

# **MAIN METHODOLOGICAL PRINCIPLES OF SOLVING ENVIRONMENTAL PROBLEMS IN URBAN PLANNING**

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*Settlement as an aggregate of global, regional and local processes of location of a growing population on the planet on an increasingly large scale determines the development of an urbanized environment on the Earth, the main material element of the life activity of society in its interaction with the biosphere. At the same time, the most important historical task of mankind is the preservation of the biosphere as the main prerequisite for the life on earth of man as a biological species and as a social being. At the same time, the problem of the methodology of security activities and the utmost improvement of the environment in the immediate habitats and the maximum concentration of people – cities, towns and other settlements, whose impact on the natural environment has reached global proportions, and, nevertheless, continuously increases.*

*Key words: Urboecology, Urban Development Methodology, Territorial Planning*

## **INTRODUCTION**

Issues related to the protection of the environment, the solution of ecological and town planning tasks of resettlement should be considered at all territorial levels. At the same time, the activities and nature of these issues determine, mainly, the scale of the territory under consideration and the type of scientific and design work on urban development.

It is common for all levels that the development of measures related to the rational use of the territory, its functional zoning, the most effective mutual placement of production and the population should have an important place in their documents. That is, proposals for the environmental optimization of resettlement and the protection of the environment should have a particularly territorial character. This feature is comprehended the stronger, the smaller the scale is and the higher the degree of generalization of design decisions in this or that town-planning project is.

So, for example, the rational placement of car parks in residential neighborhoods cannot be the task of the General Settlement Scheme. At the same time, this is an important issue within the most specific types of urban planning. In turn, macrozoning of the territory, taking into account environmental constraints, presenting the most important ecological task of the higher floors of urban planning, is of no practical importance

when considering the problems of planning residential areas and microdistricts.

According to these peculiarities, the methodology of regional settlement and district planning should be based on sufficiently wide and universal scientific approaches and ecological principles, the introduction of which into scientific research and project practice can provide solutions to environmental and town planning tasks in accordance with the requirements of scientific and technical and social progress.

## **INTEGRATION OF ENVIRONMENTAL KNOWLEDGE**

The results of many studies show that it is possible to judge the preferences of one form or another from one ecological point of view only in the most general terms. The structure of urban education, its functional and planning features and parameters can be identified and justified by a sufficiently in-depth analysis of a specific situation, including the environmental situation.

Therefore, when planning and designing the resettlement, it is necessary to proceed not only from planning, social and economic principles alone, but also from a sufficiently deep ecological understanding of the place, role, dynamics of the given system of settlement in the natural environment. The implementation of such an approach is impossible without a system of views,

concepts and methods that can adequately assess the nature of direct and feedback between a person and nature within an urban education, and if necessary within a wider range.

Constructive proposals ensuring the protection and improvement of the environment acquire the particular importance in the design of the settlement, which is essentially the modeling of the human habitat. The development of such proposals should be based on a methodology capable of ensuring, within the framework of scientific and design works on urban development, the fulfillment of the minimum ecological requirements for resettlement that is necessary in the era of the scientific and technological revolution.

Most researchers of the environmental problem believe that the practical activities of human society in its relationship with the environment in an era when this activity is close in scope and strength to natural processes should rely on science or even a whole system of sciences studying the most complex interrelations between society and nature.

Not yet born, such a science received many names – “social ecology”, “complex geography”, “general theory of interaction of nature and society”, “geodemology”, “general anthropoecology”, etc. Most often and, it seems, more reasonably this science is called “human ecology”.

A wide range of problems of human ecology, its understanding as a whole association of scientific and applied disciplines, objectively led to life and private anthropoecological directions in science related to human activities under certain conditions. Thus, opinions are expressed about the legitimacy of the existence of ecological morphology, ecological pathology, epidemiological ecology, urban ecology or ecology of the city, engineering ecology.

The city’s ecology is of particular interest in this case – a complex of town-planning, medical-biological, geographic, social, economic and technical sciences that, within the framework of human ecology, study the interaction of people’s productive and non-productive activities and natural processes occurring on the territory of urban settlements and zones of their influence [01].

Within the sphere of structural urban development the existence of such an application of discipline is fully justified, especially as this area is quite successfully developing. However, the transfer of the term “city ecology” to the higher

levels of urban planning seems to be insufficiently justified, since it does not reflect the specificity of urbanization as a deep process covering vast areas devoid of urban development (rural areas, recreation areas, etc.) and, moreover, somewhat passive, unconstructive shade (such as “forest ecology”, “ecology of the sea”, etc., i.e. purely biological disciplines that study the interaction of a set of organisms inhabiting a certain environment with this environment). The term “urban ecology” seems more preferable, and the term “regional urban ecology” – as applied to the study and designing of settlement.

The field of application of regional urboecology is quite broad. Studies can be conducted independently or aimed at solving a number of problems in the sphere of interaction of the biosphere and its individual elements with the urban structures of the regional level – settlement systems, a network of populated areas associated with individual natural and economic zones of countries and continents, as well as with the largest urban development subsystems – recreational, social services, etc. However, the greatest importance of regional urban ecology has as a methodological basis for the solution nature protection tasks in complex, covering vast areas, scientific and design work on regional resettlement and district planning. Within the framework of these urban disciplines, regional urban ecology acquires the most concrete content and clearly expressed constructive orientation.

The methodological basis of regional urban ecology is the methodology of urban development, the whole arsenal of town-planning concepts, categories and principles. Widely used in it, the methodical techniques are known in urban planning and district planning (integrated assessment and functional zoning of the territory, variant studies, etc.). In turn, regional urban ecology significantly enriches the urban planning methodology with an ecological approach.

One of the most important ecological disciplines, whose task is the development of theoretical bases for optimizing the conditions of the human environment from the standpoint of its health, is hygiene. It combines all existing knowledge about human health in an integrated system that allows you to manage the process of preserving and strengthening people’s health, taking into account the diverse social and biological factors. Hygienic science uses a wide arsenal of meth-

ods and is based on the patterns revealed by it that characterize the reactions of the human body to the effects of various environmental factors. Hygienic research is mainly aimed at obtaining quantitative criteria that characterize the optimality of an agent in terms of human health [02].

This feature of hygienic science is widely used in urban planning by taking into account the maximum permissible concentration (MPC) of certain air, water and soil polluting substances, as well as other important indicators as constraints, zoning criteria, etc. Urban development also uses the achievements of hygienic science in the field of rationing of various sanitary ruptures, cleaning of industrial emissions and wastewater, disposal of domestic garbage, etc.

All this is important to use for the following reasons:

- the main task of regional urban ecology is to ensure urban conditions for the preservation and strengthening of human health, and without hygienic norms and standards, it is practically impossible to develop appropriate proposals in the field of resettlement;
- hygienic standards for the establishment of sanitary protection, water protection and other areas, for medical zoning in resort areas, etc. – necessary elements of the spatial organization of settlement, planning organization of any region or region – the object of regional settlement and district planning;
- measures for the purification of sewage and industrial emissions, the organization of waste disposal, the fight against local manifestations of epidemiological and endemic diseases, and many others are included as an essential part of the complex of measures for the protection and improvement of the environment, developed in the framework of regional urban ecology;
- hygienic standards are doubly important in conditions when there are no standards for the quality of the natural environment, since they to some extent take into account the capacity of ecosystems and the resistance of certain species of plants and animals to pollution and other disturbances in nature.

Thus, the field of use of hygienic developments in regional urban environment is very wide, although it is limited by those problems that are

solved on the scale of regional settlement and district planning – the most important hygienic problems of insolation, aeration, control of local manifestations of noise, electromagnetic radiation, etc., Characteristic for individual populated areas and their parts.

Recognizing the importance of hygienic methods and standards in town planning studies, it should be noted at the same time that under the biospheric (general ecological, not only anthropocentric) approach to large town-planning structures, some hygienic methods are no longer sufficient. In conditions of growing industrialization and urbanization, it is important to investigate not only the factors of the urban environment proper, but also take into account the influence of fairly large surrounding urban areas of territories [03]. This is all the more important, because hygienic standards, for all their importance for regional urban ecology, do not always adequately reflect the nature of the reverse negative connections between man and nature.

All this testifies that the scientific bases of regional urban ecology are far from being exhausted by hygiene. In particular, the scientific and technological revolution, stimulating the development of advanced technologies to solve environmental problems in the sphere of material production, opens up great opportunities for protecting the natural environment through engineering and technological measures.

The rapid development of production, a radical change in technological processes, the development of transport, communications, and military equipment have led to significant changes in the nature of the relationship between nature and society. Over the past 100 years, the speed of communication has increased 10 million times, the speed of data recording – 1 million times, energy production – 1000 times, the power of weapons – 1 million times, the production of goods – tens and hundreds of times [04].

As a result of such changes, the technogenic pressures on the natural environment have multiplied many times, but the negative feedback reactions on the part of the latter have become so great that violations in nature are increasingly affecting production efficiency. Increasingly, therefore, attempts are being made to directly neutralize the harmful impact on the environment directly in the production sector, and engineering and technological methods – the improvement



of energy, chemical, metallurgical and other production cycles, irrigation and transport systems, communication systems etc.

The following directions in ecological compensation by engineering and technical means are of the greatest interest for regional urboecology;

- development of technology for wastewater treatment, emissions into the atmosphere, solid industrial and municipal waste, etc .;
- introduction of low-waste and non-waste technologies into production, deeper processing of raw materials, utmost utilization of waste, etc .;
- development of new, more “green” transport systems, energy, water, communications;
- introduction in practice of new methods of engineering preparation of territory in a broad sense (including irrigation, melioration, etc.).

Cleaning systems are very powerful in the struggle to preserve the natural environment, and this provision will continue for a long time to come. In the field of regional urboecology, the analysis of prospective cleaning systems, taking into account the expected changes as a result of scientific and technical progress, is of paramount importance.

At the same time, if we strive for the lowest entropy production, then the expansion of the compensating activity, that accompanies the main production, can be considered a forced, far from optimal exercise. The treatment facilities themselves represent a region of environmental pollution, and as a result of the processes occurring in them, the entropy increases, which is generally characteristic of any process occurring in a closed system. Therefore, in principle, we should strive not to create production, which includes two types of activities – production and compensating, but to the development of such production processes that can provide a minimum increase in the entropy of the environment (increasing use of solar energy, the creation of an artificial reaction of photosynthesis, etc.) [05].

At present, the main task is to reduce the entropy of the environment in every possible way by means of a gradual transition from unproductive treatment facilities (where possible) to productive waste and emissions utilization. The development and implementation of low-waste and non-waste technological processes is of particular importance. Although they do not lead to the

complete elimination of harmful emissions and a significant reduction in the entropy of the environment, but as a complex of interrelated measures at all technological stages from processing raw materials to using finished products, they ensure the minimization of harmful emissions and reduce the impact of waste on the environment.

The introduction into practice of new engineering systems with a high degree of “environmental friendliness” (“clean” and noiseless modes of transport, progressive water treatment systems, reliable devices to protect the environment from electromagnetic waves, etc.) is particularly effective in combination with planning methods that ensure rational tracing of transport highways and other engineering communications, as well as the placement of appropriate engineering and technical devices within a particular territory. Regional urboecology should give recommendations on the most effective methods of combining engineering and technical and planning ecological compensation that can be used in the design of engineering corridors, the formation of special infrastructural functional sectors and other planning elements of the territory within the framework of the regional planning.

The importance of an ecological approach to resettlement, urban planning is generally determined by the exceptional role played by living matter in planetary processes. The atmosphere, soil and vegetation cover, surface and groundwater are environments that are in an unstable equilibrium, which cannot be ensured by itself. The main factor supporting these environments in a stable state, necessary for the existence of life on Earth, is the living substance itself, which has the property of ecological self-sufficiency.

### **METHODOLOGICAL APPROACHES**

Regional urboecology develops as a part of specific urban planning disciplines – regional resettlement and district planning, uses many of their methods and is largely based on their methodologies. Therefore, the most important methodological approaches in regional resettlement and district planning are simultaneously applicable in regional urboecology.

At the same time, the specificity of this science prompts to look for a new approach to the methodology of regional settlement and district planning and to focus on the most important approaches from the point of view of regional ur-

boecology – territorial-town-planning, integrated, systemic and bioeconomic.

The territorial and town-planning approach to solving the problems of regional urban ecology is determined by the peculiarity of the projected measures for environmental protection, planned in the regional scientific and design urban planning works. These activities form a certain system, the spatial boundaries and the nature of the functioning of which are determined by the specific territory, features and structure of its planning organization. The territory acts as an integrating category in this case and how efficiently it is used, how effective its planning organization is, not only the harmonious development and location of the economy, the formation of a settlement system, but also the effectiveness of environmental measures depends. In turn, territorially balanced nature management is one of the most important prerequisites for rational resettlement, location of production and non-production facilities.

An integrated approach to the design of town-planning structures at the regional level is to strive to achieve the greatest completeness and complexity both horizontally (covering as many of the branches of the economy as possible on the given territory and, accordingly, developing a wide range of sections) and vertically (the desire to consider fully and comprehensively all the questions). This is equally important for constructive and analytical sections, for the anthropogenic and natural components of a given territory, since only a joint study of all the various problems can lead to the adoption of really valid and serious design decisions.

The idea of a systematic approach – the consideration of a phenomenon as a complex whole, consisting of a set of interrelated elements – is not new for many branches of knowledge. In particular, the regional planning (and in its composition and regional urbanecology) is essentially a systematic method, since its main content is to create an integrated model of the region on the basis of analysis and synthesis of the interrelationships between the natural, social, ecological and technical components of the territory and in specific conditions to identify activities for its implementation.

The development in recent years of a systematic approach, including the general theory of systems and system analysis, successfully applied

in the development and implementation of many large-scale plans and programs, has led to the creation of a clear system of methodical and procedural techniques. The number of ways to represent objects systematically can be very large, since this representation is subjective. However, in any case, two important conditions must be taken into account.

The first condition is a comprehensive coverage of all natural, economic and social factors, since the planning solution must be the optimal model of "... an exemplary formulation of a small "whole", but a nominal "whole", i.e. not one economy, not one branch of the economy, not one enterprise, but the sums of all economic relations, the sum of all economic turnover, at least a small area".

The second condition is the dismemberment of any complex problem into a number of lower-ranking problems requiring their own special approach and having the best solution for the rational functioning of the system as a whole.

As management systems (i.e. systems containing a set of design solutions and recommendations), regional resettlement and district planning should be based primarily on system analysis – the "methodology for solving major management problems" [06], capable of streamlining the logic of urban development (including urbo-ecological) problems, reconciling the goals with the available resources and reliably selecting the necessary variant of the planning solution.

A special place in urban ecology is taken by the bioeconomic approach. The large scale of economic activity causes enormous damage to the natural environment. But there are intense negative feedbacks – the oppression and degradation of nature turn into enormous losses for the economy, the social sphere, and society as a whole. The higher the level of pollution of the environment is, the greater the costs of their prevention are, respectively. Further growth of these costs in the end can make any production unprofitable. On the other hand, the lower the costs of cleaning the environment are, the greater the damage from pollution and other disturbances in the natural environment is. This is the economic content of the problem of finding optimal effects on nature. The desired optimum can be achieved when the additional costs of preventing the negative consequences of anthropogenic pressure on nature are at least balanced by savings from

reducing the damage from such pressure [07].

The diverse natural and anthropogenic processes are so closely interrelated at present that an objective necessity has long appeared for approaching modern production as a complex ecological and economic system without opposing the economic and natural systems to each other, as many researchers of this problem have noted. This approach requires the implementation of production processes, taking into account the preservation of the equilibrium of the environment, that is, in essence, the implementation of principles of environmental management.

Successful management of modern social production is impossible without combining the methods of managing economic development with the methods of managing natural biological processes into a single methodology, managing the bioeconomic system, which should be understood as the integration of economy and nature, which is the interrelated and interdependent functioning of social production and the flow of natural processes in nature [08].

Since any process associated with human activities, like any natural process, takes place in space and in time, regional settlement and district planning, in which a purely utilitarian socio-economic approach still prevails, are of particular importance in their harmonization. Under the new conditions, the ecological component of the regional settlement and district planning, i.e. analysis, prediction, synthesis status of all components of the natural environment of an area, should be greatly enhanced. It is necessary to have a new approach to the issue of environmental management as a part of the urban disciplines to take into account the potential of ecosystems possible with sufficient reliability. This, in turn, means that the traditional approach to regional resettlement and regional planning must give a way to more progressive and more relevant to modern conditions wide bioeconomic approach, that involves consideration of "equal" anthropogenic and natural subsystems of the area and ensures the achievement of combined effectiveness of planning activities aimed both at the rational organization of agriculture and settlement in the area, and the preservation and enrichment of the environment.

## CONCLUSION

The development and implementation of a set of measures that ensure the preservation and improvement of the natural environment in an area, combined with the desire to obtain the greatest possible economic and economic effect, are extremely complex. In addition to the difficulties associated with analyzing and forecasting the nature of interactions between natural and anthropogenic subsystems, overcoming conflict situations between them, and lack of ecological standards for the environment, there are difficulties in assessing and predicting the diverse exogenous links of district systems, especially since the development of targeted development programs for individual systems resettlement should begin already at the macroterritorial level, that is, at the level of the country and its large regions. In these conditions, the importance of implementing systemic, bioeconomic and other approaches within the framework of regional urban ecology is even greater.

All this shows that in addition to integrating scientific ecological knowledge, fairly general, large-scale and universal environmental principles are needed that could be used as a basis for solving constructive tasks of resettlement at various territorial levels.

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