Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 5, 2021, Pages. 1038 - 1043
Received 15 April 2021; Accepted 05 May 2021.

The Concept and Principles of Nature Pollution Monitoring

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Summary: Humanity will come early, and probably late, to the recognition of the need for international agreements to limit pollution and impacts on the biosphere according to the limits agreed for each country. Only such a radical way can prevent the development of a global ecological crisis on Earth. We have proposed a method for calculating the permissible pollution of the biosphere as a whole. According to our calculations, the annual mineralization and destruction of organic matter on Earth is accompanied by the formation of up to 9-12 billion tons of pollutants. In accordance with the ten percent rule, the permissible limit of all emissions on Earth is 0.9-1.2 billion tons. At present, emissions are 3-4 billion tons, and according to the latest data, 6 billion tons, i.e. 5 times higher than the permissible value. Countries' limits on technogenic pollution can be obtained by multiplying 0.9-1.2 billion tons on the relative contribution of their phytosphere to the annual bioproductivity of the Earth.

Keywords: environmental monitoring, phytoindication, bioresources, algorithmic processing

Based on the ISR model (impact - state - response), a new scheme for environmental monitoring of coastal ecosystems is given, consisting of 3 blocks: monitoring of the study of the impact of pollution sources; monitoring the state (quality) of the environment, monitoring the effects of influence on aquatic organisms. Based on the results of monitoring the impact, an assessment was made of the use of coastal ecosystems by fisheries in terms of stock indicators, the cost of a stock of biological resources, as well as specific indicators of the stock and the cost of a stock of biological resources. The use of coastal ecosystems as bioreactors for wastewater treatment in industry and communal services is assessed by integral indicators: the amount of damage caused to biological resources; environmental indicators - specific indicators of the damage caused, specific indicators of the mass of discharged pollutants; environmental indices - indicators of the total excess of the MPC of pollutants entering the waters of the bays from pollution sources.

According to the damage caused, the ecological state of the bays and their zones is classified. Assessment of the state of the water column in coastal areas is carried out according to the following indicators: temperature, transparency, color, PH, salinity, suspended matter,

dissolved oxygen, content of heavy metals, radionuclides, oil hydrocarbons, biotesting. In bottom sediments, the following are determined: particle size distribution, redox potential, content of heavy metals, radionuclides, petroleum hydrocarbons, biotesting. Studies to assess the response of biota are based on two approaches: bioindication and biotesting. The number, species composition, species diversity, physiological and morphological parameters of plankton and the accumulation of heavy metals and radionuclides in benthic organisms are determined. Associated analysis of the ecological state of the inner bays of the bay. Peter the Great is conducted on the basis of a comparison of BCO indicators. Recorded biota responses are acute effects. The information obtained as a result of monitoring has design features, is an information resource, and can be used in the development of environmental protection measures.

The object of this work is about the need for holistic environmental monitoring according to the BCO model: assessment of the impact of pollution (pressure) - state of the environment (state) - biota response (response).

Concentration of primary information in state reports "On the state of the environment of the Republic of Uzbekistan" and systematization of certain types of environmental information according to rank assessments does not mean the use of environmental indicators to introduce system concepts into economic and social policy.

There is now a great need for reliable, quantitative indicators of economic activity and environmental quality. These indicators have not yet been developed; an intensive search is underway for them. Practical, forward-looking ecosystem management is based on an understanding of how natural ecosystems function, their value and the cost of preserving them.

The Working Group “on Assessing the Use of World Ecosystems and World Wealth: Towards Dynamics and an Integral Approach, with the support of the National Center for Environmental Analysis and Synthesis (NCTAS), has defined environmental and economic concepts in assessing ecosystem use and has developed a number of indices characterizing the economic value of the environment ... These include: full ecological footprint - “measure of impact” and ecological deficit - “measure of maintenance”. Much attention in these works is paid to the problem of integrating assessments of economic and biological systems and modeling research. The environmental indicators developed in the EEC are an integrated assessment of the state of the environment and are seen as a means to improve the efficiency and consistency of research and to strengthen the interaction between science and policy. In Uzbekistan, the system of environmental indicators is just beginning to form. The functional system of environmental indicators corresponds to the WZO model developed by the Organization for Economic Development and Cooperation. To a greater extent, environmental and economic indicators are present in the “impact” section. The priority environmental problems of this model include “aquatic environment” and “bioresources”.

Systemic fisheries ecological monitoring is based on the fact that the natural environment, biological resources and humans are irreversibly linked and involved in production. In this

case, the purpose of monitoring is to assess the impact of pollution, the state of the environment and the response of aquatic organisms, predict the consequences, calculate compensation costs and make decisions on the safety of bioresource potential, since renewable marine bioresources under the influence of anthropogenic pressure become exhausted, and measures are required to protect them. and artificial reproduction. Environmental monitoring of this direction is carried out according to the block type, in which preference is given to environmental-economic, biological methods, express analysis and integral assessments.

The WCO model assumes 3 blocks of research: monitoring the impact of pollution sources; monitoring of the state (quality) of the environment; monitoring the effects of influence on aquatic organisms. Monitoring the impact of anthropogenic pollution on biological resources and the natural environment is a difficult task, the solution of which requires taking into account many interrelated characteristics of different quality. The initial data are: the quantitative and qualitative composition of the discharged wastewater, the stock of biological resources of the investigated water body, wholesale prices for biological resources, the biologically active volume of water in the water area.

The average annual availability of biological resources was taken on the basis of forecasts of the possible catch of commercial aquatic organisms in the Far Eastern basin, stock materials, the results of expeditionary studies of biological laboratories of the TINRO Center, scientific publications and, in some cases, expert assessments of the staff of the TINRO Center. Wholesale prices for biological resources were determined on the basis of an analysis of extensive materials on the sales of Russian products from manufacturers, importers and intermediaries of primary wholesalers in the APR markets. The calculation of the cost of biological resources was carried out using the Microsoft Excel program.

On the other hand, there is a wide range of works and studies (EIA, monitoring), where environmental impact assessment is still used using physicochemical analyzes of various objects and samples (air, water, soil, plants) and comparing the obtained indicators with MPC, MPD or background levels of ingredients. Consequently, a contradiction arose: modern ecology scientifically substantiated the ecosystem approach in solving problems of nature protection and proclaimed the priority of its methods of studying them, and in practice, the anthropocentric methodology of nature protection and non-ecological standards of permissible environmental pollution are still used.

This situation forced researchers and us to search and develop methods for bio- and phytoindication of environmental pollution and the state of biota and communities. It is known that the most significant factor affecting humans, the food chain and nature in general is the violation of the chemical composition of the surface layer of the atmosphere. Air pollution significantly affects the resistance of the human body, which directly leads to morbidity and negative physiological changes in the body. Breathing in polluted atmospheric air is a process as a result of which the body is not able to defend itself and a large amount of harmful pollutants, in particular suspended matter and dust of various fractions, directly enter the lungs. The formation of air flows in a city is influenced by the density of buildings, the

height of buildings, the terrain, the width and configuration of streets, their location and many other factors that must be difficult to take into account when solving problems of environmental monitoring. The issues of protecting the air environment in the zones studied in the article from environmental pollution are associated with significant costs, therefore, they require an integrated science-based approach.

First of all, to solve this problem, it is necessary to create mathematical models that describe the processes of air pollution. In tandem with the environmental monitoring service, mathematical modeling makes it possible to monitor the state of the atmosphere at the current moment, as well as to predict dangerous periods of peak environmental pollution in cities.

The author notes that today there are many software products developed for the purpose of cartographic support and visualization of environmental studies. The use of computer software products, known for convenient graphical tools, makes it possible to create a cartographic array of environmental data obtained in order to regulate and ensure environmental safety in the studied territories. Modern scientific research in the field of environmental safety is aimed at reducing the possible negative impacts of facilities under construction and already in operation, aimed at meeting the permissible norms of impact on the natural ecosystems of territories.

Based on the foregoing, it is proposed to conduct a comprehensive monitoring of the urban ecosystem using environmental modeling using GIS technologies, which allows the development of ecological-geographical maps of the urban environment. Combining the results of the study with a digital map of the city makes it possible to assess the level of environmental hazard of the area under consideration in order to further monitor these areas using a mobile laboratory.

The following research methods were used: bioindication and chemical-analytical, methods of statistical and algorithmic processing of research data, methods of landscape-ecological analysis, methods of thematic mapping, methods of mathematical modeling.

In the scientific work, an integral assessment of the quality of the ecological situation of the urban environment was carried out, including the compilation of isolinear maps based on bioindication data, reflecting the zones of high ecological tension, and the construction of overlays of the pollutant concentration fields in the obtained zones, using the methods of mathematical modeling of the territorial distribution of pollutants.

The first stage of research involved the organization of an ecological and biological approach. The selected ecological and biological indicators reflect the nonspecific responses of biological systems to various types of anthropogenic influence. This allows us to consider them as indicators of the integral action of anthropogenic factors.

To assess the state of various components of the urban environment, both lower plants (communities of epiphytic lichens) and higher (herbaceous cover and woody vegetation) were used as groups of bioindicators. The description of the higher vegetation was carried out according to the compiled form at 19 key areas, which included descriptions of the stand,

undergrowth, grass cover, as well as the projective cover of mosses and lichens. In addition, 107 soil samples were taken and about 2,875 dandelion leaves were collected. By identifying changes in the characteristics of plant objects, one can judge the pollution of the environment and predict the danger of environmental threats to humans.

The assessment of the state of soils in urban areas was carried out by analyzing morphogenetic changes in plants using the method of fluctuating asymmetry (FA) of the dandelion (Taraxacum officinale Wigg) leaf blade. In order to create a database containing information on the ecological characteristics of soils and vegetation, the points of sampling of plant and soil samples were spatially coordinated using GPS technologies.

The second stage of research involves the construction of an overlay of pollutant concentration fields in the area of a major city highway located in the pre-risk zone identified at the first stage of research. To assess the concentrations of components of transport emissions into the atmosphere, we used models for calculating turbulent diffusion of varying degrees of complexity, taking into account the influence of various natural and climatic factors on the dispersion of pollution, as well as the terrain, development of the territory, characteristics of the underlying surface and processes occurring in the atmosphere.

At the initial stage of the development of the monitoring system, a simplified model for calculating the concentration of pollutants based on the calculated solution of the equation was used. This model takes into account the influence of the following factors on the spread of harmful substances (HE) in the breathing zone of people (2.0 m): emission of substances from a pollution source per unit of time (kg / h), spatial coordinates, wind direction and speed, ambient temperature (K), the initial rise of impurities (m), as well as a change in the coefficients of turbulent diffusion with a change in some of the above parameters.

However, the lack of accounting for the development of the territory in this model significantly affects the scope of its application. An acute ecological situation also arises in the closed volumes of courtyard territories: under the conditions of cramped buildings, so-called stagnant zones are formed, where in calm weather there is practically no forced wind transfer of pollutants impurities and dispersion of emissions is carried out due to natural convection. Therefore, it becomes promising to increase the adequacy of the model, which makes it possible to take into account the development of the territory for the final distribution of the pollutant concentration fields in the considered monitoring site.

It should be noted that the models used are universal in nature, and their binding to the conditions of specific objects and regions is carried out, as a rule, at the level of input information (values of pollutant emissions, parameters of the adjacent territory development, climatic factors). This means that for the practical use of models, it is required to create a special information base containing information on the geographic and climatic conditions of the objects under study.

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