Application of information technology for environmental monitoring of various ecosystems, engineering and environmental surveys

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Abstract. In recent decades, the problem of the ecological status of not only the Russian Federation, but also in most countries of the world it is an urgent widespread problem. This article provided by the terminology of environmental monitoring, which in turn includes subsystems such as geophysical, climatic, biological and sanitary-hygienic monitoring, as well as appropriate the monitoring systems the environment. The tasks on the conduct of environmental monitoring are set and control are set, which include surveillance the status of the environment, obtaining information about ecosystems, assessing and predicting anthropogenic impacts, implementing plans and measures for nature protection, analyzing the effectiveness of management decisions and actions for acceptance security environmental safety.

1. Introduction
The environmental monitoring — an integrated system for surveillance the state of the environment, which also includes the assessment and forecasting of changes in the environment under the influence of by natural and anthropogenic factors.

The distinguish between the following environmental monitoring subsystems:

- geophysical monitoring;
- climatical monitoring;
- biological monitoring;
- sanitary and hygienic [1].

Today, humanity has come to the conditions of an aggravated environmental crisis, in overcoming which environmental education and upbringing are becoming increasingly important. In the course of life, a person has an increasingly significant impact on the environment [2]. Therefore, for the sustainable development of the ecosystem and the entire biosphere, it is necessary do not exceed the defined loads impact on the environment. The objects of state environmental monitoring are atmospheric air, land, surface and underground waters, subsurface resources, flora and fauna, as well as the Earth's climate and ozone layer, ecological systems, and environmental factors affecting the health of the population [3].

The information system monitoring environmental contains the following monitoring subsystems:
• status monitoring environmental;
• monitoring of natural resources;
• geophysical monitoring.

Engineering and environmental surveys are a set of studies conducted to assess the current state and forecast possible changes in the environment under the influence of external loads in order to prevent and reduce harmful and dangerous environmental consequences and preserve optimal environmental conditions.

During surveys, the following are investigated:

• atmosphere;
• water and moisture sources;
• soil condition;
• its composition and physicochemical properties;
• radiation background;
• electromagnetic waves;
• noises and vibrations.

The study highlights the existing and potential problems of economic security in the environmental sphere. Negative changes in the environment are not general in nature, but are purposeful in nature. Local disruptions often occur where various mining, processing, and other industries are located.

According to the feasibility of the study, the main components can be distinguished:

• identification of ecosystem and microclimate characteristics;
• protection of the environment from the influence of civilization;
• determination of the area of influence of the building on other factors;
• establishing the extent of this influence in terms of technical and physical aspects;
• study of economic use of land;
• forecasting of possible changes;
• Hazard and risk assessment;
• development of recommendations for prevention and prevention of negative consequences;
• preservation of cultural, ethnic and historical heritage of the site;
• programming of further works in the territory.

2. Problem statement and solution of investigated problems
Procedures fulfilling the requirements of engineering and environmental survey and environmental quality control have the following tasks:

• Collection and analysis of data of the studied area in the same climate to make primary forecasts and have the concept of "pitfalls."
• Decryption of satellite surveys in different projections for general study of terrain, terrain and significant defects - collapses, landslides, flowing waters, marshy areas.
• Visual inspection of the entire property with marks on the state of the terrain, soil, landscape, terrestrial and aquatic ecosystems, debris or other contaminated objects.
• Laboratory analysis of the soil, soil, precipitation on the chemical composition.
• Studies of air, impurities in gas.
• Study of flora and fauna in the area under study.
Preparation of a report on the work done, making recommendations.

To combat environmental pollution, it is necessary to take measures to reduce emissions into the atmosphere: to improve the technological process, to work on conditioned raw materials, as well as to develop and apply technological processes with a closed cycle of gas recirculation, to exercise strict control over emissions of harmful substances. It is necessary to improve the methods of cleaning and gas dust extraction. The optimization of the location of enterprises to reduce transport emissions, as well as the competent application of economic sanctions, is of great importance. Technological measures [5], as a rule, cannot provide sanitary standards for the content of harmful substances, so in most cases it is necessary to clean the exhaust gases from dust and gaseous components. Commercial plants should be located in such a way as to make the best use of the assimilation capacity of the source; production with more polluting waste is replaced by production with less impurities in the effluent. Technological improvements that eliminate or reduce harmful impurities in wastewater. They create «clean» end products, the decomposition components of which are safe for residents and people when they get into the water. One of the most effective measures is to reduce the consumption of fresh water and its rational use. For this purpose, water recirculation systems are used, closed water use systems are created, waterless and low-water technological processes are switched, and air cooling is used. Reducing the risk of oil pollution is possible by improving the reliability of tankers. To prevent contamination of the earth's surface, it is necessary to prevent contamination of the soil by industrial and domestic wastewater, solid household and industrial waste. It is necessary to sanitize the soil and the territory of settlements where such violations are detected.

Guided by experience of public environmental organizations, it can be stated that the construction and operation of hydro energy plants have a negative impact on the ecosystems of rivers and adjacent territories, as well as reservoirs; the process of planning and building a hydroelectric power plant is accompanied by the concealment of inconvenient facts concerning the economic feasibility and environmental danger of the project, while public hearings on projects in most cases represent information.

Many projects within the program are aimed at optimizing various processes, such as recycling, manufacturing, and others environmental cleaners. However, not all of them can be considered as such. Environmentalists believe that petrochemical plants are not able to create production completely isolated from the environment. They are sure that such enterprises can harm the recreational area and nearby settlements.

Thus, the improvement of the environmental situations is one of the factors that ensure the economic security of the region. In turn, the rational use of the environment is the most important tool for achieving these goals. Today, there are many levers of environmental management, both international and Russian. Many of them are engaged global problems, and some deal with — purely specific regional problems. Therefore, it is necessary to analyze which of them can improve the management of processes that affect the relationship with the environment in the region under consideration. It is necessary to analyze the experience of other regions of Russia, as well as the documents regulating the sphere of ecology in the Russian Federation.

To address this issue, it is recommended that environmental engineering and quality control activities be carried out. Environmental survey and control shall be carried out at three levels:

- in conditions of field exit;
- laboratory works;
- Reporting and summarizing results.
- After that, the project passes into the hands of builders and developers.
- Engineers perform the following operations on the site:
  - Visual inspection and recording of all data on the features of the territory. Also at this moment, a detailed survey is carried out - the materials are then stored for a long time in the archives.
  - Collecting natural components (soils, soil, waters, air) for the further physical and chemical
analysis.

- Study of the territory by biologists and environmentalists for an overview of the ecosystem, animals and plants, as well as verification according to the requirements of sanitary rules and regulations.

Laboratory activities:

- Check samples for contamination.
- Determination of radiation level.
- Chemical and physical composition of soil, water.
- Level of impurities in oxygen.

Final Stage:

- Summary of data.
- Preparation of reporting documents.
- Obtaining approval of Rospotrebnadzor and sanitary and epidemiological report.

The main documents of environmental management are the series of international standards ISO 9001 and ISO 14001. They set requirements for the company to manufacture products and do not contradict other laws and standards, but they correspond to with them and help to fully ensure environmental safety. The actions of this law can be taken within the framework of various management systems, not only environmental safety, but also such as occupational safety and health protection [6]. One of the main requirements is respect for the environment in which the company operates. These standards are the basis for the rational use of natural resources and ensuring responsible activities in relation to the environment and the population. Businesses that include compliance with these standards help prevent natural disasters and take care of both economic and environmental situations.

In addition to international standards, Russia has a federal law «On Environmental Protection». The law assumes for «mandatory participation in environmental protection... public associations and non-profit organizations, legal entities and individuals» [7]. At the same time, Chapter XIV of this Law establishes liability for violations of this legislation, the procedure for compensation and compensation for damage caused to the environment in the course of the activities of individuals and legal entities.

3. Conclusions

Summing up, it is necessary to highlight the main points that contribute to the quality of management and its effectiveness in ensuring economic security. The mechanism of action of the executive is as follows:

- understanding and awareness of environmental problems, their impact on the economic situation of the organization and the economy of the country;
- integration of environmental aspects into the company's activities, subsequent achievement of goals taking into account environmental protection;
- preparation of equipment, systems, and technologies for standards natural resource use;
- connection to standards and other regulations that coordinate the environmentally sound functioning of the organization;
- formation of environmental policy within the framework of the organization’s policy;
- building a strong organizational culture whose core values are continuous improvement and change, which involves following the principles of the PDCA (plan-do-check-act);
- maintaining the company's sustainable operations.
In addition, in order to process the collected information on environmental engineering survey and environmental quality control, software is needed that should include functionality from the following basic minimum:

- Work in 2D and in 3D.
- Volumetric visualization.
- Open files with different extensions.
- Connect an extension to import and analyze geospatial data.

As a result, if an organization aligns the interests of society with its own interests and conducts its activities in accordance with standards, economic security will become a much more achievable goal than before. Today, large companies in Russia have a significant share of influence on the processes taking place in all spheres of society. And in their power create a powerful business society that will guarantee a prosperous region with a stable economy and a beautiful environment.

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