



SUCCESS STORIES 2017-2019

EU STRATEGY FOR
THE DANUBE REGION
PRIORITY AREAS 4&5



IMPRESS

The texts of the project descriptions were discussed by 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 (PA4 HU) with the help of Diana Heilmann (PA4 HU), Kinga Perge chief advisor of the EU Strategy for the Danube Region „Environmental Risks” Priority Area Hungarian coordination (PA5 HU), László Balatonyi (PA5 PAC HU) and Viktor Oroszi, National EUSDR Coordinator, Hungary.

The lead partner of the projects of DTP PAC1 PA04 and DTP PAC1 PA05 that financed this brochure is the Ministry of Foreign Affairs and Trade of Hungary.

Disclaimer

This document reflects only the author's view and neither the European Commission nor the Ministry of Foreign Affairs and Trade of Hungary are responsible for any use that may be made of the information contains.

This project is supported by the Danube Transnational Programme funded under the European Regional Development Fund with the contribution of partner states and institutions.

More information about the EU Strategy for the Danube Region

„Water quality” Priority Area:

<https://www.waterquality.danube-region.eu/>

„Environmental risks” Priority Area:

<https://environmentalrisks.danube-region.eu/>

TABLE OF CONTENTS

INTRODUCTION	4
--------------------	---

PROJECT RESULTS

JOINTISZA	8
DanubeSediment	16
DriDanube	22
CAMARO-D	34
SIMONA	42
Danube Floodplain	46
MEASURES	50
DAREFFORT	54
DEEPWATER-CE	58
Framwat	62
Raab Flood 4cast	66
EAST AVERT	70
WATERatRISK	76
Platform	80
DAREnet	84
Interfloodcourse	88

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. EUSDR PA4 gives a hand, e.g. in the promotion of measures addressing wastewater treatment measures in non-EU countries, the facilitation of sub-basin activities or the improvement of fish migration.

The coordination of the **Environmental Risks Priority Area (PA5)** is managed by Hungary and Romania. The main focus of the work is to address the challenges of water scarcity and droughts in line with the Danube River Basin Management Plan, the report on the impacts of droughts in the Danube Basin in 2015 (due in 2016) and the ongoing work in the field of climate adaptation. Therefore, in the past few years EUSDR PA5 contributed to the elaboration of the ICPDR Climate Change Adaptation Strategy Update 2018, supported

project elaboration and implementation in the field of drought management and climate change related spatial planning, disseminate scientific results to anticipate regional and local impacts of climate change through research. Flood risk management is also a significant target of the priority area. In order to achieve reduction of flood risk events EUSDR PA5 provides and enhance continuous support to the implementation of the Danube Flood Risk Management Plan. In case that these prevention measures are not effective enough, than disasters occur, therefore EUSDR PA5 supporting the assessment of disaster risks in the Danube Region, encouraging actions to promote disaster resilience, preparedness and response activities.

The main decision-making body of both priority areas is their Steering Group (SG), comprised of representatives from all Danube Region countries. Both PA4 and PA5 of the EUSDR assist 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. The PAs were active in supporting the preparation of projects: in several cases 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 PAs 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. This was the case for example in the JOINTISZA project which resulted in the updated Tisza River Basin Management Plan and the **ministerial declaration of five countries signed in September 2019**.

The activities of the PA4 and PA5 is harmonized well with the Danube Transnational Programme's (DTP) Capitalisation Strategy that was launched on 25-26 January 2017 in Budapest. The overall aim of DTP capitalization is to cooperate with each other most efficiently, to build synergy between the DTP projects, as well as with other projects funded by other financial instruments. The capitalization has been welcomed by the projects awarded funding and by the Priority Area Coordinators (PACs) of the EUSDR as well.

Joint results of cooperation

Direct results of the capitalization are already visible: the related projects invited each other to their own kick off events and project meetings; and all Pole projects were invited to the SG meetings of Priority Area Water Quality and Priority Area Environmental Risks to share experiences. Pilot projects were initiated for stringer cooperation and shared project results.

Please note that capitalisation in some cases went further than visiting each other's meetings and sharing results by establishing **common thinking and even common actions** concerning topics interesting for more than one project (e.g. see the example of droughts below).

The capitalization process makes it possible for the projects and PACs to get to know each other's work, establish professional links to cooperate and score better outcomes and results through peer learning, benchmarking. Different Thematic Poles were created based on the EUSDR Priority Areas to reinforce the links between the Programme and the Strategy and foster the capitalisation opportunities. Four DTP projects were identified originally in January 2017 to cooperate in the capitalization framework of DTP Thematic Pole 4 in connection to Water Management (Thematic Pole Water Management). EUSDR takes active part in the capitalization procedure via the coordination teams of PA4 and PA5. PA4 undertook voluntarily the main coordination role of Thematic Pole Water Management.

PA4 and PA5 cooperate with projects related to different water management issues. While the projects address different issues like steering land use to safeguard water resources and reduce flood risk; coordinating sediment management along the Danube river; developing an Integrated River Basin and Flood Risk Management Plan for the Tisza River Basin; improving drought monitoring, management and emergency response in the Danube Region; they seek for synergies for the common benefit. The projects involved in capitalization from the DTP 1st call are: CAMARO-D, DanubeSediment, DriDanube and JOINTISZA. In the second DTP Call further four projects started to cooperate in line with capitalization in 2018: Simona, Danube Floodplain, Dareffort and MEASURES.

Apart from projects financed by the DTP, projects financed by other programmes, such as INTERREG Central Europe, Horizon2020 and several CBC programmes are also important for the work of the PAs and projects such as DEEPWATER-CE, FRAMWAT, RaabFlood4cast, East Avert, WATER@ RISK, PLATFORM, DAREnet and Proline-CE were included in the capitalization process.

EXAMPLES OF JOINT EVENTS:

- ▶ JOINTISZA and DanubeSediment held joint events on Transnational Cooperation for Sustainable River Basin Management Conference on 11 April 2017, (Budapest, HU).
- ▶ All team members participated and jointly held an EUSDR organized side event of the Hungarian Hydrological Annual Conference on 5-7 July 2017 (Mosonmagyaróvár, HU).

- ▶ Several DTP Capitalization Workshops were held, such as in the frame of the Annual Forum of the EUSDR in Budapest in October 2017.

Discussions reinforced the already existing linkages and cooperation initiatives among the projects.

- ▶ In line with JOINTISZA project activities areas for cooperation have been identified with all projects, e.g. water and land use issues (within CAMARO-D), the first “Danube Sediment Management Guidance” (within Danube Sediment project) was identified to serve as an inspiration to relevant sections of the Joint Tisza Survey Manual.
- ▶ Synergies were found between DriDanube and JOINTISZA in the area of drought management; within the JOINTISZA project by investigating climate change-induced water quantity-related issues in the Middle



DTP Lead Partner Seminar – 2nd Call of Proposals, Budapest, 27 June 2018: water management projects



Capitalization workshop at the 6th Annual Forum of the EUSDR, Budapest, October 2017

Tisza and in DriDanube by developing joint Strategy for efficient and operational drought management in the region which is using similar approach of involving stakeholders as it is described in Shared Vision Planning (from JOINTISZA project).

(DAREFFORT, CAMARO-D, Danube Floodplain, DanubeSediment, JOINTISZA, SIMONA and DriDanube).

- ▶ The steps for better drought management described in DriDanube Strategy inspired JOINTISZA to better address drought in Tisza RBMP.
- ▶ A Lead Partner Seminar – 2nd Call of Proposals of the Danube Transnational Programme was held on 27 June 2018 in Budapest. The event included a session on capitalisation working groups. Thematic Pole Water projects invited each other to their own kick off events that were held in September - October 2018.

Further capitalizations are ongoing, namely in the frame of the DAREFFORT project a main capitalisation event was held on 4 February 2019 in Vienna with 52 participants from seven projects

This document was compiled by EUSDR PA4 and PA5 with the help of the projects to contribute sharing knowledge and accessing results for the sake of improving the quality of waters and fight against environmental risks 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 their funding instruments and project period.

JOINTISZA

STRENGTHENING COOPERATION BETWEEN RIVER BASIN MANAGEMENT PLANNING AND FLOOD RISK PREVENTION TO ENHANCE THE STATUS OF WATERS OF THE TISZA RIVER BASIN



Funding instrument: Danube Transnational Programme (1st Call)

Project duration: 01. 01. 2017. – 30. 09. 2019.

Budget in Euro: Overall 2,254,126.8

Priority: Environment and culture responsible Danube region

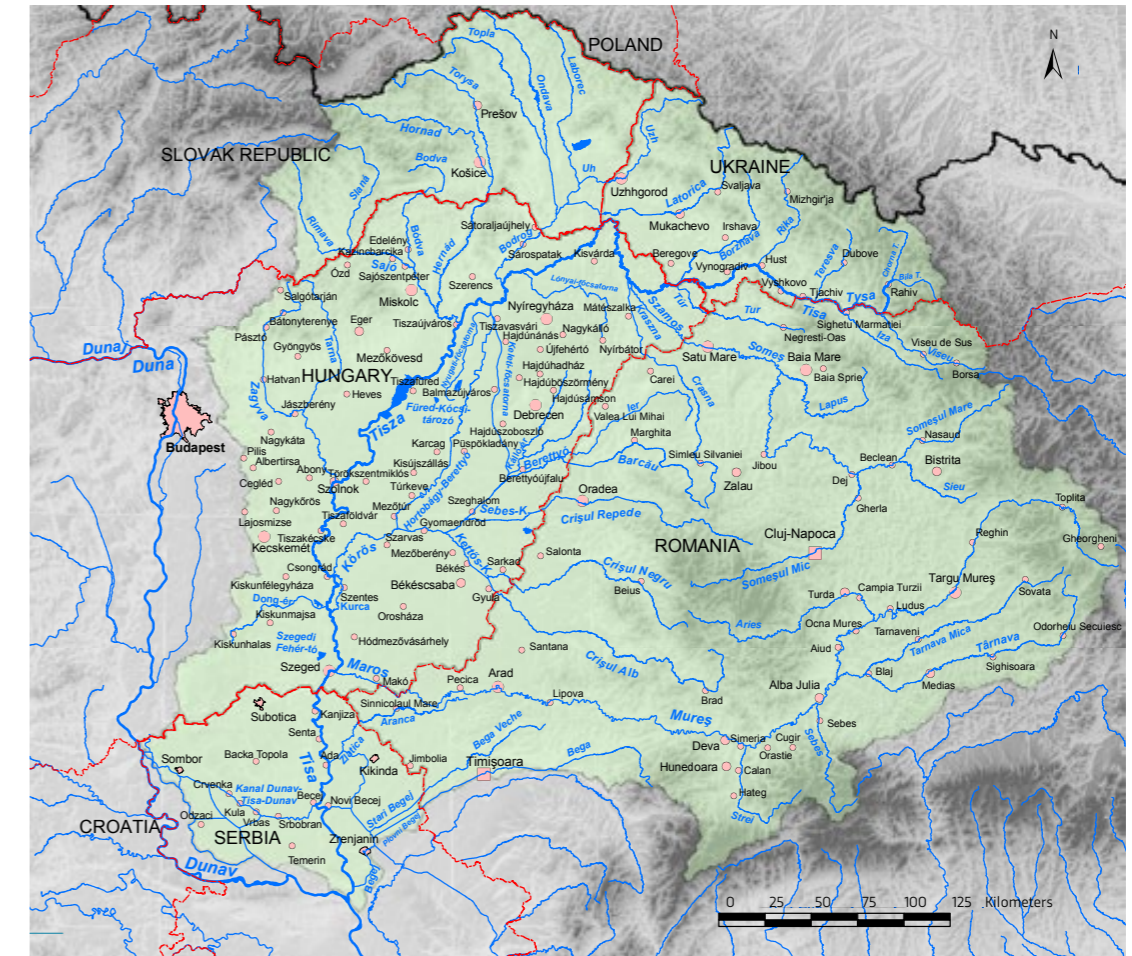
Specific objective: Strengthen transnational water management and flood risk prevention

Lead partner: General Directorate of Water Management, Hungary

Project manager: Balázs Horváth, jointisza@ovf.hu



Project
website



- Tisza River Sub-basin
- Danube River Basin District (DRBD)
- Tisza and Danube
- Tributaries (river basins larger than 1,000 km²)
- Lake water bodies (surface area > 10 km²)
- National borders
- Cities 10,000-50,000 inhabitants
- Cities 50,000-100,000 inhabitants
- Cities 100,000-250,000 inhabitants
- Cities 250,000-1,000,000 inhabitants



The map of the Tisza River basin

EXPECTED RESULTS

- ▶ Updating Tisza River Basin Management Plan - integrating flood protection aspects
- ▶ Strong stakeholder involvement process
- ▶ Pilot actions, focusing on urban hydrology management and drought management

UPDATING TISZA RIVER BASIN MANAGEMENT PLAN – INTEGRATING FLOOD PROTECTION ASPECTS

Under the Tisza Group activities, the 1st Integrated Tisza River Basin Management Plan (1st ITRBMP) was elaborated and endorsed by the ICPDR Heads of Delegations of the Tisza countries in 2011. In addition to significant water management issues (SWMIs) and groundwater issues, water quantity management issues (flood and excess water, drought and water scarcity, and climate changes) relevant for TRB and their inter-linkage with water quality management are identified in the 1st ITRBMP. In the frame of the JOINTISZA project the update of the 1st management plan has been prepared. The new Updated ITRBMP is built on the structure and approaches applied in the development of the 1st ITRBMP and DRBMPs. It is developed based on updated data and information reported and verified by Tisza countries relevant for e.g., surface water bodies and groundwater water bodies monitoring network, pressures and status assessment, water quantity issues relevant for TRB and proposal of

measures for all SWMIs and TRB relevant water quantity issues. Furthermore, the flood risk management win-win measures that support EU WFD environmental objectives are elaborated in the ITRBMP update, as well as the environmental objectives and exemptions have been adjusted for surface and groundwater bodies.

The Updated ITRBMP devotes an important chapter with stronger emphasis to the topic of integration with other sectorial policies. The integration of flood risk management and climate adaptation received particular attention, beside the issues of water scarcity and drought which are also addressed. The Updated ITRBMP includes results of innovative approaches, such as i) continuation of the knowledge improvement on the integration elements of water and flood management objectives into the river basin management planning process via training events and consultation; ii) shared vision planning application to involve stakeholders; iii) setting up ground for drought and climate change issues in river basin management planning; iv) improving methods for urban hydrology management purposes; v) simulation of dike removal with a transboundary effect and vi) preparing a manual for the Joint Tisza Survey.

STRONG STAKEHOLDER INVOLVEMENT PROCESS

In the frame of the project there was an intention to involve stakeholders (SH) in national level in all participating countries. The goal of the national-



View from Carpathian Mountains on Rakiv city and river Tisza

level SH involvement was to establish a list of SHs of the 5 countries for further steps as well as to receive general comments of the SHs on basin wide importance problems of the Tisza River and the 1st ITRBMP and integrate them into the updated Plan.

The most important lessons learned during the national-level SH involvement:

- ▶ during the consultations it became clear, that the 1st ITRBMP is generally not known by the SHs. One reason for that is the **language barrier (the full version is only available in English)** and other might be the relative **novelty of the Plan** (known only since 2010-2011) compared to other Plans and Directives;
- ▶ **some sectors were contacted and involved; however, they sent no significant comments yet:** industry and chambers in Hungary, agriculture, aquaculture, industry in Slovakia, forestry in Ukraine, etc.;
- ▶ **it is easier to reach governmental institutions, then private ones;**
- ▶ **personal or sectoral connections are highly important:** without these it is difficult to effectively reach some SHs;
- ▶ **some SHs are already overloaded** with different consultations from different projects, while others face this opportunity for the very first time (f.e. Ukraine);

- ▶ **the „quality” of the comments is mixed,** many of those focus on local issues or have not searched for exact connections with the existing ITRBMP. The reason of this must be the lack of knowledge and the availability of the plan and other supporting documents, plus the language barrier mentioned above; many SHs proposed to have more detailed or exact comments after they would receive new drafts of the plan or its elements. On the other hand, it took time to make them understood that during the preparation phase, gathering their inputs is useful and their inputs will be considered during the compilation of the 1st draft of the 2nd ITRMP;
- ▶ there is a need to **focus on the SHs role too in the implementation of the Plan** in the future („not only blaming water sector or others”) – however it is very important to build partnerships.

JOINTISZA – SHARED VISION PLANNING APPROACH APPLIED IN TISZA RIVER BASIN

(Source: Global Water Partnership Central and Eastern Europe Website)

The uneven distribution and quality of water resources in the Tisza River Basin brings challenges on how to elaborate the Programme of Measures as required by the EU Water Framework Directive. The team of 43 experts was working on the update of River Basin Management Plan under the Interreg project JOINTISZA. By bringing together

authorities and experts from five European countries (Hungary, Romania, Serbia, Slovakia and Ukraine), the JOINTISZA project aims to enhance the status of waters of the Tisza River Basin. The project focuses on interactions of two key aspects of water management — river basin management (RBM) and flood protection.

An important part of the project was to consult relevant stakeholders who play a pivotal role in the Tisza RBM planning process.

An innovative approach was used/tested in the JOINTISZA the so-called Shared Vision Planning (SVP). This methodology is gaining momentum in the water resources planning. Traditionally, engineers are skilled to develop decision supporting models to resolve complex water management problems. On the other hand, essential wisdom and experience are represented by stakeholders, decision-makers, and local community. Typically, both parties are involved in river basin planning and management, but they tend to follow separate pathways. Usually, these two paths tend to cross only at the beginning of the process when data are collected, and at the end when the model results are presented for discussion and decision-making. Stakeholders often have little option but to accept the results obtained by the experts. SVP aims at breaking the isolated positions and planning approaches into a concerted effort.

The SVP methodology is being tested in the pilot area of Tisza basin. Several workshops were held to train both authorities and other stakeholders in



Ceremonial Tisza tree planting with the representatives of the five Tisza countries in Rose Park in Szolnok (held in the frame of the closing event of the JOINTISZA project on 30 May 2019)



Tisza Ministerial meeting, Budapest, Hungary, 26 September 2019



Mayflies in the Tisza River, Hungary

using SVP. In November 2018 the final stakeholder workshop was held when the planners and the stakeholders jointly summarized the outcome of the SVP application on the pilot area.

GWP together with Deltares, the Netherlands, committed to Integrated Water Resources Management, produced knowledge products in order to illustrate how benefits can be generated

from cooperation and thus begin to push parties towards a focus on sharing benefits, rather than simply sharing flows.

PILOT ACTIONS, FOCUSING ON URBAN HYDROLOGY MANAGEMENT AND DROUGHT MANAGEMENT

Urban hydrology

A **manual** was prepared to promote the organization parameters of the integrated planning process in urban hydrology. However, due to space limitations, it was not possible to discuss all the technical details of the planning process. Therefore, the manual focuses on the most important aspects and highlights integrated water management approach referring to urban sites as a complete hydrological unit.

Drought management

One of the pilot actions of the project within the JOINTISZA project focused on **climate change induced drought and flood related issues**. The main goal of this pilot activity was to investigate the impacts of climate change induced drought and flood on a smaller region within TRB. The task was to test the concept of Shared Vision Planning (SVP) in a smaller region of the basin focusing on the middle part of the TRB and to investigate the drought periods how to optimize the available water resources according to the ecological and irrigation water demands. The overall process was tested via SVP methodology and as a tool via the part of the

Tisza-Körös Valley Water Management System, which was built-up and operated by Hungary.

One of the conclusions of the documents states that it would be a good solution to keep more water in the area with some alternate ways to avoid the water restriction measures. Constructing reservoirs in deep areas to hold back excess water, and the development of the canal network are realistic options. Reforming the agricultural practices can also improve the hydrology of the area, such as reforming the current land use structure, abandoning monocultural plant production and the development of irrigation technologies.

In the frame of the high level statements at the Tisza Ministerial meeting, in Budapest, Hungary on 26 September 2019, the main results of the DTP- JOINTISZA project were acknowledged and the high representatives of the five countries of the Tisza River Basin, stressed their' countries commitments towards the future joint work and signed the Tisza Memorandum of Understanding. The updated Integrated Tisza river Basin Management Plan can be a good basis for the future joint activities.

DANUBE SEDIMENT

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



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@epito.bme.hu

Communication Manager: Hanna Skiba, Bavarian Environment Agency (LFU) Augsburg, Germany, DanubeSediment@lfu.bayern.de



Project
outputs



Project
website



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,



The two photos show instruments used to monitor sediment. The top photo shows a US P63-Sampler, which is a best practice device for monitoring sediment. The photo directly above shows a water sampling method used to analyse suspended sediment

Photos: © Marlene Haimann, IWA/BOKU

as of January 2017, 14 partners and 14 associated strategic partners from nine countries are working together in the DanubeSediment project. Their goal is to improve the transnational sediment management in the Danube. The project will close knowledge-gaps, draft a first common

Danube Sediment Balance and develop guidance for the implementation of measures that improve the sediment balance. The project will develop key contributions for the 3rd Danube River Basin Management Plan and 2nd Danube Flood Risk Management Plan.



In the on-board laboratory, sediment is analysed during the monitoring campaign.

Photo: © Christoph Maier, LfU

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 past year, the sediment balance is being 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, we need to complement this information with data on morphological characteristics. For example, the amount of material removed and deposited into the river and information on river-bed material and composition. Historical maps are used as references for the river width and length. The sediment balance will help 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" will be published by the end of November 2019 (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. Interruptions of longitudinal continuity and lateral connectivity are rated as significant pressures, e.g. dams, dykes, groynes, ship locks etc.

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 water administration, hydropower, nature protection and water management, the project partners collected and evaluated so-called "good practice measures" to improve the sediment regime. These will be 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"* address policy-makers by giving recommendations on transnational cooperation and improving the management of water and sediment in the Danube River Basin.

All reports will be available in the "library" of the project website by the end of November 2019: <http://www.interreg-danube.eu/approved-projects/danubersediment/outputs>

DRIDANUBE

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



Funding instrument: Danube Transnational Programme (1st Call)

Project duration: 01. 01. 2017. – 30. 09. 2019.

Budget in Euro: Overall 1,974,750

Priority: Environment and culture responsible Danube region

Specific objective: Improve preparedness for environmental risk management

Lead partner: Slovenian Environment Agency

Project manager:

Andreja Sušnik, andreja.susnik@gov.si

Communications manager:

Gergana Majercakova, gergana.majercakova@gwpcee.org



Project
website



Drought
Watch



Deliverables



DriDanube
Gallery





- ▶ Final outputs are presented in the leaflets and our new final video Drought - Be prepared. Know the risks. Take action
- ▶ Deliverables will be available in September 2019 on this link: <http://www.interreg-danube.eu/approved-projects/dridanube/outputs>
- ▶ DriDanube Gallery: <http://www.interreg-danube.eu/approved-projects/dridanube/gallery>

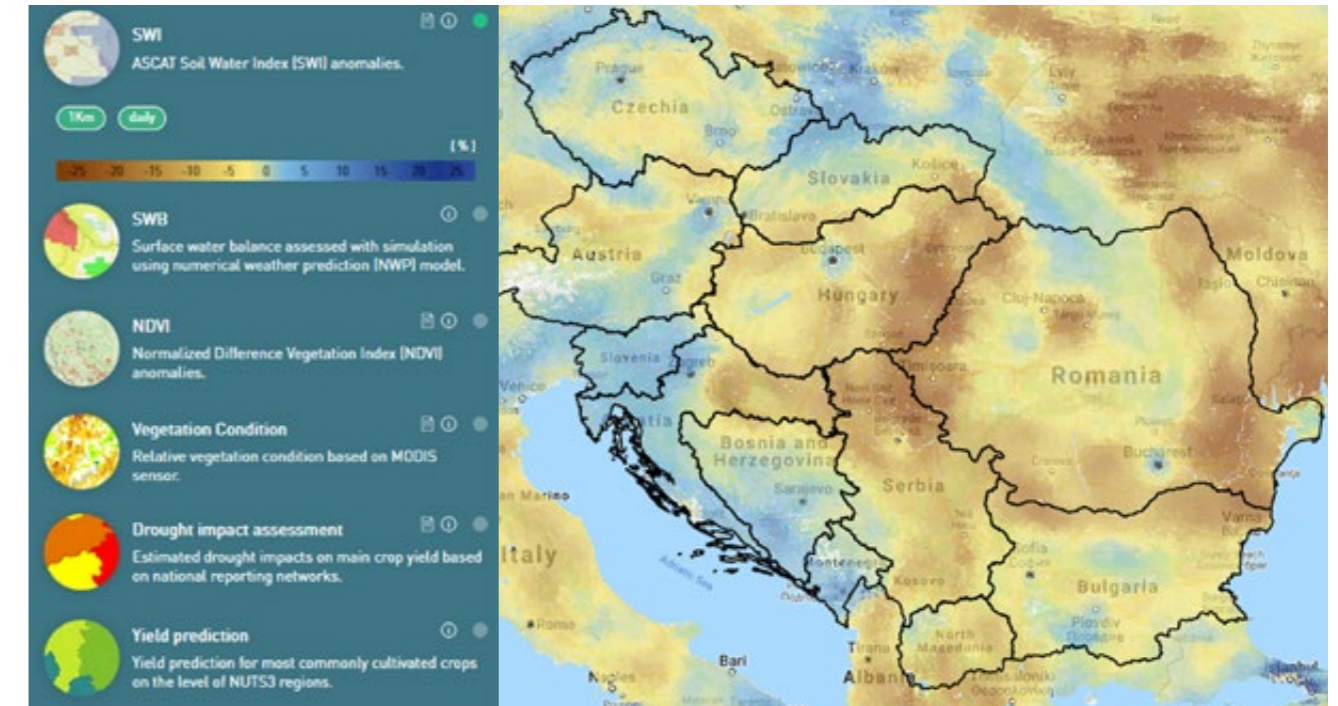
MAIN RESULTS

1. DROUGHT WATCH (DROUGHT USER SERVICE)

Drought Watch

- ▶ a web-based tool enabling more accurate and efficient drought monitoring and early warning across the entire Danube region;
- ▶ includes a set of Earth Observation data from a range of operational remote sensing satellites, processed into ready-to-use drought information available to general public online;
- ▶ improves operational day-to-day work of national authorities and end users in all phases of drought.

DriDanube partners developed an innovative and interactive tool Drought Watch which will enable more accurate and efficient drought monitoring



Soil Water Index as seen in Drought Watch on 9 April 2019

MAIN GOALS:

The project aimed to increase the capacity of the Danube region to adapt to climatic variability by **enhancing resilience to drought** with recently developed tools and data sets.

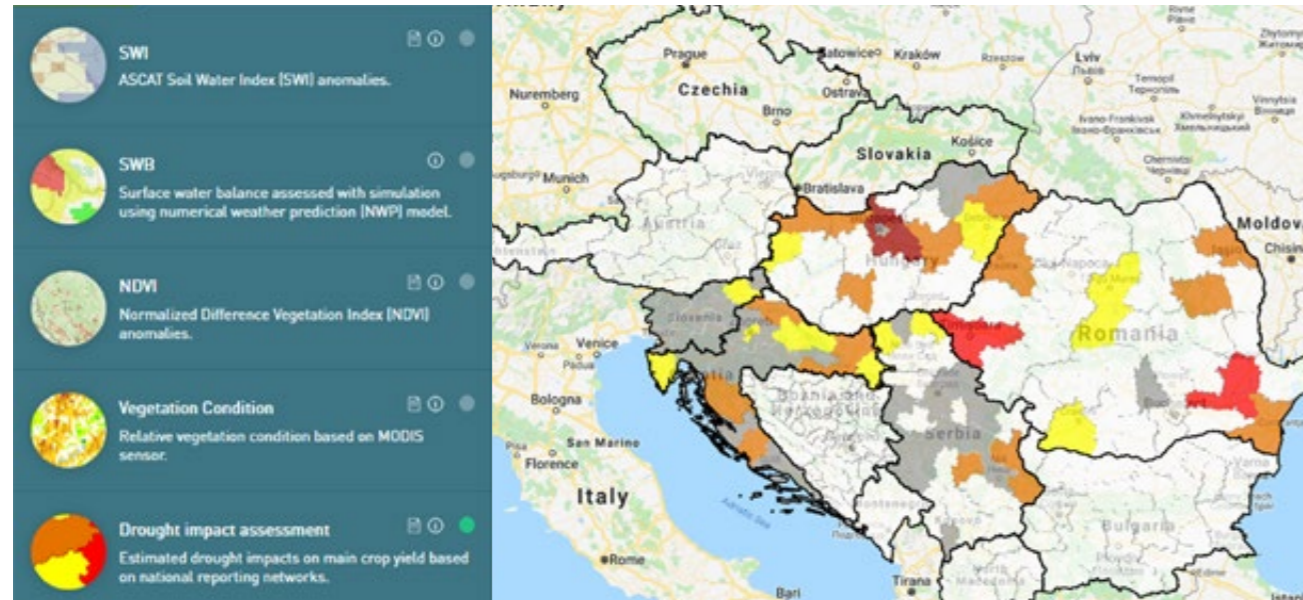
MAIN RESULTS SUMMARY:

- ▶ Drought Watch: <https://droughtwatch.eu/>; Article; Video; Tutorial
- ▶ Drought Strategy article; Report on current status of Drought Management in the region (Strategy will be finalized in September 2019)

and early warning for the entire Danube region. This tool will serve the need of understanding the stage of drought and will help to improve operational day-to-day work of wide range of end users in all phases of drought. It can be a great tool not only for the drought experts, meteorologists, water managers or farmers but also for the decision makers to monitor and detect droughts on transboundary level to be able to make appropriate decisions leading to application of mitigation measures. To avoid bigger losses and

impacts of drought, timely and proactive steps are crucial that can be done based on Drought Watch data.

Drought Watch includes a set of Earth Observation data from a range of operational remote sensing satellites, data from meteorological stations and drought impact reports processed into ready-to-use drought information available to general public with a web interface at <http://www.droughtwatch.eu/>.



Observed estimations of drought impacts on main agricultural crops, 14 April 2019



Desiccation cracks on corn field

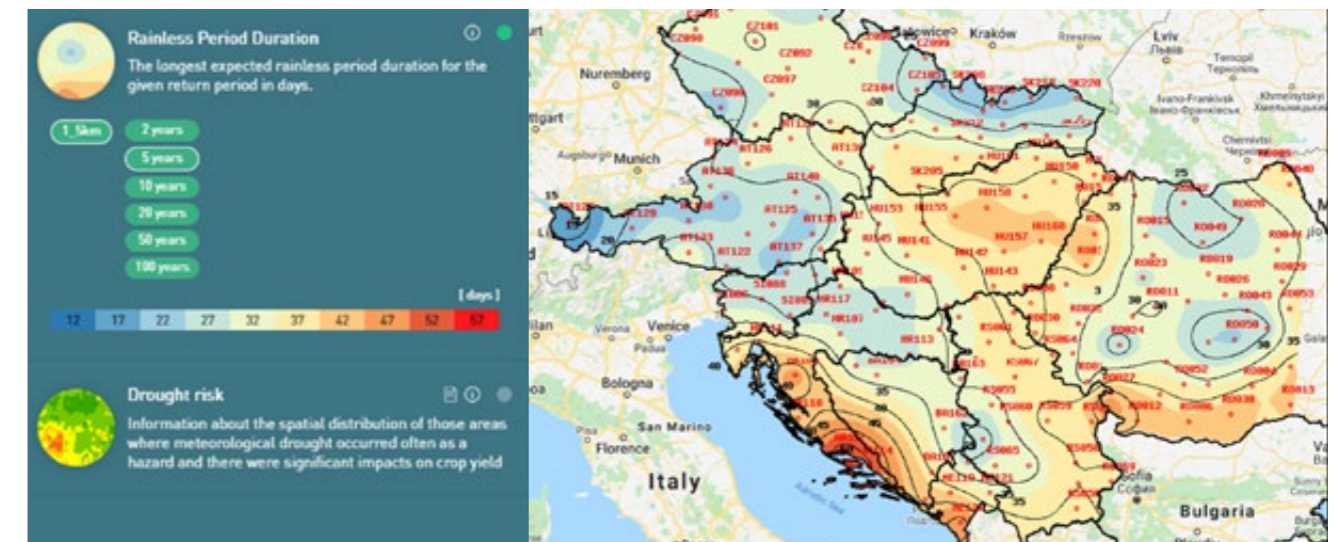
Drought impacts reporting networks

- near-real-time observations of drought impacts by reporters;
- more than 1000 reporters (farmers, agriculture and forestry experts) across 10 Danube countries engaged in reporting observed drought impacts on weekly basis;
- drought impact maps are a weekly operational product in Drought Watch based on reported observations of how drought influences crop yield or forest growth in the Danube region.

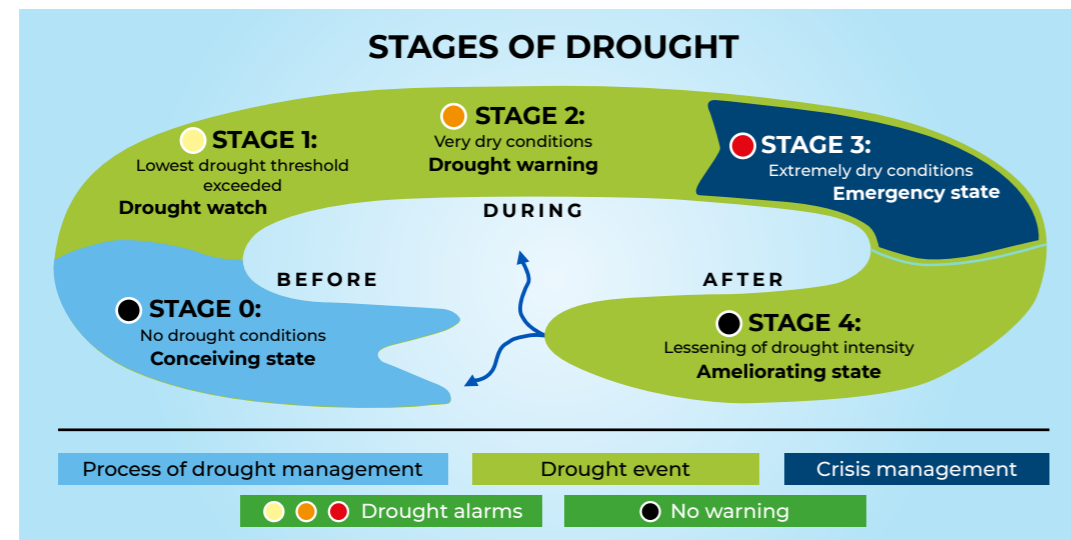
2. METHODOLOGY FOR DROUGHT IMPACTS ASSESSMENT AND FORECAST AND DROUGHT IMPACTS REPORTING NETWORKS

Drought can cause devastating impacts on the environment and society. These impacts make understanding and monitoring drought extremely important. Scientists usually look only at the drought indicators to get the picture of the current drought situation. DriDanube project combined this with the information on drought impacts “from the ground” to fully characterize the current drought condition.

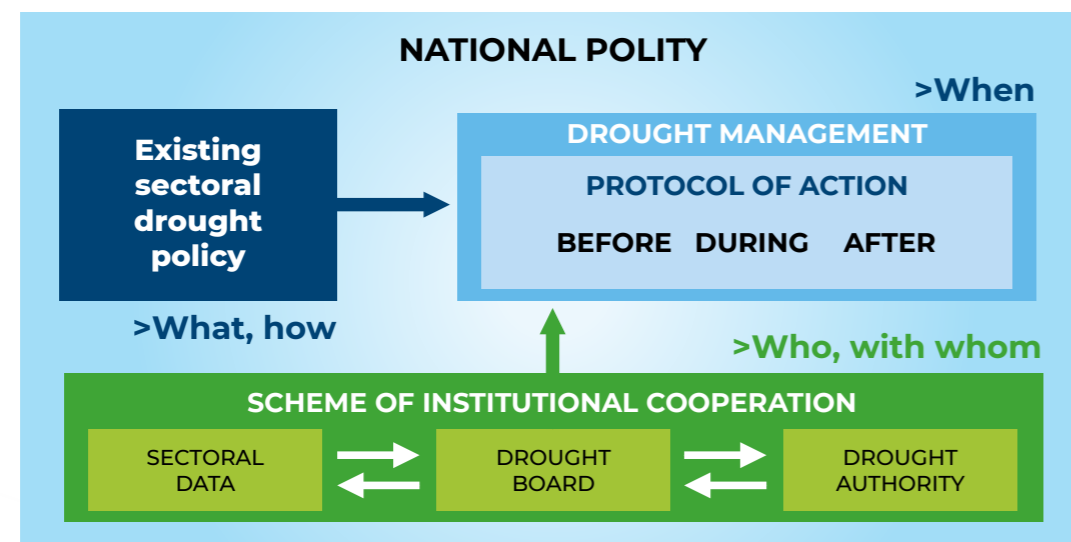
Apart from the remote-sensing based layers of the Drought Watch, that allow to estimate the soil



Expected length of longest period during vegetation season heaving a 5-year return period



Protocol of actions



Optimal drought management model

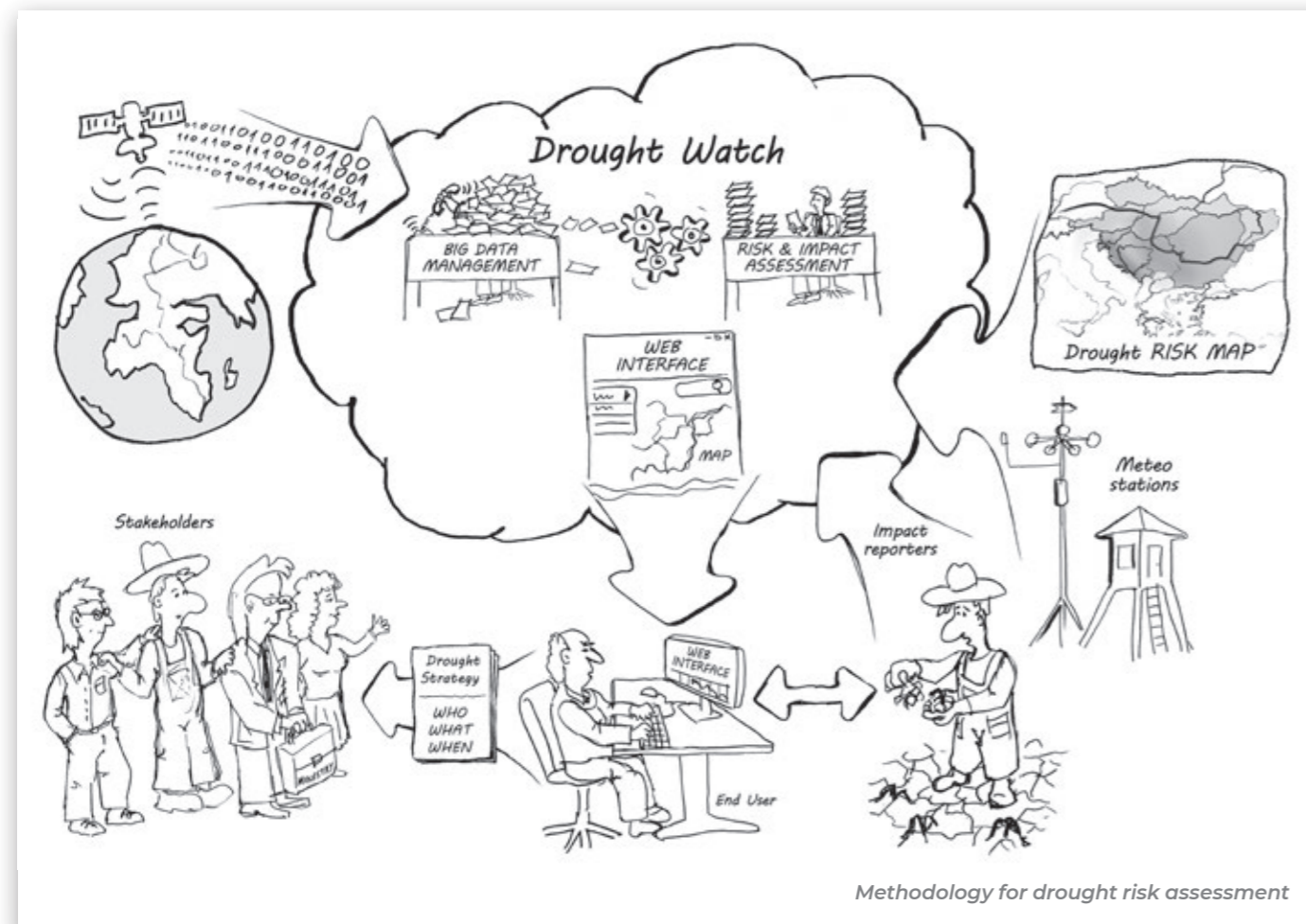


Drought on Danube Basin

Drought risk maps

- a unified drought risk assessment comparable among countries of the Danube region
- provide information about spatial distribution of the areas where meteorological drought occurred often as hazard with significant impacts on crop yield in the Danube region
- integrated into Drought Watch and available for maize, wheat, barley and oilseed rape for different drought occurrence probability levels (5, 10, 20, 30%)

water content and condition of the vegetation, there an add-on value of integrated data on **near-real time drought impacts was developed** that is allowing quick and efficient assessment of the current drought situation. This kind of data (that compliment and validate data in Drought Watch) was collected through the **National Reporting Networks**. The reporters are engaged individuals who report their observations on a weekly basis via simple questionnaires on the state of soil and vegetation in the field. Processed data on drought impacts are then seen in Drought Watch (click on "Drought Impact Assessment").



Establishing a nation-wide network of reporters is however a long-lasting process that takes few years. DriDanube partners started the whole process in each of the 10 project countries and set good foundations for its further growth after the project end. Network started to be built on an

example of Czech Republic and Slovakia and in the last years network in 10 countries reached over 1000 reporters with 800 weekly active reporters.

Historical drought impacts collection (1981 – 2016) in Danube Region: DriDanube partners

prepared repository of drought event impacts (article) across the Danube catchment countries between 1981 and 2016. The analysis will help in the future to predict the possible impacts of drought, their spatial localization and also the most affected sectors of the national economies based on the knowledge of the expected future climate development.

3. METHODOLOGY FOR DROUGHT RISK ASSESSMENT

Droughts and their impacts are occurring with increasing frequency and magnitude across the Danube region. Their costs are underestimated, particularly in countries where assessment capacities and drought management systems are the weakest. The risk assessment and mapping of the drought risk are key parts of the successful drought risk management process.

Risk assessments when carried out at national level are crucial for enhancing disaster prevention and preparedness activities and contribute significantly to planning and capacity building.

DriDanube project improved coherence among the risk assessments undertaken in all involved countries and developed one drought risk assessment comparable among countries. This leads to a greater transparency and it will facilitate co-operation in efforts to prevent and mitigate shared drought risks, such as cross-border drought risks.

Methodology developed for the purpose of preparation of regional risk maps for selected crops is following conceptual framework set in the European Commission's Risk Assessment and Mapping Guidelines for Disaster Management.

4. DROUGHT STRATEGY

The shift that DriDanube project wants to bring is that we will not be only reacting to the damages caused by drought but start acting ahead of the crisis and get prepared in advance. Drought Strategy is a document proposing a new framework for improved drought management in the Danube region. It includes an Optimal Drought Management Model, a concept of how

Drought Strategy

- ▶ a document proposing a framework for improved drought management in the Danube region;
- ▶ its optimal drought management model organises already existing legislation and institutions in an optimal way of cooperating and reacting at different stages of drought development for wholesome risk management (from monitoring and early warning to response and evaluation);
- ▶ compiled together with stakeholders at 30 national seminars and trainings and 2 international conferences.

drought management would optimally function to comprehensively tackle drought management issues. The model addresses institutions within the **institutional scheme** to jointly implement **drought policies** in a way as specified in **protocol of actions**, and therefore has 3 main elements. It organizes already-existing legislation and institutions in a country in an optimal way of cooperating and reacting in different stages of drought risk management: from acting preventively during time of no-drought conditions, early response upon its

first signals and further development, and during mitigation and evaluation process.

However, for effective drought management everybody involved needs to understand **who is doing what and when** during each stage of drought.

Drought strategy would be finalized in September 2019.



Danube Drought Conference participants

DANUBE DROUGHT CONFERENCE

Focusing on the challenges and joint cooperation in the area of drought management in the Danube region, DriDanube project organized its Final conference on 7-8 May 2019 in Vienna in the concept of the regional event - Danube Drought Conference. To emphasize importance of the joint cooperation, the event was held in cooperation with the partners from the Drought Management Center for Southeastern Europe and the Integrated Drought Management Programme in Central and Eastern Europe. It was attended by almost hundred

participants from various sectors dealing with drought – national hydrometeorological services, ministries, universities, business sector, international organizations, non-governmental organizations etc.

Read the Outcomes of the Danube Drought Conference which are summarizing work of DriDanube, DMCSEE and IDMP CEE partners in the last couple of years in the region and emphasizing some key areas of the future work. The conference participants consider them a pathway towards integrated drought management in the Danube Region.

CAMARO-D

COOPERATING TOWARDS ADVANCED MANAGEMENT ROUTINES FOR LAND USE IMPACTS ON THE WATER REGIME IN THE DANUBE RIVER BASIN



Funding instrument: Danube Transnational Programme (1st Call)

Project duration: 01. 01. 2017. – 30. 06. 2019.

Budget in Euro: Overall 2,588,138.36

Priority: Environment and culture responsible Danube region

Specific objective: Strengthen transnational water management and flood risk prevention

Lead Partner: Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management

Hubert Siegel, hubert.siegel@bmnt.gv.at

Elisabeth Gerhardt, elisabeth.gerhardt@bfw.gv.at

Project-management: Gudrun Schrömmner, gudrun.schroemmer@prisma-solutions.at



CAMARO-D
platform



Film
on YouTube



Interview with
Hubert Siegel



Project
website



PROJECT GOALS:

CAMARO-D aimed at developing comprehensive recommendations towards a strategic policy for the implementation of an innovative transnational catchment-based “Land Use Development Plan” for the Danube River Basin. It also provided important inputs for the further development of

the EU Strategy for the Danube Region (EUSDR) and other relevant EU-policies. Its main goals were:

- ▶ Setting the frame for a harmonized transnational land use management system, taking into account the demands of water resources protection and flood prevention.



ENNS flood 2013 © AREC PP1



Excursion accumulation lake SRB © E. Gerhardt



Wetlands protected area AT © AREC PP1

- ▶ Harmonizing and improving the protection of water resources against negative impacts of land use and climate change as well as reduction of flood risk.
- ▶ Bringing life to the project outcomes by developing a transnational “Land use Development Plan” as a driving force for a transnational land use management

MAIN RESULTS:

During 30 months of project implementation, the partnership developed various tools and strategies in order to foster long-lasting protection of water resources and of enhanced flood risk prevention. Different measure bundles, defined as transnational “**Best Practice Manuals**”, related to arable agriculture, grassland management, forestry, spatial

OVERVIEW OF TRANSNATIONAL BEST PRACTICE MANUALS, ALLOCATED TO THE DIFFERENT CLUSTERS		
CLUSTER 1 GROUNDWATER RESOURCES	CLUSTER 2 TORRENTS AND SMALL RIVERS	CLUSSTER 3 RIVERS AND ACCUMULATION LAKES
Groundwater protection through targeted silviculture	Tailored forest management in torrential watersheds	Adapted agriculture for optimal surface water and soil protection under climate change
Best practice restrictions for drinking water quality in agricultural land		Conversion from arable land to grassland mitigating soil erosion
	Practical guide to spatial planning in catchments and river stretches	
Mountain grassland management towards groundwater protection	Beaver management to protect flood prevention measures	
Hydropower plants and wastewater treatment	Hydrotechnical measures mitigating flood risks & establishing of flood forecasting maps in torrential watersheds and along rivers	
Control of invasive plant species		
Awareness raising		

planning and water management to mitigate the relevant risks were elaborated and partially tested and implemented in selected pilot areas. Within those pilot areas, stakeholder workshops and trainings were conducted in order to initiate this process. Furthermore, a concept for a **Land Use Development Plan** (LUDP) was elaborated which will enable cooperation and coordination of different sustainable land use management practices in the Danube river basin. It represents the initial action for a transnational catchment-based cooperation and the commonly

developed measure bundles should therefore be integrated in existing River Basin Management Plans and Flood risk management plans. **An innovative transnational guidance for sustainable land use planning (GUIDR)**, tested within the pilot action areas, will allow stakeholders and decision makers to take an active approach for participation in processes of planning and management. Those guidelines will contain a set of best management practices for the adaptation of different land uses and environmental management for the long-term protection of



Pilot activity with children © AREC, PP1

water resources and flood mitigation while taking into account extreme weather conditions. By means of a tailored **“Stakeholder toolkit”**, decision makers and other stakeholders get support for the mitigation of different conflicts of interest and receive recommendations for the implementation of optimized steering tools for regional development strategies and respective funding programmes. These newly developed planning instruments demonstrate procedures for a sound water management on a transnational basis and additionally provide important inputs for the further development of the EU Strategy for the Danube Region (EUSDR) and other relevant EU-policies like the Water Framework Directive, Floods Directive and Nitrates Directive.

SUMMARY OF CHALLENGES AND EVALUATION OF ACTUAL PRACTICES

In a first step, the project CAMARO-D identified negative practices used within the entire Danube catchment. These gaps were listed at pilot area levels, depending on the respective forms of land use. Two directions were used:

- Review of available official materials, identifying key environmental problems of target areas
- Specific check-lists, where GAP analysis was performed and negative practices were listed by national experts from CAMARO-D countries, assessed by frequency and importance of their use

This approach gives a unique opportunity of confrontation of literature (objective

information), with specifically gathered information from CAMARO-D expert teams (GAP analysis) and stakeholders' opinions (SWOT analysis). Individual approaches differ sometimes, bringing interesting results. The performed analysis helped to define real gaps in landscape management.

These results built the basis for the formulation of a catalogue for Best Management Practices (BMPs):

- Agriculture – arable land · Agriculture – grassland
- Forestry · Water management · Spatial planning.

Pilot action clusters in the CAMARO-D project,

the areas of operation were divided into three different clusters:

- Cluster 1: Groundwater resources
- Cluster 2: Torrents, small river and their catchments
- Cluster 3: River and accumulation lakes.

TRANSNATIONAL BEST PRACTICE MANAGEMENT

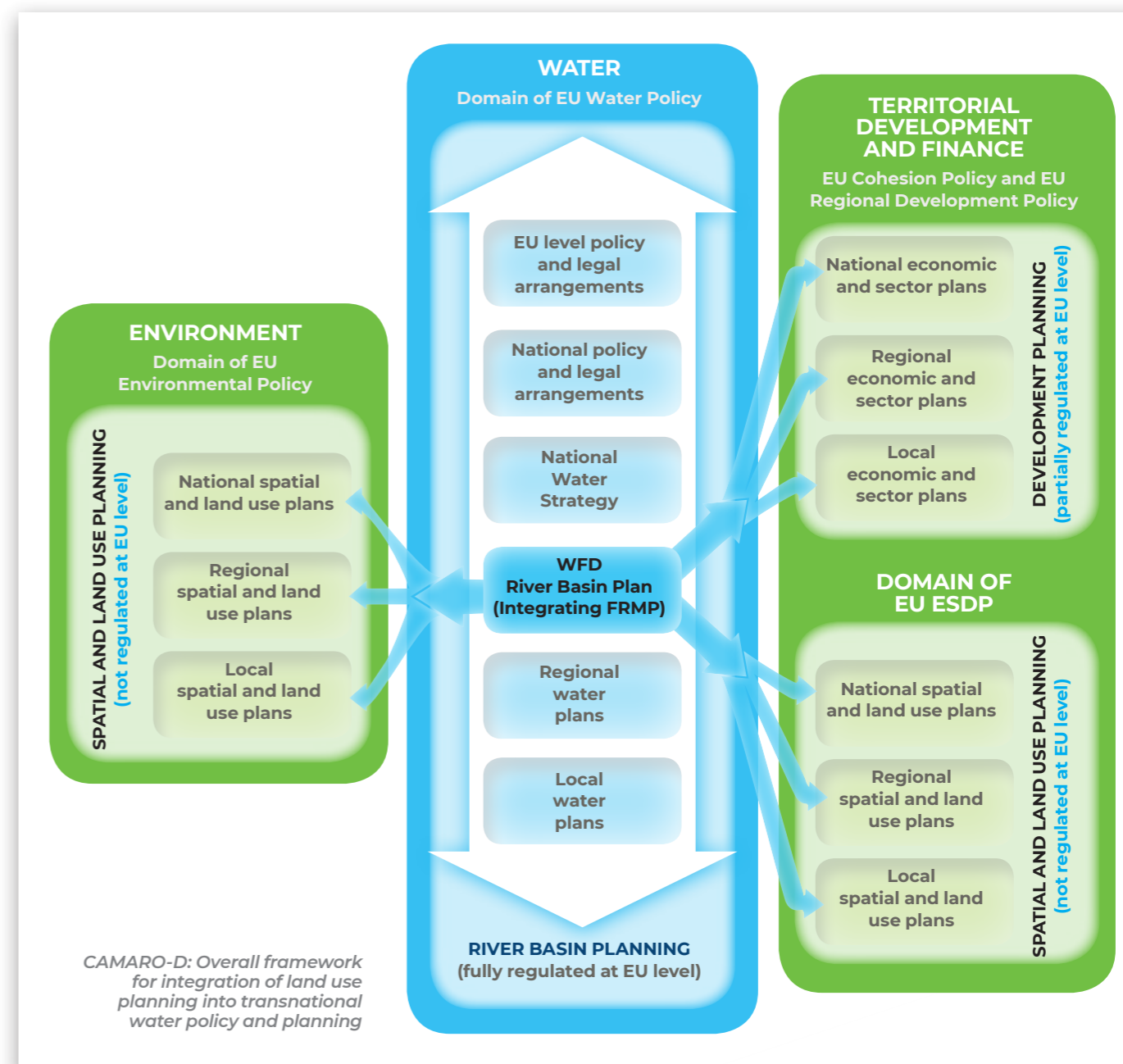
The transnational approach means that certain “problems” were identified in several countries of the Danube River Basin and the respective best practices were elaborated by the whole project consortium. Twelve transnational best practice manuals (BPMs) provide ideas of how to solve existing conflicts between land uses or vegetation cover and the protection of water resources. Furthermore, they show how flood prevention challenges in the countries of the Danube River Basin are linked to existing strategies and policies while also collaborating with the local population, institutions and governmental authorities.

The **GUIDR (Guidance for sustainable land use planning) document** provides specific guidance and recommendations for land use planning focused on different land uses clustered in the project (agriculture, forestry, grasslands and alpine pastures). It also gives land use planning guidance focused on:

- Standards for catchment based, function-oriented land use management and spatial planning
- Effective decision-making process and active participation of all stakeholders

- ▶ Catchment based political oriented, trans-sector and transnational cooperation
- ▶ Findings on trans-sector and transnational cooperation
- ▶ Implementation of best practices in existing strategies, policies etc.

In the transnational context of the CAMARO D Project it is clear that the Water Framework Directive, the Flood Directive, the Groundwater Directive and the Nitrate Directive are the main EU Policy components within which water related land use planning has to occur. These directives call for cooperation on transnational level. In this context the GUIDR provides the overall framework for the integration of land use planning into the transnational policy framework which is an integral part of the WFD.



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. – 31. 05. 2021.

Budget in Euro: Overall 1,749,152

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. Jasminka Alijagić, Jasminka.Alijagic@GEO-ZS.SI

Communication manager: dr. Peter Kumer, Peter.Kumer@GEO-ZS.SI



Accessible
project pictures
(with copyrights)



Accessible
deliverable



Promotional
products



Project
website



Danube, Budapest

© Peter Kumer

SUMMARY OF THE MAIN PLANNED RESULTS

The first specific objective of SIMONA is to describe the current status and common needs in order to serve as a baseline and status quo assessment in terms of existing good practices, national protocols, methods and databases in relation to sediment quality monitoring, water quality analysis and chemical status assessment.

The second specific objective is to establish a durable and operational framework which consists of sampling and laboratory measurement and evaluation protocols, and online IT tool for enabling water authorities and stakeholders to accomplish their daily work on WFD chemical status assessment.

The third specific objective is to develop the common knowledge and skills for the governmental bodies, sectoral agencies, national/regional/local water authorities, ICPDR, research institutes and the wider WFD expert groups in the DTP countries for comprehensive water assessment in order to aid their daily operational work in transnational water management.

PROJECT GOALS:

The main objective of SIMONA is to respond to the current demand for the effective and comparable measurements and assessments of sediment quality in surface waters in the DRB by delivering a ready-to deploy Sediment-quality Information,



SIMONA

© Jasminka Alijagic



SIMONA

© Jasminka Alijagic

Monitoring and Assessment System to support transnational cooperation for joint DRB water management.

The main result of SIMONA will be the improved, harmonized and coordinated sediment quality monitoring of water body status in the Danube River Basin. Together with experts trained in sediment quality management by SIMONA, the project will also generate international cooperation between stakeholders concerning the monitoring of HSS concentration in water, in sediments and in biota. The immediate and middle term benefit of the project will be a transparent method supported by the SIMONA-tool for sediment quality monitoring that will encourage the cooperation in transnational water management.

The project is the long-needed and timely response to the pressing demand of the effective use of sediment quality assessment for the next RBMPs due in 2021.



SIMONA Kick off meeting 2018

DANUBE FLOODPLAIN

REDUCING THE FLOOD RISK THROUGH FLOODPLAIN RESTORATION
ALONG THE DANUBE RIVER AND TRIBUTARIES



Funding instrument: Danube Transnational Programme (2nd Call)
Project duration: 01. 06. 2018. – 30. 11. 2020.
Budget in Euro: Overall 3,672,65.88
Priority: Environment and culture responsible Danube region
Specific objective: Strengthen transnational water management and flood risk prevention
Lead partner: National Administration "Romanian Waters" Romania
Project manager: Ionel Sorin Rindasu-Beuran, sorin.randasu@rowater.ro



Accessible
deliverable



Project
website



Grazing land on the Daube Basin



Danube river

The project main result will be an improved and sustainable transnational flood risk mitigation management in the Danube River Basin. The concrete measures identified in the frame of the project pilot areas, together with measures related to priority areas will contribute to increasing potential capacities in natural flood retention, to improve retention and flood protection downstream from pilot and future restoration sites and to advancing the DFRMP and DRBM programme of measures.

Further, the project result will contribute to a harmonized approach for dealing with floodplain conservation and restoration measures, to a consensus of local stakeholders on priority measures *and to a wider public support for integrating flood management with floodplain conservation and restoration.*



Floodplain restoration

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. 05. 2021.

Budget in Euro: Overall 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: Paul Meulenbroek, University of Natural Resources and Life Science Vienna, measures_coord@boku.ac.at

Project assistant: Daniel Trauner, University of Natural Resources and Life Sciences, Vienna, measures_coord@boku.ac.at

Communication manager: Alexandru Negru, WWF Romania, anegru@wwf.ro



Project
website



Illustration from the MEASURES project website

In the three years of the project, MEASURES means:

- ▶ mapping and identifying of key habitats by developing and testing a methodology for migratory fish habitat mapping;
- ▶ developing a harmonized strategy for restoring green corridors and supporting implementation in future management plans;
- ▶ restocking of two native species to conserve their genetic pool in Hungary and Romania, establishment of a network for concerted repopulation of the target species and elaboration of a manual for the operation of broodstock facilities that will provide the offspring needed for the re-population;
- ▶ the implementation of the MEASURES Information System that will facilitate the access of experts, decision-makers and the general public to the relevant information available.

Concrete input into the next drafts of policy- and management plans will secure the translation of project outcomes into sustainable management of relevant sites restoring ecological corridors.

MAIN RESULTS AND ACHIEVEMENTS UP TO SUMMER 2019:

Project implementation started a year and the MEASURES project team has made important steps so far. The process of mapping and identifying key habitats has started and in February 2019 a project team started the field work activities in the upper part of the Mura river in Slovenia. They were mapping potential wintering habitats for sterlet (*Acipenser ruthenus*), nase (*Chondrostoma nasus*), barbel (*Barbus barbus*), vimba (*Vimba vimba*) and cactus roach (*Rutilus virgo*).

The mapping activities continued in March 2019 and members of the project team gathered in the cold



morning hours of early March to perform wintering habitat mapping for sterlet (*Acipenser ruthenus*), nase (*Chondrostoma nasus*), barbel (*Barbus barbus*), vimba (*Vimba vimba*) and cactus roach (*Rutilus virgo*) on the Lower Sava River in Slovenia.

Once habitats and migratory corridors are identified, a basin-wide map will allow the development of a basin-wide strategy. This will allow a push for more collaborative effort among the many key stakeholders within the DRB. Another vital approach to saving the sturgeon and other endangered migratory fish species within the Danube consist of manually replenishing their numbers by restocking the remaining species through state-of-art conservation methods. Restocking is a common method to increase the natural population size of intensively utilized fish species.

Danube River fauna was enriched in April 2019, as three important sturgeon stocking events

have taken place in Isaccea (Romania) and Baja and Ercsi (Hungary). The aim of this activity is to save and strengthen two highly endangered Danube sturgeon populations by state-of-the-art conservational methods. The fish was previously tagged, in order to enable identification in case of recapture by in-situ surveys, and assist evaluation of survival rates for those released. This will provide valuable insight for larger stocking plans in the future.

5000 juvenile sterlet (*Acipenser ruthenus*) were released in Hungary, and more than 1000 of Russian sturgeon (*Acipenser gueldenstaedtii*) in Romania. The fish was previously tagged, in order to enable identification in case of recapture by in-situ surveys and assist evaluation of survival rates for those released. This will provide valuable insight for larger stocking plans in the future.

DAREFFORT

DANUBE RIVER BASIN ENHANCED FLOOD FORECASTING COOPERATION



Funding instrument: Danube Transnational Programme (2nd Call)

Project duration: 01. 06. 2018. – 30. 05. 2021.

Budget in Euro: Overall 1,351,898.63

Priority: Environment and culture responsible Danube region

Specific objective: Strengthen transnational water management and flood risk prevention

Lead Partner: VIZITERV Environ Ltd. – VIZITERV Environ Ltd., Hungary

Project manager: dr. Bálint Zoltán, balint.zoltan@environ.hu



Accessible
deliverable



Project
website



Flood on the Danube in 2013 (Budapest)



Project Management Team

MAIN RESULTS SUMMARY

The project DAREFFORT, having on board 11 partners from 9 countries of the Danube region and 12 associated partners from which there are 7 national and 5 international organizations, started its 3-year implementation in June 2018. The project brings together partners from sectors of hydrology, hydrometeorology, water management, research and environment in order to reach its target of establishing a standardized international hydro-meteorological data exchange platform, which can improve the quality and efficiency of national forecast services. This would feed a public near real time system - Danube Hydrological Information System (Danube HIS) by International Commission for the Protection of the Danube River (ICPDR) - that provides data for flood risk management or for any water related scientific activities.

One year into the project, the participants of the project already managed to register progress, starting with preparing and completing the questionnaire – country fact sheets- on the status quo of the Danube regional flood and ice forecasting systems and methodologies. Based on the questionnaires, the first very important output – Evaluation report on flood and ice forecasting systems and methodologies in the Danube countries was completed by the responsible partner. The quality management team accepted the output together with the map of hydrological and meteorological stations. The report is available in the library of the project website.

At the same time, to reach harmonized data exchange, the first steps of software development were made, by identifying the structure of the system in order to fit the existing data collecting

methods into one practical framework. The final concept for the software architecture EnvironNet/ HyMeDES has been developed and finalized in close consultation with ICPDR.

As the partnership also planned to transfer the knowledge accumulated by the project, the first Danube Forecasting Forum (DAFF) has been

organized in Vienna on 05/02/2019, where relevant authorities and potentially interested stakeholders have met and exchanged their experience and enjoyed the lectures and presentations given by high class presenters. The preparation of knowledge transfer workshop is also in progress which will help to place in use the developments of the project.



Project meeting

DEEPWATER-CE

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



Funding instrument: INTERREG Central Europe Transnational Programme

Programme priority: 3. Cooperating on natural and cultural resources for sustainable growth in CENTRAL EUROPE

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

Budget in Euro: Overall 1,771,535.96

Priority: Cooperating on natural and cultural resources 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 organisation: Mining and Geological Survey of Hungary

Project manager: Elisabeth Magyar, magyar.elisabeth@mbfsz.gov.hu

Communication manager: Dąbrowska Dominika, dominika.dabrowska@us.edu.pl



Project
website



Pilot site in Zahorie Lowland (Slovakia), water course recharging groundwater resources for agricultural purposes

© Andrea Vranovska



DEEPWATER-CE Kick off meeting held in June 11-12, 2019 in Budapest

A kick-off meeting for the DEEPWATER-CE was held in June 11-12, 2019 in Budapest, Hungary. The event was hosted by the project's lead partner, the Mining and Geological Survey of Hungary.

PROJECT GOALS:

Climate change is expected to affect central Europe considerably in the near future, with predicted increases of rains leading to hectic variations in the discharge of rivers and negative effects on the availability of water resources that potentially

increase user conflicts. There is an urgent call for groundwater recharge through managed aquifer recharge schemes (MAR). This is a viable approach for collecting excess surface water and precipitation in periods characterised by water abundance and storing it for dry times in underground aquifers. However, implementation of these schemes in central Europe is scarce.

The DEEPWATER-CE project aims to develop integrated environmental management capacities of responsible public actors so that they become able to plan water resources and adopt managed

aquifer recharge schemes in central European countries as a solution to climate change induced water scarcity.

This comprehensive approach to water planning and management will encompass ecological, social, and economic objectives ensuring preparedness for water shortage periods and potential user conflicts.

MAIN OBJECTIVE:

Develop integrated environmental management capacities of responsible public actors for a comprehensive transnational approach to planning water resources and adoption of MAR (Managed Aquifer Recharge) solutions in central European countries as a solution to climate change induced water scarcity.

SPECIFIC OBJECTIVES:

- ▶ To improve preparedness of the CE competent organisations for integrated environmental management of water underground storage through MAR
- ▶ To tailor, pilot and evaluate MAR solutions to Central Europe climatic scenarios and hydro geologic surroundings as well as existing technologies
- ▶ To enable developing a policy framework for MAR with the aim to facilitate the long-term sustainability of water supply within the region

WORK PACKAGES:

T1: Development of a transnational knowledge base on the applicability of MAR in Central Europe

T2: Development of a transnational assessment methodology for decision-making on MAR locations in CE

T3: Feasibility assessment of establishing MAR schemes in CE

T4: Development of policy recommendations and national action plans

OUTPUTS:

- ▶ Trainings for knowledge transfer on MAR solutions and their environmental and economic benefits,
- ▶ Transnational decision support toolbox for designating potential MAR locations in Central Europe,
- ▶ Pilot feasibility studies for MAR projects with integrated environmental approach/porous aquifers or karst aquifers,
- ▶ National Action Plans for adopting MAR solutions in national water resource management schemes.

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 resources 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



FroGIS
tool



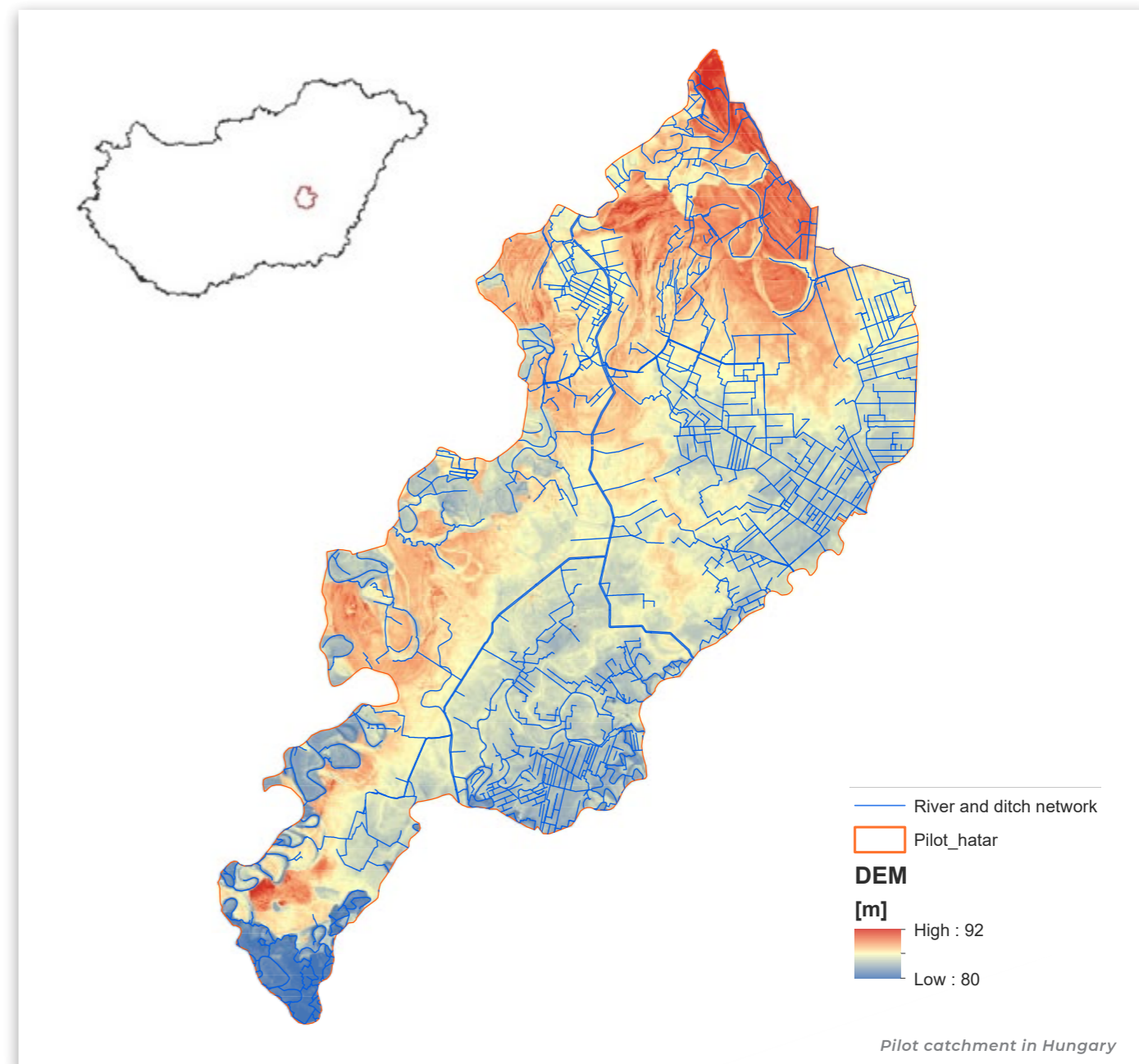
Screenshot
with results of
FroGIS's analysis



Report from the
development of
prototype FroGIS



Project
website



FramWat aims to strengthen the regional common framework for floods, droughts and pollution mitigation by increasing the buffer capacity of the landscape. It will do so by using the natural (small) water retention measures (N(S)WRM) approach in a systematic way. So far, the majority of water management and flood protection measures lack innovation and follow more traditional approaches without taking into account valuable ecosystem services provided by nature in the landscape settings.

The FramWat project supports the idea of using landscape features to help solving environmental

problems in water bodies in a sustainable way. Partners will develop methods which translate existing knowledge about N(S)WRM features into river basin management practice. This will result in improving the water balance, in decreasing sediment transport, and in enhancing nutrients recirculation. Moreover, it will provide decision makers with appropriate tools to incorporate N(S)WRM into the next cycle of River Basin Management Plans and offer guidance and raise awareness about the importance of horizontal integration of different planning frameworks.



Project Team

PROJECT RESULTS

FROGIS tools – 3 outputs:

Landscape Valorisation Method (VM) and GIS Tool for identifying locations where N(S)WRM are needed www.interreg-central.eu/Content.Node/O.T1.1-TOOL-Output-fact-sheet.pdf

- ▶ Training course on how to use the GIS tool
- ▶ Prototype of the GIS tool
- ▶ Training course for the GIS Tool
- ▶ Testing GIS tool in the pilot catchments

6 Pilot areas - 5 Pilot actions - 6 Action Plans: valorization, validating, modelling, assesment, CBA assesment, Development of Decesion 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



Sunset over water

MAIN RESULTS SUMMARY

FroGIS

A publicly available web application to analyze the needs and possibilities of water retention, the result of which is the valorization map supporting the N(S)WRM planning process. The application is available at <http://WaterRetention.sggw.pl> and has the character of open software, the development of which is conducted at <http://gitlab.com/framwat>.

RAAB FLOOD 4CAST

CROSS-BORDER TEMPORAL AND SPATIAL PREDICTION OF FLOOD
AREAS TO SUPPORT THE OPERATIONAL PLANNING
OF FLOOD AND CIVIL PROTECTION



Funding instrument: INTERREG V-A Austria-Hungary Cross-border
Cooperation Programme

Project duration: 07. 2016. – 12. 2019.

Budget in EUR: Overall 1,933,155.20

Priority: Environment and resource efficiency

Specific objective: Improving the management and protection of water bodies

Lead partner: Regional Government of Styria, Austria,
Division 14 – Water management, Resources and Sustainability

Project manager: Dr. Robert Schatzl, robert.schatzl@stmk.gv.at



Accessible
deliverable



Project
website



Raab river



Raab

MAIN RESULTS SUMMARY:

Both in the Austrian and in the Hungarian part of the catchment area of the Raab flood events lead to flooding and consequently to a risk to life and infrastructure. It is therefore in the interests of the flood prevention and disaster management organizations to receive information in the event of a flood as early as possible on how the expected floods are developing so that disaster relief planning can be carried out efficiently across borders. The overall goal of the project is to significantly reduce the risks of floods in the Raab catchment area by presenting expected floods in terms of their spatial extent and time course in a warning tool that is to be developed.

The core outputs of the project are, on the one hand, the updated flood forecasting model Raab and, on the other hand, the warning tool to be developed for the presentation of the expected flooding areas. For the first time, this EU project enables not only the forecasts of discharge at defined cross sections along water bodies, and also makes the expected flood areas available.

There is a huge benefit from these developments on the one hand, for the operator of the forecast models, and on the other hand, for the organizations of the flood and disaster management and the population affected by the flood.



Kick off meeting in Stagersbach

EAST AVERT

REVENTION AND FLOOD PROTECTION IN SIRET AND PRUT RIVER BASINS,
THROUGH THE IMPLEMENTATION OF A MODERN MONITORING SYSTEM WITH
AUTOMATIC STATIONS



Romania-Ukraine-Republic of Moldova
CROSS BORDER COOPERATION

Funding instrument: ENPI CBC Joint Operational Programme Romania – Ukraine – Republic of Moldova 2007-2013
Project duration: 29. 11. 2013. – 31. 12. 2017.
Budget in Euro: Overall 9,243,784.56
Lead partner: Ministry of Environment, Romania
Project Coordinator: Marisanda PÎRÎIANU, marisanda.piriiianu@mmediu.ro
Project Coordinator Assistant: Silvia NEAMȚU, silvia.neamtu@mmediu.ro



Hydrological
forecasting,
warnings and
data exchange



Website in
Ukrainian
language



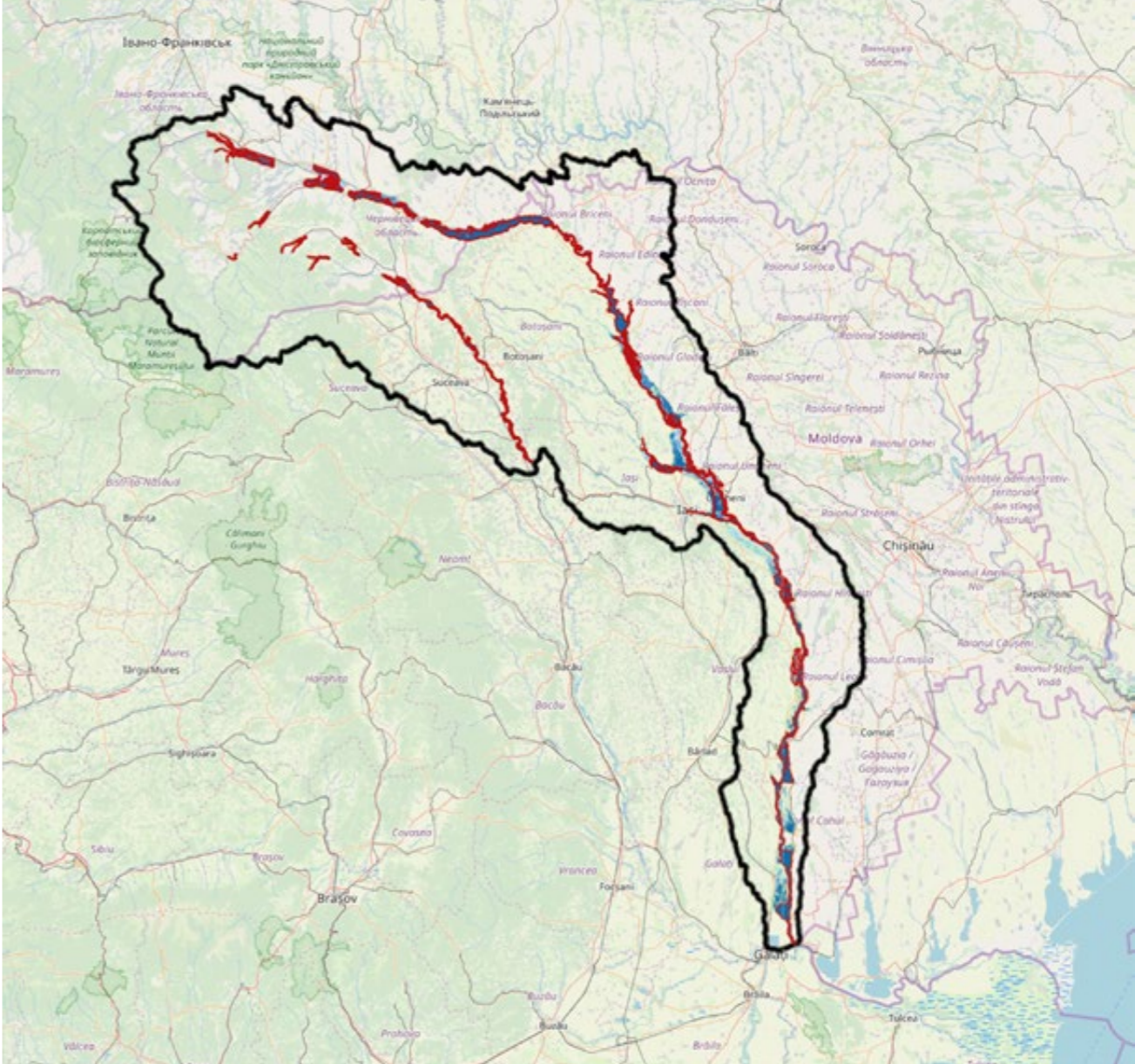
EAST AVERT
Atlas of hazard
and risk maps



Forecasting and
data exchange



Project
website



PROJECT RESULTS

In accordance with the overall objective of project, namely the **protection and reducing border localities vulnerability in the upper Siret and Prut River Basins against the natural dangerous hazard of water cycle**, the project results aimed:

- ▶ **Ensuring of a high quantitative monitoring level of the Siret and Prut River Basins**, including on the main hydraulic infrastructures as “Stanca-Costesti” Dam and Reservoir, **for prevention and protection against floods and accidental pollution events**; 32 automatic monitoring stations were installed: 30 stations on Ukraine territory and 2 stations on the RO-MD the border (Stanca Costesti dam and Ripiceni – dam reservoir).
- ▶ **Reducing the environmental, economic and social vulnerability of targeted localities from the border region** between the Republic of Moldova and Romania against flood risk by enhancing the functional capacities of the Hydro-technical Complex “Stanca-Costesti”. **Works and investments for dam rehabilitation, cumulating around 2 million euro, were realized on both sides (Romanian and Moldavian)**. It has to be highlighted that no other important works for consolidation of this dam weren’t performed since 1978, the year when was given in function.
- ▶ **Elaboration of the maps representing the flooded areas during the historical flood events in the Siret and Prut River Basins**, of

the hazard and risk maps, at an adequate scale, using the high-resolution satellite images, for Siret and Prut River Basins.

- ▶ **Providing of the Common Action Plan for the protection against ice-floods, hydrological drought, accidents occurred at the hydrotechnical constructions and accidental pollutions for the Siret and Prut River Basins.**
- ▶ **Improving the early warning system (EWS)** by a better common forecasting procedures and modelling.
- ▶ **Increasing the reaction capacity by a better data and forecasts dissemination, public information about flood hazard and risk**; a common exercise, testing the common hydrological information system (HIS) was developed.

During EAST AVERT project activities implementation, Romanian experts shared their experience for increasing the capacity of partner institutions from Ukraine and Republic of Moldova to implement the 2007/60/CE Directive, beyond the EU borders. The interaction with individual project partners was primarily in connection with the joint technical tasks implementation for monitoring the hydrometeorological situation in Prut and Siret River basins, forecasting, modelling of expected floods and exchange of relevant data. An important basis for interaction was the constant experience transfer for development of the hydrological, forecasting and geo-informational systems. One of the main

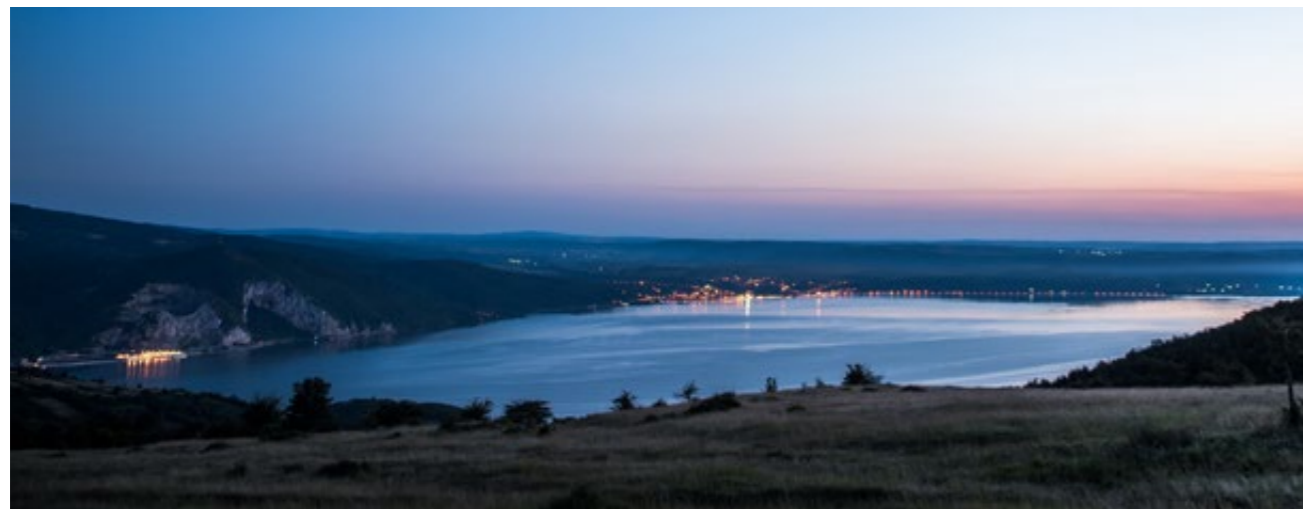


conditions for the successful implementation of the project was the involvement of a high level of qualification experts, with which a productive work process had been set up. It's important to say that the EAST AVERT partners were an effective, highly skilled team working for a joint result and capable of meeting any tasks, beyond any geographical border.

EAST AVERT project implemented a better flood protection early warning system (EWS; 24 alert settlements) for cities and localities along the Prut and Siret River basins, based on information received in **real time** from the **new created hydrological informational system (HIS; 32 automatic monitoring stations)** and **improved modelling & forecast software**. The new created HIS and EWS

enable triggering alerts allowing better and faster protection measures for downstream areas in case of events generated by natural hazards. **A bilingual (ENG-RO) brochure „Integrated Flood Forecasting and Warning System EAST AVERT” was realised and disseminated to stakeholders.**

Another **important project result, which highly impacted the entire programme area, was the technical rehabilitation and functional parameters enhancement of the Hydro-technical Complex “Stanca-Costesti”**: (i) on Romanian side, after revision and fixing the damages, new equipment for the hydraulic assembly was installed on Stanca Costesti Dam; (ii) on Moldavian side, the “Moldavian Waters” Agency ensured the reparation of ground barrage



and “Old mine” barrage, concreting and anchoring rocks from the wet slope, strengthening “Old mine” barrage with concrete injection, hydrologic equipment maintenance **and instalment of an adequate monitoring system (piezometric sensors in 69 points) used for tracking of construction behaviour;** (iii) consolidation works of the slopes (reducing the slope and riverbank consolidation of two sectors of the reefs above the 93.5m elevation; joint rehabilitation; closure of voids beneath the riverbank reinforcement plates). **In Ukraine were developed construction works of 770 m bank strengthening.**

The realisation of hazard and risk maps for the Prut and Siret River basins, completing for border region the information reported by Romania, as Member State, to the EU according

to the Flood Directive provisions. During process were presented and analysed the methodologies used in Romania for implementation of the EU Flood Directive and were organized trainings with Romanian, Moldavian and Ukrainian experts for the application of these mapping methodologies. Printed information was disseminated to stakeholders: (i) **a technical brochure „Common Methodology for Flood Hazard and Risk Mapping in the Prut and Siret Upper River Basins (Guideline)”**, and, (ii) **The EAST AVERT Project (MIS ETC 966) Atlas Flood Hazard and Risk Maps.** The Atlas was realised in ENG-RO and ENG-UA languages versions.

Considering that The Ministerial Declaration adopted by the Danube countries in the framework of their cooperation on water management states that “flood

prevention and protection are not short term tasks but permanent tasks of the highest priority”, and the Declaration commits the signatories to “develop one single international Flood Risk Management Plan based on the ICPDR Action Programme for Sustainable Flood Protection”, **during EAST AVERT project implementation partners developed a Common Action Plan to fight against flood risks on Prut and Siret border regions.** The EAST AVERT Common Action Plan identified and comprises specific measures of reduction the risks posed by floods. For Siret River Basin more measures for adequate water management were pointed especially on the Ukrainian side, those measures being important as having an indirect impact on flood risk reduction in Romania, as downstream receiving country; for Prut River Basin the plan provides mirroring measures to be applied both for RO-UA and for RO-MD. On Ukraine side, the plan includes, as non-structural measure, to realize in the border region a non-permanent accumulation to reduce the flood impact.

The technical project outputs & results conducted also to the improvement of bilateral agreements for water management in the border area, which was a very specific targeted project output. Romania approved through a Governmental Order the project and considered it as one of the large-scale strategic projects for the border area development. According to the Order of Ukrainian Government no 1151/07.12.2008, the objectives of the project had been included into State Program for complex floods protection in the basins of Dniester, Prut and Siret Rivers. The Council of the Euro-Region “Upper

Prut” support for the project was also stated by the Resolution of 29.06.2010 Nr 81-R. Project partners, authorities in the field of environment and waters protection from Romania, Ukraine and Republic of Moldova, signed an Agreement to states their future collaboration for flood risk warnings and prevention, throughout different horizontal and vertical actions and institutional involvement in improving national policies for flood risk management, allowing increasing the effectiveness of regional policies and actions to reduce the socio-economic and environmental vulnerability and the flood risks.

The hydrometeorological monitoring and forecasting systems created during the EAST AVERT project foresees, also, the continuation and further improvement of cooperation between water authorities of three countries (i.e. project partners) through the exchange of hydrometeorological information and the exchange of results of hydrological forecasting.

Moreover, by applying a mirroring institutional cooperation in all 3 countries, partners committed to continuation of works developed within the project by identifying new possibilities in attracting EU funds, and, nevertheless, making own efforts (financial and technical).

Considering the project technical outputs & different languages specificity, partners developed many web-sites, serving for project transparency, for technical information dissemination to stakeholders and general public, or for sharing among partners technical data.

WATER AT RISK

IMPROVEMENT OF DROUGHT AND EXCESS WATER MONITORING
FOR SUPPORTING WATER MANAGEMENT AND MITIGATION OF RISKS RELATED
TO EXTREME WEATHER CONDITIONS

Interreg - IPA CBC
Hungary - Serbia



Funding instrument: Interreg-IPA Cross-border Cooperation
Programme Hungary-Serbia (Interreg-IPA CBC Hungary-Serbia)
Project duration: 01. 10. 2017. – 30. 09. 2019.
Budget in Euro: Overall 852,085.00
Priority: Improving the cross-border water management and risk
prevention systems
Specific objective: Water management and protection against
extreme weather conditions
Lead partner: University of Szeged, Hungary
Project manager: Mr János Bajusz, bajusz.janos@gmf.u-szeged.hu



Accessible
deliverable



Project
website



Remote sensing with quadcopter drone

PROJECT SUMMARY

Weather extremes, intensified by climate change, can more and more frequently lead to the development of hydrological hazards. Among these drought and inland excess water inundation have the largest areal coverage and also the greatest regular impact on the agro-economic potential and sustainable development of the CB region. In spite of several earlier initiatives the estimation and mitigation of related risks has not reached an

operative level yet. The present project proposal primarily aims at the development of innovative and harmonized monitoring solutions and water management operational plans to facilitate early warning and raise outputs to an operative level.

The project is implemented by the most important sectorial research centres and water management authorities of the region to ensure the successful elaboration of outlined professional and communication objectives.

During the project the HUSRB-CB Drought and Excess Water Research and Monitoring Centre was established to ensure the effective coordination of the R&D and monitoring activities, and the broad dissemination of project results for the stakeholders and the public. Project outcomes are highly contributing to the development of cross-border water management and risk prevention systems, to the improvement of the ecological and quantitative status of water bodies and to the minimization of drought and inland excess water inundation risks.

The main results of the project are related to the development of regional monitoring solutions, establishment of an interactive website to publish the regularly updated monitoring results, improvement of water management supporting solutions for operating canal systems and an agricultural risk assessment. The development of regional monitoring solutions is aimed to develop a structure applicable in practice (e.g. drought and excess water monitoring, hazard risk mapping etc) developing



Theodolite



Corn field

methodology for automation for operative application using high resolution multispectral and radar images and high precision UAV systems.

MAIN RESULTS SUMMARY

Interactive website is developed to publish the regularly updated remote sensed monitoring results of inland excess water inundations, vegetation condition and soil moisture, furthermore station-based data of soil moisture. The website also hosts a GeoApp to involve public in the monitoring.

The improvement of water management supporting solutions included the development of an inland excess water and an integrated hydrological model for a pilot catchment, surveying canal conditions, and building of new discharge monitoring stations to improve a more adaptive daily operational water control practice based on the results. Agricultural risk assessment focused on the development of crop specific drought index and vegetation stress experiments to study the effect of extreme hydrological situation on crops, including field measurements and remote sensing data by high precision UAV surveys.

PLATFORM

PROACTIVE LAJTA/LEITHA FLOOD RISK MANAGEMENT



Funding instrument: INTERREG V-A Austria-Hungary Cross-border Cooperation Programme

Project duration: 01. 07. 2016. – 31. 12. 2018.

Budget in Euro: Overall 278,000,00

Lead partner: North-Transdanubian Water Directorate, Hungary

Project manager: József Németh, titkarsag@eduvizig.hu



Platform on the
DRS



Platform on the
DRS



Accessible
deliverable



Project
website



Flood exercise on Leitha

In the last decades the joint river basin of the Leitha/Lajta River has been affected by several floods which caused widespread damage in the neighbouring regions of Austria and Hungary. The flood risk in the border region can only be reduced efficiently by transnational and coordinated flood risk management as stipulated in the EU Flood Directive.

The necessary basic information, preliminary flood routing calculations and possible measures have been elaborated within the former “Ceframe” project and a bilateral Memorandum was signed with recommendations for future cooperation. Since the APSFR areas are not aligned at the border in this area, further common strategic activities are necessary for the adjustment of the safety level to the particular requirements of each of the two

countries. The flood propagation of the last 37 km of the Leitha/Lajta river is a complex process where inundations, reservoirs, and several riverbeds are effective. Both countries’ measures influence reciprocally the local conditions. Only coordinated efforts lead to mutual benefits.

The main objective of the project is the implementation of the bilateral Memorandum for strategic flood risk management: support the Austrian-Hungarian Water Commission (AHWC) decision making procedure with necessary investigations and calculations, fix already known problems with direct field measures, involve and exchange information with the local communities, prepare up-to-date plans for the forecasted circumstances with the essential incorporation of the ecological aspects. It is a unique opportunity

to establish a tangible international flood risk management strategy, where the integrated solutions really serve the regulations of the EU Flood Directive, Water Framework Directive and Habitat Directive. Furthermore the results fit the demands from the local till the macro-regional level.

The project was submitted to the Interreg Cross-border Cooperation Programme Austria-Hungary 2014-2020 and selected by the Monitoring Committee for support. The project received Letter of Recommendation from EUSDR PA5 during the preparation phase in 2016 considering its relevance to the PA5 action plan.

MAIN RESULTS SUMMARY

Near the state border a channel named *Összekötő csatorna* is connecting the Lajta/Leitha main riverbed and the Balparti csatorna/Komitats Kanal. Along the *Összekötő csatorna* has been made river bed section extension and the previous fixed hump has been over build in to a fish ladder which ensure ecological interoperability. There has been public water damage prevention and water quality protection practices organized by the partners in the area of Mosonmagyaróvár and Hegyeshalom, in 2016 and 2018. There has been a technical supporting documentation and action plan elaborated for the Hungarian-Austrian Water Committee (MOVB) which facilitates the elaboration and adaptation of a flood risk management strategy which takes into account the ecological aspects too.



Partners meeting on 26th of November in 2018
© ÉDUVIZIG



Fishes in *Összekötő csatorna* fish ladder during the fish monitoring

© ÉDUVIZIG

DARENET

DANUBE RIVER REGION RESILIENCE EXCHANGE NETWORK

DAREnet



Danube
River Region
Resilience
Exchange
network

Funding instrument: Horizon 2020

Project duration: 01. 09. 2017. – 31. 08. 2022.

Budget in Euro: Overall 3,500,000

Lead partner: Federal Agency for Technical Relief, Germany

Project manager: Dr Christian J. Illing, christian.illing@thw.de

Project communication: Balazs Kern, kern@arttic.eu



DAREnet
Challenges
RDI Topics and
the DAREnet
RDI Roadmap



DAREnet
Challenges
RDI Topics and
the DAREnet
RDI Roadmap



DAREnet
Practitioner
Initiative



Project
website



Flood exercise

MISSION AND OBJECTIVES

The mission of the DAREnet project is to support flood Practitioners, dealing with Danube flood prevention, response and recovery, across different disciplines and EU Danube region member state borders, to deepen and broaden their Research, Development and Innovation related collaboration. In particular, DAREnet will enable practitioners to develop joint and coordinated RDI (Research, Development, Innovation) Initiatives, addressing both, common and specific gaps or needs in the practice of flood prevention and response. These initiatives will be conceived, developed and steered by practitioners and will thereby strengthen sustainably flood resilience and practitioner collaboration in the Danube River region.

OBJECTIVES AND RESULTS:

OBJECTIVE 1:

Full deployment the DAREnet Network concept

The aim is to involve a broad range of civil protection professions and organisations from all countries of the Danube catchment

The DAREnet Network Secretariat and DAREnet National Contacts (DNC) has started their work in order to build national communities of practitioners and experts from academia and industry. Due to their efforts, the national networks are connected now with other relevant national and international networks. The project has established strong links to industry, academia, operational networks as well

as policy makers, also it is an active member in the Community of Users on Secure, Safe, Resilient Societies

OBJECTIVE 2:

Identifying, assessing and prioritise research and innovation results

Potentially selecting those which are being useful, usable and used by practitioners

A set of challenges has been collected and identified as potential RDI Topics. Based on the results, DAREnet has successfully set up a common exchange platform and process for innovators (academia, industry and innovating practitioners) to communicate about concepts, prototypes and solutions. This platform also enables for collecting the identified innovations in a knowledge base, accessible for all members of the platform. Topic Working Groups have been established with a task to review and analyse existing solutions, like RDI activities, products and services on the market, best practice of practitioners. This would enable the development of a transparent, verifiable and



Flood exercise

practitioner-centred assessment procedure for prioritising innovation opportunities.

OBJECTIVE 3:

Development and updating on a yearly basis an RDI Roadmap for the entire region

This would enable practitioners to drive the uptake of new solutions through own initiatives

DAREnet has released its first RDI Roadmap, compiling the most promising opportunities which address the identified challenges in the area of flood response and assessed by experts according to defined parameter and prioritised. During the first cycle more than 100 RDI topics could be identified, and within this first roadmap 20 could be addressed. The second roadmapping cycle has been launched, which will focus on “training”. The next steps are including a workshop with experts is currently and the release of the second DAREnet RDI Roadmap in early 2020.

OBJECTIVE 4:

Full involvement all strategic stakeholders in the process

Concerning in particular the EUCPM, EUSDR, and to build a long-term partnership for the implementation of the DAREnet RDI Roadmap and Initiatives

DAREnet could establish contacts to relevant European projects and initiatives and exchange information and best practices. It started connecting and collaborating with representatives of strategic



stakeholder organisations at European, regional, national, local level. The EUSDR Priority Area 5 with the focus in management of environmental risks in the Danube Region is supporting the project events and activities as well.

OBJECTIVE 5:

Establishment of collaborative innovation

Achieving sustainable region-wide, collective practice

DAREnet has launched its first “Call for Practitioner” initiatives, i.e. practitioners are invited to formulate and develop RDI (Research, Development and Innovation) Initiative Concepts according to their needs and addressing key-challenges in the Danube region; DAREnet provides support in terms infrastructure and logistics. Eventually all initiatives will be compiled and made accessible to the DAREnet Community and relevant stakeholders in the Portfolio of Practitioner Initiatives. Submission of initiatives is possible at: <https://ec.europa.eu/eusurvey/runner/DAREnet-practitioner-initiatives>.

INTERFLOODCOURSE

INTERNATIONAL POSTGRADUATE COURSE ON FLOOD MANAGEMENT



Funding instrument: The Danube Strategic Project Fund, part-financed by the European Union and the City of Vienna

Project duration: 01. 01. 2018. – 31. 01. 2019.

Budget in Euro: 78,045.8

Project Lead Partner: Hungarian National University of Public Service
Faculty of Water Sciences

Project manager: dr. Anna Enikő Tamás, tamas.eniko.anna@uni-nke.hu



Project
website



Field exercise

The project Inter Flood Course developed a curriculum and training material for an international postgraduate course on flood risk management. The target was to harmonize methodologies and foster academic mobility of engineers in training. Operative flood management bodies were involved in the development of the course contents from 7 countries of the Danube region (Croatia, Germany, Hungary, Romania, Serbia, Slovakia, Slovenia). Within the framework of the project an International Conference on Flood Management Education was organized in Baja, Hungary.

THE PROJECT ACHIEVED:

1. 16 course materials, roll-up, leaflet, homepage
2. River engineering / training, sediment processes (HU)
3. Flood defence planning and management (SRB)
4. Historical floods on the Danube (SRB)
5. Flood and excess water control techniques and technologies (HU)
6. Management of navigation during floods (SRB)
7. Management within urban infrastructure hydraulic systems during floods (HU)
8. Water retention and localisation (HU)
9. Climate change and effects on floods (SRB)

10. Logistics of flood and excess water control (HU)
11. Flood frequency analysis (HU)
12. Hydraulic modelling (SRB)
13. Flood forecasting (SRB)
14. Flood risk assessment (SRB)
15. Soil mechanics of flood control structures (HU)
16. Environmental aspects management during floods (SRB)
17. Policies and regulative (such as directives, planning plans etc.) (HU)
18. Field trip (study trip) – first semester (SRB)
19. Measurements (river Danube) – second semester (HU)

MAIN RESULTS SUMMARY

A comprehensive flood management curriculum that offers a professional development possibility for Civil engineers, homepage and framework for the implementation of the international course is developed. Higher number of civil engineers will get acquainted with flood management, flood protection experiences and techniques in the Danube basin. Academic mobility and number of international co-publications will be increased.



Sundown on the Danube





This project is co-funded by the European Union (ERDF fund) with the financial contribution of partner states and institutions.

The lead partner of the projects of DTP PAC1 PA04 and DTP PAC1 PA05 that financed this brochure is the Ministry of Foreign Affairs and Trade of Hungary.



MINISTRY OF
FOREIGN AFFAIRS AND TRADE
OF HUNGARY