Sustainable Subsoil Use as a Factor of Innovative Development of Mining Region

Elena Dotsenko[1,*], and *Natalia* Ezdina[1]

[1] Russian University of Economics, Department of Political Economy and History of Economic Science, 117997, Moscow, 36 Stremyanny lane, Russia

Abstract. Historically, the process of economic and technological development the was caused by both extensive and intensive use of natural resources, in which, in general, the ecological principles of development were not taken into account. By the beginning of the 1970s, the need for a fundamental change in the activities of primary production and business units became evident, which is explained by two factors: environmental awareness of the public and activation of the preparation of market mechanisms for the adaptation of socio-ecological attitudes At the turn of the 1990s, ideas of this kind were no longer popular. On the contrary, today the modern forms of scientific and technological development should be considered in the context of adequate "work" of market relations, creating prerequisites for a "balanced relationship" between productive, economic, social activities and the preservation of the natural environment.

1 Introduction

Rational nature management should be considered in the context of the formation of optimal management of this process. Traditional management of environmental use (in the model of unsustainable development) focused mainly on economic growth and increasing consumption of natural resources, while focusing not on efficiency (productivity) of resources, but on labor productivity (production efficiency).

In the sphere of environmental use, the aim of management should be to use natural resources most effectively and the dominant of the new development model is to increase the efficiency (productivity) of natural and other resources.

2 Materials and Methods

Active work to implement a sustainable development strategy among countries with rich natural resources is under way in Canada, where the idea of sustainable development at the local (community) level has now become very popular. The experience of realizing the concept of sustainable development in indigenous communities, in particular, within the framework of Arctic environmental strategy, as well as the program for integrating the traditional knowledge of Indians for environmental use management and modern science (the

*Corresponding author: ktyf110372@rambler.ru

experience of the Northwest Territories or the five-commune project in the provinces of Alberta, Manitoba, Ontario, Quebec and New Brunswick).

In the report to the Club of Rome "The Factor Four" [1-2], the so-called efficiency revolution, which meets the criteria of sustainable development and is considered a new direction of scientific and technological progress in the 21st century, was grounded. Its essence lies in the following: the productivity of resources can be increased at least four times. This means that wealth extracted from one unit of a natural resource can quadruple [3-5].

1. The principle of the unity of economic, environmental and social aspects, which implies an organic complement of the economic system of sustainable environmental use by social and environmental factors and criteria.

2. The principle of taking into account the regional aspect of environmental use management, which implies taking into account the impact of this area of activity on the socio-economic state of the region in its transition to sustainable development.

In this regard, it is possible to fully support the proposal on the expediency of developing the Concept of the Regional Policy of the Ministry of Natural Resources, paying special attention to the links between the three spheres (environmental use management, welfare obtaining and environmental safety), since many issues of their interaction are addressed at the regional level [6-7]. The need for a more complete and adequate consideration of the regional characteristics of economy reproduction, of all its stages, increases in conditions of transformation to a market economy. Thus, the development and implementation of regional economic policies and strategies, based on the basic principles of a market economy, becomes especially urgent.

Nowadays the researches of sustainable development of the mineral and raw materials complex is carried out both within the framework of regional economic studies and by specialists in the field of the economy of mineral raw materials [8-10]. If the subsequent development is conducted irrationally, with violations of the material interests of future generations, in accordance with the requirements of the concept of sustainable development, certain compensation contributions allocated to the target “fund of future generations” should also be included in the cost of geological exploration. These two components of the cost of geological exploration, are the characteristic of a socially oriented market economy in conditions of sustainable development and meet the national long-term interests of any country exploiting its natural resources.

One of the first attempts to assess the feasibility of implementing the concept of sustainable development in subsoil use in Russia was made in the context of the prospects for the development of the gas industry and was based on the greening of the production and consumption of natural gas. The transition to more stringent environmental standards will require a serious improvement in all parts of the technological chain of the gas industry, reducing the anthropogenic pressure on the biosphere. The transition to environmentally safe gas technologies, even with a significant increase in production, transportation and consumption of natural gas, makes it possible to not only increase gas pollution, but also even to reduce the total and relative amount of emissions and discharges. Thus, the transition to environmentally safe technologies in the gas industry will make it possible to consider this industry to the greatest extent meeting international environmental standards and the imperatives of sustainable development.

3 Results and Discussion

Interpretation of the global concept with respect to subsoil use and the basic elements of regional economic systems is to justify the criteria for their development based on common criteria for sustainable development, taking into account the nature of nature management

processes, and the starting point of this is the concretization of the term "sustainability". Here are some interpretations of this term.

1. "Sustainability of equilibrium". The equilibrium of a mechanical-like system is stable if, for a small perturbation (displacement), the points of the system deviate little from their equilibrium positions in the ensuing time; otherwise, the equilibrium is unstable.
2. "Firm sustainability". The characteristic of the stability of the firm, which determines the financial condition of the enterprise, whose economic activity provides, under normal conditions, the fulfillment of all its obligations due to sufficient incomes and the matching of income and expenses.
3. "The sustainability of the automatic control system (ACS)". It represents the ability of the ACS to function normally and to withstand various unavoidable disturbances (impacts). The state of the ACS is said to be stable if the deviation from it remains arbitrarily small for any sufficiently small changes in the input signals.
4. "Sustainability of the investment project (decision)". An investment project or investment decision is sustainable if the coefficients of variation in the project's performance indicators (decisions) are minimal, i.e. the efficiency of the investment project (decision) is reduced minimally with the deterioration of the main influencing factors.

As follows from the above interpretations, all of them in one form or another include such concepts as "small" ("minimal") and "normal". With reference to the study of the problems of sustainable development in subsoil use, all the above definitions can not be copied, even with their appropriate adaptation to the condition of mining regions of Russian Federation. Therefore, it seems to us that in this case the most applicable interpretation of stability in terms of the system approach.

From the standpoint of the system approach, sustainable development can be characterized as a certain type of progressively directed, internally determined changes in regional industrial complex, associated with an increase in the level of its organization. Development becomes unstable in the event of a crisis of the regional economy, which is associated with its destruction or transition to a new qualitative state.

In accordance with the concept of sustainable development, all projects for the development of natural resources must satisfy the following main conditions (requirements) for sustainability: prevention of damage to critical natural environment; restriction of the use of renewable natural resources at a level that ensures their sustainability; prevention of irreversible processes in the natural environment.

Thus, the main requirements (conditions) for the sustainable development of mining industrial systems (MIS) in the current economic conditions are:

• prevention of damage to critical natural capital and prevention of irreversible processes for the environment;
• restriction of the consumption of renewable natural resources at a level that ensures their sustainability and takes into account the replacement costs of these resources.

Experts in the field of sustainable development issues define two criteria for the sustainability of development – "human" and "biosphere". At the same time, the "human" criterion is a real increase of "quality of life" of the population (increase in average wages, pensions, health care costs, education). An integrated indicator of the "quality" of life is the indicator of the average life expectancy. The "biospheric" criterion should record that the growth of the "quality of life" of a person did not lead to a change in the historically established local, regional and national ecosystems, i.e. should be recorded a real reduction of discharges of technogenic origin in the habitat, which confirms the implementation of the trend of stabilization of biosphere processes.

The MIS is the basic element of the economic system of the resource and raw material region, which is an element of the macroeconomic system. Therefore, the basis for the social and economic development of the ACS should be the general criteria for the sustainability of

the economic system, formulated taking into account the specific nature of the ACS as a production and economic structure.

"Sustainable" subsoil use can be presented as a process that guarantees future generations reliable supply of mineral raw materials in sufficient volume, taking into account the interests of protecting the environment and the interests of the population. None of these goals can be considered absolute, that is, we should talk about implementing a compromise in the form of a reasonable set of management decisions in the field of subsoil use.

An important place in the solution of the problem of greening economic activity is given to environmentally oriented innovations. Eco-innovations are new or modified production and management technologies, equipment, materials, etc., which allow to reduce the harmful impact on the environment in all aspects of economic activity. They differ from other innovations in that they produce an additional interconnected internal and external effect. The most common variants of eco-innovation are:

• manufacture of environmentally cleaner products, in this case, a product known to consumers acquires a new quality;
• introduction of new technologies to improve eco-efficiency and release of environmentally friendly products;
• reduction of energy consumption, natural raw materials or replacement of traditional raw materials.

Among eco-innovations, the most important, in our view, are innovations in the field of energy conservation, since energy costs (energy intensity) per unit of final output in Russia are 2-3 times higher than in developed countries. Energy saving can be considered as a tool to increase energy efficiency, without reducing, as a minimum, the volume of products and services, without deteriorating their consumer properties.

4 Conclusion

Thus, the main criteria for the sustainable development of the MIS in the current economic conditions are: to increase the economic efficiency of the MIS; improving the quality of life of the population of the territory; balance in the natural environment.

Indicators of sustainable development of mining industrial systems should cover all three areas (economic, social and environmental) and include such characteristics as: assessment of the natural resource potential; the amount of revenues to the revenue side of the budget as a result of ACS development; the number of jobs created; level of socio-economic stability; the level of rational use of natural resources; anthropogenic impact on the environment; magnitude of environmental damage.

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