Ecological and economic competitiveness urbanized territories: conditions and results

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Abstract. The article is devoted to the consideration of the development processes of modern urbanization. The peculiarities of development of urbanized territories leading to environmental pollution and further to its degradation are highlighted. It is determined that scientifically grounded landscaping of urbanized environment leads to the growth of the quality of life of the local population, forms an attractive image for the city, thus contributing to the sustainable development of these territories. It is noted that the main task of "green infrastructure" is to level the negative anthropogenic impact and the fullest disclosure of the ecological and natural potential of the urban environment. Some physiological and ecological features of green spaces that determine their important role in the greening of urbanized areas have been studied. It is also noted that ecologically sound approach due to the growth of ecological and economic competitiveness of the territory in the creation and operation of urban green spaces can give the municipal budget additional funds.

1 Introduction

With the increase of the Earth's population and the intensification of industrialization and urbanization, a qualitative leap in the relationship between society and nature has occurred. As a result of economic pressure, the natural cycle of substances in the biosphere has been disrupted, jeopardizing the health of current and future generations of people. There are many different diseases caused by a general decrease in immunity due to environmental disruption, but the most common are endocrine and cardiovascular disorders. [1] Today, the idea of environmental protection is considered by the world community as the dominant societal paradigm, shaped by the impact of anxieties about the future. Mankind began to realize that the size and resources of the planet are rather limited, the polluted environment negatively affects the health of the current generation of people and endangers the lives of the next ones.

2 Research methodology

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When conducting this scientific research on the problem of sustainable development of urban areas, the works of famous Russian scientists devoted to the processes of modern urbanization were used.

Kovalenko P.P. investigates the peculiarities of climate formation in urbanized areas, considers the impact of the negative impact of the urban environment on human health, manifested in the development of various diseases.

Vernadsky V.I. believed that the biosphere, which is the face of the planet, is changed by man chemically dramatically not only consciously, but to a greater extent this process occurs unconsciously.

V.I. Danilov-Danilyan and others point to the increase of negative human impact on the environment due to the use of more powerful means of influence in resource extraction.

A.M. Alpatyev, considering the principle basis of nature protection, notes the importance of observing the principle of geographical and ecological equivalence.

According to the Concept of the country's transition to sustainable development of 1996, priority measures are defined, which are aimed at environmental protection and development. Much attention is paid to the sanitation of urbanized areas and land reclamation.

In his work devoted to the ecology of the city, N.S. Kasimov points out the necessity of developing wildlife zones and their monitoring in urbanized areas.

A.N. Tetior, studying the basic principles of sustainable development of settlements, refers to them the protection of urban and suburban green zones, architectural and spatial planning of cities and others.

Pivkin V.M. also points out the specificity of the processes of urban air formation, in particular, the formation of "urban breezes", points out the significant difference of urban climate from the climate of other territories.

Vladimirov V.V. in his research states the impossibility of achieving sustainable development of urbanized environment without achieving ecological balance between urban subsystems.

Gamaley A.A. considers landscape-ecological framework with continuous greening of spaces as a variant of urban greening.

Pertsik E.N. believes that in the study of sustainable urban development processes their economic and geographical position should be given great importance, as it is a kind of "spring" for the development of urban settlement potential on a certain territory.

Frolov A.K. trampling and annual cleaning of fallen leaves from urban areas, etc. refers to the causes of impoverishment of urban soils with organic matter.

Gonchar A.A. notes high phytoncidal properties of coniferous plants, due to which at the same closed tree crowns the number of pathogenic bacteria in a pine forest is twice less compared to a deciduous forest.

Belov S.V. considers air ionization as one of the important reasons for the favorable effect of plants on human well-being.

The level of dustiness in cities, as noted by Beryushev K.G., in summer time can be reduced by 30-40% due to the influence of plants.

In this work such scientific methods as statistical analysis, comparative analysis, functional analysis, positive and normative analysis were used. The scientific study was conducted in accordance with the problem-chronological principle, the principles of systematicity and scientific objectivity.

3 Results and Discussions

Vernadsky V.I. considered mankind as a living substance, which is inextricably linked to the material-energy processes of such a definite geological shell of planet Earth as the

biosphere, together representing a powerful geological force. [2] Each year, for each inhabitant of the Earth, an average of approximately 20 tons of raw materials are extracted, which are then processed into consumer products using 800 tons of fresh water and 2500 watts of power. Deforestation, for example, not only produces the wood needed for production, but is also accompanied by the removal of elements such as carbon, oxygen, nitrogen, phosphorus, potassium, and water from the forest ecosystem, while altering the balance of carbon dioxide and oxygen in the atmosphere. Some geophysical parameters, first of all energy and water parameters, are changed in the place of forest clearing. Fauna and microbiological processes also undergo radical reorganization. Thus, there is a large-scale disturbance of natural landscapes with the formation of a huge mass of waste polluting the environment. [3]

According to A.M. Alpatyev, an important criterion in the system of rational nature management is the observance of the principle of geographical and environmental equivalence. The scientist notes three directions for maintaining the ecological security of all mankind:

- Development of processes of expanded reproduction of natural ecosystems, especially concerning plant communities, the environment-forming function of which is to support normal dynamic equilibria in the human environment;
- management of natural-economic systems whose environment-forming functions are equivalent to the natural ecosystems they replaced;
- transition to environmentally friendly technologies that can eliminate unfavorable for human life consequences of production activities. [4]

The issues related to the sustainable development of urban areas are becoming the most urgent for the modern technogenic society. Through sustainable development of territories it is possible to achieve a significant increase in productivity and living standards of society while minimizing existing environmental risks to the environment and public health. One of the factors of such development can be considered as ecologization of urbanized landscapes, creation of comfortable living environment for citizens. Since 1972, within the framework of UNESCO, all cities of the world have been considered as ecosystems, which are collections of interconnected natural elements, including various living organisms and man-made objects. This approach suggests the need to form wildlife zones in urban areas along with the development of production technologies and to monitor them. [5]

In modern times, cities account for a significant proportion of the world's total population. The twentieth century is characterized by the emergence of a large number of different cities in the form of both small urban-type settlements and giant megacities. According to UN experts, the urban population at the turn of the XX-XXI centuries should have been equal to the rural population. Today in the Russian Federation urban areas account for 75% of the total population of the country. [6]

In its development, urbanization changes the landscape, land and water resources, in mass quantities there are wastes polluting natural ecosystems. The growing urbanization has caused many environmental problems of our time, among which the low level of habitat quality, inherent vulnerability of urban systems, increasing population concentration and migration processes, large volumes of waste, reduction of the area occupied by fertile land, should be noted.

Cities, where scientific, educational, technical and cultural activities of the society are active, concentrating an overwhelming number of industrial companies, landfills, etc., at the same time massively pollute the environment, thus contributing to its degradation. The prospects for the development of the entire human community, respectively, are determined to a greater extent by the possibility of transforming urban areas into territories of sustainable development. To solve this problem through the "ecological" reconstruction of settlements, in which there is an organic entry of the city as a friendly component in the

surrounding biosphere, which is an environmentally favorable environment for people to live in. [7]

Natural elements of cities, forming a natural complex, thus give them more stability both in time and space, strengthen the ability to resist emerging deformations. To a large extent, the processes of loss and degradation of the most important for human properties of the ecosystem as the purity of the atmosphere, accessibility of natural recreation areas, aesthetic properties of landscapes, etc. occur in settlements and cities, where there is a high concentration of people and economy. Improvement of the ecological situation in such areas is possible through the improvement of green spaces, which should take into account urban planning zoning, soil conditions, climatic features.

Urban green spaces are considered as the most important ecosystem services. First of all, green spaces are a socially stabilizing factor that provides city dwellers with an opportunity for affordable and quality recreation, significantly reducing the conflict and tension of the environment. The key task of "green infrastructure" is to level the negative type of anthropogenic impact and the fullest disclosure of the inherent ecological and natural potential of the urban environment. Thus, the main condition for improving the quality of life in the city is scientifically based greening of the urbanized environment.

In the future, the use of ecosystem approaches and investment in the development of "green infrastructure" of cities can be reflected in the growth of economic efficiency of these territories, as the indicators of urban greening are among the indicators of sustainable development of urbanization centers. The formation of new approaches and improvement of environmental aspects, based on modern requirements, in the system of landscaping of settlements are considered among the most important conditions for sustainable development of the urban environment.

Russia's transition to sustainable development implies, as priority measures of environmental protection, sanitary cleaning of urban and suburban areas, as well as other settlements, their landscaping and landscaping, land reclamation. [8] According to experts, the implementation of ecologization of the existing urban territory or its part is easier and more expedient than the creation of a new eco-settlement. [9, p. 45]

The main ecological task in the field of urban ecology is the creation of "good" biogeocenoses, i.e. such landscapes, which in the conditions of urbanization would have increased resistance to anthropogenic influence of the environment. [10, p. 35] Landscape-ecological framework, dividing the urbanized areas into permanently greened landscape-planning ecological modules, is one of the types of such ecologization. [11, p. 78] The presence of complexity and diversity in the structure of artificial biogeocenoses in their modeling allows to have such their qualities as productivity and resistance to anthropogenic impact from the environment. [12]

For the sustainable development of cities a significant role is played by their economic and geographical position, acting as a kind of "spring" of the deployment of the potential of urban settlement in a given geographical location. [13] The natural complex of the city is an important part of this potential, in which important ecological functions are performed by urban green spaces. The reason for the high sanitary and ecological efficiency of plants in the implementation of greening of urbanized land is their physiological, morphological and ecological peculiarity. Plants by accumulating sulfur compounds, heavy metals, etc. from the environment in the tissues of their leaves, thereby reducing the indicator of urban atmospheric pollution. Thus, plants can absorb up to 50-60% of toxic gases from atmospheric air.

To a greater extent, the gas-protective role of plants is determined by the gas resistance of elements and species of landscaping. Also, plants emitting oxygen and absorbing carbon dioxide reduce bacterial air pollution due to phytoncidity. The surface of foliage in 1 m2 during vegetation can give oxygen in such quantities: lilac - 1.1 kg; 1.0 kg - aspen; pine -

0.81 kg; 0.62 kg - maple. More than 500 species of phytoncidal trees and shrubs are capable of destroying bacteria dangerous to humans or preventing their development. Thus, a hectare of juniper is able to disinfect the air in the entire territory, the size of a small city. [14] Phytoncidal properties of coniferous species are especially strong, so in a pine forest pathogenic bacteria are twice less than in a deciduous forest with the same closed crowns. [15, p. 84]

Also, many woody plants can improve the ionic composition of the air by increasing the amount of negatively charged light ions in it, which confirms their importance in the geosanitary plan. The number of light ions per 1 cm3 of air in industrial cities and crowded spaces can average 100-500 pc, while the minimum limit of light negative ions per 1 cm3 of air is considered to be 25. At the same time, the number of light negative ions per 1 cm3 of forest atmosphere can reach 2-3 thousand pcs. Released by woody plants resinous substances and various natural processes affect the ionization of air. Air ionization has a favorable effect on human well-being. [16, p. 65] Mixed plantations and mature pine forests ionize the air best of all.

The physical and chemical ability of the surface of plant leaves and their branches to trap and precipitate dust particles leads to a significant reduction in the amount of dust in the atmosphere, which plants can do even in the absence of leaves. Over the course of a year, coniferous plantations can trap about 40 t/ha of dust, and deciduous plants up to 100 t/ha. Plants have different dust-holding properties, so, elm leaves have a dust content of 3.4 g/m2; Hungarian lilac has 1.6 g/m2; maple ash-leaved maple has 1.0 g/m2; laurel poplar has 0.6 g/m2. The ability to retain dust is determined by the texture of the leaf lamina. Thus, due to the roughness of the leaves, elm can six times more dust retention compared to poplar, whose leaves are smooth. Resinous needles with sticky leaves have high dust-holding properties at the beginning of the growing season, which then begin to decline.

Lawns also capture dust well: a 1 m2 lawn with a height of 10 cm has up to 20 m2 of leaf area. Compared to soil without vegetation, grass can deposit 3-6 times more dust and ten times more dust compared to a tree. Due to plants, the level of dustiness in cities in summer can be reduced to 30-40%. [17, p. 567-593]

In general, green spaces are not only natural resources that provide urban residents with the necessary conditions for living and improve their quality of life, but also economic, as they contribute to the growth of attractiveness of these territories and provide additional funds for the municipal budget if used correctly.

4 Conclusions

Any economic development is based on three factors of economic growth: labor force, artificially created means of production, and natural resources. And in connection with this, there is a growing realization that the economy should not only live in accordance with economic laws, but also take into account the importance of environmental laws. A new branch of scientific knowledge - ecological economics - has emerged in connection with the growth of environmental problems

Today, the competitiveness of goods and services is also affected by the consumer properties of green areas, thus determining the possibility of increasing the standard of living of the population to forecast the growth of demand for environmentally clean areas. Thus, the economic role played by green areas of cities is to increase the quality of life and health of the population living in them, by improving the conditions of sanitary-hygienic and recreational type, as well as in the creation of aesthetically attractive landscapes. Increasing the efficiency of use and preservation of green spaces, increasing the level of competitiveness of both individual urban areas and the entire urbanized ecosystem leads to

the implementation of accounting for the ecological and economic value of the natural framework of territories of settlements.

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