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GOVERNMENT OF HUNGARY

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NATIONAL LABORATORY FOR WATER SCIENCE AND WATER SECURITY

# NATIONAL LABORATORY FOR WATER SCIENCE AND WATER SECURITY

## *WITH APPLIED RESEARCH FOR SUSTAINABLE WATER MANAGEMENT*

We will implement new, security related innovations in water science and water resource protection of Hungary to maintain the quality of Europe's precious resources. In accordance with the guidelines of the European Union, the Laboratory meticulously evaluates the quality and quantity of surface and groundwater bodies. Applying state of the art laboratory testing, field campaigns, computer simulations, and stakeholder participation. This unique integrated multidisciplinary based research consortia, effectively can contribute to improve resilience of drinking water industry, 'smart' urban water management, sustainable agricultural water management, and the modernization of water and wastewater treatment.

## MAIN RESEARCH AREAS

- Hydrodynamic, morphodynamic and ecological processes of river habitats
- Freshwater ecology and nature protection
- Extreme hydrological conditions
- Early-warning systems for algae dynamic forecasts and for catchments of small rivers
- Karst hydrogeology, hydrogeological monitoring
- Microplastics, micropollutants
- Water monitoring system based on artificial intelligence (AI).
- Water resources management practices to safeguard drinking water, ecological water demand and irrigation.
- Integrated urban hydrological management
- 5G-based precipitation monitoring system
- Drought, irrigation and reclamation, increasing water supply and storage capacity

**CONSORTIUM LEADER:**

University of Pannonia

**CONSORTIUM PARTNERS:**

Budapest University of Technology and Economics

General Directorate of Water Management

Hungarian Meteorological Service

HUN-REN Balaton Limnological Research Institute

HUN-REN Centre for Agricultural Research

HUN-REN Centre for Ecological Research

National University of Public Service

Széchenyi István University

University of Debrecen

University of Miskolc

**PROJECT NUMBER:** RRF-2.3.1-21-2022-00008

**FUNDING PERIOD:** 01.06.2022 - 28.02.2026

**OVERALL BUDGET:** 8.000.000.000 HUF

HUNGARIAN NATIONAL LABORATORY

## BENEFITS TO BE EXPECTED FROM LABORATORY RESEARCH

- Assessment of the status of various surface and groundwater bodies, using high-tech laboratory and field measurements and complex computer simulations and IT tools.
- New, intelligent monitoring and data processing systems.
- Creation of a new common scientific platform with the involvement of the top-quality scientists from technical-natural-agricultural academic sectors and senior experts, decision-makers to holistically evaluate the sustainability of the Hungarian water resources, to improve different scenarios and optimise the implementation processes.
- Involvement in international workflow, joint research ecosystem.
- Substantially broaden the knowledge base on fluvial and lacustrine systems.
- Publish ~150 national and international scientific articles publications, organize conferences.
- Knowledge transfer to all levels of educational curricula.
- Creation of a strong multidisciplinary network that enables individual expertise in market and international projects.
- Strengthening relations between sectors in order to closely cooperate with think tank networks.

## THE PROFESSIONAL TEAM

**University of Pannonia**

The Consortium is led by the University of Pannonia. In the National Laboratory one of the sub-projects aims to develop modular, watershed-specific monitoring and warning systems to control water and sediment quality. As a result of the project, the knowledge that remains hidden by standard sampling programs will be uncovered. The aim of another sub-project is to map the priority pollutants in our waters with the help of laboratory measurements and by connecting existing national databases and connecting to international databases.

**Balaton Limnological Research Institute**

The aim of the Balaton Limnological Research Institute is to conduct high-level research in the field of limnology, with particular focus on the living organisms within Lake Balaton and its watershed, and the environmental and anthropogenic factors affecting them. The project includes research activities such as studying the entire lake's primary production and key factors, ecotoxicological research, monitoring the spread of invasive species, and better understanding the diversity and organization of the biota with special focus on the role of anthropogenic effects.

**Budapest University of Technology and Economics**

The Department of Hydraulic and Water Resources Engineering uses innovative measurement methods and simulation tests to focus on the study of rivers and lakes as well as to explore the physical processes occurring in bodies of water. The Department of Sanitary and Environmental Engineering conducts extensive research in the areas of water supply system planning, development, and operation, drinking water and wastewater treatment, urban stormwater management, and protection of the aquatic environment.

**Centre for Agricultural Research**

The main goal of the Institute for Soil Sciences is to protect soil quality, evaluate soil-environment interactions, and rationalize soil use to improve human quality of life. The institute is a multi- and interdisciplinary research institution that is open to environmental and earth sciences, agricultural fields as well as environmental and nature conservation. The institute's research activities focus on soil-plant-environment interactions, dynamic modelling of water and material flow processes, assessment and mapping of soil degradation processes, and the development of soil databases and spatial data infrastructure.

**Centre for Ecological Research**

The Institute of Aquatic Ecology (IAE) conducts research on communities of living organisms, their environment and their interactions within the Danube River and its tributaries. Within the current National Laboratory program, tracking the transport processes of microplastics, examining concentration changes of traditional and new types of micro-pollutants, revealing the hydrodynamic and ecological processes of river habitats, testing the self-regulation techniques of aquatic plants, and environmental DNA-based analysis of river organisms (mainly microbiota) are among the research activities.

**General Directorate of Water Management**

The National Water Directorate's (OVF) tasks include protecting against water damage, directing national water management activities, and developing water management public services using European Union funds. In this project, the OVF takes on a leading role in 12 sub-projects and a project partner role in 3 others. As part of its profile, the organization has undertaken applied industrial research activities related to operational work. Additionally, the OVF provides databases (water management, water quality, geodesy, etc.) and state-owned ‘sample’ areas for university research and scientific work planned as part of this project in the relevant field. In this way the OVF establishes direct relationship between the scientific institutions and recent practical demands.

**Hungarian Meteorological Service**

The Hungarian Meteorological Service (OMSZ) has been collecting, analysing, and providing meteorological data for over 150 years in Hungary. It operates the synoptic measuring and observation network, the meteorological radar network, and the lightning localization system, and it prepares analyses of the past and current climate of Hungary, and future climate projections. OMSZ bases its medium and short-range weather forecasts on global and regional models. OMSZ provides data and expertise for climate change-related studies in the project, develops warning systems based on short-term and ultra-short-term forecasts, and participates in the installation of meteorological instruments.

**Széchenyi István University**

The Water Resources Research Group will focus on responding to short to medium-term water resource issues and preparing effective water management decisions. As part of the flood risk analyses, the research will evaluate the flash flood events' behaviour and impact on small watercourses. Additionally, we assess flood protection works' structural and hydraulic load capacity on large to medium size rivers. The integrated water management research aims to develop a region-wide integrated water management model, focusing on the water value yield concept. Finally, we focus on micro- and macro-scale applications of blue and green infrastructure and economic assessment in small residential and rural areas.

**University of Debrecen**

The Water and Environmental Management Institute leads 4 sub-projects of the No. 4 Regional and Agricultural Water Management pillar, which conduct integrated international research on agricultural drought, water management and monitoring of integrated urban hydrology. The Hydrobiology Department deals with the quality and biota of surface waters, models their changes, examines populations of species under nature conservation protection, and explores invasive species. The Department of Physical Geography and Geoinformatics applies geoinformatics and remote sensing methods to evaluate river restoration.

**University of Miskolc**

The Faculty of Earth and Environmental Sciences and Engineering at the University of Miskolc has an outstanding educational and research portfolio in the field of earth sciences. The faculty focuses on sustainable water resource management and further develops their expertise related to groundwater protection and utilisation. The Institute of Water Resources and Environmental Management has broad international connections and has maintained a very strong research program in the past decade. Their most recent efforts are directed toward developing karst water resource monitoring and research as well as further development of innovative groundwater monitoring systems.

**University of Public Service**

The main research areas of the Faculty of Water Sciences include technological development of hydrometric measurements, water management impacts of sediment transport and river morphology, precision monitoring, modelling of precipitation-runoff and small watercourses, more effective defence against extreme water damage situations, hydrodynamic basis of integrated water management, unique small-scale individual wastewater treatment units, development of water technology structures, morphology and molecular taxonomy of diatoms, assessment of ecological status with phytobenthic living organisms, monitoring.

## POSSIBLE PARTNERSHIPS

National and international small and medium-sized enterprises to utilize research results. Our primary international partner is the European Union.

National and international universities and research institutes for the purpose of generating and implementing Horizon Europe and other international projects.

Research coordinated with sectoral priority projects and industrial partners (e.g., healthcare, telecommunications, Industry 4.0).

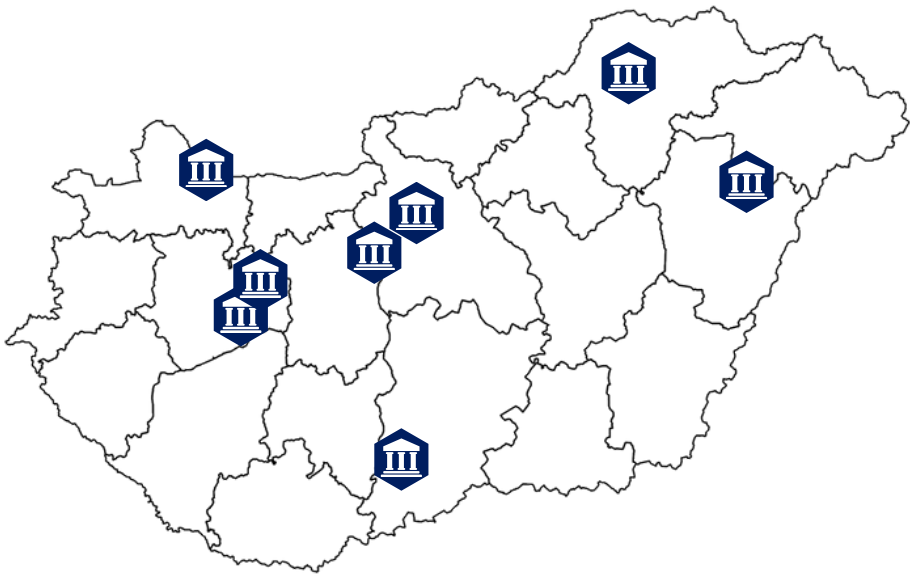
Involvement of market partners, for whom the National Laboratory can offer integrated research resources and can provide funds for applied research projects coming from priority areas.

## TARGET GROUP

- Industrial market participants
- State administration, Law makers
- Authorities of Water sector,
- Decision makers mainly from Water-Energy-Food-Industry sectors,
- Engineering, Agricultural, Commercial Chambers
- Industrial professionals, Engineers, Ecologist, Agricultural engineers, Landscape managers, Urban developers
- Local Government
- NGO-s

## PLACES OF IMPLEMENTATION:

- Baja
- Budapest
- Debrecen
- Győr
- Martonvásár
- Miskolc
- Tihany
- Veszprém

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