Consideration of geo-environmental factors in formulation of territorial sustainability strategy

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Abstract. The paper examines the role of geo-environmental impacts in developing a territorial sustainability strategy. It reviews the literature concerned with the definition of geo-environmental impacts and a globally accepted definition of “sustainable development”. The paper deals with the keys to local sustainable development and principles necessary for developing territorial sustainability strategy. It studies the challenges that hinder sustainable development of Russian regions in modern geopolitical and environmental conditions; preconditions for stable geo-environmental bonds in order to minimize territorial imbalances. The objectives and aims of territorial development are set. The levels of territorial sustainability for development are proposed. The paper addresses a geo-environmental approach to territorial development strategy in the context of accelerating global interaction, sensitive to a great number of impacts. The authors are concerned with different interpretations of the concept and the relationship between geo-environmental and geo-economic research by various domestic scientists. They identify prerequisites for sustainable geo-environmental bonds in order to minimize territorial imbalances. The priorities of geo-environmental territorial sustainability strategy imply various levels, hierarchies in the target socio-environmental-economic system, each of which has corresponding objectives set and implementation tools developed. The strategy for territorial development based on geo-environmental impacts is proposed, containing the priorities, aims and objectives.

1. Introduction

The wider objective of territorial strategic development is to move towards sustainable development. The term “sustainable development” originated more than 30 years ago in the report of the UN International Commission “Our Common Future”. As defined by the Commission, it is development that meets the needs of the present without compromising the ability of future generations to meet their needs [2]. According to a globally accepted definition, sustainable development is a process of economic, environmental and social change, in which the exploitation of natural resources, the pattern of investment, and the focus of science and technology development, personal development and institutional changes are aligned with each other and strengthen current and future capacity to meet human needs and aspirations. According to the authors, the environmental component is a current priority [1].

The report reiterates the impossibility of solving environmental issues without referring to social, economic and political challenges. The report calls for a new model of environmental development, referred to as “sustainable development model”. [3]. Sustainable territorial development is possible
provided that the consumption of non-renewable natural resources is minimized. They are replaced with renewable resources and the latter is restored to the level necessary to preserve the environment in a sustainable state [4].

The United Nations Conference on Environment and Sustainable Development held in Rio de Janeiro, Brazil, in 1992, recognized, among other things, that environmental and ethical boundaries should be set to prevent the economy from interfering in nature, but the goals and values of sustainable development are not the same as those of a market economy. The participants called upon the leaders of all countries to adopt national plans for sustainable development, which was accepted in 100 states, including Russia.

The Global Agenda, adopted by the UN General Assembly in September 2015 under the document “Transforming Our World: The 2030 Agenda for Sustainable Development”, set 17 sustainable development goals and 169 targets that should be addressed in all regions, countries and cities of the world [5]. Central to the document is the interconnectedness of elements constituting sustainable development, namely, economic growth, social inclusion and environmental protection.

The major pillars of territorial sustainable development are the equity of interests between environmental factors of development [6]. Thus, territorial sustainability largely depends on ecological advancement, Fig. 1. Table 1 shows the aims and objectives for territorial sustainability, where environmental component plays a crucial role.

![Figure 1. Structure of ecological sector within sustainable nature management](image)

| Table 1. Aims and objectives for territorial sustainability development |
|---------------------------------------------------------------|
| **Aims and objectives for territorial sustainability development** | **Environmental impacts** |
| Raising of environmental awareness | Consideration of environmental factors when making management decisions |
| Restoration of natural capacity | Reducing environmental pollution and its impact on humans |
| Reducing man-induced impact | Integration of requirements to incorporate ecosystem values into strategic plans at federal and regional levels |
| Protection, regeneration and sustainable use of natural resources |

The problems that hinder the sustainable development of Russian territories in modern geopolitical and environmental conditions are becoming increasingly acute. The transition to territorial sustainable development in modern conditions is a complex task that should encompass the effect of all factors combined. Geo-environmental impacts must be emphasized.

2. Materials and methods
Geo-environmental strategy implies integrating the objective laws of environmental friendliness into the strategy of territorial sustainable development. The priority areas of geo-environmental strategy
involve promoting territorial sustainable development at different levels, increasing the level of closure of their resource flows, etc., being aware of the value of ecosystems and biological diversity when planning and elaborating development strategies [7].

Differentiating natural resource, production and environmental capacity of territories creates prerequisites for establishing sustainable geo-environmental bonds in order to minimize territorial imbalances. A geo-environmental approach to formulating the strategy for territorial development in the context of accelerating global interaction is sensitive to a great number of impacts: ethnocultural, ecological and geographical. In this an important role is assigned to the natural resource potential of the territory and its natural and climatic conditions.

A.Yu. Davankova, E.A. Postnikov believe that the following key dimensions of territorial development can be distinguished [7]:

1. global strategic development;
2. theoretical orientations of territorial development strategy;
3. simulation of territorial development strategy based on closed resource cycles [7].

The authors think that there is a need to create a new scientific dimension of geo-environmental development strategy both at a global and regional scale.

**Table 2. Interpretations of the concept of geo-environmental research**

| Author                   | Object                                                                 | Subject                                                                 |
|--------------------------|------------------------------------------------------------------------|-------------------------------------------------------------------------|
| V.S. Preobrazhensky      | geosystems                                                             | their equivalent ties                                                   |
| E. B. Alaev (1990)       | territorial ecological systems                                        | their subsystems                                                        |
| V. T. Trofimov, N. F. Reimers | high-level natural and transformed ecosystems                          | functioning and evolution patterns                                       |
| K. M. Petrov             | geographic, biological and socio-production systems                  | their interaction                                                        |
| A. I. Zhirov             | geo-environment space                                                 | characteristics of environmentally significant properties of subjects and objects of man-induced impact and the population, as well as features of their ecological relations |
| G. I. Schwebs            | natural-social systems and environment                                 | their interaction                                                        |
| S. V. Klubov, L. L. Prokhorov | lithosphere and biosphere                                             | interaction of the lithosphere and biosphere, building on human nature and their activities patterns of formation and spatio-temporal changes in the biosphere influenced by natural and man-made causes |
| V. T. Trofimov           | biosphere                                                              |                                                                         |
| V. T. Timashev           | natural, natural and natural, natural-anthropogenic or man-induced territorial complexes | their interaction                                                        |
| A. G. Isachenko          | geographic environment                                                 | its status from an environmental point of view                           |
| A. N. Vitchenko          | geographic environment                                                 | natural and natural and man-induced geosystems                           |
| G. N. Golubev            | ecosphere                                                              | an intertwined system of geospheres in the process of its interaction with society |

Geo-environmental research is aimed at developing theoretical foundations, principles and guidelines for rational nature management, sustainable development of society and optimization of its interaction with the environment. Currently, the term “environmental geology” is understood
ambiguously [8]. The interpretation of the concept of geo-environmental research by various domestic scientists is presented in Table 2.

Today, the geo-environmental strategy of territorial sustainable development assumes various levels, hierarchies, in the target socio-environmental-economic system, each of which has corresponding objectives set and implementation tools developed [9].

Scientific researchers dealing with the issues of geocology identify the following levels: global, state, regional and local, as well as aims and objectives of various levels.

The authors further show the principles necessary to build territorial sustainability (Table 3).

| Table 3. Principles necessary to build territorial sustainability |
|---------------------------------|---------------------------------|
| **Principle**                   | **Description**                 |
| Systematic                     | Considering the territory as a system of interrelated characteristics (each system is a subsystem of a higher system) |
| Information                    | Capturing consistent features based on empirical and statistical foundations |
| Ecological                      | Adaptive interaction between humans (societies) and their natural environment |
| Balanced                        | Harmonized in the system of interaction between nature and society |
| Synergetic                      | Cumulative two or more impacts, when their effect is substantially greater than that of each separately |
| Nature compatibility            | Reconciliation (harmonization) of the processes of nature and society |
| Health promotion                | Targeted activity to improve and maintain health |
| Affirmative                     | Selecting ways to balance and harmonize the relationship between nature and society |

The above table details the basic principles that should be used in shaping territorial sustainability.

3. Results

Elaborating territorial development strategy is a complex scientific and practical task that can be solved by joint efforts of authorities (region) and scientific societies in the field of territory management [10].

In turn, planning territorial development strategy is the process of developing a strategic plan by formulating goals and management criteria, analyzing problems and the environment, defining strategic ideas, selecting scenarios and core development strategies, predicting environmental development [11].

Notably, programs and strategies for territorial development should be developed based on environmental studies. It is very important to prepare needs analysis specifying the status of natural resources available in a given area. Tailored to the indicator “potential of the territory”, it is possible to create both economically sound plans for territorial development, and to evaluate the prospects for territorial development in the light of ecological component.

Thus, territorial development strategy should rest on the following aspects shown in Fig 2.

**Figure 2. Aspects of territorial development strategy**
Figure 3 shows the results of managing territorial development strategy.

![Managing territorial development strategy](image)

**Figure 3. Aspects of territorial development strategy**

The development of an environmental foresight is basic to the overall territorial development. Below are the blocks for strategic sustainable territorial development (Fig. 4).

![Strategic territorial development planning](image)

**Figure 4. Blocks of strategic sustainable territorial development**

The experts drafting territorial development strategy are responsible for the program for socio-economic development of a particular region. The program is a system covering the most important issues of territorial ecological development and effective ways and means of solving them.

Table 4 considers the proposed territorial development strategy sensitive to geo-environmental impacts.
Table 4. Territorial development strategy sensitive to geo-environmental impacts

| Priorities                     | Aims                                      | Objectives                                                                 |
|--------------------------------|-------------------------------------------|----------------------------------------------------------------------------|
| Priority 1. INDIVIDUAL.        |                                           |                                                                            |
| High quality of human life     | 1.1 Improving living standards            | Welfare of citizens, promoting effective employment of the population and developing human resources |
|                                | 1.2 Human capital development             | Ensuring the effective functioning of the social protection system, Improving public safety, Affordable and comfortable housing |
| Priority 2. GEOECONOMICS.      |                                           |                                                                            |
| Sustainable economic development| 2.1 Development of manufacturing and service sectors of the economy | Investment climate and investment strategy, Consumer services, Farming industry |
|                                | 2.2 Development of science, innovation and information technology |                                                                            |
| Priority 3. SUSTAINABLE        |                                           |                                                                            |
| ENVIRONMENTAL USE. GEOECOLOGY. | 3.1 Improving the quality of the natural environment and human living conditions | Conservation and protection of the natural environment, creation of environmentally friendly environment, Encouraging ecology |
| Achieving sustainability in natural ecosystems | 3.2 Nature management and development of a “green” economy | Production ecology, Implementation of nature use forecasting, Balanced territorial development, Providing infrastructural connectivity allowing access for territories and residents to sources of socio-economic growth, Strengthening of interregional ties, A strategy for an enabling environment for export activities |
|                                | 3.3 Reducing negative impact on the environment |                                                                            |
| Priority 4. SPACE.             |                                           |                                                                            |
| Balanced spatial development   | 4.1 Organization of an effective system of resettlement and distribution of productive forces | Balanced territorial development, Providing infrastructural connectivity allowing access for territories and residents to sources of socio-economic growth, Strengthening of interregional ties, A strategy for an enabling environment for export activities |
|                                | 4.2 Integration into interregional and global socio-economic relations. |                                                                            |

Table 4 describes the aims and objectives of the territorial development strategy, tailored to geo-environmental impacts. The key priorities are highlighted.

4. Conclusion
All in all, the findings indicate that geoecology is relevant today, as evidenced by a number of scientific studies and publications in scientific journals. The authors think that there is a need to create a new scientific direction of geo-environmental development strategy both at a global and regional scale. Geo-environmental research is aimed at developing theoretical foundations, principles and standards of rational nature management, sustainable development of society and optimization of its interaction with the environment. When developing territorial development strategy, geo-environmental factors must be fully addressed. The territory of the Russian Federation stretches over a
large area and it is important to respect both localization and natural features of the regions, including environmental characteristics.

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