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CREATION OF ENVIRONMENTAL MONITORING COMPUTER SYSTEM

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Abstract: The object of the research is environmental monitoring. This article describes environmental monitoring. It also addresses the purpose, functions and main issues addressed by the environmental monitoring system. This article focuses on environmental protection. With the help of an environmental monitoring system, it is possible to forecast the future level of environmental pollution. The environmental monitoring system is part of the environmental information system. This article also discusses the main components, functions, objectives and objectives of environmental information systems. It also describes the knowledge base, which is part of the environmental information system. One of the problems is the systematization of environmental data. Relational tables were used in the research. The research looked at an environmental information system that uses to manipulate environmental data. Part of this system is environmental monitoring, which is used to monitor the environment. The main part of the environmental information system is a database in which all necessary information is structured. This article discusses the main issues to be addressed in the environmental information system. Requirements for such a system are also considered. The structure of the environmental information system consists of three levels: high, medium, low. This article also discusses the conceptual model and structure of the database. The article has developed an information system that addresses various issues in the environmental monitoring system, such as atmospheric air and precipitation, water, soil pollution levels, as well as the cost of radioactivity. In addition, the IS makes the appropriate calculations for these components and presenting their results in various forms and etc. The results of this study will provide a more detailed description of the level of environmental pollution, i.e. improve environmental monitoring.

Keywords: environmental problems, environmental monitoring, computer systems, information systems, environmental management.

1. Introduction

Ecological monitoring is the measurement, evaluation, prediction and response of anthropogenic changes in the inorganic composition of the biosphere, as well as ecosystem changes as a result of impacts. According to the United Nations Environment Programme (UNEP), monitoring the renewable resources of the biosphere. GEMS (Global Environmental Monitoring System). Simply words,

environmental monitoring refers to a process that aims to provide a database of environmental and environmental management [1, 2].

The main issues of ecological monitoring include atmospheric, hydrosphere, lithosphere control, observation, forecasting of the situation and indicators of changes. This information helps to assess the current state of the environment. It is necessary to study the content of the information necessary for the proper implementation of the monitoring system. The analysis determines the essence of the data stored in the system's database. It is important to know the purpose of monitoring in order to organize the integrity of the system to be created. This determines the functionality of the system [2, 3].

The so-called system of environmental monitoring, as mentioned above, is an automated, computerized environmental information system designed to make the information obtained as a result of environmental monitoring accessible to employees [4].

The main objective of the environmental monitoring system is to collect information on environmental changes in various components of the environment (automated direct mobile, routing and stationary labs or inputs into the database based on the necessary calculations). In addition, monitoring systems provide the relevant staff with the necessary information to speed up the process [5, 6].

Human society is developing in its interrelation with nature, using its renewable or non-renewable resources (oil, gas, etc.). If we look at the changes that have taken place, both in nature and in society, from the time of its existence until now, we can see this clearly [7].

From the beginning of the 20th century, processes in the world, as well as in some regions of the country, have been prevented by environmental pollution. The impact of human civilization on the environment is manifested in hydrosphere pollution, ozone depletion, soil cover and deforestation and so on [8].

The issue of environmental protection is one of the most urgent problems in the world today. Understanding the global environmental problem forces mankind to look for ways out of the crisis. From this point of view, it is necessary for civilization to move towards environmentally balanced development. At this point, it should be noted that the management system in world continues to improve, as well as in the field of environmental protection and public health [9].

In recent years, various enterprises operating in the field of environmental monitoring have been collecting rich information on the impact of harmful emissions into the environment, on the health of the population, and the public awareness of the public health dependence on the environmental situation. There is a need for an automated, computer-based computer system to keep the information obtained from environmental monitoring in an acceptable form for environmental protection workers [10].

Thus, environmental monitoring has been selected as the object of the research. The aim of the research is development an environmental monitoring system to assess the environmental situation, organize the use of fuzzy surveys.

2. Methods of research

Environmental Information System (EIS) is a hardware-software system that collects, processes, stores, exchanges, extends and implements coordinated environmental data. EIS is designed for the analysis and evaluation of environmental situations, forecasting and management, scientific and application of inverting. Its main function is to provide information to decision makers in the management process. The core of the EIS is environmental databases, data entry into the central database, automatic mapping systems with input subsystems, logical and mathematical data processing. The EIS is a layout system that describes the object information model - a system of layers of information and space components, such as administrative units, reliefs, environmental sources, hydrography, pollution indicators, and so on. Based on these, the process of changing the environment is performed to analyze the layers and to obtain additional information for making any management decisions. The main source of EIS is environmental atlases and maps, space and aero images, hydrometeorological and statistical data.

Global, nation-state (interstate), regional, municipal and local EIs are differentiated by location. Such systems can be designated to solve a particular type or multi-purpose complex issue (for example, natural resources or construction site assessment), which can be problematic.

In developed countries, information networks are created, thus facilitating access to various problem-oriented and spatial EDs.

The EIS allows for changes in the same area, such as green space, for different cities or different parts of the city. With the help of this type of system, it is possible to make different proposals for buildings proposed and to clarify the degree of greenery. The basis of EIS is, as we know, a database (VB) consisting of cartographic and factographic parts. The cartographic section includes electronic maps. These maps are composed of layers that contain different information of the same geographical location. Comparative analysis between EIs and these layers can be performed by means of special tools. The factual section includes tables with the following attributes:

– city area;
– cell number;
– upper right corner of the cell;
– upper left corner (street and house number, coordinates);
– lower left and right corner of the room;
– total area;
– sowing area;
– grazing area;
– the number of people living in this room;
the area of trees;
– the greening ratio, and so on.

As mentioned earlier, environmental monitoring:

– Quantity of pollutants in the air is determined to check the air quality. To ensure the quality of atmospheric precipitation, special installations are being installed to collect precipitation. Later in the sample, it was found that the solubility, chlorine, carbohydrate, nitrate, sulfate, etc. The amount of contaminants is determined.

– Radioactivity measurements are carried out in specific areas. Radiation measurement laboratories have been established mainly in the border areas.

– The composition of samples taken from time to time during the water pollution control is checked and the contamination rate is determined.

– The amount of the pollutant environmental monitoring devices in the soil sample is determined.

The data collected in the database should be implemented in such a way as to reflect the dynamics of the above-mentioned monitoring. It should be noted here that both the type of monitoring and the pollutant, the amount of contaminant and the degree of contamination, and the sampling date. However, we can see the results of the monitoring conducted in the same city at different dates, the dynamics of the change, and the cost of different monitoring in the same city.

Due to the wide area of the subject, the system user category can be:

– Organizations and individuals working in the field of ecology;
– Working group of organizations controlling the environmental state of the environment;
– Employees of manufacturing facilities;
– Employees of local and foreign companies whose watersheds are primarily available on the Caspian Sea and offshore; and so on.

As a result of researching the subject area, the issues of interest of the user groups were clarified. Users have been querying the system as follows:

– Determining the amount of environmental pollution of water, air and rainfall, radiation and soil content in a particular area;
– Determination of radiation, atmospheric air and precipitation, water and soil contamination at specific dates;
– Identification of areas with excessive levels of contamination within the area of contamination;
– Determination of contamination levels at the sites where inspections are carried out at regular intervals;
– Determining the time and place of monitoring for specific pollutants;
– Obtaining separate monitoring data.

The database has been created for the types of inquiries assigned.

3. Research results and discussion

3.1. Experimental procedures

To establish environmental monitoring computer systems, first of all, you need to find answers to these questions:

– What are the harmful effects of the “benefit - harm” function of the “locality” in the local environment considered? (unacceptable or unwanted);

– What degree of anthropogenic impacts, as well as the processes and impacts of natural disasters occurring in the natural environment, are acceptable to individual components or complexes of the environment, and what natural resources are available to restore the original adequate ecological balance?

– What level of anthropogenic impacts on the natural environment (or its components or complexes) is unacceptable or is a crisis limit? (the level of impact is considered to be the limit of the crisis when it is no longer possible to restore the ecological balance of the natural environment).

As a result, the information system to be built on modern information technologies must meet the following requirements:

– The information model of the subject area and the information requirements of the users should be fully reflected in the database;

– The integrity, consistency and security of the data collected in the database should be ensured;

– The excess of data stored in the database must be minimal;

– In addition to arbitrary and regular inquiries, the system should be able to handle fuzzy inquiries;

– The results of user surveys should be available in the format they require;

– Working with the system should be as simple and user-friendly as possible;

– Realization of the database should be based on a compactness model that is characterized by compactness, paying the required conditions, efficiency, easy implementation and management;

– Each software used in the evaluation process must meet the following requirements:

– Distributed information management applications that contain monitoring data should be able to store, archive, display for a preliminary review and compile reports that reflect general results;

– Have sensors or data-receiving applications directing measuring devices to perform data management functions;

– There should be equipment to prevent information loss and corruption;

– Must have software to prevent the effects of viruses and other harmful applications;

– These are more widely used in environmental monitoring systems, and they provide the following solutions:

– Modeling of environmental processes taking into account the level of anthropogenic impact;

– Preparation of reports;

– Preparation of forecasts about possible consequences of integrated economic information about economic activity;

– Risk assessment for existing areas in existing and projected facilities;

– Receiving, processing and compiling the results of local remote monitoring;

– Obtaining periodic data on environmental parameters to predict environmental conditions and so on.

In general, given the requirements, we can say that the following issues need to be addressed for the implementation of the information system:

– Study of subject area, existing documents and information materials;

– Creation of an applied model of the infrared field on the basis of user surveys and information analysis of the subject area;

– Creating a database that fully integrates the infotainment model;

– Create search algorithms and methods for researching and responding to user requests;

– Creating a search method to enable the processing of fuzzy inquiries, depending on the usage needs;

– Development of system software and databases in a reliable programming environment;

– Application of the system.

It is worth noting that the environmental monitoring information system can be divided into three levels: high, medium, low.

– Top-level – program modules to support decision-making;
– Medium level – software that enables systematic analysis of environmental information;
– Low level – organization of modules for processing of primary environmental information.

From bottom to top, decision-making density decreases. As you go from top to bottom, the system's functionality is reduced. As such, low-level environmental monitoring systems are only automated or mechanical, such as collecting, processing, storing data, displaying initial information, organizing simple queries. In the mid-level IS, however, new modules are added to the system for organizing data in multidimensional cubes, and for systematic data analysis. High-level monitoring systems also contain decision-making modules, thus making the decision-maker's work easier.

Taking into account the foregoing, an environmental information system has been established.

3.2. Conceptual schema of the database

An important step in the creation of each information system is the infographic model of the database. Depending on the selected information model, a VB conceptual scheme is established. The main purpose of the VB conceptual design is to manage the database user data accessible and independent of its database management system. That is, the user needs to synthesize the information that is to be collected, and then select the necessary form of description.

Structural elements and contents of the database were identified, and a relational model database was created and normalized by user surveys and information analysis of the subject area. A conceptual scheme that meets the requirements has been developed.

3.3. Database creation

In the implementation phase of an information (infrared) model, the types of attributes that have already been defined are defined, and the selection of the environment to which it will be created is correlated with the form specified in the conceptual scheme. Otherwise the calculated information will not be written to the database. The Sample Schedule, as we said, was created to keep up with the new monitoring results. The current date value of the system is set by default to the date attribute to relieve the user of the current billing calculation at any time.

Relationships should be established in such a way that they can meet the demand for complex queries. It is possible to create inaccurate queries using linked ratios.

The Monitoring and City tables do not contain duplicate data in columns. The other 2 ratios are duplicates in the moniName (monitor name) column, but not so much that it causes excessiveness. All tables are in the 1st normal form.

In general, the system consists of the following classes:

– The Uni.monitoring.dao folder contains an interface that names the methods and a class that implements this interface. Method codes are stored in this class.

– The Uni.monitoring.gui folder contains the Jframe components that make up the graphical interface and the background images of the login interface.

– The Uni.monitoring.main folder contains the main method. The entire system is run with this class.

– Uni.monitoring.model contains classes that store the attributes of tables stored in the database as variables

– The interface in the Uni.monitoring.service folder contains the names of the methods in uni.monitoring.dao and the types of data that the methods return in the class itself.

– For the sake of security, the main method class is called the appropriate method in the service folder. This method runs the code in the dao folder.

– The Uni.monitoring.util folder contains a class containing methods for linking the system with the database.

4. Conclusions

The research produced a database that structured environmental data. In the future, it can provide the necessary knowledge to forecast the level of environmental pollution.

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