

THE VALUE OF URBAN PARKS IN LODZ

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Abstract

An awareness of the role of public space is growing among the inhabitants of cities. This space is an integral part of our daily lives. It consists of places outside the home where we spend free time, i.e. the streets we walk on, the squares and greeneries where we meet, as well as playgrounds, parks and green areas where we rest and do sports. The quality of such space affects many aspects of human life.

Positive trends in terms of growing public awareness do not, however, seem to be reflected in the awareness and actions of public entities in Poland, strong evidence of which are the widely criticized amendments of regulations governing the felling of trees.

The goal of this article is to present the different dimensions of the value of urban parks, as well as to apply the direct use approach to measure the recreational value of the park system in Lodz. Expressing different aspects of the value of public space, especially parks, in monetary units and incorporating these values in spatial planning analysis can contribute to a significant improvement in the quality of life of urban dwellers and their perception of urban space.

Key words: *green spaces, parks, public space, value, direct use.*

JEL Classification: *R30, D03, D70.*

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1. Introduction

Cities are economic entities; they can be considered both as economic units as well as areas, which are sets of economic entities. They constitute a mosaic of built-up and open spaces. Prosperous urban centers are equipped with adequate housing, as well as commercial, office and industrial facilities to provide residents with high quality conditions for living, working and consumption. There are also numerous public facilities and public spaces in cities, providing a variety of services, enabling mobility, meetings, leisure and sports.

In prosperous and developing cities, private and public spaces complement and stimulate each other by generating synergic effects, far exceeding the sum of the individual components. In cities which are in crisis and shrinking, some aspects of interrelationships between the components of space become distorted: areas of production, trade, transport, or housing resources may be unsuited to the demands or expectations, and public spaces may be too restricted, poorly equipped or poorly maintained (THE TRUST FOR PUBLIC LAND 2010).

In recent years, public space has become more and more common in scientific and public debate on the design and management of urban space. As a result of this discussion, we begin to realize the role this kind of space plays in modern cities. Increasingly rich literature on the subject points to numerous benefits and explores the value of open space in cities (CÖMERTLER 2007; CZOCHANSKI 2010; GODZINA 2015). Green areas, especially those which form a system of urban parks, are an integral element of the urban system. Such areas are increasingly valued due to their social, environmental and health aspects (CÖMERTLER 2007, MAKSYMIOUK 2013). The knowledge and awareness that open space generates various economic benefits is also increasing among urban researchers (GRUEHN 2008).

The quality of green spaces and other public spaces is an important element contributing to a competitive advantage and attracting businesses, residents and tourists to the city (CÖMERTLER 2007; GODZINA 2015; SZCZEPANOWSKA 2012). Contemporary cities are increasingly competing with each other to gain the interest of these groups (BARAN 2014). The influx of tourists brings income to local businesses and residents, which then translates into increased tax revenues. Newly emerging, relocating or expanding businesses increase the city's tax base and create jobs. New residents flowing into the city also contribute to the expansion of the tax base and, moreover, increase the resources of local human and social capital.

The quality of life is among the important factors contributing to the attractiveness of cities from the inhabitants' perspective and an essential location criterion from the perspective of businesses (THE GREATER PARIS INVESTMENT AGENCY, KPMG 2015). The CUSHMAN & WAKEFIELD study (2011) shows that the quality of life and environmental quality are among the 12 key criteria to be considered when choosing a location for a business.

Apart from economic, infrastructural, social and environmental factors, the quality of life is also one of the pillars of the prosperity of cities (UN-HABITAT UNITED NATIONS HUMAN SETTLEMENTS PROGRAMME 2012). It is determined by the varied opportunities for the use of goods available to individuals and the freedom to make choices in the use of them (SEN 1999). The quality of life is the result of all the activities, policies and sectoral programs implemented by municipal authorities and the synthesis of all dimensions of prosperity. Cities with a high quality of life generate jobs, provide their inhabitants with a high quality of infrastructure, environment and housing resources, as well as broad access to public goods, such as education, health care, public transport and public spaces, with a particular focus on green areas (THE NEW CHARTER OF ATHENS 2003, WDOWIARZ-BILSKA 2010). Economic development and the quality of life are interdependent. On the one hand, skilled workers are attracted to cities ensuring a high level of satisfaction of material and non-material needs. On the other hand, the available resources of human capital attract companies seeking qualified staff and the possibility to offer them friendly living conditions. A tax base increased by the growth of the population and businesses, in turn, allows for raising the standard and availability of public goods (UN-HABITAT UNITED NATIONS HUMAN SETTLEMENTS PROGRAMME 2012).

Green spaces in cities also play an important ecological role and are, therefore, an important element improving the quality of the environment (CÖMERTLER 2007; SZCZEPANOWSKA 2012). This aspect will be elaborated on in the next part of the article.

Parks, as well as squares, schools, churches, and other meeting venues are key resources of the local community. Such institutions form a network of social relationships and can contribute to the growth of security, prosperity and the integration of local communities.

Despite the arguments set out above, little attention continues to be paid to green space in public debate and space management practice. In many cities, the issues of providing, protecting and improving the quality of these areas are ignored or neglected (UN-HABITAT UNITED NATIONS HUMAN SETTLEMENTS PROGRAMME 2012). This results in serious long-standing negligence and the poor condition of this type of space, which not only translates into significant reductions in the potential benefits, but can also be a factor in the progressive degradation of certain urban areas, since neglected and underserved parks are conducive to the development of crime and are associated with areas of poverty and exclusion (GRUEHN 2008).

Cities constitute a broad field of research. Previous studies on their functioning primarily explored the issues of housing, manufacturing, commerce and culture. Issues related to the management of non-urban spaces in the city, in particular those relating to green areas and their functions, are still not treated in the same way as other aspects of the urban economy (CÖMERTLER 2007; GIERGICZNY, KRONENBERG 2012; SZCZEPANOWSKA 2010). This is due to the scarcity of financial resources dedicated to the preservation of nature in the city and the failure of decision-makers to see what value city dwellers attribute to nature (GIERGICZNY, KRONENBERG 2012). Many participants in the urban development process perceive green areas as a burden on the municipal budget. As a result, green areas are losing when faced against many other infrastructural and construction needs when spatial and financial decisions are made. This results in a steady reduction of vegetation cover and removal of trees to provide space for new investments (SZCZEPANOWSKA 2010).

Finding the answer to the question of what added value parks bring to the urban system can make the role of parks in the entire system better understood and properly appreciated. Estimating and attributing a specific monetary value to green areas will help compare this sphere of management

with others, such as transport, housing, trade, etc. Analysts and researchers can gain important information to help them understand the role of parks and their place in the urban economy. Increasing the knowledge of planners, urban planners, municipal authorities, and residents in this regard may result in more conscious and effective urban space management. Entities managing the city will also gain hard data, motivating them to place greater importance on the care of these areas. Quantifying the value of the benefits generated by green areas can help change their perception by the city authorities. Green areas will no longer be seen as unused areas which require maintenance. Instead, they will be understood as a resource, generating a variety of benefits from the perspective of the city and its inhabitants, requiring rational management in order to maximize these benefits.

The purpose of this paper is to present the different dimensions of the value of urban parks, as well as to apply the direct use approach to measure the recreational value of the park system. The purpose of the research is also to draw the attention of decision-makers, city dwellers and researchers to the value of green areas and the need to take that value into account at the stage of making planning or investment decisions. The scope of work covers the area of Lodz, the third city in Poland in terms of recorded population.

2. Literature review

2.1. Green spaces on the basis of literature and Polish legislation

Urban green areas are, undisputedly, classified as an important element of the public space system of cities. Parks and greenery are listed on equal footing with squares and streets, as a strategic factor in providing the city with public areas for meetings and widely understood recreation, as well as other activities (SUTKOWSKA 2006). Public space is defined in the current Act of 27 March 2003 on Spatial Planning and Land Development as an area of special importance for meeting the needs of residents, improving the quality of their lives, and facilitating social contacts due to its location and functional and spatial features (Art. 2, point 6 of the ACT OF 27 MARCH 2003 ON SPATIAL PLANNING AND LAND DEVELOPMENT 2003).

At the same time, urban green spaces are not clearly defined or identified. Their classification is also varied. Generally, they can be classified by their functions, development and area. According to these criteria, urban greenery is divided into parks, green squares, sports facilities, gardens, cemetery greenery, street greenery, protective greenery, communal forests, allotment gardens (community gardens), lawns, and natural greenery. These areas are included in spatial development (GODZINA 2015). GIEDYCH (2003) gives examples of the classification of green areas based on the criteria of function, location, availability, level of service to the residents and category of leisure space. SZUMAŃSKI and NIEMIRSKI (2005) suggest detailed classification which takes into account the overriding criterion of utility function, and distinguish nearly 80 subgenres of green areas (BOŻĘTKA 2008).

The use of terms “green” and “green areas” interchangeably broadens the scope of this concept and gives the possibility of including the green areas of residential housing estates, roadside greenery, insulating greenery, and even vines, in this category (SOBCZYŃSKA 2014).

An ambiguous understanding of the term “green areas” can also be observed in the legal acts in force in Poland. Article 5 of the Act of 16 April 2004 on Nature Protection defines green areas as sites set up with technical infrastructure and buildings functionally associated with them, covered by vegetation and performing public functions, in particular parks, greenways, promenades, boulevards, botanical gardens, zoological gardens, parks for children and historic parks and cemeteries, green areas along roadsides in built-over areas, and greenery on squares, historic fortifications, buildings, depots, airports, railway stations and industrial facilities (Art. 5 point 21 of the ACT OF 16 APRIL 2004 ON NATURE PROTECTION 2004).

Green areas under Polish legislation are recognized as (SOBCZYŃSKA 2014):

- a) A component of urban greenery (Act of 16 April 2004 on Nature Protection),
- b) civil engineering objects (in the Polish Classification of Buildings) or
- c) recreational and leisure areas (Classification of Land and Buildings).

The lack of clear criteria for the definition of green areas, as well as the lack of a precise legal approach, make it difficult to identify such sites in practice.

Literature on the subject also recognizes the category of an urban greenery system. This is a conventional conceptual unit comprising urban green areas, organized into an organizational arrangement, usually referring to the urban composition. Conventional, inter alia, because this system is characterized by reference to the natural structures of the neighborhood - it is usually extended in open areas of the suburban zone and then becomes part of the network of ecological relationships on a supra-local scale. The administrative boundaries of the city, on the other hand, unnaturally restrict the area of the system (BOŻĘTKA 2008).

2.2. The role and importance of urban green areas

This paper focuses on urban green areas, and in particular on city parks, which create a system of recreational areas. Arranged greenery has various functions and generates a wide range of diverse benefits, both from the perspective of local residents and local businesses, as well as the city and its authorities. These benefits are diverse; they can be achieved through direct income, increased wealth, and also in the form of direct savings.

Functions performed by urban green areas, as well as the benefits generated by them, can be classified into one of three groups, i.e. economic, social and ecological (Fig. 1).

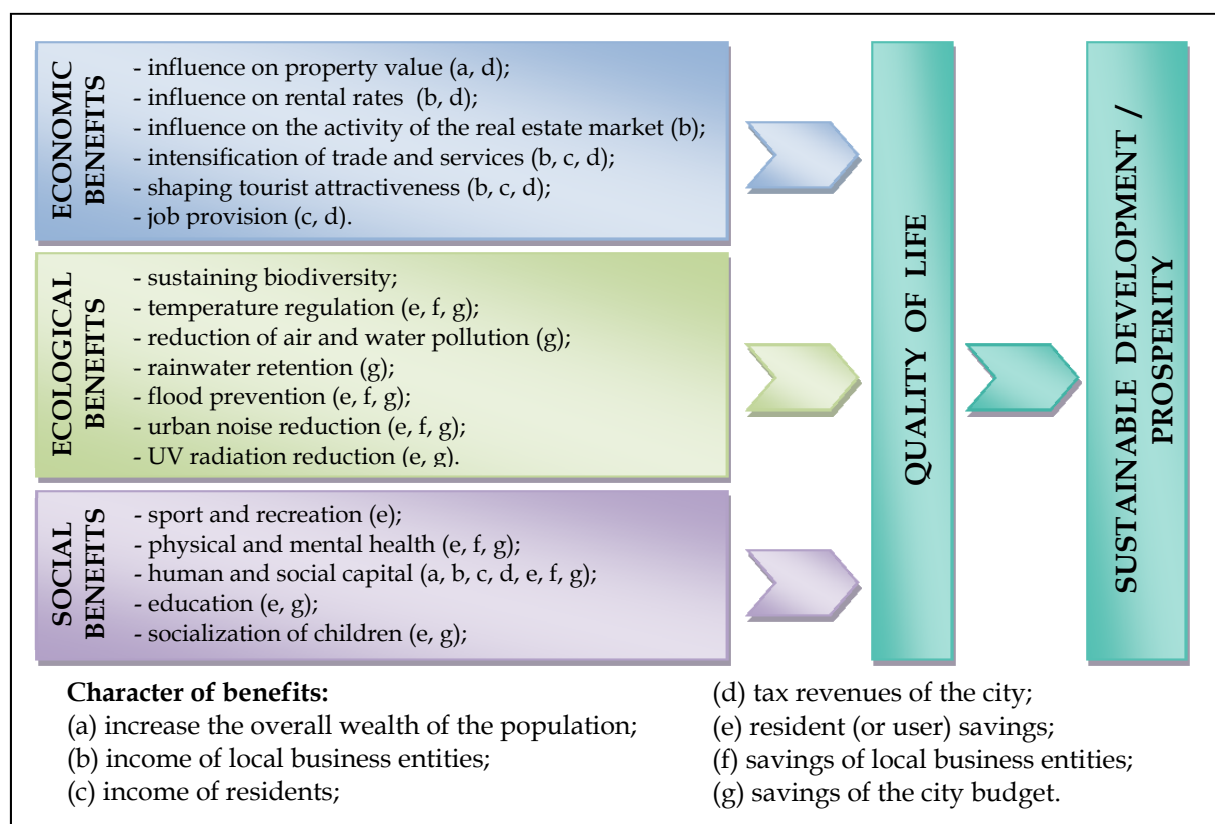


Fig. 1. Benefits generated by urban green areas. *Source:* Own study on the basis of literature review, inter alia: DE BRUN 2007; CROMPTON 2005; FAUSOLD, LILIEHOLM 1996; LUTTIK 2000, PARKS FORUM 2008; THE TRUST FOR PUBLIC LAND 2010; THE TRUST FOR PUBLIC LAND 2009; THE TRUST FOR PUBLIC LAND AND PHILADELPHIA PARKS ALLIANCE 2008; WOLF 2004.

In the group of economic benefits, we will find a number of effects observed on the real estate market. Higher property values can be observed in the vicinity of well-functioning public spaces, including attractively developed and well-maintained parks (ACTIVE LIVING RESEARCH 2010; CÖMERTLER 2007; CROMPTON 2005; JIM, CHEN 2006; JIM, CHEN 2010; MAKSYMIUK 2013; SAZ SALAZAR, MENENDEZ 2007; SZCZEPANOWSKA 2010; THE TRUST FOR PUBLIC LAND AND PHILADELPHIA PARKS ALLIANCE 2008; THE TRUST FOR PUBLIC LAND 2009). Potential buyers are often willing to pay more for property located near parks, whether they plan to actually use the nearby green areas or not. Even the very view of a green area, or awareness that such an area can be found in the neighborhood may be an incentive to pay a higher price. The results achieved by various authors fall into a fairly diverse.

Research conducted in the Netherlands (LUTTIK 2000) presents a variety of relationships between the location of a property in the vicinity of open space and transaction prices on the real estate market. In Apeldoorn, the prices of houses near a park (up to 400 m) were higher by an average of 6%, while the view of a park brought an additional 7% premium compared to similar properties in other locations. A study in Hong Kong's Quarry Bay District found that there was a 16.88% premium due to the proximity of a park, including 1.95% resulting from a view of it (JIM, CHEN 2010). A study conducted for Warsaw, found a statistically significant impact of the area of the nearest green infrastructure facility on property prices (MAKSYMUK 2013).

The impact of parks found in the neighborhood on property prices and values can be diverse, both in terms of the strength and direction of the relationship. There have been reported cases of no impact of such surrounding on the value of real estate, as well as the presence of a negative relation. John Crompton (DE BRUN 2007) presents four possible scenarios for the impact of the proximity of parks on the value of real estate (Fig. 2). Both, a positive as well as negative impact on the value of real estate is possible:

- A large, good quality park, well-maintained and cared for, has a positive effect on the value of real estate located up to approx. 600 m away.
- A smaller, good quality park, well-maintained and cared for, positively assessed by the residents, has a positive effect on the value of properties located up to approx. 150 m away.
- A large, crowded park, with a high level of noise and traffic intensity lowers the value of properties in the immediate vicinity, but increases the value of properties located at a distance, that is out of reach of the inconvenience, though still ensuring easy access to the park (i.e., approx. 2 blocks).
- A poorly-maintained, poorly lit, dirty park, with damaged equipment, seen as a meeting place for undesirable groups of people, lowers the value of property in the neighborhood.

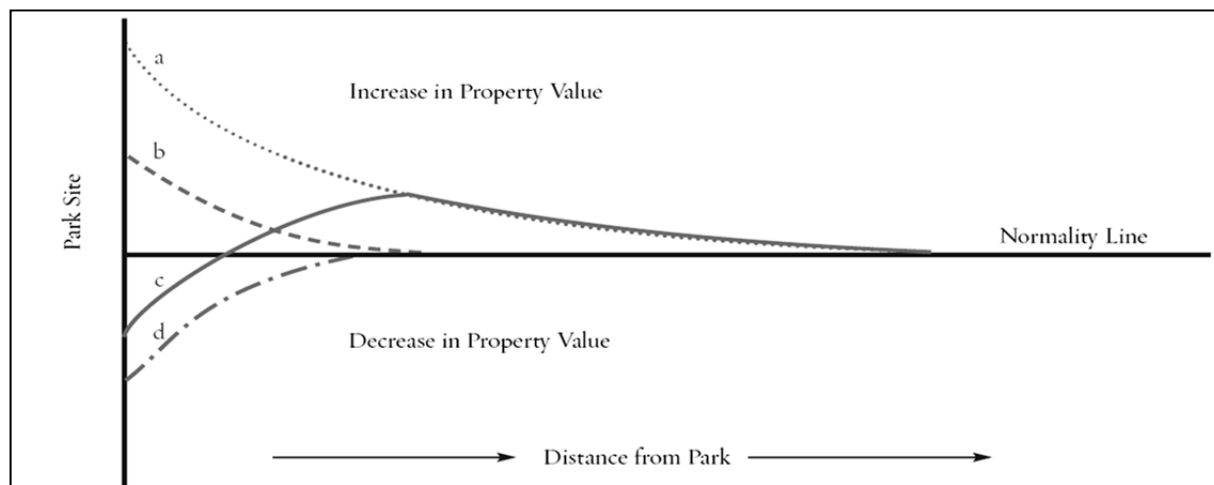


Fig. 2. Alternative scenarios of the impact of parks on the value of nearby residential real estate.

Source: DE BRUN 2007, p. 8.

The relationships described above highlight an extremely important aspect of urban space management - the direction and intensity of these impacts depends not only on the size of green areas, but, above all, on their condition, quality, recreational opportunities, image and level of security.

However, the benefits from the presence of parks observed on the real estate market extend well beyond the price and value aspect; they can also be observed in terms of the duration of the market exposure period (JIM, CHEN 2007; WETLI 2010) and the activity and prices on the rental market. Studies of commercial rents have shown that, in the case of real estate located in wooded areas of high quality landscape, rents were, on average, 7% higher (WOLF 2004). Following the renovation of Bryant Park in New York, a 60% increase in tenants' activity in the neighborhood was observed accompanied by an increase in rental rates of 40% within 24 months of completing the investment (URBAN LAND INSTITUTE 2011).

High-quality public space also attracts more buyers, which may translate into higher sales in retail business districts (KOZLOFF 2012; SZCZEPANOWSKA 2012; WOLF 2004) and generate additional jobs (THE

TRUST FOR PUBLIC LAND AND PHILADELPHIA PARKS ALLIANCE 2008; THE TRUST FOR PUBLIC LAND 2009; PARKS FORUM 2008). Research conducted by Kathleen Wolf (2004) demonstrates that people are willing to pay 10% more for products purchased in an area where trees appear, compared to similar areas devoid of these elements of the landscape.

Good quality parks, apart from cultural infrastructure, historical sites, monuments, diverse events and recreational infrastructure, may also be among the factors attracting tourists. Tourists spend money on food, accommodation, various attractions, and shopping at the locations they chose to visit. These spendings constitute the income of local business entities. Revenue from tourism contributes to an increase in the wealth of the inhabitants of the area and the tax revenues of local and supra-local authorities. The spendings of tourists are an external inflow to the local economy, and its level reflects the attractiveness and competitiveness of an area, gained also thanks to the existence of specific spatial development. Revenue from tourism can be a powerful impetus for the local economy. Apart from direct economic benefits resulting from the development of tourism, it is also worth stressing that tourist attractiveness is one of the elements of a competitive advantage over other territorial units.

Open green spaces generate a whole range of ecological benefits, for example: maintaining biodiversity, a milder climate, reducing air and water pollution, preventing floods and local flooding, reducing rainfall removed by urban sewerage, and reducing urban noise and UV radiation (DE BRUN 2007; CHIESURA 2004; CÖMERTLER 2007; CZERWIENIEC, LEWIŃSKA 1996; FAUSOLD, LILIEHOLM 1996; URBAN LAND INSTITUTE 2011; WOLF 2004; THE TRUST FOR PUBLIC LAND AND PHILADELPHIA PARKS ALLIANCE 2008; THE TRUST FOR PUBLIC LAND 2009; SZCZEPANOWSKA 2007).

Parks and other green areas are habitats for plants and animals. In addition to providing opportunities for the survival of diverse species, they also offer education for children and adults (PARKS FORUM 2008) through observation of nature and field activities, as well as providing space for research and experimentation.

Green areas of cities are responsible for improving air quality (SZCZEPANOWSKA 2007). Plants capture some of the gaseous pollutants and dust from the air. The main pollutants removed by the plants are: carbon monoxide and carbon dioxide, ozone, sulfur dioxide, nitrogen dioxide and dust pollution (particulate matter). The reduction of pollution by the Philadelphia park system generates \$1.53 million in municipal savings (THE TRUST FOR PUBLIC LAND AND PHILADELPHIA PARKS ALLIANCE 2008), and \$19.87 million in Washington (THE TRUST FOR PUBLIC LAND 2009). Total annual savings resulting from the reduction of urban air pollution in the US are estimated to be at \$3.8 billion (DE BRUN 2007).

Green areas filter and reduce water pollution; they capture and store rainwater, thereby relieving the urban sewer system and reducing the risk of flooding and local flooding (CZERWIENIEC, LEWIŃSKA 1996). It is estimated that a 100% green areas retain up to 90% of rainwater, an area that is 75% impervious stores 45% of water, while a 100% impervious area (e.g. asphalt covered parking) holds only 2% of rainwater, while the remaining 98% runs off into the sewerage system (DE BRUN 2007). The savings achieved through the reduction of the amount of wastewater by green spaces in Philadelphia are estimated to be at \$5.95 million a year (THE TRUST FOR PUBLIC LAND AND PHILADELPHIA PARKS ALLIANCE 2008).

Urban green areas also provide a number of benefits which can be classified as the social sphere, which include providing recreation and sports facilities, venues for meeting and exchanging views, education, inspiration for integration around various initiatives, socialization of children, physical and psychological health, and the promotion of culture and healthy living (CÖMERTLER 2007, SZCZEPANOWSKA 2007).

Parks provide many opportunities for city residents to enjoy sports and recreation, such as walking, running, cycling or roller-skating, football, basketball, volleyball, table tennis, tennis, mini-gyms and children's playgrounds. If parks were not publicly available, or if there were no parks at all, their users would have to spend some of their income on the use of recreational or sport areas. Most of the listed activities are free of charge; therefore, their availability generates direct savings for users. Research on the recreational function of green areas was conducted in Poland in relation to forests. In these studies, the average consumer surplus for a single visit to the forest was estimated at PLN 13.51 per capita. The total economic surplus for recreational benefits was at the level of PLN 3.31 billion a year, which means that the economic surplus for recreational benefits per hectare of forest is PLN 363 a year (ŻYLICZ, GIERGICZNY 2013).

Space for pedestrian and bicycle traffic (paths, less traffic, wide sidewalks, access to green and recreational areas) helps to increase the physical activity of children and adults (JIM, CHEN 2007, BEDIMO-RUNG ET AL. 2005). This can reduce the risk of becoming overweight and obesity, chronic diseases such as diabetes or heart disease, as well as cancer (URBAN LAND INSTITUTE 2011). American studies show that the introduction of moderate physical activity reduces the average annual medical costs by \$865 per person (WOLF 2004). Based on this type of research, one can estimate the total savings in medical expenses resulting from the physical activity of the residents. In Philadelphia, these savings were estimated at \$69.42 million for 2007, and in Sacramento - at \$19.87 million (THE TRUST FOR PUBLIC LAND AND PHILADELPHIA PARKS ALLIANCE 2008).

Some of the benefits of urban green areas result in other benefits or increase their scale. For example, the reduction of pollution and improving air and water quality has a positive impact on the general health of the population.

Public space, including green spaces, also integrates the local community and contributes to the creation of social capital. It is a place for meetings and interactions, creates and strengthens interpersonal relations, and inspires initiatives aimed at protecting or rehabilitating these places. Such initiatives often result in the creation of interest groups and attract volunteers who get to know each other, establish contacts, and learn cooperation and negotiation skills, as well as building a sense of pride and civic responsibility (PARKS FORUM 2008).

3. Data and methods

3.1. Methods of measuring the value of the benefits generated by urban parks

Urban parks, as elements of public space, are classified as public goods, characterized by the impossibility (or very high cost) of excluding anyone from their consumption, and also by the fact that the use of such goods by one person does not reduce or limit their use by other consumers. Due to the inability to exclude people from consumption, public goods acquire a non-market character. It is, therefore, not possible to measure their value on the basis of observations of transaction prices (FAUSOLD, LILIEHOLM 1996).

The assessment of public space value is difficult because it performs many functions at the same time, while the created different types of values are measured in different ways and expressed in different, often incomparable, units (FAUSOLD, LILIEHOLM 1996).

Methods of estimating the monetary value of non-market effects and goods (and non-market benefits and costs) are based on measuring (PRICE 2003):

- 1) measurable effects arising from non-market goods and effects (e.g., effects generated on the real estate market, income of local business entities, inhabitants or the city budget);
- 2) savings observed in comparison to another location or costs incurred in other locations to achieve the same result;
- 3) the value of similar products being the object of market exchange in another location;
- 4) the volume of voluntary contributions (offerings and donations) for purposes or campaigns related to the availability of non-market goods;
- 5) consumers' willingness to pay for non-market goods;
- 6) willingness to pay for or spendings on market goods, which allow access to non-market goods.

The potential benefits associated with the impact of parks on the value of real estate translate primarily into the increased wealth of their owners. On the scale of a city, we can identify these types of relationships indirectly by examining transaction prices on the real estate market. The basic assumption in this kind of analysis is that we prefer to live in an attractive area, *inter alia*, in the neighborhood of parks. If people are, in fact, willing to pay more for an apartment near a park than for a similar property in a less favorable location in this respect, this fact should be confirmed by the distribution of housing prices on the local market.

The Hedonic Pricing Method (HPM), which makes it possible to verify the above assumption, is a revealed preference method. This method consists in analyzing the transaction prices observed on a given local real estate market by formulating an econometric model, explaining the relationship between the price and the particular characteristics of the properties sold. A hedonic model is designed to isolate the impact of individual features on real estate prices (SAZ SALAZAR, MENENDEZ 2007; ACTIVE LIVING RESEARCH 2010; CROMPTON 2005; THE TRUST FOR PUBLIC LAND AND PHILADELPHIA PARKS ALLIANCE 2008; THE TRUST FOR PUBLIC LAND 2009; JIM, CHEN 2006, 2010).

There are also methods for estimating the benefits of tourism associated with green areas, such as the Travel Cost Method (TCM). This method is based on estimating the travel expenses to a given place (such as a reservation or national park). In this case, we assume that the benefits of visiting certain areas are at least equal to the costs incurred by individual visitors. The sum of these costs therefore provides the value of the area for visitors. This method is mainly used for large areas, which are recognized tourist attractions and are the primary destination of most visitors to the area (JIM, CHEN 2010). However, it does not produce satisfactory results in relation to urban parks.

In the case of urban tourism, parks are only part of the leisure time offer and may be one of the reasons for visiting a city, though, generally, they do not tend to be the only destination for tourists. In this case, it is worth looking closer not so much into the benefits from the perspective of tourists, but at the benefits from the perspective of the city, its inhabitants and local businesses. These benefits are estimated by distinguishing a group of tourists who have visited at least one park during their stay in a given city and for whom the park was one of the purposes of visiting the city (THE TRUST FOR PUBLIC LAND AND PHILADELPHIA PARKS ALLIANCE 2008; THE TRUST FOR PUBLIC LAND 2009, 2010). Expenditure incurred by this group of tourists contributes to the revenue of local entrepreneurs from tourism associated with green areas.

Valuing environmental benefits consists, most often, in estimating the savings generated by the urban system of green areas. The savings result from the comparison with alternative costs, such as, for example, the reduction of pollution. These costs are calculated on the assumption of a lack of green areas and the need to use other methods of removing such pollutants (THE TRUST FOR PUBLIC LAND AND PHILADELPHIA PARKS ALLIANCE 2008; THE TRUST FOR PUBLIC LAND 2009, 2010). A similar measurement method is used for measuring the benefits of rainwater retention. The value of benefits, in this case, is the sum of the alternative costs which would have to be incurred if the areas storing significant quantities of rainwater were replaced by impervious areas.

The method for measuring the benefits connected with recreation and a wide offer of sports will be discussed in the next chapter.

The level of social capital and its economic value are difficult to assess but, for Philadelphia, they were quantified indirectly by measuring the amount of time and financial resources residents have allocated to engaging in initiatives such as “friends of parks”. In 2007, the value of these efforts in Philadelphia was estimated at \$8.6 million (THE TRUST FOR PUBLIC LAND AND PHILADELPHIA PARKS ALLIANCE 2008). At the same time, this calculation did not take into account interpersonal benefits (knowledge and skills acquired by volunteers) and benefits resulting from community building (interaction, meeting new people, creating a network of contacts, etc.).

3.2. Method for estimating the direct use value of recreation

Parks attract two types of users - city dwellers and tourists. The benefits associated with the use of green areas by tourists and the method of measuring their value were discussed in the previous chapter. Unlike the benefits of tourism, however, the benefits of using parks by residents will not reflect the expenses incurred by this group. Although residents of the city incur a variety of expenses, for example associated with travel to green areas, these are only transfers between entities of the same local economy, which do not change the overall level of community affluence. The benefits of the inhabitants result from the direct use of the parks. We quantify these benefits by using the direct use approach.

Parks, as a local resource, provide a wide range of sports opportunities and recreation. The most common activities are walking, running, cycling, skating, and skateboarding, as well as team games such as football, basketball or volleyball (including beach volleyball), but also the use of outdoor gyms, playgrounds for children, etc.

Although recreational services offered by urban parks are usually available free of charge, we can estimate their value by referring them to fees charged for the same or similar commercial activities. The question we will seek to answer is: if there were no public parks in the city, what would the inhabitants (consumers) pay for the ability to take part in similar activities offered by private entities? Unfortunately, only some of the activities have relatively close substitutes on the basis of which one might attempt to make such an estimate.

Another method of estimating the value of benefits offered by most of the activities available in parks is the Unit Day Value technique applied under the direct use approach (THE TRUST FOR PUBLIC LAND AND PHILADELPHIA PARKS ALLIANCE 2008; THE TRUST FOR PUBLIC LAND 2009). In this technique,

we count the value of the benefit separately for each activity. To do this, we assign monetary value to each activity and estimate the demand for that activity (the number of people involved in it, including the frequency of the activity).

Although nature has no price, we know that it has value. This value is revealed when people make different decisions, such as choosing to live near green areas or protesting against the removal of trees in the city. We can also learn the value by asking the inhabitants of the city how much the specific components of nature or the services they provide are worth to them. To conduct such a study, it is necessary to create of a hypothetical scenario which assumes the possibility of changing the state of the good which we value. In this way, we may learn the marginal willingness to pay for that good or service, i.e., the value which the inhabitants attribute to its availability (GIERGICZNY, KRONENBERG 2012).

Due to the characteristics of public goods, a market for these goods does not exist. Therefore, the only way to estimate the benefits provided by public goods is to create a hypothetical market where people will be able to make hypothetical purchases of public goods (GIERGICZNY, KRONENBERG 2012). Such a market, where the respondents were able to make hypothetical transactions, was created for the purposes of this study.

The approach used for this study is derived from the Contingent Valuation (CV) methodology. The Contingent Valuation Method consists in asking the respondents about their Willingness to Pay (WTP) for ecosystem services (GIERGICZNY, KRONENBERG 2012; SAZ SALAZAR, MENENDEZ 2007).

A survey concerning forested areas (TYRVÄINEN 2001), conducted in the Finnish towns of Joensuu and Salo, found that two out of three residents were ready to pay for recreation in urban green areas (€7-9 per month). The so-defined benefits of recreation in these areas clearly outweigh the costs incurred, during the same time, for their maintenance by public institutions. It was assumed that the above mentioned costs would be incurred in the form of a fee for the use of recreational areas and a tax preventing potential development in them (GIERGICZNY, KRONENBERG 2012).

3.3. Study area and data

The study area is Lodz, a city in central Poland with ca. 700,000 inhabitants and an area of 293 km². Green areas are an important asset to Lodz. There are 35 parks located within the borders of the city with an area exceeding 500 ha. The area of forests in Lodz is 2,378 ha, including the largest urban forest in Europe - Lagiewniki forest (FUNDACJA SENDZIMIRA 2011). Green spaces take up approximately 13% of the area of Lodz, i.e., about 50 m² per inhabitant. Forests represent 7% of the area of the city, parks - 3%, allotment gardens - 2%, and cemeteries - 1%. Based on statistical analysis of basic indicators related to urban green space planning, including changes in the area of green spaces, BAYCAN and NIJKAMP (2012) suggested that Lodz scored poorly in this field when compared with other European cities (CZEMBROWSKI, KRONENBERG 2016). Lodz also scored poorly in pan-European studies on urban green space availability (FULLER, GASTON 2009; KABISCH, HAASE 2013), which suggests that increasingly scarce green spaces should be a desired non-market good (CZEMBROWSKI, KRONENBERG 2016).

The only Polish study using a direct valuation method in the context of urban greenery was performed in Lodz and suggested that its inhabitants were willing to pay for increasing the number of streetside trees in the city center were they to be given such an opportunity (GIERGICZNY, KRONENBERG 2014).

Another study conducted in Lodz considered the influence of different environmental characteristics on residential real estate prices (CZEMBROWSKI, KRONENBERG 2016). In this study, the vicinity of Lagiewniki forest, small forests and large parks, as well as the percentage of greenery in a 500 m radius were considered as amenities. Apartments located closer to large parks were characterized by higher prices than those located further away. A one percent increase of the distance to the nearest large park was estimated to result in a loss of PLN 57, i.e. a 1.5% decrease in the average price of a square meter. The general importance of urban green space for apartment buyers was reflected in the influence of the percentage of greenery within a 500 m radius. The study proved that, on average, an additional 1% of greenery increased the apartment sale price by PLN 3.95 per square meter (CZEMBROWSKI, KRONENBERG 2016).

Data needed to apply the direct use approach are most often obtained through questionnaire surveys in which respondents (park users) are asked about the frequency of taking part in particular

activities and willingness to pay for the use of parks.

The questionnaire was administered, face-to-face, on a sample of the Lodz population, with interviews conducted in public places. For the purpose of this paper, a questionnaire survey was conducted in 15 locations: 13 urban parks (1 Maja, 3 Maja, Helenow, Julianowski, na Mlynku, nad Jasieniem, Poniatowskiego, Reymonta, Staromiejski, Staszica, Stawy Jana, na Zdrowiu, Zrodliska), on the premises of the Lodz Gallery and the Manufaktura shopping complex. In the period from mid-October to mid-November 2015, a total of 495 questionnaires were completed.

The purpose of the survey was to obtain data on the frequency of using urban parks by their users, taking into account individual activities, and estimate the willingness to pay for a single use of the activities made available by the parks. Respondents were asked specific questions about the frequency of being involved in various activities in the parks and the willingness to pay for the ability to take part in these activities. Based on the responses, the annual number of visits to the Lodz parks was defined and broken down into individual activities, and the average willingness to pay for them was estimated. Only activities offered free of charge were included in the surveyed activities, thus tennis was deliberately omitted, as practicing this sport involves the payment of fees.

The following assumptions were made for calculation purposes:

- 1) to a greater or lesser degree 30% of inhabitants of the city use urban parks in Lodz¹, with a population of 700,982², the number of users is 210,295;
- 2) Lodz residents visit urban green areas for 8 months of the season (from March to October);
- 3) during a single visit to the park, only one activity is carried out;
- 4) the willingness to pay, demonstrating the benefits of sport and recreation, is the average of indications of those who declare participation in a given activity (actual users).

4. Empirical results

Out of 495 people surveyed, only nine respondents (1.82%) indicated that they did not use Lodz urban parks at all; the others were identified as users of this type of space. The dominant activities during a single visit to the park were identified based on the respondents' answers (Table 1).

Table 1

Number of park users by activity, dominant activity during a single visit and frequency of use

No.	Activity	Dominant activity during a single visit	Number of users	Percentage of users in terms of frequency				
				Everyday	Twice a week	Once a week	Once a month	Sum
1	Walking	23.91%	50,280	17.39%	27.23%	19.91%	35.47%	100.0%
2	Resting on a bench	14.99%	31,523	12.46%	25.82%	16.91%	44.81%	100.0%
3	Walking the dog	14.28%	30,026	36.31%	34.39%	12.74%	16.56%	100.0%
4	Observing nature	11.30%	23,760	19.17%	27.46%	22.28%	31.09%	100.0%
5	Running	9.53%	20,033	14.67%	28.26%	27.17%	29.89%	100.0%
6	Meeting with friends	7.36%	15,479	4.42%	20.08%	28.51%	46.99%	100.0%
7	Riding a bicycle	6.92%	14,545	10.30%	23.64%	28.48%	37.58%	100.0%
8	Playing with children	5.83%	12,250	9.63%	31.85%	21.48%	37.04%	100.0%
9	Football	1.39%	2,931	4.26%	21.28%	27.66%	46.81%	100.0%
10	Participating in cultural, sports and other events	1.31%	2,762	0.93%	5.56%	8.33%	85.19%	100.0%
11	Rollerblading or Skateboarding	1.11%	2,342	2.38%	21.43%	28.57%	47.62%	100.0%

¹ A study on the recreational use of green spaces in Lodz indicated that 77.5% of inhabitants visit parks for recreational purposes in their free time, 46.4% visit sports facilities and 42% - cemeteries (JAKÓBCZYK-GRYSZKIEWICZ et al. 2008). In this study, the author, at first, cautiously assumed that the proportion of inhabitants visiting parks for recreational purposes is 10%, but the findings of the study provided reasons for reconsidering this assumption.

²Population on 31 December, 2015 according to Central Statistical Office of Poland.

12	Chess	0.75%	1,584	0,0%	23,53%	23,53%	52,94%	100.0%
13	Basketball	0.54%	1,128	0,0%	15,63%	15,63%	68,75%	100.0%
14	Volleyball	0.47%	998	0,0%	8,8%	17,6%	73,5%	100.0%
15	Table tennis	0.31%	652	0,0%	8,0%	12,0%	80,0%	100.0%
SUM		100.0%	210,295					

Source: Own study.

The respondents' answers show that the most frequently mentioned activities in urban parks involved walking, resting on benches, observation of nature, walking dogs, running and cycling. Urban green spaces are also frequently visited to spend time with children and friends. Team sports, such as football, volleyball or basketball, are less popular in parks, which may be due to the lack of adequate sites and facilities.

Indications of the dominant use of parks were used to determine the number of users in regards to individual types of activity. Respondents were also asked about the frequency of participating in particular activities (Table 1). Their responses were used to estimate the number of individual visits per year by activity and frequency (Table 2).

In order to estimate the number of users for a given frequency, the number of users by activity was multiplied by the appropriate percentage characterizing the frequency of visits. In the case of walks, among the 50,280 declared participants, 8,744 people (17.39%) performed this activity daily, 13,691 people (27.23%) twice a week, 10,011 people (19.91%) once a week, and 17,834 (35.47%) once a month. The estimated numbers of users were then multiplied by the number of visits which characterize the frequency. During the assumed 8 months of the year (March to October), users make:

- 245 visits at a daily frequency,
- 70 visits at a frequency of two per week,
- 35 visits at a frequency of one per week or
- 8 visits at a frequency of one per month.

Table 2

Estimated annual benefits deriving from recreation in urban parks in Lodz

Activity	Annual number of visits by frequency				Total number of visits per year	Average willingness to pay (in PLN per visit)	Annual benefits (in PLN)
	Everyday	Twice a week	Once a week	Once a month			
1 Walking	2,142,356	958,423	350,348	142,670	3,593,797	1.76	6,325,083
2 Resting on a bench	962,535	569,664	186,614	112,997	1,831,810	1.57	2,875,942
3 Walking the dog	2,670,803	722,924	133,875	39,780	3,567,382	2.37	8,454,697
4 Observing nature	1,115,960	456,725	185,275	59,091	1,817,052	1.90	3,452,399
5 Running	720,210	396,306	190,532	47,905	1,354,952	2.06	2,791,201
6 Meeting with friends	167,535	217,578	154,480	58,187	597,780	1.95	1,165,671
7 Riding a bicycle	367,163	240,662	145,014	43,725	796,564	2.45	1,951,581
8 Playing with children	289,010	273,130	92,102	36,296	690,538	3.07	2,119,951
9 Football	30,560	43,658	28,378	10,977	113,573	4.45	505,399
10 Participating in cultural, sports and other events	6,266	10,742	8,057	18,824	43,890	6.64	291,428
11 Rollerblading or Skateboarding	13,663	35,132	23,422	8,922	81,139	1.98	160,655

12	Chess	0	26,089	13,044	6,709	45,842	2.13	97,643
13	Basketball	0	12,342	6,171	6,206	24,719	3.66	90,473
14	Volleyball	0	6,164	6,164	5,871	18,199	3.41	62,060
15	Table tennis	0	3,651	2,738	4,172	10,561	3.36	35,486
SUM								30,379,668

Source: Own study.

This means that 8,744 people going on daily walks throughout the year will participate in this activity a total of 2,142,356 times ($8,744.31 \cdot 245$). The annual number of visits for the remaining frequencies and activities was calculated in the same way. The total annual number of visits was then calculated as the sum of the annual number of visits by activity. The results have been presented in Table 2.

In order to estimate the value of the benefits obtained by users of Lodz urban parks as a result of free recreation, the respondents were also asked about their willingness to pay for the activities they engage in. The results of their average willingness to pay have also been presented in Table 2. Users of parks in Lodz are willing to pay the most for the opportunity to participate in various events. The average willingness to pay, in this case, is PLN 6.64. The opportunity to practice team sports, such as football (PLN 4.45 per visit), basketball (PLN 3.66) or volleyball (PLN 3.41) is also highly appreciated.

Next the annual benefits gained from the possibility to take part in individual activities were estimated as the product of the total annual number of visits and the average willingness to pay for a single opportunity to participate in that activity.

The value of using urban parks by the inhabitants of Lodz was estimated on the basis of the adopted assumptions and the results of questionnaire surveys. This value is the sum of the annual benefits gained from the implementation of individual activities (Table 2).

The value of the annual benefits gained by the residents of Lodz from the ability to engage in sports and recreation offered by parks was estimated at PLN 30.38 million. These benefits are gained by people who use parks for recreational purposes and are of direct savings nature. Park users value the services provided by urban green areas and see their worth, which is reflected in their willingness to pay for them. The lack of a fee for access to particular activities is the source of the savings in question.

5. Discussion and conclusions

Given the rather cautious assumptions adopted at the end of chapter three, it is expected that the calculated value is more likely to be underestimated rather than overestimated. This is mainly due to assumptions 1-3.

Firstly, it was assumed that only 30% of Lodz residents use the parks at least several times a year. Actual numbers may be much higher, especially since respondents in the Lodz Gallery and the Manufaktura complex had declared a high level of use of the parks, which is confirmed by the results of research presented by JAKÓBCZYK-GRYSZKIEWICZ (2008). Telephone surveys could provide reliable data on the percentage of Lodz residents using urban parks, however, this method was not possible to use in this case, due to the high cost and need for a database comprising only urban residents of Lodz.

Secondly, the underestimation may also be due to the length of the season assumed in the case of using parks by the residents of Lodz. Some users use the parks throughout the year, regardless of the weather. This group may comprise, for instance, dog owners.

Thirdly, during one visit to the park, users often perform two or more activities taken into account in the calculations, therefore assumption 3 can also be regarded as rigorous.

For the purposes of this paper, the value of annual benefits estimated above was calculated for only one of the functions of urban parks discussed at the beginning of this paper. This value results only from the benefits of free recreation. It does not include the benefits of property owners related to the potential positive impact of the green neighborhood on the prices and value of their properties, the benefits of increased tourist attractiveness, or any of the numerous environmental benefits. Estimating the value of the full spectrum of benefits generated by the system of green space in the city is not currently possible. However, already in the case of the individual functions of green areas, the scale of the benefits should appeal to our imagination.

The estimated value can be compared with the planned expenditures for the maintenance of urban greenery in Lodz. In 2016, PLN 31,721,320 was designated for this purpose in the city's budget,

comprising both current and investment expenditure. It can therefore be concluded that the annual benefits generated by urban parks in Lodz, resulting only from the opportunities for the leisure and recreation of city dwellers, offset the annual costs associated with maintaining these areas.

For some time now, comprehensive analyses have been conducted in the United States in this regard, additionally taking into account the benefits resulting from the impact on the value of real estate, the benefits of tourism, the improvement of the quality of the environment, as well as health and social benefits. In Poland, such analyses are not currently being conducted. However, the estimation of the value of one aspect of these benefits indicates that their total value may be significant.

We have been witnessing a tendency to reduce the area of public green areas in large Polish cities, as they represent attractive investment areas located in city centers (NIEWIADOMSKI 2013). The economic criteria prevailing in urban management and spatial planning favor commercial forms of space utilization and discriminate the non-commercial, such as the discussed green areas. The presented methods of estimating the value of public goods should be a tool for sustainable urban management.

Green areas perform many functions and meet diverse human needs. Some of these needs and the benefits of satisfying them can be measured more or less accurately, and expressed in economic value. Assessing the value of the individual components of public space is difficult because they perform many functions at the same time, and the different types of values created are measured in different ways and expressed in different, often incomparable, units. The present study presents various ways of measuring the value of the benefits generated by green areas. It is worth stressing that the stock of available methods and tools is not complete and needs to be improved. This opens wide opportunities for further research and analysis. The results of research conducted in various cities throughout the world provide arguments for the protection and conscious development of urban common spaces.

The issues related to the management of non-urban space of a city, in particular relating to green areas and their functions, are still not treated in the same way as other aspects of the urban economy. Defining the added value which parks bring to urban systems can contribute to a better and more complete understanding of the role they play within them. Obtaining such estimates will help make better-informed decisions and compare this sphere of management with others, such as transport, housing or trade. This type of analysis provides important information that can be used to promote effective urban space management. The estimates shown in this paper demonstrate that parks and other green areas should be seen as a resource, generating a variety of benefits from the perspective of the city and its inhabitants, and requiring rational management to maximize these benefits.

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