

Management of the socio-ecological and economic systems functioning in a single information space

Gestión de los sistemas socioecológicos y económicos que funcionan en un único espacio de información

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Contents

1. Introduction

2. Methods

3. Results

4. Conclusions

References

ABSTRACT:

The current state of functioning of the socio-ecological and economic systems is considered in the article. The fundamental goals of socio-ecological and financial operations of the region are identified and named the creation of a reliable and objective basis for the development of a sound state policy for regulating territorial development and determining its priorities; development of a strategy for the development of the region, forecasting socio-ecological and economic processes and programming; control over the course of execution of existing programs. The level of pollutant emissions into the atmosphere, as well as the value of environmental protection costs in the Russian Federation for the year 2015, has been analyzed. Measures have been developed to improve the effectiveness of biological management control. Principal differences in the organization and management of environmental management in the implementation of the principles of environmental management are determined.

Keywords: socio-ecological and economic system, natural resource management, information space, industrial production, region.

RESUMEN:

El estado actual del funcionamiento de los sistemas socioecológicos y económicos se considera en el artículo. Se identifican los objetivos fundamentales de las operaciones socioecológicas y financieras de la región y se nombra la creación de una base confiable y objetiva para el desarrollo de una política de estado sólido para regular el desarrollo territorial y determinar sus prioridades; desarrollo de una estrategia para el desarrollo de la región, previsión de procesos y programación socioecológica y económica; control sobre el curso de ejecución de programas existentes. Se ha analizado el nivel de emisiones contaminantes a la atmósfera, así como el valor de los costos de protección ambiental en la Federación de Rusia para el año 2015. Se han desarrollado medidas para mejorar la efectividad del control de la gestión biológica. Se determinan las principales diferencias en la organización y la gerencia de la gestión ambiental en la implementación de los principios de gestión ambiental.

Palabras clave: sistema socioecológico y económico, gestión de recursos naturales, espacio de información, producción industrial, región.

1. Introduction

At the present stage, the economy is a leading element in the livelihood of the population. At the same time, economic and social development cannot be considered separately from each other. It is impossible to achieve social stability, justice and security without an efficiently functioning economy, just as sustainable economic success cannot be made without an appropriate level of social security and stability. In this regard, socioeconomic monitoring is used to improve the social and economic performance of society, identify problem areas and determine the most effective forms and methods of their state support.

The tool for detection and elimination of these problems is socio-ecological and economic monitoring or an environmental assessment system, which is a specially organized targeted systematic observation and short-term forecasting of the progress of the most important SEE processes for their analysis, identification, and determination of the regulated factors range from the preparation and decision making (Rossinskaya 2012).

However, the problems related to the "confrontation" of the economy and the environment are becoming increasingly important. Growing population, congestion by the industrial enterprises, transport, etc. remarkably exacerbate the ecological situation, which obviously affects the deterioration of the health of the people, reducing the average life expectancy (Tikhomirov, Tikhomirov, Tatuev, Tikhomirov, Rokotyanskaya and Budaeva 2016; Tikhomirov 2016). Nowadays, 52% of the population is under the influence of high or very high air pollution, surface water, and soil.

2. Methods

The methodology was built on the systematic approach, complemented by theoretical and empirical generalizations, demographic groups method, calculation, and design method, functional and structured analysis, expert method, graphical visualization method.

3. Results

3.1. Assessment of the various industrial facilities pollution degree

At both the regional and national levels, a periodic assessment of the degree of contamination of various facilities is carried out.

Resolving the dilemma associated with the rapidly developing economy of the cities and the impact on the environment can be ensured by the availability of reliable and complete information reflecting current aspects of the state of the economic and social spheres, as well as the natural environment that will enable real-time rapid assessment of territorial development and generate adequate to it managerial decisions.

Consequently, there is a need to conduct a periodic socio-environmental and economic assessment (SEEA), which combines elements of social, economic and environmental research and control, revealing the relationship and effectiveness of their accounting in interaction.

The fundamental tasks of the region's SEEA are:

- Creation of a reliable and objective basis for the development of a sound state policy for regulating territorial development and determining its priorities;
- Development of a strategy for the regional event, forecasting of the socio-ecological and economic processes and programming;
- Control over the existing programs implementation.

Data collection for evaluation purposes is carried out by the method of statistical observation, which means mass, systematic, scientifically-organized view of social and economic life phenomena, which consists of recording the selected characteristics of each unit of the population (Bondarev 2010, p.189). To collect and analyze data, mathematical models of regional economic systems are used, the main disadvantage of which is the interactive interaction of the data collection specialist and information providers, which may affect the underestimation or overestimation of some indicators.

3.2. Genesis of the concept of "monitoring".

Academician A. Nikonov notes that monitoring is understood as a set of methods for control, analyzing, assessing and forecasting socio-economic processes associated with reforms, as well as collecting, processing information and preparing recommendations for reform development. Later, E. Antosenkov and O. Petrov in their article define monitoring as an operational collection of data on complex phenomena and processes described by a relatively small number of key, especially essential indicators for prompt diagnosis of the state of the research object in dynamics. Continuing to explore this area, it can be said that in some scientific works monitoring means the constant receipt of reliable, operative information about the objects of observation themselves, and other works say that this is a control over the situation in the system itself and over the system in a complex, as well as the systematization, forecasting and tracking of information about the state of the territories themselves both in the system itself and taking into account all possible processes occurring in the socio-ecological system itself.

In turn, according to A.E. Bondarev, monitoring is a process of continuous monitoring of the socio-economic systems functioning and development, including the collection of data reflecting the dynamics of changes in the state of the system and the identification of trends in its development. This is an efficient complex system of observation, control and operational management of the socio-economic facilities development which allows reacting quickly to the current situation, to obtain maximum information about the state of the facility and to forecast possible threats, thereby creating the prerequisites for the effective management of the sustainable development (Bondarev 2010).

According to Seliverstov V.E.: "The main information base for monitoring regional situations and regional problems can and should be only statistics" (Seliverstov 2010).

Thus, summarizing all of the above, we believe that monitoring is the observation of processes taking place in nature, society, in the ecological and social system itself, connected with the assessment of their condition, taking into account the time factor and the forecasting system. It is important to note that the information factor has relatively independent value in socio-natural systems. It is especially crucial that timely information on the status and trends of changes in the natural and social environment is a prerequisite for the management of these systems. In this regard, it should be noted that it is the work in the order that takes into account all the changes in the socio-natural environment: environmental, economic, social indicators, provide a comprehensive assessment of the monitoring and evaluation of the state and use of these systems, both in time and in the account of the spent actions.

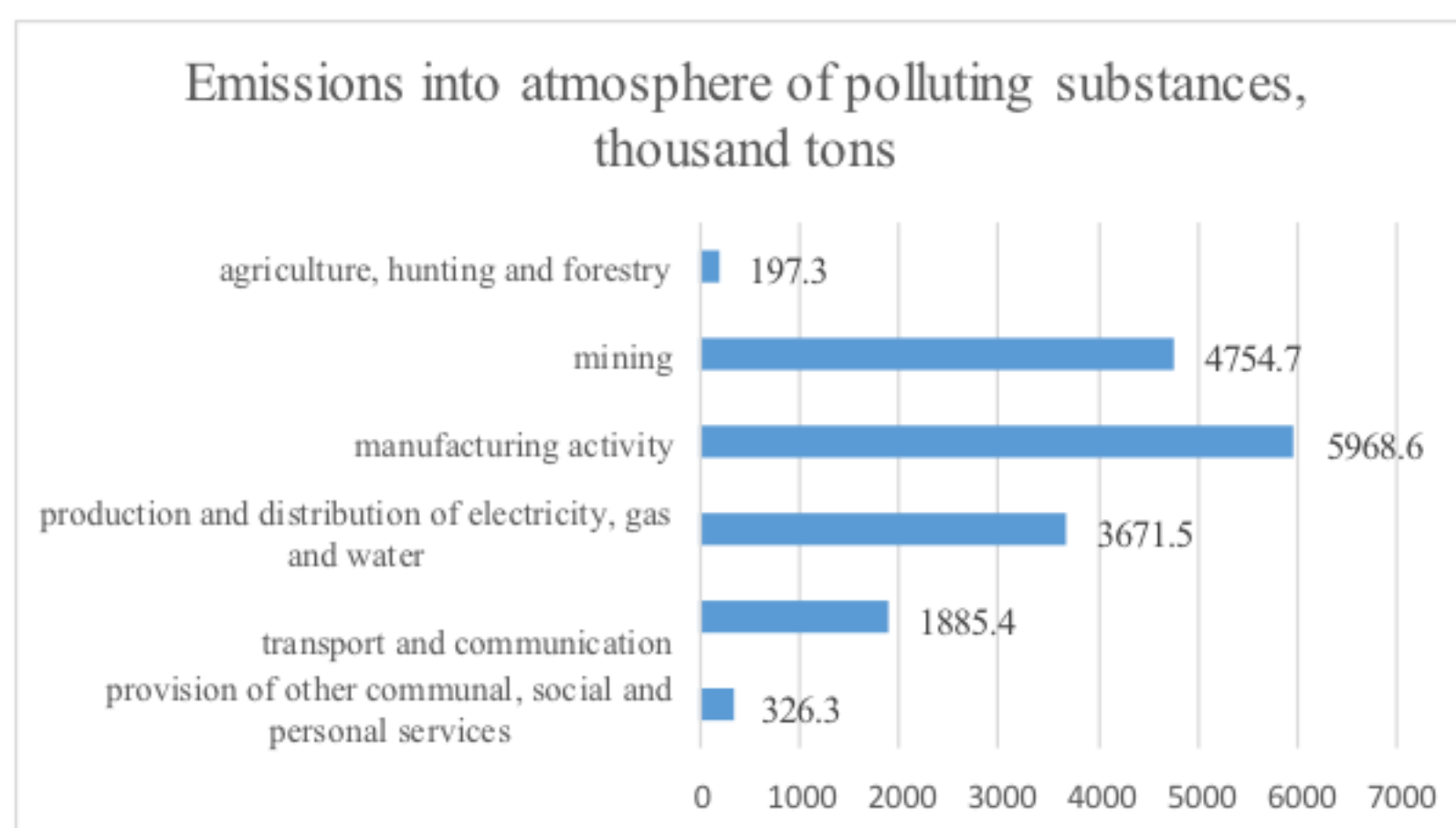
3.3. Stages of the socio-ecological-economic system.

The socio-ecological and economic system includes monitoring, tracking information, assessing and forecasting the operation of this system in it. By GOST R 17.0.0.06-2000, each enterprise compulsorily develops an environmental passport, which is a normative and technical document that describes the relationship between the company and the environment. The information which contained in the ecological passport of the enterprise and received by the territorial body of the Ministry of Natural Resources of the Russian Federation is an integral part of socio-ecological and economic monitoring, the basis for developing measures to protect the environment and is controlled by this body by imposing administrative responsibility on the person committing the unlawful act in this sphere.

The Code of Administrative Violations of the Russian Federation contains articles that provide penalties for:

- Failure to comply with environmental and sanitary and epidemiological requirements when collecting, accumulating, using, neutralizing, transporting, placing and otherwise handling waste from production and consumption or other dangerous substances, a fine of up to 250 thousand rubles or suspension of activities up to 90 days (Article 8.2)
- Concealment or distortion of environmental information, a fine of up to 20 thousand rubles. (item 8.5);
- Failure to pay in due time fees for negative impact on the environment, a fine of up to 100 thousand rubles. (Article 8.41) (Does your director know that the activities of the company can be suspended due to violation of environmental legislation, n. d.).

Figure 1
Emissions of pollutants emitted into the atmosphere from stationary sources, by economic activity (data for 2015)



In the absence of an environmental passport, an enterprise is deprived of the right to use natural resources and economic activities or is subject to a significant fine.

Also, to control and protect the environment, environmental certification is carried out in Russia - voluntary or mandatory. Obtaining an ecological certificate for products at the same time is a significant factor in increasing the competitiveness of an enterprise.

In recent years, the population of the Rostov region is increasingly influenced by electromagnetic pollution of anthropogenic nature. The most significant sources of such radiations are radio, television and radar stations, as well as base stations of cellular radiotelephone communication. The problem of electromagnetic pollution of anthropogenic nature at the moment acquires a global character in the cities of the Rostov region (Ecological Gazette of the Don «On the state of the environment and natural resources of the Rostov region in 2015», 2016).

The most significant number of radio transmitting objects is concentrated in Rostov-on-Don and large cities of the Rostov region: Volgodonsk, Kamensk - Shakhtinsky, Novochoerkassk, Taganrog, Shakhty.

The most significant is the regional radio and television broadcasting center in Rostov-on-Don (Ecological Gazette of the Don «On the state of the environment and natural resources of the Rostov region in 2015», 2016).

The primary attention in the field of assessing the influence of the radiation factor on public health is given to the system of determining the doses of radiation to employees and the population from all types of irradiation. Radiation-hygienic certification of organizations operating ionizing radiation sources and territories, in general, is carried out. A unified system of monitoring and accounting of individual exposure doses to citizens (USMAD) is implemented for the certification of organizations and administrative territories of the Rostov region, which is part of the subsystem of the Ministry of Health of Russia within the framework of the Unified State Automated Control System for Radiation Conditions (USASCRC) (Ecological Gazette of the Don «On the state of the environment and natural resources of the Rostov region in 2015», 2016).

In 2015 to of systematize of the radiation-hygienic monitoring in the territory of the Rostov region by selecting the control areas for radiation monitoring of environmental objects and estimating the population's dose load, a complex of radiation-hygienic monitoring activities, previously developed (in 2014), was conducted. When conducting radiation monitoring by a set of measures, some tasks are solved, one of which is the prediction of the possible changes in the parameters of the radiation and hygienic situation.

The radiation situation on the territory of the Rostov region in comparison with previous years has not changed significantly and generally remains satisfactory.

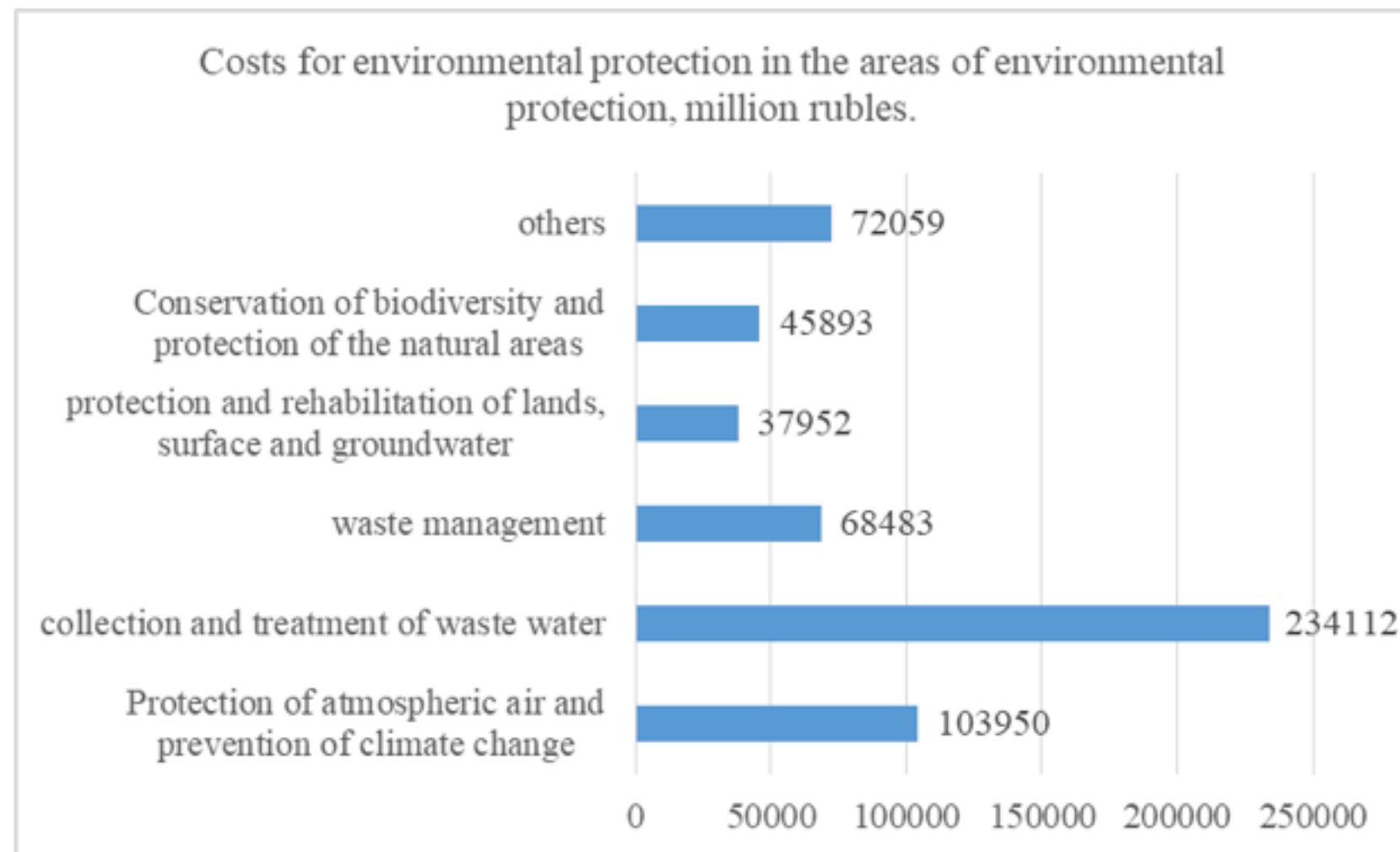
According to radiation-hygienic passport data, the structure of irradiation of the population of the region remains stable. The main dose-forming factors are natural sources of ionizing radiation (88.25%) and medical irradiation (11.64%). The increase in the population dose for 2010 is caused by coverage of more than 90% of organizations using sources of ionizing radiation, certification.

The contribution of the other types of exposure, in particular, the professional use of sources of ionizing radiation, and global fallout due to past radiation accidents is less than 1%.

The level of gamma background is determined by natural sources of ionizing radiation and is 0.08-0.16 $\mu\text{Sv} / \text{h}$ and does not exceed the values of long-term observations in the territory of the Rostov region (Ecological Gazette of the Don «On the state of the environment and natural resources of the Rostov region in 2015», 2016).

At present, environmental activities are sponsored by the state in such areas as protection of atmospheric air; Cleaning of drains; waste management; protection and rehabilitation of soil, underground and surface water; conservation of biodiversity and habitat and other (Figure 2) (Federal State Statistics Service, n. d.).

Figure 2
Costs for environmental protection in the Russian Federation (data for 2015)



3.4. List of measures to improve the effectiveness of environmental management

To enhance the efficiency of environmental management, we propose to consolidate the rights to environmental activities and conduct systematic collection and processing of environmental information for public organizations and associations. Correspondingly, for the purposes of environmental management, we propose to introduce a new form of reporting or assessment of the work of governors on the ground - compliance with environmental norms in the territory, which will promote efficient use of natural resources and improve the quality of life of the population of the subject of the Russian Federation.

By Art. 16 of the Federal Law of 10.01.2002 No. 7-FZ "On Environmental Protection," the negative impact on the environment is paid.

Payers of payment for negative impact on the environment are:

- Legal entities, regardless of their organizational and legal forms and forms of ownership;
- Individual entrepreneurs;
- Foreign legal entities and individuals.

Currently, the fee is charged for the emission of pollutants into the air, discharges of pollutants into water bodies, disposal of production and consumption wastes.

The duty to pay fees for negative impact on the environment arises irrespective of the types of activities (production, non-production or other spheres). It must be executed by the person who is the payer, independently. Subjects of small and medium-sized business in case of negative impact on the environment are also required to pay the specified fee to the budget.

According to Art. 8.41 of the Code of Administrative Offenses of the Russian Federation "failure to pay in due time fees for negative impact on the environment entails the imposition of an administrative fine on officials for three thousand to six thousand rubles; on legal entities - from fifty thousand to one hundred thousand rubles. "

In 2015, in the consolidated budget of the Rostov Region, due to nature-resource payments, there were received:

- on payment for negative impact on the environment 326.4 million rubles. (in 2014 - 312.8 million rubles);
- for the use of water objects - 495.8 million rubles. (in 2014 - 378.1 million rubles);
- for one-time payments for the use of subsoil - 3.9 million rubles. (in 2014 - 11.9 million rubles);
- on auction fees for the granting of subsoil use - 1.7 million rubles. (in 2014 - 2 million rubles);
- on payment for conducting state geological expertise of mineral resources - 0.6 million rubles. (in 2014 - 0.56 million rubles);
- for the tax on the extraction of minerals - 191.0 million rubles. (in 2014 - 168.1 million rubles);
- for regular payments for the use of subsoil - 2.4 million rubles. (in 2014 - 1.8 million rubles.) (Ecological Gazette of the Don "On the state of the environment and natural resources of the Rostov region in 2015", 2016).

Today, in addition to environmental controlling, environmental management is actively spreading, which is an initiative and useful activity of economic entities aimed at achieving their own environmental goals, projects, and programs based on the principles of eco-efficiency and ecological justice. The principal differences in the organization and controlling of environmental management in the implementation of the laws of environmental management are reflected in Table 1 (Butko 2011; p.51).

Table 1
Principal differences in the organization and controlling of the environmental management in the Ecological Management implementation

Environmental controlling	Ecological Management
Implemented by public authorities and economic entities	It is carried out exclusively by economic entities
Externally motivated activities determined by the requirements of environmental legislation	Internally motivated activity, determined by the principles of efficiency and environmental justice.
Obligatory activity in its core	Activity is initiative and voluntary in its core.

Activities carried out within the framework of official duties and instructions	Activities that depend on the manager's personal interest in the final results and determined by his qualifications, experience, and art.
The predominance of the management process over the result. Ignoring the Negative Results	The predominance of management results over the processes of their achievement. Active use of negative results.
Initial formalism, conservatism and limitations	Primary activity, the need to search for new opportunities, ways, creative aspects
Relative ease of imitation and falsification and effective operation	. Practical impossibility of imitation and falsification of effective activity.

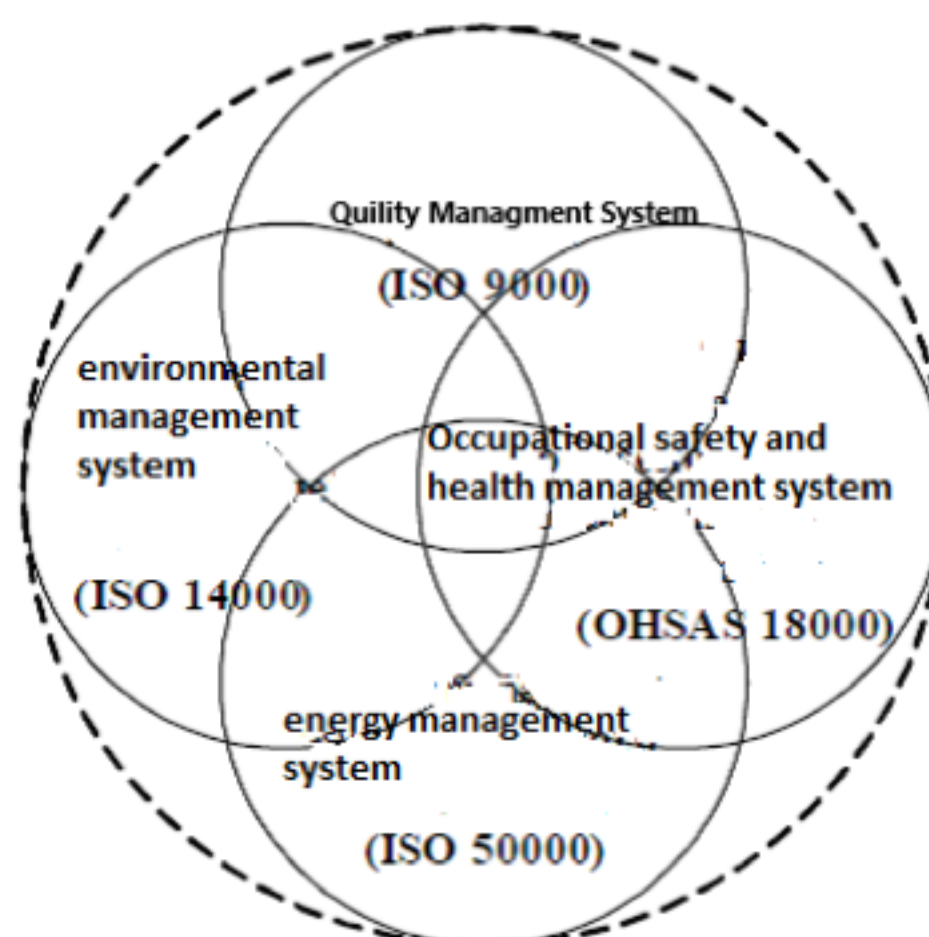
Environmental management was recognized as one of the leading ways of solving the environmental problem in the world in 1992 during the Uruguay Round of negotiations on the World Trade Agreement and the Rio Summit on Environment and Development on the agenda for the 21st century.

The ISO 14001 international standard provides recommendations for an environmental management system (EMS) to enable any organization to formulate policies and objectives, taking into account the requirements of legislation, regulations, and information on significant environmental aspects and environmental impacts. The EMS examines the ecological issues of the organization that it can control, and the effect on which one can expect (Kuznetsova 2011).

At the enterprise level, eco-management aims at monitoring the implementation of environmental legislation, environmental standards, acts; ensuring the improvement of production technology regarding reducing its accident rate, the degree of technological risk, the energy and material consumption, the quantity and toxicity of emissions, etc. The core of the EMS is the program - a comprehensive document describing the organization of the enterprise's activities in the field of eco-management, as well as specific events and actions for its implementation, developed by environmental policy, goals, and objectives.

The creation of EMS programs and their implementation at a large industrial enterprise is carried out by the environmental management service, and in the case of small production - a separate qualified specialist (manager-ecologist), authorized to solve the relevant tasks. According to the estimations of the specialist, the least efficient structure of EMS is the structure in which functions in the field of eco-management are assigned to an official (chief engineer, chief technologist, etc.) as an additional load. In the opinion of Doctor of Economics, Butko G.P, the environmental management service should be separated into a separate subdivision of an industrial enterprise, which has its head but does not have sufficient weight in the hierarchical structure of the company. This enables its employees to study environmental problems comprehensively and thoroughly and solve their management tasks.

Figure 3
Diagram of an integrated management system



Mudraya A.V. offers the introduction of an integrated management system (IMS) of the enterprise (figure 3) for the solution of environmental problems, including the quality management subsystems (ISO 9000), the environment (ISO 14000), occupational safety and health (OHSAS 18000) and energy efficiency (ISO 50000). The IMS is called upon to address environmental issues by linking ecological protection objectives with its economic capabilities and thereby maximizing the cost-effectiveness of environmental measures (Mudraya and Lukashevich 2011).

Direct benefits from the use of environmental management systems at the enterprise are related to the possibility to expand the sales market, avoid unnecessary expenses, reduce costs, save the fixed assets of the business, increase its potential in obtaining investments; indirect - improving the motivation of the company's employees, relations with the local population, the reputation of the enterprise.

In the West, by the concept of sustainable development, environmental management is being introduced into all spheres of production. In European countries, a system of qualitative assessment of environmental impact factors of an enterprise, developed in the Danish consulting company COWL, has been successfully applied.

In Russia, the problem of providing the economy with natural resources is the acutest. Therefore, it is necessary to create an efficient system of environmental management, to train specialists - ecological managers with the knowledge and a high level of environmental culture.

4. Conclusions

Today, the issue of managing socio-ecological and economic systems is especially relevant due to the growing number of the urbanized cities, the development of high-tech production around the world is actively developing, the waste and by-products of which can affect the ecological system. The issue of the threat of an environmental catastrophe is a worldwide problem that requires the concentration of the economically developed and developing countries efforts, their cooperation in the sphere of environmental protection, the creation of new environmental technologies and an active legislative base both at the state and international levels.

Thus, the proposed approaches to the unified information space of SEEA, as an information territory that has a variety of data in economic, social and environmental fields, connect them and provide a comprehensive assessment of the effectiveness of the sustainable development of the region by reliable, complete and timely information.

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[Índice]

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