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URBAN PARKS AS PUBLIC GOODS: A COMPREHENSIVE REVIEW OF BENEFITS AND COSTS IN METROPOLITAN LANDSCAPES

Abstract:

This article examines urban parks in metropolitan landscapes from a public goods theory perspective, highlighting their significance in providing recreational spaces, improving air quality, and offering ecosystem services. It traces the concept of urban parks from historical roots to modern implications for city planning and environmental management. Focusing on a case study of Warsaw's green areas, the review identifies correlations between the costs of maintenance and user satisfaction, underscoring the economic and social benefits of urban parks. By exploring the non-excludable and non-rivalrous nature of parks, the study advocates for their recognition as public goods that merit sustained investment. The findings suggest that strategic development and maintenance of urban parks are crucial for sustainable urban living, emphasizing their role in enhancing the quality of life in cities. Future research directions are proposed on managing and financing urban green areas.

Keywords: city parks, costs of maintenance, green areas, local government, public goods

JEL codes: Q26, R3

Introduction

The purpose of this article is to analyze the role of urban parks within metropolitan areas through the lens of public goods theory, highlighting their economic, environmental and social benefits to urban populations. It aims to bridge the gap between theoretical concepts of public goods and practical

implications for urban planning and environmental management, with a focus on evaluating the relationship between maintenance costs and user satisfaction within the context of urban green spaces.

As indicated by W. Niemirski (1973, p.60) the urban park is one of the elements of green areas that is areas developed primarily with vegetation, serving recreation". M. Siewniak and A. Mitkowska (1998, p.12) describe a park as a variety of garden composition, within the basic division into gardens and parks. Compared to a garden, a park is characterised by a much larger area dedicated to the plant composition, and also "blurring the boundaries of the composed ensemble and neighbouring areas", and is intended for the general public of the city.

The etymology of the word "park" can be traced back to the 11th century in Sicily, where a vast royal park with woods, mountains and a stone wall was built near the city of Palermo and called "parco", which in Italian still means park today.

A city park is a public organised space within a city, landscaped with vegetation. It has a leisure and recreational function, often also a sporting or other function depending on the particular park setting. It is distinguished from an urban garden by its larger size and the complexity of the functions it performs. In most cases, the park has designated paths and routes for walking, in addition to landscaping, playgrounds, gazebos, monuments, fountains or other water features. As E. Roberts (2001, p.20) describes the parks described, especially those with large areas, are a substitute for a forest in the city, thus transporting the visitor beyond the mental boundaries of the metropolis.

As K. Malesa (2012, p.345) describes urban greenery, and in particular trees, are the 'lungs' for the city. The importance of caring for them, especially the oldest ones, can be seen in the example of a 100-year-old beech tree, which produces 1.7 kg of oxygen per hour, which amounts to 3500 kg of oxygen per year in the growing season, the amount used by around 10 people. The value of such an old tree can be demonstrated by the fact that the same tree can absorb 4800 kg of carbon dioxide as 1700 young ten-year-old trees.

One of the most important needs of the city citizen is the need for contact with nature, and this is made possible by park space. "This need characterises the modern citizen, although it is similar to the needs of citizens of the 19th century city" Wolski (2006, p.10). According to A. Zachariasz (2006, p.25) parks and urban green spaces can be considered as a kind of indicator of civilisation development and living standards. This view is supported by opinions placing access to open spaces on a par with access to basic services, considered essential for a good quality of life and sustainable development at the local level. Trees in the city act as filtering mechanisms

for dust and gas pollutants, and are responsible for absorbing toxic gases and heavy metals emitted by car exhausts and factory chimneys.

As K. Malesa (2009, p.43) describes One deciduous tree is able to absorb the pollutants produced by burning 130 kilograms of fuel during the growing season. City parks, which are generally clusters of large, old specimen trees, are the city's 'oxygen factories', so they should be cared for and increased in number wherever possible. In the city, where traffic is heavier than in rural areas, green spaces play a significant role, especially in terms of cleaning the air of carbon dioxide, but not only. In addition, all vegetation has a beneficial effect on the movement of air masses especially among buildings, temperature regulation and air humidity.

While all the above-mentioned advantages of urban parks are indisputable and valid, it is also worth bearing in mind that these public assets provide many residents with relaxation and a place where they can find an oasis of calm and feel a specific microclimate in relation to the polluted urban climate. It is worth adding here that "the archetype of all parks is the natural landscape" P. Wolski (2008, p.10). This is the secret of urban parks and why residents feel good in them, because unlike the architecture of the city, when entering one feels the natural landscape, which is hard to find or not notice in the daily "urban rush". This is confirmed by A. Lis (2004, p.48), who notes that the perception of the environment through park settings evokes positive emotions, and for this very reason urban parks, being a place of contact with nature, are a source of relaxation and rest. A similar opinion is held by B. Gołębiowska (2004, p.93), who describes the inextricable link that exists between man and nature and the fact that mankind derives countless benefits from the natural environment in the form of goods and services. A good city park is an attractive place for all people regardless of age and social status. It is a unique, unrepeatable part of the city with a strong identity and good landscaping. However, to be such, it needs to fulfil many functions. The above sentences are confirmed by G. Jellicoe (1991, p.373), who argues that "the parks that are set up become a reflection of society and its needs". Parks are needed, people try to fit them to their needs, and sometimes they even set them up themselves, interestingly sometimes illegally, but with very good results. One such interesting example of how determined residents can be in their need for a park is 'Nasz Park' in Warsaw's Kabaty district, where a group of residents decided on their own, it is worth adding, without any permits in an undeveloped area near their housing estate, thus protecting the area in front of their blocks from potential development.

The above example testifies to the resurgence of civil society in people, to the fact of how important urban greenery is to them. One can mention the action of the year in 1980, which urged people to "plant family trees".

The research gap addressed by this article revolves around the comprehensive understanding and empirical evaluation of urban parks within the framework of public goods theory, particularly in terms of the relationship between maintenance costs and user satisfaction. Despite the extensive literature on the benefits of urban green spaces, there remains a scarcity of integrated analyses that connect these benefits to the economic and policy dimensions governing urban parks. Specifically, the gap lies in the quantification of how investment in park maintenance translates into public satisfaction and how this relationship can inform sustainable urban planning and policy-making. This article seeks to fill this void by offering a detailed case study of Warsaw, thereby contributing to a more nuanced understanding of urban parks' role as public goods in metropolitan landscapes.

The structure of the article is designed to methodically bridge this research gap, beginning with an introduction that sets the stage by defining urban parks as public goods and highlighting their significance. This is followed by a methodological section that explains the dual approach of literature review and empirical case study analysis, ensuring a solid theoretical foundation and practical insights. The core of the article is divided into two main parts: the first explores urban parks from the perspective of public goods theory, detailing the theoretical underpinnings and legal considerations; the second part presents the case study of Warsaw, analyzing maintenance costs versus user satisfaction. The conclusion synthesizes findings, discusses implications for urban policy and planning, and suggests directions for future research, thus providing a comprehensive examination of the subject matter structured to address the identified research gap effectively.

1. Methodology

The methodology of this article is anchored in a dual approach, combining a comprehensive literature review with an empirical case study analysis. Initially, the literature review methodically examines historical records, theoretical frameworks, and contemporary research on urban parks, public goods theory, and the economic, environmental, and social impacts of green spaces within urban settings. This review serves not only to trace the evolution of urban parks from their origins to their current status within metropolitan landscapes but also to elucidate the theoretical underpinnings that classify urban parks as public goods. By integrating insights from a broad spectrum of sources—including academic journals, historical texts, and policy documents—the literature review establishes a solid foundation for understanding the multifaceted role of urban parks. This groundwork is crucial for bridging theoretical concepts with practical implications,

providing a nuanced context that informs the subsequent empirical investigation.

The empirical component of the methodology focuses on a case study of Warsaw, utilizing quantitative data to explore the relationship between the costs of maintaining urban parks and the satisfaction of their users. This analysis is predicated on the collection of data from surveys and municipal reports, which detail the unit costs of maintenance and average satisfaction scores across different districts within Warsaw. By employing statistical techniques to assess correlations between maintenance expenditure and user satisfaction, the case study offers tangible evidence of how urban parks are valued by residents and the financial implications of their upkeep. This methodological approach not only grounds the theoretical discussion in real-world outcomes but also highlights the practical challenges and opportunities faced by urban planners and policymakers in managing urban green spaces. Through this detailed examination, the article aims to contribute actionable insights into the effective management and strategic development of urban parks as essential public goods within the urban fabric.

Following K. Malesa (2008), for the purpose of this study a survey was conducted to find out the opinions of urban park users about Warsaw's green spaces, in particular city parks, their equipment and maintenance methods. The survey was intended to give an idea of how residents evaluate parks in terms of aesthetics, accessibility, functionality and the quality of their maintenance.

The survey was conducted personally by the author of his doctoral thesis among users of urban parks in the districts where such parks were located, i.e. in fifteen of the eighteen districts of Warsaw.

The study used an author's survey questionnaire; in addition, the budget execution reports of the City of Warsaw for individual districts were used. From the budget reports, detailed data was selected on the maintenance of parks, the average monthly cost of maintaining one hectare of park, greenery maintenance with particular emphasis on the purchase and planting of plant material, weeding and grass cutting, as well as park cleaning, costs related to electricity and water for park facilities, costs related to repair works of park infrastructure and landscaping in parks, purchase of baskets and park benches, expertise, maintenance and operation of fountains and water cascades, sewage disposal fees and snow removal from park alleys were also examined. For the purposes of the research, the choice of statistical methods was based on a questionnaire survey and statistical analysis of detailed data from the city's budget reports based on the area and maintenance costs of green spaces. All results were then compared and the level of satisfaction was determined in relation to the expenditure made.

2. Urban parks in public goods theory perspective

"The theory of public goods is one element of a broader theory of public choice that includes, among others, the economic theory of democracy, the theory of interest groups, the theory of common goods and the analysis of the mechanisms of rent-seeking" M. Maciejczak (2009, p.10). The above-mentioned theories operate in the trend of new institutional economics, which is a successful synthesis of neoclassical economics and institutionalism. It is currently one of the fastest growing currents in contemporary economics and is of interest to numerous social sciences, including political science, sociology and law. Public choice theory is also referred to as the economic theory of politics. This relatively new field of economic science uses the methodological tools and assumptions of standard economics to analyse people's behaviour in activities of a political nature and in other areas of the public sphere. The sphere of research and analysis of public choice theory is the area of political decisions, the formation of public order and the mechanism of public goods provision. As indicated by J.Wilkin (2005, p.7) the scientific literature emphasises that including the category of institutions in the analysis not only enriches the economic sciences, but also brings economics closer to other scientific fields such as law, psychology, sociology or political science. The concept and theme of public goods appeared in Polish legal doctrine and economic thought in the interwar period. Polish pre-war science in building their concept reached to normative and doctrinal solutions formed in Western Europe. The issue of public goods, then called public things, was also dealt with in the first years of the People's Republic of Poland, but the pre-war concepts were rejected as not being suited to socialist reality. A renewed interest in this topic in Poland was brought about by systemic and economic reforms initiated at the turn of the 1980s and 1990s.

The originators of the theory of public goods from their inception are considered to be the Americans, who described them during the period when the Second World War took place in Poland. The currently cited definitions of public goods come from the inter-war and early post-war literature, and classifications of this concept are also drawn from this period, which form the basis for consideration of contemporary public goods, which belong to the category of public property and are the subject of public ownership by I. Sierpowska (2009, p. 315).

Forerunners of the concept of public goods were economists working on problems of the purpose and scope of state spending and taxation, among them: David Hume(2010, p.143), John Stuart Mill, Richard Musgrave (1939, p. 214), as well as Erik Lindahl, Emil Sax and Knut Wicksell. One of the earliest definitions concerning the theory of public goods, however, was created by Paul Samuelson (1954, p.388) in 1954, who in his work 'The Pure Theory of Public Expenditure' considers collectively consumed goods as those

that are non-excludable and non-rivalrous. Public goods, moreover, have a utility function for individuals, no one is excluded from the benefits of their use, and they can be used by a great many economic agents. R. Sturn (2010, p.281) in his article presented the situation of the subject of public goods before the promulgation of the theory of P. Samuelson. He describes that R. Musgrave had already dealt with the income and expenditure theory of public goods in 1939, where he noted that despite the penetrating insights of D. Hume, J. Mill, and H. Bowen (2010, p.288) they did not point out the differences that exist between goods in the broad sense and public goods. R. Sturn (2010, p.301) describes that despite the many similarities linking the two concepts described by these authors and the fact that in some cases public goods can also be commodities, it was R. Musgrave who essentially separated the concept of public goods and commodities. More than twenty years later, R. Musgrave (1959, p.129) introduced, and in fact expanded, the definition of a public good by referring to its non-excludability and non-rivalness.

R. Musgrave(1959, p.129) pointed out that the non-rational character of consumption implies the existence of positive externalities. In doing so, however, he noted that this does not mean that every beneficiary of such a good obtains the same subjective satisfaction – utility – from it, or even that the good or service so obtained will have the same quality in each individual case. R. Musgrave noted that a good or service available to the public need not have the same quality for each recipient and that beneficiaries of an equally available public good may derive different subjective satisfaction – utility from it. Urban parks are an example of this observation. While they are available to the public, the assessment of their quality and the inhabitants' satisfaction with how they look and the assessment of how a given local authority manages them may differ. In addition, residents of a given local authority may have access to unequal amounts and quality of goods provided by the local authority, as some will be closer and others further away from a given park setting. If there is a need to study accessibility and satisfaction with these goods from the consumer-demand side and not only from the supply side, a survey is necessary.

The zero-one assumption of the traits described by Samuelson leads to a division of the set of goods into pure private and pure public, a division that is in principle impossible to apply in empirical research, not least because excludability is understood as the level of cost at which it can be achieved, not as excludability at zero cost of providing it. It is therefore accepted that both characteristics can vary continuously from zero – the absence of a characteristic, to unity - its full presence A. Kondratowicz (2009, p.19). D. Pearce (1983, p.360) described that economists tend to regard the pure public good construct as purely hypothetical, with no factual rationale, but necessary and beneficial for public choice analysis.

The definition of a public good is therefore clear and precise, saying that these are goods characterised by the fact that they cannot be excluded from consumption - non-excludability - and at the same time are not competitive in consumption - non-rivalrousness. The first principle means that if a unit of a good has been provided, it is not legally possible to prevent others from using the good. The second principle, on the other hand, means that the consumption of a good by one person, does not deprive other people of the possibility of consuming the same good, and therefore, without any consequences, the good can be consumed by many people at the same time.

Public goods are a type of public thing in the strict sense. Public goods include roads, bridges, rivers, canals, beaches, sea water and parks, among others. The public nature of a good as defined by I. Sierpowska(2009, p.310) may arise either due to its natural characteristic, as is the case of a river or a sea coast, or through legal designation, as, for example, a city park, which, assuming that it is not a historical establishment, arises on a place that previously had a different designation. This division also refers to the distinction between natural and manufactured goods. The former were created by natural forces, the latter are the product of human activity. Nowadays, in the case of many public goods, this division is becoming more and more indiscernible, as many natural goods are subject to constant human intervention. Examples of this include the regulation of rivers and coasts, which involve significant amounts of labour and capital, which are necessary to adequately maintain the goods described.

As A. Błaś (2003, p.292) describes the literature points out that in the case of public goods, whether they are natural goods such as a national park or manufactured goods such as a city park, in order to become public property, they must undergo a phase of legal qualification in forms considered appropriate, usually this is done through an administrative or normative act, for example the creation of a national park, a nature reserve, a landscape park or a resolution of a municipality, a city to create a city park.

Public property, as an object of public ownership, is subject to a specific legal regime, which refers primarily to the limitation of the owner's power to dispose of the thing. Already in the pre-war literature it was emphasised that "public property is inalienable as long as it serves a public purpose, is not subject to prescription, lien and compulsory execution" described by I.Sierpowska (2009, p.309).

When describing urban parks as an example of public goods, it is therefore worthwhile to lean into the legalities that detail what can and cannot be done with all public goods, including parks. These conditions are also an indicator confirming that urban parks belong to the group of public goods.

Public goods with special historical, cultural, national values are excluded from circulation and are subject to special legal protection. Some of them

can only be the subject of public ownership, they cannot become entirely the subject of market transactions, and unlike private property, the State Treasury cannot relinquish the right to their ownership either. Public goods such as, for example, city parks, state schools, prisons are subject to administrative supervision and special protection against, for example, wear and tear, destruction or change of use pointed by J. Szaluchowicz (2000, p.19).

Public assets are subject to public ownership, owned by the state, which in individual cases delegates the authority and care of them to local government units, which take direct care of the entrusted objects in their area. Sometimes, however, individual objects are handed over to other entities, for example scientific entities, for a given period of time. Public property belongs to the state or local government, but the users of sites designated for public use under specific legal provisions, such as a lending agreement with a scientific institution, may also be other entities, but in this case the site loses the character of a public property. Such an example is the palace and park complex in Natolin in Warsaw's Ursynów district. More than a hundred hectares of city parks and a historic palace together with numerous buildings were transferred in the early 1990s on a long-term lease for educational purposes to the College of Europe, a branch of the College of Europe in Bruges, Belgium. On the one hand, this resulted in the park being closed to people not connected with the European College for many years, making it impossible for local residents to enjoy the charms of the place on a daily basis; on the other hand, however, the Natolin European Centre Foundation, which looks after the monument, has carried out conservation and adaptation work on the buildings of the former palace complex, thanks to which the building has retained its splendour. In addition, during the more than twenty years of the facility's use, several new buildings were erected for the use of lecturers and young academics, the Rector's Office and conference and lecture halls. The architectural form of the new buildings referred to the restored historical buildings described by M. Drozdowski (1972, p.47).

J. Owsiak (2005, p.28) includes national parks to public goods, without referring to their size and location, so they can be compared to city parks, which, according to this theory, also belong to public goods. The situation regarding this division becomes unclear, according to J. Owsiak, when a significant number of visitors come to a city park, as described earlier, or when a fee for entering it is introduced. This problem is clearly solved by P. Samuelson, who argues that an increase in the number of users does not eliminate or diminish the possibility for all users to benefit from a given good, so this is an important statement to take into account when classifying urban parks as public goods.

The criteria that determine whether a good is public or private are the criterion of utility, considered as social, and the criterion of retribution, understood as economic.

Public utility is not uniformly defined, in a broad sense it is sometimes equated with public tasks, the implementation of which is the responsibility of government and local government administration. The Act of 8 March 1990 on municipal self-government defines public utility tasks as those tasks whose purpose is to satisfy the collective needs of the population on an ongoing and uninterrupted basis through the provision of universal services. Taking this definition into account, it can be assumed that the public utility of the goods in question consists in their use to meet the needs of the population on an ongoing and uninterrupted basis as a result of universal accessibility to the good in question. The economic criterion, on the other hand, determines by means of the source of payment whether a good can be classified as a private or public good. According to E. Denek (2003, p.11) the distribution of goods, social services may be performed by various methods, in other words, their provision may be free of charge, partly payable and fully payable. This implies that some social services are included in the broadly defined public goods. Pure public goods are those goods, commodities or services that are entirely financed by public funds such as, *inter alia*, local government budgets or the state budget. This creates the collective consumption of society, which is financed by public funds. Pure public goods are free of charge for their recipients, whereas private goods are partially or fully chargeable.

The difference between the two approaches lies in their benefits. The benefits of private goods are limited to one user or his or her family, whereas public goods have a wider reach. If one person uses a private good such as a car, it is inaccessible to other people, the opposite is true for public transport, which, as A. Skrzypek (2017, p.204) notes, should outpace the development of other sectors of the economy. One of the characteristics of private goods is the rivalry of their users, in order to own them they have to compete among themselves R. Musgrave (1984, p.8). The situation is different with public goods, which are not affected by the rivalry described earlier.

The universality of the use of different types of public goods is unlimited, which means that everyone can use a public good at the same time and to the same extent. This use may be unconditional, when, for example, a city park is open twenty-four hours a day to all wishing to visit it, or it may experience various restrictions, for example, through the opening hours of the park, relevant laws or actions of administrative bodies may extend or tighten the use of the good, make it subject to additional conditions or the payment of fees. Paid admission to a park means that not every citizen will be able to enter it, if admission is paid for everyone, including in particular

residents of the area in which the park is located, in which case the park should be classified as private property. In the case of the discussion on charging for entry to city parks, the statements of J. Owsiak who believes that free public goods are controversial among economists and politicians, should be cited. The fact that public goods are free of charge and that there is no charge at all can lead to waste, causes users not to respect green spaces such as city parks, not to take proper care of them. "This is because public goods are used by everyone, regardless of whether those who use them contribute to the costs of their maintenance or not" P. Gołasa (2015, p.134).

Admission to most city parks in Poland is free, in some cases they are closed for the night and well-maintained, in others, generally open 24 hours a day and without adequate protection, one may encounter painted benches, scattered rubbish on the lawns or various acts of vandalism. Such a situation is not observed, among others, in Japan, where admission to most city parks is paid. These are small fees, equivalent to a few euros⁴⁷, but this ensures that city parks are visited by interested parties and not by random people who, in some cases, do not respect the place where they find themselves.

Another example of a city park entrance fee is the Giardino dei Boboli and Giardino Bardini in Florence, one of the most visited cities in Italy by tourists, with over 8 million visitors a year, introduced an entrance fee to its two most beautiful and oldest parks a few years ago. The purchase of a ticket to enter the two parks mentioned is ten euros and applies to all tourists. Free admission to the parks is available to those living in Florence and to people over 65. In this case, the gardens described are public goods, but only for people registered and paying taxes in the city where they live. Tourists, in order to enter them, have to pay an appropriate fee, part of which goes to cover the maintenance costs of the park described by G.Malin (2014, p.93).

Another different example of an entrance fee can be found in India, where the Taj Mahal temple, considered one of the seven wonders of the world and surrounded by a beautiful garden, also has an entrance fee, except that Indian citizens pay an entrance fee of 10 rupees and tourists of other nationalities pay 75 times more, or 750 rupees. This imbalance is mainly due to the desire to get as much money as possible from tourists and the price differences prevailing in India and, for example, in Europe. The Indian example excludes the Taj Mahal as a public good because regardless of nationality or place of residence everyone has to pay a fee to enter it, only the amount changes.

The examples listed above show how the criteria of usefulness and chargeability influence the classification of individual park facilities as public or private goods, and what benefits these criteria have for urban

parks, which in Poland are in the vast majority of cases classified as public goods due to, among other things, their non-excludability from consumption and non-privatisation in consumption.

3. Costs of green area maintenance versus user satisfaction: case of Warsaw

As described by K. Malesa (2018, p.282), Table 1 summarises the unit maintenance costs and average satisfaction scores for urban parks, street greenery and residual greenery in the various districts of Warsaw.

Table 1. Average satisfaction with green spaces and unit maintenance costs in 2014
District

District	City parks		Street green areas		Other green areas	
	Medium satisfaction	Unit cost maintenance (thousands PLN/ha)	Medium satisfaction	Unit cost maintenance (thousands PLN/ha)	Medium satisfaction	Unit cost maintenance (thousands PLN/ha)
Bemowo	3,45	20,7	3,16	6,8	3,43	8,3
Białołęka	3,44	18,4	3,13	6,0	3,30	5,7
Bielany	3,50	43,0	3,41	18,4	b.d.	b.d.
Mokotów	3,65	10,6	3,50	9,9	3,31	13,3
Ochota	3,58	13,2	3,13	10,8	3,13	8,3
Praga Płd.	3,81	24,5	3,12	19,0	3,30	43,5
Praga Płn.	3,02	12,9	2,79	25,0	3,14	12,9
Śródmieście	3,75	14,1	3,10	43,4	3,20	37,2
Targówek	3,74	22,7	3,28	13,1	3,60	25,3
Ursus	3,87	45,9	3,46	19,8	3,81	13,7
Ursynów	3,58	40,9	3,38	61,9	3,43	16,3
Wesoła	3,45	26,6	3,61	69,1	b.d.	b.d.
Włochy	3,42	28,2	3,00	16,2	2,87	24,6
Wola	3,06	13,5	3,02	13,1	2,77	15,4
Żoliborz	3,73	26,4	3,49	24,3	3,56	19,1

Source: research on the basis of surveys and reports on the implementation of the budget of the City of Warsaw and The Role and Costs of Maintenance of City Parks by the Example of Warsaw K. Malesa (2018, p. 247)

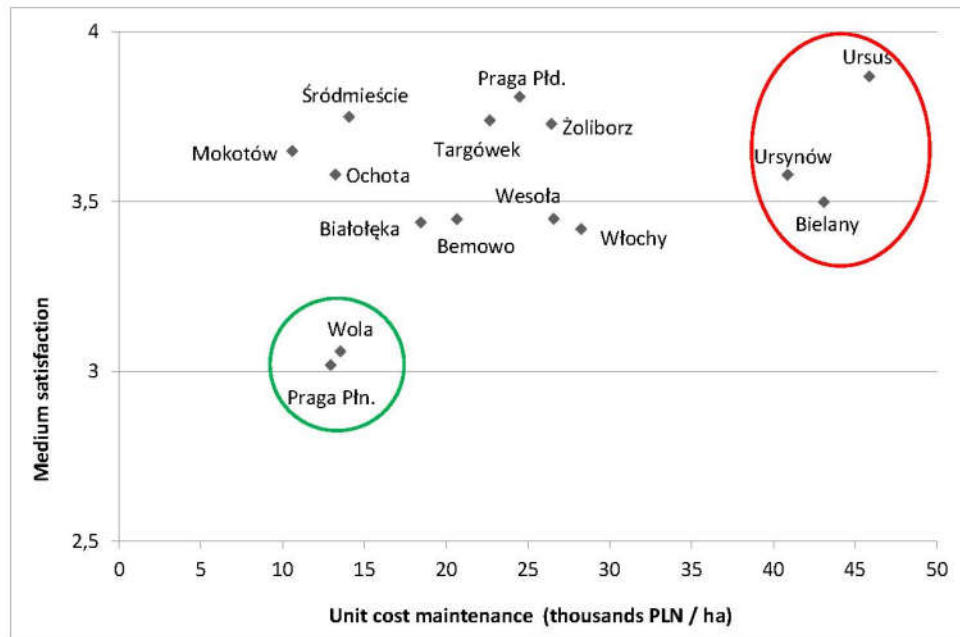
When comparing unit maintenance costs for 1 ha of city parks and satisfaction with of them in individual districts of Warsaw (Table 1), two clusters of districts can be seen, differing from the others. The highest unit costs for maintenance of urban parks in 2014 were found in 3 districts: in Ursus (PLN 45.9 thousand), Bielany (PLN 43.0 thousand) and Ursynów (PLN

40.9 thousand). At the same time, users of city parks in these districts rated their satisfaction with these parks similarly: mean score of 3.5 in Bielany, 3.58 in Ursynów and 3.87 in Ursus.

The lowest satisfaction with city parks was among surveyed users in two districts: in Praga Północ (mean score of 3.02) and Wola (mean score of 3.06). These ratings mean that, on average, users of urban parks in these districts were neither satisfied nor dissatisfied with these parks. At the same time, unit maintenance costs for 1 ha of urban parks in these two districts were low and amounted to 12.9 thousand PLN in Praga Północ and 13.5 thousand PLN in Wola.

In the remaining districts of Warsaw, unit maintenance costs for 1 ha of urban parks ranged from 10 to 30 thousand PLN, with average satisfaction scores oscillating around 3.5.

Figure 1. Average satisfaction with city parks and unit cost of maintenance in 2014

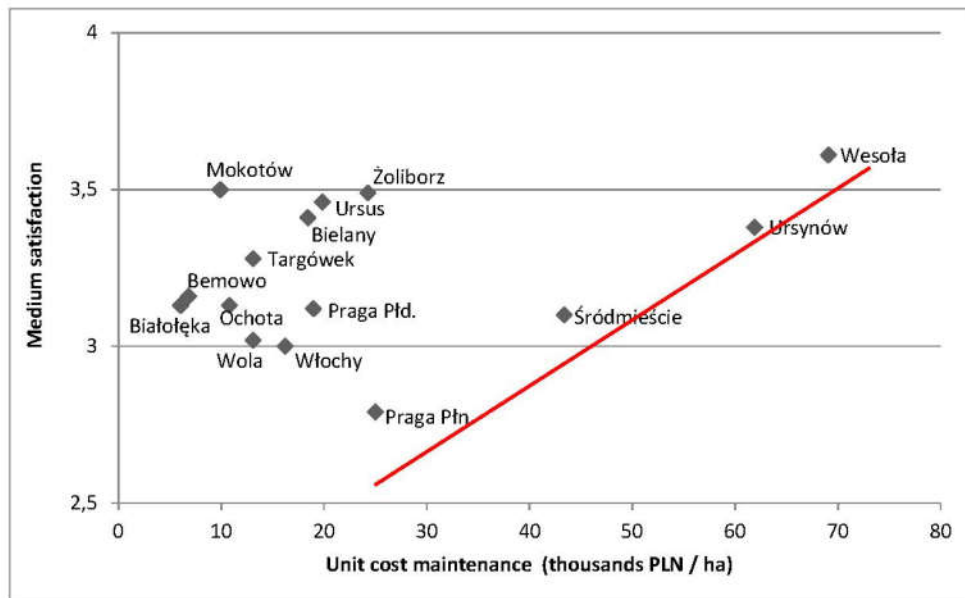


Source: The Role and Costs of Maintenance of City Parks by the Example of Warsaw K.Malesa (2018, p. 249)

Comparing the unit maintenance costs of 1 ha of street green areas and satisfaction with it in individual districts of Warsaw (Figure 2), one can see a linear, positive and very strong relationship between unit maintenance costs for 1 ha of street greenery and satisfaction with it in 4 districts: Wesoła, Ursynów, Śródmieście and Praga Północ (correlation coefficient 0.993). This means that the higher the unit cost of maintaining 1 ha of street green areas,

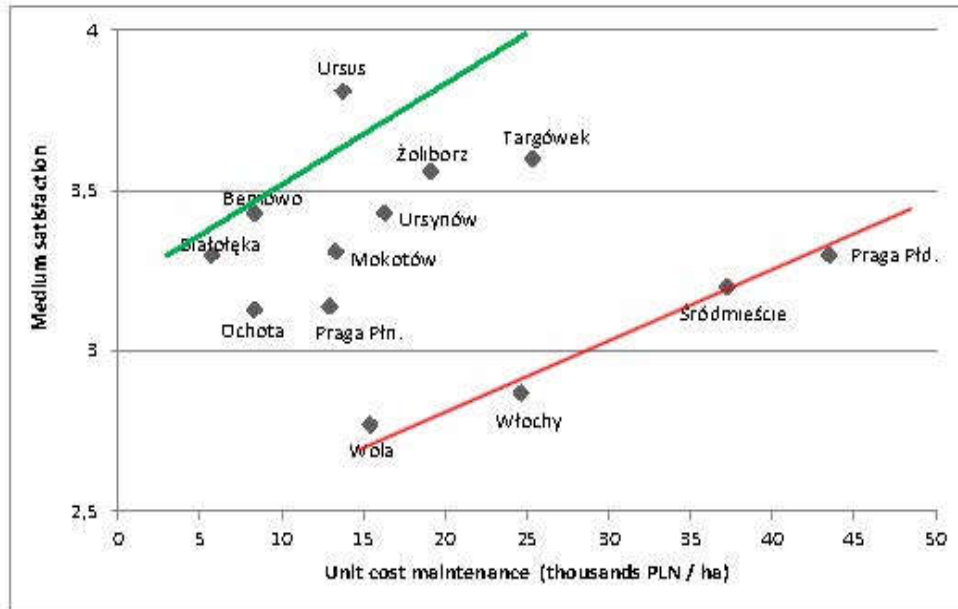
the more satisfied on average the residents of these 4 districts were with these areas. Unit maintenance costs for 1 ha of street greenery were highest in Wesola (PLN 69.1 thousand), lower in Ursynów (PLN 61.9), even lower in Śródmieście (PLN 43.4), and lowest in Praga Północ (PLN 25.0). At the same time, satisfaction with these areas decreased on average in these 4 districts: it was highest in Wesola (mean satisfaction score of 3.61), lower in Ursynów (3.38), even lower in Śródmieście (3.10) and lowest in Praga Północ (2.79). However, in the remaining districts of Warsaw, the unit maintenance cost of 1 ha of street greenery ranged from PLN 6 to 24.3 thousand, with average satisfaction scores ranging from 3 to 3.5, and no correlation between the two was demonstrated.

Figure 2. Average satisfaction with street green spaces and unit maintenance costs in 2014



Source: The Role and Costs of Maintenance of City Parks by the Example of Warsaw K.Malesa (2018, p. 250)

Figure 3: Average satisfaction with residual green spaces and unit costs of their maintenance in 2014



Source: The Role and Costs of Maintenance of City Parks by the Example of Warsaw K.Malesa (2018, p. 252)

Comparing the unit costs of maintaining 1 ha of residual green space and satisfaction with it in individual Warsaw districts (Figure 3), two partial linear positive correlations can be seen between unit maintenance costs for 1 ha of residual green areas and satisfaction with it. The first of these relationships concerns 4 districts: Wola, Włochy, Śródmieście and Praga Południe (the correlation coefficient of 0.989 indicates a linear, very strong and positive correlation between unit maintenance costs of 1 ha of residual greenery and satisfaction with it). Unit maintenance costs for 1 ha of residual green areas were highest in Praga Południe (PLN 43.5 thousand), lower in Śródmieście (PLN 37.2), even lower in Włochy (PLN 24.6), and lowest in Wola (PLN 15.4). At the same time, satisfaction with these areas decreased on average in these 4 districts: it was highest in Praga Południe (mean satisfaction score of 3.30), lower in Śródmieście (3.20), even lower in Włochy (2.85), and lowest in Wola (2.77). This means that the higher the unit cost of maintaining 1 ha of residual green areas, the more satisfied on average the residents of these 4 districts were with these areas.

The second correlation relationship applies to the remaining districts of Warsaw (correlation coefficient of 0.523 indicates a linear and positive correlation of moderate strength between unit costs of maintenance of 1 ha

of residual green areas and satisfaction with it). Lower unit maintenance costs for 1 ha of residual greenery (from PLN 5.7 to 16.3 thousand) and lower satisfaction with this greenery (from 3.13 to 3.43) were in 6 districts: Ochota, Praga Północ, Białołęka, Bemowo, Mokotów and Ursynów. Higher unit costs of maintenance of 1 ha of residual greenery and higher satisfaction with this greenery (was in 2 districts: in Żoliborz and Targówek (average satisfaction of about 3.6, and unit costs of 19.1 and 25.3 thousand PLN/ha respectively). The users of residual greenery were the most satisfied with their greenery in the Ursus district (3.8 on average), and the unit cost of maintaining one hectare of it was PLN 13.7 thousand.

4. Conclusions

Based on literature review and analysis of current economic theories, including the theory of public goods shows that urban parks are sample of public goods and should be recognized as such. They are financed from common funds coming mainly from budgets of local governments and are available to all users. Analyzes carried out for this work indicate that urban parks play a significant role in shaping the city and the life of its inhabitants as public goods.

The author has presented that green areas play an important role in the life of the city and in the life of its residents, among others through the fact that they have a positive impact on the quality of life and on everyday well-being. City parks as public goods provide rest for many residents and a place where they can find an oasis of peace, feel a kind of microclimate in relation to the polluted urban climate, the hustle and bustle of everyday life. Residents going to the park, although they know that it is created by a man, have the impression that they are surrounded by nature, a natural landscape in which they feel much better than sometimes a few hundred meters away amid the street hustle and bustle. These are places that, in the residents' opinion, deserve them, should simply be in the city as many as possible, moreover they should be neat, clean and systematically nurtured.

In the article, the author compared the unit maintenance costs of 1 hectare of city parks and the average satisfaction of residents, park users in different districts of Warsaw, and showed a correlation between them.

The research has a chance to support the development of the city and green areas through savings and better management of public funds. They will expand issues related to the issues of city management and economic approach to the problem of green areas.

Deepening knowledge about the functioning of green areas as an example of public goods and understanding how other cities in the world manage and finance their green areas are possible topics for future research.

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