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## **APPLICATION OF ECONOMIC-MATHEMATICAL MODELLING IN THE SYSTEM OF TRAINING OF THE CIVIL PROTECTION SPHERE EMPLOYEES**

In XXI century world economy shifted to the qualitatively new stage of its development which is based on the informational technologies and computer networks. So far, there arises the need for quick processing of increasing quantity of data during a short period of time, a speedy and adequate reaction at the formation of new data, keeping large amounts of informational massive. All this makes ground for the qualitative changes in the management of the Civil Protection sphere processes at all levels of hierarchy.

A significant contribution into the development of practical application of methods of mathematical modelling in economy was made by such scientists as B. Burkins'kyi, V. Vovk [2], T. Ivashchuk [4], Ya. Honcharenko, M. Pratsiovytyi [3] etc. Using economic-mathematical methods, they created their theories, carried out practical analyses, gave valid conclusions, forecasted and estimated risks of multiple economic phenomena and processes.

The majority of the above-mentioned scientists researched in their scientific papers different trends of socio-economic processes, analyzed existing economic-mathematical methods and models. However, the peculiarities of the application of economic-mathematical methods and models in the system of training of Civil Protection sphere specialists and during the research of indicators in the Civil Protection sphere are not studied.

A mathematical model can be displayed as an internally closed system of mathematics relations without controversies which serves as an efficient tool of representation of a certain class of qualitative and quantitative characteristics inherent to the studied economic process or phenomenon. It broadens our presentation about the consistency and interrelations and helps to form scientific thinking and skills of comparative analysis at a new, higher level. Thus, to study peculiar characteristics of the class of mathematical models applied in economy, the term «economic-mathematical modelling» is used.

Today, the pressing need and perceptiveness of the methods of economic-mathematical modelling in the research and prediction of economic processes are airtight. Their application is a significant trend in the improvement of not only economic analysis but also the analysis in the Civil Protection sphere. In modern economy, economic-mathematical methods are widely spread because of a high

level of development of production, acceleration of pace of scientific and technical progress and informational technologies development [1].

The target of teaching of the subject «Economic-Mathematical Methods in The Civil Protection Sphere» for the future Civil Protection specialists is to form the system of knowledge on the methodology and tools for the construction and application of economic-mathematical models of different types in the Civil Protection sphere. The task of the course on the subject of «Economic-Mathematical Methods in The Civil Protection Sphere» is to study main principles and tools of problem setting, to construct economic-mathematical models, methods of their solving and analysis with the aim of their practical application. As a result of studying of the course, a future Civil Protection sphere specialist should:

- know: main theoretical and methodological principles of economic-mathematical research of qualitative and quantitative laws governing socio-economic phenomena and processes and apply the knowledge in practice;
- be able to: use main methods of modelling, construct economic-mathematical models, calculate on their basis summarizing indicators;
- apply: obtained results of researches to validate managerial decisions in the Civil Protection sphere and predict progress perspectives.

Taking into consideration above-mentioned, it is obvious that economic-mathematical modelling as an educational subject combines the theory of four subjects – Economy, Mathematics, Computer Sciences and Civil Protection. Economic-Mathematical Methods in The Civil Protection Sphere as a course teaches how to apply acquired skills to solve particular production or other problems, the basic aim of which is crisis-less stable operation of certain institutions by any changes in the external market environment. It is evident that economic-mathematical modelling as a methodology and tools by no way challenges the above-mentioned subjects and compete with them, actually it synthesizes and complements them. In foreign journals and monographs it is obligatory to use mathematical terminology to solve the tasks of socio-economic development. International practice convinces us in the high efficiency of mathematical methods application by solving multi-level problems and economic growth direction, as well as by the research of the mechanisms of functioning of the financial, banking and other systems.

The application of methods of economic-mathematical modelling is one of the perspective lines of research in the Civil Protection sphere which not only helps to evaluate the process from the point of view of its quality but to reasonably assess quality as well.

The application of economic-mathematical methods and models in the Civil Protection sphere make it possible:

- to give precise and brief Civil Protection Service provisions;
- to formally describe relations between the Civil Protection variables;
- to solve problems of optimum planning and management reflecting specific properties of indicators in the Civil Protection sphere;

- to react timely at the changes in the goals, resource constraints, and adequately adjust plans and managerial decisions;
- to obtain information about the entity, its operation;
- to predict the object and its behavior in the future.

An adequate model construction and efficient application of economic-mathematical models must be a subject of the independent science «Economic-Mathematical Methods in The Civil Protection Sphere» which, as well as Economy, has its own theoretical, «political» (methodical and methodological) and practical (result-oriented – application of models in the Civil Protection sphere) components. Thus, it is possible to speak about the existence of «economic-mathematical» triangular in the Civil Protection sphere: «the theory of modelling» – «methodology and techniques of modelling» – «the practice of construction and application of models».

Mathematical methods and models used nowadays by conducting analysis of the indicators in the Civil Protection sphere may be classified into the following groups:

1) methods of correlation-regressive analysis are used by the analysis of the indicators in the Civil Protection sphere to detect the forms and penetration of relations between different parameters of the researched object, the character of functional dependence between which is not established. In most cases, this relation is scholastic. The correlation expresses a probable dependence between variable parameters of the algorithm of relation. The correlation dependence can be detected both between two quantitative parameters – pair correlation and between many – multivariable correlation;

2) methods of mathematical programming are for the optimization of agricultural activity and they let evaluate the level of development of the potential, identify resources that limit «bottlenecks», competitive level and scarcity. Methods of mathematical programming include linear and dynamic programming. Methods of linear programming are used to solve many optimization analytical tasks in which functional relationships of the researched phenomena and processes are determined. The task of the linear programming by conducting economic analysis is a search for the extreme value of the researched parameters of the object which deliver maximum or minimum of the criterium by the resource constraints.

3) methods of dynamic programming are used when solving optimization tasks where the objective function or limitations are characterized by nonlinear relations. These methods are applied when researching scholastic factor systems; matrix methods and models of economic analysis based on the linear and vector-matrix algebra, used when modelling complex economic structures.

The most widespread up-to-date models of the economic analysis are as follows: input-output balance model; multicriteria optimization matrix; key matrix etc. As a part of other economic-mathematical methods and models, nowadays the

following ones can be distinguished: mathematical games theory; mathematical waiting theory; operations research; fuzzy sets theory etc.

Thus, it is summed up, that modelling of processes in the Civil Protection sphere is used both for the assessment of statistics or comparative statistics, and for the analysis and forecast of their dynamics for the short-term and long-term outlook.

A wide application of mathematical models is an important trend in the improvement of the analysis of the indicators in the Civil Protection sphere which increases the efficiency of taking managerial decisions in the Civil Protection sphere. The main reason of the rapid increase of the methods of economic-mathematical modelling is a drastic complication of the modern economic practice, rate of growth of scientific and technical progress, requirements as to the increasing of the efficiency of using natural resources.

The economic-mathematical modeling in the Civil Protection sphere can be taken to be a set of tasking which can be solved in three steps. The first step is the determination of the application and specific features of the models, mathematical tools and information support which are to be used in the research, main trends and tendencies in the development and application of the models, trends and methods of conducting the research. The second step predetermines the research of the models, detecting and assessment of capability for the economic-mathematical tools for the analysis of the indicators. At the third stage, the feasibility and necessity in the development of the models is researched, coherence in their operation is secured, the project of the model of the investigated system is developed.

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