Urban ecology as a means of ensuring the ecological balance of modern cities

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Abstract. Through the prism of the phenomenon of modern large cities, the article notes the dualism of these formations at the present time. Cities, on the one hand, have a large and diverse potential, and on the other hand, they must ensure the implementation of their population numerous needs. Achieving a balance between these two components will ensure the stable development of the urban and surrounding territories, as well as the interests of economic entities and society. However, cities are part of the world, along with nature, which means they have an impact on it. The larger the city, the more intense it is in the world around it. Therefore, it is also important to ensure a balance between the constantly ongoing various processes of the city and the environment, which urban ecology may contribute to.

1. Introduction
The development of engineering and technology, including information technology, which continues over the past decades, has led to a reorganization of the territorial distribution of human activity. As a result, small settlements began to grow, becoming cities, cities, uniting with other cities, began to form urban agglomerations, and agglomerations began to strive for even larger entities – metropolises. [1]

In the era of globalization in which we now live, this process is irreversible. Urbanization covers all the large cities, which is facilitated by the increased concentration of productive forces in the context of scientific and technological progress. [2]

As a result, a modern large city is a place where the economic, political, social, cultural life of the population is concentrated as part of a particular society. Accordingly, a large amount of financial, natural and human resources, certain needs and expectations, but also specific problems are concentrated in this place. [3]

Thus, we can note the dualism of modern large cities, which, on the one hand, have great potential, and on the other hand, must ensure the implementation of the numerous needs of their population. Achieving a balance between these two components will ensure the stable development of the urban and surrounding territories, as well as ensure that the interests of economic entities and society are respected.

This should entail the creation of a convenient business environment with the preservation of sociocultural values in different areas of the city.

For this purpose, a scientific understanding of current trends and problems of the development of large cities and the adjacent territories is necessary [4].
2. The phenomenon of the modern city

The modern city, and even more so the large city, is no longer just the place of residence of the population. This is a special habitat, which has its own characteristics, allowing us to talk about the phenomenon of the modern city. [5] These include the following:

- A large concentration of residents in a relatively small area.
- High-density urban development of buildings and structures, including multi-storeyed buildings.
- Increased number of vehicles and traffic intensity.
- Numerous utility systems (power utilities, public water supply) in a limited area.
- Location of potentially hazardous industrial facilities on the territory of the city.
- Substitution of natural objects for artificial landscape;
- Loss of human direct contacts with nature (tactile, sound, visual, olfactory);
- The influence of the city on the natural daily biorhythms of a person (night work, lighting of cities at night, noise).

If we consider the particular characteristics of large cities from a scientific point of view, we can talk about an independent concept based on the development of economic theory, economic geography and sociology, as well as a number of other sciences. Then the agglomeration appears as a result of the spatial distribution of places of residence (settlements), united by intensive production, labour, cultural and recreational relations. [6]

The phenomenon of the modern city lies in the fact that:

- Large cities accumulate the political, administrative, and economic functions of society [7].
- The metropolis as an urbanized space is growing due to the nearest outlying districts.
- Initially, the space outside the city is a source of resources for the development of the city. Over time, part of the production and recreational functions of the city is transferred to the suburbs. As a result, the outlying districts are actively developing. In the end, there is a process of merging these territories, in which the suburb becomes part of the city itself and is already the city itself. [8]
- There is a tendency to unite cities into urban agglomerations, and then the agglomerations grow to the size of metropolises.

Nevertheless, the main thing remains unchanged. This is still primarily the environment and place of residence of people. The need to comprehend the social phenomena that accompany the emergence of urban agglomerations, such as urbanization, migration, the emergence of new forms of inequality in the labour market, blurring the boundaries of the social space of the city, required interdisciplinary studies of urban development.

The versatility and complexity of social life in large cities allows us to study this phenomenon from the perspective of various sciences: philosophy, social anthropology, history, economics, geography, ethnology, sociology. [9, 10]

3. Problems of modern cities

However, the problems of urbanized cities are also becoming widespread. Thus, one of the main problems at present is the problem of ecology. [11]

This problem is typical for the vast majority of modern large cities. Nevertheless, with its general similarity, one can note the diversity of various aspects of environmental problems for modern large cities [12]:

1) Air pollution
Huge damage to the environment, and as a result, to humans is caused by emissions from internal combustion engines, as well as industrial and energy facilities. These contaminants contain such harmful substances as nitric oxide, lead, dust, sulfur. These compounds cause cancer, congenital defects, and the destruction of the immune system.

2) Water supply problems
Urban ecology is characterized by a shortage of water resources due to the fact that the use of water in megacities is 10 times greater than in rural areas. The volume of effluents per person reaches 1 m³ per day. One city with more than 1 million inhabitants discharges up to 365 million tons of wastewater per year.

The process of water pollution by industrial and household waste has reached catastrophic proportions. This leads to the extinction of river animals and plants. The underground water arteries of cities are significantly depleted due to constant pumping and pollution to a great depth.

The result of such processes is the shortage of drinking water on a planetary scale.

3) Waste generation
A significant source of water and soil pollution is litter. The decomposition time of each individual material varies in certain climatic conditions. The decay of some synthetic elements lasts up to 500 years. A city with a million people annually accumulates about 3.5 million tons of solid waste (slag, ash, construction waste, plastic, paper). After raw material processing, a lot of waste pollutes the environment.

4) Problems of causing harm to the land and related facilities.
Damage to the soil, reduction of agricultural land, etc. creates a separate set of problems in the field of agriculture and agribusiness. [13]

5) Social issues
The social problems of cities include issues of the safety of its inhabitants and inequalities of a personal and social nature. The solution to the problems of production and labour inequality is in the redistribution of working conditions, national income between the subjects of the labour process, districts, and regions.

The concentration of capital leads to a wider gap between social demand, individual abilities and interests.

4. Urban ecology of the city ecosystem
The main problem of the 21st century is the problem of ecology, and specifically, the ecological situation in cities. Urbanization in recent decades has become widespread and an ongoing process. The environmental consequences of human activities, which are observed everywhere, are especially noticeable in urban areas.

This explains the interest in the study of urban positions in ecology and the development of such a science as urban ecology in collaboration with other sciences (medical, biological, urban planning, etc.), including new scientific directions [14], which study the ecological interaction of human activity with the environment of the city.

Based on the data of urban ecology and the technosphere, ways are being developed for a new environmentally friendly urban development by studying the mechanisms of interaction between the urbanized and natural environment.

The task of urban ecology is to develop such a plan for the development of an urban settlement that would ensure a high quality of human life, health protection, litho-, hydro-, atmosphere and biosphere protection from the harmful effects of the urban environment.

5. Conclusions
The development of modern cities is manifested in the intensive socio-economic, technological and infrastructural development of large urban centers and surrounding suburban areas. They are complex conglomerates of central and outlying districts, and transport, communication and other links between
them provide various economic, administrative, social and other institutions that determine the specific configuration of the structural elements of the agglomeration.

The ongoing changes are large-scale, they indicate an increasing role of cities at the global level and at the same time are unique to each specific city. These processes are very fast, which does not seem possible to develop a single universal scheme that could be laid in the foundation of development management of any large city.

However, to streamline these processes, and most importantly, to protect them as much as possible in order to ensure the life and health of the people living in the cities, as well as for the environment, is the main task of urban ecology.

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