# SUCCESS STORIES 2020-2022

## EU STRATEGY FOR THE DANUBE REGION PRIORITY AREA 4

Interreg
Danube Transnational Programme

DANUBE REGION strategy
Water Quality

## IMPRESS

The texts of the project descriptions were discussed with the projects included. The brochure development was coordinated by Zsuzsanna Kocsis-Kupper, chief advisor of the EU Strategy for the Danube Region „Water quality" Priority Area Hungarian coordination with the help of Diana Heilmann.

The lead partner of the PA04-Water Quality project (DTP-PAC2-PA04) that financed this brochure is the Ministry of Foreign Affairs and Trade of Hungary.

Brochure completed in November 2022

*Disclaimer*


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# INTRODUCTION

In order to increase growth and strengthen cooperation at a macro-regional level the European Union adopted the EU Strategy for the Danube Region (EUSDR) in 2011 with eleven priority areas to harmonise development policies connecting fourteen countries. Hungary, together with Slovakia has been assigned to coordinate the Water Quality Priority Area (PA4) and to ensure integrated water management towards reaching the good quality of waters in the Danube River Basin. EUSDR PA4 aiming at to maintain and restore the quality of waters, to 'safeguard Europe's water resources', furthermore, to assist in the implementation of the EU Water Framework Directive and the Urban Waste Water Treatment Directive.

The main decision-making body of EUSDR PA4 is its Steering Group (SG), comprised of representatives from all Danube Region countries. EUSDR PA4 assists in the process of alignment of funding, facilitate project proposal developments and project implementation as well as provides a platform to create networking opportunities towards setting up project consortiums. EUSDR PA4 was active in supporting the preparation of projects: in several cases

**Nine years after the adoption of the EUSDR, the Danube Strategy was revised in 2020 to align it with the new priorities and challenges of the region and better link the Danube strategy's actions with the new EU priorities, i.e. such as the European Green Deal. Accordingly, the targets and actions of EUSDR PA4 was also revised and now include:**

**Action 1: HAZARDOUS & EMERGING SUBSTANCES: Promote monitoring, prevention and reduction of water pollution deriving from hazardous and emerging substances (EU priority substances and watch list candidates as well as Danube basin specific pollutants candidates and others e.g. micro plastics-plastics, pharmaceuticals, PFOS). ACTION 2: WASTE WATER: Continue boosting major investments in building, upgrading, maintaining and rehabilitating urban wastewater treatment facilities and promote alternative collection and treatment of wastewater in small rural settlements, including measures to build capacity at the regional and local level across the Danube basin. ACTION 3: WATER & AGRICULTURE: Promote prevention and reduction of diffuse pollution, promote nutrient retention, smart irrigation and water reuse, foster and develop an active process of dialogue and cooperation between authorities responsible for agriculture and environment to ensure that measures are taken to address diffuse pollution and ensure smart water use ACTION 4: DRINKING WATER: Promote measures aimed at reducing knowledge deficits related to protecting water resources and safeguarding drinking water supply. ACTION 5: MIGRATORY FISH: Promote measures to enable fish migration in the Danube River basin ACTION 6: CLIMATE CHANGE: Promote measures to adapt to climate change impacts in relation to water quality and quantity. ACTION 7: TOOLS: Enhance cooperation, increase and exchange knowledge and secure financing to water quality measures in the Danube Region.**

supported them technically, assisted in finding partners, introduced the project ideas at the SGs and to the national representatives and assisted in obtaining letters of recommendations. During project implementation the Priority Area followed the projects, participated at several project events, and aimed to seek the projects' results assisting that their outputs could be built into the decision-making process.

Furthermore, in 2022 ***Danube Strategy Flagships*** were identified indicating projects or processes that contribute to the implementation of the EU Strategy for the Danube Region, to have a clear macro-regional dimension and a multi-level governance approach. They are of high importance for the Danube Region's economic, social, and territorial cohesion and for improving the quality of life in the Danube Region. In the case of EUSDR PA4 three flagship processes were identified and selected in 2022: climate change, migratory fish, and emerging substances. Several of the projects that contribute to the renewed Action Plan of the EU Danube Strategy assist the aims also defined in the Water Quality Action Plan, consider to be flagship and are listed in the current brochure.

The activities of PA4 are harmonized well with the Danube Transnational Programme's (DTP) *(in the new financing period, the Danube Regional Programme)* ***Capitalisation Strategy*** that was launched in 2017 in Budapest. The overall aim of the capitalization is to cooperate with each other most efficiently, to build synergy between the water related projects funded either by the Danube Programme or by other financial instruments.


*Graphic design by Renáta Rippl for the Danube Story Telling Cards*

EUSDR PA4 cooperates with projects related to different water management issues. While the projects address different issues like coordinating sediment management; preparing a Tisza-Danube integrated action plan to eliminate plastic pollution of rivers; managing and restoring aquatic ecological corridors for migratory fish species; tackling hazardous substances pollution in the Danube River: they seek for synergies for the common benefit. Apart from projects financed by the DTP, (namely: Danube Hazard mc3, IDES, SIMONA, MEASURES, Tidy Up, SaveGreen, LifelineMDD); projects financed by other programmes, such as INTERREG Central Europe, Horizon2020, LIFE and several CBC programmes are also important for the work of the PAs and these projects (such as DEEPWATER-CE, FRAMWAT, MICACC) were also included in the capitalization

process. Information about project results were shared in different international events and at the PA4 SG meetings as well.

Some projects (for example DanubeSediment, MEASURES, WE PASS, Danube Hazard m3c) were also providing additional input to the Danube River Basin Management Plan (DRBMP) Update 2021 together with the Danube Flood Risk Management Plan (DFRMP) Update 2021 adopted by the strategic partner of EUSDR PA4, the International Commission for the Protection of the Danube River.

This document was compiled by EUSDR PA4 with the help of the projects to contribute sharing knowledge and accessing results for the sake of improving the quality of waters in the Danube Region. The aim of compiling this brochure was to collect and disseminate information about the results achieved in the Danube Region by the referred water projects and to use it as a knowledge-base for future implementation. The projects are listed in this brochure by alphabetical order.


*EUSDR and ICPDR experts in 2022 September*

# CLEANDANUBE

**Funding instrument:** **Baden-Württemberg Foundation, Postcode Lottery, Hansgrohe, Menschen brauchen Menschen e.V. and Arburg.**

**Project duration:** 01. 01. 2022. – 31. 10. 2022.

**Budget in Euro:** Overall 250.000

**Focus:** raising public awareness of how to deal with plastic and our rivers

**Co-organizers:** AWP – association for wildlife protection e.V and Furtwangen University

**Contact:** Mario Kümmel, mario@awpwildlife.org

**Project website:** cleandanube.org

**Project website**

Every day the Danube washes 4 tonnes of plastics into the Black Sea. Some Danube countries have neither effective bottle recycling systems nor sound waste prevention strategies. Plastic bottles, plastic bags and microplastics are found along the banks and at the bottom of the riverbed. Microplastics is especially alarming. Like many serious types of pollution endangering the Danube, microplastics are not visible to the naked eye. Disturbingly, there are more plastic particles than fish larvae dispersed throughout the water.

In many places, swimming is inadvisable since the water is polluted to the point that it is hazardous to health. This has robbed people of the opportunity to experience the river in her full glory while the reputation of the Danube waterscape has suffered immeasurably.

In public discourses, these grievances and the sustainable conservation of the Danube as a natural habitat have not been given due attention, especially across national borders. A lack of information and educational opportunities is the reason for the

***Andreas Fath.*** *Photo: Tim Kiefer*

dearth of motivation and skills for people to make initiatives for positive changes in their behaviour and to work towards social and political transformation.

What's more is the lack of water analyses of every section of the Danube to determine the precise degree of pollution. Added to this is the scarcity of transfer of scientific findings to the society at large.

## PROJECT ACTIVITIES

In spring 2022, Andreas Fath, Professor of Chemistry at Furtwangen University of Applied Sciences, was set to swim the entire length of the Danube – from the Black Forest to the Black Sea, to be in the water nearly every day for 2 months and is expected to garner media attention at every stretch of the river. Swimming the entire stretch of the Danube is the uniqueness of the project while attracting media attention to highlight the issues of Cleandanube is the aim.

AWP accompanied him on his tour with a mobile knowledge workshop in order to bring visibility to and make tangible the plight of the Danube at various stations. Modularized training units booster the competence of young people between ages 14 and 25 along the project route.

In the research part of the project, water samples were analysed daily to put together a comprehensive overview of the degree of pollution impacting the Danube. A documentary accompanying Andreas Fath's journey would provide additional coverage, as well as to ensure the findings continue to reverberate long after the project's completion.

With numerous partner organisations, a variety of activities such as clean-ups, swim-alongs and paddling, receptions, lectures and information events as well as exhibitions were held along the project route. The partners encompass the widest spectrum of organisations – from large, well-known environmental protection agencies to medium-sized and small local NGOs, universities, educational institutions, schools, municipalities and cities, as well as supra-regional networks and public institutions.

The measures taken as a whole is intended to reach beyond the mainstream and make scientific knowledge appreciable to the population at large living in the Danube region, so as to inspire them to contribute to the protection of their environment.

The transnational project contributes to water conservation through interlinked measures. The aim is to reduce water pollution, avoid plastic waste, recognise the dangers of microplastics and appreciate the Danube as an invaluable natural habitat. Results will be available at: *cleandanube.org*


***Andreas Fath.*** *Photo: Tim Kiefer*

# DANUBE HAZARD M³C

## TACKLING HAZARDOUS SUBSTANCES POLLUTION IN THE DANUBE RIVER BASIN BY MEASURING, MODELLING-BASED MANAGEMENT AND CAPACITY BUILDING

**Funding instrument:** **Danube Transnational Programme (3rd Call)**

**Project duration:** 01.07.2020. – 31. 03. 2023.

**Budget in Euro:** Overall 2 597 483.94

**Priority:** Environment and culture responsible Danube region

**Specific objective:** Strengthen transnational water management and flood risk prevention

**Lead partner:** TU Wien

**Project Manager:** **Ottavia Zoboli,** ozoboli@iwag.tuwien.ac.at

**Project website:** https://www.interreg-danube.eu/approved-projects/danube-hazard-m3c

**Project website**

## ISSUE

Many industrial and other human activities release chemical compounds into the environment, which can pose a risk to human and ecological health even at very low concentration levels. The knowledge on the occurrence of hazardous substances (HS) in the Danube River Basin (DRB) and especially on their main emission pathways into water bodies is still very poor.

Eleven institutions from nine DRB countries, under the lead of the Institute for Water Quality and Resource Management of the TU Wien (AT) and with the support of 13 associate strategic partners, merged forces to pave the path for a durable and effective transnational control and reduction of water pollution with hazardous substances in the DRB.

The project builds on the three elements of water governance: Monitoring, Modelling and Management, complemented by Capacity building (figure 1). While monitoring and modelling build the bridge between science and policy by providing a sound knowledge base to derive management recommendations, capacity building increases understanding, skills and competences in administration.

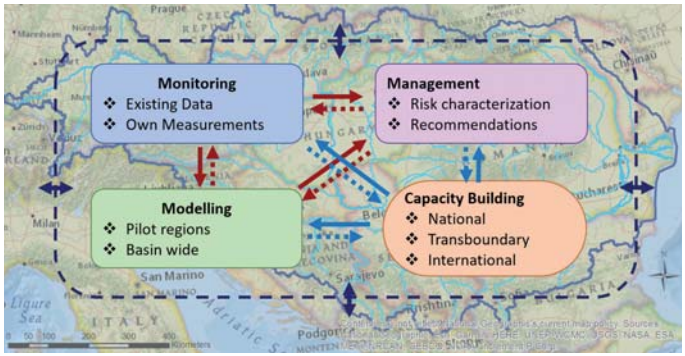



*Figure 1: Danube Hazard m3c approach.*

## MONITORING AND MODELLING

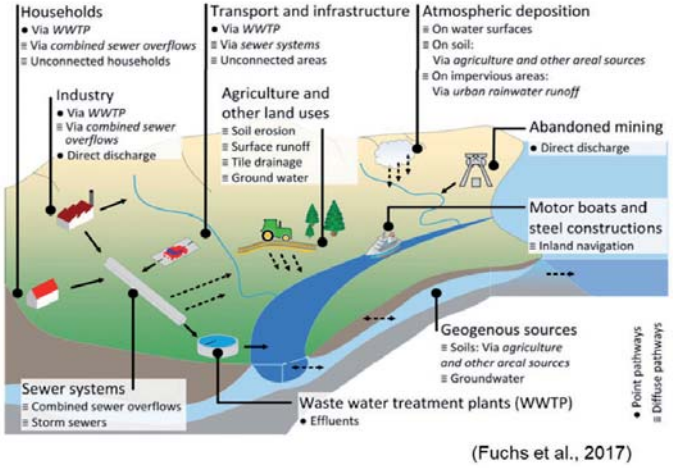



*Figure 2: Sources and pathways of hazardous substances into water bodies.*

The interlinkage between human activities and water quality is shown in figure 2. Persistent substances are released into the environment via several sources and can be transported into ground and surface waters via different pathways. If we can identify and quantify these different emissions pathways, we can predict concentrations and loads of contaminants in water systems and identify where management measures have to be implemented to reduce pollution.

Monitoring is essential to provide basic information on concentrations and loads of different substances for example in atmospheric deposition, soils

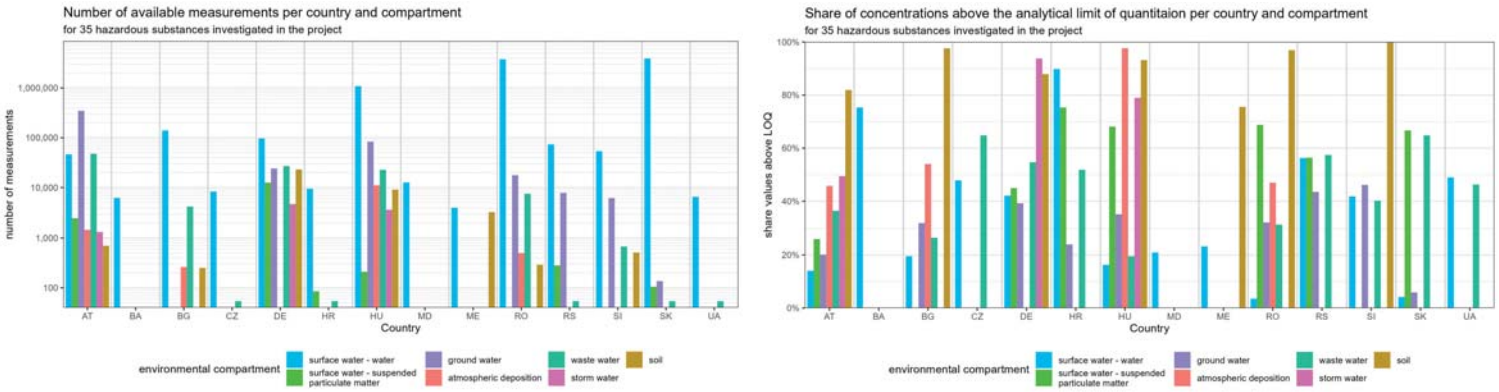
and wastewater. Combining this data with cross-sectoral metadata on infrastructure (e.g. municipal and industrial water management), hydrology (e.g. river net, river flow), land use and landscape morphology leads to a so-called inventory. Such inventories form the essential empirical basis to apply models through which we can extrapolate local information to regional scale, assess the relevance of different sources and pathways of water pollution, predict concentration of pollutants in unmonitored rivers and evaluate scenarios of potential future developments, ranging from management strategies to climate change.

## MONITORING

A first step of the DHm3c project was dedicated to merge and harmonize the fragmented and dispersed available information on concentration of hazardous substances in rivers, soils, wastewater treatment effluents and groundwater for the partners' countries into a database. Besides the great value of the collected data and of their evaluation, the project is using the large database to showcase the development of a much-needed integrated, well-documented and harmonized inventory across compartments.

To fill critical gaps and demonstrate alternative and cost-efficient monitoring approaches in addition, the consortium carried out targeted measurements in seven pilot regions (figure 4). Bearing in mind the large number of chemicals present in the environment, the project focuses on 17 indicator substances of high relevance in the Danube River Basin and representative for different major sources and emission pathways. These include metals, pharmaceuticals, pesticides and industrial chemicals.

*Figure 3: Data availability in the different countries. Left: number of measurements per country and per environmental compartment. Right: percentage of measurements with values above limit of quantification and thus suitable for following usage in quantitative analyses.*



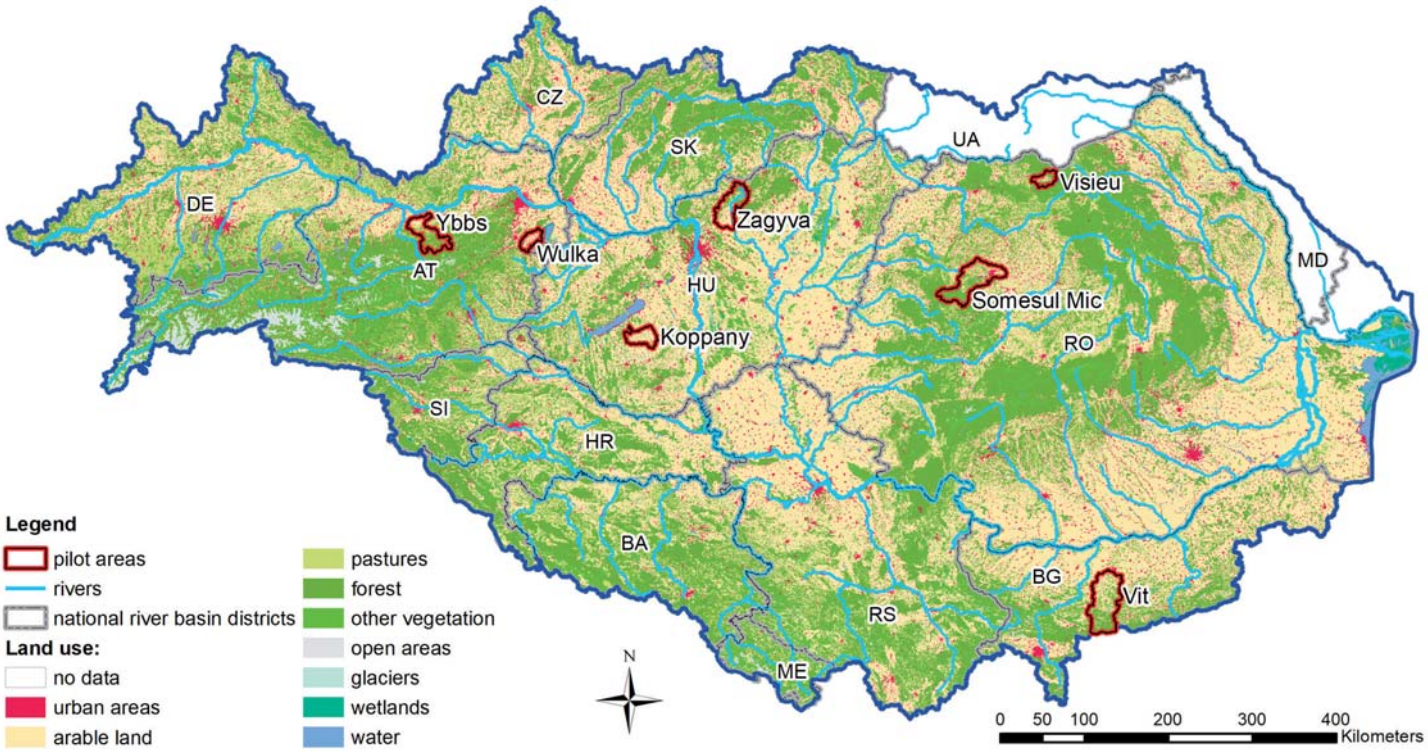



*Figure 4: Pilot regions in the project.*

## MODELLING

In the project two complementary modelling approaches are used. The MoRE model (Modelling of Regionalized Emissions) is applied to the seven pilot regions to quantify emission loads into surface waters via point and diffuse emission pathways. Building on the increased system understanding generated via this detailed analysis, the Danube Hazardous Substances Model (DHSM, based on the SOLUTIONS model) is applied to identify and estimate sources and emissions of hazardous substances for the whole DRB. Preliminary results from the DHSM have been already used to develop the Danube River Basin Management Plan 2021 (examples in figures 5 and 6).

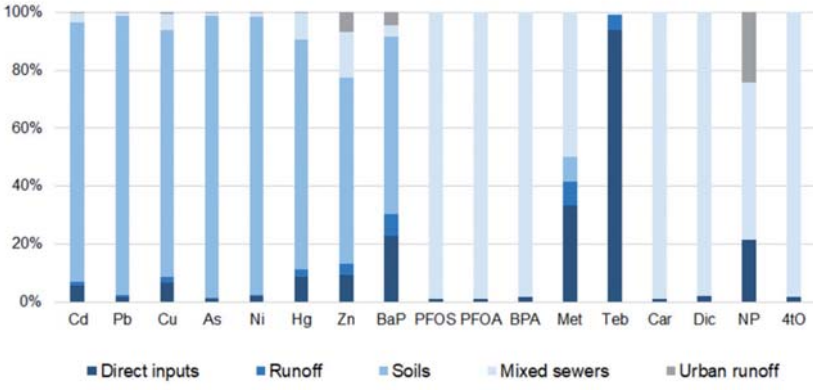



*Figure 5: Relative proportion of the emission pathways of the target compounds (preliminary results of DHSM model at DRB scale). Cd: cadmium, Pb: lead, Cu: copper, As: arsenic, Ni: nickel, Hg: mercury, BaP: benzo(a)pyren, PFOS: perfluorooctanesulfonic acid, PFOA: perfluorooctanoic acid, Met: metolachlor, Teb: tebuconazole, Car: carbamazepine, Dic: diclofenac, NP: nonylphenol, 4tO: 4-tert-octylphenol.*


*Figure 6: Total estimated emissions of the pharmaceutical carbamazepine at DRB scale (preliminary results of DHSM model).*

# MANAGEMENT

## A CRITICAL REVIEW OF THE NATIONAL POLICIES AND OF THEIR IMPLEMENTATION

The project has critically reviewed the existing national policies of HS pollution in twelve countries, which cover over 85% of the DRB territory and about 80% of its population. The analysis has identified some critical aspects, whose lack of harmonization hinders a harmonized transnational control of HS pollution in the DRB:

- The regulatory control of specific non-priority HS and the respective environment quality standards for water bodies
- The number of HS and the respective emission standards for industrial wastewater discharges
- The monitoring of HS in discharges from wastewater treatment plants and the evaluation of the contribution of combined sewer overflows
- The setting of the pollution fees for the discharge of HS
- The analytical methods for the chemical analysis of HS
- The inventory process by enhancing the quality of the self-monitored data, applying the pathway-oriented approach for estimation of diffuse emissions, harmonizing data series for transboundary sub-basins and considering the accumulation of HS in sediment and biota
- The format and public accessibility of the existing data basis.

## POLICY GUIDANCE DOCUMENT

The outcomes of all analyses of the project, but especially of the scenarios evaluated with the DHSM and MoRE models, are finally used to derive policy recommendations. A preliminary version of the policy guidance document produced by the project was an important contribution to the Danube River Basin Management Plan 2021. It contained among others the following recommendations:

- Well-designed and targeted monitoring efforts through the DRB over longer periods are strongly needed. Such efforts should be focusing on a limited but well selected number of substances
- Policies controlling HS should be source and pathway oriented, instead of focusing on individual substances
- Usage regulation and restriction of HS in products is mostly effective, but not always feasible, such as in the case of pharmaceuticals, whose positive health effects outweigh negative environmental impacts
- Measures ranging from stormwater treatment to erosion control and from upgrade of wastewater treatment plants to reducing the transfer of pollutants from highly contaminated sites vary considerably in their cost, effectiveness and applicability depending on the scope of substances and on the territorial characteristics. Building on a robust emissions inventory and on a reliable pathway-oriented model, it is possible to assess the optimal combination of measures for each different river catchment and water body.

## CAPACITY BUILDING

Last but not least, a tailor-made program of training and workshops transfers know-how and triggers constructive discussions among the different players in the field of water quality management across the basin with the overall objective of more effective transnational water pollution management in the DRB.

Nine national and regional trainings on Monitoring, three transnational trainings on Modelling and one international workshop on Management contribute to turning the project's vision into a reality and to achieve long-term changes. Building on the project's innovations, results and lessons learned, several actors in the field of water quality across the whole DRB had multiple opportunities to discuss in-depth and to enhance their competence on the different pillars leading to a better control of hazardous substances pollution.

*For more information see the project webpage https://www.interreg-danube.eu/approved-projects/danube-hazard-m3c*

***Selection of some pictures from three trainings in Romania, Hungary and Montenegro.***

# DANUBESEDIMENT

## DANUBE SEDIMENT MANAGEMENT RESTORATION OF THE SEDIMENT BALANCE IN THE DANUBE RIVER

Interreg
Danube Transnational Programme
DanubeSediment

**Funding instrument:** **Danube Transnational Programme (1st Call)**

**Project duration:** 01. 01. 2017. – 30. 11. 2019.*

**Budget in Euro:** Overall 3,558,581.62

**Priority:** Environment and culture responsible Danube region

**Specific objective:** Strengthen transnational water management and flood risk prevention

**Lead partner:** Budapest University of Technology and Economics, Hungary

**Project Manager:** **Barbara Kéri**, Budapest University of Technology And Economics (BME) Hungary, Keri.Barbara@emk.bme.hu

**Project website**

* *The project provided important input to the Danube River Basin Management Plan (DRBMP) Update 2021 and therefore included in the current brochure.*

## PROJECT GOALS

The transport of sediments is a natural process in river systems. Over the past decades, human activities within the Danube and its tributaries have led to strong changes in the natural sediment load. These changes negatively influence important water management issues such as flood risk, inland navigation, ecology and hydropower production. In order to address these changes, we need an integrated sediment management plan for the Danube. Since the Danube flows through 10 countries, this topic needs to be addressed internationally. Therefore, from January 2017, 14 partners and 14 associated strategic partners from nine countries worked together in the DanubeSediment project. Their goal

was to improve the transnational sediment management in the Danube. The project closed knowledge-gaps, prepared a first common Danube Sediment Balance and developed guidance for the implementation of measures that improve the sediment balance. The project developed key contributions for the 3rd Danube River Basin Management Plan and 2nd Danube Flood Risk Management Plan.

## RESULTS ACHIEVED

The first reports on sediment data monitoring and data analysis were published in Spring 2019. “Sediment Monitoring in the Danube River” describes the methods used by the Danubian countries to monitor sediment and to calculate the sediment load. Practical recommendations are found in the

"Handbook on Good practices in Sediment Monitoring". One key recommendation to support cooperation to restore the sediment balance of the Danube is to establish an international, Danube-wide data management network.

So how has the sediment balance of the Danube changed? Over two years, the team collected and analysed an enormous amount of data. The "Analysis of Sediment Data Collected along the Danube" takes a first look at this data and explains the need for data harmonisation, for example when different instruments have been used over time.

During the project lifetime, the sediment balance was prepared. The analysis has shown interesting results: along the Romanian and Bulgarian reaches up until the Danube Delta, the long-term suspended sediment load has decreased by ~70% compared to data from before the construction of the hydropower plants.

The data shows that dams function as sediment traps and strongly reduce the transported amount of suspended sediment. In order to calculate the whole sediment balance, the project complemented this information with data on morphological characteristics.

The sediment balance helped to identify river reaches with long-term erosion, sedimentation or dynamic stability. Reports on the "Assessment of the Sediment Balance of the Danube" and the "Long-term Morphological Development of the Danube in Relation to the Sediment Balance" was published by the project . (see link below).

The report on the "Interactions of Key Drivers and Pressures on the Morphodynamics of the Danube" describes the human activities that impact the sediment regime. Navigation, hydropower and flood protection are the main drivers generating significant pressures on the transport and continuity of sediment in the Danube and the key tributaries. In order to reduce these pressures, we need to implement measures that improve the sediment regime. In close cooperation with experts working in sediment-related fields such as waterway administration, hydropower, nature protection and water management, the project partners collected and evaluated so-called "good practice measures" to improve the sediment regime. These were published in the "Sediment Manual for Stakeholders", which aims to support practitioners in implementing measures that improve the sediment balance. The "Danube Sediment Management Guidance" addresses policy-makers by giving recommendations on transnational cooperation and improving the management of water and sediment in the Danube River Basin. The ICPDR named in 2020 in their SWMI (Significant Water Management Issues) report sediment balance alteration as sub-SWMI under Hydromorphological alterations. This resulted in Sediment balance alterations being included in the Danube River Basin Management Plan Update of 2021.

All reports are available in the "library" of the project website:
*http://www.interreg-danube.eu/approved-projects/danubesediment/output*

# DEEPWATER CE

## DEVELOPMENT OF AN INTEGRATED IMPLEMENTATION FRAMEWORK FOR MANAGED AQUIFER RECHARGE SOLUTIONS TO FACILITATE THE PROTECTION OF CENTRAL EUROPEAN WATER RESOURCES ENDANGERED BY CLIMATE CHANGE AND USER CONFLICT

**Funding instrument:** **Interreg Central Europe Programmee**

**Project duration:** 01. 05. 2019. – 30. 04. 2022.

**Budget in Euro:** Overall 1.766.210,96

**Priority:** 3. Cooperating on natural and cultural resources for sustainable growth in CENTRAL EUROPE

**Specific objective:** 3.1 To improve integrated environmental management capacities for the protection and sustainable use of natural heritage and resources

**Lead partner:** Authority of Regulatory Affairs of Hungary (formerly the Mining and Geological Survey of Hungary)

**Project Manager:** **Annamaria Nador**, annamaria.nador@sztfh.hu

**Project website:** https://www.interreg-central.eu/Content.Node/DEEPWATER-CE.html

**Project website**

DEEPWATER-CE is a project that has brought together seven partners from five central European countries: Hungary, Germany, Poland, Slovakia and Croatia. The main aim of this cooperation was to develop a comprehensive and integrated approach to implementing solutions for Managed Aquifer Recharge (MAR).

Partners have tackled a growing problem that affects more and more people, which is a lack of sufficient and, in places, good quality groundwater. The methods they have used involve managed aquifer recharge techniques. In case of prolonged droughts or general water shortages, this enables groundwater to be abstracted for human consump-


*Attached are graphics rights to the University of Silesia in Katowice*

***Photo of the Dunajec river in Poland*** *Photo: K. Janik*


***Photo with project partners*** *Photo: K. Stachniak*

tion, agriculture, or industry. As a result of the DEEP-WATER-CE project, different MAR solutions are now better known to a larger audience thanks to training and collaboration with international stakeholders. The team has developed a Transnational Decision Support Toolbox in the form of a handbook, in which a methodology designed to help stakeholders select the appropriate location for a MAR facility is proposed. This handbook is a set of selection criteria to assist in properly assessing the suitability of a given region for the chosen MAR type. On the Global Groundwater Information System (GGIS) online platform of the International Groundwater Resources Assessment Centre, you can explore the MAR suitability maps produced on the basis of the methodology tested in the four partner countries.

The results of the pilot actions, tools and proposals were developed for the implementation of MAR, an overview of the relevant legislative acts was made, and the conclusions were presented to the decision-makers and stakeholders in the partner countries, where the consortium received a lot of interest and positive feedback. In a broader, long-term perspective, this innovative project will help to increase the security of our and future generations' access to drinking water and irrigation water resources in the face of constantly changing climatic conditions in Central Europe. The DEEPWATER-CE projects have contributed significantly to achieving INTEREEG CENTRAL EUROPE's aim of integrating and sustaining the management of natural heritage.

## PROJECT WORK PACKAGES

**1. Development of a transnational knowledge base on the applicability of MAR in CE**

- involvement of stakeholders on a national and transnational level
- collection of good practices and benchmark analysis of existing MAR solutions
- trainings for stakeholders via webinars

*Collection of Good Practices and Benchmark Analysis on MAR solutions in the EU:*

**2. Development of a transnational assessment methodology for decision-making on MAR locations in CE**

- identification of the most appropriate sites in CE for implementing MAR
- selection of areas most directly affected by climate change and where MAR may be needed most
- development of a common decision supporting tool for locating MAR sites

*Transnational decision support TOOLBOX for designating potential MAR locations in Central Europe:*

**3. Feasibility assessment for establishing MAR schemes in CE**

- common methodology for conducting feasibility studies
- pilot feasibility studies carried out in four countries
- preliminary assessment of the environmental impact of potential MAR implementation

*Common Methodological Guidance For DEEPWATER-CE MAR Pilot Feasibility Studies:*

*PILOT FEASIBILITY STUDY OF MAR SCHEMES WITH INTEGRATED ENVIRONMENTAL APPROACH IN POROUS GEOLOGICAL CONDITIONS IN HUNGARY:*

*PILOT FEASIBILITY STUDY OF MAR SCHEMES WITH INTEGRATED ENVIRONMENTAL APPROACH IN POROUS GEOLOGICAL CONDITIONS IN POLAND:*

*PILOT FEASIBILITY STUDY OF MAR SCHEMES WITH INTEGRATED ENVIRONMENTAL APPROACH IN POROUS GEOLOGICAL CONDITIONS IN SLOVAKIA:*

*PILOT FEASIBILITY STUDY FOR MAR SCHEMES WITH INTEGRATED ENVIRONMENTAL APPROACH IN KARST GEOLOGICAL CONDITIONS IN SEMIARID KARST REGION (CROATIA):*

**4. Development of policy recommendations and national action plans**

- development of policy recommendations in line with current legislations and regulations
- technical guidelines for incorporating MAR in river basin management plans and strategies
- roundtable discussions with relevant stakeholders to ensure their support and receive their suggestions
- roundtable discussions with decision makers

*Set of policy recommendations to include MAR solutions into the legislation:*

*Guidelines for integrating MAR into the national river basin plans and strategies-drafted:*

*COMPARATIVE TRANSNATIONAL REPORT OF CE LEGISLATION AND POLICIES ON MAR*

*TRANSNATIONAL GUIDELINES FOR BETTER MAR ADOPTION IN CE REGION LEGISLATION AND STRATEGY*

# FRAMWAT

## FRAMEWORK FOR IMPROVING WATER BALANCE AND NUTRIENT MITIGATION BY APPLYING SMALL WATER RETENTION MEASURES

**Funding instrument:** **Interreg Central Europe**

**Project duration:** 01.07.2017. – 30. 06. 2020.

**Budget in Euro:** Overall 1,611,000

**Priority:** Cooperating on natural and cultural resoures for sustainable growth in Central Europe

**Specific objective:** To improve integrated environmental management capacities for the protection and sustainable use of natural heritage and resources

**Lead partner:** Warsaw University of Life Sciences, Poland

**Project Manager:** **Tomasz Okruszko,** framwat@levis.sggw.pl

**Project website:** https://www.interreg-central.eu/Content.Node/FramWat.html

**Project website**

The main objective of the FramWat project was to strengthen the regional, common framework for floods, droughts and pollution mitigation by increasing the buffer capacity of the landscape using the natural based solution approach and small water retention measures in a systematic way. So far, the majority of water management and flood protection measures lack innovation and follow more traditional approaches, including large scale grey infrastructure investment programs or capital projects. They have not been balanced by green infrastructure which takes into account valuable ecosystem services provided by nature in the landscape settings.

FramWat supported the idea for using the landscape features to help solving environmental problems in water bodies in a sustainable way. The innovative way for doing so was the development of methods which translate existing knowledge about N(S)WRM features into river basin management practice. This resulted in preparing new methodology for incorporation of natural and small retention measures in a form of action plan to be implemented in river basins. The project consortium has developed new tools: GIS based tool for assessment of needs and possibilities (FroGIS), Excel based tool for comparison of different variants of catchment development (StaticTool) and Decision Support System

which summarises all findings. The proposed approached is written down in the form of Guidelines and tested in the six catchments developed together and approved by local water authorities for the further use.

The project integrated the stakeholders most affected by droughts and floods (municipalities, forest districts, representatives of agriculture, nature protection agencies) with each other and experts, and facilitated creating ideas for in mitigating their effects. Problems and possible solutions were identified (Action plan), and tools (DSS planner) were provided to support stakeholders in the process of implementing activities (i.e. legal and technical guidelines).

The following results were obtained during the project:

3 TOOLS
6 PILOT AREAS
5 PILOT ACTIONS
6 ACTION PLANS

***Guidelines*** - Practical Guidelines on Planning Natural and Small Water Retention Measures

***Manual*** - on how to assess effectiveness of the system of measures in the river basin

***DSS*** - Decision Support System for Planning of Natural (Small) Water Retention Measures

***FroGIS*** - A publicly available web application to analyze the needs and possibilities of water retention

*Photo: László Balatonyi*

***StaticTool*** - Expert-knowlange-based system to support planning of small/natural water retention measures in rural landscapes

***6 Action Plans*** - for implementing N(S)WRM into the RBMPs: valorization, validating, modelling, assessment, CBA assessment, Development of Decision Support System (DSS)

- Austria – Aist Basin's pilot catchment
- Croatia – Bednja River's pilot catchment
- Hungary – Tisza River's subbasin: Nagykunság Basin – pilot catchment
- Poland – Kamienna Basin' pilot catchment
- Slovakia – Slana River's pilot catchment
- Slovenia – Kaminska Bistrica River's pilot catchment

*Photo: László Balatonyi*


*Photo: László Balatonyi*

# IDES

## IMPROVING WATER QUALITY IN THE DANUBE RIVER AND ITS TRIBUTARIES BY INTEGRATIVE FLOODPLAIN MANAGEMENT BASED ON ECOSYSTEM SERVICES

**Funding instrument:** **Danube Transnational Programme (3rd Call)**

**Project duration:** 01.07.2020. – 31. 12. 2022.

**Budget in Euro:** Overall 1,951,170

**Priority:** Environment and culture responsible Danube region

**Specific objective:** Strengthen transnational water management and flood risk prevention

**Lead partner:** Catholic University of Eichstätt-Ingolstadt, Germany

**Project Manager:** **Dr. Barbara Stammel,** barbara.stammel@ku.de

**Project website:** https://www.interreg-danube.eu/ides

**Project website**

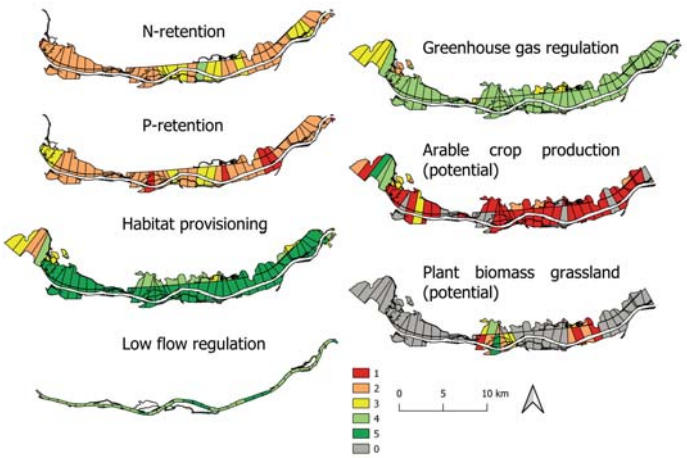
## THE IDES TOOL AND IDES MANUAL

At the start of the project in 2020, the use of the ES concept in the Danube region was heterogeneous. Most ES studies were conducted at the national or regional level, most often considering only a few services, and often the scale was too small to obtain information for decision-making at the river basin level. Other countries did not use the ES approach at all. Therefore, the IDES project developed a transnational harmonized method to assess all ES related to water quality, based on the data available in the Danube region.

The developed IDES tool represents a joint and harmonized ES evaluation scheme that can be adapted to varying regional data availability in the Danube river basin and benefits from already applied evaluation approaches in different countries.

As a first step, promising floodplains for improving water quality (by retaining nutrients from different sources) were identified, using the well-established MONERIS model and an indicator-based assessment. The geographical coverage of the assessment of Ecosystem Services comprises the floodplains of the Danube and its major tributaries, differentiated into active and former floodplains. The geodata for

*Intact floodplains provide the Ecosystem Service of nutrient retention during floods by reducing the flow velocity and enhancing the surface/shear stress, but also always serve as buffer against nutrient input from the catchment into the river.* 




*Examples of assessments of seven different ecosystem services in the Austrian pilot area National Park "Donau-Auen", showing the large differences in their provision.*

this delineation of floodplains is based on the results produced by other projects (Danube Floodplain Project, riparian zone data set of Copernicus Land Monitoring).

The thematic coverage reflects 26 relevant Ecosystem Services for water quality management in floodplains in the three ES-classes of provisioning (e.g. arable crops, timber production), regulating (e.g. nutrient retention, flood risk prevention, habitat provision) and cultural ES (e.g. water-related activities, landscape aesthetic quality). Depending on data availability and quality, two assessment methods (indicator-based approach (Podschun et al. 2018), capacity matrix approach (Stoll et al. 2015)) were adapted to the Danube region. They complement each other and can be combined, as both follow the same assessment framework (assessment classes ranked 1 to 5 and in 1km floodplain segments). Joint visualizations of the assessment summarize synergies and trade-offs of ES in the status quo and in various scenarios.

All assessment methods have been clearly described in the IDES manual together with factsheets for each ES, in order to enable decision-makers to do the assessment on their own and identify the most effective and integrative option of implementing related nature-based solutions at the transnational level. Key actors in the water sector were trained in applying the IDES tool during national training courses in eight different countries.

## WATER QUALITY MANAGEMENT CONCEPTS

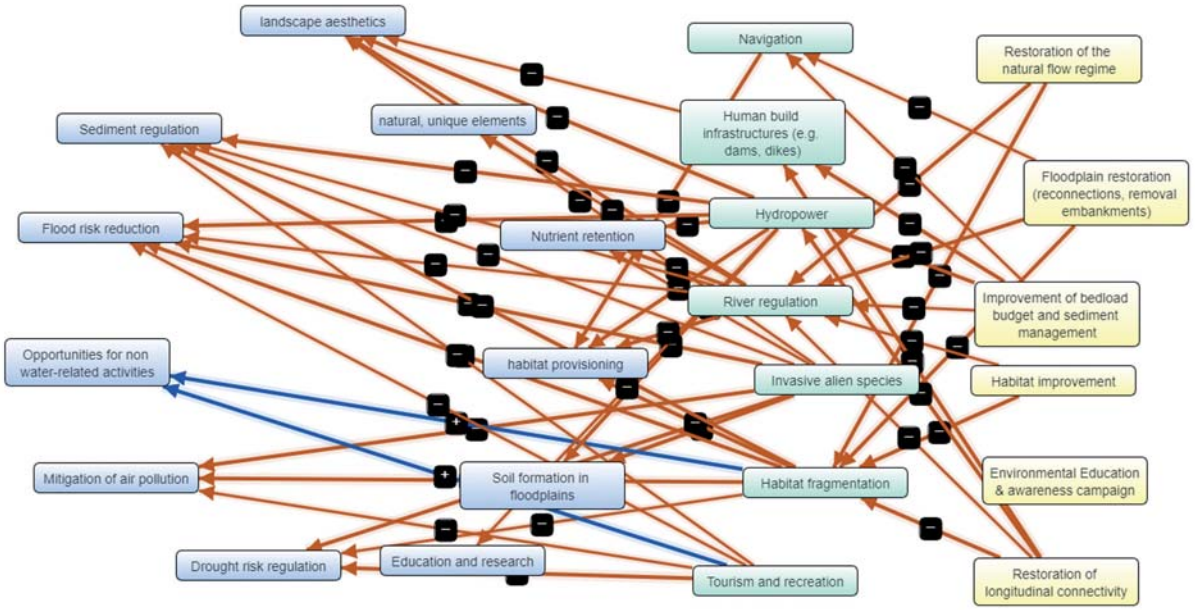
In five pilot areas in Austria, Slovenia, Hungary, Serbia, and Romania innovative water quality management concepts were co-created together with local and regional stakeholders. This was done during two stakeholder workshops in each pilot area. At the first one, the most relevant ES in the pilot area were discussed and identified. Based on this selection, a site-specific fuzzy cognitive map (FCM) on the relationships between the ES, pressures on them and potential water quality measures were jointly developed by the stakeholders. One year later, at a second workshop, based on the assessments achieved by implementing the IDES tool in the pilot area and on the FCM, stakeholders jointly drafted water quality management concepts for each pilot area. Stake-

holders were made aware of water quality issues, but also of the demands and needs of other stakeholders. Better stakeholder understanding and awareness will thus lead to an improved and accelerated implementation of water quality management in the future.

## THE IDES STRATEGY

All partners jointly developed a transnational strategy and national roadmaps providing the operational pathway for measures in high-priority areas to integrate the ES approach into future water quality planning processes. Feedback from a transnational stakeholder workshop in October 2022 helped in fine-tuning the IDES tool and strategy in the final phase and in fostering its implementation. The strategy will help to reduce eutrophication of the Danube and the Black Sea in the future.

*hyperlink to accessible deliverable:*
*https://www.interreg-danube.eu/approved-projects/ides/outputs*




*Fuzzy cognitive mapping of relevant ecosystem services, pressures and measures and their interconnections. The model here was jointly developed by the stakeholders of the Austrian pilot area, while in the other pilot areas different models were created. The FCMs helped the stakeholders to understand the different needs in the area, the relations in the ecosystems, and the effects of human actions. They were used to calculate scenarios for the development of water quality management concepts.*

# LIFELINEMDD

## PROTECTING AND RESTORING ECOLOGICAL CONNECTIVITY IN THE MURA-DRAVA-DANUBE RIVER CORRIDOR THROUGH CROSS-SECTORAL COOPERATION

**Funding instrument:** **Danube Transnational Programme**

**Project duration:** 01.07.2020. – 31. 12. 2022.

**Budget in Euro:** Overall 2,987,789.19

**Priority:** Environment and culture responsible Danube region

**Specific objective:** Foster the restoration and management of ecological corridors

**Lead partner:** WWF Austria

**Project Manager:** **Kerstin Böck,** kerstin.boeck@wwf.at

**Project website:** https://www.interreg-danube.eu/approved-projects/lifelinemdd
http://www.amazon-of-europe.com/en/lifelinemdd/

**Project website**

The Mura, Drava and Danube form one of the most valuable river corridors in the Danube Basin, a lifeline for people, species and habitats. Flowing more than 700 kilometres and connecting an area of 930,000 hectares stretching across Austria, Slovenia, Hungary, Croatia and Serbia, they connect a unique landscape. In 2021 this area was designated by UNESCO as the world's first '5-country biosphere reserve' and thereby has become the largest riverine protected area in Europe.

However, connectivity within the corridor is reduced due to human-made changes to rivers and their natural processes. Thus, the main goal of lifelineMDD was to improve ecological connectivity through a cross-sectoral partnership and the implementation of restoration measures. While the Interreg DTP project coop MDD established cooperation between Protected Area managers, lifelineMDD takes cooperation one step further, crossing over from joint planning to joint scientific work and pilot implementation of field works.

## LIVING RIVERS

Despite its widely known rich biodiversity and diverse habitats, the unique river corridor of the TBR MDD is also under immense pressure due to human-made changes. To preserve this lifeline, joint solutions and efforts are needed, such as to establish a scientific knowledge base and the first 5-country meta-database. Scientific studies were conduct-

*Mura-Drava confluence* ©Ante Gugic

*Bird mapping* ©IRSNC

*Volunteering action Croatia* ©JU ZDP VZ

ed on fish populations, river birds, sediment transport, river training structures and climate change. All results are compiled into one ***synthesis report***, wrapping up challenges detected and solutions recommended.

This will set the basis for future concerted restoration projects within the TBR MDD.

## LIVING COOPERATION

A cross-sectoral learning process between nature protection and water management authorities based on pilot restoration actions raises institutional competences and strengthens cooperation between key stakeholders.

***Three pilot restoration projects*** served as joint learning cases. Dealing with distinct issues of connectivity and being situated in different river types, they provided excellent practical cases for transboundary cross-sectoral learning, planning and joint review of results in the field.

- At the Austrian Mura an old river branch reconnection was enhanced.
- At the Slovenian Mura the riverbed was widened and sediment mobilized
- In the Bačko Podunavlje Biosphere Reserve the water management and retention in the floodplain and oxbows was improved

A ***River Restoration Toolbox*** has been developed that offers simple and concise information on the methods that can be used and combined for achieving sediment input through revitalisation, thereby addressing the largest river engineering and ecological problems in the TBR MDD (Transboundary

*Fish monitoring* ©Boku

*Pilot site Austria* ©Ante Gugic

*Study visit* ©IRSNC

Biosphere Reserve Mura-Drava-Danube) area. The experience exchange and joint learning process based on pilot actions strongly contributed to its development. The toolbox describes suitable state-of-the-art restoration measures for different ecological river types (stretches within TBR MDD), based on experiences from all over Europe.

The ***TBR MDD River Restoration Strategy*** incorporates the synthesis report of scientific studies and the ***River Restoration Toolbox*** and summarizes joint plans for future restoration works in the TBR MDD, based on a commitment to science-based improvement of the river ecosystems.

To ensure long-lasting cross-sectoral cooperation and successful implementation of the TBR MDD River Restoration Strategy with the aim of better protection and restoration of the ecological connectivity in the river corridor, a potential framework for stakeholder platforms has been developed. Joint efforts and stronger integration of stakeholders in the future, through formal or informal networks, aim to ensure a living cooperation beyond project duration.

## LIVING MINDS

Rivers symbolize various values for the community living in its vicinity - human connection with nature, health, but also a sense of pride since the river is a part of the cultural heritage for people living nearby. By implementing innovative approaches and building knowledge on topics of ecological connectivity, nature protection and river restoration can help to establish a network of real advocates for rivers in the years to come.

Local communities had the opportunity to ***get active for their rivers*** and to learn about river dynamics and connectivity through educational and

different volunteering activities, such as clearing steep banks, removing embankment or other direct involvement actions.

On the other hand, a ***train-the-trainer*** approach ensured long term knowledge exchange by including teachers, youth workers, nature education guides in educational activities. It included content know-how, didactic and pedagogical methods and tools, as well as building up general guiding skills for educators. A comprehensive training handbook and various didactic materials were developed that served as basis for the trainings and shall also be a basis for future educational activities in the TBR MDD.

The first ***TBR MDD Nature Academy***, based in RIVERS'COOL Velika Polana, offered a chance for the local community to learn in nature about nature. The educational programme focused on biodiversity and ecological connectivity in the TBR MDD, and the benefits that people have from preserving them.

**Links to accessible deliverable:**

Fish population status study:

Fish study Serbia:

River Training structures and Historical mapping:

Sediment Mobilization Study:

Climate Change Study:

Hydrology Study:

River Restoration Toolbox:

Training Handbook on educational activities:

lifelineMDD project leaflet:

# LIFE LOGOS 4 WATERS

## INTEGRATED APPLICATION OF INNOVATIVE WATER MANAGEMENT METHODS AT RIVER BASIN BY COORDINATION OF LOCAL GOVERNMENTS

**Funding instrument:** **LIFE Programme**

**Project duration:** 01. 10. 2024. – 30. 09. 2025.

**Budget in Euro:** 3,764,915

**Priority:** Climate Change Adaptation (CCA)

**Specific objective:** Strengthen the adaptation skills of vulnerable municipalities with catchment level cooperation

**Lead partner:** Ministry of Interior of Hungary

**Project Manager:** **Petra Szatzker dr.,** petra.szatzker@bm.gov.hu

**Project website:** https://lifelogos4waters.bm.hu/en/home/

**Project website**

The LIFE LOGOS 4 WATERS project builds on the experiences and connections gained in the LIFE-MICACC project, however, it is not a direct continuation of it. The goal is similar: strengthen the adaptation skills of Hungarian municipalities against the negative effects of climate change. But the level of execution is bigger.

The LIFE LOGOS 4 WATERS project will incorporate the NWRM prototypes tested in LIFE-MICACC project and create a line of defence for small catchments by creating several small interventions in an integrated way.

As the consortium noticed during the implementation of the LIFE-MICACC project, the lack of a "common language" needs to be dealt with, so created additional activities focusing on tackling this issue. The capacity building and knowledge sharing actions will deal with the identified gaps caused by prior misunderstandings and lack of understanding each other. Methodology guides and manuals, training materials for professionals to primary school students, demonstration centres and virtual tours will guide us to create a common understanding about the way and language of natural water retention measures and nature-based solutions. Creating an Integrated Support Board and a Multi-stakeholder Catchment Forum also serves this purpose.

The project is still under implementation, but further information and related news and event are shared frequently on the project website.

# LIFE-MICACC

## MUNICIPALITIES AS INTEGRATORS AND COORDINATORS IN ADAPTATION TO CLIMATE CHANGE

**Funding instrument:** **LIFE Programm**

**Project duration:** 01. 09. 2017. – 30. 11. 2021.

**Budget in Euro:** Overall 2,564,783

**Priority:** Climate Change Adaptation (CCA)

**Specific objective:** Strengthen the adaptation skills of vulnerable municipalities

**Lead partner:** Ministry of Interior of Hungary

**Project Manager:** **Zsuzsanna Hercig**, zsuzsanna.hercig@bm.gov.hu

**Project website:** https://nwrm.bm.hu

**Project website**

## PROJECT RESULTS

### THE 5 PILOT AREAS - 5 MODEL SOLUTIONS

In the frame of the LIFE-MICACC project the partnership implemented Natural Water Retention Measures (NWRMs) in the intervention areas selected in the five partner municipalities. The selected settlements are among the most vulnerable settlements in Hungary: they are very prone to extreme weather events such as droughts, floods, flash floods, inland flooding or a combination of these. The water retention measures designed and implemented in the project were adapted to the climatic challenges and conditions of the municipalities.

**Bátya** - Multi-basin, stormwater fed wetland, flood management

**Püspökszilágy** - Reducing the risk of flash floods in hilly areas by slowing down runoff

**Rákócziújfalu** - Drought risk management based on water retention by transforming the existing sewage channel

**Ruzsa** - Water conservation on the Sandbanks (Homokhátság), greywater reuse

**Tiszatarján** - Complex floodplain adaptation model with ecotourism element

**BÁTYA.** On the site of an old abandoned clay pit a multi-basin open water pond of about one hectare has been created, which also functions as a wetland. The lake can absorb and retain excess water, mitigate the effects of heat waves and droughts by re-

charging groundwater, improve the microclimate through evaporation, and provide recreational opportunities for local people. The revitalisation of the lake aims to preserve Bátya's valuable water resources for drier times, thereby recharging groundwater and mitigating droughts that is amplified by climate change. The lake is designed so that the northern side with its reedbeds and irregular shoreline is more for wildlife and nature, while the southern side with its straight shoreline is for recreation.

Short movie about the pilot in Bátya:
*https://youtu.be/_kB_B1VsNLQ*

**PÜSPÖKSZILÁGY.** Instead of draining the focus was on slowing down run-off, conserving and retaining water in the landscape. On the side branch of the Szilágyi stream, 7 leaky wooden dams were constructed from local timber and 4 stone sediment traps were also renovated. These natural barriers slow down the flow of water, flatten the flood peak and prevent flooding. In addition, a lateral reservoir

has been constructed at the lower catchment, which can absorb excess water and also serve as a wetland. The aim of the complex solution is to reduce the risk of flash floods in Püspökszilágy, while preserving the valuable water resources of the settlement for drier times in the created wetland, and thus mitigating the expected adverse effects of climate change.

Short movie about the pilot in Püspökszilágy: h*ttps://youtu.be/1TnzpVUoDUc*

**RÁKÓCZIÚJFALU.** The excess water caused by flooding and heavy rainfall is held in place by modifying the existing sewage network, building structures and a dam. Next to the canal, a deeper area has been created to which excess water (stormwater/rainwater) can be diverted from the canal. A wetland will be created in this area to help recharge groundwater during periods of droughts. The aim of the intervention is to preserve the valuable water resources of Rákócziújfalu for drier times, as the lake cools the local climate by evaporation, making the settlement more livable in times of increasingly frequent droughts. This will mitigate the likely adverse effects of climate change and provide habitat for many water-dependent species. The project also wants the lakeside to serve as a recreational park for local residents.

Short movie about the pilot in Rákócziújfalu: *https://youtu.be/K7EBtMsGpvQ*

**RUZSA.** The project tested the recycling and reuse of greywater, including both treated wastewater and proces water. An internal pond of about 700 $m^2$ has been created, where groundwater recharge based on the retention of decanted water as a by-product of drinking water treatment was implemented. As an important advantage, the environment is greener and the microclimate is improved, making the area suitable for recreation.

A reservoir of about one hectare has been built behind the wastewater treatment plant, which discharges about 150 $m^3$ of treated wastewater per day, in order to store the treated wastewater. On the other hand, the external drainage system has been renovated and wooden barriers have been installed to prevent water from running off the site during wet periods and preserving it in place. This also helps to replenish soil water reserves and reduce drought risks. In the Homokhátság, every drop of water has a real value. Nevertheless, the little water that sometimes appears here has run off from Ruzsa through the canal. The aim of the project is to preserve the precious water resources of Ruzsa in the canal and small lakes for drier times, to recharge groundwater and thus mitigate heat waves and the expected adverse effects of climate change.

Short movie about the pilot in Ruzsa:
*https://youtu.be/rzagkJVhYK4*

**TISZATARJÁN.** In order to increase the retained water resources the existing cubic basin system has been extended with a new basin, and natural gullies have been created on the banks. In addition, the Municipality of Tiszatarján used its floodplain areas for grazing and energy plantations, which also helps to control the invasive 'Amorpha fruticosa'. This is a unique floodplain management model which we are now making accessible and demonstratable by building a nature trail. The aim of the project is to increase local flood safety, prevent invasive species from infesting the floodplain and increase the amount of water that can be retained in the landscape. The small pond system will store valuable water resources and inland water from the Tisza flooding, thus mitigating the adverse effects of climate change. In addition, the water buffalos and grey cattles grazing on the restored floodplain will also help to develop the local economy as a nice ecotourism programme.

Short movie about the pilot in Tiszatarján:
*https://youtu.be/eOYn5FOk5rU*

## TRAININGS, TRAINING MATERIALS

Within the framework of the LIFE-MICACC project three training sessions were held, twice in two days, to introduce the different municipalities' participants the negative effects of climate change (at the municipal and river basin level) and the basic principles and possible ways of adaptation, through presentations and different exercises. Participants prepared vulnerability assessments for their own municipality/watershed, and assessed the climatic situation, challenges and opportunities in their municipality. The training participants had the opportunity to consult with representatives of the following fields: ***meteorology, water resources management, environmental management, urban stormwater management, urban planning and health.***

Training content and methodology (training material) is available on the project website (only in Hungarian).

## E-LEARNING MATERIAL

Another important tool for knowledge transfer is the e-learning material prepared in the project, which is ***available free of charge*** on the project website for all interested parties (in Hungarian). The e-learning covers the topics of ***local adaptation to climate change and water retention*** through 6 modules and several interactive exercises. Users can find useful information on the following topics:

- What are the basic concepts and processes of climate change?
- How to adapt to water-related risks?
- How to prepare a vulnerability assessment for a settlement?
- How to adapt to the identified vulnerabilities?

## APPLICATION TO SUPPORT NATURAL WATER RETENTION MEASURES


The project has developed an application that aims to ***provide community-based information*** on natural water retention measures and provide an opportunity for stakeholders ***to learn and share good practices***. The mobile app is mainly designed for municipal staff, but it can also be useful for water management, environmental experts and farmers, as well as for the laymen, as it brings together all relevant information on natural water retention in one place in an easy-to-understand way. Through the app people can find out what solutions exist,

what projects (good practices) have been successfully implemented in Hungary and abroad, and get information about related events and news that may be of interest to them.

## RUNOFF MODEL TO THE FIVE AFFECTED CATCHMENTS

Runoff models have been prepared for the five pilot catchments to help ***identify locations that may be highly affected and vulnerable*** to the increasing frequency of extreme weather events in the future. The model shows, at different water flows, the extent to which a watercourse or canal can be expected to spill, and the areas most likely to be affected by the spill. In a hilly area, the model can also estimate how runoff rate changes in a given area under certain land cover changes (e.g. by increasing the proportion of forest cover). The modeling identifies sensitive areas where, in partnership with local stakeholders, natural water retention solutions can be developed that can effectively increase the climate adaptation capacity of settlements and river basins in the long term. The model also facilitates the development of partnerships between municipalities at river basin level by identifying common interests, threats and possible points of intervention in the river basin.

## INTERNATIONAL EXPERIENCES AND RELATIONS

Within the project several activities were included to gain international experience, as the practice of natural water retention measures is not well-known and applied in Hungary. So, the consortium organized five study trips abroad and three networking trips, and participation in international conferences also occurred. On these occasions gained a number of useful and transferable solutions and experiences that can be applied in the domestic environment. The visits highlighted that the issue of climate change adaptation and awareness can be approached in a variety of ways, but the integration and coordination of different activities is of key importance. (Detailed trip reports can be found on the project website.)

## SHARING RESULTS, KNOWLEDGE TRANSFER, DISSEMINATION

Sharing project results is a priority. During the project the partnership wanted to raise awareness as widely as possible of one possible effective method of local adaptation: natural water retention measures. From local residents, through the leaders of other municipalities and water professionals, to

the media. To this end, several events have been organised (roadshows, conferences, local forums, field visits and press trips) with the active participation of the guests.

## REPLICATION OF NWRMS

An obligatory element for all LIFE projects is the broad replicability of the activities carried out, facilitating their replication. The project included several ways to encourage and support the application of the implemented pilot NWRMs in other municipalities - in addition to a series of events and roadshows - such as:

**COOPERATION AT RIVER BASIN LEVEL, JOINT PLANNING FOR THE FUTURE.** Within the framework of the project a separate action was launched for cooperation and joint reflection involving interested municipalities in the catchment areas of the five pilot municipalities. The project included a two-day training course on how to prepare a vulnerability assessment. Based on the conclusions, the applicability of the NWRMs implemented in the project has been identified by the municipalities to reduce their vulnerability and increase their adaptive capacity, developing a shared vision at the river basin level.

**SELECTION OF THE FIVE REPLICATION SITES, FEASIBILITY STUDIES.** The aim of the activity was to help five other municipalities with similar climatic difficulties to find and design appropriate NWRM solutions to increase their adaptive capacity. The main aim is to replicate and implement the NWRM solutions tested in the project. Feasibility studies have been carried out for five additional municipalities selected from the 24 external partner municipalities in the project.

**PROMOTING CROSS-BORDER REPLICATION.** The results and experiences of the five pilot projects were also presented to municipalities in neighbouring countries through field visits and an international online conference. Based on the online questionnaire completed in January 2021 (with around 400 respondents), there is strong interest from neighbouring countries. Local communities are also familiar with the problem from their daily lives and are looking for real working solutions.

## WATER RISK FILTER FOR COMPANIES AND MUNICIPALITIES

Water is associated with many risks that can have a profound impact on the development of a municipality or company. Moreover, these risks are increasing as a result of climate change. In the LIFE-MICACC project the Water Risk Filter (launched in 2012 by WWF) was populated with Hungarian data in addition to the global databases, to help local authorities ***find the water risks in the catchment areas of their interest***. The high-resolution Hungarian databases also show spatial differences, such as the differences between the Transdanubian and the Great

Plain regions, which the global map cannot show. The Water Risk Filter also helps to start a dialogue between municipalities and companies operating in their areas with higher water risks on common environmental challenges and possible adaptation measures on the ground.

An online guide to the Water Risk filter has been produced in Hungarian and is available at *https://vizkockazat.wwf.hu/.*

## MAKING RECOMMENDATIONS TO THE GOVERNMENT

During the project the partnership – based on the experiences of the designing and the implementation phase - gathered its recommendations to the Government.

***The primary objective*** is to create a supportive legal environment for the application of close-to-nature solutions through regulatory recommendations, and to expand and develop the powers and tools of local authorities in the field of climate change adaptation.

## ADAPTATION GUIDE

Based on the experience of the LIFE-MICACC project the Adaptation Guide is a toolkit for municipalities, and describes:

- the role and options for actions of local authorities in adapting to climate change;
- possible ways of retaining water (near water courses, in forestry, agriculture);
- the additional benefits of natural water retention measures;
- the process and steps (from designing to permitting and operation) of creating close-to-nature solutions;
- national and international good examples, best practices, case studies;
- effective methods and tools for involving stakeholders, recommendations for communication;
- useful links, further reading on the subject.

***Goal:*** Encourage and inspire local municipalities to think about and implement similar solutions in their own settlements. The Guide is intended to provide a practical, useful tool and methodology for this purpose.

***Target group:*** Mainly local municipal leaders, experts.

Link to the accessible project deliverables: *https://vizmegtartomegoldasok.bm.hu/en/documents*

# MEASURES

## MANAGING AND RESTORING AQUATIC ECOLOGICAL CORRIDORS FOR MIGRATORY FISH SPECIES IN THE DANUBE RIVER BASIN


**Funding instrument:** **Danube Transnational Programme (2nd Call)**

**Project duration:** 01.06.2018. – 31. 07. 2021.

**Budget in Euro:** 2,512,931.08

**Priority:** Environment and culture responsible Danube region

**Specific objective:** Foster the restoration and management of ecological corridors

**Lead partner:** University of Natural Resources and Life Sciences, Vienna

**Project Manager:** **Silke-Silvia Drexler**, measures_coord@boku.ac.at

**Project website:** https://www.interreg-danube.eu/approved-projects/measures

**Project website**

Freshwater ecosystems provide a wide range of ecosystem services like drinking and irrigation water, recreation or mitigation in climate change among others. At the same time these vulnerable systems face pressures due to pollution, invasive species, global warming and river engineering and the herewith related habitat loss. This habitat loss has a negative impact on biodiversity especially of aquatic species. The Danube and its tributaries are inhabited by more than sixty fish species whereof the sturgeons are mostly threatened. All sturgeon species are critically endangered or even extinct. To safeguard the last sturgeon populations as well as the populations of other migratory fish species great efforts are needed.

The DTP Interreg project "Managing and restoring aquatic ecological corridors for migratory fish species in the Danube river basin (MEASRUES) set its focus on reestablishment of ecological corridors by identifying key habitats and initiating protective measures along the Danube and its main tributaries. To reach the project goals sturgeons and other migratory fish species acted as flagship species. These aquatic organisms were and are of high economic value and represent an important natural heritage of the Danube and are indicators for the connectivity of the river. Transnational management of these corridors and restoration actions, as well as restocking with indigenous species are essential. The project was based on four pillars:

(1) Identification and mapping of migratory fish habitats.
(2) Provision of a concept to conserve Danube sturgeon species, including an appropriate design of brood stock facilities.
(3) Development of a harmonised and improved strategy (including prioritisation) for the reconnection of migratory fish habitats to secure and re-establish vital ecological corridors in the DRB to be implemented into policy and management plans.
(4) Establishing an online database to provide specific data for the DRB.

## MAPPING THE HABITAT

Migratory fish species require different types of habitats according to their respective life cycle stages. Within the MEASURES project spawning, nursery, feeding and wintering habitats were identified in a first step through analysing secondary data like historical data, fishery management plans or information from fishermen as well as navigation and bathymetric maps. For verifying the habitats in the Danube, a joint method was developed for all involved project partners to investigate the respective case studies. Besides electro-fishing, net fishing and tagging of fish and additionally the innovative e-DNA method was established detecting the rare sturgeon species in the DRB. More than 2200 places were identified through data analysis for 16 migratory fish species. Of these around half could be confirmed as actually used. To reach the goals of the MEASURES project sturgeons and other migratory fish like e.g. shads *(Alosa immaculata)*, barbel *(Barbus barbus)*, nase *(Chondrostoma nasus)* etc. were

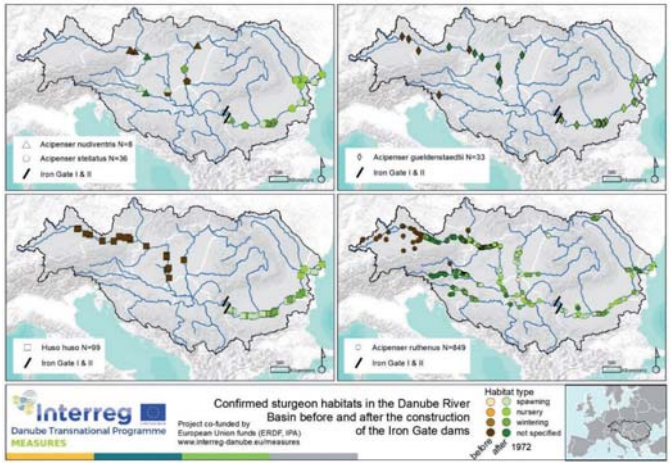
focused on as flagship species. Of the Danube sturgeon species, the critically endangered Beluga Sturgeon *(Huso huso)*, the Stellate Sturgeon *(Acipenser stellatus)*, the Russian Sturgeon *(A. gueldenstaedtii)*, the functionally extinct Ship Sturgeon *(A. nudiventris)* and the Sterlet *(A. ruthenus)* where investigated.

On the basis of the endangered status of sturgeons their conservation is of major concern for the ICPDR (International Commission for the Protection of the Danube River). Therefor the habitat mapping results of MEASURES were integrated into the updated Danube River Basin Management Plan 2021 to foster on a transnational level the recovery of the Danube sturgeon species.

## CONSERVATION STOCKING

Vital fish populations are an essential indicator for the ecological status of freshwater systems and further for the functionality of ecological corridors. In the last decades this organism group suffered substantially from pollution, overfishing and poaching as well as from habitat destruction and missing connectivity of those. To conserve the genetic pool and to strengthen the wild populations of selected species sustainable conservation stocking of native fish is highly needed.

Wild organisms of Russian sturgeon and Sterlet were collected in MEASURES to establish ex-situ facilities for regular restocking events in the Danube. Such scientifically based hatcheries were erected in Hungary and Austria and provide the opportunity to rear fish under controlled conditions. In 2019 and 2020 a total number of about 30,500 sterlets and 2,500 Russian sturgeons were released in the lower Danube and the tributaries.



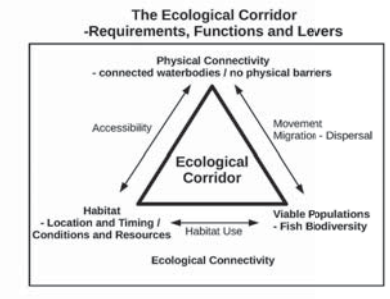

*Confirmed sturgeon habitats in the Danube river basin before and after the construction of the Iron Gate dams*

## MIS – MEASURES INFORMATION SYSTEM

The MEASURES Information System (MIS) is an online platform to provide data about migratory fish, their habitats and the Danube itself, which can be easily accessed by scientists, decision makers and the broad public. The system is available via the following link: *https://mis-metadata.ddni.ro* or via the MEASURES website *http://www.interreg-danube.eu/approved-projects/measures/section/measures-information-system-mis*. At the online information centre a reference library, a metadatabase and a data centre are provided with information about ecological corridors and the connectivity of habitats for long- and medium-distance migratory fish with-

*Tagged sterlet restocked within the MEASURES project* (MATE, 2019)


*Sterlet restocking near Ercsi, Hungary in 2019* (MATE, 2019)




*The ecological corridor – requirements, functions and levers* (Haidvogl et al., 2021)

in the Danube River Basin. With closure of the project, in July 2021, 747 different datasets were available in the metadatabase. Of these more than 75% were publicly available, 22% were open for MEASURES partners and stakeholders and the rest was limited to MEASURES partners only.

## DEVELOPING A HARMONIZED STRATEGY

All key-findings of MEASURES were integrated into a basin-wide strategy to manage and restore habitats for safeguarding the Danube as ecological corridor for migratory fish. The "Strategy for ecological corridor conservation and restoration in the Danube catchment" was one of the main outputs of the project *(https://www.interreg-danube.eu/approved-projects/measures/outputs)*. Through involvement of relevant stakeholders (from nature protection, conservation and restoration, river management and flood protection, fishery, hydropower, navigation and agriculture) three rounds of national workshops were held in each of the 8 partner countries to establish a network of relevant interest groups, which helps to implement the proposed measures of the guidance document at national levels. The strategy itself addresses specific topics to secure the Danube and its tributaries as vital corridors. Eight types of measures were defined which further consist of specific activities and priorities. The first three types of measures (ToM) deal with the management of the Danube and its tributaries: (1) Assessing, mitigating or eliminating the negative effects of migration barriers; (2) Protection and restoration of migratory fish habitats; (3) Green infrastructure for flood management and nature-based solutions for navigation. ToM 4 and 5 focus on biotic factors in supporting viable fish populations of migratory fish species (4) and in harmonized monitoring of their habitats (5). The last three ToMs propose the active participation of relevant stakeholders through development of National Activity Plans for Migratory Fish Species (6); the implementation of "Local Migratory Fish Networks" (7) and finally to involve the citizens in supporting local migratory fish networks (8).

# OPTAIN

## OPTIMAL STRATEGIES TO RETAIN AND RE-USE WATER AND NUTRIENTS IN SMALL AGRICULTURAL CATCHMENTS ACROSS DIFFERENT SOIL-CLIMATIC REGIONS IN EUROPE



**Funding instrument:** **EU Horizon 2020, Research and innovation programme under grant agreement No. 862756**

**Project duration:** 30. 09. 2020. – 31. 08. 2025.

**Budget in Euro:** 6.999.856,25

**Priority:** Use of water and nutrient retention measures in solving agricultural and environmental water management issues

**Specific objective:** Identifying optimal combinations of Natural Water Retention Measures for better water management in agricultural catchments.

**Lead partner:** Helmholtz-Centre for Environmental Research-UFZ, Leipzig, Germany

**Project Manager:** **Prof. Dr. Martin Volk**, martin.volk@ufz.de

**Project website:** www.optain.eu
https://www.optain.eu/deliverables#deliverables
https://cordis.europa.eu/project/id/862756/results

**Project website**

## MOTIVATION

The increasing number of droughts and heavy rainfall aggravates the existing conflicts among agricultural water uses and other human and environmental demands for water. Natural/Small Water Retention Measures (NSWRMs) can help mitigate such conflicts and serve a sound management of head watersheds, which could significantly contribute to an improved water quality, more resilient agriculture and society.

## WHY IS IT IMPORTANT?

NSWRMs contribute to the achievement of different Sustainable Development Goals (e.g., SDG 2, 6, 12, 13 and 15) and environmental targets formulated in several water- and agriculture-related policies of the European Union. But despite the existing comprehensive set of techniques to increase water and nutrient retention on both catchment and farm levels, knowledge is still lacking on the effectiveness of different scale- and region-specific NSWRM across various soil climatic regions and agricultural systems, especially under changing climate conditions.

## PROJECT SUMMARY

To tackle these problems, the EU Horizon 2020 project OPTAIN compares the effectivity of NSWRM across three different biogeographical regions (continental, pannonian, and boreal) of Europe. For this, OPTAIN will build upon already existing frameworks (NWRM.eu, WOCAT), but also consider the information necessary for implementers and the wider community to develop a coherent catalogue of relevant NSWRM that can be fed back to the mentioned frameworks. To ensure consistency and comparability amongst the 14 case studies, OPTAIN aims for a comprehensive harmonisation and develop common protocols for actor involvement, data retrieval, NSWRM parametrisation and cataloguing as well as modelling and optimisation. This will enable a sound synthesis of the findings and thereby increase the overall knowledge on the effectiveness of NSWRM irrespective of case study specificities.

The project also identifies which combinations of those measures are most efficient for the retention and reuse of water and nutrients in the case studies that are suffering from Nitrogen and Phosphorus losses as well from increasingly occurring flood and droughts. Therefore, 21 project partners from 14 countries select in close cooperation with local actors NSWRMs at farm and catchment level and will model and optimize their spatial allocation and combination, based on environmental and economic sustainability indicators. OPTAIN will conduct an efficient search for such optimal implementation designs by employing environmental and economic models within CoMOLA, a framework and tool for 'Constrained Multi-objective Optimisation of Land-use Allocation' developed by UFZ (Strauch et al., 2019).

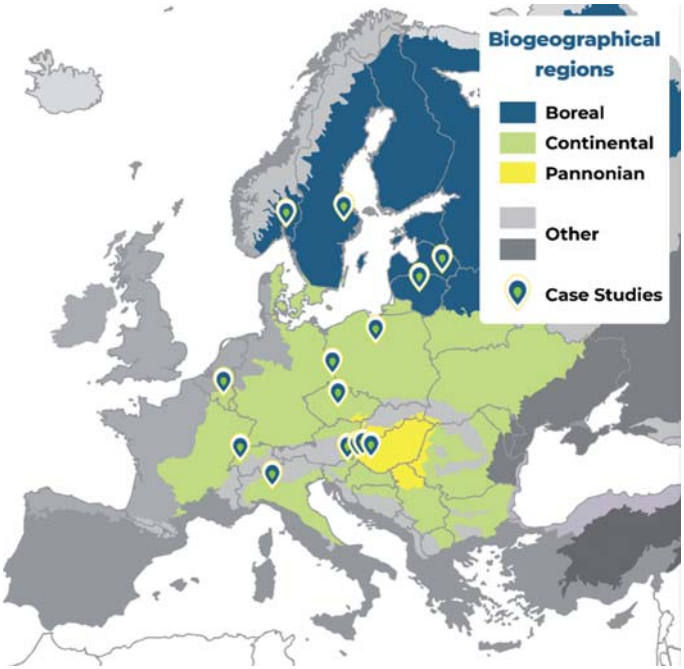
As the long-term overarching impact of the OPTAIN activities, the consortium sees that the farmers will be empowered to adapt their management, and to improve the sustainability of their agricul-

tural system, which will stabilize yields and income. Moreover, the exchange will enable agricultural and water consultants to advice their clients based on the increased understanding of the relationships between agricultural systems, different landscape characteristics and specific NSWRM. This also supports expert personnel and policy makers in their decision-making processes, including the design of targeted and effective incentive systems. Finally, the scientific audience and professional experts will benefit through the methods, tools, data and publications that OPTAIN will provide with open access to. This will increase their innovation capacity in multiple ways. All gained knowledge will be translated into a Learning Environment allowing analysis of trade-offs and synergies between multiple values/goals in the management and design of NSWRMs.

## PRELIMINARY RESULTS

### ESTABLISHMENT OF STAKEHOLDER REFERENCE GROUPS

OPTAIN follows a harmonised multi-actor approach, which means that stakeholders such as farmers, representatives from, for instance, water management, and agro-environmental agencies, spatial planning, nature protection, and non-governmental organisations (NGOs) on different administrative levels play an essential role in the project. In the period from the start of the project to now, each case study identified relevant stakeholders, set-up a multi-actor reference group (MARG) and conducted a MARG kick-off meeting. MARG are supporting the scientific investigations with their expertise and





*The OPTAIN procedure*

operational knowledge, being at the same time end-users of the project results. Multi-disciplinarity of the involved stakeholders adds value in all tasks related to the assessment, prioritisation and comparison of measures. MARG are the main non-scientific partners "having significant scientific value" in terms of participatory and multidisciplinary approaches.

## NSWRM PRE-SELECTION FROM MARG AND SCIENCE/MODELLING PERSPECTIVE

To develop OPTAINs catalogue of NSWRM) an initial description of NSWRM existing in the CS has been elaborated. Each of the 14 case studies discussed existing and further potentially relevant NSWRM at the MARG kick-off meetings and collected experiences of local stakeholders regarding measure impacts and effectiveness, implementation potential and limiting factors. Together with the MARG a preselection of the most promising NSWRM has been done in each case study, which makes sure that OPTAIN's research is relevant for the stakeholders and "the practice". For the documentation and dissemination of OPTAINs NSWRM, the project has the ambition to update and further develop the already existing database 'World Overview of Conservation Approaches and Technologies' (WOCAT; https://qcat.wocat.net) and the platform of 'Natural Water Retention Measures' (NWRM; www.nwrm.eu).

## CLIMATE SCENARIOS AND OTHER MODELLING DATA

The retrieval of modelling data and solutions to overcome data scarcity, is another important part of OPTAIN. OPTAIN developed and published bias-corrected regional climate model simulation data for all 14 case studies (ZENODO link: https://doi.org/10.5281/zenodo.6202061). The data will be used as input for the catchment- and field-scale models, to simulate the effectivity of NSWRM and combinations of them under changing climate conditions. Other approaches to derive missing data are currently under development for a variety of datasets. Examples for such activities are the derivation of field-specific crop cultivation data from satellite images, spatially distributed concentrations of soil labile phosphorus, soil hydrological properties, and various time series datasets for model calibration.

| Natural/Small Water Retention Measures in OPTAIN | |
|---|---|
| Agricultural | maintenance and restoration of grasslands, buffer strips, soil conservation practices, green cover, mulching, crop management, etc. |
| Hydro-morphological | basins, ponds, wetlands, restoration of natural infiltration, riparian buffers, stream re-naturalisation, etc. |
| Small technical | related to drainage infrastructures and the recovery/re-use of water (e.g. dual systems) and nutrients (drainage channel bio reactors, etc.) |

*Examples for measures to be modelled in the OPTAIN case studies*

## FARM- AND CATCHMENT-SCALE MODELLING

Moreover, in the middle of the project lifetime, the project team has developed procedures for data

harmonization, and also the parametrization of the field scale (SWAP model, setup in 7 of the case studies), catchment (SWAT+), as well as the economic models are important ongoing activities for a realistic representation of the simulated processes. SWAT+ is adapted and further developed (routing, spatial processes distribution, etc.) due to the specific demands of the case studies and the project. The project team also assessed the local conditions important for NSWRM implementation.

**POLICY ANALYSIS**

Furthermore, existing policy regulations and measures that promote different NSWRM in the different case studies are analysed, and gaps are identified. There is insufficient knowledge and overview of aggregated and inter-sectoral impacts of measures on diverse policy objectives. OPTAIN will conduct a multi-sectoral policy assessment to complement the results of the multi-objective modelling/optimisation framework.

***Edge-of-field filter & flowering strips***
*(Source: https://www.lfulg.sachsen.de/download/lfulg/Nachlese_KAM_Bluehflaechen-auf-dem-Ackerland.pdf)*

***Grassed waterways***
*Photo taken by Christoph Schürz, 2021*

***Retention/ detention pond*** *Photo taken by Christoph Schürz, 2021*

# PLASTICFREEDANUBE

## MACRO PLASTIC WASTE IN AND ALONG THE DANUBE

**Funding instrument:** **Interreg V-A Slovakia-Austria 2014-2020 / www.sk-at.eu**

**Project duration:** 01. 10. 2017. – 31. 03. 2021.

**Budget in Euro:** Overall 1.230.000

**Priority:** PO2 Promotion of natural and cultural heritage and biodiversity

**Specific objective:** To establish a scientifically sound knowledge base as well as a methodological approach on plastic waste in and along the river in terms of entrance points, quantities, transport patterns and environmental threats.

**Lead partner:** University of Natural Resources and Life Sciences, Vienna - Department of Water - Atmosphere – Environment – Institute of Waste Management and Circularity (ABF-BOKU)

**Project Manager:** **Gudrun Obersteiner**, gudrun.obersteiner@boku.ac.at

**Project website:** https://plasticfreeconnected.com

**Project website**

Estimates suggest that up to 80% of marine plastic litter originates from land-based sources and is primarily discharged via rivers. Nevertheless, the sources and origins of plastic litter, as well as transport pathways and environmental impacts in fluvial systems, are still insufficiently understood. Therefore Austrian and Slovak project partners of PlasticFreeDanube (University of Natural Resources and Applied Life Sciences Vienna (ABF-BOKU & IWA-BOKU), viadonau, RepaNet, Polymer Institute SAS and Danube Floodplain National Park) investigated the Danube river section between Vienna and the Slovakian power plant Gabčíkovo during the transboundary project "PlasticFreeDanube" over three and a half years and established a sound knowledge base on the sources, generation and composition of macro plastic waste (>5mm) in and along the Danube river.

Herein, the analysis of plastics transportation behaviour, the retention potential of hydropower plants and environmental impacts were of special interest. Generated data on origin, quantities and composition of microplastic waste was basis for the establishment of a material-flow-analysis (MFA). Sampling and sorting protocols for plastic waste along rivers were developed that are suitable for clean-up activities and also for scientific sampling approaches. To raise awareness of plastic pollution, education and training materials in English, German and Slovak language were developed and trainings courses were held. Pilot actions were implemented in Austria and Slovakia. All recommendations and suggestions derived were made available to relevant stakeholders by means of an Action Plan.

## RESULTS ACHIEVED

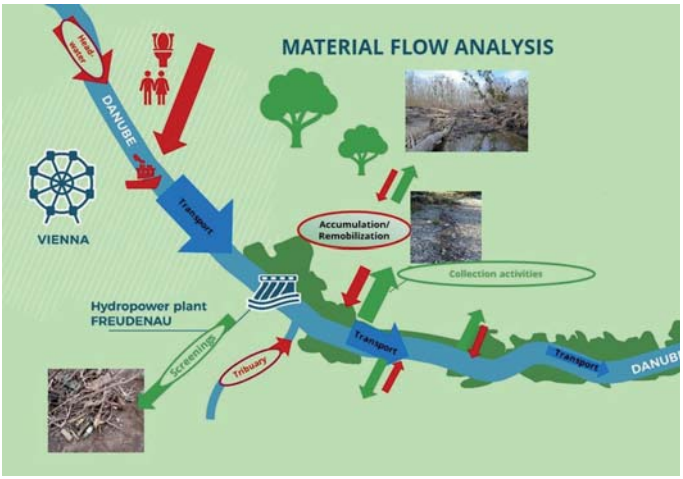
Based on initial clean-ups in the National Park Donauauen and sorting activities conducted by volunteers and the Institute of Waste Management and Circularity (ABF-BOKU), standardized sampling and sorting protocols to gain information about boundary conditions and plastic waste of riverine systems were developed and evaluated. The methodology for qualitative analysis and knowledge of the composition of plastic waste has been developed and extensively tested by collecting, sorting and scientifically analyzing around 2,000 kilograms of plastic waste. Not only plastic waste from shores was investigated. IWA-BOKU developed a net measuring method which can be used to investigate (macro) plastic pollution at several depths in the river's water column.

The results of the plastic waste sampling and sorting activities gave an important insight into plastic waste amounts and also into the composition of the

***Donauufer*** *©BOKU- Sebastian Pessenlehner*

plastic waste. The categories of the sorting protocol were determined considering the fact that the approach needs to be practicable and also should give as much info as possible about the origin of the waste. It may also give information about the location of the pollution and entering pathways into the river. Some plastics like toilet stone holders reveal a lot information about where they were improperly disposed of (WC) and how they got into the water body (sewer) while, for example, with PET bottles it is difficult to trace where they came from and who is responsible for the pollution. Nevertheless, some

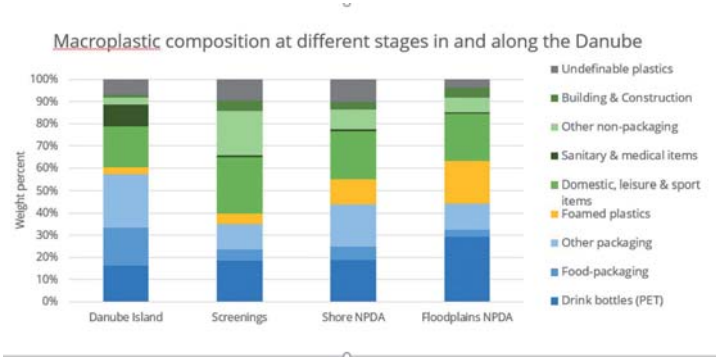
*Plastic waste sorting*
©NPDA-Baumgartner




*Simplified depiction of plastic flows within project area*
©PFD-Team

interesting results were gained during the project. For example, that about 50% percent of macro plastic waste can be attributed to packaging waste. Another interesting fact was the very long retention time of plastic waste within the riverine system. The oldest plastic waste which was sorted was a shampoo-bottle which was common in the 1980s and probably 40 years old. During sorting analysis from screenings also a fork bite with an expiration date of 04/14/1989 was found and shows how long plastics are preserved in the nature.

Laboratory analysis improved the knowledge of plastic types, additives and attached substances of the collected plastics and the potential harmful impact of macro-plastic waste pollution in and along the Danube River. The study on the abrasion and fragmentation behaviour of macro plastics in fluvial systems was done to elucidate which types of plas-




*Plastic waste sorting results*
*©BOKU- Johannes Mayerhofer*

tic found in Danube banks are sources of microplastics production and are useful for general assessment of microplastic formation.

For a better understanding of the pathways of plastics within the riverine system hydrodynamic models were created and evaluated by means of trackers (marked bottles and GPS tracers). GPS tracers were used to track individual plastic particles, making it possible to determine the transport routes, stranding sites and residence times on the shore, as well as the remobilization of these particles. The average distance travelled to the next stranding was determined to be 10.4 km, basically plastic particles remain on the river side where they enter the system. It could also be proven by GPS tracers that hydroelectric power plants partially retain plastic waste, but one tracer could be tracked during its transport to Bratislava. Computer models were used to investigate the influence of hydraulic structures such as groynes on the accumulation behaviour of plastic. In this way, frequent stranding areas could be identified and quantified. Through the findings from the modelling, similar structures could be sought or even built in the future to be able to remove large amounts of macro plastic from a river as efficiently as possible.

All this information was then together with other data (e.g. plastic consumption amounts) used for the establishment of a plastic Material Flow Analysis which depicts main sources, input pathways and transport routes and provides an overview of plastic flows within Danube river system of the project region between Vienna and Gabčíkovo. It includes information on quantities produced by different sources, disposal routes, as well as entry points for plastic waste into the Danube, which are indicators for major sources and pollution hotspots.

Now that the problem was better understood, measures to reduce plastic pollution of riverine systems were developed and implemented in the project area of Danube River. Education and training materials on plastic waste were developed and tested during awareness raising measures (e.g. children's university). They are now shared on the project homepage *https://plasticfreeconnected.com*, which serves also for the distribution of outcomes.

To make derived recommendations and suggestions available to relevant stakeholders an Action Plan was provided.

hyperlink to accessible deliverable:
*https://plasticfreeconnected.com/dow*

# REVITAL I.

## ENVIRONMENTAL ASSESSMENT FOR NATURAL RESOURCES REVITALIZATION IN SOLOTVYNO TO PREVENT THE FURTHER POLLUTION OF THE UPPER-TISZA BASIN THROUGH THE PREPARATION OF A COMPLEX MONITORING SYSTEM

**Funding instrument:** **INTERREG Hungary-Slovakia-Romania-Ukraine ENI CBC Programme, co-funded by the European Union (ERDF and ENI funds)**

**Project duration:** 01. 09. 2019. – 28. 02. 2023.

**Budget in Euro:** Overall 1.075.817,59

**Priority:** Sustainable use of the environment in the cross border area - preservation of natural resources, actions to reduce GHG emission and pollution of rivers

**Specific objective:** Examine and evaluate the current environmental state of the Solotvyno salt mine and its wider surroundings with the aid of the innovative technology, and set up an investigative monitoring and to prepare a future complex monitoring system for tracking the surface and near subsurface water qualitative and quantitative changes and the soil movements.

**Lead partner:** Tisza European Grouping of Territorial Cooperation Limited Liability (Tisza EGTC) tiszaegtc@gmail.com

**Project Manager:** **Szabóné Cap Andrea,** capandrea@gmail.com

**Lizmap site**
**User: Geogoldvendeg**
**Pass: Vendeg1234**

**Tisza ETT**

**Project site**

## PROJECT GOALS

The main goal of REVITAL I. is to set the foundation for the establishment of the revitalization process of the Solotvyno mine and surrounding area through deepened cross-border cooperation between Transcarpathia and adjacent areas. The project proposal approaches this goal through the achievement of 3 specific objectives:

*1.* to examine and evaluate the current environmental state of the Solotvyno salt mine and its wider surroundings (geological, geomorphological, structural, hydrogeological, hydrological surveys) with the aid of the cutting-edge technology,

*2.* to prepare the establishment of a complex monitoring system fitting into the wider regional framework for tracking the surface and near subsurface water qualitative and quantitative changes and the soil movements.

*3.* to raise awareness and promote the results of the project on different levels. This is important not only for the Solotvyno administration and its population but due to the nature of the problem, also the settlements along the border, and along the River Tisza basin.

## FIELD MEASUREMENTS

In the first step electrical and electromagnetic geophysical measurements were carried out. With these methods the project could map the exact shape of the salt dome, together with the position and extent of the contained cavities and shafts. Geological formations which can influence the hydrogeological flow system (pebble, sand, clay and

their combinations) are also identified in the vicinity of the salt body.

Surface Deformation Monitoring and Risk Mapping were carried out in the Solotvyno Salt Mine area between 1992 and 2021.

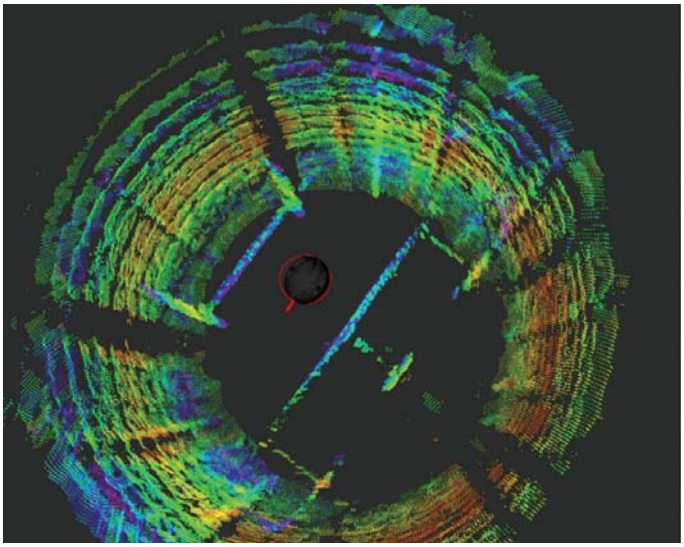
The project marked out a monitoring system. To collect water flow data, Dataqua brand water level registers were used. Water quality monitoring contain the following steps:

*a.* Examination of the Black Moore (natural lake in Solotvyno)
*b.* Examination of crater lakes
*c.* Examination of mine shafts (shaft 10).
*d.* Examination of near-surface waters flow in the alluvium of the Tisza floodplain

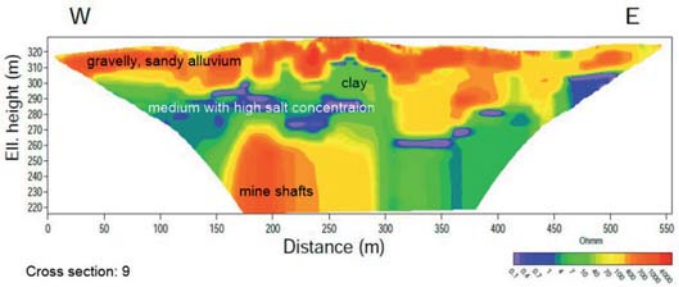
To determine water flow directions and travel times, tracer studies were performed. The applied Tinopal and Fluorescein agents are non-hazardous tracers that are widely used internationally.

## OUTPUTS

Based on the archival data and the results of surface geophysical surveys, the project created a 3D geological model of the Solotvyno area and built a hydrogeological monitoring network with the help of



*High-precision sonar measurement in a 10 mm shaft*




the newly formed wells and existing private wells. The consortium determined the main flow directions, which are the input parameters of the completed hydrodynamic transport model. Using multivariate data analysis methods, grouped the water samples taken 12 times from 54 test points during the project period (2019-2022), by which separated the areas under the influence of natural and anthropogenic pollutants (mainly salt pollution). The project used robotic technology to examine the typical water quality in mine shafts as a function of depth, and we also carried out an examination of the structural condition of the shafts. Further investigated the effect of the flood wave on the Tisza River using piezometers deepened on the river terraces. The results of the field measurements were summarized in professional final documentation and in the strategic concept note, which will support the decision makers in the future.

## EVENTS

The most important event was the inter-project conference in 2021. On June 17, 2021, the press conference of the project was held in Solotvyno. The event was organized around the ceremonial launch of the special UX-1 robotic device, which is used to survey the underground passages of the abandoned salt mine.

*Opening conference of the REVITAL I. project was held in Solotvyno in 2019.*

# SAVEGREEN

## SAFEGUARDING THE FUNCTIONALITY OF TRANSNATIONALLY IMPORTANT ECOLOGICAL CORRIDORS IN THE DANUBE BASIN


**Funding instrument:** **Interreg Danube Transnational Programme (3rd Call)**

**Project duration:** 01. 07. 2020. – 31. 12. 2022.

**Budget in Euro:** 2,681,728.70

**Priority:** Environment

**Specific objective:** SO 2.3 Foster the restoration and management of ecological corridors

**Lead partner:** WWF Central and Eastern Europe

**Project Manager:** **Hildegard Meyer**, hmeyer@wwfcee.org

**Project website:** www.interreg-danube.eu/savegreen

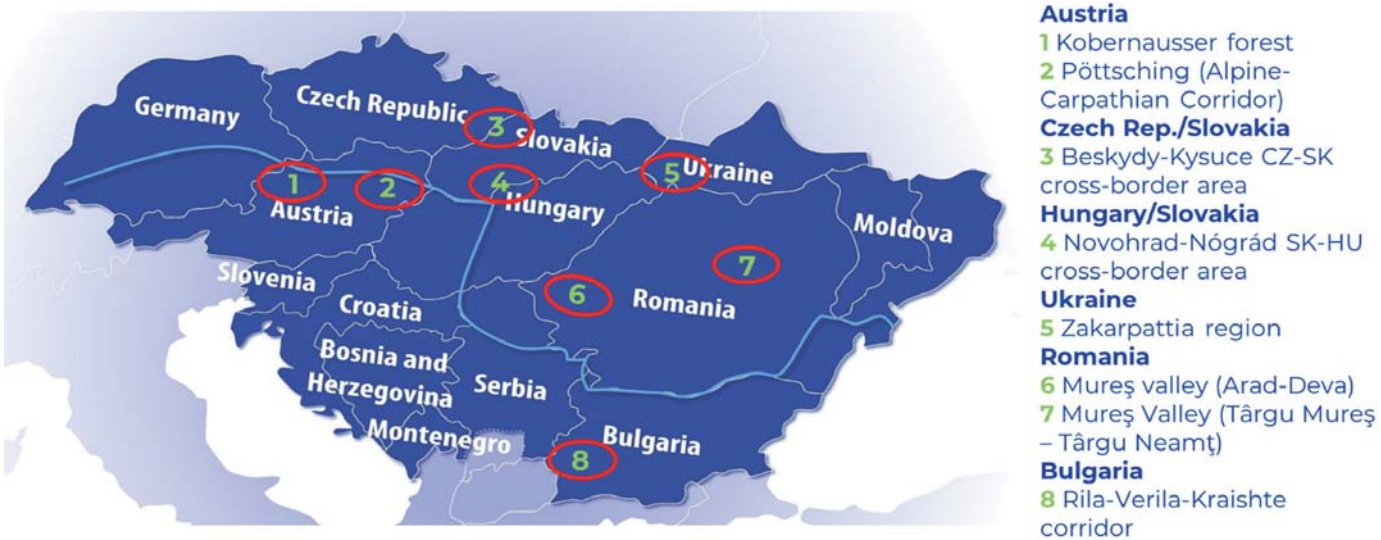
**Project website**

Mountainous regions in the Danube basin are rich in biodiversity. In comparison to the Western European countries, the area is characterized by large intact natural and semi-natural landscapes with a high degree of ecological connectivity.

Over the past decades, human activity has impaired ecological connectivity in the region. Uncoordinated and carelessly planned construction of transport infrastructure, settlements and industrial sites, and intensive agricultural, forestry and water management practices have fragmented the landscape and habitats, curtailing the ability of wildlife to move, feed, seek shelter and reproduce.

Accompanying mitigation measures – such as green bridges or underpasses – often achieve unsatisfactory results due to inadequate design, ill-suited locations or inappropriate forms of land use in the surroundings, or are missing all together. In addition, other sectors like agriculture do not consider adequate management measures to preserve ecological corridors.

The Interreg project SaveGREEN aims to demonstrate ways of designing appropriate mitigation measures and maintaining or improving the functionality of ecological corridors through integrated planning. Building on the results of its predecessor projects, TRANSGREEN, ConnectGREEN, and HARMON, SaveGREEN focuses on critical ecological corridors of the Kobernausser forest between Alps and Bohemia and the Alpine-Carpathian Corridor in Austria, Beskydy-Kysuce CZ-SK cross-border area, Novohrad-Nógrád SK-HU cross-border area, the




**Austria**
1 Kobernausser forest
2 Pöttsching (Alpine-Carpathian Corridor)
**Czech Rep./Slovakia**
3 Beskydy-Kysuce CZ-SK cross-border area
**Hungary/Slovakia**
4 Novohrad-Nógrád SK-HU cross-border area
**Ukraine**
5 Zakarpattia region
**Romania**
6 Mureş valley (Arad-Deva)
7 Mureş Valley (Târgu Mureş – Târgu Neamţ)
**Bulgaria**
8 Rila-Verila-Kraishte corridor

*SaveGREEN pilot area locations*


*The project team at the Austrian-Czech Transnational Experience Exchange Workshop in June 2022*
*©Ivo Dostal, CDV*

Mures valley in Romania (Arad-Deva, Târgu Mureş – Târgu Neamţ), Zakarpattia region in Ukraine, and the Rila-Verila-Kraishte corridor in Bulgaria – all of them impacted by linear transport projects and unsustainable land use.

Based on monitoring work on the impacts of human activity on ecological connectivity and the effectiveness of mitigation measures in the 8 pilot areas, SaveGREEN is formulating recommendations for adequate follow-up measures and preparing tools to support their implementation in collaboration with relevant stakeholders. To facilitate these efforts, the project is working to improve awareness and knowhow in relevant sectors to encourage collaboration amongst these key actors, seeking to ensure that the degree of importance attributed to the maintenance of ecological corridors in the Carpathians mirrors their importance for biodiversity and the continued provision of ecosystem services in the region.

The EU Interreg funded project is about to finalise its results in the upcoming months.

The SaveGREEN partnership consists of representative entities with complementary fields of expertise (nature conservation, transport, spatial planning, environmental impact assessment, and re-

*Project team and experts at Ipoly river, Slovakia*
*©Romana Uhrinova.*

search) from Austria, Bulgaria, Czech Republic, Hungary, Romania, and Slovakia, supplemented by experts working in Ukraine. More than 20 associated strategic partners, mainly regional and national public authorities (ministries of environment, transport, and environment agencies), national motorway companies, research institutions, and the IENE from 3 more countries (Germany, France, and Ukraine), support the implementation of the project and guarantee exploitation of its results. WWF-CEE has the lead.

## RESULTS ACHIEVED

**SCIENCE.** a scientific sound methodology has been developed to monitor structural and functional ecological connectivity including a technical application toolbox that allows for data gathering in the field, transferring to and analysing data on the server, as well as displaying them on a web portal. This will help to assess the functionality of mitigation measures in a systematic way using up-to-date technology to is easily applicable for fieldworkers and analysts alike.

**STAKEHOLDER ENGAGEMENT.** together with stakeholders and experts from different sectors, the project partners have developed solutions for the improvement of ecological connectivity in 8 pilot areas. The solutions do not only address transport infrastructure, but also include the wider landscape and its structure around it. International experience exchange workshops were organised in each country, where local project partners presented solutions

and discussed them together with experts in field. One of such workshops will take place in the frame of the IENE Conference.

**CAPACITY BUILDING.** currently, a capacity-building program for authorities and other stakeholders is under development. It will offer tools to assess impacts of the transport projects on the environment and support decision taking. Project partners will roll out the program in national training events in autumn this year.

**POLICY.** the joint Declaration "Achieving functional biodiversity in the Danube-Carpathian Region by mainstreaming ecological connectivity" elaborated in cooperation with important players in the region under the lead of project was endorsed by the Carpathian Convention, the International Commission on the Protected of the Danube River, EU Strategy for the Danube River Priority Areas 4, 5 and 6 reflecting needs for green and blue infrastructure alike.

*Motorway near Dupnitsa, Bulgaria, copyright Petko Tsvetkov, Bulgarian Biodiversity Foundation*

*Green bridge near Pöttsching, Alpine-Carpathian corridor, copyright: Gebhard Banko, Environment Agency Austria.*
*©Gebhard Banko*

# SIMONA

## SEDIMENT-QUALITY INFORMATION, MONITORING AND ASSESSMENT SYSTEM TO SUPPORT TRANSNATIONAL COOPERATION FOR JOINT DANUBE BASIN WATER MANAGEMENT

**Funding instrument:** **Danube Transnational Programme (2nd Call)**

**Project duration:** 01. 06. 2018 – 30. 11. 2021.

**Budget in Euro:** Overall 1,835,150.74

**Priority:** Environment and culture responsible Danube region

**Specific objective:** Strengthen transnational water management and flood risk prevention

**Lead partner:** Geological Survey of Slovenia

**Project Manager:** **dr. Meta Dobnikar,** meta.dobnikar@geo-zs.si

**Project communication:** **dr. Teja Čeru,** teja.ceru@geo-zs.si

**Project website:** https://www.interreg-danube.eu/approved-projects/simona

**Project website**

***Workshop in Virovitica, Croatia.*** *Photo: Zsolt Szakacs*

## BACKGROUND

The results of the "Joint Danube Survey 2 Expedition" have shown that sediments contaminated with hazardous substances are a problem in the Danube basin. However, most Danube countries are unable to tackle the problem of sediment pollution. Major challenges are faced in implementing a common system to even monitor the concentrations of these substances. This is either due to a lack of experience, technological capacity and resources, or the absence of harmonised international protocols and procedures for joint monitoring of sediment quality. The EU Water Framework Directive (WFD) has been created in order to ensure the sustainable use of water resources of Europe. SIMONA project has been fully and completely dedicated to support the implementation of WFD by the Dan-

*Passive sampling station in Barcs, Hungary.*
*Photo: Zsolt Szakacs*

ube Countries. It focused on supporting transnational cooperation in sediment monitoring. As river basins are not limited by national borders, the spread of pollution is a transboundary problem. Thus, the SIMONA Consortium included 30 partners from 13 different countries and represents the largest part of the Danube River Basin.

## MAIN RESULTS:

The main objective of SIMONA, "the improvement of transnational water management by providing support for the National and Regional Water Au-

thorities to implement the monitoring surface water sediment quality required by WFD" has been achieved by delivering the SIMONA System comprised of the Sampling Protocol, the Laboratory Protocol, the Evaluation Protocol and the SIMONA-IT Tool. The success of the SIMONA System, which is the main result of the project, has been achieved primarily by developing the methods on 3 concrete transnational Test Areas (Drava, Upper Tissa, and South Danube), and testing and demonstrating them on two National Baseline Points in each Danube Basin Country. The SIMONA Tool is appropriate for collecting and analysing sediment sample data, running status and risk classification, and generating sediment quality report. Besides the protocols, many practical guidelines, manuals, professional videos, solid case studies and training materials were developed.

In the last two periods of project three training events (Sampling, Laboratory and Evaluation) and four small group workshops (Bulgaria, Croatia, Hungary, Czech Republic) were organised to gather national stakeholders and target groups active or interested in harmonised sediment quality monitoring and management in the Danube River Basin. The main principle of 2-days workshops was to „train the trainers" - which means that workshops were mainly aimed at presenting, demonstrating and practising the sediment sampling methodology of the SIMONA project.

*Sampling Sediment kit delivery in Austria*

One of the innovations and upgrade activity of the SIMONA project was the development and implementation of the passive sampling system (JDS box and passive membranes) for suspended sediment monitoring in all 3 test areas (Drava, Upper Tissa, and South Danube). After the all activities, SIMONA Sediment Sampling kits were delivered to the representative authorities with short demonstration of equipment.

**HYPERLINK TO ACCESSIBLE DELIVERABLE**

Promotional video on Youtube: *https://www.youtube.com/watch?v=2YJcH87YQPc*
Accessible deliverables: *https://www.interreg-danube.eu/approved-projects/simona/outputs*
Project website: *https://www.interreg-danube.eu/approved-projects/simona*

# TID(Y)UP

## F(OL)LOW THE PLASTIC FROM SOURCE TO THE SEA: TISA-DANUBE INTEGRATED ACTION PLAN TO ELIMINATE PLASTIC POLLUTION OF RIVERS


**Funding instrument:** **Danube Transnational Programme (3rd Call)**

**Project duration:** 01. 07. 2020. – 31. 12. 2022.

**Budget in Euro:** Overall 1628193.54

**Priority:** Environment and culture responsible Danube region

**Specific objective:** Strengthen transnational water management and flood risk prevention

**Lead partner:** Filmjungle.eu Society

**Project Manager:** **Attila Dávid Molnár,** molnar.attila.david@termeszetfilm.hu

**Project website:** https://www.interreg-danube.eu/approved-projects/tid-y-up

**Project website**

Tid(y)Up project is focusing on the improvement of water quality and reduction of plastic pollution of the Tisa River from its source to the Black Sea. Currently there are no standard methods and consistent data available on plastic pollution of rivers in the Danube Basin that would help harmonized actions of water management authorities and allow cooperation with other sectors necessary to stop the pollution. Within the project partners develop and launch a set of integrated actions, consult, and provide tools for relevant stakeholders and initiate long term transboundary and intersectoral cooperation with the aim of eliminating the plastic pollution of rivers. The project operates with a list of diverse tools including scientific actions and recommendations to standardize methods for estimation of the size of pollution, on-site expeditions, pilot-actions for identification and clean-up of polluted areas and sources, as well as education and awareness raising actions for the prevention. The novelty of the project is that it provides tools, data, and the assessment of various used methodology for understanding of the sources, nature and risks of contamination flows; and delivers practical examples of possible actions and legislative solutions both on local and transnational level. The key focus is to gather all necessary information, raise awareness of the relevant actors and provide them with practical tools, in order to create active, co-operating communities in the fight against the plastic waste contamination and contribute to the work of water authorities to improve water quality by also providing input for the revision and implementation of DRBMP.

The project objectives are:

- Implementing innovative pilot actions in the identified heavily polluted river areas of the participating countries;
- Setting base for harmonised measurement protocols of micro and macro plastic river pollution and fostering changes in legislation at local, national and regional level;
- Involvement of local communities and decision makers by implementing, testing and evaluating transferable transnational actions;
- Assessing water management and stakeholder cooperation systems to identify best practices;
- Harmonized actions of water management authorities and allow cooperation with other sectors necessary to stop the pollution;
- Formulating strategic and legislative recommendations to all levels including the ICPDR and EUSDR;
- Raising awareness of key actors and the public about plastic litter pollution in rivers, improving cooperation among stakeholders and developing innovative tools for better management.

Activities to reach this objective include awareness raising actions with a floating exhibition, clean-ups and reducing plastic use.

Further information/news about TidyUp are available here: *http://www.interreg-danube.eu/approved-projects/tid-y-up*

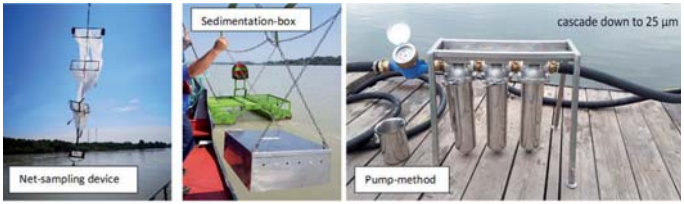
***Recent activities and progress along the Work Packages***

***WPT1 activities and deliverables – lead PP: BOKU (AT)***

Inspired by the JDS4 sampling sites, MP-measurements were performed in Danube river in Hainburg (AT), Budapest (HU), Bezdan (RS), Pancevo (RS), Ruse (RO/BG), Tutrakan (RO/BG) as well as in the Tisza river (upper course, Vásárosnamény, HU) and close to the estuary (Titel, RS) from March to July 2021. Primary objective of the sampling campaign was to compare the different methods and to get a rough picture of the MP-pollution situation in the Danube and Tisza River. According to previous studies, the content of microplastics in flowing waters can vary greatly depending on flow velocity or discharge, water depth and positioning in the transverse profile of the river (influence of groyne fields, etc.). To consider the depth variance and spatial distribution of microplastics, sampling was performed across the river cross-section and at different depths.

Within Tid(y)Up project 3 sampling methods were tested under varying boundary conditions:

- Multiple depths net-method: Simultaneously net sampling with mesh sizes of 500 µm and 250 µm in three different depths of water column. Advantages are that within short timeframes huge amounts of water can be investigated in parallel in 3 depths (≈ 3,000 $m^3$ of water per net and 15,000 $m^3$ per sampling point within approx. 45 min). Disadvantages are mainly the need of a bridge or a vessel for sampling and the heterogenous sample composition which greatly increases the effort for sample preparation for analysis.
- Pump-method: sampling with a 1 mm pre-filter with subsequent cascade filtration down to 300µm, 100µm and 50 µm; applicable in varying depths of water column, sample volume 1000-2000 litres depending on suspended solids.
- Sedimentation-box: sampling close to water surface for approximately 2 weeks; it was also used within the Joint-Danube-Survey.

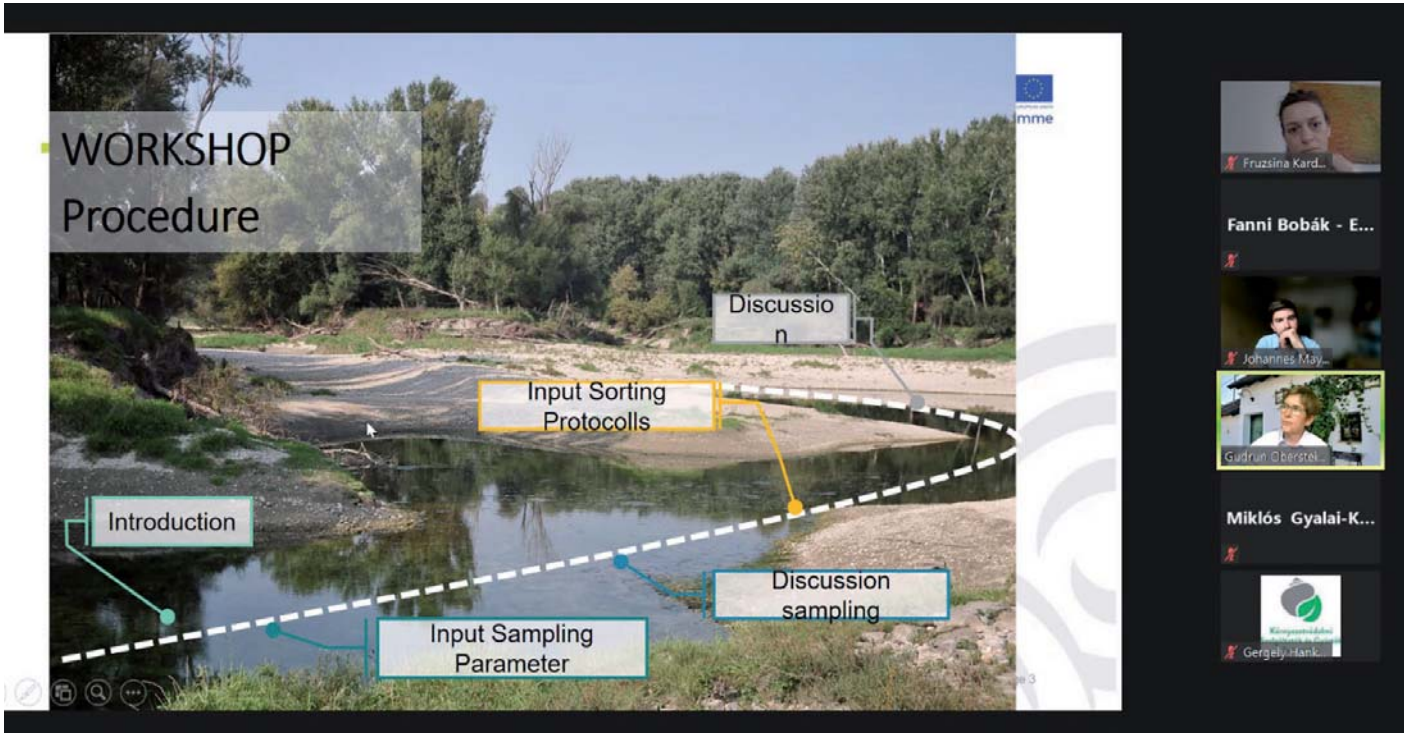


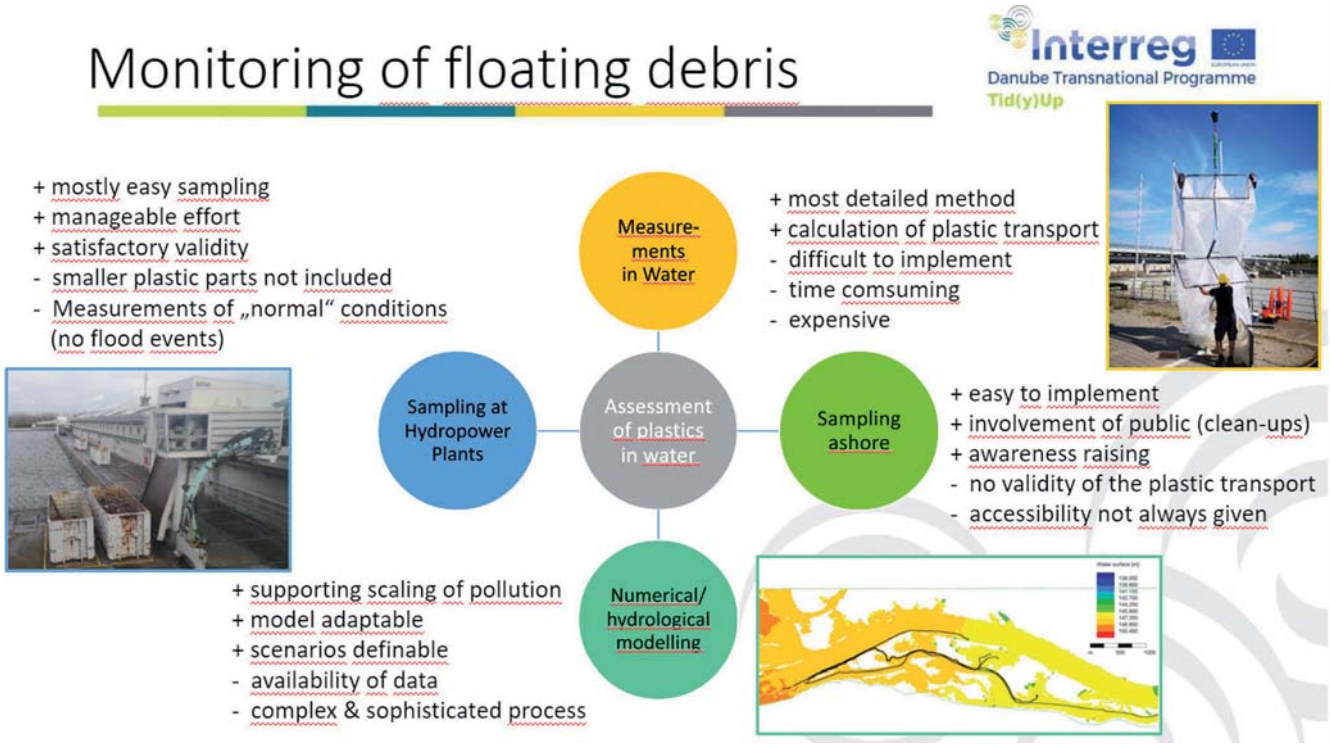

The Study on the assessment of microplastic measurements under different conditions in fluvial systems (D.T1.1.1.) will include a comparison on the three used sampling methods (sedimentation box, suction pump and net device). The analytics of the microplastic assessment samples is still in progress. BOKU has requested the partners to summarise their experiences on the implemented assessment actions to be able to compare the used methods. The collected data will provide a rough estimation of the microplastic pollution as samples have been taken from Austria to Bulgaria along the Danube and the Tisza. BOKU purchased a new microscope that will speed up the analytics, because the assessment of the collected samples required more time than originally planned. The plan is to submit a scientific paper at the end of the project about the assessment process and results.

The first personal meeting of the PPs was in June 2021 after which BOKU held a „Hands-on" Macro-plastic training (OT.1.2.) for the PPs in June 2021. The training familiarised all stakeholders with the application of current methodologies for macro-plastic assessment. The training was combined with the study visit of partners to the 2nd Plastic Cup of Tisza Lake organized by THU.

Handbook on the introduction of standard procedures for the assessment of macro plastic in fluvial systems, including the retention capacity of hydropower plants and other barriers (DT1.2.2) has been already started. The Handbook template on standard procedures for the assessment of macro plastic has been prepared and the Handbook on the introduction of standard procedures for the assessment of macro plastic in fluvial systems, including the retention capacity of hydropower plants and other barriers is being further developed by BOKU with the contribution of the project partners.

Hot-spot localizations (DT.1.2.3.) are also important part of the WP and set basis for the clean-ups. During the PP meeting in April 2022, the partners discussed their experiences. As a conclusion, the Trash-out App will be updated and extended with all tributaries hosting the cleanups.






*There are a lot of ways to monitor the floating debris*

Since September 2021, all planned cleanups were carried out by the PPs: in Slovakia, Serbia, Bulgaria, Romania and Ukraine. Although all the cleanups were a big success, the pollution situation is still distressing in many areas.

Also within WP T1 ***a micro and macro plastic database*** has been elaborated ***(DT1.3.1).***

The outline of the pollution map and micro-macro plastic database is drawn by the hot spot localisation activities. There is an exportable database behind the pollution map. The main challenge during the development of the pollution map is to invite the general public into data collection (citizen science approach) and at the same time to create a database that is convertible and usable by experts, professionals such as researchers of the relevant fields of science. The LP experimented with the transferability of field-collected data to the desktop environment in this period and now it is possible to open WGS 84 files in QGIS and save the transformed database in an EOV environment. The experiment showed that the database behind the pollution map can provide support for small and large scale clean-up efforts as well as for further analysis purposes.

*Slovak-Hungarian joint cleanup 2021*

*Serbian-Rumanian joint cleanup 2022*

***WPT2 activities and deliverables – lead PP: ASRD (SK)***

Regarding WPT2, the main progress has been made in the following activities:

The ***Handguide (DT2.1.1.)*** written by HAEE and THU includes a step-by-step illustration about how to organize clean-up interventions. The first version of the Handguide has been finalised by the PPs. The plan is to finalise the Handguide including the experiences of the cleanup actions implemented within the project and to make the Handguide useful globally.

Using the instructions of the Handguide and the study visit, 4 international, cross-border cleanups were planned and implemented within WPT2. As an additional one, ASRD (SK) has organized a second cleanup on the Bodrog River in June 2022. The schedule of the cleanups was the following:

- SK-HU cleanup (Bodrog) – 5-8 September 2021
- RO-RS cleanup (Timisoara, Becej, Novi Becej) – 7-9 April 2022
- RO-BG cleanup (Oltenica, Tutrakan) – 29 April – 1 May 2022
- UA cleanup (Latorca) – 13-15 May 2022
- SK cleanup, vol.2. (Bodrog) – 23-24 June 2022

The 1st ***SK-HU cleanup*** proved to be a large success – not only in terms of collected waste but participants involved. Attracting more than 100 volunteers from Eastern Slovakia and Hungary, the three-days action collected near 4 tonnes of waste from the Bodrog river and its surrounding floodplain forests and more importantly showed the importance of involvement of local actors. With the contribution of local people, water authority staff and schoolchildren the action was a great success and contributed


not only to a cleaner river but awareness raising, too. This event was probably the biggest cleanup action ever organized in Slovakia so far.

The collected waste was sorted every day into separate fractions of PET bottles, metal, glass, polyethylene, municipal waste and caps from PET bottles aligned with the practice of the waste management utility for increased recycling ratio. The largest piece of waste was a couch set, which the volunteers managed to catch out of the water. The project partners organized the Slovak part in cooperation with the Slovak Water Management Company – Bodrog river management (associated partner of the project) and river rafting Agency Splavujeme.sk, while for

the Hungarian part, the North-Hungarian Water Directorate (associated partner of the project) and Zöld Kör association, a local NGO were the cooperating parties. The involvement of the local water authority staff was of crucial importance on both sides of the border.

Regarding the ***RO-RS cleanup***, In the Romanian part, when the local municipality was informed about the cleanup, it quickly cleaned the chosen territory before the cleanup action. On the plus side, it is great (lesson learnt: let's 'scare' the municipalities so they clean their territories), on the down side, another territory had to be chosen. Therefore, it is always important to recheck the chosen territory close to the upcoming date. Several bags of trash were collected, but it was mainly a test cleanup, since the weather was bad, and volunteers arrived in inappropriate clothes. It must be emphasised that it is important to invite local NGOs and volunteers independent from the local municipality – and to motivate and inform them better.

*Bulgarian-Rumanian joint cleanup 2022*

About the Serbian part of the cleanup, there were around 50 volunteers on both days (students, hunters, etc). Participants had to do the cleanup in the middle of a plastic flood, which complicates the process a lot and is also dangerous. Most of the decisions were very well made, and there was a special attention on the wellbeing of the people. The media coverage was very good during the event. The volunteers were so motivated, that they could nearly organise a competition (a small Plastic Cup) but due to the storm it had to be called off.

***RO-BG cleanup*** – The event started out in Romania, Oltenita. Followed by a training of the volunteers the next day, who came from Varna, Shumen, Stara Zagora, Ruse and Sofia, Bulgaria. Even the Environmental Minister visited the event, generating more impetus to the activity.

On the second day, the cleanup took place around the Pozharevo Island. Canoes were used as the way of transport on water. In the end of each day, the participants sorted out the collected waste. On the 3rd day, the cleanup action happened on both water and land. The river section was the same as on the previous day, the floodplains of the Pozharevo Island, however the volunteers have formed 4 groups who focused on the riverbank. The cleanup on land took place on a total length of 10 kms, on the riverside from Tutrakan East to Pozharevo West.

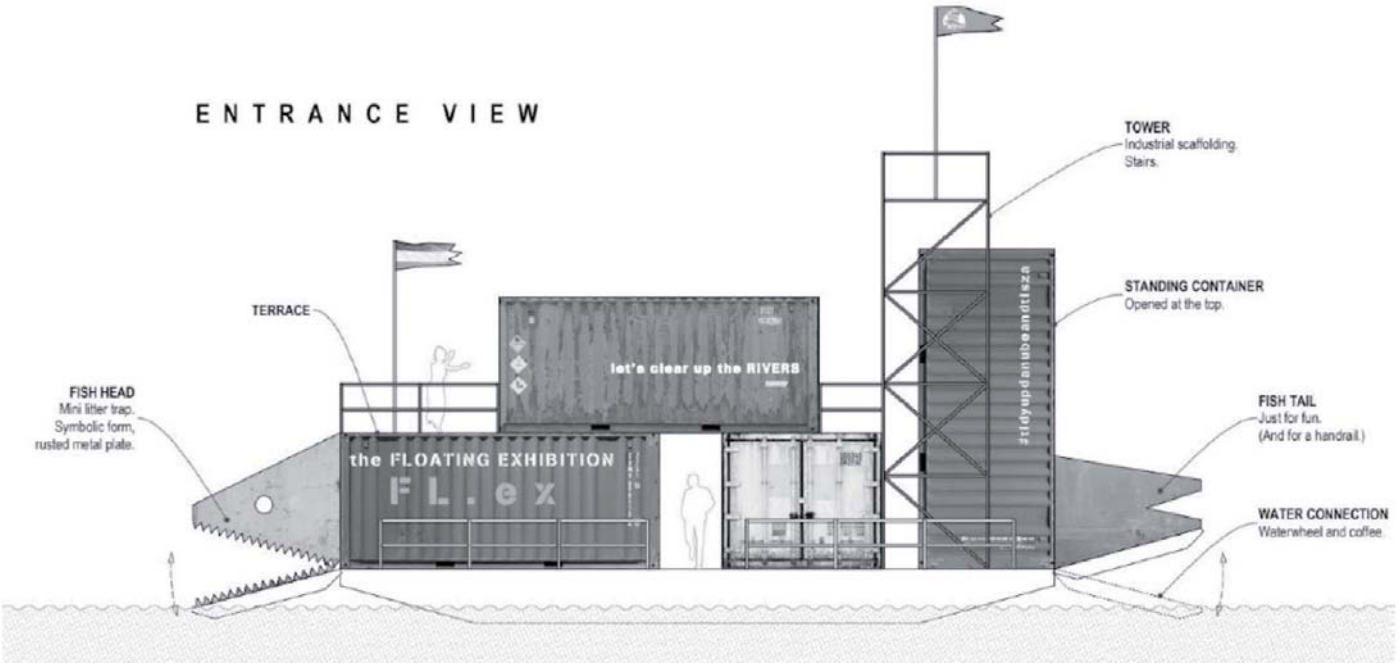
The ***UA cleanup*** location was a 300 m long section of the Latorica river, mapped during the hot spot localisation activity surrounded by forests on both sides, hidden from locals so far. The river section was so heavily polluted on this short section that the water could not be seen, and volunteers

could walk on the stuck debris. More than three tons of waste were collected during the three days of the event.

The special methodology for organizing transnational, river cleanups is definitely an asset of the project which is applicable in multiple settings within the Danube Region and beyond.

The ***Floating Exhibition (FLEX, AT2.3)*** is still under active preparation by LP and HAEE, requiring a lot of creativity and restructuring due to the price explosion of raw materials since 2019, and the team has to face some authorization problems and an extreme rise in transportation prices. Despite all that, an upgraded ferry has been bought. Works on the superstructure started in January 2022. The first FLEX exhibition was held in Kosice (SK) and the plan is to organise the exhibition in the downstream countries in September-October 2022 and to have the final stop of the exhibition on water at the final conference of the Project.

***FLEX - The Floating Exhibition - (DT.2.3.2.)*** is a very important dissemination material and communication tool of the project. The detailed description of the concept is already available. FLEX will be able and ready to communicate the results of Tid(y)Up in all partner countries, being a floating exhibition along the Tisza and Danube. Its main message is 'use less and reuse more'.



***WPT3 activities and deliverables – lead PP: IO-BAS (BG)***

Another recent activity of the project is the ***Legislative analysis (DT.3.1.1.) carried out by all partners on the legislative background in their countries on the water and waste management situation.*** Country reports have been finalised and merged into one document containing best practices and recommendations on how to overcome legislative gaps. The document has been finalised by HAEE and IO-BAS including the agreed TOP10 recommendations of the partnership for legislative improvements at EU and country level. This document is now under further development into a policy recommendation formulated per request of ICPDR.

A ***Waste Reduction Toolkit (DT.3.2.1.) has also been developed within the project*** to be disseminated amongst all project partners. The toolkit targets three different groups: 1) riverside holiday resorts and restaurants, 2) local governments, 3) the general public. The toolkit was finalized and made available for partners in English as one important input for the roundtable discussions and translated by all PPs to their national languages.

Within the ***organization of regional and country level roundtable discussions (AT.3.2.)***, HAEE organized the first regional roundtable discussion on 13th of September in Tokaj, Hungary as a follow-up of the 2nd Plastic Cup on Bodrog river (which continued the international cleanup from Sárospatak, Hungary). Emphasizing the role of international cooperation in solving the plastic pollution issue, participants also joined from Ukraine and Romania who also presented their efforts to stop the pollution. Based on the experiences of this roundtable discussed at the PP meeting in Kosice and following the instructions provided in the guide and implementation report template provided by Multisalva. PPs have organized the regional roundtable discussions in their country. The main aim of organising the roundtable discussions is to involve stakeholders and facilitate knowledge sharing.

*'Sárazsadány' (a name of a village in Hungary) is the origin of the ferry, and per request of the village we will indicate the village's name on the FLEX.*

As part of WPT3, the partnership on behalf of the project provided input to the public consultation process of the ICPDR about the 2021 update of the DRBMP.

The closing conference is to be held in Budapest and Kisköre (Hungary), on 8-9 November 2022, during which the FLEX – floating exhibition will be open to public.

# WE PASS

## FACILITATING FISH MIGRATION AND CONSERVATION AT THE IRON GATES


**Funding instrument:** **European Commission (DG REGIO)**

**Project duration:** 23. 11. 2018 – 22. 11. 2021

**Specific objective:** To facilitate fish migration in the Danube River Basin

**Contact:** International Commission for the Protection of the Danube River (ICPDR)

**Project Manager:** **Edith Hödl**, edith.hoedl@icpdr.org

**Communication:** **Hélène Masliah-Gilkarov**, helene.masliah-gilkarov@icpdr.org

**Project website:** https://www.we-pass.org/

**Project website**

## PROJECT PARTNERS

This project was funded through a grant awarded by the European Commission (DG REGIO), and aspired to have a strong macro-regional character, focusing on its impact and the ramifications for the whole Danube Region. It is for this reason that a close and constant implementation of the EU Strategy for the Danube Region (EUSDR) was central to this project, while various other synergies are always explored.

We Pass was a joint effort of several partners:

- ICPDR (International Commission for the Protection of the Danube River)
- Jaroslav Černi Water Institute, in Belgrade, Serbia
- DDNI (Danube Delta National Institute), in Tulcea, Romania
- CDM Smith in Bochum, Germany I OAK Consultants, in Utrecht, Netherlands
- NINA (Norwegian Institute for Nature Research), in Trondheim, Norway
- Subcontracted by DDNI, was IMSI (Institute for Multidisciplinary Research, University of Belgrade) in Belgrade, Serbia

## PROJECT GOALS

The main objective of this project has been to improve biodiversity in the Danube region.

More specifically though, this project focused on the Iron Gates (aka Portile de Fier/Đerdap), a hydropower plant complex located on the Danube River's main course on the border between Romania and Serbia. This facility is shared between the two countries, and has been a vital source of low-carbon energy for the region for decades, though all such plants come with adverse ecological effects. The blockage of key migration corridors for Danube fish species is one of the most pressing issues. The Danube River isn't, however, just a key migration route, it also represents a vital habitat for a variety of species. Constructing fish passes at the Iron Gate dams would open up 960 km of the Danube River, running all the way until the Gabčikovo Dam in Slovakia, and granting migratory fish access to many long-inaccessible tributaries. With coordinated studies and efforts such as We Pass, iconic fish species, including the various Danube sturgeon species, can still be saved from completely disappearing. Better yet, should we act swiftly, there's a possibility we could see their numbers brought back up to healthy levels throughout the Danube River Basin and beyond.

## PROJECT OUPTUT

The aim of We Pass0 was to assess the background of and develop technical solutions for fish migration at Iron Gates I & II, the first large barrier for sturgeons and other migratory fish along this vital route.

In order to explore different options for fish migration facilities and fully analyse the current situation at the Iron Gates, it was necessary to collect data at the following sites:

- *Iron Gate I: Main Dam*
- *Iron Gate II: Main Dam*
- *Iron Gate II: Romanian Ship Lock*
- *Iron Gate II: Dam on the Gogoșu Branch*

Another key step in We Pass was the collection of data on fish passage facilities for migratory fish worldwide, and to assess the feasibility of bringing a comparable solution to the Danube River. This involved studies on fish passes that were specifically designed for sturgeons, as well as fish passes that were originally designed for other species, such as salmon. In general though, available information on sturgeon fish passes is scarce. Only few such facilities suitable for sturgeons have been built worldwide so far, and each case study represents a very specific solution, designed to suit the very specific characteristics of their location.

Additionally, the available information is often incomplete and/or inconsistent, limiting in-depth comparisons between case studies. Nevertheless, for some criteria, it was possible to collect and analyse sufficient information.

A key part of the study comprised a field study to monitor migratory fish behaviour to assess how and where the vast majority of migratory species would approach the Iron Gate II, if they find their way through the reservoir between Iron Gates I & II, while also investigating the downstream migration at Iron Gate II.

Sturgeons are considered living fossils, having first appeared some 200 million years ago. The family comprises 27 species, of which 6 are native to the Danube. While two of these species are already considered extinct, the remaining population still represents a natural heritage of the Danube River Basin. They require different habitats at different stages of their life cycle, and due to their sensitivity to environmental pressures, sturgeons are a crucial indicator species for the ecological quality of rivers. This makes them the ideal candidate to represent the region's various threatened migratory fish species, and general ecological well-being as a whole. Due to their role in the river system, the ICPDR has adopted the ‚living fossil' and highly threatened sturgeons of the Danube as its flagship species.


Photo: ICPDR/We Pass

References to sturgeon conservation activities can be found in the national River Basin Management Plans of the Danube countries, the ICPDR's Danube River Basin Management Plans, and Danube Ministerial Declarations. Thus, advancing broad public awareness and political commitment for Danube sturgeon species- in addition to other characteristic migratory fish of the Danube- is a priority towards safeguarding the ecosystem of the entire Danube River Basin.


Photo: ICPDR/We Pass

## YET TO PASS? LOOKING AHEAD AT THE IRON GATES

What will the Iron Gates be like in 2050? This was one of the key questions posed to a panel of experts at the We Pass Final Conference in November of 2021. While, of course, far from an easy question, the expectations of our experts provide us with an insight into a variety of possible future scenarios.

### MANAGING EXPECTATIONS

It's going to be essential for any fish passage to enable free migration for fish in both directions - up- and downstream of the Iron Gates. This process will need to be accompanied by improvements for many years to come however, so we should already be aware of this condition from the outset. Poaching, sedimentary shifts in the river, and major habitat deficits will require special efforts to overcome. Additionally, these ancient species continue to exhibit a ‚homing' instinct.

### FURTHER OBSTACLES

We Pass is only the beginning. The Iron Gates are the largest obstacle for fish migration in the Danube. Access to the Upper Danube is still blocked by the Gabčikovo Dam in Slovakia, for example, and this needs to be examined as well, sooner rather than later. Any re-establishing population of migratory fish will require a network of ecological corridors. What's more, illegal fishing and black-market practices throughout the Lower Danube countries will also be essential to curb in parallel with any measures.

### TIME DELAY

We Pass' experts are eager to underline that, even if we have established fish passages by 2030, we will not have the Danube River full of sturgeons by 2031! We will all need to be prepared for the lag time between taking the measures and having the results. In some sturgeon species, sexual maturity only occurs after 15 - 20 years, so there's always going to be a delay when waiting for repopulation to occur. While we will hopefully have a recovery of the population over time, it will in all eventualities take time. With the combination of measures and the strategies already agreed upon it will be possible to bring the Danube River back to sustainability and resilience. Furthermore, this will require the establishment of a network of ecological corridors. Due to


Photo: ICPDR/We Pass

the variety of serious economic questions, it is very important to convince various stakeholders of the benefits.

**OUTLOOK**

The second phase of We Pass has already begun: We Pass 2! This continuation of We Pass funded by the European Commission, will see the aims and scope of the project extended and further analysed.

Key aims include:

- *Development of a preliminary design for fish pass(es) at the Iron Gates, including all necessary technical elements*
- *A cost estimate for the construction of fish pass(es)*

In terms of outlook of, the project will see:

- *A small change in We Pass pre-existing management structure (albeit not very big change). CDM Smith taking over the project management side of things.*
- *Several key deliverables, some of which are already being worked towards, including the milestone of the Interim Report (due September 2022).*
- *A market increase in hydrophone placement at Iron Gates I and II during We Pass 2, scaling up monitoring activity.*
- *Detailed fish movement study using cutting-edge 3D fish telemetry tracking technology.*
- *A meeting with EC DG ENV, relevant stakeholders, and specialist on fish migration facilities and sturgeon behaviour held, aiming to conclude on best fish pass option(s) that shall be elaborated further in the preliminary design (due December 2022).*

*https://www.we-pass.org/#activities*

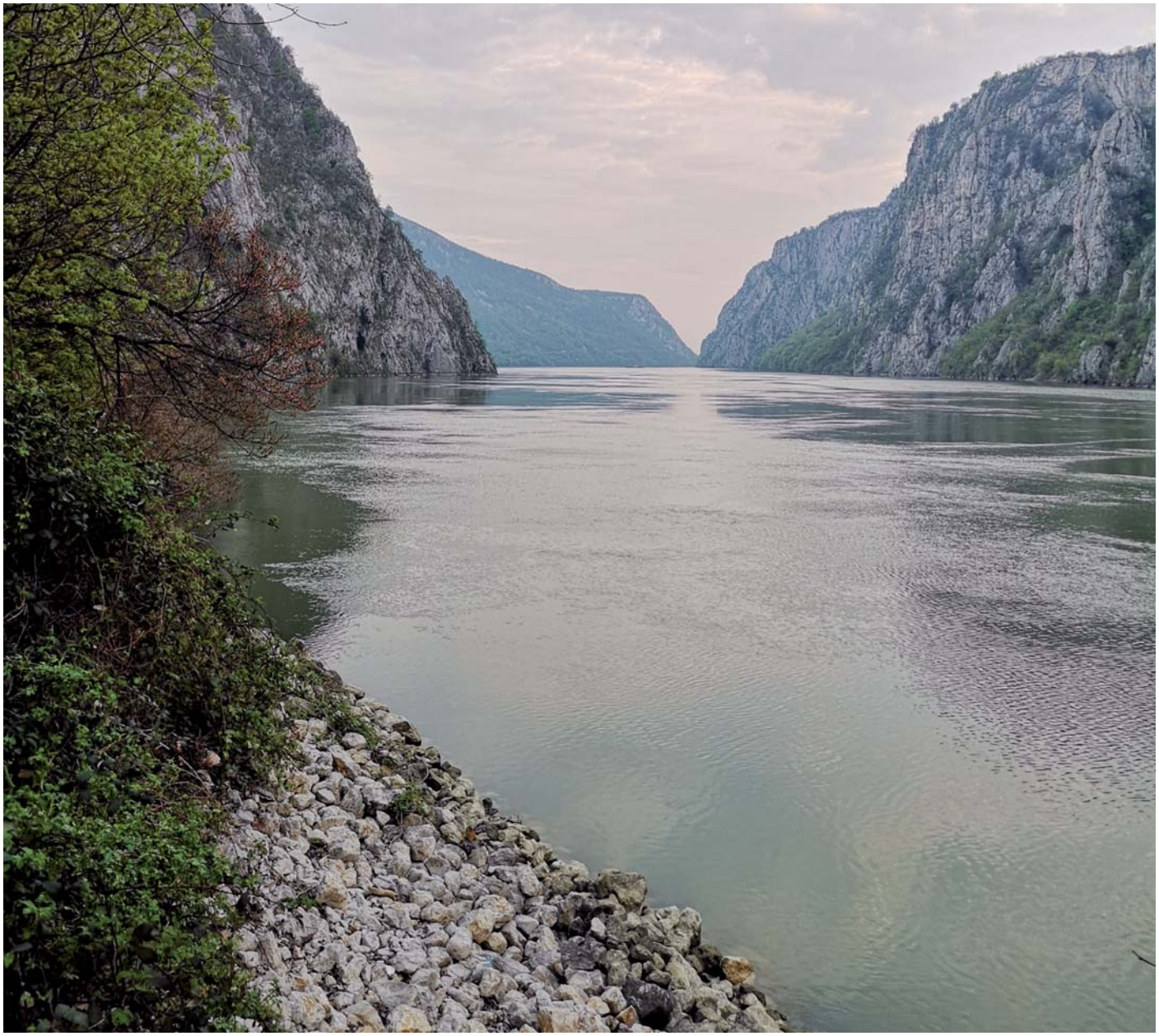


*Photo: ICPDR/We Pass*

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