Aldona HARASIMOWICZ

GREEN SPACES AS A PART OF THE CITY STRUCTURE

Aldona **Harasimowicz**, PhD – *Bialystok University of Technology*

Correspondence address:
Faculty of Civil and Environmental Engineering
Wiejska street 45E, Bialystok, 15-351, Poland
e-mail: a.harasimowicz@pb.edu.pl

ABSTRACT: The article describes the role of green areas as an integral element of urban space. The aim of the study is to characterize green spaces in the city and to indicate the most important benefits that these resources generate for both residents and the entire urban system. The method of analyzing the literature of the subject was used to achieve the above objective. The result of this research is an indication of the most important types of urban green spaces and ecological, social and economic values they provide, including identification of a series of connections between the environmental level and social and economic conditions of the cities.

KEY WORDS: urban green spaces, city, urbanization

Introduction

Urbanization affect not only the size and number of cities, but also change the structure of urban areas. One of the dimensions of these changes is the natural environment both in the city itself and outside it. During the systemic changes, as a result of Poland transforming from the command-and-quota economy and shifting towards empowerment, green areas began to disappear on a massive scale, replaced with new developments and increasingly fragmented settlement structures. This process has continued ever since. Throughout this time, approximately 30% of open areas used in a variety of ways have vanished (taken up by the new developments) (Hrehorowicz-Gaber, 2015). Urbanization has negative impacts on the natural environment by exerting pressure on and shrinking green spaces in many cities in Europe, North America, South America, Asia and Africa with the situation in Africa being critical (Abebe, Megento, 2016). Loss of urban green spaces has been recorded in both developing and developed countries, and is dependent on the rate of urban growth often determined by prevailing socio-economic factors (Gairola, Noresah, 2010).

Increased population density and spatial expansion has exerted huge negative impacts on green areas and transforms urban green spaces to impervious landscapes. In recent years, a lot of studies have documented urban growth and consequent loss of urban green spaces (Odindi, Mhangara, 2012). Part of them identify the growth of human settlement on urban fringes as the major cause of loss in green spaces and consequent negative environmental impacts (Yuan et al., 2005). Moreover, urban green spaces in particular have long been recognized as the most critical environmental resource in an urban ecosystem (Gairola, Noresah, 2010).

Urban green spaces play a remarkable role to reduce bad consequences of the rapid rate of urbanization (Li, Pussella, 2017). They have very important part in creating the space of cities because quality of an urban is a result of balanced distribution between buildings, transport infrastructure and green spaces. Besides different types of green areas in the city, their functions and services reveal the impact of quality life (Gülgün et al., 2015). This is why underestimating the importance of green spaces can be dangerous in urban development. The aim of the article is the characterization of urban green spaces based on the literature and indication main benefits appear from their existence for contemporary cities.

What are the green spaces of cities?

The definition of green space has long been argued, and a universally accepted definition of urban green spaces is still lacking. Most developed countries have their own definitions of urban green spaces (Byomkesh et al., 2012). Urban green spaces can be defined as vegetated areas which are found in urban environments and named as semi natural areas in a city (Jim, Chen, 2003). These areas can be covered with natural or man-made vegetation but are present in built-up areas (Li, Pussella, 2017). The term "urban green space" is used to mean formal and informal green sites, and also to refer to "open spaces" that have potential to provide ecological functions (like sports clubs, playing fields, open barren land, etc.) (Qureshi et al., 2010). In reference to green spaces the European Commission (2013) is talking about green infrastructure and defined it as a strategically planned network of high quality natural and semi-natural areas with other environmental features, which is designed and managed to deliver a wide range of ecosystem services and protect biodiversity in both rural and urban settings.

Green spaces in the city consist of various types of natural elements and usually include parks, forest patches, open spaces, residential gardens of narrow strips of trees along streets (Jim, Chen, 2003). Arabi et al. (2014) grouped urban green spaces into four categories:

- public green spaces, usually called parks, which have been allocated for general public to engage in their activities leisurely,
- semi public green spaces such as open spaces in hospitals, government or private departments etc.,
- private green spaces which are the residential garden units maintained by urban residents,
- street green spaces which are the tree layouts along roadways.

Yang et al. (2017) proposed another way to divide green spaces, they have distinguished six types of such areas: Attached Green Spaces (AGS), Park Green Spaces (PGS), Ecological Green Spaces (EGS), Road Green Spaces (RGS), Other Green Spaces (OGS), and Productive Plantation Green Spaces (PPGS) (figure 1).

From the view of land use and cover, green spaces include woodland, farmland, garden plot, grassland, wetland, and garden green space within the built-up areas (Xu et al., 2011). In other words, urban green spaces include all that have the vegetation and provide a wide range of functions that include air and water purification, mitigation of environmental pollution, carbon sequestration, regulation of micro-climate, habitat for urban wildlife, recreation and spiritual and therapeutic value (Odindi, Mhangara, 2012).

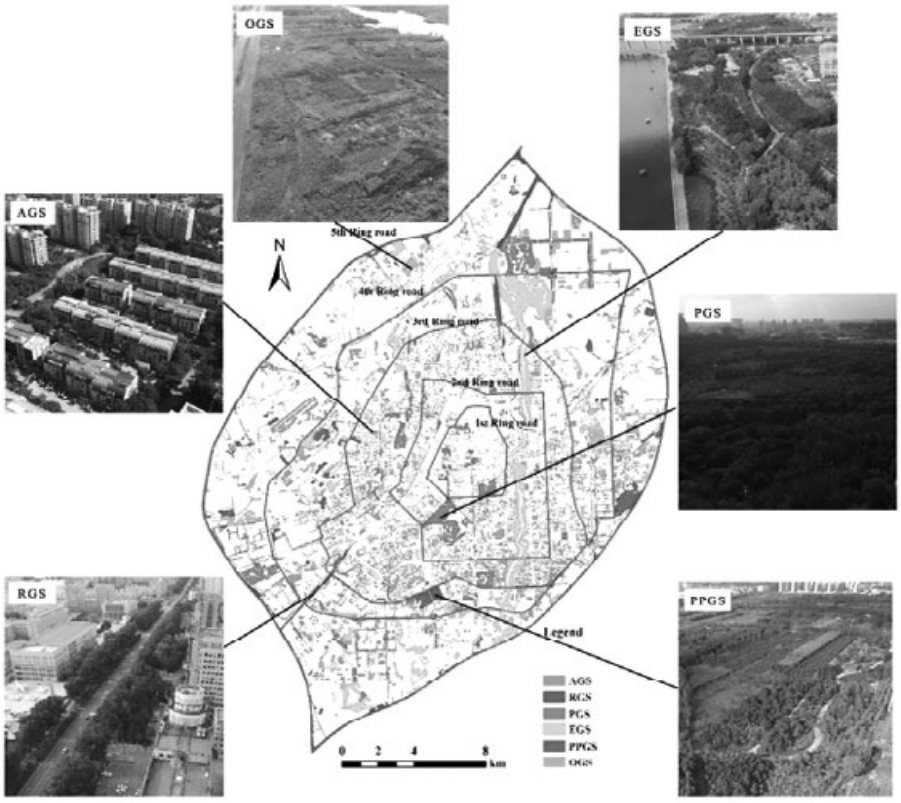

Figure 1. Six types of urban green spaces in Changchun (China)
Source: (Yang et al., 2017).

Urban green spaces have become widely recognized as an important component of the infrastructure in urban areas. Increasing urbanization and development have, however, placed urban green spaces under extreme pressure, threatening their abilities to maintain the basic ecological and social functions upon which human existence depends (Chen et al., 2006). On the other hand, many cities experiencing intensive growth are facing the reduction of green spaces (figure 2, 3, 4), which deepens the existing problems, especially that ecosystem is closely related in other components of urban system – social, economic, cultural or political. For example, Colombo city, the former capital city of Sri Lanka, was nominated as one of the fastest growing urban cities in South Asia by the World Bank in 2013. Yet, Colombo generally has a comparatively, low rate of population growth. Therefore, if the green space reduction rate would be considered.

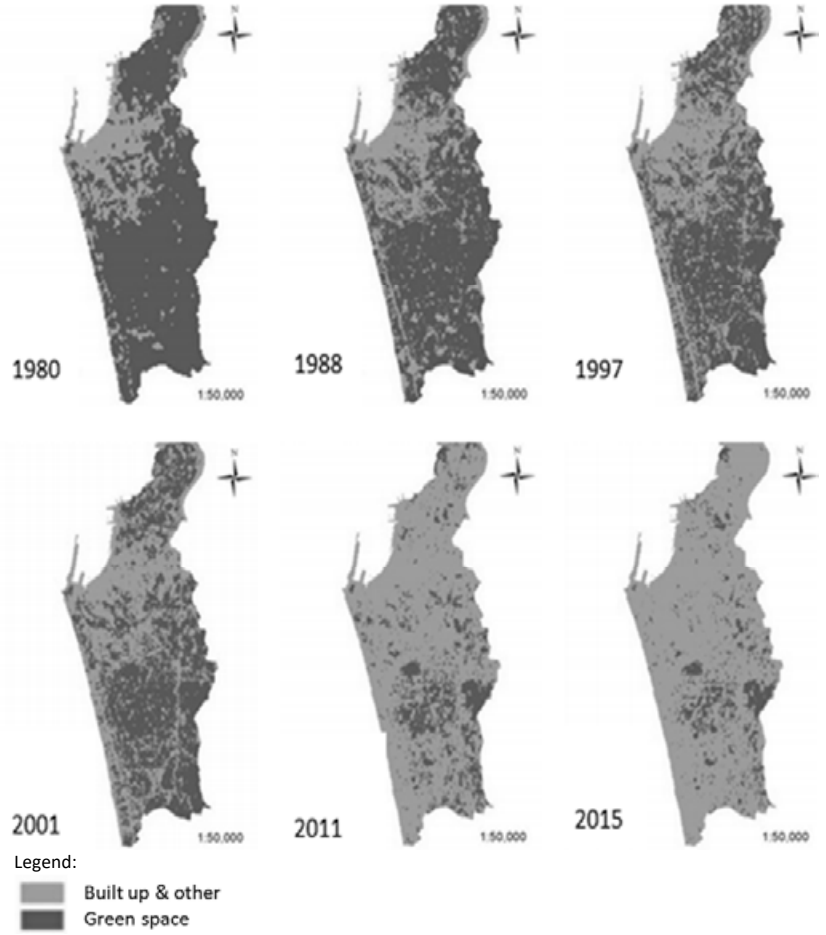

Figure 2. Changes in green spaces in Colombo city, the former capital city of Sri Lanka in 1980, 1988, 1997, 2001 and 2015

Source: (Li, Pussella, 2017).

Colombo could be the worst city with the highest rate of reduction compared with other cities (figure 2) (Li, Pussella, 2017). Addis Ababa hosting nearly 30 percent of the urban population of the Ethiopia was once said "forest city". This unprecedented growth of this city has shrunken green areas in significant scale. The problem is expected to worsen in the coming years due to the massive construction of houses, buildings and roads and the less attention given to green spaces (Abebe, Megento, 2016). In China, however, the distribution of green spaces in cities is not homogeneous. Because green spaces may be insufficient and unequally distributed, conservation of these spaces and their multiple functions is becoming an increasing concern for most Chinese cities (Chen et al., 2006).

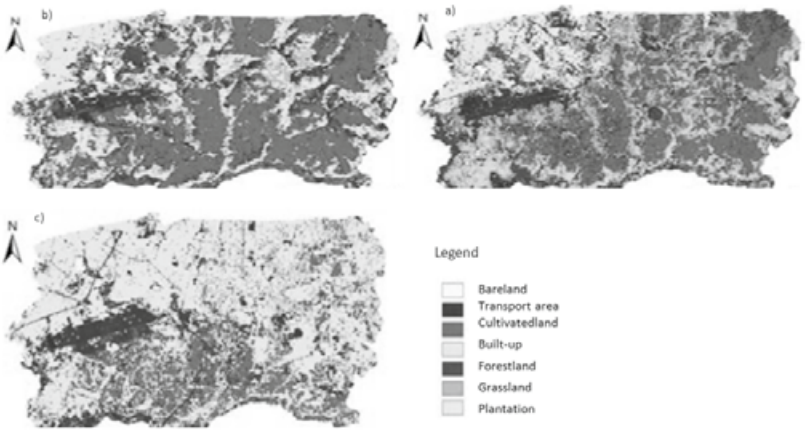

Figure 3. Land use change in 1986 (a), 2000 (b) and 2015 (c) in the city of Addis Ababa, Ethiopia
Source: (Abebe, Megento, 2016).

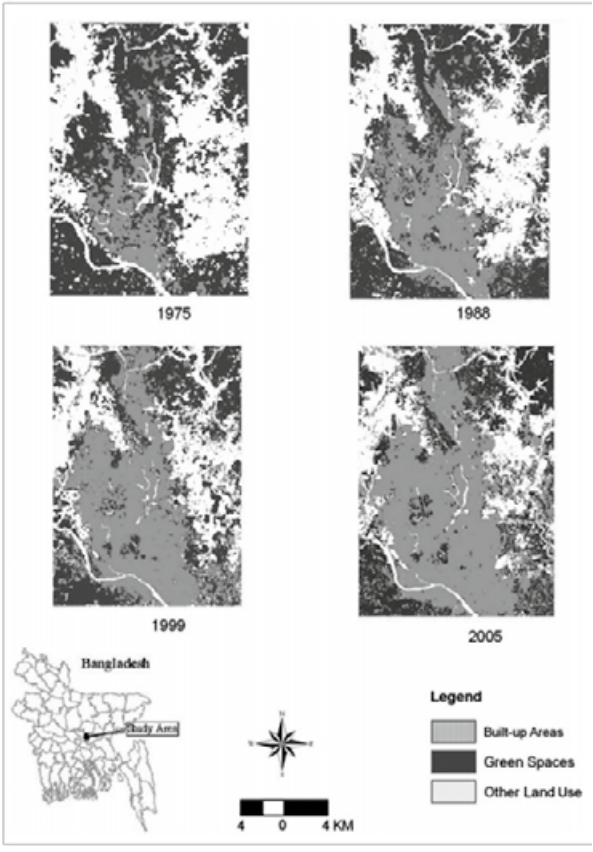

Figure 4. Changes in green spaces in Greater Dhaka the capital of and largest metropolitan area in Bangladesh in 1975, 1988, 1999 and 2005

Source: (Byomkesh et al., 2012).

Parts of urban green spaces

Urban landscape depends on the surrounding area, such as suburban, rural, and bioregional landscapes that are seen in ecological watershed units (Arifin et al., 2009). The largest and most visible parts of green areas in the city space are parks and forests. Urban parks can play an important role in the conservation of biodiversity (Cornelis, Hermy, 2004), they also provide a range of ecosystem services for urban citizens (Heyenga, Savill, 2008). Assessing the accessibility of the urban residents to green spaces, most authors have defined that the urban parks should be within 400 m, it means 5 minutes walking distance, from residencies (Herzele, Wiedemann, 2003). According to the standard which was recommended by National Recreation and Park Association, USA, a space of 0.41 km^2 has to be kept as urban parks for 1000 residents (Nicholls, 2001).

Parks can be designed to perform various functions for city dwellers, so they can be traditional and multifunctional (figure 5). Research shows that urban parks are visited primarily by residents, but it is also an attractive space for visitors from nearby areas and tourists (Schmidt et al., 2016).

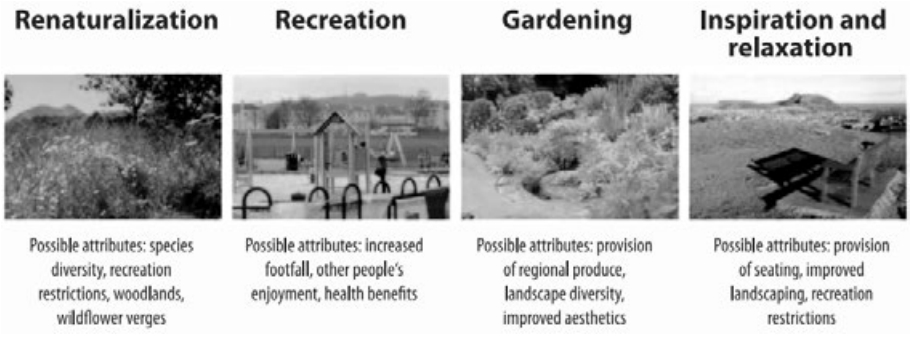

Figure 5. Different types of parks

Source: (Schmidt et al., 2016).

Urban forests play similar role to city space as parks do. General figures for urban open space and urban forests show a wide variance between different European towns and cities. Most woodland is found in the urban fringe. The percentage cover ranges from 1% in Copenhagen to 65% in Stuttgart in the 5 to 10 km ring around the city center (Pauleit et al., 2005). Despite the recognized positive role of forests in metropolitan contexts, a reduction in their functionality has been observed in most urban regions (Tomaoa, 2017). While the percentage of cover of woodlands in Europe's urban areas does not seem to be directly related to their geographic location or the size of urban

areas, four different types of urban woodland (figure 6) could be distinguished (Pauleit et al., 2005):

- closed woodland surrounding the city (e.g. Oslo, Ljubljana),
- woodland islands and belts within the city (e.g. Ljubljana, Munich),
- dispersed woodland within an urban matrix (e.g. Black Country),
- small woodland areas in parks and gardens within the city,
- dispersed woodland in an agricultural matrix around the city (e.g. Florence).

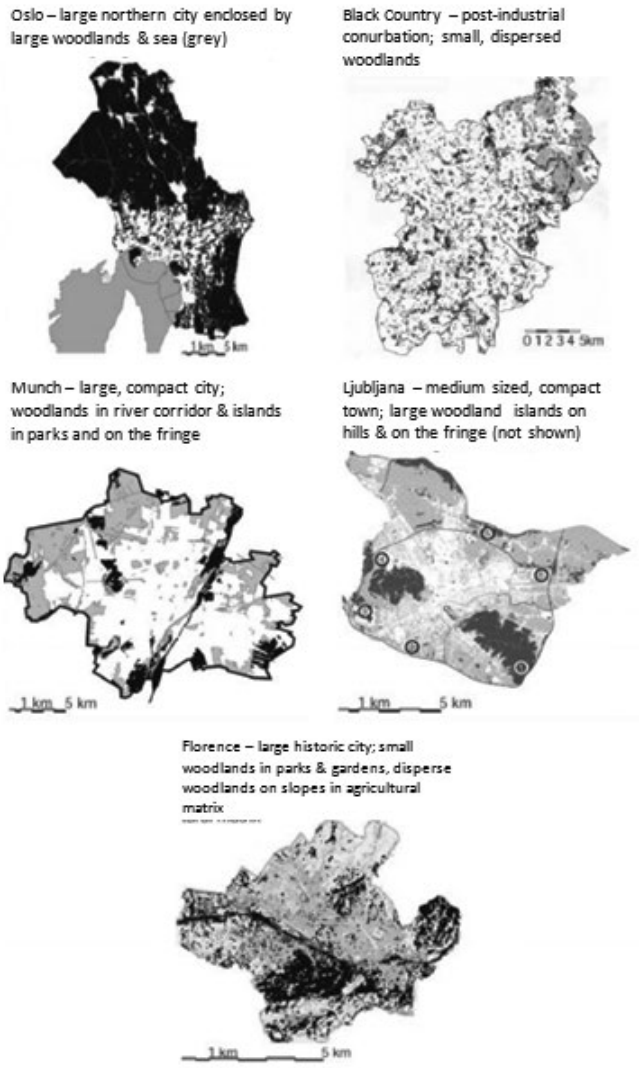

Figure 6. Different types of urban forest (woodlands are shown in black, other open spaces in gray, built-up areas in white)

Source: (Pauleit et al., 2005).

Another element of urban green spaces are private gardens (private green spaces) and roadside green spaces. Private gardens are very heterogeneous in their size and structure and cover a large proportion of urban areas – for example: between 22–7% of the total area of seven UK cities (Loram et al., 2007) or 36% in a small New Zealand city (Mathieu et al., 2007). As a one of the major component of green spaces, privet gardens have vast potential for creating biodiversity benefits (which can varying depends on size and features of gardens) (van Heezik et al., 2012). Roadside green spaces consist of linear corridors between sidewalks (figures 7 and 8). This type of greenery is important not only because its ecological meaning, but it also has aesthetic value. In addition, the design and maintenance of roadside green spaces must comply with the requirements of road safety (e.g. in terms of visibility or roads and pavements contamination).

Figure 7. Roadside green spaces in Jakarta, Indonesia

Source: (Arifin, Nakagoshi, 2011).

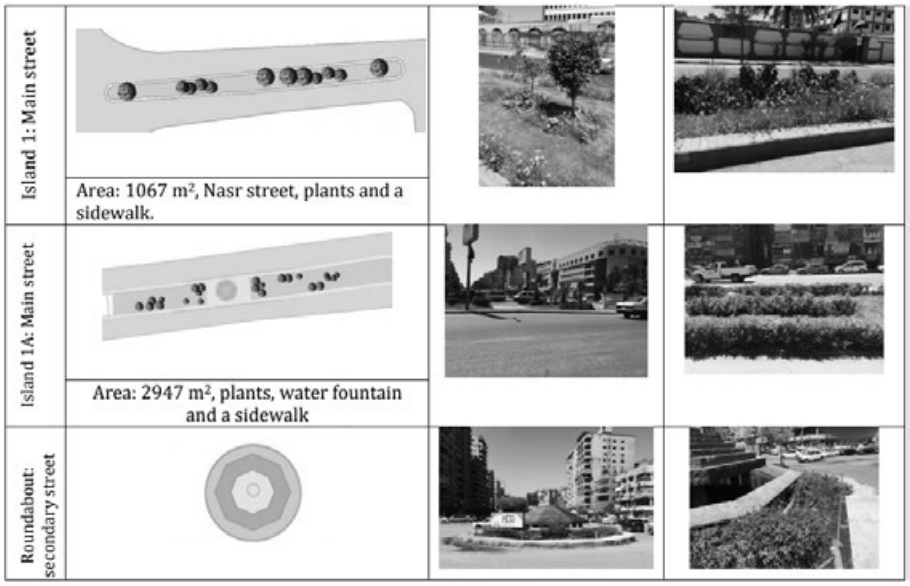

Figure 8. Roadside green spaces in in Naser City, Egipt

Source: (Abd El Aziz, 2016).

In addition to traditional urban green spaces, alternative solutions are now being proposed that increase the spectrum of possibilities for urban nature. This are: vertical gardens, green roofs (figure 9), green terraces (figure 10) and green graffiti (figure 11). Vertical garden structure was invented by French botanist Patrick Blanc and to build them were started in Paris, London, Tokyo and New York since 1988. Vertical garden structure is garden design which consists of vegetations placed on the wall surface. This kind of green elements can improve the air quality of building and can save energy (Gülgün et al, 2015). Roof and terrace gardens are a multifunctional green roof build-up with high water storage. It is suitable for lawns, perennials, and with deeper system substrate, for shrubs and trees. Two types of roof and terrace garden can be distinguished in terms of features and benefit functions: intensive green roof (figure 9 left) which is appropriate to roam or to do various recreational activities, and extensive green roof (figure 9 right) – not suitable both for recreational activities or walking (Gülgün et al, 2015).

Figure 9. Intensive roof garden (left) and extensive roof plantings (right)
Source: (Gülgün et al, 2015).

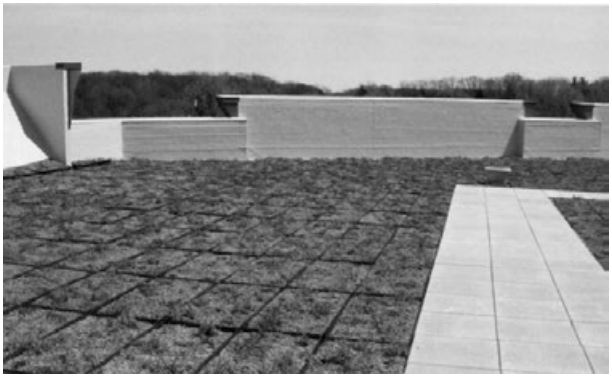

Figure 10. Green terrace
Source: (Berkooz, 2007).

Figure 11. Green graffiti

Source: (Jansen, Ruifrok, 2012).

Roof gardens are becoming more and more popular in urban spaces, for example in U.S. an increasing number of cities now require green roofs in new construction projects – partly to help mitigate global warming. Green roofs slow the flow of rainwater into a storm water system, reduce the energy needed for heating and cooling, and diminish urban heat island effects. More than two million square feet of Chicago's rooftops have been planted with low-growing sedums, native grasses, herbs, and shrubs. Minneapolis, Boston, and other large cities have various "green" requirements as well (Berkooz, 2007).

Benefits of urban green spaces

Green spaces are an inseparable element of the city structure, hence they generate many social, economic and ecological benefits. In the other words, urban green spaces have a constructive role in social, economic and ecological fields and they reduce the negative effects of the urban life (Ignatieva et al., 2011).

Social benefits of existing green spaces are primarily associated with interpersonal relationships and human health. City residents use parks and gardens for restoration and relaxation, exercise and to engage in social interactions. Green spaces within cities are also associated with wider social benefits such as diminished crime, violence, and aggression (Sushinsky et al., 2017). Urban green spaces contribute in a positive manner to maintain public health by facilitating appropriate space for physical exercise to improve physical and psychological well-being, reducing stress, depression and support longevity – their role is seen in improving the quality of life by offering esthetic enjoyment, recreational opportunities, and place for different social

interactions (Li, Pussella, 2017; Loukaitou-Sideris, 2016; Saporito, Casey, 2015; Dinnie et al., 2013; Ozgűner 2011; Irvine et al., 2009; Chiesura, 2004). In this aspects green spaces are especially important – human health and well-being is inextricably linked to experiences of nature and as health problems in cities rise there is a critical need to improve people's access to nature (Sushinsky et al., 2017). The importance of urban parks and green spaces in cities and especially metropolises becomes more evident, when the destructive effects and nonproductive functions of cities in isolation of people from nature, incidence of deceases, psychological pressures caused by crimes in cities and finally the formation of machinery life is realized (Thompson et al., 2002).

Outdoor physical activities in the city are often combined with nature observation, bird watching, photography, or similar directly nature-related activities (Schmidt, 2016). Thus, urban green spaces have also an educational function. Urban green spaces play an important role in the basic education of school children with regard to environment and nature but for academic education and research as well. Urban green spaces are beautiful and therefore have an aesthetic appeal. The presence of urban green spaces in a city increases the quality of life, not only because of their beauty but also because the aesthetic quality of urban green spaces enables people to orient themselves in space and time. Through all this, urban green spaces give neighborhoods their own identity, which makes them more attractive to live in. Urban green spaces can additionally be seen as a compensation for low-quality areas (Rodenburg et al., 2001).

Urban green spaces are important for all residents, but there are particular groups for which they are especially important. For low-income, inner-city seniors in particular, who live in small apartments without private yards and outdoor space, neighborhood parks can offer respite and opportunities for contact with nature, walking, and exercise (Loukaitou-Sideris, 2016). The researchers of 3,144 Tokyo seniors born in 1903, 1908, 1913, and 1918 shown that living in neighborhoods with parks and walkable green spaces positively influenced the longevity of those seniors, independent of age, sex, marital status, income, or baseline functional status (Takano et al., 2002). Rappe et al. (2006) find in their study that self-reported health of older women in a Helsinki nursing home is related positively to more frequent visits to neighborhood parks and green spaces. In addition to seniors, green spaces have special value for children. Green areas plays a significant role in the well-being of children: provide safe play areas for children, have a positive effect on children's cognitive functioning, contribute to their physical, mental, and social development and have an important role in education (Baycan-Levent et al., 2009; Wells, 2000).

One of the most essential issues related to green spaces is the distribution of advantages they generate. Research shows that the benefits of green areas are unevenly distributed. Frequency and manner of using green areas depends on social factors such as age, gender, and education. Socioeconomically disadvantaged areas often have lower quality and quantity of public green spaces, vegetative cover and species richness (Sushinsky et al., 2017). Study proves relationships between racial and economic segregation and differences in exposure to green space between the members of different racial and income groups. Findings generally show that lower-income people and racial minorities live closer to a patch of green space than white people but live in neighborhoods with lower densities of green space (Saporito, Casey, 2015).

Urban expansion significantly affects the natural environment of cities – can causes environmental destruction and pollution. Therefore, green spaces are important from their environmental benefits – they moderate the impact of human activities. Green spaces provide key ecological functions such as carbon storage, producing oxygen, maintenance of air quality, soil conservation, noise buffering, maintain a certain degree of humidity in the atmosphere, regulate rainfall, groundwater protection, reduction of air temperature, form the basis for the conservation of fauna and flora and maintain biodiversity of the city (Bao et al., 2016; Baycan-Levent et al., 2009; Irvine et al., 2009; Chen et al., 2006). Urban green areas contribute to the maintenance of a healthy urban environment by providing clean air, water, and soil, protection against natural hazards, improve the urban climate and maintain the balance of the city's natural urban environment. They preserve the local natural and cultural heritage by providing habitats for a diversity of urban wildlife and conserving a diversity of urban resources (Baycan-Levent et al., 2009).

Economic benefits of urban green spaces are generally connected with market values they generate – in direct and indirect meaning. From an economic perspective, urban greening improves the social wellbeing of city residents in a variety of ways. The greening projects tend to reduce costs related to urban sprawl and infrastructure provision, attract investment, raise property values (Baycan-Levent et al., 2009). Developed areas close to green spaces are the most preferred areas in cities and have higher economic values. Recent research has also shown that green spaces increase the value of nearby area (Biao et al., 2012; Özgüner et al., 2012).

The cities of today have to be lively, offering diverse, integrated functions which attract users, investors and tourists, whilst also enhancing the quality of life of the local residents (Cilliers et al., 2015). Environment quality becomes key for urban competitiveness. Urban green spaces improve urban environmental quality, reduce energy costs, invigorate local economies:

provide employment opportunities, attract businesses and boost urban tourism (Shirazi, Kazmi, 2015; Byomkesh et al., 2012; Odindi, Mhangara, 2012; Baycan-Levent et al., 2009).

Urban green spaces might also deliver products such as fuel, wood, medicine or food and also compost and energy as a result of urban green production (Byomkesh et al., 2012; Rodenburg, et al., 2001). For example, in the American city Ann Arbor (Michigan) many sedums, grasses, and herbs are grown on green roofs, giving economic development (Berkooz, 2007). However, Rodenburg et al. (2001) note that the values of timber production and of picking mushrooms and berries in urban forests are lower than in rural areas. This is because the environmental conditions for growth are limited due to pollution, fragmentation of forests and trampling effects. In addition, the net revenues from timber are usually fairly small if any, because management of areas is relatively expensive due to small-scale management practices.

Despite the many benefits that urban green spaces give, it should be emphasized that they may involve some negative aspects. They can also be a source of crime and therefore be unsafe, especially at night. Urban green space is often seen by some criminals as an attractive place for doing illegal business and the homeless may choose to sleep there. This has to do with the camouflage abilities of urban green space, a park with many bushes and dark places is more dangerous than open space (Rodenburg et al., 2001). Among other inconveniences from green spaces are indicated: causing some allergies, limbs falling from tree sidewalk damaged by tree roots, sap dripping from tree, leaves, flowers, fruits, or seed pods falling from tree, tree roots clogging sewers, insects in tree, darkened streets creating issues of security, unsightly in appearance when not maintained (Chen et al., 2006).

Conclusions

Regardless of the city location, green spaces are today an indispensable element of the "healthy" urban structure. Green areas satisfy a wide spectrum of needs of the entire urban system, especially its residents. Due to their unique benefits, urban green spaces have been recognized as one of the most important components of urban areas (Tian et al., 2012). As Thompson (2002) indicates, in the future, the social and spatial implications of new lifestyles, values, and attitudes toward nature and sustainability will lead to even higher demands for urban green spaces. There is no doubt that urban green areas provide an added value to the urban environment. Therefore, green spaces should be the subject of well thought out planning in cities, so that their quantity, quality, type and distribution contribute to maximizing

the benefits they give and at the same time contributed to the sustainable development of urban areas.

Design and maintenance of urban green spaces should take into account such parameters of the city as population, environmental conditions, climate conditions and different cultural behaviors of immediate residents. As urban expansion and urban population growth are continuous phenomenon, keeping green spaces in accordance with appropriate standards is a challenging task (Li, Pussella, 2017). The two greatest challenges that planners face today in the city are controlling costs and creating more livable spaces in urban areas (through sustainable design) (Abd El Aziz, 2016) and find the good balance between protecting green spaces and developing urban spaces because land use is considered an important factor in urban economic growth and development (Cilliers et al., 2015).

Acknowledgements

This research has been realized within the framework of the project S/WBiIŚ/4/2016.

Literature

Abd El Aziz N.A. (2016), *Water sensitive landscape case study: public open green spaces in Naser City, Egypt*, "Journal of Landscape Ecology" Vol. 9, No. 3, p. 66-83

Abebe M.T., Megento T.L. (2016), *The City of Addis Ababa from 'forest city' to 'urban heat island': assessment of urban green space dynamics*, "Journal of Urban and Environmental Engineering" Vol. 10, No. 2, p. 254-262

Arabi Z., Hatami D., Jadidoleslami M. (2014), *Analysis of the pattern of spatial-local distribution of green space (case study of Mehr city in Iran)*, "Indian Journal of Scientific Research" No. 8(1), p. 197-202

Arifin H.S., Nakagoshi N. (2011), *Landscape ecology and urban biodiversity in tropical Indonesian cities*, "Landscape & Ecological Engineering" No. 7, p. 33-43

Arifin H.S. et al. (2009), *Analisis Lanskap Agroforestri*, IPB Press, Bogor, p. 199

Bao T. et al. (2016), *Assessing the Distribution of Urban Green Spaces and its Anisotropic Cooling Distance on Urban Heat Island Pattern in Baotou, China*, "International Journal of Geo-Information" Vol. 5, No. 2, doi: 10.3390/ijgi5020012, p. 1-20

Baycan-Levent T., Nijkamp P. (2009), P*lanning and Management of Urban Green Spaces in Europe: Comparative Analysis*, "Journal of Urban Planning & Development" Vol. 135, No. 1, p. 1-13

Berkooz C.B. (2007), *Green Roofs: A Way to Start Small, Planning*, "American Planning Association" August/September, p. 14-15

Biao Z. et al. (2012), *The Effects of Public Green Spaces on Residential Property Value in Beijing*, "Journal of Resources and Ecology" Vol. 3, No.3, p. 243-252

Byomkesh T., Nakagoshi N., Dewan A.M. (2012), *Urbanization and green space dynamics in Greater Dhaka, Bangladesh*, "Landscape & Ecological Engineering" No. 8, p. 45-58

Chen B., Bao Z., Zhu Z. (2006), *Assessing the Willingness of the Public to Pay to Conserve Urban Green Space: The Hangzhou City, China, Case*, "Journal of Environmental Health" Vol. 69, No. 5, p. 26-30

Chiesura A. (2004), *The role of urban parks for the sustainable city*, "Landscape and Urban Planning" Vol. 68, No.1, p. 129-138

Cilliers E.J. et al. (2015), *Green Place-making in Practice: From Temporary Spaces to Permanent Places*, "Journal of Urban Design" Vol. 20, No. 3, p. 349-366

Cornelis J., Hermy M. (2004), *Biodiversity relationships in urban and suburban parks in Flanders*, "Landscape and Urban Planning" No. 69, p. 385-401

Dinnie E., Brown K.M., Morris S. (2013), *Community, cooperation and conflict: Negotiating the social well-being benefits of urban green space experiences*, "Landscape and Urban Planning" No. 112, p. 1-9

European Commission (2013), *Building a Green Infrastructure for Europe. Publications Office of the European Union*, doi: 10.2779/54125, p. 7

Gairola S., Noresah M.S. (2010), *Emerging trend of urban green space research and implications for safe guarding biodiversity: A viewpoint*, "Nature and Science" Vol. 8, No. 7, p. 43-49

Gülgün B. et al. (2015), *Alternatives of the green tissue in the city centres*, "International Journal of Ecosystems and Ecology Sciences" Vol. 5, No. 1, p. 17-22

Herzele A.V., Wiedemann T. (2003), *A monitoring tool for the provision of accessible and attractive urban green spaces*, "Landscape and Urban Planning" No. 63, p. 109-126

Heyenga S., Savill J. (2008), *New management for Brisbane's natural assets*, "ECOS" No. 144, p. 14-15

Hrehorowicz-Gaber H. (2015), *Role of green areas for space integration of Kraków's Metropolitan Area, "*Bulletin of Geography. Socio-economic Series" No. 28, p. 69-76

http://evdekora.com/resim/2012/10/cati-bahceleri-5.jpg/ [22-04-2014] http://v1.raf.com.tr/images/Image/product/2012/39/11_02.jpg/ [22-04-2014]

Irvine K.N., Devine-Wright P., Payne S.R., Fuller R.A., Painter B., Gaston K.J. (2009), *Green space, soundscape and urban sustainability: an interdisciplinary, empirical study*, "Local Environment" Vol. 14, No. 2, p. 155-172

Ignatieva M., Stewart G.H., Meurk C. (2011), *Planning and design of ecological networks in urban areas*, "Landscape and Ecological Engineering" Vol. 7, No. 1, p. 17-25

Jansen R., Ruifrok R.J. (2012*)*, *Presentation on principle design process for Place Des Wallons, Louvain-la-Neuve*, Belgiquo, University of Applied Science, Van Hall Larenstein, p. 24

Jim C.Y., Chen S.S. (2003), *Comprehensive green space planning based on landscape ecology principles in compact Nanjing city, China*, "Landscape Urban Planning" No. 65, p. 95-116

Li L., Pussella P.G.R.N.I, (2017), *Is Colombo City, Sri Lanka secured for urban green space standards?*, "Applied Ecology And Environmental Research" Vol. 15, No. 3, p. 1789-1799

Loram A. et al. (2007), *Urban domestic gardens (X): the extent and structure of the resource in five major cities*, "Landscape Ecology" No. 22, p. 601-615

Loukaitou-Sideris A. et al. (2016), *Parks for an Aging Population. Needs and Preferences of Low-Income Seniors in Los Angeles*, "Journal of the American Planning Association" Vol. 82, No. 3, p. 236-251

Mathieu R., Freeman C., Aryal J. (2007), *Mapping private gardens in urban areas using object-oriented techniques and very high resolution satellite imagery*, "Landscape and Urban Planning" No. 81, p. 179-192

Nicholls S. (2001), *Measuring the accessibility and equity of public parks: a case study using GIS*, "Managing Leisure" No. 6, p. 201-219

Odindi J.O., Mhangara P. (2012), *Green Spaces Trends in the City of Port Elizabeth from 1990 to 2000 using Remote Sensing*, "International Journal of Environmental Research" Vol.6, No.3, p. 653-662

Özgüner H., Eraslan Ş., Yilmaz S. (2012), *Public perception of landscape restoration along a degraded urban streamside*, "Land Degradation & Development" Vol. 23, No. 1, p. 24-33

Özgǔner H. (2011), *Cultural differences in attitudes towards urban parks and green spaces,* "Landscape Research" Vol. 36, No. 5, p. 599-620

Pauleit S. et al. (2005), *Urban Forest Resources in European Cities* in: C.C. Konijnendijk et al. (eds), *Urban Forests and Trees*, Berlin, Heidelberg, New York, p. 49-80

Qureshi S., Breuste J.H., Lindley S.J. (2010), *Green Space Functionality Along an Urban Gradient in Karachi, Pakistan, A Socio-Ecological Study*, "Human Ecology. An Interdisciplinary Journal" No. 38, p. 283-294

Rappe E., Kivela S.L., Rita H. (2006), *Visiting outdoor green environments positively impacts self-rated health among older people in long-term care*, "Horttechnolog" Vol. 16, No. 1, p. 55-59

Rodenburg C. et al. (2001), *Urban Economic Indicators for Green Development in Cities*, "Greener Management International" No. 36, p. 105-119

Saporito S., Casey D. (2015), *Are There Relationships Among Racial Segregation, Economic Isolation, and Proximity to Green Space*?, "Human Ecology Review" Vol. 21, No. 2, p. 114-131

Schmidt K. et al. (2016), *The Sociocultural Value of Upland Regions in the Vicinity of Cities in Comparison With Urban Green Spaces*, "Mountain Research and Development" Vol. 36, No 4, p. 465-474

Shirazi S.A., Kazmi J.H. (2016), *Analysis of socio-environmental impacts of the loss of urban trees and vegetation in Lahore, Pakistan: a review of public perception*, "Ecological Processes" Vol. 5, No. 5, p. 2-12

Sushinsky J.R. et al. (2017), *Maintaining experiences of nature as a city grows*, "Ecology and Society" Vol. 22, No. 3, p. 1-12

Takano T., Nakamura K., Watanabe M. (2002), *Urban residential environments and senior citizens' longevity in megacity areas: The importance of walkable green spaces*, "Journal of Epidemiology and Community Health" Vol. 56, No. 12, p. 913-918

Thompson C.W. (2002), *Urban open space in the 21st century*, "Landscape and Urban Planning" No. 60, p. 9-72

Thompson R., Crowe T.P., Hawkins S.J. (2002), *Rocky intertidal communities: past environmental changes, present status and predictions for the next 25 years*, "Environmental Conservation", Vol. 29, No. 2, p. 168-191

Tian Y., Jim C.Y., Tao Y. (2012), *Challenges and Strategies for Greening the Compact City of Hong Kong*, "Journal of Urban Planning and Development" Vol. 138, No. 2, p. 101-110

Tomaoa A. et al. (2017), *Resilient landscapes in Mediterranean urban areas: Understanding factors influencing forest trends*, "Environmental Research" Vol. 156, p. 1-9

Wells N.M. (2000), *At home with nature. Effects of 'greenness' on children's cognitive functioning*, "Environment and Behavior" Vol. 32, No. 6, p. 775-795

Xu X. et al. (2011), *Green Space Changes and Planning in the Capital Region of China*, "Environmental Management" No. 47, p. 456-467

Yang Ch. et al.(2017), *The Effect of Urban Green Spaces on the Urban Thermal Environment and Its Seasonal Variations*, "Forests" No. 8 (153), p. 1-19

Van Heezik Y.M., Dickinson K.J.M., Freeman C. (2012), *Closing the Gap: Communicating to Change Gardening Practices in Support of Native Biodiversity in Urban Private Gardens*, "Ecology and Society" Vol. 17, No. 1, p. 1-9

Yuan E. et al. (2005), *Land cover classification and change analysis of twin cities (Minesota) metropolitan area by multi-temporal Landsat remote sensing*, "Remote Sensing of Environment" No. 98, p. 317-328