of Kosovo. Urban vegetation plays an important role when it comes to cope with the challenges that are related to the urban infrastructure of XXI century. From the historical time period, human being has appreciated greenery to find the flavor of life, form some physical and psychological dependency on nature. Cities have been the centers of economic and social developments, as well as sources of many major environmental problems.Issues regarding urban vegetation, public green spaces per inhabitant, public parks and recreation areas are frequently highlighted as important factors to make the more sustainable, pleasant and attractive for its citizens.

Key words: plant community structure, vegetation, quality of life, ecology, greenery, parks.

Introduction

Urban green spaces include a wide variety of vegetated public spaces, from large parks on the urban periphery to small green spaces located in densely populated urban neighborhoods (Maruani & Amit-Cohen, 2007). Urban green spaces are often viewed in different lights because ecologists and other stakeholders have contrasting opinions on their role in biodiversity conservation and their value to society.

Air quality is a major problem in many urban areas in the Republic of Kosovo and therefore has an impact on human health. In the Republic of Kosovo there is an increased the tendency for environmental regulation with different ornamental plants, in parallel with the expansion of urban centers, large cities, new houses, residential areas.

Urban green spaces comprise a range of habitat types that cross a continuum

from intact remnant patches of native vegetation, brownfields, gardens, and yards, to essentially terraformed patches of vegetation that may or may not be representative of native community associations (Cilliers et al., 2013). Urban vegetation provides a wide variety of ecosystem services, including air quality improvement, climate regulation, and other elements that enhance urban environmental quality (Bolund & Hunhammar, 1999).

A variety of land use practices and environmental factors affect urban park biodiversity and vegetation structure, composition, and ecological function, but few studies have compared plant taxonomic composition, structural complexity, and species traits across different types of urban green spaces.

Green and open areas can be public or private properties and are differentiated by their function, their ecological value and their belonging to other land use types. Such green space is diverse, varying in size, vegetation cover, species richness, environmental quality, and proximity to public transport, facilities, and services.All forms of vegetation contribute to visual improvement and in this context they are of aesthetic value and contribute to urban architecture (Smardeon, 1988).

Urban park planted with various species provides a wide range of ecosystem benefits including regulating, supporting, cultural, and provisioning services (Arnberger & Eder, 2012). Urban green spaces provide critical ecosystem services to urban area residents. While urban green spaces provide a range of ecosystem services, cultural ecosystem services may be the most prominent to residents. Cultural ecosystem services provide benefits through educational, recreational, social, and spiritual opportunities (Almas, 2016).

As a result of rapid population growth and a lack of urban planning, cities in developing countries tend to have higher population densities and lower environmental quality compared to cities in developed countries (Peschardt & Stigsdotte, 2013). In this context, the creation of green spaces has been a strategy for the improvement of environmental quality, due to the positive effects that such spaces have on social and environmental dimensions connected to quality of life.

This study investigates the relationship between neighborhood green spaces and residential satisfaction considering both the quantity and quality of green space. Green spaces play an important role in supporting urban communities both ecologically and social.

Material and Methods

Study area

Location of this study was in Pristina City in Republic of Kosovo. During the study we have analyzed the vegetation in different locations in the central and northern parts of the Pristina City (Fig. 1). The study was conducted in four urban parks (Germia Park, City Park, Tauk bashqe Park and Dardania Park) in Pristina City, between May 2020 and October 2021. The city covers 572 km^2 and has a population of over 600.000 inhabitants. Kosovo is located in the central part of the Balkans. It lies between 41°50′58″and 43°51′42″ of northern geographic latitude and between 20°01′3″and 21°48′02″ of eastern geographic length.

Data of type of parks categories were compiled from urban green maintenance maps, Pristina Municipality, cadastral maps, and land maps. Plant identification at the site was done using the botanical key. The structure and function of urban park vegetation were analyzed using Summed Dominance Ratio (SDR), indices of diversity, species richness, evenness, and similarity. SDR index was used to analyze the plant species dominance and frequency of the four

urban parks in Pristina City. SDR was calculated using the formula below (Muhlisin et al., 2021):

$$SDR = \frac{FR+DR}{2},$$

where: FR is Relative Frequency and DR is Relative Dominance. Relative Frequency (FR) was calculated by dividing the frequency of species-i by the sum frequency of all species then multiplying by 100 percent. Dominance Relative (DR) was calculated by dividing the individual number of species-i by the dominance of all species multiplied by 100 percent. Dominance of species-i (Di) was obtained by dividing the individual number of species-i by the individual number of all species.

The species diversity index was calculated using the Shannon-Wiener formula (Spellerberg & Fedor, 2003).

Results and Discussion

In total, across four urban parks in Prishtina City observed in this study, there were 13.500 individuals of plants recorded, consisting of 76 species belong to 16 families.

Table 1 shows species and cultivars with the highest Summed Dominance Ratio (SDR)in four urban parks in (*Tilia cordata, Platanus orientalis, Catalpa bigninoides, Betula alba, Aesculus hippocastanum, Magnolia grandiflora, Prunus cerisfera, Thuja occidetalis, Tagetes patula, Salvia splendens, Petunia x hybrida, Salix babylonica, Fagus sylvatica, Robinia pseudoacacia, Photinia fraseri, Buxus sempervirens*).

Fig. 2 shows species and cultivars with the highest Summed Dominance Ratio(SDR) in city parks in Prishtina City (*Tagetespatula "Carmen", Salvia splendens "Scarlet Sage", Petunia "Million Bells", Thujaocidentalis "Smaragd", Pynuscaricifera "Kanzan", Tiliatametosa "Brabant"*).

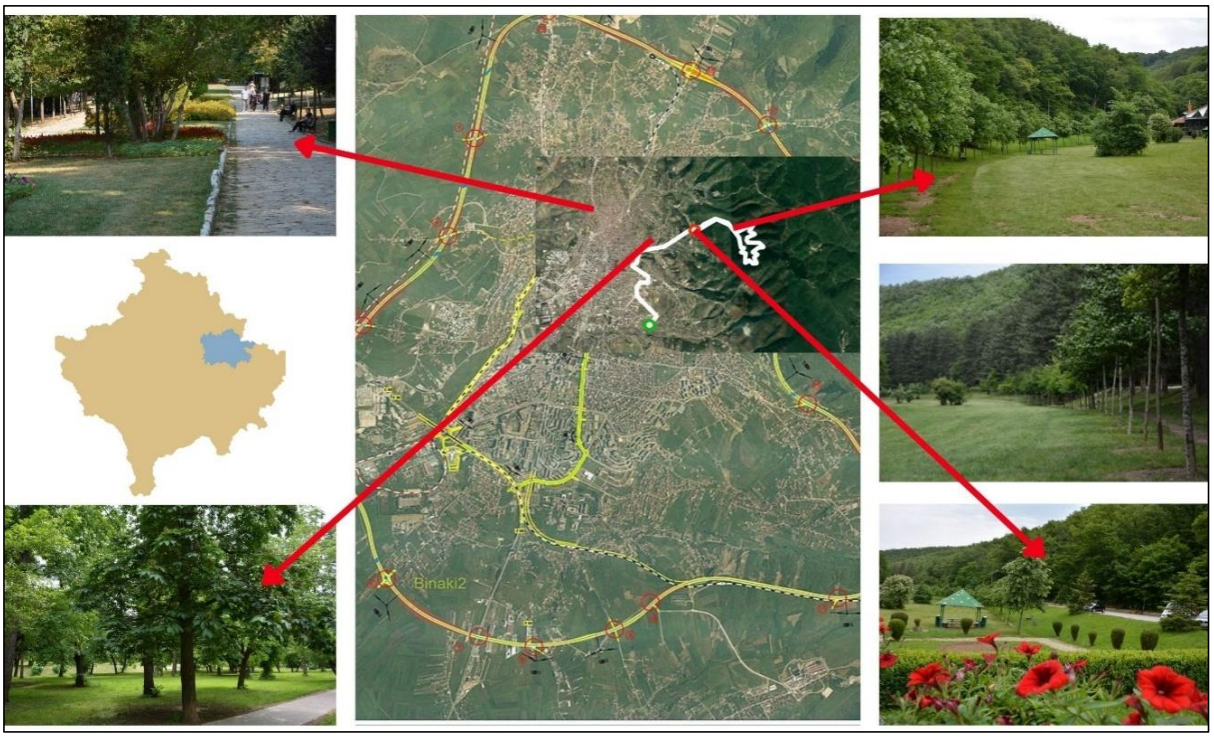

Fig. 1. Photographs of the analyzed green spaces. Geographical location of selected neighborhoods and green spaces in area of Pristina City.

Table 1. Twenty plant species with the highest Summed Dominance Ratio (SDR) in for urban parks in Pristina.

Botanical name	Common name	Plant category	Color leaf
Tilia cordata	Lime	Deciduous	Green
Platanus orientalis	Platanus	Deciduous	Green
Catalpa bigninoides	Catalpa	Deciduous	Green
Betula alba	Brich	Deciduous	Green
Aesculus hippocastanum	Aesculus	Deciduous	Green
Magnolia grandiflora	Magnolia	Evergreen	Green
Prunus cerisfera	Japonese Cherry	Deciduous	Red
Thuja occidetalis	Americanarborvitae	Evergrenn	Green
Tagetes patula	French marigold	Annual plant	Orange
Salvia splendens	Scarlet sage	Annual plant	Red
Zinnia elegans	Zinnia	Annual plant	Green
Petunia hybrida	Petunia	Annual plant	Green
Salix babylonica	Weeping willow	Deciduous	Green
Fagus sylvatica	European Beech	Deciduous	Purple
Robinia pseudoacacia	Black locust	Deciduous	Green
Platanus acerifolia	London plane	Deciduous	Green
Berberis thunbergii	Japanese barberry,	Deciduous	Purple
Forsythia x intermedia	Forsytia	Deciduous	Yellow
Photinia fraseri	Photina	Evergreen	Green
Buxus sempervirens	Boxwood	Evergreen	Green

Plant species diversity index in urban parks in Prishtina City is ranged from 1.21 to 1.67 point in the medium category, except in Dardania Park which was in the low category (0.68). The high diversity of plant species in urban parks provides an important value in biodiversity conservation (Goddard et al., 2010) and puts urban parks as an important habitat of biodiversity (Lepczyk et al., 2017).

The CityPark in Pristina City is one of the oldest parks in the city with an area of 7.6 ha. This park is located near the city center, which is frequented by a large number of visitors.

Fig. 3 shows species and cultivars with the highest SDR in Dardania urban park in (*Viola wittrockiana "Majastic Gaint", Viola wittrockiana "Dynamite", Thuja smaragd, Legustrum ovalifolium, Abies normandiana, Viola x hybrida*).

Bedding plants can be annuals, biennials or perennials. Annuals are plants which are grown from seed, produce flowers and die in one growing season. Biennial plants grow leaves, stems and roots the first year, and then go dormant for the winter. Perennials are plants which are live longer than two years and are typically cold-hardy plants that will return each year in the spring. Perennials play an important role every garden and green public spaces.

Table 2 shows species and cultivars with the highest SDRin Germia park (*Corylus avellana, Tilia platyphyllos, Catalpa bigninoides, Viburnum lantana, Rosa sp., Carpinus betulus, Picea abies, Betula alba, Fagus sylvatica, Quercus pubescens, Acer campestre*).

Table 3 shows species and cultivars with the highest SDR in Taouk bashçe Park in (*Aesculus hippocastanum, Tilia platyphyllos, Potentilla micrantha, Viburnum lantana, Ulmus campestris, Carpinus betulus, Picea pungens, Betula alba, Fagus sylvatica, Hedera helix,Catalpa bigninoides*).

Fig. 2. Plant species diversity and SDR in Pristina City Park.

Fig. 3. Plant species diversity and SDR in Prishtina Dardania Park.

Table 2. Ten plant species with the highest SDR in Germia Park in Pristina City.

Botanical name	Common name	Plant category	Color leaf
Corylus avellana	Hazel	Deciduous	Green
Tilia platyphyllos	Lime	Deciduous	Green
Catalpa bigninoides	Catalpa	Deciduous	Green
Viburnum lantana	Brich	Deciduous	Green
Rosa species	Rosa	Deciduous	Green
Carpinus betulus	Hornbeam	Deciduous	Green
Picea abies	European spruce	Evergreen	Green
Betula alba	Brich	Deciduous	Green
Fagus sylvatica	European Beech	Deciduous	Green
Quercus pubescens	Pubescent oak	Deciduous	Green

Table 3. Ten plant species with the highest SDR in Taoukbashçe Park in Pristina City.

Botanical name	Common name	Plant category	Color leaf
Aesculus hippocastanum	Aesculus	Deciduous	Green
Tilia platyphyllos	Lime	Deciduous	Green
Potentilla micrantha	Pink barren strawberry	Deciduous	Green
Viburnum lantana	Brich	Deciduous	Green
Ulmus campestris	Olmo	Deciduous	Green
Carpinus betulus	Hornbeam	Evergreen	Green
Picea pungens	Blue spuce	Evergreen	Red
Betula alba	Brich	Deciduous	Green
Fagus sylvatica	European Beech	Deciduous	Orange
Hedera helix	Ivy	Deciduous	Red

Conclusions

The manifestation of the concept of a sustainable city of the XXI century, raised the themes at analyzing the role of vegetation and green spaces in urban and suburban areas in the Republic of Kosovo. Urban vegetation of Pristina City is comprised of species of landscaping shrubs, urban trees, flowers, woodland, tall shrub, conifers, herbaceous and other vegetation.

Plant species diversity index in urban parks in Prishtina City is ranged from 1.21 to 1.67 point in the medium category, except in Dardania Park which was in the low category (0.68). The CityPark in Pristina is one of the oldest parks in the city with an area of 7.6 ha. This park is located near the city center, which is frequented by a large number of visitors.Issues regarding urban vegetation, public green spaces per inhabitant, public parks and recreation areas are frequently highlighted as important factors to make the more sustainable, pleasant and attractive for its citizens.

As the city of Pristina is facing some of the same challenges,is an initiative to optimize the provision of urban green environments by establishing 6 new "Parks projects" to 2024 has been implemented.

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