Regional and Sectoral System for Integrated Assessment and Green Supply Chain Management of Natural Resources

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Abstract- **Initially, any economic activity is associated with a negative impact on the environment. In modern realities, this situation requires mandatory preliminary assessment of an investment project in order to prevent or at least minimize the negative impact on the territory. In this regard, one of the urgent tasks of sustainable development in the territory is using green supply chain management (GSCM) to improve the system of strategic management and analysis of investment projects in order to identify the main reasons for its improper functioning. In accordance with the principles of system analysis, all kinds of complex problems that constantly arise in front of society (first of all, the problem of strategic management) must be considered in a holistic context, in the form of a system of interaction between all its components, as a rule, such as an organization of components focused on a single goal. However, due to the fact that in everyday practice, real systems are more complex, they prefer to use those models for the purposes of system analysis, that reflect the studied properties of real systems in a certain approximation. Any investment project can be considered not only as exclusive project documentation, but also as a set of economic relations that arise between many participants: subsoil users, the public, government agencies, and the environment itself. Moreover, these relationships are manifested at all stages of the investment project's life cycle from the design and implementation processes to its liquidation. The methodological approaches of cybernetics and system analysis are effectively used to understand the behavior of such organizational systems. In the theory of effective environmental management, there is still no proper reflection of the problems concerning qualitative and quantitative research of material and energy flows, the flow of pollution of natural objects, through which the interaction between productive forces and environmental systems takes place. All this, of course, shows the relevance and importance of developing new criteria for ecological and economic systems.**

Keywords; *economic entities, production and economic activities, green supply chain management, investment project, comprehensive preliminary assessment, socio-ecological and economic support, environmental management.*

1. Introduction

The methodology for solving the complex problem of the rational interaction of productive forces and ecological systems should be based on the provisions of the law of balanced nature green supply chain management (GSCM). Hence, it can be assumed that the allocation and development of economic activity within a particular region must be carried out in accordance with its environmental sustainability to techno genic impacts. [1-7]

The environmental support and a reasonable assessment of investment projects system itself is part of an integrated socio-ecological-economic system, which requires the development of modern criteria for diagnosing investment projects and territories. Hence one can argue about the complex socio-ecological-economic nature of the developed evaluation criteria.

It should be emphasized that the current requirements only indirectly affect environmental issues. Moreover, these standards are not interconnected, and also they do not take into account the features of the GSCM impact. As a rule, they come down only to sanitary-hygienic estimates [8]. This situation allows us to argue that the current standards do not correspond to modern requirements of environmental regulation, which means that they cannot act as the initial base for the protection of natural components. Moreover, it should be emphasized that not all real pollutants have maximum permissible values of their concentration, and there are also no similar regulatory values for a large array of combinations of various agents, etc.

In the context of the digital economy, it is necessary to create an economy of environmental restrictions and regulations, as well as a modern methodology for their actual assessment and environmental management.

This situation implies that in the balanced development of a territory (in addition to sanitary standards), an active use of a set of modern environmental standards that establish maximum permissible levels of exposure, both for humans and for ecological systems, and their components is necessary. At the same time, as a basic condition for the implementation of the planned activity, the principle must be observed that the technogenic load on the territory should not exceed the self-healing potential of the natural complex of the territory in question. [9, 10]

We have to admit that in the Russian Federation there are no unified environmental standards governing the environmental and economic balance of the territory and allowing an objective systematic description of the territory to obtain.

2. Research methodology

The increased attention given to the topic of green supply chain management (GSCM) warrants the writing of this paper. To solve the problems posed, a number of empirical methods were used, as well as systemic; logical and structural-functional analysis; expert assessments, groupings, comparison and generalization of statistical indicators. The information and statistical base of the study was made by the regulatory legal acts of the Russian Federation and its entities regulating environmental protection, nature management and ensuring sustainable development, and by a number of regulatory documents of foreign countries.

In the course of the study, we also used statistical data, reports and forecasts, government and international reports on environmental protection and the state of the environment, etc.

3. Research results

Green supply chain management is considered as an environmental innovation. The concept of GSCM is to integrate environmental thinking into supply chain management (SCM). GSCM aims to minimize or eliminate wastages including hazardous chemical, emissions, energy and solid waste along supply chain such as product design, material resourcing and selection, manufacturing process, delivery of final product and end-of-life management of the product . Any system functions and develops in an appropriate environment, which acts for the environment under study as a subsystem. The complex of various properties of the system depends on the properties of its main parts, and the properties of parts dependon the system as a whole.

Moreover, one should always proceed from the fact that any system is only part of a larger system, and, as a rule, they appear in the form of a ranked hierarchy of systems, where its super-systems form the function of an individual system.

In special literature, all the diversity of the world is considered as successively arising hierarchies: natural, physical, chemical, biological, and the socio-technical one that arose on its basis. Moreover, the entire hierarchy is considered as a single system. [11-13]

In the course of studying a set of global problems that reflect the interaction of the technosphere and the biosphere in the global socio-ecological-economic system, it is proposed to use a special “man-economy-biota-environment”model. The system under consideration is capable of auto-regulation; it also has the properties of a degenerative circuit. Due to the fact that the circuit has two strong parallel unbalanced negative relations, the system has a rather unstable position. Indeed, it can be assumed that the well-being of mankind is ensured by two positive connections:

“Economy → + people” and “environment → + people”.

But, the increase in the scale of economic production and the growth of the world’s population took place and is happening through the excessive withdrawal of biosphere resources, which not only led to an enormous burden on nature and radical changes in the biosphere, but also led to the line beyond which there is a point of no return.

The point is that the complacency and well-being of mankind at the dawn of the XXI century is actually nothing more than imaginary well-being. Hence, society today faces an extremely difficult task: to return the system to a stable, self-regulating state, which, in turn, requires a change in the strength of relations in the system, a comparison of the scale of economic development with the capabilities of the environment (nature). [2]

Regarding the subject of our study, i.e. investment projects, then in order to form a reasonable, objective description of them, it is necessary to conduct a system analysis based on the influence of all its main factors, including social, environmental and economic. All of this, in aggregate, will make it possible to identify and evaluate the safety of the implementation of the planned activity, because this will, one way or another, affect the environmentally balanced development of the area.

Another independent problem is the need for a reliable assessment of natural capital.

An analysis of the specialized literature on this issue indicates the presence of many approaches to the disclosure of this concept. So, in the work “Natural Capital and Sustainable Development” [11] t is proposed to consider natural capital as the reserves of the environment from which valuable goods (services) will be produced in the future. One of the most important properties of natural capital is the ability of the natural

complex to withstand anthropogenic stress, the so-called "assimilation potential". [4]

It seems to us that one of the reasons for the irrational use of natural complexes and the penetration of harmful substances into the environment is their presence in an amount exceeding the assimilation potential. The consequence of this situation can be assumed that in a certain period, the assimilation potential will cease to be a renewable resource and will become already non-renewable.

Directly, the environmental potential itself can be given both environmental and economic assessments. Making an economic assessment of the specific damage to natural potential, the intersection between the curves of the benefit and the cost of compensation for damage depending on the degree of compensation for damageis determined. [10]

There are other approaches, including those based on energy. At the same time, biomass and annual biota production are expressed in joules, and then estimated using the dollar equivalent of joule at world prices for hydrocarbons. [2]

Experts note the backwardness and underdevelopment of estimated indicators of the state of socio-ecological-economic systems, and their focus on outdated criteria. [3, 11] It is clear that in the digital economy, new, adequate to modern realities, criteria for assessing the state of the system and criteria for its optimization are required. [1-4]

The traditional economic system considered the maximization of net profit with a minimum of the total technogenic pollution flowas the main optimization criteria.

Stable productivity can be considered with a maximum of environmental systems' resistance to technological impactsas the main criterion for the optimization of the natural block.

Minimization of the environmental intensity of production and the provision of a normative ratio between the natural and economic potential of the territory now appear as the main criterion for optimization in the socio-ecological-economic system: the environmental intensity of production should not exceed the assimilation potential of the territory. [8]

A number of leading world institutions, such as the UN, the World Bank, the European Commission, the Scientific Committee on Environmental Issues, and others, have developed a set of indicators of sustainable development using various indicators and indices, as well as an aggregated indicator, which allows to cover the ecological-economic, ecological-social-economic, and environmental groups of indicators. [5, 6]

In the context of the digital economy and increasing globalization, it is already obvious to everyone that no achievement of balanced national development can guarantee against the possible threats of the global environmental crisis: for many decades, global climate change, shortage of drinking water, loss of biodiversity, activation of natural phenomena, etc. have been observed. In these conditions, the priorities must be shifted towards global environmental sustainability and act as an effective incentive for global integration in preserving the environment and sustainable and balanced use of natural resources. [4,9]

GSCM practice is positively related to sustainability performance. In accordance with the Russian Human Development Report in the framework of the Millennium Development Goals, the following items are proposed as promising indicators of progress in ensuring environmental sustainability:

1. Undisturbed production and economic activities of the region;
2. The coefficient of renewal of fixed assets;
3. The number of people using drinking water that does not meet sanitary and hygienic standards (million people)

As far back as 1993, the Statistics Division of the UN Secretariat proposed a system of environmental and economic accounting, A System for integrated Environmental and Economic Accounting, to be included in national statistics, which undoubtedly expands the system of national accounting. At the same time, the environmental transformation of national accounts is based on an environmentally adjusted net domestic product(EDP).

EDP = (NDP – DPNA) – DGNA,

Where NDP - net domestic product, rubles;

DPNA - cost estimate of depletion of natural resources due to total hydrocarbon production, deforestation, etc., rubles;

DGNA – valuation of environmental damage due to pollution of air, water, soil, etc.

According to preliminary UN estimates, the parameters of an ecologically adapted net domestic product, on average, fluctuate around 60-70% of GDP. [3]

There are other similar indicators, including indicator of “true national savings”, etc.

It is noteworthy that the use of the above and other methods for assessing environmental damage has demonstrated a significant discrepancy between traditional economic and environmentally-friendly indicators. The above calculation methods convincingly showed that even in countries where there is high economic growth, environmental degradation is observed. Moreover, in a number of countries, consideration of the environmental factor has led to a significant reduction in GDP and industrial growth, and in some cases to negative values of their growth. So, in the Russian Federation in 2000, GDP growth was about 9% compared with the previous year, but at the same time, true national savings showed the opposite situation - a 13% reduction in GDP, mainly due to the depletion of the raw material base. [3]

In recent years, researchers have been interested in such an important integral indicator of the socio-ecological-economic system state as the human development index (HDI).

This integrated indicator determines the level of generally accepted achievements in the following key areas of human development:

- longevity provided through a healthy lifestyle;
- knowledge;
- adequacy of living standards. [5]

We also consider it appropriate to lead the joint development of scientists from Yale and Columbia Universities. They proposed the Environmental Performance Index (EPI) considered on the basis of 20 indicators that formulate the environmental profile at the state level and allow considering the problems of reducing the anthropogenic burden on public health and the problems of ensuring the viability of ecosystems and the rational consumption of natural resources. The EPI also allows us to dynamically explore global indicators by comparing environmental indicators with GDP, population, territory and other parameters.

In the conditions of the regional economic system, we were particularly interested in the criteria for socio-ecological-economic justification of production and economic decisions. The 21st century is characterized by the peculiarity of the increase in the extensiveness and intensity of material and energy flows between economic and natural systems. For example, in the depressed republics of the North Caucasus, the problem of balanced nature management is of particular importance among the most important problems of the socio-economic development of regional economic complexes. [7] In the republics, there is an acute shortage of personnel with market thinking at all regional levels of management. Current management at all hierarchical levels needs to learn in a short time to reasonably argue for the coherence and commensurability of production, economic and natural potentials on a regional basis. [3]

An objective assessment of the possibilities of implementing the planned activity in a particular territory requires the reasonable use of quantitative criteria for the level of balance of natural and economic potentials.

In accordance with the principle of sustainability of balanced nature management cited in the introduction of our article, the concept of commensurability allows it to be considered in the form of limiting the amount of production environmental capacities within a specific region for the n-th time by the environmental technological capacity of the territory of the corresponding natural complex. In this case, we understand the ecological technological capacity of the territory as the generalized characteristic of the territory reflecting the self-healing potential of the ecological system and being quantitatively equal to the maximum technogenic load that the set of all recipients and ecosystems of the region can withstand for a certain period of time without any special violations of their structural and functional properties. [8]

The ecological technological capacity of the area can be expressed as an array of substances standardized in terms of toxicity, as well as represented in monetary or energy terms.

The full ecological capacity of the area as a natural complex can be expressed by such indicators as volumes of the main natural reservoirs of the air basin; set of water bodies and watercourses; land area and soil reserves; biomass of flora and fauna; power flows biogeochemical cycle, updating the contents of these tanks, etc. [8]

One can note among the priority areas for building sustainable development of the socio-ecological-economic system of the Russian Federation the need for a radical increase in energy and environmental efficiency, the use of resource-saving breakthrough technologies based on modern economic and legal tools, which will significantly reduce the cost of natural resources and pollution produced per unit of final result. This also implies an innovative scenario of sustainable and balanced development of the Russian Federation.

Under these conditions, solving the problem of ensuring environmental sustainability becomes especially urgent.

4. Conclusions and offers

Based on the literature review, undoubtedly, GSCM and sustainability performance are two inextricably related SCM concepts.

- The use of modern regional environmental standards requires the rapid creation of an institutional base and reliable tools to effectively use them.

- In depressed republics of the North Caucasus, leaders of all hierarchical levels of the region should choose the optimal environmental standard, develop and approve the methodology for its calculation, a set of consolidated guidelines for the development of environmental sections of project documentation.

- Such an approach will allow federal structures to give a strategic assessment of the problem areas of the North Caucasus, rank them according to indicators of assimilation potential, regulate production and business activities and build a system for assessing and managing natural resources on the basis of a single algorithm.

- In view of the foregoing, in our opinion, it is advisable to intensify the use of integrated environmental standards developed on the basis of the energy approach, including such as the environmental technological intensity of the territory.

Conflict of interest

Authors confirm that there is no conflict of interest.

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