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**SCIENTIFICALLY SUBSTANTIATED
RECOMMENDATIONS OF WATER MANAGEMENT OF
KATLABUKH LAKE UNDER CURRENT AND FUTURE
CLIMATE CHANGE**

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The relevance of the work is related to the study of water and salt regimes of the Danube Katlabukh Lake, which is one of the sources of water supply in the southern region of Ukraine. In this case, the hydrological regime of the lake is poorly understood, and some components of the water and salt balance do not have systematic observations, which requires the development of methods for their assessment and determination. In recent decades, water exchange in the lake, as an artificially regulated reservoir, has deteriorated, leading to a critical decrease in water levels and an increase in the mineralization of water in it. This has led to restrictions on the use of lake water for water management and drinking water supply [1]. Therefore, one of the important tasks is the restoration and rational use of the natural resources of Katlabukh Lake, improving its hydrological and hydrochemical regimes in the interaction of natural and anthropogenic factors and in the conditions of present and future climate fluctuations, developing recommendations for improving the conditions of the reservoir's functioning.

In terms of climate, the study area is characterized by a temperate continental climate with insufficient humidity. The annual rainfall (for the period 1961-2020) for the meteorological stations Bolgrad and Izmail are 487 mm and 454 mm (respectively), and their greater mass (from 64-66% of the annual sum) falls in the warm period (IV-X). The average annual air temperatures at these stations are 10.9°C and 11.1°C and are higher by 0.6-0.5°C than the climate standard.

Analysis of the data on observations of air temperature and precipitation at the meteorological stations Bolgrad and Izmail as a whole confirms the available data on the current warming of the climate - the increase in annual air temperatures over the period 1961-2020 averages 1.0 °C than the climate standard. Synchronization is observed annual rainfall and temporal trends are insignificant. Regarding the evaporation values from the water surface (station Bolgrad), which are an expense component of water balances of reservoirs, with the average annual (for the period 1960-2020) the evaporation value for the year 819 mm, they tend to increase, especially since 2012.

The research of the water regime of Katlabukh Lake [1], its rivers and the Danube [2] have shown that they have long-term trends and seasonal variations, and for Katlabukh Lake they have a regulatory influence on hydraulic structures. Against the backdrop of not significantly decreasing water levels in the Katlabukh Lake (1980-2020), in recent years (since 2012), there have been long-term seasonal reductions, with minimal levels sometimes below the dead storage (LDS = 0,7mBS). In the hydrologic regime of the rivers Veliki Katlabukh,

Yenika and Tashbunar, which flow into Katlabukh lake the development of anthropogenic use of rivers, as well as the current climatic conditions have led to a decrease in the water content of the rivers and a deterioration of water quality in them.

It is established that the main reasons for increasing the water mineralization of the lake are the seasonal decrease of the water levels in the lake (almost to the mark of LDS = 0,7mBS) due to the increase of evaporation volumes from the water surface and reduction of water exchange from the Danube. The deterioration of water exchange conditions in the reservoir is also associated with a decrease in irrigation water intakes in the northern part of the reservoir, which led to critical values of water mineralization in this water area of the lake (up to 3.1-3.35 g/dm³ and more). At the same time, in the southern part of the lake, where water is exchanged with fresh water in the Danube, the water mineralization is somewhat lower - by an average of 18%. The estimated values of mineralization were obtained in water-salt balances slightly higher than observed, which resulted in a decrease in the flow of mineralized waters of rivers flowing into the lake in the current period of their water (by about 50%) [1].

Using data from the SMHI-RCA4 Climate Model Ensemble (RCP4.5 scenario), the variability of water levels and lake salt regime was simulated under current (2006-2018) and future climatic change (up to 2050). It is established that the modeled and, according to the climate models, the level and, accordingly, the salt regime of the Katlabukh Lake are largely determined by the water content of the Danube, which will change in the coming decades due to climate change. Therefore, the results of the evolution of the simulated levels and the mineralization of the water in the lake serve to illustrate their sensitivity to climate change scenarios (greenhouse gas emission trends) rather than to the actual prediction of the lake water level and mineralization.

Scientifically substantiated recommendations of possible management decisions of further water management use of the reservoir aimed at maintenance and restoration of natural resources of the lake.

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