



АВТОНОМНАЯ НЕКОММЕРЧЕСКАЯ
ОРГАНИЗАЦИЯ «НАЦИОНАЛЬНЫЙ
ИССЛЕДОВАТЕЛЬСКИЙ ИНСТИТУТ
ДОПОЛНИТЕЛЬНОГО ПРОФЕССИОНАЛЬНОГО
ОБРАЗОВАНИЯ» (АНО «НИИ ДПО»)

АКТУАЛЬНЫЕ ПРОБЛЕМЫ И ПЕРСПЕКТИВЫ РАЗВИТИЯ МИРОВОЙ НАУКИ И ТЕХНИКИ: СОСТОЯНИЕ, ПРОБЛЕМЫ И ПУТИ РЕШЕНИЯ

Материалы XV Международная
научно-практической конференции

30 ноября 2023 г.

Серия: естественные и технические исследования

Издательство "ПАРАГРАФ"
г. Ставрополь – 2023



AUTONOMOUS NON-PROFIT ORGANIZATION
"NATIONAL RESEARCH INSTITUTE OF
ADDITIONAL PROFESSIONAL EDUCATION"

CURRENT PROBLEMS AND PROSPECTS FOR THE DEVELOPMENT OF WORLD SCIENCE AND TECHNOLOGY: STATE, PROBLEMS AND SOLUTIONS

Materials of the XV International
Scientific and Practical Conference

November 30, 2023

Series: Natural and technical research

**PUBLISHING HOUSE "PARAGRAPH"
STAVROPOL – 2023**

УДК 001.8
ББК 72.4
Ц 75

Печатается по решению оргкомитета
XV Международной научно-практической конференции
**«АКТУАЛЬНЫЕ ПРОБЛЕМЫ И ПЕРСПЕКТИВЫ РАЗВИТИЯ МИРОВОЙ НАУКИ И
ТЕХНИКИ: СОСТОЯНИЕ, ПРОБЛЕМЫ И ПУТИ РЕШЕНИЯ»**, протокол заседания
оргкомитета № 195-НТ от 08.11.2023г.

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XV Международной научно-практической конференции (г. Ставрополь,
30 ноября 2023 г.). Серия: естественные и технические исследования –
г. Ставрополь, ООО "ПАРАГРАФ", 2023. – 231с.

ISBN 978-5-6051192-4-1

Сквозь призму научного поиска в данном сборнике представлен широкий круг исследований естественно-научного и инженерного профиля, в том числе авторские научные работы, касающиеся цифровизации и информатизации производственно-технических и учетно-аналитических процессов дифференцированно по отраслям народно-хозяйственного комплекса (включая специфику сельскохозяйственного производства), исследования в сфере анализа организационно-технических и технологических особенностей различных бизнес-моделей. Материал сборника, кроме того, дает панорамное представление о различных актуальных аспектах изысканий в области фундаментальной физики и химии, научно-исследовательских подходах к изучению техногенного воздействия на окружающую среду, а также способов мониторинга и контроля экологической обстановки. Раздел, посвященный организации и функционированию системы здравоохранения, содержит статьи, характеризующие особенности применения экспериментальных терапевтических схем; содержащие подробный разбор клинических случаев, обзоры современных здоровьесберегающих технологий, а также авторские работы, популяризирующие передовые методики в сфере физической культуры, восстановительной медицины и спорта.

Издание может быть интересно для представителей профессорско-преподавательского состава высших учебных заведений различного профиля, научных сотрудников отечественных и зарубежных исследовательских учреждений, а также для широкого круга читателей, интересующихся общенаучной проблематикой и теми направлениями научного поиска, которые актуальны в академической среде.

Материалы публикуются в авторской редакции. Все включенные в сборник статьи прошли научное рецензирование и опубликованы в том виде, в котором они были предоставлены авторами. За содержание статей ответственность несут авторы.

ISBN 978-5-6051192-4-1

УДК 001.8
ББК 72.4

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АНО «НИИ ДПО», 2023

USING FORESIGHT IN ENVIRONMENTAL FORECASTING

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The article presents the analysis of environmental forecasting methods and the content of these methods for predicting the consequences of environmental problems and crises. The necessity of using foresight technology in ecological forecasting and its content are highlighted. The effectiveness of using foresight is based on the development of scenarios and strategies for environmental sustainability in Uzbekistan.

Keywords: ecology, prediction, method, foresight, technology, scenario, strategic plan.

In developed countries, long-term strategic development programs of the state or region are developed on a scientific basis based on the achievements and results gained in recent years, as well as the problems that have arisen [1]. Several methodological and organizational principles and technologies are used in strategic planning. As the main of such technologies, Foresite technology has been widely used in recent years. Foresight is a science-based technology for predicting the strategic development of technology, technology, economy and society in the long-term future, aimed at bringing the most economic and social benefits based on high probability.

In the research process, the analysis of scientific and teaching-methodical literature, pedagogical observation, comparative analysis, generalization, pedagogical experiment-test and foresight methods were used.

Forecasting, in short, is special scientific research to determine how a certain process will develop in the future [2]. The need for ecological forecasting is to study what the future state of an ecological problem will lead to on the basis of scientific research. Accordingly, forecasting principles are divided into the following types: statistical (errors in current assessments), probabilistic (variability of future events), empirical (methodological errors in the future model) and philosophical (limitation of current knowledge).

The degree of accuracy of the prediction results depends on the following criteria:

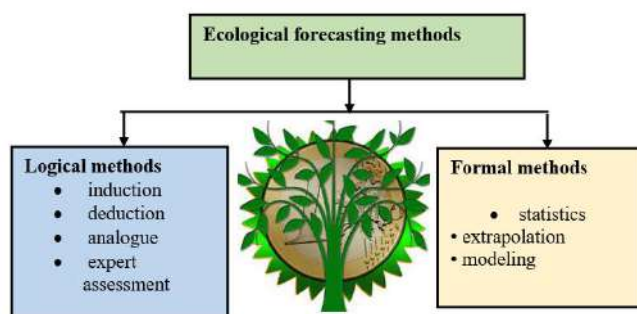
- The amount of "real" data (confirmed with fixed errors) and the period of their collection;
- unconfirmed initial data and the period of their collection;
- characteristics of the predicted object (problem) and its interaction with the subject of prediction;
- forecasting methodology and its model.

It is divided into the following types:

according to the term: short-term, medium-term and long-term;

according to scale: private, local, regional, sectoral, within one country and global;

In practice, the methods used in environmental forecasting are divided into the following two groups: logical ("logic") and formalization ("formalizovannyye"). Taking into account that ecology, including issues of rational use of nature, develop depending on complex connections, that is, nature and socio-economic relations, the following logical (logical) forecasting methods are primarily used in ecological forecasting: inductive, deductive, expert assessment and method of analogues.



Picture 1 - Ecological forecasting methods

The inductive method is widely used in studying the reasons for connection between objects and events. In this method, research begins with the collection of factual data and the identification and generalization of similarities and differences between objects. For example, weather forecasting requires first observation and measurement of climate parameters, and then daily weather is predicted based on this research data.

The deductive method is predicted based on general laws, analysis and conclusions based on specific facts. This method is used to determine the strategy of forecasting research. Intuitive and deductive methods are used in conjunction with each other.

The expert assessment method is based on studying the opinions of experts in this field in the absence of reliable information about the predicted object. There can be individual and collective expert examinations. Statistical, cartographic and other materials are used in forecasting using the expert evaluation method.

The method of analogues is based on applying the development laws of one process to another process with certain changes. This method is mostly used in local predictions. For example, when predicting the impact of a newly built chemical industrial enterprise on the environment, it is possible to use the data of previously built and operated chemical enterprises in this environment.

Formalization methods [3] are divided into such types as statistical, extrapolation and modeling. The statistical method relies on quantitative indicators in order to determine the level of future development.

The extrapolation method is based on predicting the future state of the development character of a given area. For example, as a result of the operation of a chemical plant, the surrounding air began to be polluted, as a result of which the consequences of climate change in this environment are predicted. Dynamic series is the basis of the extrapolation method. Dynamic series refers to data obtained as a result of many studies over a period of time.

An analysis of many scientific researches on ecological forecasting shows that at the current stage of development of ecology, forecasting mainly consists of 4 paradigms: verbal, functional, sketch and imitative. (Paradigm (Greek - "example, template") is a set of scientific achievements. A paradigm is recognized by the scientific community at one time or another and should serve as a model basis for new scientific research [4].

The verbal paradigm is the first emerging model in ecological prediction. The verbal paradigm is implemented on the basis of causal information, with the help of the expertise of professional ecologists. It does not use mathematical calculations.

The functional paradigm is based on the functional approach to environmental forecasting, regression, correlation and factor analysis, the theory of experimental planning, evolutionary modeling, time series analysis, and cluster analysis. This paradigm is mainly used for short- and medium-term environmental forecasting. A model of the future is created using differential equations and laws of probability theory in ecological forecasting based on the sketchy paradigm. A sketchy paradigm is based on quality indicators and has high generality. The simulation paradigm is based on systematic

analysis and simulation modeling of complex systems in environmental forecasting. This paradigm is used to predict the state of the biosphere. The term "Ecological foresight" (environmental foresight or environmental futures projects in English) means scientific research on the environment and nature protection using foresight technology [5].

Eco-foresight is a relatively new term in Uzbekistan. Forecasting the future on the basis of foresight can be similar to or similar to the production of environmentally friendly products or "Green Space" activities. Only these activities are carried out in order to improve ecology [6]. And foresight, initially, predicts on a scientific basis what the development of current environmental problems will lead to in the future, for example, in 10 or 30 years, creates future scenarios [7] and models, develops long-term strategic plans, concepts, and implements them to eliminate these crises, provides for provision and control.

As a result of high-level scientific and technical progress, future specialists are required to have the ability to draw up scenarios for the development strategy of a specific enterprise, institution, company for environmental protection based on the results of long-term scientific forecasting and forecasting of the consequences of environmental pollution [8]. The use of foresight technology is the most effective and reliable in the development of such long-term strategies, concepts and technological roadmaps. For this, formation and development of "Eco-foresight competence" in future specialists is required. For this purpose, in 2019, the draft Presidential Decree No. ID-3800 on "Establishing foresight centers in leading higher education institutions of the Republic of Uzbekistan" was prepared and discussed.

On the basis of the above analytical data, it can be concluded that in the higher education system of Uzbekistan, providing sufficient information about foresight technology in the training of competitive specialists in line with world standards, including subjects related to foresight in the block of elective subjects of the curriculum, their foresight development of competence and formation and development of "Eco-foresight competence" in future ecologists is the need of the hour. However, until now, in Uzbekistan, scientific-research works have not been carried out and dissertations have not been defended in order to obtain the scientific degree of doctor of philosophy (PhD) and doctor of science (DSc). Foresight topics on the formation and development of "Eco-foresight competence" in future ecologists are not included in the curriculum of specialized subjects or as a separate subject in the block of elective subjects of the curriculum. For this reason, training of professional ecologists in higher educational institutions in Uzbekistan who can see the future and can correctly predict the consequences of enterprises or organizations' impact on the environment, and scientific justification of the methodology of formation of eco-foresight competence in them is relevant and important. is one of the most important issues.

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ИСПОЛЬЗОВАНИЕ ФОРСАЙТА В ЭКОЛОГИЧЕСКОМ ПРОГНОЗИРОВАНИИ

Шомуротов Б. Х.

В статье представлен анализ методов экологического прогнозирования и содержания этих методов для прогнозирования последствий экологических проблем и кризисов. Освещается необходимость использования технологии форсайт в технологическом прогнозировании и ее содержание. Эффективность использования форсайта основана на разработке сценариев и стратегий обеспечения экологической устойчивости в Узбекистане.

Ключевые слова: экология, прогнозирование, метод, форсайт, технология, сценарий, стратегический план.
