

Prospects of ecological transformation within the framework of sustainable development of spatial systems

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Abstract. The need to solve the problem of economic progress through the regression of ecology is an urgent issue of our time. Therefore, humanity needs to try to discover and use its own potential to solve environmental problems, while maintaining economic growth. This issue is reflected in sustainable development. The author defines the term "sustainable development of spatial systems", points to the approaches used to assess sustainable development. In conclusion, the author gives the stages of the implementation of the process of greening economic activity, and also notes the importance of a comprehensive assessment of the sustainability of any spatial system, which must necessarily assume a balanced functioning of all the elements that make it up.

1 Introduction

Currently, the overdue conflict between man and nature entails the solution of the most important task – the implementation of economic progress through the regression of ecology. The progress of the economy is always directed to satisfying the material needs of man, and in the process of evolution, the needs of mankind increase, making technological development inevitable. As a result, the development of the economy, since the XX century, is no longer imaginable without scientific and technological progress, which ensures and maintains constant, steady growth rates of production, and this, in turn, implies an increasing dependence on those resources that come to the economy from the natural environment. Thus, a contradiction is generated that humanity wants to "consume" without making efforts to "save". In addition, it is important to note that the economy requires immutable and constant development, but such a development process generates consequences harmful to the environment. In turn, economic growth, which leads to the constant development of the economy, the increase in production capacity, the growth of the gross national product and other indicators, only increases the negative impact on the environment.

Based on all of the above, it should be emphasized that the imbalance caused is explained by the inability of people to unambiguously resolve the issue of harmony between economic and environmental development. Therefore, humanity needs to discover

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and use its own potential to solve environmental problems, while maintaining economic growth [4].

The English term sustainable development, which was later translated into Russian as sustainable development, originally appeared in nature management. Before anyone else – in the middle of the XX century. – this phrase was used by Canadian experts on fisheries regulation. So they called the system of exploitation of fish resources, in which these resources are not depleted, the catch corresponds to the possibilities of simple reproduction of the fish population. But even 100 years before the Canadian fishermen, the same idea, but in relation to other resources and in a different language, was put forward by German foresters: they had in mind such a system of forest exploitation in which the forest is preserved, logging does not exceed natural growth and cutting areas are organized in such a way that the forest ecosystem is reproduced without loss. With such a system, both in fishing and forestry, the exploitation of a resource can continue indefinitely, if extraneous factors unrelated to nature management as such do not interfere. The adjective sustainable emphasizes, along with stability, the long-term nature of the process, that it is maintained in such a way that its important properties are continuously reproduced.

Thus, the concept of "sustainable development" should include an understanding of the formation of the territory taking into account the balanced development of its economic, social and environmental components implemented in the process of urban planning decisions, ensuring the interests of the population and creating prerequisites for subsequent progressive development, while any anthropogenic impact occurs within acceptable limits [3].

2 Materials and methods

Indicators of sustainable development are used to determine the possibilities of achievement and dynamics in the movement towards the set goal, as well as for possible correction of the selected initial direction and specific actions. Without them, it is impossible to assess the effectiveness of progress towards the set goals of sustainable development, the level of achievements, the fidelity of the means used to achieve the result.

Based on the scientific literature, two approaches to the construction of indicators of sustainable development are derived (Figure 1).

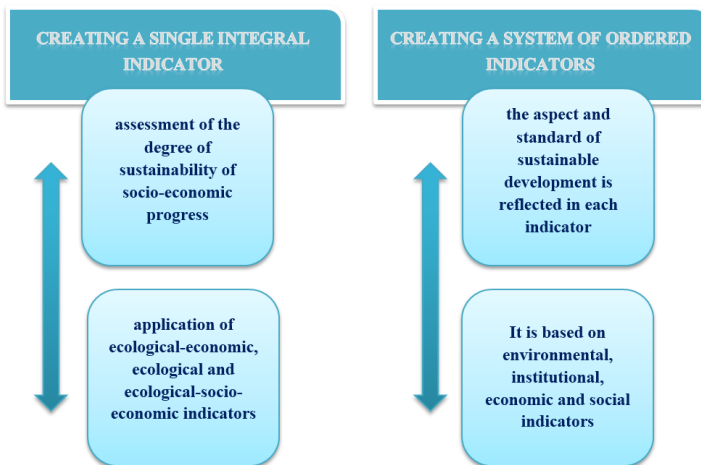


Fig. 1. Approaches to building sustainable development indicators.

The integral indicator is one of the most thought-out and theoretically prepared indicators of sustainable development, it has extensive statistical information, and its calculations can be carried out both at the federal and regional levels [1]. In turn, the Development Program evaluates and compares the environmental sustainability of countries based on the indicators shown in Figure 2.

The indicator of fossil fuel consumption reflects dependence on raw materials. The use of fossil fuels negatively affects the climate and sustainable development, as it leads to large amounts of CO₂ emissions [1].



Fig. 2. Indicators for assessing and comparing the environmental sustainability of countries.

Today, the world community is working on the development of indicators and specific criteria for sustainable development, including in relation to the totality of the entire spatial system. The United Nations, for example, acts as the developers of the indicators necessary for the evaluation of the system (belongs to the creation of a system of integrated environmental and economic accounts for "Ensuring environmental sustainability" in the "Millennium Development Goals") [10]. Other reputable international organizations are also working on such indicators. The fundamental point of these approaches is the subtraction of the damage caused by environmental pollution and depletion of natural resources, which is a kind of ecological adjustment of the main socio-economic indicators of development.

Using official indicators of international organizations, including the UN human development Indices and adjusted net savings of the World Bank, it is possible to determine the significance of environmental and social problems in the development of the country.

Considering that in the Concept of Sustainable Development, the leading role is assigned to the problem of assessing long-term environmental consequences based on

decisions taken at a specific time on the development of territories [5]. Minimization of possible negative environmental consequences is taken as the target function of the indicator, therefore, well-known approaches as part of the criteria for sustainable development suggest: an approach based on the classification of natural resources of the territory and their reproductive dynamics - a regional approach, as well as an ecological and economic approach.

The regional approach is based on the classification of natural resources and the dynamics of their reproduction [2]. It is based on four criteria (Figure 3).

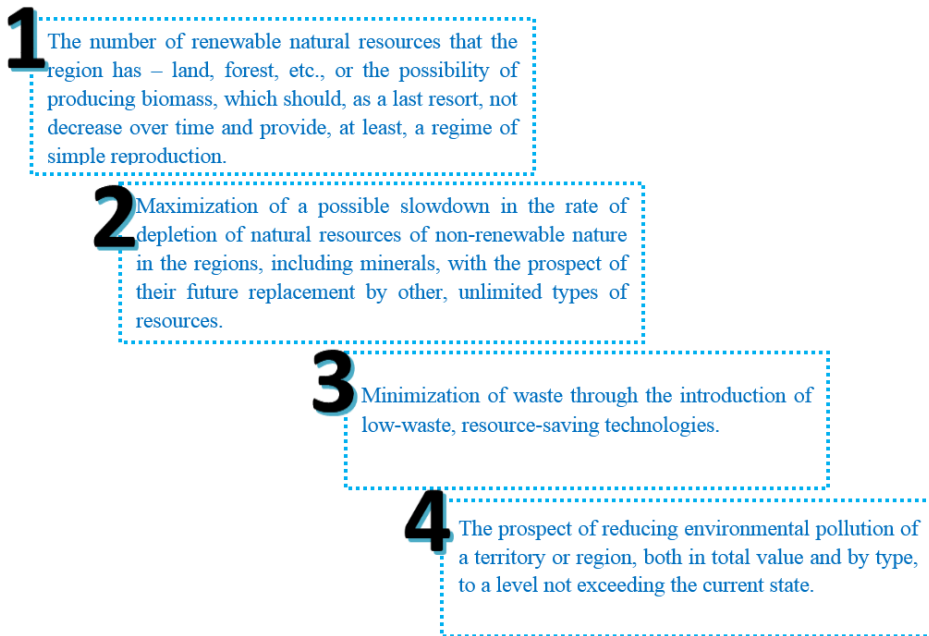


Fig. 3. Criteria for the classification of natural resources and their reproduction in the regional approach.

The ecological and economic approach has a basis of two basic standards:

- Reduction of the natural intensity of the economy, which can be achieved in a process where the Indicator of natural intensity makes it possible to assess the efficiency with which natural resources are used at all stages and stages of processing and consumption. This indicator can be calculated as a coefficient at the macro level and also at the level of industries. The level of a separate industry assumes a coefficient of natural resource intensity by determining the costs of a natural resource – N per unit of final product – V , which is produced using this resource, for example, the area of land required for the production of 1 ton of grain; the amount of forest resources required for the production of 1 ton of paper, and so on.

$$e = N / V \tag{1}$$

Where N – costs of a natural resource; V – unit of final product (multiplicity) [2].

In fact, this assessment is an assessment of the effectiveness of the functioning of the natural product vertical, which connects primary natural resources with the final products of an enterprise or industry [6]. At the same time, the lower the indicator, the more effective is

the process of converting natural substances into products, and waste and pollution, respectively, are less.

3 Results and Discussion

Greening of economic activity with the provision of sustainable development of territories, including enterprises and regions, is possible in the following order:

- Alternatives of options in solving environmental problems on the structural restructuring of economic activity, changing the policy in the field of export of products, conversion.
- Evolvement of low-waste and resource-saving production technologies.
- Technological changes [7].
- Environmental protection measures of direct action for the construction of treatment facilities, filters, as well as the formation of protected areas, reclamation, etc.

Alternative solutions to environmental problems can be implemented at the macroeconomic and microeconomic levels. Priority in assessing indicators of sustainable development at the macro and micro levels remains with the environmental component, in which the objective function of sustainable development remains the economical expenditure, conservation and restoration of natural resources [8, 9].

The standarts for the sustainability of an enterprise should be of a complex nature and their exhaustive assessment of the sustainability of the functioning of the enterprise is provided only by a system of criteria characterizing a specific and sufficiently important share of sustainability. There should be at least seven such criteria that make up the sustainability of the functioning and development of an industrial enterprise in practice: economic sustainability, financial sustainability, technical sustainability, marketing sustainability, logistical sustainability, environmental sustainability and social sustainability.

However, the particular complexity of the problem in assessing and managing sustainability lies in the fact that its assessment is possible for individual types – economics, finance, technology, ecology, etc., but effective management, at the same time, is possible only in a comprehensive, unified system. This circumstance arises from the fact that the sustainability of the development of any economic system necessarily implies the balanced functioning of all the elements that make up it.

4 Conclusion

Ecological safe technologies available in the modern world economy contribute to strengthening the process of sustainable development of spatial systems, coupled with the implementation of structural transformations and, among other things, increasing economic efficiency, as one of the priorities for the overall development of the territory. It is also necessary to introduce state support in the development of highly efficient industries, small and medium-sized businesses. At the same time, it is necessary to abandon the implementation of projects that damage the environment, even if the consequences of such are not fully clear.

It is important to carry out this process in the format of general stabilization of the environmental situation in the country, as well as its improvement in the most disadvantaged regions of the Russian Federation.

Consolidation and the establishment of unity in the stratified Russian society should be taken as the main domestic political condition for sustainable development.

Since the goal of sustainable development involves ensuring the dynamic socio-economic development of the country, with the effective use of the resources of its economy, which would include the achievements of scientific and technological progress and the advantages provided by the international division of labor and with the sustainable reproductive potential of the natural complex, the development of a sustainable model involves the establishment of world economic relations of a more equitable nature [11]. To realize this perspective, it is necessary, first of all, to continue the further development of an effective socially and environmentally organized market economy, with a gradual increase in the role of planning, which will ensure a decent standard of living for people, together with the economy of natural resources, environmental cleanliness and competitiveness of products.

An important task in establishing and developing a sustainable development model is the introduction of resource-saving and waste-free technologies into the economy, together with the modernization of production, as a condition for increasing economic efficiency and preventing emergencies from technogenic and natural reasons.

In the field of ecology, actions are required to preserve and restore natural ecosystems, as well as to stabilize and improve the quality of the environment, reduce harmful discharges and emissions into the aquatic environment and atmosphere, reduce the total mass of waste generated, especially toxic, and ensure the organization of their safe processing and further disposal.

The perspective of the development of the sustainable development model [6] suppose:

- Poverty eradication and poverty reduction, coupled with the improvement of the human environment, the further development of its social activity, the strengthening of the social component of the state, in providing conditions for equal opportunities in education, seeking medical care and restoring health.
- Providing social protection of citizens of the Russian Federation.

Sustainability should also be present in the implementation of a purposeful external environmental and economic policy, which is focused on maintaining Russia's national interests on the use of global environmental potential, which, among other things, is located within the jurisdiction of its territory.

In the long term, the implementation of the sustainable development model implies harmonization in the relationship between society and nature on a global scale and in the country using such factors as:

- Development of economic activity within the limits allowed by the reproductive capabilities of the biosphere.
- Shifting the emphasis in the system of human values to spiritual and moral ones from material and material ones, since this corresponds to the further orientation of the development of society in the noospheric development.
- Awareness by society as a whole and by all its members individually of the need for rational consumption.

At the same time, the operational task remains the need to postpone the ecological catastrophe for several decades, after which, moving along the trajectory of sustainability and using the achieved economic base and ecologization of consciousness, it is necessary to act with more radical methods of noospheric-ecological transformation. The strategy of gradual and state-regulated transition to sustainable development should be carried out taking into account the peculiarities of individual regions of Russia [3], since the pace and timing of transformations may be different, but their environmental imperative must be strictly consistent with the requirements that are put forward by the general stability and the real situation.

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