National Research, Development and Innovation Office

Ministry for Innovation and Technology

HUNGARIAN NATIONAL LABORATORY

NATIONAL LABORATORY FOR WATER SCIENCE AND WATER SECURITY

WITH APPLIED RESEARCH FOR SUSTAINABLE WATER MANAGEMENT

Considering Hungary's location, water management and water resources, the National Laboratory aims to support the implementation of water science and water safety innovations with our current research that contribute to the protection of water quality, affecting the issues of rivers, lakes, groundwater, rainwater, urban water management and catchment management.

MAIN RESEARCH AREAS

- Extreme hydrological conditions
- Microplastics
- Hydrodynamic, morphodynamic and ecological processes of river habitats
- Freshwater ecology and nature protection
- Early-warning algae dynamic prediction system
- Karst hydrogeology, hydrogeological monitoring
- Integrated urban hydrological management
- 5G-based rainfall monitoring system

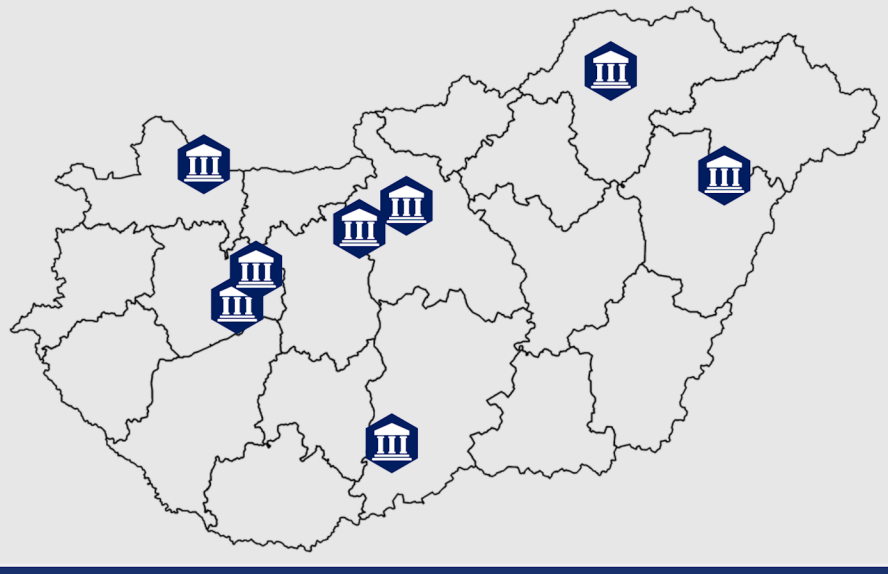
CONSORTIUM LEADER:

University of Pannonia

CONSORTIUM PARTNERS:

Balaton Limnological Research Institute
Budapest University of Technology and Economics
Centre for Agricultural Research
Centre for Ecological Research
General Directorate of Water Management
Hungarian Meteorological Service
National University of Public Service
Széchenyi István University
University of Debrecen
University of Miskolc

PLACES OF IMPLEMENTATION: Baja, Budapest, Debrecen, Győr, Martonvásár, Miskolc, Tihany, Veszprém



CONTACT INFORMATION: www.vnl.hu vnl@pen.uni-pannon.hu

BENEFITS TO BE EXPECTED FROM LABORATORY RESEARCH

- Development of a sampling tool for determining plastic contamination, and setting up a data set on the qualitative and quantitative occurrence of plastic contamination.
- Laboratory technological developments in research and regional laboratories.
- Enhancement of monitoring and data collection systems, collection of new data.
- Development of novel environmental monitoring techniques and applications.
- Establishment of a hydrogeological measurement site.
- Learning of the effect of land use and other anthropogenic alterations on freshwater ecosystems.
- Development of climate adaptation solutions in the field of drought, inland water, urban hydrology and ecological services of watercourses.
- Exploring the population dynamics of microbiota, macro- and micro-vegetation.
- Exploring the role of hydrodynamic and community factors that determine the diversity and community organization of living organisms in the River Danube, as well as clarifying the role of human influences in changing the hydrodynamic and bed morphological conditions of the river and its floodplain, and in the transformation of river habitats.
- Exploration of plant stock and plant biomass regeneration processes in order to optimize annual stock thinning.
- Exploring the effect of stock reduction on the biological diversity of the microflora and on the algae-animal interactions.
- Lake Tisza reservoir simulation model.
- Hydrological warning system for small watersheds.
- Clarifying the calculation of the water balance components in the case of Lake Balaton and Lake Fertő.
- A short- and ultra-short-term hydrological warning system that helps to effectively prepare for severe, damaging weather events in small watersheds (e.g. flash floods).
- Development of hierarchically structured, three-dimensional soil hydrology databases based on pedotransfers and creation of web map data services.
- A new competence for the targeted creation of synthetic algal-bacterial cultures for bioenergetic, bioremediation and environmental condition-diagnostic purposes. Controlled utilization of algae-bacteria cultures for a cleaner environment (favorable CO2 balance), greener energy production, and in the long term, the development of a healthier society through algae-based proteins.
- Application of genomic methods during monitoring tests for compliance with the new VKI. The DNA and sequencing laboratory provides a professional background for genomic-based water quality.
- Provision of comparative data on the operation and efficiency of individual small wastewater treatment equipment.
- Methodological development for the identification of water quality changes (indicator parameters) in surface water catchment areas using modular on-line monitoring and early warning systems (EWS).
- Development of methods to support the water quality assessment approach of the Water Framework Directive (WFD) using network analysis procedures.
- Creation of an international database of micropollutants in our waters.
- Basic research data on the environmental status of Lake Balaton, and on various fresh waters in general.
- 5 G-based precipitation measurement methods are developed in urban environment.
- AI software development related to urban stormwater management.
- Wastewater monitoring to understand the process of cleaning systems.
- Development of methodological proposals for engineering design and operation.

During the entire project period:

- National cooperation: 67 pcs
- International cooperation: 39 pcs
- Intellectual property rights: 9 pcs
- PhD student/young researcher: 76 people
- International tender: 18 pcs
- Article Q1: 61 pcs
- SMEs involved in digitization activities: 25

THE PROFESSIONAL TEAM

Renáta Gerencsér-Berta, PhD (University of Pannonia), research fellow, deputy director, professional manager of the National Laboratory. Since 2014, she has been a researcher responsible for the analytical tasks of the Soós Ernő Research and Development Center. Area of expertise: qualitative and quantitative testing of drug residues and pesticides in water and develop to remove the contaminants using adsorption and innovative membrane technology processes. Member of the Hungarian Separation Science Society, member of the public body of the Department of Chemical Sciences of the Hungarian Academy of Sciences,
member of the MTA VGTB Water Supply and Sewerage Academic Committee committee, member of the Hungarian Chemists Association, Membrane Technology Department.

Other professional managers of each consortium partner:

Dr. Józsa János (BME) hydraulic engineer, professor, rector, head of research group, member of the Hungarian Academy of Sciences (MTA). International memberships: CISM Scientific Council, IAHR Fluid Mechanics Section, European University Association. Main research topics: Interface processes and dynamics in lakes, hydrodynamics and morphology in rivers, turbulence and mixing in surface waters. He is the lead researcher of numerous exploratory and R&D domestic and international projects. Scientific publication (SP) 238, citations (C) 1414, Hirsch index (H) 21.

Dr. Tibor Bíró, PhD: Dean of the Faculty of Water Sciences at the University of Public Service, his experience in science organization is proven by numerous research projects and organizational memberships. He specializes in integrated and adaptive water management. He is the founder and head of the nationally unique Wave Field Research Workshop and one of the professional leaders of the monitoring planning of Lake Balaton. He has worked in the fields of remote sensing, floodplain management, water quality modelling and agricultural water use. He was a member of the Presidential Committee on Water Sciences of the Hungarian Academy of Sciences, and Secretary of the Subcommittee on Water and Environment of the Hungarian Academy of Sciences. He was the member of the Technical Advisory Board of the National Water Strategy (Kvassay Jenő Plan).

Dr. Tibor Erős (ELKH-BLKI) biologist, PhD; ecologist, hydrobiologist, MTA doctor, scientific advisor, BLKI director, head of the Fish and Conservation Ecology Research Group. His related field of research is the study of the diversity and organization of fish communities in freshwater, and the exploration of biological invasions and anthropogenic effects. Scientific publications (SP) 174, citations (IC) 2550, H-index 30.

Prof. Dr. János Tamás (DE), general agricultural engineer; plant protection engineer, soil energy management engineer; water management engineer; geospatial engineer, scientific deputy dean of the Faculty of Agriculture. Within the framework of the NL, he is the coordinator of the agricultural and regional water management pillar of the project, his field of expertise is applied hydrological GIS, remote sensing and modeling, he is responsible for the watershed management.

Attila Engloner (ELKH-ÖK) PhD,scientific associate, his main research area is the research of factors and laws affecting the distribution and mass of aquatic macrophytons, the exploration of the phenetic and genetic diversity of seaweed species; cane decay and colonization; adaptation of plants to water supply in aquatic and terrestrial ecosystems, research on the composition of the biofilm formed on aquatic macrophytons, environmental DNA-based investigation of the living organism communities of the River Danube and other water bodies and the effects of climate change-related processes on the communities, Szigetköz monitoring, participates in the International Danube Expedition (Joint Danube Survey)

Dr. Zsófia Kovács (PE), research fellow, Research area: on-line and EWS monitoring of surface water, WFD based water quality assessment, sediment sampling methodology, experience as head of an accredited laboratory.

Dr. László Pásztor (TAKI) Director, head of department, academic advisor; in terms of education, he is a certified physics teacher and astronomer. His area of expertise is digital soil mapping, spatial modeling, planning, building and operation of spatial soil information systems and integrated environmental geospatial databases, spatial investigation of soil properties, integration of geospatial information, remote sensing and stochastic modeling in the mapping of soil sensitivity and soil degradation processes, multivariate and spatial statistical methods in astronomy and remote sensing, field remote sensing.

Dr. Gabriella Szépszó, (OMSZ), meteorologist, specializes in meteorological numerical modeling, regional climate modeling and air quality modeling, as well as related developments.

Dr. Péter Szűcs (ME) general vice rector, university professor, doctor of the Hungarian Academy of Sciences. Area of expertise: hydrogeology, modeling procedures, complex investigation of subsurface flow systems, subsurface transport processes of special contaminants, thermal water, mineral water and healing water exploration.

Dr. Antal Örs (OVF), head of department of the River Management Department of the OVF Flood Protection Department, professional leader of the OVF sub-projects in the National Laboratory program, has been dealing with the coordination of the implementation of water management projects since 2012. Since 2015, he has been in charge of flood protection improvements at the OVF, and from 2020, he has been Head of the Lakes and Rivers Division.
He carried out doctoral (PhD) research between 2012 and 2018 in the field of the technical possibilities of the prevention of natural disasters, in particular hydrological damage.

Dr. Katalin Bene (SzE), associate professor. Her research areas include hydrological modelling of river basins, field measurements, numerical modelling (HEC HMS, SSA, SWMM, TR 55), modelling and laboratory and field testing of saturated and unsaturated soils.

Further renowned researchers and professional practitioners from all consortium partners participate in the coordination of the professional work.

TARGET GROUP

- National and international research teams
- Laboratories for Environmental Protection and Nature Conservation;
- Educational institutes
- Water utility managers
- Water industry, Water utility, Agricultural and Food industry
- National Parks specialists
- NGOs
- Those involved in water management
- Water management decision makers
- Industrial, commercial, engineering and agricultural chambers
- Authorities
- Local and regional governments
- Inhabitants
- Fishing clubs
- Disaster management

POSSIBLE PARTNERSHIPS

In the professional field of the National Laboratory, cooperation with national and international universities and research institutes in order to generate Horizon Europe and other international projects.

Cooperation with national and international SMEs in order to utilize research results.

PROFESSIONAL CONTACT

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