

Economic Mechanisms of Competitiveness in Nature Management, Environment Protection and Ensuring Medico-Ecological Safety

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Formulation and implementation of socio-economic development strategy and policy of nature management, environment protection and ensuring medico-ecological safety are interrelated as health and social and ecological welfare of people are inseparably tied. Economic mechanisms of nature management provide for including ecological parameters in pricing system, improvement of commercial nature management system and mandatory ecological insurance. The effectiveness of environment-oriented activities of nature users is governed by establishment of financial incentives and introduction of economic instruments in connection with environment protection stimulation, as nature preservation and environment improvement are priority areas of state and public. For enhancement of current nature management and assessment of landscape conditions as well as for updating the information obtained from topographic bases, remote-sensing methods are important, in the form of good quality digital terrain images from space.

Key words: Economy, competitiveness, nature management, ecology, medico-ecological safety, biodiversity, ecosystem, forest policy, green economy, Life environment, monitoring, payment for ecosystematic services, recreation.

Medico-ecological safety is ensured by a system of measures (prognostication, planning, deliberate preparation for the complex of preventive measures) ensuring minimizing unfavorable impact of nature and technological processes in connection with nature use on people's life and health, keeping sufficient rates of industry, communications and agriculture development.

Medico-ecological safety is a mechanism allowing permissible negative impact of natural and anthropogenic factors of

ecological danger on the environment and people.

Policy of medico-ecological safety is the focused activity of governmental authorities, public organizations, legal entities and individuals in connection with ensuring ecological safety.

Medico-ecological safety system ensures the aggregate of legislative, medical and biological measures aimed to sustain the balance between the biosphere and man-induced impact as well as natural external impact.

Methodology

Methodological research is based on sustainable development of territories, high quality of life, health and medico-ecological safety of people which may be ensured only

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subject to the preservation of natural systems and standards of environment quality [1].

The policy of nature management, environment protection ensuring medico-ecological safety is based on comprehensive approach principles in strategic modeling based on the following:

- a) Prevention of negative ecological consequences as results of commercial activities, accounting for remote ecological consequences;
- b) Restrain from commercial and other projects related to impact on natural systems if their consequences are unpredictable for the environment;
- c) Ensuring medico-ecological safety and environment-oriented activities based on risks analysis and ecological harm compensation;
- d) Preservation of maximal possible number of specially protected natural areas;
- e) Preservation of unique black earths contributing to competitive agricultural products;
- f) Commercial nature management and compensation to people and environment of any harm done in violation of

- g) Development of inter-sector complexes accounting for natural resources potential and local opportunities of territories;
- h) Development of kinds of ecological tourism;
- i) Transparency of ecological information and ensuring participation of civil society, public authorities and business in the preparation, discussion, making and implementing decisions in connection with environment protection and rational nature management.

RESULTS

Currently, there are two basic concepts related to territorial development from the point of view of medico-ecological problems.

According to the first concept, solution of ecological problems lies in assessments of environment pollution, development of regulated permissible pollution of various media, creation of treatment systems and resource-saving technologies. Under that concept, present direction of certain environment-oriented activities was established, like the systems for

Table 1. Levels and measures in connection with effect on environment and ensuring medico-ecological safety

System levels	Measures
Comprehensive ecological assessment of a territory	Finding and assessment of ecological danger factors manifesting in given territory; Zoning territories by resistance to manifestation of ecological danger factors; Making cadaster of environment-effecting objects; Making cadaster of natural resources; Finding man-induced impact; Making and keeping cadaster of polluted areas.
Ecological monitoring	Norming environmental impact; Control of environmental impact sources; Quality control of environment components.
Management decisions	ecological policy; Prevention of man-induced factors of ecological danger; Minimization of ecological danger factors manifestation; Development and improvement of environment-oriented regulations and methods for creating ecological mindset.
Environment quality control methods	Measurement methods are strictly quantitative expressed by numeric parameters (physical, chemical, optical, etc.); biological methods qualitative or partially quantitative;
Methods and models for prognostication	System analysis methods, system dynamics, information science, etc.;
Combined methods	Ecological and toxicological methods including various groups (physical and chemical, biological, toxicological, etc.).

local treatment of the environment from pollution and regulation of environment quality by a narrow (a few dozens) set of parameters, as well as introduction of resource-saving technologies².

The second concept sees setting stability area of any ecosystem which allows for finding permissible disturbance value – impact on ecosystem, to find stability thresholds of certain ecosystems³.

Stability indicators should comply with the following basic criteria

1. Application on national scale’s macro level;
2. Combination of ecological, social and economic aspects;
3. Being maximally clear and having single-valued interpretation for decision-makers;
4. Quantitative expression;
5. Being based on system of national accounts;
6. Not requiring much costs on collecting information and calculations;
7. Being representative for international comparisons;
8. Being able to be assessed in temporal dynamics;

9. Being limited in number.

Management and level of costs on environment protection and ecological safety allow for optimization of the following:

1. Total volume of payments for negative impact on the environment made to consolidated budget of a region by industry’s enterprises;
2. Costs on environment protection measures from various funding sources total by industry;
3. Sector’s programs on rational nature management, environment protection and ecological safety;
4. Positive ecological initiatives including those related to attracting investments;
5. Certified system of ecological management on sector’s enterprises;
6. Number of planned and realized measures on environment protection on industrial and manufacturing sites (compliance with ecological policies adopted by enterprises);
7. Number of realized measures on environment protection under budget’s target programs.

Table 2. Environment quality management methods

System levels	Measures
Environment quality management methods	Ddevelopment of mechanisms and regulation measures in connection with decrease of ecological risks; Finding quantitative parameters of potential and real threat to people’s health from environment pollution; Comparing and ranking various effects by degree of manifestation (morbidity, mortality); Setting more reliable and safe regulatory levels of pollution; Identification in certain conditions of the most dangerous factors and groups of people mostly exposed to unfavorable impact; Ranking areas by the level of risk for people’s health both now and in prospect; Finding variability limits of risk parameters in uncertainty conditions in connection with limited data and scientific problems; Ddescription and assessment of remaining risks after steps on decreasing pollution; Identification of the most sensible and exposed subgroups of plant and animal populations; Finding the most crucial areas where decrease of uncertainty level will lead to the most effective growth of risk parameters reliability and therefore will ensure the best methods of its decrease; Decrease of uncertainty level in decision-making; Practical application of the data obtained in decision-making in connection with functional zoning of territories; Finding which industrial enterprises may be left in communities and which should be moved away from communities; Optimization of monitoring system in large communities

8. Additional parameters may be worked out accounting for geographical, economic, ecological and social specifics, differentiated by territories⁴.

Stimulating nature users for environment-oriented measures and rational nature management should be done with the assistance of economic mechanism for nature management providing for ecological payments system⁵.

Payments for environment pollution ensure economic stimulation of environment pollution decrease via growing rates tool for excess use of resources or excess emissions and discharge of pollutants.

Payment rates for environment pollution are set based on the volume and kind of pollutants⁴.

Ecological restrictions on realization of investment projects are related to the need to strengthen the role of ecological expertise and monitoring in the course of new projects in the most exposed zones of natural landscapes, introduction of modern systems of sewage and exhaust gases treatment, recycling water supply and disposal of solid wastes, using innovation potential to decrease impact on the environment⁶.

That issue is also related to the absence of monetary expression for many representatives of plant and animal world accounting for their

Table 3. System of basic indicators of sustainable development of territories based on priority ecological and economic parameters (indicators)

Indicator	Unit of measure	Problems
Energy consumption	reference fuel/rubles	natural resources consumption; change of economic structure; technological level.
Fixed assets renewable factor	%	emergencies and catastrophes; ecological damage; renewal of fixed capital; technological level.
Emission of pollutants in atmosphere	thousand tons/million rubles	environment pollution; public health; technological level.
Emission of solid substances from stationary sources	million tons/million rubles	environment pollution; public health; technological level.
Discharge of pollutants	thousand m ³ /million rubles	environment pollution; public health; technological level.
Water consumption	million m ³ /million rubles	environment pollution; public health; technological level.
Unused and untreated hazardous wastes	million tons	wastes; technological level
Areas of specially protected natural areas	thousand ha	preservation of ecosystematic functions and biodiversity
Territory not disturbed by commercial activities	%	preservation of ecosystematic functions and biodiversity
Greenhouse gas emission	million tons	global climatic change (greenhouse gas emission quotas market)

Table 4. Dynamics of investments spent on environment-oriented construction

Indicator	Unit of measure	Period	
		2012	2013
Investments in fixed capital (without small business and informal activities)	million rubles	241,610.1	370,210.5
Investments on construction of environment-oriented objects (without small business and informal activities)	million rubles	414.0	425.2
Share of investments spent on construction of environment-oriented objects in the total volume of investments in fixed capital (without small business and informal activities)	%	0.2	0.1

territorial value and the absence of uniform cadasters of natural resources and estimations of ecological potential of separate territories.

The existing guidelines on assessment of ecological and economic damage contain price parameters which do not allow for precision of measurements, inflation processes are hard to assess and record and mechanical increase of damage volume will hardly adequately reflect the changing value of separate components of the environment.

Therefore the assessment is made by expertise method based on statistical data. The economic damage to Krasnodar Krai's territory from wastes put on dumps in 2013 was at least 22.14 billion rubles (not including the remediation works).

Average rate for collecting and disposal of wastes is 250 rubles per 1 m³.

Meantime, the costs on dumping 1 m³ of wastes are 324 rubles. Thus, payments according to the rates ensure compensation for

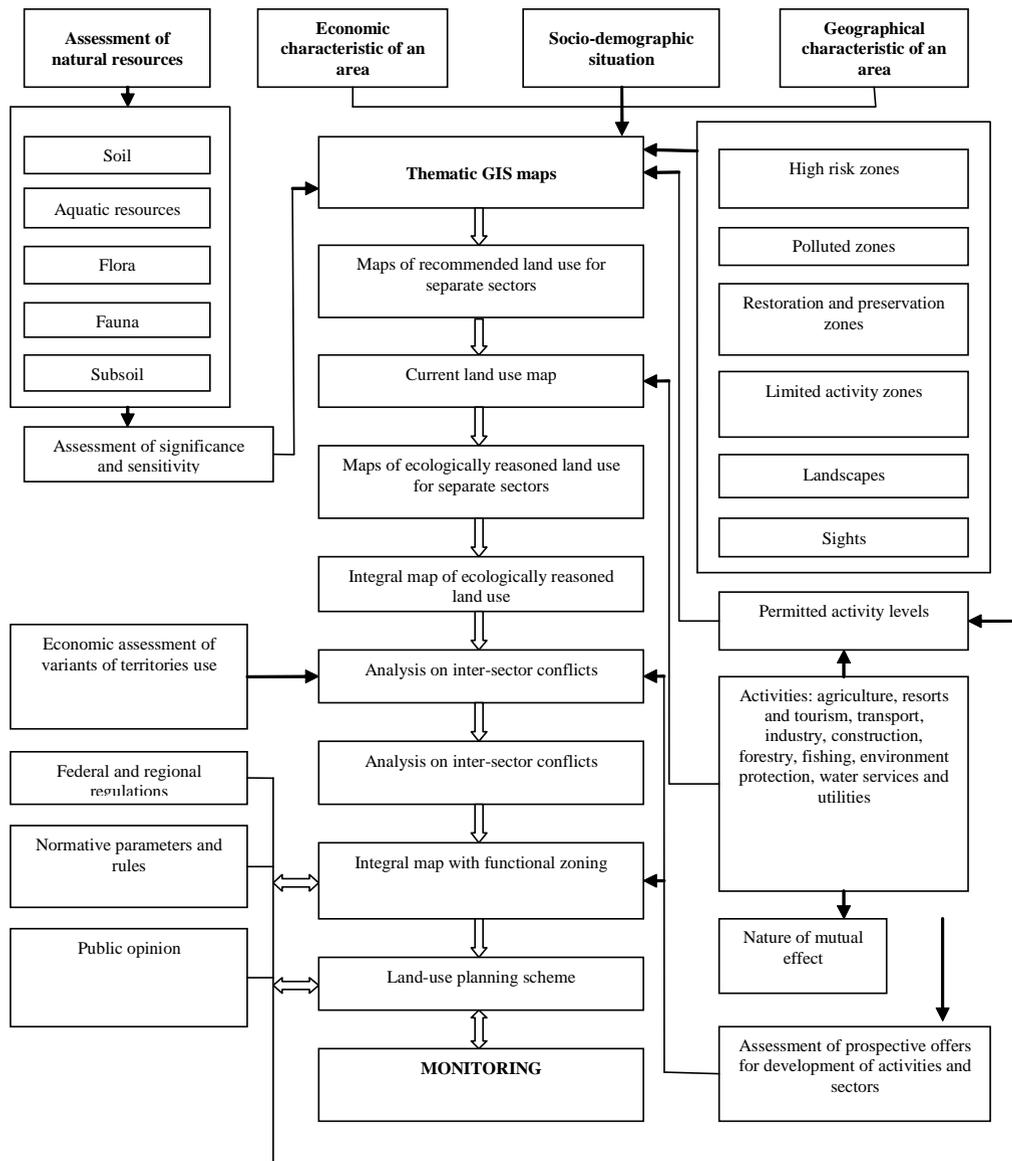


Fig. 1. Functional zoning scheme based on assessment of significance and sensitivity of natural components

waste disposal by 77% only which does not comply with the principle “contaminator pays” [7].

The actual cost for treatment of annually dumped wastes (14 million m³) is at least 4.5 billion rubles.

If separately collected dry secondary material resources are sorted, the cost decrease per 1 m³ of the volume dumped may reach 28 rubles and dumping volume may drop by 80%.

Thus, to save the funds of the consolidated budget of Krasnodar Krai optimization of payment for disposal of wastes may work subject that wastes are sorted.

According to the information from Department of investments and project follow-

up of Krasnodar Krai, in 2013 large and middle organizations of all kinds of ownership spent some 370,635.6 million rubles of funds on construction and investments in environment-oriented objects of Krasnodar Krai which is 53.1% increase on 2012.

According to the state statistics it is impossible to determine the costs on environment-oriented activities born by organizations and business entities of all kinds of ownership¹.

Total investments flow spent by various structures and forms of ownership for the purpose to protect the environment and reproduce the natural resources of territories (Krasnodar Krai) was over 5.9 billion rubles worth, including:

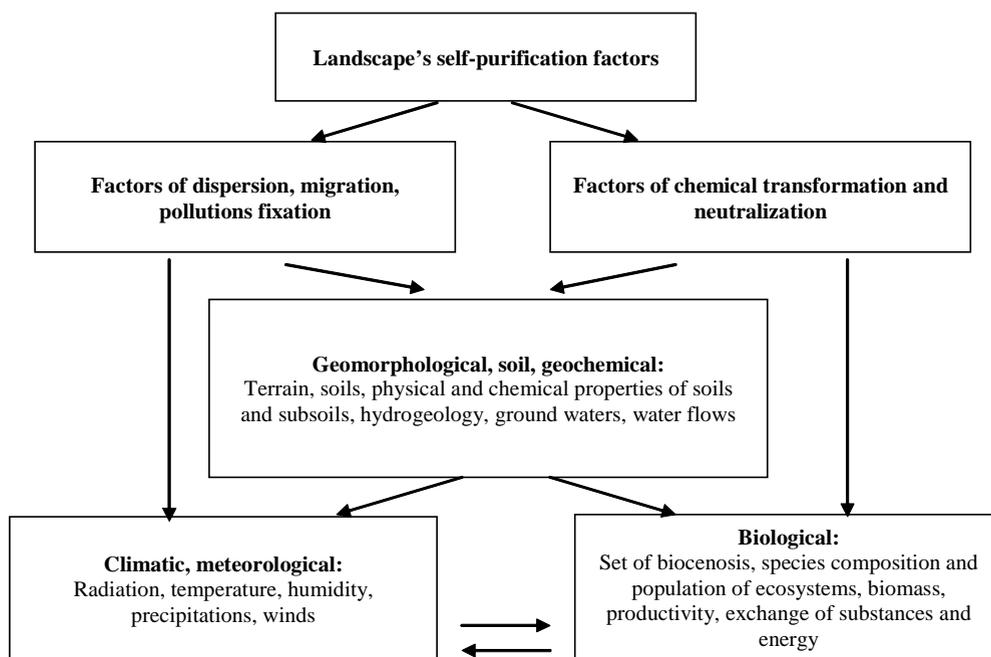


Fig. 2. Classification of self-purification factors of landscapes

1. costs on environment protection was at least 5.1 billion rubles;
2. - financing part of regional target program “Providing for construction of Olympic objects and Sochi city development as mountain climatic and balneotherapeutic health resort” was 201.7 million rubles;
3. budget allocation by sections and subsections, target items and kinds of costs of budget costs classification was 109.1 million rubles;
4. costs on overhaul of fixed production assets for environment protection in 2013 were 209.3 million rubles.;
5. costs on environment protection measures by kinds of economic activity were about 4,591.0 million rubles.
6. Great significance for realization of current nature management and assessment of landscapes conditions as well as update of information received from topographic

base is in the application of remote-sensing methods by Roskosmos in the form of good quality digital terrain images from space:

7. making balance of natural resources;
8. monitoring forests including recreational ones;
9. environment regulations violation facts;
10. sewage and discharge from industrial objects and vessels;
11. aerial visual control over ports;
12. fair value assessment of plant resources (forests, planted vegetation).

Ecological capacity of a territory is determined by the two important properties of ecosystems – stability and self-purification ability.

The above examples characterize first of all the ability for self-purification, i.e., the ability of landscapes, natural-territorial habitats to process (dissolve, absorb, etc.) or remove the pollutants which got into an ecosystem².

To make a system stable, it is required to ensure the preservation of the core parameters: number of species in an ecosystem, populations sizes, biomass, productivity, ability for self-purification⁸.

Next, a compulsory parameter for project investment analysis is the environmental capacity of a territory which is the aggregate volume of commercial withdrawal and damage of local renewable resources including pollution of the environment and other forms of man-induced suppression of recipients including public health deterioration⁹.

DISCUSSION

Due to its natural specifics, Krasnodar Krai plays an important part not only in the Russian Federation but in the world as well from the point of view of global public benefits, providing material ecological services for the whole planet. This is evidenced by the decision of International Olympic Committee on hosting Winter Olympics in 2014 in Krai's territory. Caucasus national park is located in Krai as well, classified by UNESCO as world natural heritage.

Ecological reasoning of territorial planning schemes is a systematic assessment of

the condition and potential of natural components (soil, water resources, flora, fauna, etc.) and man-induced impact on the environment as well as alternatives to natural management and socio-economic conditions to select and approve the best nature management variants.

Safety of an ecosystem determines its integrity, preservation of species, biodiversity, preservation of internal relations while for people safety is first of all health and welfare.

Basis cost items on restoration of damaged environmental conditions are the works on recovery, their costs are divided by the following components of the environment: water, atmospheric air, forest and non-forest vegetation, including trees, shrub and grassland, game and non-game animals, rare wildlife, urban vegetation, ecosystems in general.

CONCLUSION

Currently, large-scale investments should be made in modernization of municipal treatment facilities, disposal of solid wastes based on separate sorting of solid household wastes components, establishment of wastes recording system, analysis of their volume and composition, management logistics including disposal besides storage, recycling elements, introduction of rubbish treatment system compliant with the current ecological standards, conditioning new culture of people behavior¹⁰.

Attracting investors for waste treatment (construction, use and remediation of solid household waste (SHW) dumps, sale of raw materials and products, sale of heat and electric power generated in the course of the disposal of SHW organic parts, recycling of complex household and office appliances, disposal of construction and demolition wastes, etc.) will create added value effect in the gross regional product.

Economic instruments are enhancing strict norms and standards on business activities for the purpose to bring innovations and rational use of natural resources, development and introduction of more effective and low-waste technologies. The damage caused to the environment due to any violations of environment-oriented regulations is subject to compensation

in full, depending on the level of pollution and damage/harm caused, costs on remediation, reproduction and other losses and expenses.

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