

**ECOLOGICAL RESILIENCE OF UKRAINE'S AQUATIC  
ECOSYSTEMS: CHALLENGES AND RESTORATION  
OPPORTUNITIES (CASE STUDY OF THE DNIPRO  
AND DANUBE RIVERS)**

**Golikova Olha**

*PhD in Economics, Scientific Secretary of Institute, Researcher,  
State Organization "Institute of Market and Economic & Ecological  
Researches of the National Academy of Sciences of Ukraine"*

**Karpenko Olha**

*PhD in Economics, Senior Researcher,  
State Organization "Institute of Market and Economic & Ecological  
Researches of the National Academy of Sciences of Ukraine"*

The issue of ecological resilience of Ukraine's aquatic ecosystems has become particularly relevant under the conditions of intensive climate change, growing anthropogenic pressure, and transformation of natural landscapes. Water resources, especially river systems, play a crucial role in maintaining ecological balance, biodiversity, and socio-economic stability of the regions. The Dnipro and Danube basins are key to Ukraine's water management, energy production, transport, and food security. At the same time, these river systems are among the most vulnerable to the impacts of human activities – pollution, eutrophication, hydraulic engineering interventions, habitat destruction, and hydrological regime alteration. The research is conducted within the framework of the "Network for the Preservation of Sturgeon and for the Sustainability of the Black Sea Basin Ecosystem" project (SturNet, BSB00172), funded by the Interreg NEXT Black Sea Basin Program. The goal of the project is to protect and preserve sturgeon in the Black Sea basin [1].

Project consortia consist of 6 partners Bulgaria, Romania, Moldova, Greece, Turkey and Ukraine: Protection of biodiversity in Bulgaria Foundation, The National Institute for Research and Development on Marine Geology and Geo-ecology, Ecological Counseling Center Cahul, Aristotle University of Thessaloniki, Gebze Technical University. From Ukraine, the official project partner is the State Organization "Institute of Market & Economic & Ecological Researches of the National Academy of Sciences of Ukraine" (IMEER) [1].

The aim of the study is to analyze the ecological resilience of Ukraine's aquatic ecosystems using the Dnipro and Danube basins as examples, to identify major challenges and risks to their functioning, and to determine opportunities for restoration and strengthening of resilience based on modern scientific approaches and international experience.

The study is based on the analysis of historical and contemporary long-term monitoring data on river ecosystems [2]. A multidisciplinary approach was used, incorporating hydrological, climatic, biological, and socio-economic aspects. The data were collected in the Lower Danube (Vylkove) and the lower Dnipro (Khortytsia Island, Zaporizhzhia). Methods included statistical analysis of temperature, salinity, water level changes, plankton development, and ichthyofauna status. Special attention was paid to the consequences of the Kakhovka Hydroelectric Dam destruction, changes in the Danube's hydrodynamics, navigation impacts, and environmental monitoring and restocking practices.

The study results showed that the Dnipro and Danube ecosystems are under significant anthropogenic pressure, manifested in water pollution, eutrophication, shoreline degradation, and biodiversity loss. The destruction of the Kakhovka HPP in 2023 became an unprecedented ecological disaster, the consequences of which include the loss of spawning areas, formation of toxic sediments in the former reservoir, and deterioration of the oxygen regime.

In the Danube basin, salinization and nutrient accumulation processes are observed, leading to the development of cyanobacteria and deterioration of conditions for aquatic organisms. However, thanks to natural floods, recovery processes, and international environmental initiatives, the Danube Delta remains one of Europe's most valuable natural sanctuaries [2; 3]. An important stabilizing factor is international cooperation, particularly within the framework of the Danube River Protection Convention.

Positive trends are also observed in the recovery of sturgeon populations in the lower Dnipro and Danube. Regular restocking, the creation of protected areas, and the implementation of ecological corridors contribute to the gradual restoration of natural ecosystem functions. Promising restoration directions include biotechnical rehabilitation of water bodies, restoration of natural spawning grounds, modernization of hydraulic structures, and strengthening of scientific monitoring [4].

The ecological resilience of aquatic ecosystems is determined by their ability to self-recover and adapt to changing conditions. This requires an integrated combination of environmental, engineering, and social approaches. Within the concept of «blue growth», Ukraine's water resources are considered a strategic element of sustainable development, requiring a comprehensive management approach at all levels – from local to national.

### **Conclusions**

1. The ecological resilience of Ukraine's aquatic ecosystems is a key factor in the country's sustainable development.
2. The main challenges for the Dnipro and Danube basins include pollution, eutrophication, hydromorphological changes, and biodiversity loss.
3. The destruction of the Kakhovka HPP demonstrated the vulnerability of water systems and the need to strengthen their adaptive capacity.

4. International cooperation, ecological revitalization, and the development of nature-based technologies are key areas for enhancing resilience.

5. The use of multidisciplinary data and scientific approaches enables the formation of effective water resource management policies and ensures environmental security under current challenges.

### **References:**

1. Network for the Preservation of Sturgeon and for the Sustainability of the Black Sea Basin Ecosystem. Interreg NEXT Black Sea Basin Programme. Available at: <https://www.blacksea-cbc.net/interreg-next-bsb-2021-2027/projects/bsb00172>

2. Andryeyeva N. M., Karpenko G. Y. Economic and ecological sustainable development vectors of the Lower Danube region of Ukraine. In National Economic Reform: experience of Poland and prospects for Ukraine: collective monograph. Kielce, «Izdevnieciba «Baltija Publishing», 2016. Vol. 2. P. 213–230.

3. Karpenko G.Y. Determination of environmental risks and threats in the lower Danube region. *Economic Innovations*. 2016. Vol. 18. Iss. 1 (61). P. 157– 163.

4. Yakovenko V., Melnik S., Fedonenko E. Species Composition, Seasonal Dynamics and Distribution of Phytoplankton of the Zaporizke Reservoir. *International Letters of Natural Sciences*. 2017. No. 62. P. 1–10. Available at: <https://www.academicoa.com/ILNS.62.1.pdf>.