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УДК 004.94

MODELING OF GEO-PHYSICAL AND CHEMICAL PARAMETERS OF HYDROOBJECTS OF THE WATERWAY FROM THE BALTIC SEA TO THE BLACK SEA

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The paper proposes a project to study the state of the geological environment, including vegetation and, in particular, forest cover. A project is proposed to study the state of the environment using mathematical modeling methods: stress-strain state and thermal processes in geophysical studies along watercourses in the direction of the Vistula-Dniester. It is proposed to conduct research to obtain data for ecological and geophysical engineering related to civil safety on the waterway from the Black Sea to the Baltic Sea. It is expected to obtain low- and medium-resolution aerial and satellite images, in particular, data from unmanned aerial vehicles during the construction and operation of the geo-information system under development. To increase the level of safety of the population related to civil protection and fire safety on the waterway under study. To use the geophysical information system to solve problems in the river basin of the waterway from the Baltic to the Black Sea, taking into account the seismicity and thermal state of the region. Improve the in formativeness, efficiency, and reliability of decision-making, allowing for the preservation of civilian objects and buildings in conditions of natural and man-made threats on the waterway of the planned canal from the Black Sea to the Baltic Sea along the Vistula-Dniester river line.

The development and testing of a geo-information system and its use in the organization of business process management is proposed.

The research analyzes the regulatory and legal framework for geo-information systems, the use of methods for monitoring information provision processes, measurements based on data from drone aircraft, decision modeling, and forecasting the results of modeling using models. The scientific novelty of the results obtained is based on the development of a geographic information system at L'viv State University of Life Safety and the development of methods for its use in studying the waterway from the Baltic to the Black Sea. Assessments of the waterway and destination areas using drone aircraft are proposed.

In the context of geophysical exploration, the line of rivers connecting the Baltic Sea with the Black Sea will be investigated. A well-known reference from published information can be found in the article (Ziolo et al., 2013; Kazanski 2016). The publications mention archaeological evidence of waterways connecting the Baltic Sea with the Black Sea.

In the late Roman period, during the Great Migration, there was a river route connecting the Pontius (Black Sea) with the Baltic Sea via the Vistula, Western Bug, and Danube rivers. The article (Kuźniar et al., 2006) provides an assessment of the navigability of the Vistula between Płock, Poland, and Warsaw, including the Żerański Canal and the lower Western Bug. It analyzes the hydrology and geomorphology of the rivers, the state of the infrastructure, and identifies restrictions on navigation. The article (Witkowski & Konrad, 2024) considers projects for the construction of a transport link from Vistula to Dniester as

infrastructure heritage. In this study, the issues of concept, implementation, environmental impact, and current status of the project remain open. An analysis of the current E40 project is provided in the article (Hurska, 2020), where the E40 project – the Gdansk-Kherson waterway – is discussed on the initiative of the EU and partner countries with the aim of creating an inland waterway through the Vistula, Western Bug, and Dnipro rivers. A report on the technical and economic feasibility and preliminary assessment of the project has also been published (Final Report, 2025). The report "Restoration of the E40 inland waterway..." draws conclusions about the route, environmental risks, budget, and infrastructure changes. According to the aforementioned source, a plan for the green restoration of the Vistula River basin (Western Bug and San River basins) was presented in Ukraine, which was developed to assess the ecological and geophysical condition of the Western Bug-Vistula River basin. First and foremost, it includes an analysis of anthropogenic impact in the context of water transport on the land part of the route.

It is proposed to carry out a research project as a continuation of scientific research conducted at L'viv State University of Life Safety. The work is aimed at solving the problem of forecasting natural disasters and man-made conditions in cases where it is necessary to obtain long-term and short-term predictions of the state of the Earth's crust and objects along watercourses in the direction of the Vistula – Dniester from the Baltic to the Black Sea, conducting specialized computer processing and providing current information to state emergency services.

The latter is proposed to be achieved through interactive processing of observation data using drone aircraft observations. At the same time, the use of Earth monitoring systems makes it possible to predict and warn of natural disasters and cataclysms. The use of observation data in combination with emergency modeling and the combination of aerial and ground-based observation means allows for the identification and prediction of dangerous geophysical phenomena and the operational monitoring of data in threatened geological areas of the planned Baltic Sea–Black Sea waterway.

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