

Regional management and local self-government

UDC 353

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PECULIARITIES OF INFORMATION AND ANALYTICAL SYSTEM OF NATURAL RESOURCES MONITORING

Summary. *The state of functioning and development of the state environmental monitoring system and its compliance with current requirements have been analyzed. The troublesome issues of insufficient efficiency of this system due to the interaction of environmental monitoring entities, their tasks and fundamental principles of organization have been studied. The priority directions of the state ecological policy concerning creation of effective information and analytical system of monitoring of natural resources have been offered. The functioning of an effective information and analytical system of environmental monitoring is an integral part of state policy in the field of environmental protection.*

The key purpose of environmental monitoring is collecting, storing and processing reliable and up-to-date information necessary to develop measures to prevent and reduce the negative consequences of changes in the environment. The importance of introducing an effective environmental monitoring system is of vital importance in the context of reforms of environmental management and protection. All indicators of environmental monitoring should become part of a single national network. It will include information on the state of air, surface, groundwater and marine waters, lands, soils, forests and biodiversity, as well as monitoring waste management, geological processes and the effects of temperature, noise, vibration, and radiation on people and the environment.

The environmental monitoring system is an integrated information system that should collect, store and process environmental information for departmental and comprehensive assessment and forecast of the environment, biota and living conditions, making sound recommendations for effective social, economic and environmental decisions at all levels of state executive power, improvement of relevant legislative acts as well as fulfillment of obligations of Ukraine on international agreements, programs, projects and activities.

Key words: *environmental monitoring, GIS system, operational information, natural resources, land monitoring.*

Problem setting. The purpose of the article is to assess the state of implementation and creation of information and analytical system for monitoring natural resources, in particular environmental monitoring. Viable monitoring of natural resources requires the creation of a modern land monitoring system, namely the rational use, reproduction and protection of natural resources in accordance with European standards and requirements to ensure the compliance with environmental rights and ensure free access to environmental information based on current information about their condition

and its dynamics. Such an information system will allow reacting on time to any negative changes, taking appropriate measures to prevent them.

Analysis of the latest researches and publications. The analysis of scientific research shows us the insufficient study of general issues related to the creation of information and analytical system for monitoring natural resources, as well as problems of state regulation of environmental safety, especially at the state and regional levels. Thus, O. Kutsenko, A. Holikov, V. Lisnychyi, S. Romaniuk, M. Tomenko, V. Rebkal, O. Adamenko, H. Rudko, V. Medvediev, M. Klymenko, V. Patyka consider issues of public administration in their works. V. Shevchuk, H. Biliavskyi, O. Lazor, and others research theoretical principles and practical recommendations for improving the state regulation of environmental safety of regions and the creation of information and analytical system for monitoring natural resources.

The main material. Contemporary meaning of *environmental monitoring* can be considered as an analytical and information system, which covers the following major areas:

- 1) *monitoring* the state of the environment and the factors that affect certain elements of the environment;
- 2) *assessment and analysis* of the actual state of all components of the environment;
- 3) *forecasting* the state of the environment and assessing this state;
- 4) providing *scientific and information support for managerial decisions*.

Thus, the environmental monitoring system is a system of observation, collection, processing, transmission, storage and analysis of information on the state of the environment, forecasting its changes and developing scientifically sound recommendations for decision-making to prevent negative changes in the environment and adherence to environmental safety.

Establishing an effective information and analytical system for monitoring natural resources is an integral part of government environmental

protection policies, aimed at ensuring citizens' constitutional right to a safe environment. The main thing in this direction of environmental monitoring is the collection, preservation and processing of reliable and operational reliable information necessary for the development and planning of measures to prevent and reduce negative impacts and changes in the environment.

Widespread use of contemporary information technology is crucial for economic development, effective management and improvement of the environment and people's living conditions. Geographic information technologies, remote sensing of the Earth and some others have been the most widely used to work with data that change in space and time.

Considering purpose, a geographic information system or geo-information system (GIS) is an information system that provides the collection, storage, processing, access, display and dissemination of spatially oriented data (spatial data).

From the point of view of software and information implementation, a geographic information system (GIS) is a set of electronic maps with symbols of objects on them, databases with information about these objects and software for easy work with maps and databases as a whole.

GIS technology is the technological basis for the creation of geographic information systems that allow you to implement the functionality of GIS.

Creation and development of GIS-technologies is one of the most essential areas of application of modern achievements of computer and space technology in various spheres of human life (economy, defense, environment, science, management, etc.).

Hundreds of thousands of geographic information systems are successfully operated worldwide. Diverse applications of geospatial information, continuous improvement of technical means, development of new technologies, international cooperation in creating global earth exploration systems imply that GIS technologies will soon find wider application in

environmental activities, especially in the organization and operation of environmental monitoring systems.

It is important that GIS studies not only geographical information, but also all processes and phenomena on the earth surface, in the economy and in society. Mandatory features of GIS include spatial (coordinate) data binding; display of spatio-temporal relationships of objects; availability of information in databases about map objects; the ability to update databases quickly; creation of new information by analysis and synthesis of existing data; providing scientific support for managerial decisions.

Concerning environmental monitoring in Ukraine, the most common GIS platforms are MapInfo, ArcView and ArcInfo (ArcGIS), GeoDraw, ArcView, Map (GIS "Panorama"), Digitals, VNetGIS, OKO and others. Each of them is constantly updated, so there are several versions at once. In this case, as a rule, the capabilities of the older version are fully implemented in the new one.

The main stages of solving problems of environmental monitoring using GIS are the following ones:

1. *Collect input material to solve the problem.*
2. *Selection or creation of a geographic information electronic map (GIS basics).* Due to the absence of a ready-made GIS suitable for solving the problem, we need to find a raster image of the desired area and conduct its digitization and vectorization. It is better to use high-resolution aerial photographs.
3. *Filling the electronic map with cartographic and attributive information* – administrative units (boundaries of regions, districts, forests, etc.), addresses of enterprises and locations of other sources of pollution, species composition of flora and fauna, environmental monitoring points, etc. The information is entered into the attributes of the GIS map objects.
4. *GIS analysis of the environmental situation* – solving problems of data processing and analysis using GIS support, temporal and spatial analysis,

forecasting the development of these processes, such as assessing surface water quality, possible impact of pollution sources and extreme weather conditions on air pollution air, analysis of the feasibility of the location of certain facilities, such as preschools in the relevant area, agricultural land, etc.

5. *Visualization of input data and the results of solving the problem* – using the capabilities of GIS in the visualization of both input data and research results: construction of thematic maps and charts, construction of three-dimensional static and moving images.

For most administrative regions of Ukraine and basins of large and medium rivers of Ukraine, geo-information systems for environmental monitoring and decision support for environmental management and control and integrated water resources management have been created and implemented, which contain relevant layers and data. The main scale is 1: 500 000 and 1: 200 000. For some regions, GIS environmental monitoring is created using more detailed scales: 1: 100 000, 1:50 000, 1:10 000, etc.

The importance of establishing an effective information and analytical system of environmental monitoring is especially significant in the context of environmental management and protection reforms, where the need to coordinate the activities of executive bodies to harmonize legislation and effective environmental monitoring should be considered. In addition, the unsatisfactory state of environmental monitoring is identified as a threat to national environmental security. The procedure for creating and operating an automated information system in the system of natural resource use is determined by the central executive body, which ensures the formation of state policy in the field of environmental protection.

Ensuring the functioning of a single monitoring system is a rather complex task that requires solving a number of both organizational and technical issues. In accordance with the functional tasks (obtaining and storing primary data; processing, analysis and submission of information; assessment, control

and planning of measures to improve certain components of the environment) should implement a system of regulatory regulation of integrated monitoring of land use and other natural resources. It is shown in Figure 1.

Introduction of the Normative and legal complex system of monitoring of land use and use of other natural means provides maintenance of development of the uniform state system of monitoring of the environment directed on:

- increasing the efficiency of its operation;
- providing executive authorities, local governments and the population with timely and reliable information about the state of the environment, increasing the level of citizens' environmental knowledge;
- determination of common priorities during the planning of actions of the subjects of the monitoring system;
- creation of a single network of observations;
- technical re-equipment and improvement of regulatory and methodological support of the monitoring system; coordination of elements of information technologies used by the subjects of the monitoring system.

The organizational structure of the environmental monitoring system is determined by a number of documents, in particular the Resolution of the Cabinet of Ministers "On approval of the regulations on the state environmental monitoring system" [2].

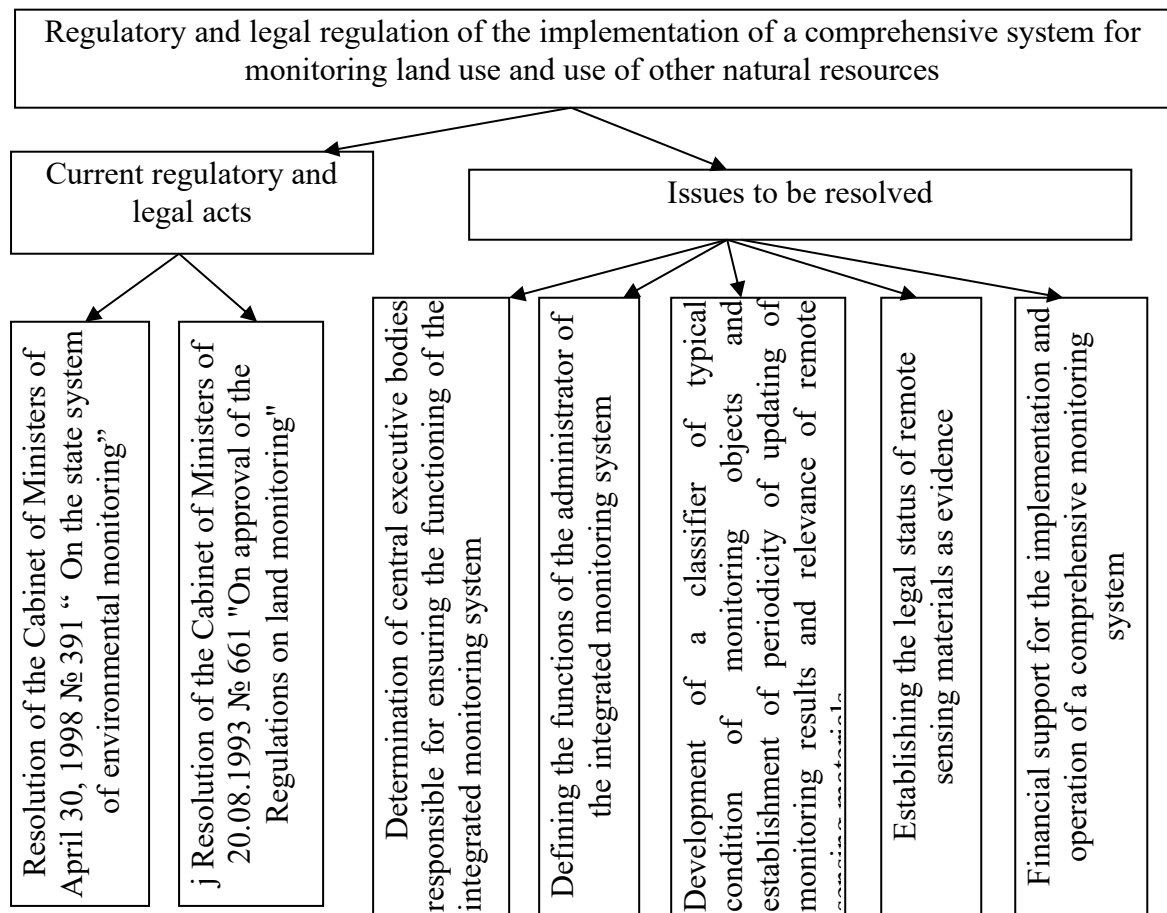


Fig. 1. System of monitoring land use and use of other natural resources

A coordination mechanism has been put into place so as to coordinate the work of eleven bodies involved in the monitoring system. The Interdepartmental Commission for Environmental Monitoring has been established to coordinate the activities of ministries and agencies, determine the basic principles of state policy on the development of environmental monitoring, and ensure its functioning based on a single regulatory and methodological support from the Cabinet of Ministers of Ukraine [3]. Figure 2 shows the subjects of the integrated monitoring of natural resources.

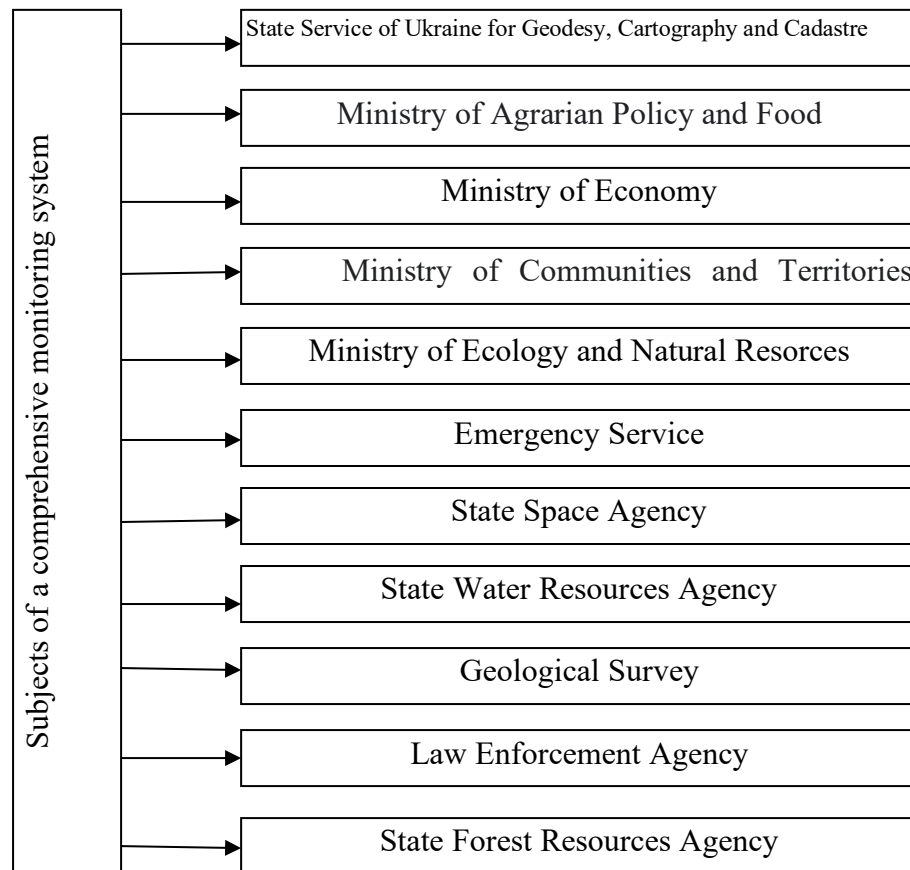


Fig. 2. Subjects of integrated monitoring of natural resources

The environmental monitoring system is based on the use of existing organizational structures of the subjects of monitoring and operates on the basis of combining information with a single organizational and regulatory support. Relationships between the subjects of the monitoring system are based on mutual information support of decisions in the field of environmental protection, coordination of actions during planning, organization and joint activities, effective use of existing organizational structures, means of environmental monitoring and computerization of activities.

Conclusions. Environmental monitoring system as an important part of public administration of environmental safety and sustainable development policy, implementation of international obligations of Ukraine in the field of environmental protection needs to be improved, especially in the introduction of modern technologies of geographic information systems and remote sensing.

One of the tasks is the organization of automated environmental monitoring, based on the creation and application of computer technology for the rapid collection, processing and transmission of data from a large number of remote and distributed over a large area. Increasing the efficiency of the information and analytical system at the legislative level, one should implement common approaches to the formation of the government environmental monitoring system information resources on the state of the environment, create and maintain a single electronic database on natural and man-made objects, methods and equipment of the environmental monitoring system in accordance with the Association Agreement between Ukraine and the EU. It is necessary to improve the integrated assessment and forecast changes in the state of the environment applying modern geographic information systems, remote sensing technologies, geospatial data analysis, thematic mapping and forecasting.

Reforming the state environmental monitoring system will significantly expand opportunities of Ukraine for international cooperation in the field of environmental protection. One of the key innovations will also be the flexibility of the updated environmental monitoring system and synchronization with the current needs of society. Based on the monitoring data, the authorities will be able to make sound management decisions and more effectively take into account the environmental component in the development and approval of state planning documents.

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