FUNCTIONING OF THE LOCAL PRODUCTION SYSTEMS IN BULGARIA, POLAND AND RUSSIA

THEORETICAL AND ECONOMIC POLICY ISSUES

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Olga Burmatova*

ENVIRONMENTAL AND ECONOMIC DIAGNOSTICS OF THE LOCAL PRODUCTION SYSTEMS[1]

1. Subject, purpose, objectives and main functions of ecological and economic diagnosis of the region

Regional environmental and economic diagnosis[2] has an important place among the elements of the mechanism of forecasting and environmental management in the region. On the one hand, the importance of regional environmental and economic diagnosis is determined by the possibility of obtaining a more adequate and sufficiently comprehensive assessment of the environmental situation within a given territory. This

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[2] We use the term "environmental and economic diagnosis" in order not to confuse it with the term "ecological diagnostics" used in the indication ecology, which means the study of the role of living organisms and changes of the conditions of their environment.

in turn, is essential to strengthen the validity of selection of priorities of environmental issues and to develop a conservation strategy. On the other hand, the tools of the regional environmental and economic diagnosis can be used as a set of criteria for evaluating the efficiency of current environmental policy in the region from the standpoint of achieving its goals and objectives.

In this context, we identify the term "region" with the term "local production system" (LPS), whose one of the important feature is its "manageability". Accordingly, it requires the presence of the subject and object for management by local and regional authorities in the process of conducting a deliberate policy, aimed at maximal utilization of available opportunities in its socio-economic development. Thus the local production systems are widely understood here both in terms of coverage area and from the standpoint of the possible forms of organization of production on the given territory. Accordingly, there can be municipalities, but also industrial centers and industrial nodes; territorial production clusters; free economic zones; growth poles, technoparks and technopolises; regions of new economic assimilation, formed on the basis of the long-term program approach to planning and management, etc.

In the structure of each LPS one usually distinguishes three main subsystems – economic, environmental and social. Accordingly, there are three groups of indicators for the characteristics of theses sub-systems – economic, environmental and social. Further we shall focus primarily on environmental indicators in relation to economic and social factors.

Each LPS has its specific characteristics, that are determined by the local natural, economic, social and other conditions. It seems to be necessary that development of each territory should be based on its own strategy how the use of natural resources and provide environmental protection; in more general terms – a strategy for sustainable development. The choice of a conservation strategy largely determines the content of the regional environmental policy. An effective environmental policy requires the development of quantitative assessments of the state of the environment at the country and its regions. Such estimates are needed for informed selection of priority issues, to ensure environmental security of the social and economic development at different territorial levels.

One of the solution to the above problem is to develop the tools of regional environmental and economic diagnosis. It is based on a system of indicators characterizing the ecological processes in the region. This system includes a set of parameters designed to provide an adequate assessment of the state of the environment in a particular region.

The subject of the environmental and economic diagnosis includes the identification of problematic environmental situations and problematic areas in the framework of LPS's.

Under the problematic environmental situation we should understand an established combination of the most important parameters that characterize the environment of the region, as well as the conditions governing this state. An important aspect of the regional environmental situation is to identify the most environmentally dangerous objects and their combinations. For the objective characteristics of the environmental situation in any region, one requires a variety of information and its appropriate treatment and allowing for the analysis of the environmental impact of various industries and their territorial combinations. First of all, it is necessary to analyze carefully various factors that influence the formation of the ecological situation. Identification of problematic environmental situations is based on the analysis of the initial state of the environment in the region. This is especially true for environmentally disadvantaged regions, as it allows to identify "bottlenecks" to environmental positions and forward capabilities in the first place to their undoing.

Problematic areas are the parts of the region with high-risk environmental conditions, threatening to the normal state of the environment (that is satisfying environmental standards). Problematic area is the result of applying a problematic situation on the economic, climatic and other features of a particular region. Identification of problematic situations and areas allows to establish the factors and conditions that contribute to the complication (or threat of disruption of normal) state of the environmental situation in the region and require a response from the government in the form of the development and implementation of appropriate measures to environmental regulation.

Ecological and economic diagnosis is focused on detection of deviations in the environment of the region, due to human activities, on the condition of meeting the environmental requirements. In other words, it is oriented

to detect the "environmental illness in the region" and various environmental "pathologies", arising primarily from the effect of the operation of production facilities. Identified pathologies, in turn, determine the approaches to the formation of a regional mechanism for the implementation of environmental policies, allowing a more informed choice of priorities to implement conservation strategies, and to solve problems and prevent the proliferation of new ones.

It means that the results of diagnostics are intended to serve the regional authorities as the necessary signals to how they should act in the prevailing conditions. In other words – in what directions (i.e. while overcoming "bottlenecks") they should work primarily to direct efforts and resources.

According to this, the regional ecological-economic diagnosis should include:

1. Diagnosis of the environmental situation in the region, especially caused by the characteristic critical parameters of the actual state of the environment;
2. Assessment of adverse changes in the natural environment under the influence of economic and other activities, and the identification of key issues from the point of view of solving specific problems of environmental regulation of regional development;
3. Prediction of possible changes in environmental conditions envisaged under the influence of socio-economic development and risk assessment of ecological threats.

As a result, it is possible to establish in which direction and how to transform the environmental situation and some environmental problems in the region.

The main goals of ecological and economic diagnostics are:

1. Identification of existing and potential variations in the environment (compared with standards);
2. Analysis of the causes of various pathologies in the state of the environment. Evaluation of negative changes in environmental conditions and identification of key environmental issues;
3. Prediction of the environmental situation in the region and risk assessment of ecological threats;
4. Development of a set of environmental measures aimed at improving the environmental situation in the region.

The achievement of these goals is possible by means of solving a number of interrelated problems, among which are the following:

1. Tracking of regions with difficult environmental situation, selection of regions in the need of increased attention of the authorities for active environmental protection;

2. Assessment of the ecological potential of the region, as we as the ability to adapt its economic development to the conditions of the environment;

3. Identification of the possible consequences of a change in the state of the environment in different variants of environmental policy in the region;

4. Identification of the weak points in various parts of the region in terms of the severity of the environmental situation and setting priorities in the formulation of environmental policy;

5. Comprehensive analysis of the various activities in terms of their possible implications for the environment, which allows identification of potential problems and their measurement;

6. Assessment of environmental risks and classification of areas by the nature of environmental hazards.

Conducting environmental-economic diagnosis of the region is possible by implementing the following key steps:

1. Description of the initial state of the environment in a particular territory with taking into account existing anthropogenic pressures;

2. Identification of the situation in the region (for example, assignment to a particular type of environmental situations, depending on the nature of environmental conditions);

3. Assessment of the state (usually over something taken as a state of "normal" or "average", i.e. the state of meeting the requirements of environmental standards);

4. Analysis of the causes of ecological hazards, the knowledge of which can provide the correct ways of avoiding them.

It seems that the regional environmental and economic diagnosis intends to provide:

a. formation of the initial database for the analysis and evaluation of the current state of the environment in the region. The latter assures starting position in the development of environmental strategy and the environmental policy;

b. selection of the necessary levers of management by the ecological and economic interactions in the region in accordance with the desired change in environmental situation through the formation of the required environmental protection measures;

c. possibility of evaluation of environmental performance over a certain period and the environmental and economic efficiency of the chosen system of environmental protection measures.

Thus, the use of instruments of regional ecological and economic diagnosis is designed to address the following issues:

1) for a quantitative evaluation of various environmental aspects of the socio-economic system of the region and the impacts of human activities on the environment;

2) to monitor the region's environment over time;

3) to determine in which direction a (positive or negative) change of the environmental situation is expected, in order to choose the possible ways to correct the socio-economic development in the region.

Finally, the logic of the regional environmental and economic diagnosis can be represented as a chain of links, starting with the analysis of the initial state of the environment in the region and ending with a definition of instruments and measures to the desired environmental regulations, and healthy environment (Fig. 1).

In general, the regional eco-economic diagnosis is an element environmental strategy making and a component of state environmental policy.[3] The main functions of the regional environmental and economic diagnosis in shaping environmental policy in the region as well as expected results are shown in Figure 2.

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[3] В. Лексин (2003), *Региональная диагностика: сущность, предмет и метод, специфика применения в современной России (вводная лекция предлагаемого учебного курса)*, "Российский экономический журнал", № 9−10, p. 64−86; С. Н. Бобылев, С. В. Соловьева (2003), *Методические рекомендации по разработке и внедрению индикаторов устойчивого развития регионального уровня*, ERM, Москва, p. 36; *Индикаторы устойчивого развития России (эколого-экономические аспекты)* (2001), ред. С. Н. Бобылева, П. А. Макеенко, ЦПРП, Москва, p. 220; *Новый взгляд на богатство народов. Индикаторы устойчивого развития* (2003), пер. с англ. С. Н. Бобылева, В. И. Сидоренко, 2-е изд., Весь мир, Москва, p. 128.

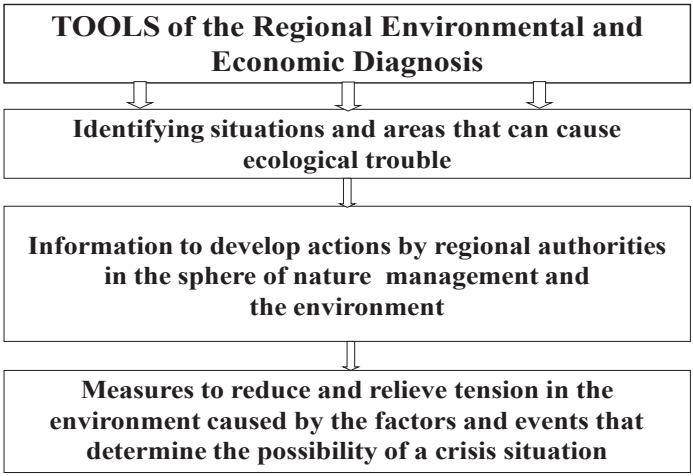

Figure 1. Sequence of actions for using the regional environmental and economic diagnosis

Source: own composition

Conducting environmental and economic diagnosis requires a large amount of various data. Therefore, environmental and economic diagnosis should be considered in close relation to environmental monitoring, the organization of which is essential conditions for life support of any region. Creation and operation of a special system of supervision and control of the changes of the environment under the influence of human activities, provide the information base needed to identify the causes and sources of adverse changes in the environment and to predict possible changes in the environmental situation of the region. Thus, the results of environmental monitoring are informational basis of environmental and economic diagnosis of the region.

With the help of the environmental and economic indicators, it seems possible to quantify the various parameters describing the regional economic system in terms of the environment and natural resources. This provides information and analytical base for more efficient management of natural resources and development of environmental policies in the region.

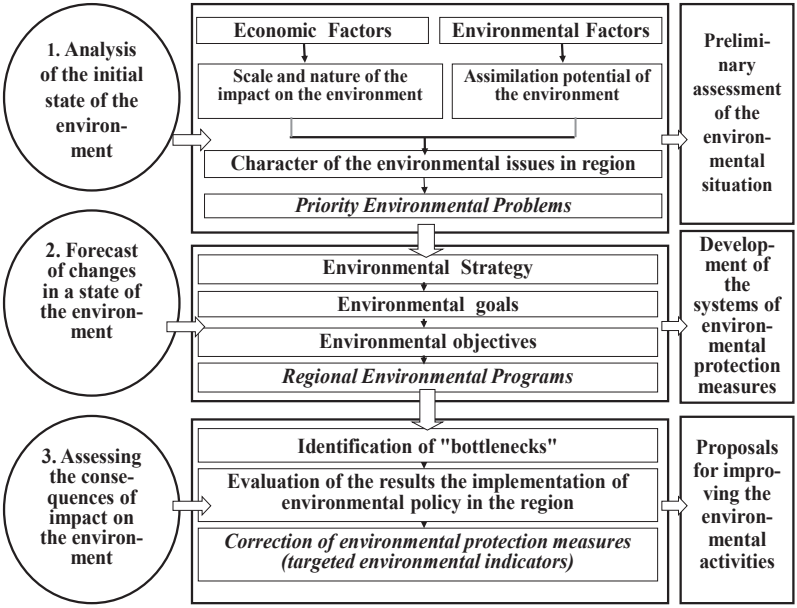

Figure 2. Functions of the regional environmental and economic diagnostics in shaping environmental policy

Source: own composition

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With the help of the environmental and economic indicators, it seems possible to quantify the various parameters describing the regional economic system in terms of the environment and natural resources. This provides information and analytical base for more efficient management of natural resources and development of environmental policies in the region.

Such a framework should include at least the following three groups of data:

1. Describing the actual state of the environment;

2. Assessing changes in the natural environment under the influence of economic and other activities;

3. Predicting possible changes in environmental conditions, envisaged under the influence of socio-economic development and risk assessment of ecological threats.

Availability of appropriate information systems, formed on the basis of the calculation of environmental indicators, is essential to make timely decisions to prevent possible negative environmental consequences of economic activity in a given region, as well as the formation and improvement of the regional environmental policy. This system is the necessary starting point for the justification and development of programs of environmental activities, the choice of priorities in their implementation, and the comprehensive substantiation of the main directions of environmental policy in different regions.

2. Structure of the system of regional environmental and economic indicators

System of regional environmental and economic indicators of primary importance, in our view, should include indicators that characterize: 1) the state of the resource and environmental (or natural resources) potential of the area and the extent of its use, 2) the impact on the environment and the character of change, 3) the state of health of the population in relation to the environmental situation.

In other words, in formulating environmental policy of the development of individual regions one should first analyze the existing environmental condition of the territory, assess its resource and environmental potential and extent of its use. Then, one should identify "bottlenecks" in the formation of the environmental situation, to measure ecological capacity of the territory, assess carrying capacity of the natural environment, its potential "accept" human impacts, perform typology of the region have achieved the degree of economic stress, etc.

The system "regional economy – environment" can be divided into two main subsystems – resource and ecological (or natural resources) and socio-economic.

In the analysis of the resource and environmental subsystems, the focus is on assessing the impact of development of the productive forces of the quantitative and the closely related qualitative depletion of natural resources of various kinds. Quantitative depletion of natural resources is accompanied by a reduction in their reserves due to high production rates and utilization of resources. Qualitative depletion is particularly an effect of pollution of the environment, which leads to its degradation.

To characterize the state of the resources and environmental potential of the region, a set of indicators that determine the degree of nature intensity of production can be used. For example, one can apply indicators that reflect the level of consumption of natural resources and the level of disturbance of ecosystems as a result of economic activity (per unit of output). Also, corresponding figures in per capita terms can be informative here, as well as macro characteristics that express the relationship between the demand for natural resources and their availability (provision of resources). Examples of indicators of this kind usually have relative level (per capita, per unit of gross domestic product and per unit of gross regional product) of consumption of energy and other resources.

The system of indicators includes also such characteristics of the environment as individual ecosystems and protected areas. These include the quality of air and water, land area (both in natural and altered state), forest areas form the point of view of their productivity and the degree of its preservation, the number of species threatened with extinction, etc.

In the socio-economic sub-system there are interesting indicators characterizing the effect of the development and distribution of productive forces in the environment, taking into account demographic factors, impacts of changes in the economic activity of the natural environment for the production and public health. To reflect these interactions, indicators of the level of economic development and environmental well-being and quality of life (including the length of a person's life, his or her health, etc.) can be used.

Generalizing criterion of the permissible load for the environment can be an indicator of economic capacity of local ecosystems. This indicator is intended to serve as a guide for the first-approximation in the search of the optimal trajectory of economic development in a particular area. This does not preclude the use of additional criteria of environmental acceptability of each economic project. Assessment of the use of the economic capacity of the territory takes

into account the scale of contamination and state of natural objects. It can serve as a starting point to support priorities in the implementation of environmental activities in the development of forecast of social and economic development of the regions, targeted programs and investment projects.

The proposed system of regional environmental indicators should reflect the strategic environmental priorities and the key environmental issues, facing the leadership and the population of a given region, and focusing on critical areas of the region and the environmental activities:[4]

1) Environmental pollution;
2) Ecological potential of the region;
3) Resource potential of the region;
4) Waste of production and consumption;
5) Anthropogenic impact on the environment (for the purposes of comparative analysis of the regions) and its features;
6) Resource and energy capacity of production;
7) Economic damage from environmental pollution;
8) Investment in environmental protection;
9) Health of people in connection with the environmental situation.

More complex ecological and economic indicators, including characterization of their relevance and content are given in the Table 1.

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[4] *Индикаторы устойчивого развития Томской области*, ред. О. В.Козловской, 2-е изд., перераб. и доп., STT, Томск 2003, p. 30; Г. Е. Мекуш, Е. В. Перфильева, *Индикаторы устойчивого развития Кемеровской области*, РОО "ИнЭкА", Новокузнецк 2004, p. 24; О. П. Бурматова (2003), *Региональная экологическая диагностика как механизм устойчивого развития региона (на примере Новосибирской области)*, [in:] *Сибирь в XXI веке: альтернативы и прогнозы развития*, материалы научно-практической конференции, в 2-х частях. Часть 1: *Красноярск: Красноярский государственный университет*, p. 269–279; О. П. Бурматова, *Эколого-экономические индикаторы в системе управления регионом. Стратегическое управление пространственным развитием субъектов Федерации и городов Сибири*, ред. А. С. Новоселова, ИЭОПП СО РАН, Новосибирск 2009, p. 248–268; О. П. Бурматова, *Формирование системы региональных эколого-экономических индикаторов. Воспроизводственный потенциал региона*, материалы IV Международной научно-практической конференции, Ч. II, отв. ред. К. Н. Юсупов, РИЦ БашГУ, Уфа 2010, p. 30–39; Т. А. Акимова и др., *Основные критерии экоразвития*, Издательство Росэкоакадемии, Москва 2009, p. 54; I. Serageldin, *Making Development Sustainable. From Concepts to Action*, "Environmentally Sustainable Development Occasional Paper Series" 2008, № 2, The World Bank, Washington D.C., p. 340.

Table 1. Environmental and economic indicators potentially useful in the studies on local production systems

Spheres of LPS	Indicators	Significance	Characteristics
1	2	3	4
Environmental contamination	1. The amount of pollution emitted into the environment per unit of GRP	The high concentration of industrial enterprises that raise the amount of pollutants into the environment, posing a threat to human health. Increase in the concentration of pollutants in the environment can lead to poor quality of air and water, and quality of life	The index includes: • air emission from stationary and mobile sources, • the amount of pollutants collected in ponds with sewage, • volume of waste of production and consumption. Improving air and water quality is an essential aspect of promoting sustainable development. Reduction of pollutants of the environment per unit of GRP is characterized by: • sustainability of the technologies, • efficiency of the gas treatment equipment • reduction of energy production, • improving the quality of the environment, • reducing the negative impact of the economy on health.
	2. Index of air pollution	Air pollution index (API) represents a comprehensive assessment of chemical pollution of the atmosphere. It takes into account the contribution to the pollution of many substances and provide the level of pollution by a single number.	In calculating the API hazard class chemical polluters are taken into account. In this case, the actual average concentration of the substance is given to the degree of air pollution with sulfur dioxide. Thus the API is calculated as a fraction of the maximum permissible concentration (MPC) of sulfur dioxide. For comparability, the values of the API must be calculated for the same number of substances in each region. The calculation of the API in Russia are usually carried out for at least 5 or more the most

Environmental contamination (cont.)		API is used in the environmental air monitoring to characterize the state of air pollution in the cities of the Russian Federation.	significant pollutants, including suspended solids, nitrogen oxides, sulfur dioxide and benz(a)pyrene, ozone, formaldehyde, phenol, lead, etc. In accordance with the methods of assessment, the level of air pollution is high, with the value of the API from 7 to 13, and very high in the API, equal to or more than 14.
	3. Index of water pollution	Water pollution index (WPI) is used to determine the contamination of the water basin. WPI calculation identifies the classes of water quality of surface water, depending on the level of WPI.	WPI is an unweighted arithmetic mean of the function, including a number of maximum 6 elements (or components). Moreover, among the components parameters such as BOD5 and dissolved oxygen must be present. Selecting the other 4 parameters depends on the extent of the excess of the MPC.
Ecological potential of the region	1. Climate potential	Favorable climate forms, on the one hand, the comfortable conditions affecting human wellbeing and health. On the other hand, it has an influence on the environmental situation, determining the mechanism of adaptation of natural systems to human impact, in particular the nature of the dispersion of pollutants in the atmosphere, transfer of pollutants in the air etc.	The annual amount of solar radiation per unit of area, frost-free period, the annual range of mean daily air temperature (in the warmest and coldest months), wind speed, calm, natural wind patterns, temperature inversions, atmospheric pressure, and other anticyclones.

Table 1. (cont.)

1	2	3	4
Ecological potential of the region (cont.)	2. Geomorphological conditions	Influence the formation of the carrying capacity of the atmosphere, the nature of the environmental situation.	Ruggedness of terrain, slope, intensity of weathering, landslides, mudflows, slides, avalanches, etc.
	3. Hydrological conditions	Determine the adaptive mechanism of water bodies to human impacts, including degradation of harmful substances in water reservoirs, transfer of pollutants in rivers and other	Annual rainfall, the water exchange rate, flow rate, humidity, fog, smoke, general water supply area etc.
	4. Soil conditions	Influence the formation of the carrying capacity of soils, decomposition and accumulation of harmful substances in the soil, etc.	Thermal treatment of soils and their ability to self-purification, the content of biologically active components, the presence of permafrost, wetlands, etc.
The resource potential of the region	1. The primary biological productivity of natural vegetation	Plant capacity as a set of natural vegetation, is used as a resource for industrial and agricultural production, recreation, and other human activities.	Productivity of natural forests, medicinal and food plants, wild fruits, berries, mushrooms, etc. Natural forestry potential as natural farming, which is closely linked to the general water-heat regime of territory and by the level of biological productivity of vegetation.
	2. Comprehensive agricultural potential	Characterizes the conditions for agriculture.	Soil quality, character of the relief, heat and humidity, rainfall patterns, reliability, weather conditions, etc. Agricultural industrial capacity – the amount of active temperature minus the amount of the average daily temperature must be greater than 10°C.

The resource potential of the region (cont.)	3. Land resources	Characterize the conditions of use of land resources.	1. Agricultural areas 2. Territory for the industrial construction (including manufacturing infrastructure) 3. Territory for civil engineering 4. Area is not disturbed by economic activities 5. Growth of specially protected areas 6. Other areas (under the green zones), etc.
	4. Water resources	Denotes the amount of surface water available for use for industrial and domestic use	The annual flow of rivers, the annual precipitation.
	5. Animal resources	Characterize the reserves and combination of the animal resources.	Fish stocks and other marine animals, game animals.
	6. Mineral resources potential	Characterize the reserves and combination of the mineral resources.	Reserves of different types of resources: fuel, energy, raw materials (metal and non-metal). The utilization of the resource potential (level of consumption of natural resources, the rate of depletion, resources, nature-production, etc.).
Wastes of production and consumption	1. Number of untreated industrial and domestic wastes	Reflects an assessment of the system of waste management. Large amount of waste that accumulate in the environment, creates a dangerous situation that could cause a state of emergency with severe consequences for human health and the environment.	The indicator shows: • sustainability of the technologies, • consumption of resources, • effectiveness of the waste management system, • quality of the environment (indirectly), • impact of the economy on health (indirectly), • environmental risk of production. Increasing degree of processing and disposal of waste –is an important aspect of promoting sustainable development of cities and regions, as well as reduced environmental risks of waste accumulation. The positive dynamics of indicators of this kind characterizes sustainable development of the region.

Table 1. (cont.)

1	2	3	4
Wastes of production and consumption (cont.)	2. Waste indices	Used to assess the environmental impact of economic development of certain regions. Characterize the proportion of different types of waste in the total mass of waste and toxicity.	Include: • index of household waste. It is the ratio of the mass of waste to total waste produced by society (for the country and its regions). The volume of waste reliably reflects the level of private consumption. Accordingly, the higher the value of this ratio, the higher the level of consumption in the region. Index of household waste can serve to characterize efficiency of natural resources (how much of natural source material is consumed in order to produce a unit of production for human consumption) • index of hazardous waste. Defined as the ratio of toxic and hazardous waste to the total waste generated in the region. Characterizes the level of toxicity of wastes.
	3. Environmental indicators of technological processes	These indicators reflect the quantitative and qualitative parameters of waste (waste with different technologies).	Calculated as the total volume of the output of various components of waste (gaseous, liquid, solid), and concentrations of the respective components in the waste divided by the MPC of the individual components of waste released into the environment. Indicator environmental processes can be useful in comparison of traditional and advanced manufacturing processes in terms of assessing their wastelessness.

Human impact on the environment	1. The composite index of technological loads	This index can be used as an integral criterion for ranking the regions and determination of their categorical nature in depending on the environmental problems.	It is the arithmetic mean of the partial indices of the four types of loads: 1) release of harmful substances into the air, 2) polluted waste water into water bodies, 3) transformation (non-agricultural) landscapes of urban areas, 4) agricultural transformation of landscapes (plowing). Defined as the ratio of the actual value of the indicator for each subject of the Russian Federation with the correction factors to the estimated magnitude of the average of one subject of the Russian Federation.
	2. Particular index of technological loads	Indicator shows the pollution on the regional level, depending on the level of development pressure.	Defined as the ratio of the total amount of release to the environment pollution of various species in a particular region per unit of urban areas in the region to the total volume of output from all sources of pollution to the environment in the country in per unit of the urban area in the country as a whole.
	3. Tension coefficient of environment situation	Indicator shows the pollution by region of the country, depending on the level of development pressure per unit of urban area.	Calculated on the basis of particular index of anthropogenic impact on urban areas with taking into account of population in the region and in the country.
Resource and energy capacity of production	Resource consumption and energy intensity of GRP	This indicator is a fundamental indicator in the system value of goods and services. Characterizes the "heaviness" of the structure of the economy (high share of extractive industries and heavy engineering) and the presence of backward technologies.	Economic indicator of the amount of consumption of resources: water, raw materials, fuel and energy (fossil fuels and refined products, converted to standard fuel on certain factors) per 1 thousand of GRP. Shows a decrease in the dynamics of the consumption of natural resources, primarily through the use of resource-saving and energy-saving technologies.. Reduction of resource and energy characterizes sustainable development of the region.

Table 1. (cont.)

1	2	3	4
Economic damage from pollution	Indicators of economic damage from pollution	Damage from pollution is the actual and potential losses of the economy, caused by the environmental pollution (including additional costs to eliminate the negative consequences of pollution), as well as losses due to deteriorating health, reducing the duration of working life and the lives of people . To damage from pollution are economic and non-economic losses associated with a more rapid deterioration of engineering structures, buildings, corrosion of materials, increased incidence of people, reducing crop yields, reduced productivity of livestock, etc., phenomena is caused by biological, physical and chemical contamination of the environment.	Figures include the costs of pollution: • air (the valuation of losses caused by air pollution, given the relative aggressiveness of the ingredients emissions), • surface water (the valuation of losses caused by pollution of water bodies, taking into account the relative hazard of pollutants in waste water), • soil (the valuation of losses caused by soil contamination and waste disposal), • forest (the valuation of losses caused by forest destruction and degradation of their functions in connection with the contamination of the environment), • subsoil (the valuation of losses caused by disturbed and contaminated subsoil).
Investment in environmental protection	The volume of investment in fixed assets in environmental protection	This indicator describes a general level of investment activity in the region in the environmental field, including the structure of sectors (industry, agriculture, construction, transport, etc.). Its dynamics shows the possibilities of the investment potential of the region for the development of environmental management.	Indicator shows the amount of funds in the environment-oriented facilities by all sources of funding. The positive dynamics of the indicator characterizes the level of sustainability of development of the region.

Source: own composition.

In addition to these indicators, as additional indicators of environmental management in the region one may take such factors as increasing share of environmentally friendly products (produced by environmentally-oriented technologies), increasing share of resource-saving technologies in production, increase in the share of environmental costs of total production costs, increase in the revenue of territorial environmental funds, increase of the share of equity in natural resource conservation activities, and increase in the share of the regional budget line devoted to finance conservation measures.

The system of regional environmental indicators should also include indicators of the region's contribution to the formation of global environmental situation (greenhouse gas emissions, the formation of ozone and acid rain, etc.) and its participation in the trans boundary movements of all kinds of pollution.

Above indicators of environmental impact, as a rule, are not reportable statistical indicators, although in most cases their calculation is based on the use of official statistics. On the one hand, these indicators allows to add the existing statistical database in the field of environmental protection. On the other hand, they provide opportunities for the analysis of ecological processes in the region.

3. Main properties of the regional environmental and economic indicators

Environmental indicators are important not by themselves, but as an instrument for achieving environmental policy objectives, providing the base for analyzing specific environmental situation in a particular area, in order to make conclude about the state of the environment in the region. The reasons for their formation is thus to build a basis for undertaking necessary actions in the field of preservation of the environment and natural resource management in the region.

Obviously, each region should develop its own system of environmental indicators, since composition of which depends on the specificity of the region – its natural, economic and social conditions, especially

the territorial organization of production and development prospects. Composition of indicators suited to the specificity of the region allows also formulation of its own environmental objectives and character of tasks.

Because each region is characterized by its own specific conditions of the environmental situation, it is impossible to develop and implement environmental policies, not having a precise information about exact ”pain points” on environmental issues of the given region, as well as an identification of significant deviations from the standard state and in consequence, deciding what special measures are needed to relieve bottlenecks in the current environmental situation. These regions should be the subject of priority in the allocation of public funds for the implementation of various regional environmental programs.

Adequate assessment of the state of the environment in a given region is possible only through a set of indicators (and not any single indicator), because universal parameter describing adequately the environment, has not been found.

Regional environmental and economic indicators, as part of the general system of regional indicators are intended to provide quantitative estimates reflecting the dependence of the relationship between the economy, the individuals and the environment, characterizing the connection “effect – change – impact – state – required environmental protection measures”. Identification of the appropriate chain relationships, following from source of environmental impacts to the environment itself, allows arising different kinds of impact on the environment and all kinds of negative consequences of such exposure in a territory. This, in turn, causes the selection of the necessary nature protection and other measures.

Among the methods of accounting and estimating the impact of human activity on the environment, quantitative approaches have a special place. They allow to characterize various aspects of the changes in the state of various elements of the natural environment in a formalized way, as well as they help to assess the environmental situation within the territories of different levels of complexity, different scale of the influence of various factors and conditions, the dynamics of the process, etc.

Therefore, development of environmental indicators is very important for quantifying the effect of different mechanisms of human activities

and their adverse effects on the environment. Only those indicators for which a cause and effect of relationships and dependences are installed, can serve as an adequate measures for the environmental assessment procedures.

In our opinion we should not seek to the formation of the widest possible range of different indicators. What is much more important, they allow to characterize the state of the environment in a complex way. However, there is always a need of abandoning the use of indicators that overlap. In other words, the indicators should be informative and their set should adequately reflect the state of the environment.

In accordance with this, the following key features of approach to the choice of set of environmental indicators used to assess the state of the environment, should be assured.[5]

First, indicators should be representative, which means that it should be possible to select from a set of their most important indices, (i.e. those that provide new and useful information needed for more informed decision-making process in the region). However, they should not give bias towards one or another aspect of the state of the environment of a particular disease.

Secondly, it is advisable to operate with such environmental and economic indicators that are simple and convenient for their practical use. They should be simply interpreted and their application should be clear that they describe.

Third, the environmental and economic indicators should reflect the change of parameters in time, and catch up with significant variations of a given phenomenon. In other words, they must be characterized by their dynamics.

Fourth, environmental and economic indicators must satisfy the requirement of the availability and reliability of data. This means that the information used to calculate the indicators can always be obtained and (including affordability), it should be available on a regular basis (once a year or two years), as well as should be trust worth.

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[5] Т. А. Акимова и др., *Основные критерии экоразвития*, Издательство Росэкоакадемии, Москва, 2009, p. 54; I. Serageldin, *Making Development Sustainable. From Concepts to Action*, "Environmentally Sustainable Development Occasional Paper Series" 2008, № 2, The World Bank, Washington D.C., p. 340; Е. А. Лобанова, В. В. Гаврилов, *Экологические показатели в управлении природоохранной деятельностью в России*, URL, //http://gisa.ru/12430.html/.

Thus, the effectiveness of the environmental and economic indicators is largely determined by the reliability of methods used to collect and process information, which makes the close relationship between the regional environmental diagnostics and environmental monitoring. The ecological and economic diagnosis serves as a tool to form an opinion on the state of environment in the region, which contains the signal for action, and environmental monitoring – as a means of continuous monitoring of the environment.

Proposed list of regional environmental and economic indicators is designed for use by regional authorities as a tool to monitor activities in the field of sustainable development in the region, assess the effectiveness of environmental protection and the implementation of timely completion and adjustment of activities aimed at achieving the environmental objectives of the territory, in case this activity will be not sufficiently effective.

In general, the results of environmental and economic diagnosis of the region are considered to be an important element of the information-analytical basis of environmental policy. They need, first of all, characterize the state of the environment in the region, but also identify trends; visual assessment of regional environmental problems. What is more, they can be helpful in the selection of specific regional issues that require urgent attention of state and municipal governments to create and implement a system of activities required to prevent and manage the existing adverse environmental situations. One of the main purposes of regional environmental and economic diagnosis is to measure both actual and projected environmental situation in the region.

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Abstract

The article describes the subject, aims, objectives and basic features of the ecological and economic diagnostics at the regional level, applicable in the context of the research on local production systems. For these purposes, characteristics of the main stages of the ecological-economic diagnosis are considered. Further, the structure of the system of regional ecological and economic indicators and their properties are given. The functions of the regional ecological and economic diagnostics in shaping environmental policy are shown. Also, main features of the approach to the choice set of environmental indicators

to assess the state of the environment and a number of requirements that they must satisfy are highlighted. Finally, regional ecological and economic diagnostics is regarded as a "must-have" item of the development of environmental policy.

Key words: diagnostics, indicators, regional development, environment.