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Financial and analytical assessment of the costs of maintaining large urban park spaces in the Mediterranean on the example of Barcelona

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Abstract. The relevance of the subject is conditioned upon the fact that large park plantations have a great positive impact on the climate of Mediterranean cities, which increases the comfort of living in them. Such weather conditions as abnormal heat are increasingly manifested in Mediterranean cities due to global warming and other causes. In addition, there is air pollution in cities with solid particles and other impurities harmful to human health. The analysis of scientific literature has demonstrated that in the cities of the Mediterranean, these problems can be solved through urban park plantings and other types of landscaping. The purpose of this study is to assess the effectiveness of the costs of maintaining large urban park spaces in Barcelona. The leading method to explore this problem is the empirical method, namely, the study of urban



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landscaping programmes and budget expenditures. The research examines the sources of financing the costs of maintaining urban park spaces and considers urban programmes for the development of landscaping, and their financing. In addition, the influence of green spaces on the comfort of living in the city of Barcelona is explored. As a result of the study, it was found that landscaping in the city of Barcelona is financed for the most part from the city budget, while spending increases annually. It has been identified that the city of Barcelona receives a significant positive effect from investments in green spaces, namely, air pollution decreases, its temperature decreases, people get places for hiking, sports, and other types of activity, the psychological and physiological health of the population improves, the urban environment becomes more comfortable to live in. It is the large park plantings that allow reducing the air temperature, which improves the quality of life in the city

Keywords: landscaping; comfortable urban environment; trees; pollution; clean air

INTRODUCTION

The maintenance of large urban park spaces in Mediterranean cities, including Barcelona, can significantly increase the comfort of living of the population and contributes to improving the health of the population both psychologically and physiologically. In this regard, it is necessary to periodically make a financial and analytical assessment of the costs of maintaining park spaces in cities, considering the positive effects that large urban park spaces bring with certain investments. Investments in green spaces cannot be called commercial, their effect is mainly to improve the quality of life of the population by reducing pollution and gas contamination of atmospheric air, reducing its temperature. The economic effect here will be a reduction in healthcare costs and cooling of premises and other facilities. Nevertheless, through green spaces, social issues concerning the normal life of the urban population are being solved.

The city of Barcelona in the 21st century has big problems associated with the need to improve living conditions and public health. Particularly acute are the following issues: environmental quality; environmental pollution by hydrocarbon combustion products; urban land balance; utilities in all microdistricts; decent housing; climate change; population migration. Data from the United Nations (UN) suggests that today 54.5% of the world's population is urban, and by 2050 the share of the world's urban population may reach 70%. Therefore, cities will become the main centres for solving the problems of humanity. Park spaces and other green areas of cities are of great importance for improving the functioning of urban ecosystems and public health. For the city development effectively in terms of ecology and good life support for the population, it is necessary to properly plan and develop green urban spaces (Master Plan for Barcelona's..., 2017).

The need for urban parks is confirmed by the UN Sustainable Development Goals (Transforming our world, 2015). All UN member states agreed that environmental and social problems deeply affect society all over the world. Sustainable Development Purpose No. 11 assumes that in cities every citizen should have convenient access to open public space within a 400-metre walk from their place of residence. However,

nowadays only 21% of the world's urban population has such proximity to decent open public spaces (Rossoab *et al.*, 2021). In the Mediterranean, 60% of the population lives in cities with high rates of urbanisation. According to research by the Union of the Mediterranean, by 2030 the urban population of the region will increase by another 22.5 million people (Nature based Solutions in..., 2019). The extremely rapid growth rate of cities generates significant territorial, economic, social, and environmental imbalances. Urban settlements of the Mediterranean have common climatic features, in particular, climate changes lead to the appearance of abnormal heat.

The overlapping effects of global warming and the increase in the number of urban heat islands have a significant impact on the increase in air temperature in cities, which leads to thermal stress, entailing serious negative consequences for the physical and mental health of citizens. The study of the issue presents that green spaces have a great positive effect on the ambient temperature in cities. Large urban parks contribute to a decrease in temperature even beyond their borders, which has a good effect on the physiological and psychological state of people (Aram *et al.*, 2020). Urban parks and green spaces can establish a temperature-friendly environment and help reduce vulnerability to heat stress. One of the most significant effects of green spaces is to reduce the intake of solar radiation due to trees (Moreno-Garcia, 2019).

Urban green areas include meadows, forests, playing fields, gardens, parks, and water areas such as wetlands, corridors along riverbanks, streams, lakes, ponds, etc. A green and aquatic environment improves people's quality of life and provides a link between ecosystems and human well-being. For example, physical activity in a natural environment reduces fatigue and the impact of adverse emotions, increases life satisfaction and self-esteem, improves physical and psychological health. In addition, green spaces improve social interaction, contribute to the development of a sense of community and promote social inclusion. It has been proven that there is a positive relationship between green spaces and human health (Pinto *et al.*, 2020).

Large urban parklands and other types of urban green spaces are thus of great importance in improving the climate of Mediterranean cities and enhancing the quality of life of the population. Considering the above, a financial and analytical assessment of the costs of maintaining large urban park spaces is important, as it allows identifying the relationship between the costs of maintaining large green areas and the positive effects that society receives from them.

The purpose of the study is a financial and analytical assessment of the costs of maintaining large urban park spaces in Barcelona. To achieve this purpose, the following tasks were solved: urban landscaping programmes were explored, the costs of these programmes were analysed, and the effects received by the city from landscaping were considered.

MATERIALS AND METHODS

Theoretical methods (analysis, synthesis, concretisation, generalisation, comparison, financial and analytical assessment) and empirical (investigation of the influence of landscaping on the comfort of living in Mediterranean cities, the positive effects of landscaping; establishment of the role of large park spaces in the urban environment of Barcelona; study of urban landscaping programmes; assessment of the cost of landscaping programmes and methods of their implementation; investigation of the effect of the establishment and maintenance of large urban parks and other green areas). The research was based on the programmes of the city of Barcelona in the field of landscaping, the open budget of the city of Barcelona, materials and practical developments of the Mayor's Office of Barcelona in the field of landscaping, research by scientists and practitioners on the greening of urban areas of the Mediterranean.

The study was conducted in three stages: At the first stage, the influence of large urban park plantings on the ecology of Mediterranean cities was identified, the effects that can be obtained from landscaping were explored, and the main problems of urban climate and human habitation that can be solved through large urban park plantings and other types of landscaping were examined. The activity of the city authorities designed to solve the problems of landscaping and improving the comfort of people's living was explored. The main problem areas solved by the city authorities in the field of its landscaping were highlighted.

At the second stage, a financial and analytical assessment of the costs of maintaining large urban park spaces and other green areas of the city of Barcelona was performed. The assessment was based on data from the city's open budget and research on the effectiveness of investments in the greening of Mediterranean cities. The main problems of the urban environment that can be solved in the city through landscaping were explored. The effects of landscaping, including

large urban park plantings, were identified. Based on the materials of various studies, the main areas of work on the transformation of the urban environment to improve the comfort of living of citizens were identified. The types of effects obtained from investments in the greening of the city have been established, which consist in reducing the dustiness and gas content of atmospheric air, reducing the air temperature in areas of large urban park plantations and in the vicinity of them, improving the psychological and physiological health of the population, the expected reduction in health care costs, improving the comfort of living of citizens and their level of well-being. At the third stage, theoretical and practical conclusions were clarified, the results obtained were generalised and systematised.

RESULTS AND DISCUSSION

The city of Barcelona is currently engaged in the development and construction of new public spaces that are focused on the well-being of residents. Building an improved environment for the residents of the city of Barcelona has been reflected in a number of city programmes. In September 2015, the UN proposed 17 Sustainable Development Goals (SDGs) for the world, which Spain also shared (Transforming our world, 2015). In the city of Barcelona, according with the UN Sustainable Development Goals, the plan "Barcelona's 2030 Agenda. SDG targets and key indicators" (2020). Sustainable Development Goal number 15 is to protect, restore, and promote the sustainable use of terrestrial ecosystems, sustainable forest management, combat desertification, and halt and reverse land degradation and halt biodiversity loss. As part of this purpose, several urban programmes are being implemented, including the Master Plan for Barcelona's Trees 2017-2037 (2017), according to which work is being conducted to expand and maintain large urban park spaces and other green areas. In the city hall, there is a special service engaged in the implementation of this programme: The Directorate of Ecology, Urban Planning, and Mobility. In addition, this plan is linked to other city programmes, for example, "Climate Plan 2018-2030" (2018).

Initially, unfavourable living conditions in industrial cities led to the need to establish urban parks. Further, parks began to be used as playgrounds for sports, and finally as places established for a more centralised life of citizens (Tate, 2018). Large urban park spaces play a very important positive role in the state of the environment of the city of Barcelona. Using the example of Ciutadella Park, the largest urban park, studies were conducted that demonstrated that there is a difference between the temperatures inside the largest park in Barcelona and the surrounding urban environment for 14 days in the winter and spring of 2015, which confirmed the existence of a clean urban cool island. The maximum difference was 5.2°C on the night of December in anticyclonic weather conditions. Studies conducted in

Ciutadella Park have found that it improves the urban climate very well (Moreno-Garcia, 2019).

It was identified that green spaces in cities have the following positive effects (6 ways trees benefit all of us, 2021): absorption of greenhouse gases; improvement of the physical and psychological state of citizens; purification of the air from dust and gases; cooling of the atmosphere. The management of green spaces includes criteria and measures for the effective management of the development of green areas in the city of Barcelona. This local programme is designed to quality control and gradually increases the percentage of each species in the city (for example, to avoid the historical dominance of bananas). In addition, there are new species that can be used in urban landscaping (Management of trees, 2021).

The management of green areas ensures that any actions related to trees will improve the quality of

plantings and contribute to the conservation of biodiversity. Barcelona has more than 150 species and varieties of trees. Each of the species has a special colour, aroma, and type of foliage, which gives individuality to the streets of Barcelona and, therewith, contributes to improving the urban ecology. Choosing a variety of trees for Barcelona's green areas is a complex process that considers both the characteristics of a particular tree and the necessary environment for its successful existence since the principle of matching the necessary tree to the correct place of its growth must be observed (Superilles, 2021). The city development plan "Barcelona Superblock Plan" (2021) is designed to providing a comfortable daily life for the population, uniting the districts, and ensuring environmental safety. The plan is designed to improve the socio-economic and environmental situation in the city (Fig. 1).

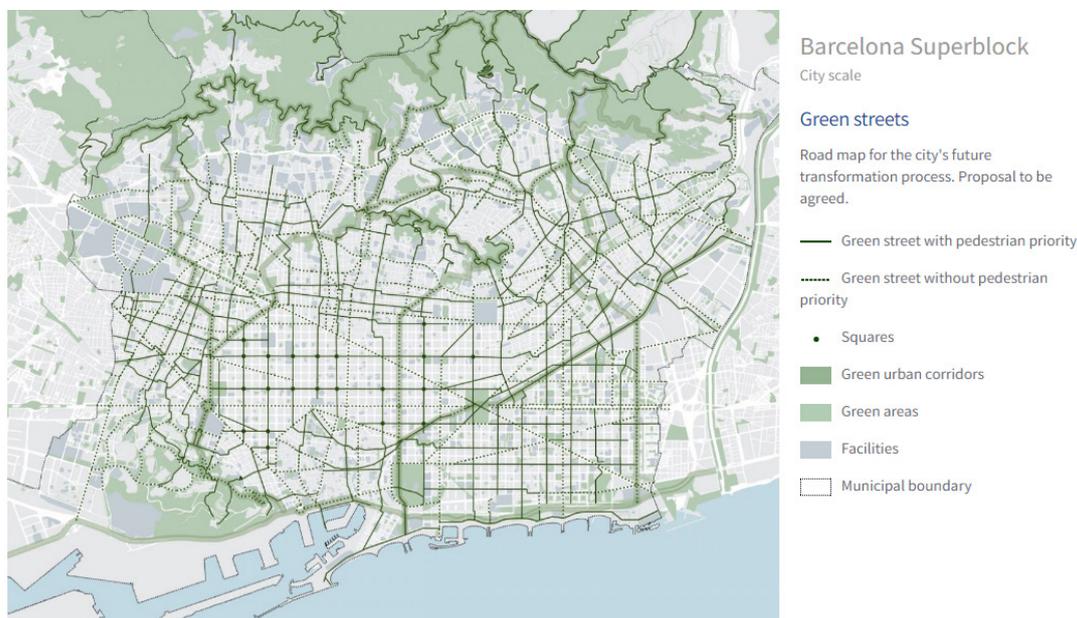


Figure 1. General scheme of Barcelona Superblock Plan

Source: Barcelona Superblock Plan (2021)

The plan model involves the establishment and implementation of various plans and projects that contribute to the improvement of urban space towards the improvement of it and comfort for the life of citizens. According to the new urban model, Barcelona should be updated and adapted to the needs of citizens and ensure environmental safety. Urban space improvement purposes (Barcelona Superblock Plan, 2021): changing public space to improve the quality of life of the population; improvement of urban neighbourhoods; growth of the city's economy; restructuring of the transport infrastructure; introduction of new public housing facilities into circulation.

The model is designed for serious transformations of public spaces in Barcelona, namely, the transformation of the area that is now used by motor transport in

urban areas, through the introduction of a more equitable structure of public space. It offers a network of green streets that extends to the whole city and gives people the opportunity to walk, as it connects green areas and gives people safety. According to the new model, green hubs with the following characteristics will be developed in the city (Barcelona Superblock Plan, 2021): limited traffic of motor vehicles; availability of a place to rest; a large number of green spaces; the possibility of hiking.

Green spaces are made to establish new squares at intersections, places convenient for people, they allow people to perform various activities, including physical. Green hubs are being established throughout the city, for example, in Eixample, 21 green centres are being established, deep in the Cerda site, with 21 new areas, establishing a total of 33.4 hectares of space for pedestrians (Fig. 2).

The transformation of the space of the Eixample district is occupied by the Barcelona City Council, which has demonstrated several priority initiatives. The City Council considers it necessary to turn certain parts of the city into green centres. Tactical initiatives have already been implemented in some of these hubs to reduce the intensity of vehicle traffic as part of measures to free up space in connection with the health emergency related to COVID-19. In the city, it is planned to establish four large squares in Eixample, each measuring approximately 2000 m². These squares will be located at the junction between two green transport hubs, occupying the space reserved so far for cars. For all this, the City Council held two open competitions to select teams of architects and engineers who will help determine the model of a quiet street of the 21st century and the squares that will be established at intersections. The purpose of the first competition is to select future developers of development projects on the four streets, who will turn them into green centres during this term of office. The second competition is dedicated to the search for developers of redevelopment projects for four squares.

In addition, other events related to the greening of the city of Barcelona are planned. The purpose of the Master Plan for Barcelona's Trees 2017-2037 (2017) is to maintain and develop well-managed, healthy and

biodiversity-rich woodlands to improve green corridors and overcome the urban heat island effect. The quantity and quality of trees, and their role as part of the green infrastructure of the city are factors of great importance for a comfortable stay in the city. This plan was developed for the municipality to be able to plan and manage urban landscaping (Nature based Solutions in..., 2019). The estimated budget for the implementation of the proposals outlined in the Master Plan for Barcelona's Trees 2017-2037 (2017) is EUR 9.6 million per year. The following aspects are considered when drawing up the budget estimates: area 1: personnel responsible for the maintenance and management of trees. This includes personnel involved in pruning and planting trees, including relevant legal and administrative resources; area 2: external contracts with contractors who provide tree care services, such as phytosanitary treatment of green spaces, removal of dead and diseased trees, stumps, etc.; changes: correspond to specific projects to improve the tree population, for example, the replacement of individual trees on iconic streets.

The estimate of the annual budget of the Master Plan for Barcelona's Trees 2017-2037 is presented in Table 1.

Table 2 demonstrates the shares of cost distribution in various strategic areas of the Master Plan for Barcelona's Trees 2017-2037.

Table 1. Estimated annual budget of the Master Plan for Barcelona's Trees 2017-2037

Area of expenses	Total amount of expenses, EUR
Area 1	4,374,869
Area 2	3,036,880
Annual investments in trees	900,000
Increase of the annual budget for the plan	1,310,000
Total	9,621,749

Source: Master Plan for Barcelona's Trees 2017-2037 (2017)

Table 2. Distribution of the Master Plan for Barcelona's Trees 2017-2037 budget by expenditure areas

Area of expenses	Share of expenses, %
1. Heritage and biodiversity	4.26
2. Knowledge	1.28
3. Communication and participation	1.1
4. Planning and connection	5.33
5. Protection and preservation	1.01
6. Tree health	12.2
7. Plant material and planting	11.48
8. Reduction and safety	36.7
9. Soil	5.86
10. Water	20.78
Total	100

Source: Master Plan for Barcelona's Trees 2017-2037 (2017)

The distribution of the budget by strategic areas presents the share of expenditures on tasks requiring solutions and additional costs. Nevertheless, in general, the budget of the Master Plan for Barcelona's Trees 2017-2037 does not imply a significant increase in costs associated with current planning and management tasks compared to previous years. The plan adds extra items of expenditure where new investments are needed. The main strategic areas of priority for investments are the management of soil and water resources. These two most important factors are the basic ones for maximising the quality and health of trees, and for society to receive environmental and social benefits brought by

green spaces. In total, 3.34% of the budget of the City of Barcelona, or almost EUR 101.4 million, is planned to be spent on the environment in Barcelona in 2021. Therewith, it is planned to spend about EUR 67.2 million on the construction and maintenance of green spaces (Open Budget, 2021). The dynamics of the expenditures of the city of Barcelona for the construction and maintenance of green spaces is presented in Figure 4.

As can be seen from Figure 4, the city of Barcelona invests quite a lot of money, about EUR 60 million annually, in its green spaces. The percentage of actual budget execution for the construction and maintenance of green spaces is presented in Figure 5.

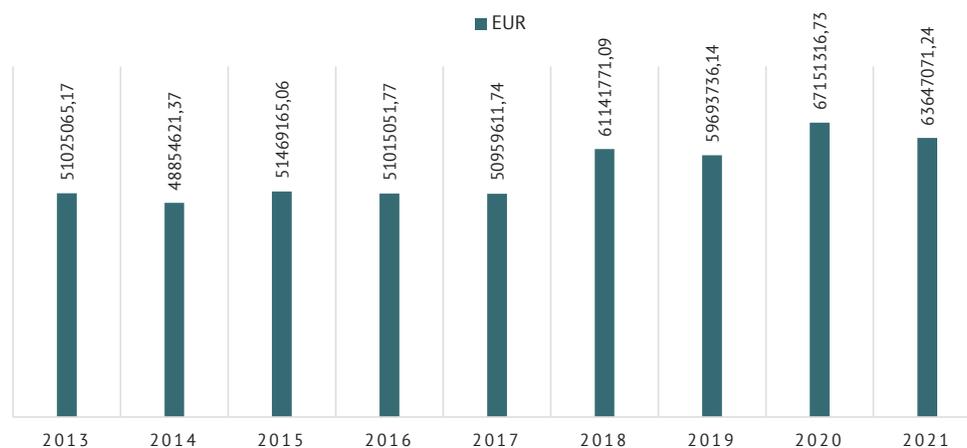


Figure 4. Dynamics of planned budget expenditures for construction and maintenance of green spaces

Source: Open Budget (2021)

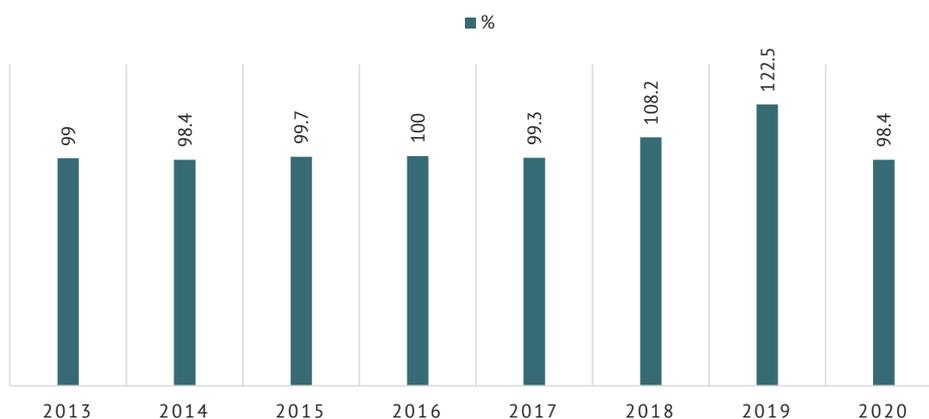


Figure 5. Percentage of actual budget execution for construction and maintenance of green spaces

Source: Open Budget (2021)

From Figure 5, it can be concluded that the planned costs for the construction and maintenance of green spaces are almost always almost completely performed (98.4-100%), and sometimes (2018, 2019) exceed the planned values. Next, the study considers the projects for financing large urban park spaces of the city of Barcelona on the example of the largest project of

the last decades – the Agrarian Park of Baix Llobregat. The beginning of the project dates back to 2004, the project is currently under implementation. The park is located in the centre of the Barcelona metropolitan area. The territory of the park (about 3500 hectares) includes rich conventional agricultural activities and contains 14 municipalities with a total population of

about 818000 people. It is protected by a special planning tool and managed by the provincial Agrarian Park of Baix Llobregat is the “lungs” of the city of Barcelona and the only one in the world that is close to the big

city. In addition, the park provides the residents of the city with high-quality food and contributes to the conservation of agricultural land. The main features of project financing are presented in Table 3.

Table 3. Financial resources of the Agrarian Park of Baix Llobregat

Type	Source
Funding sources	EU funds; city budget of Barcelona
Types of financing	targeted budget expenditures; direct financing or subsidy
Non-financial contribution of resources	provision of land; provision of goods; provision of labour; provision of other services; exchange of services
Persons making non-financial contributions	public authorities (e.g. land, utilities); citizens (for example, volunteering)

Source: Agrarian Park of Baix Llobregat (2021)

Financing of expenses for the maintenance of large urban park spaces is carried out in the city of Barcelona mainly from the city budget. Although, for example, the National Recreation and Park Association (NRPA) recommends using alternative sources of resources for the construction and maintenance of urban park spaces (Revitalising inner city parks, 2014): setting an entrance fee to the park; charging for entertainment events; partnership with government agencies; charity; raising funds from various foundations; using volunteers. Thus, in the city of Barcelona, budget funds are used for the maintenance of large urban park spaces, although, if necessary, other sources of financing can be used.

Some aspects of this problem have been explored by many researchers, while environmental and economic factors are considered in an explicit relationship. Experts believe that by 2050, most of the world’s population will live in cities. The main urban environmental problems are: very dirty air; too high air temperatures. The same problems exist in the city of Barcelona. Dust, consisting of many small solid particles, is carried in the atmosphere and is an accumulation of gaseous molecules or particles that are in it. Solid particles vary in size, which is of particular importance for human health, as it determines how easily and deeply a person inhales a particle into their lungs. Both large and small particles, when inhaled, adversely affect human health. Trees provide a significant but locally concentrated reduction of solid particles. The research of the international organisation already in 2016 demonstrated that Barcelona is a city with a high efficiency of investments in tree planting. The report says that investments in green spaces in the city of Barcelona give a high positive result to improve the ecology of the city. A large number of studies demonstrate that the leaves of trees

both filter out solid particles from the atmosphere and detain many other air pollutants. The study presented that further greening of the city would help reduce the concentration of particulate matter in the atmosphere of Barcelona, and investments in landscaping are appropriate (The Nature Conservancy, 2016).

Therefore, special attention should be paid to the areas with the greatest impact of mitigation when developing green spaces. The concentration of solid particles in the air of the city of Barcelona is assessed as good, thus, safe enough for health. The study “Planting Healthy Air” (2016) quantified the ability of nature to purify and cool the air. In this study, the return on investment (ROI) was explored when investing in planting trees with a concentration of particulate matter (PM) and temperature (T) cooling. It has been identified that green spaces are an effective solution to decrease the air temperature in cities and reduce dust and gas pollution. However, the possibilities of using green spaces for this purpose vary in different cities. As mentioned above, the current environmental problem is abnormal heat. This natural disaster of high ambient temperatures kills about 12000 people worldwide every year and causes discomfort in the lives of millions. Experts estimate that by 2050, a quarter of a million people will be exposed to climate change, which will exacerbate the threat of urban heat waves. Many studies prove that the shadows from trees and their transpiration of water during photosynthesis give the following positive effects: they can help reduce air temperature; reduce electricity consumption for cooling residential premises. The maximum temperature in the city of Barcelona is 24.28°C and it is predicted to rise by 3.8°C by 2040. Green spaces will help keep the temperature in the city at a comfortable level (Planting Healthy Air, 2016).

Thus, the costs of maintaining large urban park spaces, and other green areas, give the following positive effects in the city of Barcelona: reduce air pollution; contribute to lowering the air temperature; provide an opportunity for hiking for the population and other types of activity.

All of the above increases the level of public health and improves the comfort of living in the city of Barcelona. Therefore, the city's budget expenditures for the maintenance of green areas are effective. An important economic effect also consists in reducing healthcare costs, reducing the cost of energy spent for cooling rooms, transport, etc. The social effect is to increase the welfare of the city's population.

CONCLUSIONS

The environment is the most important element of the life support system of the urban population, the guarantee of comfortable living and the health of people living in the municipality. The state of the urban atmosphere is a decisive factor in this regard. The main problems of modern cities are the presence of particulate matter and other types of pollution in the atmospheric air, and an increase in temperature in the territories of cities. Studies present that in many cases, green spaces help to improve the state of the urban atmosphere according to these indicators. In addition, it applies to the city of Barcelona.

As a result of the conducted research, it can be concluded that the costs of maintaining urban park spaces in the city of Barcelona are an important factor in

improving the standard of living of citizens. Every year, about EUR 60 million are received from the city budget for landscaping, which is a fairly large amount for a municipality. However, investments in the development of green spaces are worth it. They allow establishing a comfortable living environment for the population in the city. Ensuring decent living for people in the future is the purpose of sustainable development of the city of Barcelona, as the city supports the UN Sustainable Development Goals, and a large number of city programmes have been developed based on them.

The management of green spaces also lies in the fact that a large number of various commercial contracting organisations of the city are involved in landscaping work, which is a positive moment for the city's economy. The mayor's office engages contractors on a competitive basis. Green spaces, including large park plantings, bring a great positive effect to the city, as they contribute to the purification of the city's atmosphere from pollutants harmful to human health and a decrease in temperature. People get the opportunity to walk and perform various types of physical activity. All this allows improving the comfort of living in the city and the health of the urban population.

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None.

CONFLICT OF INTEREST

None.

REFERENCES

- [1] 6 ways trees benefit all of us. From a city park to a vast forest, trees deliver for us when we help them thrive. (2021). Retrieved from <https://www.nature.org/en-us/what-we-do/our-priorities/build-healthy-cities/cities-stories/benefits-of-trees-forests/>.
- [2] Agrarian Park of Baix Llobregat. (2021). Retrieved from <https://una.city/nbs/barcelona/agrarian-park-baix-llobregat>.
- [3] Aram, F., Solgi, E., Baghaee, S., Garcia, H.E., Mosavic, A., & Band, S.S. (2020). How parks provide thermal comfort perception in the metropolitan cores: A case study in Madrid Mediterranean climatic zone. *Climate Risk Management Journal*, 30, article number 100245. doi: 10.1016/j.crm.2020.100245.
- [4] Barcelona Superblock Plan. (2021). Retrieved from <https://www.barcelona.cat/pla-superilla-barcelona/en>.
- [5] Barcelona Superblock: A project for the future. (2021). Retrieved from <https://ajuntament.barcelona.cat/superilles/en/superilla/eixample>.
- [6] Barcelona's 2030 Agenda. SDG targets and key indicators. (2020). Retrieved from <https://ajuntament.barcelona.cat/agenda2030/sites/default/files/2021-01/Agenda%202030%20of%20Barcelona.%20SDG%20Targets%20and%20Key%20Indicators.pdf>.
- [7] Climate Plan 2018-2030. (2018). Retrieved from https://www.barcelona.cat/barcelona-pel-clima/sites/default/files/documents/climate_plan_maig.pdf.
- [8] Management of trees. (2021). Retrieved from <https://ajuntament.barcelona.cat/ecologiaurbana/en/services/the-city-works/urban-management/coordinating-improvement-measures-in-public-areas/management-of-trees>.
- [9] Master Plan for Barcelona's Trees 2017-2037. (2017). Retrieved from <https://ajuntament.barcelona.cat/ecologiaurbana/sites/default/files/Pla-director-arbrat-barcelona-ENG.pdf>.
- [10] Moreno-Garcia, M. (2019). The microclimatic effect of green infrastructure (GI) in a Mediterranean city: The case of the urban park of Ciutadella (Barcelona, Spain). *Arboriculture & Urban Forestry*, 45(3), 100-108. doi: 10.48044/jauf.2019.009.

- [11] Nature based Solutions in Mediterranean cities. Rapid assessment report and compilation of urban interventions (2017-2018). (2019). Retrieved from https://www.iucn.org/sites/dev/files/content/documents/rapid_assessment_med_nbs_cities_jan19v2.pdf.
- [12] Open Budget. (2021). Retrieved from <https://ajuntament.barcelona.cat/estrategiaifinances/pressupostobert/en/programas/1711/green-spaces-and-biodiversity#view=functional&year=2020>.
- [13] Pinto, V.D., Martins, C., Rodrigues, J., & Rosa, M.P. (2020). Improving access to greenspaces in the Mediterranean city of Faro. *AIMS Environmental Science*, 7(3), 226-246. doi: 10.3934/environsci.2020014.
- [14] Planting Healthy Air. (2016). Retrieved from <https://tnc.maps.arcgis.com/apps/Cascade/index.html?appid=7fb38bef713d4bca9a411b0fd1079dff>.
- [15] Revitalizing inner city parks: New funding options can address the needs of underserved urban communities. (2014). Retrieved from <https://www.nrpa.org/contentassets/f768428a39aa4035ae55b2aaff372617/urban-parks.pdf>.
- [16] Rosso, F., Cappa, F., Spitzmiller, R., & Ferrero, M. (2021). Pocket parks towards more sustainable cities. Architectural, environmental, managerial and legal considerations towards an integrated framework: A case study in the Mediterranean region. *Environmental Challenges*, 7, article number 100402. doi: 10.1016/j.envc.2021.100402.
- [17] Superilles. (2021). Retrieved from <https://ajuntament.barcelona.cat/superilles/en/superilla/eixample>.
- [18] Tate, A. (2018). Form, funding and political purposes of urban parks. *Environment and History*, 24(1), 81-101. doi: 10.7480/spool.2018.2.3301.
- [19] The Nature Conservancy. (2016). Retrieved from https://www.nature.org/content/dam/tnc/nature/en/documents/20160825_PHA_Report_Final.pdf.
- [20] Transforming our world: The 2030 Agenda for Sustainable Development. (2015). Retrieved from https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E.

Фінансово-аналітична оцінка витрат на утримання великих міських паркових просторів Середземномор'я на прикладі Барселони

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Анотація. Актуальність теми обумовлена тим, що великі паркові насадження мають великий позитивний вплив на клімат середземноморських міст, що підвищує комфорт проживання в них. Такі погодні умови, як аномальна спека, все частіше проявляються в середземноморських містах через глобальне потепління та інші причини. Також спостерігається забруднення повітря в містах твердими частинками та іншими шкідливими для здоров'я людини домішками. Аналіз наукової літератури показав, що в містах Середземномор'я ці проблеми можна вирішити за допомогою міських паркових насаджень та інших видів озеленення. Метою даного дослідження є оцінка ефективності витрат на утримання великих міських паркових просторів Барселони. Провідним методом дослідження цієї проблеми є емпіричний метод, а саме вивчення міських програм озеленення та бюджетних витрат. У статті проаналізовано джерела фінансування витрат на утримання міських паркових просторів, розглянуто міські програми розвитку озеленення та їх фінансування. Також досліджено вплив зелених насаджень на комфорт проживання в місті Барселона. В результаті дослідження було виявлено, що озеленення в місті Барселона фінансується здебільшого з міського бюджету, при цьому витрати щорічно збільшуються. Виявлено, що місто Барселона отримує значний позитивний ефект від інвестицій в зелені насадження, а саме: зменшується забруднення повітря, знижується його температура, люди отримують місця для піших прогулянок, занять спортом та інших видів активності, покращується психологічне та фізіологічне здоров'я населення, міське середовище стає більш комфортним для проживання. Саме великі паркові насадження дозволяють знизити температуру повітря, що покращує якість життя в місті

Ключові слова: озеленення; комфортне міське середовище; дерева; забруднення; чисте повітря
