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## **Environmental Economic Zoning as the Basis of the Sustainable Development of Resource Territories (Based on the Example of Krasnoyarsk Krai)**

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**Subject.** *The high resource potential of the Krasnoyarsk Territory generates a topical and rapidly growing demand for its territory for the purposes of its multifunctional economic use. The variety of loads on the regional ecosystems and the desire to minimize the risk of their destruction requires a comprehensive planning and targeted use of the territories of the region.*

**Objectives.** *To substantiate an integrated approach and the construction of the index, reflecting the sustainable development of natural resource areas. To create an administrative tool based on statistical data, without expert estimates and subjective judgments, in order to make decisions about the possibility of placing production facilities in the selected municipality from a position of the three dimensions: ecology, society, economy.*

**Methodology.** *Using statistical and econometric methods, this paper substantiates the construction of the index that is an aggregated integral index of environmental sustainability for municipalities of the Krasnoyarsk Territory. The technique is applicable to various scales of territorial zoning. The scale is determined by the availability of reliable statistical information for objects of different sizes (municipality, city district, industrial zones).*

**Results.** *The article highlights the issues of environmental economic zoning of resource areas on the basis of the integral index of ecological and economic stability, taking into account environmental, economic and social factors in the context of municipalities (urban districts, municipal districts). Besides, the article shows the possibilities of environmental economic zoning for the determination of the boundaries of priority and recommended functional areas, because the local areas of institutional conflict environmental management are located precisely there.*

*A draft of Krasnoyarsk Territory Government Resolution 'On approval of a regional order and methods of environmental economic zoning of the Krasnoyarsk Territory' is developed for the purposes of balanced social, ecological and economic development of the natural and resource region.*

**Conclusion.** *The developed approach can be used to ensure the sustainable development of territories of intensive economic development, to substantiate socio-economic development programs of the Krasnoyarsk Territory and its municipalities, to carry out ecological and economic assessment and decision-making about the possibility to implement major investment projects.*

*Keywords: environmental monitoring, integrated indicator of environmental sustainability, environmental risks, economic development, public health risks.*

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Krasnoyarsk Krai has a unique natural and resource potential by volume and quality. The region dominates in the Russian Federation by many types of extraction of raw materials. The high availability of natural resources creates good starting conditions for the accelerated development of the economy of the Krasnoyarsk Territory and the transformation of the region into the leader of the social-economic development of Siberia and the Far East, the reference point and the flagship of Russia's competitiveness in the Asia-Pacific markets.

However, the rapid development of the environmental and resource-intensive industries in the region is the real source of increased anthropogenic impacts on the environment and the potential threat of a crisis, social unrest and environmental conflicts.

Environmental conditions and the level of prosperity in the field of environmental protection in Krasnoyarsk Krai is by far the weakest competitive position in the region.

The main challenges in the field of preservation of the quality environment and ecological security of the region are as follows.

1. High levels of air pollution from both stationary (industry, CHP, SDPP, TPP) and mobile sources (motor transport). Industrial centers of the region, namely, Krasnoyarsk, Norilsk, Achinsk, Lesosibirsk, Minusinsk are already

included in the priority list of Russian cities with the highest levels of air pollution. The exposure of chemical air pollution affects the growth of population morbidity of the Krasnoyarsk Territory on a number of diseases of the nervous system, circulatory system, respiratory system and malignant neoplasms. There are zones with a combined chemical pollution that is harmful to public health created in the territory of industrial cities because of the superposition of emissions from group enterprises. Currently, there is no practice of establishing unified sanitary-protection zones of groups of companies, with rare exceptions, and removing environmentally hazardous facilities from residential urban areas or resettlement of residents from dangerous areas.

2. As a result of dumping untreated and insufficiently treated wastewater, a high level of water pollution is produced. Due to the annual discharge of 450-500 mln. m<sup>3</sup> of untreated and insufficiently treated contaminated wastewater, the water quality of many surface water bodies is estimated as 'contaminated-dirty', sometimes 'very dirty'.

The quality of water in many places of the water intake and the distribution network of the region does not meet sanitary and hygienic requirements (more than 20% of water samples according to chemical indicators); 665 water

sources (43.8%) do not have organized sanitary protection zones that pose a threat to the normal livelihood of a large number of inhabitants of the region (at the beginning of 2014 a population of 134 thousand people lived in poor water conditions).

The high degree of wear of water and wastewater systems (up to 80%) predetermines a high accident rate (up to 200 accidents per year) and a large loss of water (more than 24%). The presence of outdated technology does not provide the required quality of drinking water. About 400 thousand people drink water of non-normative quality. Chemical contamination of drinking water poses a threat to many human diseases (of skin, kidneys, and central nervous, cardiovascular, immune and hormonal systems).

3. The region produces a large variety of waste including solid domestic waste (the region is among the top ten Russian regions in amount of wastes) with an insufficient number of waste disposal facilities, especially landfills, and a low level of recycling and use of wastes as secondary raw and energy materials.

4. Serious environmental problems are associated with the presence of local zones of radiation troubles in the region, which are the result of past activities of Mining and Chemical Combine, and with the consequences of nuclear weapons tests and nuclear explosions, including those conducted outside the region and the presence of naturally occurring radioactive anomalies and radon-affected areas.

5. Many hydraulic engineering structures have a high level of danger (81% of HES does not have a normal security level, 5% have an emergency level of security).

6. The situation is exacerbated by the absence of a unified information system of ecological monitoring in the region, the insufficient number of investigations and research in the field of

environmental protection and maintenance of ecological safety, a low efficiency of measures aimed at reducing the negative impact on the environment, an efficient use of natural resources and resource and energy-saving technologies.

7. In spite of the generally positive trends in recent years (the growth of the share of the region in Russia's GDP, an increase in investment in fixed assets, the growth of real incomes of the population, etc.), the region retains the acute problems related to:

- Backlog of volumes of geological and exploration works in comparison with the rate of extraction of non-renewable mineral resources;

- Lack of a clear system of government priorities in this area;

- Lack of adequate long-term ecological and social assessment of new construction projects, as well as reconstruction and modernization of existing enterprises;

- Inadequate enforcement of decisions of environmental and economic expertise;

- 'Residual' method of financing the costs of environmentally friendly and green purposes;

- Insufficient economic incentives for environmentally friendly and green measures.

In general, the situation connected with the formation of modern innovative environmentally and socially oriented model in the natural and resource sector of the Krasnoyarsk Territory should be recognized as unsatisfactory. It is necessary to move to such a model. There is no alternative to the path, assuming a dynamic and civilized (based on market principles, coupled with effective government regulation) development of the natural and resource sector of the economy in the public interest.

Sustainable economic and social development of the Krasnoyarsk Territory is largely caused by solving the problems of environmental protection and rational use of natural and resource potential based on an innovative path of development.

The main principles of the development strategy of innovative eco-social development of the Krasnoyarsk Territory should be:

- Longevity;
- Advanced character in relation to the plans for economic development;
- Assessment of the degree of economic development of natural resources, taking into account complexity, waste management and other factors;
- Evaluation of the features of the development of environmental infrastructure as an integral part of the economic complex of the region in conjunction with the features of the long term development of productive forces;
- Consideration of the territorial (spatial) characteristics of the environmental consequences of the development of production in certain macro-regions, industrial sites and urban areas.

Innovative environmentally and socially oriented path of development of the natural and resource sector of the regional economy is associated with major long-term investment not only in the development and production of natural resources, but also in the development of new high-tech infrastructure and science-based environmental sector of economics. In order to carry out such investments we need long-term stability. The transition to an innovative eco-social development strategy of the Krasnoyarsk Territory's economy involves strengthening the role of environmental assessment procedures of investment projects in the process of economic decision-making and management. Such procedures should be aimed at:

- Identification of environmental problems at the early stages of considering projects;
- Inclusion of the measures aimed at improving the quality of the environment in the draft;

– Development of the measures to prevent, reduce and compensate for environmental damage and risk.

Environmental Assessment (EA) of investment projects (IP) should be advantageously carried out at the two levels: individual (local) and integrated (regional).

In the first case, the object of evaluation is a specific investment project, in the second case it is a set of investment projects, interacting in a certain area of the region (municipality, industrial site, etc.).

A bet on the assessment of a particular project may generate errors even with the correct method of its implementation.

The weakness of the approach to assess individual projects is that in most cases individual projects are presented as particular solutions, in fact, without providing alternative options. Effective alternatives can be analyzed only while carrying out comprehensive studies related to the development of regional development programs. In addition, individual projects can be environmentally acceptable, but their combined effect exceeds the permissible limits.

Ensuring environmental and social priorities of the regional program involves testing it for compliance with the modern requirements of scientific and technological progress. The most convenient thing is to isolate the following levels of rating scale of technical and technological solutions incorporated in the investment projects of the program: the worst, the average and the best of the best, really made in the country or abroad.

The main areas, which are used to assess the impact of technology on the environment, should include:

- The degree of feedstock's completeness;
- The extent of the need and use of environmental resources (e.g., the cost of water resources);

– Volumes of production wastes and the degree of their impact on the environment;

– The possibility of waste reuse.

Another methodological aspect is to identify the focal points of technological processes that will have a significant impact on the natural resources of the region.

Modern technology has not reached the environmental perfection yet, it will inevitably have an impact on the environment. At each stage of the procedure of the assessment of the regional program's impact on the environment evaluation indicators, criteria and methods are used. It is important to provide their dock that is a logical connection and continuity. This will enable a holistic, interconnected study of all the links of the interaction of the program of regional development with nature in the chain 'a source of impact – environmental impact assessment – evaluation of the consequences in the economic sphere – a system of measures for the prevention and elimination of consequences'.

A holistic systemic approach to the environmental assessment for the industrial objects (and other production facilities, which have an impact on the environment) planned for deployment is possible on the basis of environmental economic zoning.

Currently there is no single approach to solving this problem.

Assessing the impact of the territorial program on the environment of the region, where its implementation is proposed, is complicated by the insufficient development of the regulatory framework of permissible impact on the environment (with regional amendments), and the approximate nature of both environmental and economic criteria of damage, and imperfection of estimation methods. Therefore, the development of research in these areas is very important. There are many qualitative and quantitative indicators to measure the state of the environment, reflecting

the multi-faceted nature of the problem. Many of them need to be improved, and a number of indicators should be further developed.

A natural-resource potential is used as a starting base for the formation of a system of indicators.

Six groups of indicators can be distinguished, namely, those, which:

1. characterize the current and future state of the natural-resource potential (describing certain types of natural resources and giving a comprehensive assessment of the environment);

2. reflect the current state of the economic system and the prospect of its development;

3. are used as a basis of comparison for determining the variability of natural systems and acting either as a conditional reference, or as a standard (for example, the maximum permissible concentration (MPC), the maximum permissible emissions (MPE), the maximum permissible load (MPL));

4. characterize the degree of variability in systems, obtained by comparing their current state with the reference one, and reflect the deviation from these standards, expressed in points, degrees, percentages, levels, etc.;

5. reflect the assessment of the negative consequences of the change in ecosystems in the economic sphere (cost estimates);

6. characterize the effectiveness of planned environmental measures and their effectiveness.

The proposed system of indicators will reveal links with insufficient information and focus on their improvement. The linkage between indicators for nature protection with indicators of economic and social development of the region involves using environmental-economic modeling in the framework of the theory of regional economic analysis and development of regional systems.

The authors of this article present a method of environmental economic zoning on the basis

of the integral index (IIES that is integral index of environmental sustainability), taking into account the dynamics of the ecological load on the territory, public health risks and economic development.

The three main are identified as the indicators characterizing the environmental economic state of the areas; they are economic development level, social development level and the ecological state of the territories of the Krasnoyarsk Territory.

There is an emphasis on industrial (metallurgy, mining, thermal energy facilities, etc.) districts of the region, as it is a topical problem for the Krasnoyarsk Territory.

The ecological component assesses the state of the environment, the level of its pollution as a result of economic activities of enterprises and human life. The level of public health risk caused by unfavorable environment reflects the state and stability of the social sphere. Volumes of production of goods and services are characterized by the level of economic development of the territory. The higher the level of industrial activity is, the greater the risk of adverse ecosystem effects both for the environment and for society is (first of all, public health).

In the proposed theoretical model IIES is constructed through the indices, taking into account the levels of economic and social development and environmental status for the Krasnoyarsk Territory.

The system of indicators used to construct the aggregated integral index should satisfy the following criteria:

- The possibility to be used at the regional and federal levels;
- Unambiguous interpretation for decision makers;
- Being quantified;
- Basing on the existing system of national statistics and not requiring significant costs for data collection and calculations;

- Providing temporary monitoring.

Using the apparatus of conditional probabilities requires the knowledge of local laws, the effect of one factor on the other, and reliable official statistics.

In practice, the elements of environmental economic zoning (i.e. the integration of environmental, economic and social factors) are carried out by experts. Besides, expert approaches and scales to match information that is diverse in nature are not regulated. As a result, various experts make disparate opinions on the same data. This situation is a consequence of the features of the Russian legislation built on the differential type, and the lack of regulatory enshrined instructional techniques of integrated (complex) estimation of the mutual influence of the development of industrial potential, the environmental situation and the quality of life.

Given that at the federal level and in the regions of Russia the integrated indicators (ecological and socio-economic) of assessment of the sustainability of the territories' development are not developed and are not used, the authors used the United Nations Human Development Index (HDI) as a methodological basis. The authors use an average compound of the normalized values of each component (environmental, economic, social) as a mathematical model of the human development index.

With regard to the problem of environmental economic zoning of the regional territory, the use of a construction of HDI index as an analog is rather substantiated.

The specificity of environmental economic territorial zoning should take into account:

- a) the state of the environmental situation, that is, above all, the quality of air, water and waste disposal. At the same time, official statistics provides data in the context of municipal entities (hereinafter mentioned as ME) in terms of the pollutants, such as emissions (into the air),

discharges (into the water), and the volume of waste disposal;

b) volumes of emissions, discharges and wastes directly depend on the volume of industrial development of the area (i.e., the level of production of goods and services in the territory), which is also provided by statistical information. Thus, the main factor (production of goods and services) directly related to the environmental state of the territory is selected among many of the potential economic factors;

c) the main factor among social ones associated with the state of the environment that is public health. Over the last 10 years Rospotrebnadzor has estimated and published statistics on carcinogenic and non-carcinogenic risks. The carcinogenic and non-carcinogenic risks are directly related to the ecological quality of the surrounding environment (air, water, waste).

Based on the above, as a baseline in the construction of IIES territory, the above factors are selected.

In order to compare factors (environmental, economic and social), which are various by nature, in a correct way, the authors offered a specification at an affordable (provided by reliable statistics) time slot (not less than 5 years are recommended). In fact, the specification of the type

$$I_i = \frac{A_i - A_{\min}}{A_{\max} - A_{\min}}$$

transforms a time series of any nature to the information one that varies from 0 to 1. Thus, all components included in the index are pre-standardized, which allows eventually evaluating the stability of the territory with respect to environmental, social (disease risk) and economic factors from 0 to 1.

Using the method of constructing IIES described above, on the basis of statistics on municipalities, the authors performed a comparative evaluation on ME as of 01.01.2013, which satisfactorily describes the actual state of the regional territory (Table 1).

Using the integral index of environmental economic territorial zoning allows (without a subjective approach of experts) ranking the areas and ME of the region subjectively. This approach takes into account the difference in stability of different areas, especially in the formation of long-term programs of development of the region, forms a more sensible policy on development and modernization of industrial production, as well as introduces restrictive measures in relation to those investment projects that are able to worsen the state of the ecological situation of the areas.

Based on the gradation of IIES (shown below), it is advisable to carry out ENVIRONMENTAL ECONOMIC zoning by allocating three corresponding grades of ME in Krasnoyarsk Krai based on a combined indicator proposed to use:

1)  $0,0 < Y \leq 0,25$  – stable ecological situation. Environmental (assimilation) potential of the environment provides favorable conditions for life and biodiversity. The development of economic activities is possible in the territory, provided  $Y \leq 0,25$ .

2)  $0,25 < Y \leq 0,75$  - the state of the natural system is in a stable, dynamic equilibrium. The development of industrial production is possible in case of the transition to the best available technology (BAT), and / or modernization of old ecologically dirty industries.

3)  $0,75 < Y \leq 1$  – ecological assimilation capacity of the territory is exhausted; critical condition. The economic development of the territory is possible only under condition of decrease in industrial loads, i.e., a ban on the

Table 1. The ranking of municipalities of the Krasnoyarsk Territory by a combined indicator

| <b>Rating</b> | <b>The name of the municipality<br/>(Krasnoyarsk Krai)</b> | <b>The index for 2012</b> |
|---------------|--|---------------------------|
| 1             | Norilsk  | 1,000                     |
| 2             | Nazarovo   | 0,844                     |
| 3             | Krasnoyarsk  | 0,829                     |
| 4             | Zelenogorsk  | 0,819                     |
| 5             | Lesosibirsk  | 0,796                     |
| 6             | Achinsk  | 0,764                     |
| 7             | Turukhansk municipal district                              | 0,750                     |
| 8             | Divnogorsk   | 0,731                     |
| 9             | Shushensky municipal district                              | 0,725                     |
| 10            | Minusinsk  | 0,699                     |
| 11            | North-Yenisei municipal district                           | 0,693                     |
| 12            | Tyukhtet municipal district                                | 0,691                     |
| 13            | Kansk  | 0,669                     |
| 14            | Sharypovo municipal district                               | 0,660                     |
| 15            | Motyginino municipal district                              | 0,659                     |
| 16            | Uzhur municipal district                                   | 0,652                     |
| 17            | Zheleznogorsk  | 0,650                     |
| 18            | Evenk municipal district                                   | 0,644                     |
| 19            | Bolsheuluytsky municipal district                          | 0,644                     |
| 20            | Sukhobuzimsky municipal district                           | 0,628                     |
| 21            | Nazarovo municipal district                                | 0,627                     |
| 22            | Kezhemsky municipal district                               | 0,619                     |
| 23            | Sosnovoborsk   | 0,607                     |
| 24            | Achinsk municipal district                                 | 0,605                     |
| 25            | Minusinsk municipal district                               | 0,584                     |
| 26            | Krasnoturansk municipal district                           | 0,581                     |
| 27            | Sharypovo  | 0,580                     |
| ...           | .....  | .....                     |
| 59            | Partizansk municipal district                              | 0,253                     |

construction of new environmentally hazardous industries and technological upgrading of existing facilities.

Thus, it is proposed to use the following approach to determining the need for the imposition of restrictions on economic and other activities (Table 2).

The elaboration of proposals to limit the economic and other activities is necessary for the territories of municipalities, the calculated IIES

for which today is located within the boundaries of  $0,25 < Y \leq 0,75$ , when it is  $0,0 < Y \leq 0,25$ , economic activity is not limited, when it is  $0,75 < Y$ , decision-making about starting a new business activity is not allowed without the use of best available technologies.

The implementation of the above procedure will result in the need to impose restrictions on the kind of economic and other activities when making investment decisions, including

Table 2. The criteria for environmental economic zoning of the territories of the Krasnoyarsk Territory

| The index value (Y)   | The need to establish restrictions   |
|-----------------------|--|
| <b>0,0&lt;Y≤0,25</b>  | Establishment of direct restrictions is not required. An annual monitoring of the stability of the socio-environmental and economic development on the basis of the calculation of IIES is necessary. If the index is $0,0 < Y \leq 0,25$ , economic activity is not restricted.                     |
| <b>0,25&lt;Y≤0,75</b> | The allocation of industrial facilities, provided that the estimated value of IPES (0.75) is not exceeded, is possible taking into account the impact of the new object in the system of already operating plants, i.e., the restrictive measures of administrative and legal nature are introduced. |
| <b>0,75&lt;Y≤1,0</b>  | The prohibitive measures for the allocation of economic activities, providing an additional burden on the environment are established, since the assimilation capacity of the environment in the territory have been exhausted, social risks (public health risks) are high.                         |

the allocation of land for the placement and construction of industrial plants and facilities.

If IIES of a municipality, which is planned for the placement of a new industrial facility, has a value in the range of 0.25–0.75, it is necessary to assess the value of IIES as part of the considered investment project taking into account the predicted impacts.

If the calculated value of IIES exceeds the upper limit (0.75), it is necessary to prevent the placement of industrial facilities without the upgrade of existing environmentally harmful facilities.

For example, the regional authorities would not even have considered the issue about constructing the Yenisei Ferroalloy Plant if IIES were used, as the Krasnoyarsk Territory is characterized by an index of more than 0.8. It means, the introduction of new environmentally hazardous facilities without the modernization of existing enterprises (Krasnoyarsk Aluminium Plant JSC, urban TPP) is not possible.

It is important to note the following features of the use of IIES for environmental economic zoning.

Since the federal and regional environmental monitoring networks are insufficient (both in density, and the number of registered factors

[1]), it is possible to recommend the use of IIES for zoning at the level of comparing of ME. The IIES technique allows solving even more detailed problems with the ecological and economic zoning, but this requires a radical modernization and development of existing networks of environmental monitoring in the Krasnoyarsk Territory.

Given that statistic does not contain data about the areas of the real impact of specific pollutants and legislative shortcomings (there is no concept of areas of the real impact of pollutants), it is necessary to use data on dumping, emissions, waste volumes correctly in the calculation of IIES, and to assign them at least to the area of residential and industrial zones, which are provided by applicable law. Otherwise, even Norilsk Nickel Mining and Metallurgical Company that is considered a unique pollutant not only in Russia but also in the world, 'looks' not too 'scary' in the vast territory of Taimyr Autonomous District. Nevertheless, despite formally favorable economic and social indicators, the IIES index for Norilsk is taken as 1. A further development of production is impossible without a fundamental modernization by means of the introduction of BAT in this territory (the area of environmental inaction).

The considered tool of measuring a sustainability of development of territories with the existing administrative-territorial division of Krasnoyarsk Krai demonstrates that the development of the region, high quality of life and health of the population can be achieved while maintaining the appropriate environmental conditions. The environment should be included

in the system of socio-economic relations as one of the most valuable components of the national wealth. The formation and implementation of the strategy of socio-economic development of the region and regional ecological policy should be linked, because health, social welfare and environmental safety of the population exist in their indissoluble unity.

### References

Briukhanova E.A., Kobalinskii M.V., Sibgatulin V.G., Shishatskii N.G. (2014). Sovershenstvovanie informatsionnogo obespecheniia ekologicheskogo monitoringa kak instrumenta ustoichivogo sotsial'no-ekonomicheskogo razvitiia regiona (na primere Krasnoyarskogo kraia) [Improvement of information support of environmental monitoring as a tool of sustainable social and economic development of the region (based on the example of Krasnoyarsk Krai)], *In Informatizatsiia i sviaz' [Informatization and Communication]*, 1, 43-47.

## **Эколого-хозяйственное зонирование как основа устойчивого развития ресурсных территорий (на примере Красноярского края)**

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**Предмет.** *Высокий ресурсный потенциал Красноярского края порождает в настоящее время быстро растущий спрос на его территорию для целей многофункционального хозяйственного использования. Многообразие нагрузок на региональные экосистемы и стремление к минимизации рисков их разрушения требуют комплексного планирования и целевого использования территорий региона.*

**Цели.** *Обоснование интегрального подхода и построение индекса, отражающего устойчивое развитие природоресурсных территорий. Создание административного инструмента, основанного на статистических данных, без экспертных оценок и субъективных суждений, с целью принятия решений о возможности размещения производственных объектов в выбранном муниципальном образовании с позиции трех измерений: экологии, социума, экономики.*

**Методология.** В настоящей статье с помощью статистических и эконометрических методов дано обоснование построения индекса – агрегированного интегрального показателя экологической стабильности для муниципальных образований Красноярского края. Методика применима к различным масштабам зонирования территорий. Масштаб определяется наличием достоверной статистической информации для объектов различных размеров (муниципальное образование, район города, промышленные зоны).

**Результаты.** В статье освещены вопросы эколого-хозяйственного зонирования ресурсных территорий на основе интегрального показателя эколого-хозяйственной стабильности, учитывающего экологические, экономические и социальные факторы в разрезе муниципальных образований (городских округов, муниципальных районов).

Показаны возможности эколого-хозяйственного зонирования для определения границ приоритетных и рекомендуемых функциональных зон, так как именно в них имеют место локальные районы ведомственного конфликтного природопользования.

Разработан проект постановления правительства Красноярского края «Об утверждении регионального порядка и методов проведения эколого-хозяйственного зонирования территории Красноярского края» в целях сбалансированного социо-эколого-экономического развития природно-ресурсного региона.

**Вывод.** Разработанный подход может использоваться для обеспечения устойчивого развития территорий интенсивного хозяйственного освоения, при обосновании социально-экономических программ развития Красноярского края и его муниципальных образований; при проведении эколого-хозяйственной экспертизы и принятии решений о возможности реализации крупных инвестиционных проектов.

**Ключевые слова:** экологический мониторинг, интегральный показатель экологическая стабильность, экологические риски, экономическое развитие, риски для здоровья населения.

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**Научная специальность:** 08.00.00 – экономические науки.

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