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THE USE OF MATHEMATICAL METHODS AND MODELS IN DETERMINATING THE EXPEDIENCY OF CHOOSING PROTECTIVE STRUCTURES

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Abstract. The work uses mathematical methods and models to determine the expediency of choosing protective structures based on various criteria. It also considers the advantages and disadvantages of some standard mathematical methods and models.

Formulation of the problem. The work aims to determine the practicality of choosing protective structures using mathematical methods and models and consider their operation features, advantages, and disadvantages.

Introduction. The relevance of mathematical methods and models in determining the practicality of choosing protective structures due to several factors is relatively high. First, mathematical methods and models play a crucial role in ensuring the state's infrastructure's safety, efficiency, and stability in various threats. They consist of the following. Methods and models allow for a comprehensive analysis of potential risks, including natural disasters, artificial accidents, military conflicts, and other threats. This contributes to the informed choice of buildings capable of minimizing risks and protecting people's lives and health.

Effective use of limited resources, including finance, materials, and land, is always critical. At the same time, mathematical models help optimize resource allocation and ensure the highest possible efficiency of protective structures at minimal costs. Since conditions and threats to the population's life can change, it is essential to adapt strategies to protect against adverse effects on human health. Therefore, it is advisable to use mathematical methods and models that provide tools for evaluating options that can be quickly adapted to new modern conditions.

Relevance of work. Mathematical methods and models are quite relevant in determining the expediency of choosing protective structures due to several factors. First, mathematical methods and models play a crucial role in ensuring the safety, efficiency, and stability of the state's infrastructure in various threats.

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Main part. Many uncertainties and complex technical data often accompany the decision-making process regarding protective structures. Therefore, mathematical models help structure this information and emphasize vital factors contributing to the informed choice of practical solutions. Such models and methods allow the assessment of current needs and predicting future requirements for protective structures, which helps in planning long-term strategies for developing infrastructure and protection.

These aspects emphasize the importance and relevance of using methods and mathematical models to select and develop protective structures that ensure maximum safety and efficiency under various threats.

The scientific novelty of methods and mathematical models in determining the expediency of choosing protective structures consists of integrating artificial intelligence and machine learning, developing complex multicriteria models, and using simulation models and virtual reality. At the same time, developing adaptive models that use machine learning algorithms to predict and adapt to changing threat conditions in real time is considered quite important.

Artificial intelligence is used to automate big data analysis, identify potential risks, and optimize decisions on the placement and construction of protective structures. Together with multi-level analysis, it provides an opportunity to expand the range of criteria, including economic efficiency, environmental impact, social significance, and technical reliability. Developing modern models that can be scaled and adapted to various conditions and needs provides a wide range of applications for local and global projects.

Simulation models and virtual reality allow virtual testing and evaluating the effectiveness of protective structures in various conditions and scenarios. This improves project understanding and facilitates effective decision-making.

Thus, scientific novelty in this area involves developing various risk assessment methodologies, improving data analysis techniques, and constantly updating knowledge about new threats and technological opportunities. All this is aimed at increasing the efficiency, safety, and stability of protective structures in response to the growing challenges of the modern world.

Conclusions. The work describes the practicality of determining the choice of protective structures using mathematical methods and models. It considers the peculiarities of their operation and the advantages and disadvantages of their use.