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To cite this article: T V Galanina *et al* 2017 *IOP Conf. Ser.: Earth Environ. Sci.* **50** 012030

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# Environmental-Socio-Economic Monitoring as a Tool of Region's Environmental-Economic System Management

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**Abstract.** The paper deals with the region's environmental-economic system management through a tool such as the environmental-socio-economic monitoring. The purpose of research – is analysis and development of theoretical assumptions of environmental-socio-economic monitoring system for the effective management of geographically distributed environmental-economic system. The main elements of environmental-socio-economic monitoring are identified, taking into account the characteristics of the studied area. The main result of the research is the development of multi-functional integrated monitoring system for the evaluation of the indicators "gross domestic product" and "gross national product", taking into account the influence of environmental factors. The results of the study conducted may be recommended to the regional and federal governments to support the effective, environment-friendly management decision-making consistent with the overall development concept.

## Introduction

Sustainable development of society presupposes the harmonization of relations in the system "nature - society - economy". The overall design of sustainable development concept is the alternative to the nature-destructive forms of economic activities.

The relevance of the sustainable development strategy at the regional level, taking into account the market changes, proves the feasibility of the construction of environmental-economic system management (EES) model.

The concept of the EES is used by many researchers, along with the allied concepts of "bio-economic system", "natural-economic system", "ecological and economic system". The main essence of the EES concept is the integration of the economy and the nature that is the interrelated and interdependent functioning of social production and the flow of natural processes. There are two main interpretations of environmental-economic system concept - the global and regional-territorial, or local.

The current state of environmental-socio-economic development of any region as a system of the interrelated factors have a direct impact on the adjacent areas of public life [1,2]. In particular, the unstable state of the environmental-socio-economic system of Russia is characterized by three main interrelated negative trends:



- shrinkage of the process of reproduction of means of production and of life benefits (economic downturn);
- violation of the process of reproduction of natural resources (both organic and inorganic) and the living environment conditions (specific degradation of ecosystems);
- shrinkage of the process of population reproduction (depopulation) [3].

Significant changes affecting the natural environment in the last century, in the course of human life require fundamental changes in the comprehensive assessment of the region. Due to the negative environmental situation, both in individual regions and the country as a whole, an important aspect is the adequate assessment of the state of the environment.

To develop the regional EES management model, in our opinion, the considerable amount of research is required, the basis of which is the environmental-socio-economic monitoring (ESEM). Special attention should be paid to the environmental component due to the fact that the errors in this area in the future, as practice shows and as is noted by some scientists [4, 6], have a negative impact on social and economic indicators of the state of territories.

### **Material and methods**

The object of research of the environmental-socio-economic monitoring as a part of the organizational-economic mechanism of the region's environmental-economic system management. The subject of research - social, ecological and economic ties and processes that determine the existing monitoring system. The study is based on an analysis of domestic and foreign literature on the problems of the organization of the environmental-socio-economic monitoring. Particular attention is paid to the study of the methodology for the calculation of macroeconomic indicators, taking into account environmental constraints. The elements of the system analysis and the results obtained by the specialists in the field of environmental-economic system management are also used in the paper.

### **Results and Discussion**

Currently, in most regions there are differentiated monitoring system, designed for the monitoring of particular field of activity: biomedical, economic, environmental, seismic, social, socio-environmental and others. Each of these systems has the individual methodological framework, criteria for selection of indicators and targets, the software and the certain segment of consumers of the received information.

The efficiency of the implementation of the regional development strategy depends largely on the establishment of the regional system of environmental-socio-economic monitoring. The performance and practical importance of monitoring depend on the reliability and operability of the evaluation of the processes in socio-economic and natural areas.

The term "monitoring" appeared in the XX century in foreign science and was used to determine the system of targeted repeated observations of one or more elements of the environment in space and time. Broadly speaking, monitoring (from the Latin "monitor" -warning) is the activity of monitoring (tracking) of certain objects or events [7]. Despite the priority of foreign scientists in the development of monitoring methodology the term was first introduced in the economic life by Russian economist A. Nikonov, who argued that "... monitoring is a set of methods for tracking, analysis, evaluation and forecasting of socio-economic processes, related to the reforms, as well as the collection and processing of information and preparation of recommendations for the development of reform ... " [8]. Further refinements of the "monitoring" concept for social, environmental and economic performance are given in [9-12].

The subject of regional monitoring is the complex set of socio-economic processes and phenomena in the country's regions. Here are the following areas of the complex regional monitoring: environmental; economic; biomedical; social and political; social; science and technology.

On the basis of these areas the main tasks of the regional socio-economic monitoring can be formulated:

- management of observation, acquisition of reliable and objective information about the course of the socio-economic processes on the territory;
- assessment and systems analysis of the received information, the identification of factors that influence the character of the social and economic processes;
- identification of the factors that cause economic and social threats now and in the future;
- ensuring government, enterprises, institutions and organizations irrespective of their subordination and forms of ownership, citizens with the information obtained in the exercise of ESEM;
- development of forecasts of socio-economic situation;
- preparation of recommendations aimed at overcoming the negative trends and supporting the positive ones, bringing them to the knowledge of regional management bodies.

Due to the fact that economic, social and environmental processes are the basis of life in the region, it is advisable to identify the concept of "regional monitoring" and "ESEM" (hereinafter - monitoring). The main purpose of such monitoring is to monitor and regulate the processes of regional development.

The subject of monitoring in this case is the set of economic, environmental and social processes in the region in their interdependence and interrelation. The environmental processes affect the health of population, recreational capacity of the territory of the region and the potential for the self-regeneration of environment. In addition, the environmental state of the region significantly affects the employment, migration and demographic situation. Economic processes determine the standard of living of the population, including its political activity, work and migration. Social processes are characterized by social and political activity of the population, its ecological literacy, the general level of education and other aspects. The above processes are interrelated, since their subject is a person actively implementing certain policies and defining a vector of development. It is therefore necessary to consider the region in terms of the constant interaction of these processes: environmental - natural environment, economic - industrial and economic activity and social - the society and its activities.

Establishing monitoring operation of the first stage generates the following tasks:

- acquisition of information on the indicators and indices of the processes;
- verification of the reliability and the objectivity;
- systematic analysis of the information received and its evaluation;
- definition of correlations;
- construction of the mathematical model of the integrated monitoring system;
- identification of representative factors;
- corresponding activities.

The greatest attention should be paid to the creation of information databases of monitoring (IDM), which is challenging, widely discussed task in the community of ecologists and economists. [13] ESEM can contain a different set of indicators and indices depending on the task, the model used, the regulatory framework, economic specifics of the region. In addition, it is advisable to correlate it with other databases, such as the state statistics database. The monitoring is also used as a regulator of the above processes in the region. It can serve as part of regional development management system, carrying out the functions of regular monitoring and short-term forecasting.

On the basis of the study the following basic principles of IDM of socio-economic transformation in the region can be outlined:

1. IDM of socio-economic transformation in the region should be organically integrated in the system of information support, control and regulation of social and economic development of the region, contain the information required by the federal bodies of state administration, reflecting the specificity of the region and especially its development.
2. The mandatory presence of full of information about the purposes of the system of targets in each specific area of reforming, factors, indicators and indices of reformed object development facilities at IDM of socio-economic transformation of the region.

3. The basis of the formation of the system of targets and the indices that describe them are laws, regulations, government programs, as well as instructional and teaching materials in the directions of reforming.

4. The aggregated indicators characterizing the progress and results of socio-economic transformation in the region should be clear, simple to interpret, available for analysis and use in the practice of management.

5. To create IDM of social and economic reforms, in addition to the state statistics system it is required to use the specialized information systems (banking, stock exchange, and employment systems).

ESEM must contain not only certain elements, but also unique to it traits:

- high performance of ESEM requires a long time period;
- ESEM as the system includes a plurality of environmental, social, and economic elements;
- information acquisition process is implemented on the basis of the developed technique with specific indicators;
- the data obtained as a result of information acquisition are summarized, analyzed and reflect the dynamics of the current processes.

As a result, we can formulate the ESEM priorities:

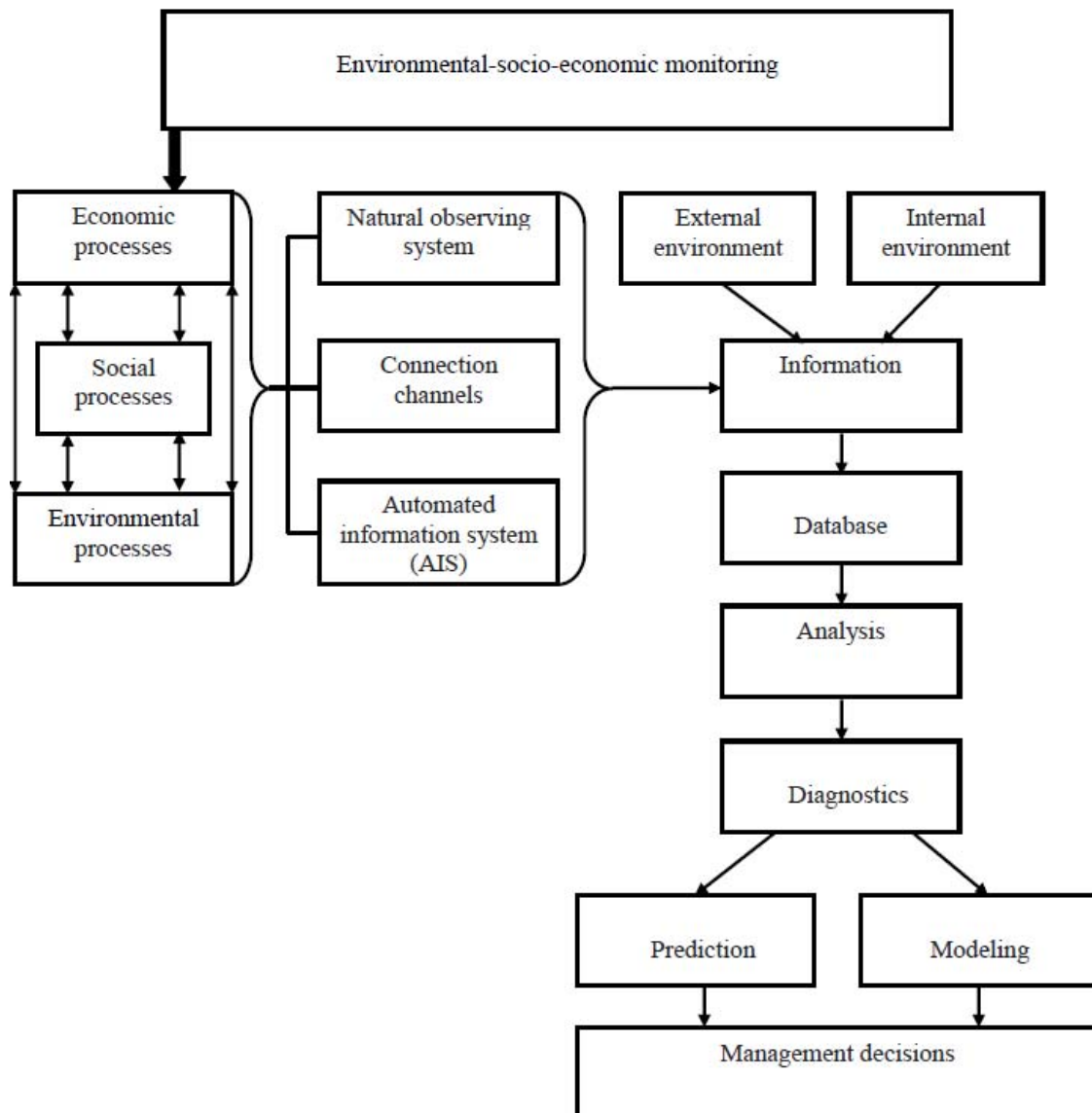
- improving the regulatory framework governing the interaction of federal executive bodies, exercising state environmental, social and economic monitoring, including the formation of the fund of information resources;
- improving the system of indices, establishment of the methodology for environmental, social and economic monitoring of the Russian Federation;
- ensuring the reliability and comparability of data of environmental, social and economic monitoring of certain sectors of the economy and regions of the country;
- ensuring transparency of environmental, social and economic information.

Schematically, the elements of environmental-socio-economic development monitoring are presented in Figure 1 [1, 2].

Despite the fact that it is impossible to take into account the impact of all environmental factors on the level and dynamics of all aggregate indices of socio-economic development, it is extremely important to consider those calculable. In the future, it is advisable to evaluate the performance of the national wealth and Gross Domestic Product (GDP), calculated taking into account and excluding the impact of environmental factors. The level of GDP, not taking into account the impact of socio-economic activities on the environment, generates an overestimation of economic development. At present, on the basis of accounting of natural capital consumption costs the methodology of calculation of environmentally adjusted GDP is being developed in order to identify the challenges of sustainable development.

The above shortcomings of the existing monitoring system in Russia suggest the absence of complete and reliable information, which requires its structuring into the information flows necessary for the efficient functioning of the regional economy.

The authors believe that without the use of ESEM the regional management will be ineffective with the "deficit" of optimal conditions for the improvement of the socio-environment state of the region. In addition, the analysis of the state and the dynamics of social and environmental factors in the process of social and environmental decision-making is necessary to determine the trend of development of the system "man-society-nature" in the region.



**Figure 1** – The basic ESEM elements

The efficiency of the integrated ESEM system forming process is hampered by a number of restrictions, the most significant of which are as follows:

- lack of access to the information for a wide number of users;
- the need to integrate the monitoring entities;
- lack of comprehensive system of indicators.
- the problem of data reliability.

Especially important is the absence of developed comprehensive system of indicators, resulting in the fact that such indicators as gross national product (GNP) and the value of individual resources or pollution flows do not provide sufficient information about the sustainability of development. In such circumstances it is necessary to use all kinds of information for the development of indicators that characterize the natural or noosphere resistance [14, 15].

The degree of "participation" of environmental and economic factors in the environmental-socio-economic model may be different. In some cases - in the "pure" economic model (for example, along

with the release of the main product) the release of "by-products" - waste as environmental pollutants is taken into account and; in others - the relationship between environmental factors are modeled and the results of the calculations are used in forecasting and planning of production tasks. Of similar importance is the model of the natural ecosystem, comprising the living organic matter (biomass) balance equation. Some researchers are engaged in the construction of complexes and models of environmental-economic systems for environmental planning and management.

A number of countries put in practice the advanced models of input-output balance, including not only the manufacturing industry but also industry destroying hazardous waste for the prediction of the impact of the economical structure on the environment. The approach to the environmental-economic balance coming from the laws of thermodynamics is of global importance nowadays: the amount of material taken from nature for the production of goods is compared to the total number of human waste (materials balance principle). In general, the development of environmental-socio-economic (regional) monitoring provides the opportunity to build an optimal EES model in the region.

### Conclusions

The conducted study of environmental-socio-economic monitoring as a tool for the region's environmental-economic system management allowed the following conclusions:

- the determinants and trends characterizing the unstable state of socio-economic and environmental-economic systems are outlined;
- the main tasks of the regional socio-economic monitoring are formulated;
- the principles of information monitoring framework are developed;
- the system-defined elements of environmental-socio-economic monitoring are determined;
- the proposals for the evaluation of macroeconomic indicators, taking into account the environmental characteristics obtained from an integrated monitoring system are made.

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