

# Eco-Economic Security of the Region: Expanding the Management System for Assessing the State of Development

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**Abstract-** The problem of ensuring environmental and economic security for quite a long time remains relevant in the world community. It is the subject of continual scientific debates. The alignment of IT strategy which is a necessity. Information technology is useful for companies when they can be used in the right way. In this regard, learning can be an effective step in transferring knowledge to human and financial management.

Unfortunately, in many cases the priority in strategic planning, namely in the mechanisms for implementing the existing strategies, is given to the interests of large manufacturers, whose goals (increase in profits, business costs, etc.) are often diametrically opposed to socio-ecological goals (for example, decrease of harmful emissions through spending more money on treatment plants in order to prevent natural degradation and morbidity of the population, etc.). The solution of this problem should be based on the concept of balanced eco-economic development and changes in the paradigm of entrepreneurship education. It is very important that any economic project is environmentally sound, and any environmental decision is economically feasible. At the same time every environmental decision should take into account the development of the well-being of citizens and the development of the region. All this requires the development of a whole system of stimulating the social and environmental responsibility of contaminating plants, both at the level of the state as a whole and at the regional level. In Russia, scientific research on this issue has been actively conducted for 10-15 years. Based on this research, some standard methods for assessing the eco-economic development of the territories were developed. However, in the context of current conditions, they need radical changes and new approaches. Let us consider this problem in more detail.

**Keywords:** *entrepreneurship education, eco-economic security, risks, ecological and economic balance, eco-economic development, educational restructuring, Technology management for supply chain, efficiency.*

## 1. Introduction

Today, with the expansion and development of knowledge in organizations, effective management of knowledge is important for the goals of the organization. Creating knowledge management infrastructures is considered to be crucial for better control and monitoring of organizational knowledge. Knowledge of capital that cannot be easily seized, so that the organization's employees are directed towards the creation and management of knowledge infrastructures, motivating factors should be provided for them in the organization. Quality management as a comprehensive management system can play a significant role in improving organizational processes. The purpose of this study was to investigate the quality management factors (cartier, autonomy, supplier participation, customer participation, and process control) and its impact on knowledge transfer in the organization. The human impact on the environment leads to intense influence of subjective factors on economic changes. The development of industry leads to an increase in consumption of resources which are clearly limited. That is why there is an urgent need to assess the region's eco-economic development to achieve eco-economic security.

The concept of ecosystem, which comes from the natural sciences, is increasingly applied to regional development and focused on the inter-organizational relationships [1]. When assessing entrepreneurship education ecosystems around the world, it is important to understand the business model, teaching philosophy, teacher training, curriculum, course content, teacher training, infrastructure, culture, network and practices of each country.

Regions of Russia urgently need integrated approaches and strategic programs for assessing the level of eco-economic security of spatial development. There are a number of methodological and statistical problems that hinder the calculation of the universally accepted integral indicator, which makes it possible to assess the eco-economic security of the region: the "market failures", the inability to adequately address externalities in the price (external effect), which is important for an integrated assessment of the eco-economic development of the regions. G. Daly, the famous American ecologist and economist, wrote that as long as human well-being is measured in traditional macro-indicators, "there are huge obstacles on the path of change" [2].

The main difficulty is to determine without excessive subjectivity the degree of importance of the initial data. The higher the level of information break-down, the more difficult it is to assess the importance of incomparable values. Estimated eco-economic damage from the negative impact of the economic activity and other activities should be perceived not as a possible threat, but as an indicator of a certain level of danger. This corresponds to the understanding that money cannot be the equivalent of a social disease or premature mortality. The calculation of a universal index of eco-economic security, taking into account environmental, economic and social threats, is a complex task, but it can be put into practice. To develop such an index, it is necessary to identify a certain system of indicators, conditionally divided into environmental, social and economic. Despite being special indicators, some indicators can reflect different aspects of security [3]. For example, the most important indicator of energy intensity can be included into various groups of indicators: economic (its level reflects the level of energy efficiency in the economy); environmental (linkage with pollution levels, greenhouse gas emissions); social (the magnitude and composition of emissions affect human health) [4].

Research of certain security spheres was conducted by both Russian and foreign scientists.

In Russia, the Law on Security No. 2446-1 of March 5, 1992, first defined the concept of security. The Decree of the President of the Russian Federation of December 17, 1997 approved the "Concept of National Security" [5]

Subsequently, economists began intensive work to create a concept of economic security policy.

We agree with I.Y. Bogdanov, who in his studies emphasizes the importance of anticipating the emerging threats to the economic security of the region, rather than passive monitoring of the events and responding to economic threats as they occur [6]. This sequence of actions is the only possible and effective way and it corresponds to the "proactive" model of the behavior of the economic security subject or to the principle of preemption in management. The implementation of this approach as a necessary condition for managing the region's economic security requires a clearly defined system of criteria that can characterize the elements of an object in the system under consideration. And the operating parameters of the objects under the influence of threats can go beyond this system.

In [7] believed that economic security is "the absence of an acute threat to the minimum acceptable level of core values, which the nation considers to be paramountly necessary. This threat occurs when there is a significant change in external economic parameters which leads to the conditions that can destroy the existing socio-political system. At the same time, someone or something threatens us with rejection of our primary values".

Until the 1990s, the research on environmental safety was of applied nature and was carried out within the framework of "zero risk" and "acceptable risk" concepts. The concept of sustainable development began the theoretical research of the problem of ecological safety. The definition of environmental safety is given in the law of the Russian Federation "Law on environmental protection": environmental safety is "protection of natural environment and vital human interests from the possible negative impact of economic and other activities" [8]. This term is used in more than 150 statutory acts, including the Constitution of the Russian Federation, 315 decrees of the President and decisions of the Constitutional Court. However, as [19] points out that in the field of environmental safety there is no single standard out of 80 state standards operating in the environmental sphere.

In this research we identified three groups of factors that determine the eco-economic security of the territory (region): economic, environmental and socio-political. In our opinion, the first two factors

are decisive, since the outcome of the taken measures depends on them [20].

The path to sustainable development involves security in all spheres of development, and the close relationship between the country's overall security and sustainable development determines the conditions for the further existence of mankind [21]. This relationship should be based on the results of a multidimensional analysis of the indicators of ecological, economic and social spheres of society.

The long transition to the market economy gave a powerful impetus to the development of eco-economic relations. Development is always associated with progressive or regressive changes [22]. Development is a change in the state of the system, as well as its ability to adapt to constantly emerging changes and continue to function, striving to achieve the goal of its existence.

The term "instability" has become generally accepted for describing the crisis of our country's eco-economic development, and we cannot overcome it without a properly-developed and balanced national security strategy [23]. The key problem of developing this strategy is that ensuring of an increase in the average standard of living is accompanied by depletion of material resources and pollution of the environment. According to [24] technological progress is not able to solve this problem by itself due to the setback effect. The multidimensional analysis of the territorial development management system reveals the insufficient effectiveness of the implemented mechanisms for ensuring the eco-economic security of the territory, the purposeful reduction of scientifically grounded parameters in the overall system of national security. In the scientific community, there is an opinion [25] that we should speak about the eco-economic security only after the introduction of its exact criteria. The complexity of determining the criteria is due to the fact that the notion of eco-economic security is very capacious and cannot be determined absolutely correctly because of the infinite learning process of the relationship between man and nature.

In the works of [26] theoretical foundations of the eco-economic security are described. Amin, S. in his scientific works highlights the solution of the problem of balanced ecological development of the state territorial unit – a region [27].

In the neoclassical theory the problems of economic growth from the position of the resource economy were considered by such scientists as D. Meadows, G. Robinson, A. Pigou. Based on the views of neoclassicists on welfare theory, Pigou divided welfare into economic and general, including the parameters of environmental quality in the concept of "general welfare."

The purpose of this research is to present a universal index of the eco-economic territorial development that will take into account a set of environmental, economic and social criteria for the secure functioning of the territory.

Despite some attempts to develop a similar methodology for calculating the region's safe development index, none is used in practice and none is reliable for forecasting and monitoring. In our opinion the presented universal index of the eco-economic development of the territory, will become an effective tool for monitoring the development of the situation in the region, the ranking by the index will be based on the integration of environmental, economic and social indicators of security threats. Universality of the region's eco-economic development index lies in the possibility of its practical application for calculation in all countries, as well as in the accessibility for all interested persons.

## 2. Methods

It is possible to distinguish two approaches to the compilation of indicators of the eco-economic development. These approaches are the most common in theory and in practice. The first approach involves the compilation of an aggregated indicator on the basis of which it is possible to estimate the degree of sustainability of the environmental and economic development (The Law of the Russian Federation "On Environmental Protection" of 10 January 2002). Integration is usually carried out on the basis of three indicators: economic, ecological, social. This approach is consistent with the goals of building an environmental rating, since it allows to obtain an integral index.

The second approach is based on the compilation of a system of indicators, each of which reflects individual aspects of the eco-economic development.

Most often the following subsystems of indicators are distinguished within the general system:

- economic,
- ecological,
- social,
- institutional.

Here it is necessary to emphasize some conventionality of division of indicators into economic, ecological and social. Some indicators can reflect various aspects of development despite being special.

For example, in the understanding of the UN, the World Bank, OECD, and individual countries the most important indicator of power intensity can be included into various groups of indicators: economic (its level reflects the level of energy efficiency in the economy); environmental (linkage with pollution levels, greenhouse gas emissions); social (the magnitude and composition of emissions affect human health). Due to this fact, individual indicators in the literature are interpreted as eco-economic, ecological-socio-economic, socio-ecological, etc.

While ensuring the eco-economic security it is realistic to increase technological possibilities of the efficient use of resources. It is desirable that the population doesn't increase and there is also a prospect for quitting quantitative progress paradigm.

The essence of the eco-economic security should be reflected in the system of indicators, the threshold values of which are of fundamental importance for its ensuring. Indicators of the eco-economic security are quantitative characteristics of the territorial development that determine the degree of its protection against internal and external threats. To obtain a detailed and comprehensive assessment of the eco-economic security of territorial development, a comprehensive analysis of the main factors, which pose threats to the security, was carried out [24]. One of the important reasons for turning to the analysis of threats is their classification and ranking by the nature and degree of the danger. Various characteristics can be used in this classification of threats. In general, while agreeing with all kinds of existing threats, we consider it necessary to add some information to their classification.

### 3. Results

The eco-economic development of the region is understood as a process that is aimed at preserving important eco-economic parameters that could ensure development and lead to qualitative changes in the reproduction of living conditions. This economic category implies the protection of the interests of the subjects, the operation of the economic mechanism, which is based on economic incentives of environmentally acceptable development.

At the same time, we address the region as an eco-economic system that includes the ability to withstand threats and negative factors, has common goals for ecologically sound economic development [25].

The purpose of the region's eco-economic development is to develop environmental and economic relations in directions favorable for nature and society that could ensure economic prosperity, quality living conditions and human health.

Eco-economic development is aimed at solving the following problems. First, to improve the efficiency of the natural resources management system. Secondly, to enforce mandatory requirements for compliance with environmental principles at the legislative level, as well as to prohibit the economic activity that adversely affects the state of the environment. Thirdly, to justify the economically balanced allocation of productive forces, taking into account the ecological aspect. Fourth, to study the features of environmental degradation. Fifth, to study the relationship between economic and environmental factors. Sixth, to analyze the impact of the degradation the process of the natural environment on the development of the ecological and economic situation. Seventh, to reduce the environmental footprint on the natural environment through the implementation of preventive measures to reduce harmful emissions, as well as through the use of waste. Eighth, to predict the socio-economic dynamics of the study. Ninth, to prevent adverse eco-economic situations in production [26].

Eco-economic security is a multidimensional definition. It is the most important condition for respecting the constitutional right of citizens to a favorable environment, on the condition of which their physical and psychological health depends, as well as for maintaining the rate of labor

productivity. To obtain a detailed and comprehensive assessment of the eco-economic security of territorial development, a comprehensive analysis of the main factors that pose threats to this security has been carried out. One of the important reasons for turning to the analysis of threats is their classification and ranking by the nature and degree of the danger. Various characteristics can be used in this classification of threats. In general, while agreeing with all kinds of existing threats, we consider it necessary to add some information to their classification.

The eco-economic index is a multidimensional indicator that takes into account the following indicators of the region's sustainable development: gross fixed capital formation, fixed investment in "Mining", depletion of natural resources, environmental pollution damage (including carbon dioxide and other emissions into the atmosphere), human capital expenditures, environmental costs and specially protected natural areas.

The definition of these indicators is necessary to achieve the following objectives:

- 1) development of a strategy for the future eco-economic development of the regions;
- 2) forecasting the effect of the proposed activities;
- 3) participation in civil activity.

In our scientific research, we suggest the use of the following approaches to assessing the region's eco-economic development:

1. Calculation of the region's eco-economic index. Ranking by index is based on the synthesis of ecological, economic and social indicators of the study region. On its basis, it is possible to analyze how environmental protection in the Chelyabinsk region as an obligatory part of the regional management system affects the economy and the population as a whole.

The index was obtained in the multidimensional analysis of the world experience in assessing sustainable development.

Adjusted net (ANS) savings for the Russian Federation regions are calculated by the formula:

$$\text{ANS} = \text{GFCF} - \text{IM} - \text{DNR} - \text{EPD} + \text{BEDHC} + \text{EC} + \text{ASPAs},$$

where GFCF – gross fixed capital formation;

IM – fixed investment in "Mining";

DNR – depletion of natural resources;

EPD – environmental pollution damage;

BEDHC – budget expenditures on the development of human capital;

EC – environmental costs;

ASPAs – assessment of specially protected natural areas.

The eco-economic index (IANS) is calculated as the ratio of adjusted net savings to GRP.

$$\text{IANS} = \text{ANS} / \text{GRP} \cdot 100\%,$$

where ANS is the adjusted net accumulation;

GRP is the gross regional product.

Based on the comprehensive analysis of the data of the Russian Federation State Statistics Service, we present the following results:

Gross fixed capital formation is the funds invested in fixed assets of production units located in the region in order to create new income in the future by using them in production. In other words, this indicator characterizes the volume of national wealth, which is the source of income for future generations.

The gross savings of Chelyabinsk region are equal to 144, 23 billion rubles. This is the 16th place among the regions of Russia [27]. Among the industrial regions of the Russian Federation, Chelyabinsk Region is the 9<sup>th</sup> and it outpaces 25 other regions.

Gross savings in the calculation of the index are correlated depending on the volume of fixed capital investment in mining industries. This is due to the need to subtract the funds directed at the development of the commodity sector from gross savings. It will lead to an increase in mining output in the future, and, consequently, to the subsequent reduction of resources for other generations. In terms of fixed investment in "Mining" (IM) Chelyabinsk region ranks 36 out of 83 represented regions – IM = 1.27 billion rubles. Chelyabinsk region ranks 19<sup>th</sup> in respect of this indicator among the industrial regions [28].

Mining operations lead to a reduction in mineral deposits. It reduces natural capital, and consequently, net savings. In this regard, gross

savings in the calculation of the index are decreased by the amount of natural resources depletion. Depletion of natural resources in relation to this index consists of two components: the depletion of mineral resources and natural resources and depletion of forest resources.

$$\text{NRD} = \text{MRD} + \text{FRD},$$

where NRD – natural resources depletion,

MRD – mineral resources depletion,

FRD – forest resources depletion.

Natural resources depletion in relation to this index consists of two components: depletion of mineral-raw resources (5.6 billion rubles in Chelyabinsk region – 36<sup>th</sup> among the regions of the Russian Federation) and depletion of forest resources.

The depletion of mineral-raw resources is estimated by the volume of gross added value by the type of activity "Mining".

MRD for Chelyabinsk region is estimated at 5.6 billion rubles (36<sup>th</sup> place among the regions of the Russian Federation) [28].

FRD is calculated regarding the average value of timber reserves in recent years. FRD of Chelyabinsk region is 0.8 million cubic meters (the 50<sup>th</sup> place among the regions).

Environmental pollution damage is defined as the amount of damage from carbon dioxide emissions and emissions of pollutants into the atmosphere.

$$\text{EPD} = \text{CO2D} + \text{PED},$$

where EPD – environmental pollution damage;

CO2D – carbon dioxide emissions damage;

PED - pollutant emissions damage.

Environmental pollution damage is defined as the amount of damage from carbon dioxide emissions and emissions of pollutants into the atmosphere.

Chelyabinsk region ranks 81 among other regions of the Russian Federation in terms of CO2D – 102 949 thousand tons. Only two regions emit more carbon dioxide into the atmosphere than Chelyabinsk region: Tyumen and Kemerovo regions.

In terms of the pollutant emissions Chelyabinsk region also holds the leading position in PED = 1180 kt (77<sup>th</sup> among other regions, the maximum value of this indicator is 3825 thousand tonnes) [28].

Human capital is one of the components of the net fixed capital formation or national wealth. According to this methodology, expenditures on the development of human capital include the expenditures of the consolidated region budgets on education, health care, physical culture and sports. The data is based on the reports on the execution of the budgets of the constituent units of the Russian Federation. The reports are published on the website of the Federal Treasury.

The source of the expenditure data on the human capital development are reports on the execution of the budgets of the constituent units of the Russian Federation. The reports are published on the website of the Federal Treasury. BEDHC of Chelyabinsk region is 36.1 billion rubles (in the middle of the list) [28].

$$\text{EC} = \text{CEC} + \text{CE},$$

where EC – environmental costs;

CEC - current environmental costs, which include all expenditures on environmental protection and rational use of natural resources, carried out at the expense of the company's own or borrowed funds, or state budget funds;

CE is the capital expenditure on environmental protection, which refers to investments in fixed assets aimed at protecting the environment and rational use of natural resources. They include construction and reconstruction costs that lead to an increase in the initial cost of the facility and are attributed to the additional capital of the organization.

The environmental costs of Chelyabinsk region are 8.32 billion rubles. The indicator is quite high among the regions of the Russian Federation (the average value is 30.85 billion rubles)

$$\text{SPAs} = \text{GRP} / (100\% - \text{SPAs}\%) \cdot \text{SPAs}\% \cdot 100,$$

where GRP is the volume of the gross regional product;

percentage of SPAs % - the percentage of specially protected areas in the total area, in%;

SPAs – specially protected natural areas.

Chelyabinsk region is rich in specially protected natural areas. The specially protected areas of Chelyabinsk region cover 947.2 thousand hectares.

The eco-economic index of Chelyabinsk region is 6.94, with an average value of 21.78. It means that the indicator is rather low. One of the main factors that caused the low eco-economic index of Chelyabinsk region is rather high specific harmful emissions, especially carbon dioxide emissions. The ratio of harmful emissions damage to GRP is one of the highest among the regions of the Russian Federation. At the same time, the increase of natural capital is facilitated by specially protected natural areas, which make up almost 15% of the total area of the region.

1. Multi-criteria approach. Problem setting in the context of a multi-criteria approach that takes into account a number of factors:

- the place of the region in the system of domestic and microeconomic communications;
- characteristics of the natural relief and the hydrological situation in the region (risks of direct contamination of water bodies from surface flood flows (including emergency cases));
- the principal seasonal differences in the wind patterns in the study areas (the prevailing winter and summer wind directions are different and they differ significantly from the average annual wind pattern);
- raw material potential of the territory;
- present level of the eco-economic development of the region.

The multi-criteria approach is based on the analysis of a large volume of static and actual data. It involves the construction of integrated eco-economic indicators of the development level of the study region.

2. Dynamic approach. This approach allows us to consider the problem of the eco-economic development of the region in a different aspect, which is different from the traditional one.

For a number of economic systems it is more rational to develop special methods and models for

analyzing the problems of the region's eco-economic development.

Special methods of research include the following:

1) development of a matrix of problematic ecological and economic situations of the region. We consider the most important components: natural-resource, industrial, investment, labor potential and environmental components.

At the same time, we will evaluate the natural resource, production, investment, labor and environmental potentials from the following positions.

The natural-resource potential will be analyzed in the context of a multi-criteria approach, taking into account temporal changes and the influence of natural and anthropogenic factors. The reserves of natural raw materials should be taken into account.

Here is the description of the region's productive potential. Metallurgical, agri-industrial, fuel-energy, machine-building, and construction complexes determine the development of the region. We will characterize the investment potential based on the calculation of the region's investment activity, the assessment of the total contribution of Chelyabinsk region to the fixed capital of the Russian Federation, etc.

We will assess the labor potential on the basis of the population-dynamics analysis of the region, the assessment of the urbanization level. Employment of the population in various sectors of the economy, the level of registered unemployment, the level of youth employment, etc.

The ecological potential will be assessed on the basis of the state of health analysis of the region, studies of the environmental factors that significantly affect the health of the population, fertility and mortality rates, their dynamics in the conditions of active development of the region's economy, analysis of the sanitary and epidemiological situation in the region, the degree of urban greening.

2) construction of a methodological chain of stabilization of the eco-economic development of the study region: dynamic innovation development - investments (implementation of endoecological projects) – focus on the development of copper production aimed at import substitution - diversified economic development - improving the

quality of life of the region's population - ensuring eco-economic security of the region.

3) identification of criteria and sub-criteria for assessing the development of the region under the conditions of economic sanctions pressure and the continuing negative impact on the natural environment. The criteria for assessing the development of the region include the overall level of economic development of the region, calculated by the method of rapid diagnostics of the region's economic security; indicators of the ecological situation; forecasting the development of the eco-economic system in the context of crisis phenomena (taking into account possible emergency cases).

The sub-criteria for assessing the development of the region include the elimination level of inter-regional disparities; level of structural and innovative development of the region; the degree of the region's economy diversification.

#### 4. Discussion

Many countries in the world urgently need an objective assessment of the eco-economic development of the territory, which will go beyond the limits of traditional methods [29-33]. The proposed index of eco-economic security will be a measure of progress in the framework of the current model of environmentally safe economy, will determine Russia's further development within the framework of the national security concept. The index of the eco-economic development of the territory will significantly improve the situation in terms of the eco-economic sustainability in remote regions. On its basis, it is possible to understand how environmental protection in the regions, in the regional governance system, and the socio-economic situation affect the economy and the population [34, 35]. The obtained results can be used for further theoretical and practical studies of the eco-economic security problems of territorial development, as well as for achieving the necessary conditions for further sustained economic growth as a result of the achieved acceptable level of environmental safety in the region. Generalization and conclusions obtained in the process of the research work can also be used by federal and regional authorities in economic reforms at the interregional and regional levels.

We also propose some practical recommendations aimed at:

- stabilization of the region's economy as a prerequisite for its sustainable development;
- sustainable development of the eco-economic systems as a result of economy stabilization;
- increase in the level of the eco-economic development of the region as a result of the first and second points mentioned above (stabilization plus sustainable development);
- achievement of the necessary conditions for further sustainable growth and eco-economic development as a result of the eco-economic security of the region;
- stable effect of modern economic (social-market) relations;
- ensuring the entry of the region into the global economic space on the rights of economic (and political) entities.

#### 5. Conclusions

Regulatory and environmental issues in supply chain operations and effects of the education in management is considered in this research. There is a number of methodological and statistical problems that hamper the calculation of the universally accepted integrated indicator, which makes it possible to assess the eco-economic security of the region. The main difficulty is determining the degree of importance of the initial data without excessive subjectivity. The higher the level of information ranking, the more difficult it is to assess the importance of incomparable values. Estimated values of eco-economic damage from the negative impact of economic and other activities should not be regarded as an "equivalent" of threats, but as an indicator of a certain level of danger. This corresponds to the understanding that money cannot be the equivalent of a social disease or premature mortality. Calculating the universal index of the region's eco-economic development is a complex task, but it is quite realizable. For its development, it is necessary to identify a certain system of indicators, conditionally divided into environmental, social and economic. Some indicators are special indicators, nevertheless they can reflect different aspects of security. For example, the most important indicator of energy intensity can be a part of various groups of indicators: economic (its level reflects the level of energy efficiency in the economy); environmental



(linkage with pollution levels, greenhouse gas emissions); social (the size and composition of emissions).

The developing strategy for ensuring eco-economic security should be of a long-term nature and it must be based on “forecasting and prevention”, which is more effective in the eco-economic sense than “reacting and correcting” in resisting threats. However, a large number of eco-economic threats make it necessary to concentrate attention and efforts on the most urgent measures to reverse these threats.

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