Interreg
CENTRAL EUROPE
European Union
European Regional
Development Fund

DEEPWATER-CE

DEEPWATER-CE

MAY 2019 - APRIL 2022

NEWSLETTER / 3

YEAR 2 / NOVEMBER 2020

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

Introduction

DEEPWATER-CE partners join their forces to develop integrated environmental management capacities of responsible public actors for a comprehensive transnational water resources approach and adoption of MANAGED AQUIFER RECHARGE (MAR) solutions in Central European countries as a solution to climate change inducing water scarcity and decreasing usage conflicts with other social and economic sectors!

We encourage you to familiarize yourself with our current project achievements.
Despite limited possibilities of contacting our stakeholders, we were able to carry out online MAR trainings and to collect important material to research and verify our ideas.

In this edition, you will find:

I. Summary report about the MAR trainings organized so far: (1) MAR principles and collection of good practices and benchmarking analysis and (2) Toolbox, selection criteria and checklist for MAR location. You will obtain access to materials from webinar recordings. If you didn't have enough time before, please find out more about MAR and the possibilities of its implementation now.
II. The transnational decision support toolbox for designating potential Managed Aquifer Recharge (MAR) locations in Central Europe. Here you will also find a link to the complete report!
III. We also encourage you to familiarize yourself with our pilot areas. Some of us spent a lot of time on the fieldwork to collect relevant material for analysis, which is the basis for verification of our project results.

WORK PACKAGE 1
On trainings

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

TRAININGS advertised through the national fora were carried out via sets of webinars or personal meetings in local language and tailored to the local contexts.

Three trainings organized within DEEPWATER-CE project addressed the stakeholders from different sectors in order to transfer knowledge on MAR solutions and their environmental and economic benefits. Each training had a different subject in order to cover all the aspects of developed methodologies, processes and checklists in the assessment of potential MAR sites locations, searching for the benefits of the MAR schemes implementation, and based on pilot sites investigation to prepare feasibility studies.

Trainings purpose:

All trainings are intended for relevant stakeholders listed in national Cross-Sectoral Stakeholders Groups (CSSG). The groups are being continuously updated by newcomers due to new emerging issues. The invitations to attend each training was somehow differentiated in order to reach the specific group of target audience.

The main purpose of the trainings is to disseminate knowledge on the basic principles of the MAR schemes, practical information on their usage, reasons why they are necessary in the future due to climate change impacts, technical information on their installation and benefits followed by practical installations examples. Additionally, specific information on national pilot site was presented, including planned investigation activities of a project partner. Within the training, geological, hydrogeological, hydrological and climatological background as well as the sensitivity of MAR schemes to extreme climatic events were introduced. Participants may learn on potential benefits arising from MAR schemes implementation for the future. Furthermore, a platform provided to discuss specific problems, exchange of experience, knowledge share, networking and earning new contacts with colleagues involved in the same field played a crucial benefits of the trainings and contributed to achieving the project's goals.

WORK PACKAGE 1
On trainings

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

Trainings for relevant stakeholders involved in Cross-Sectoral Stakeholders Group (CSSG) held at national level in national languages:

- **MAR principles and collection of good practices and benchmark analysis (D.T1.3.2.)**

The training was focused on explanation of MAR principles, the conditions for their implementation, best practice examples in Europe and national case studies. The content originated from the report dealing with collection of good practices and benchmark analysis of the existing MAR projects in Central Europe.

- **Toolbox, selection criteria and checklist for MAR location (D.T1.3.3.)**

The training provided information on toolbox helping in decision making process to select the sites which are appropriate for the location of MAR schemes in Central Europe. Within the assessment process summarized in toolbox, the general and specific criteria are considered, e.g. geological and hydrological conditions, climatic models and scenarios, and MAR schemes sensitivity to climate extremes.

- **Pilot feasibility studies to prepare policy recommendations (D.T1.3.4.)**

Within the project implementation, 4 pilot sites were selected in order to apply MAR methodologies developed in project.

The training will present the selection process of the specific pilot sites through the toolbox, related checklists and selection criteria for carrying out the feasibility studies based on common methodology (specific guidelines for assessing water supply and demand, guidelines for risk management and technical solutions, guidelines for cost-benefit analysis, regulatory and legal framework). Based on results of feasibility studies, policy recommendations for incorporation of MAR solutions into water management will be prepared.

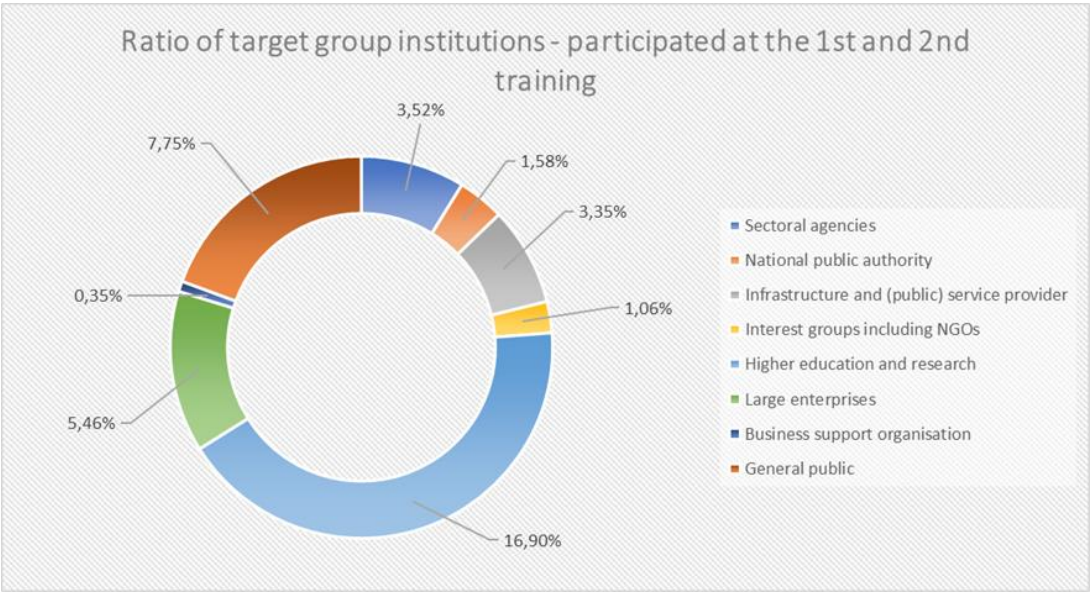

Fig.1. Summary of webinar participants for each group category.

Completed trainings!

HUNGARY
Online webinars via Zoom
1st training 08/10/2020
2nd training 15/10/2020

60/38
PARTICIPANTS

The first two trainings were arranged successfully online via Zoom in the form of a webinar. It was organized by Geogold Kárpátia Ltd. with the support of the Mining and Geological Survey of Hungary (MBFSZ).

The aim of the first training was to provide comprehensive information on MAR principles and its relevance in tackling climate change impacts and to introduce the best practice examples of MAR schemes worldwide, in Europe and in Hungary. In the second webinar, we introduced the decision support toolbox, the evaluation process of MAR suitability and gave an overview on general and specific selection criteria for potential MAR locations.
During this semester, we contacted many of our stakeholders via online seminars. We received positive feedbacks from the participants through online satisfaction surveys. We can say that the meetings met their expectations even in this challenging situation when it is impossible to arrange face-to-face meetings.

GERMANY
Online webinars via Zoom
1st&2nd training on 23/09/2020

33
PARTICIPANTS

Both D.T1.3.2 and D.T1.3.3 trainings were held in the form of a webinar via ZOOM. At D.T1.3.2 training, the content of the Good Practice and Benchmark Analysis from WP T1 was shared and, at D.T1.3.3 training, developed desicion-support toolbox for designating potential MAR locations in Central Europe was presented. Between the trainings, a virutal coffee break with the Breakout rooms tool via ZOOM was initiated in order to enable networking between the stakeholders. The meeting was recorded and is available to be viewed online on YouTube. Participants were mostly interested in the toolbox training and expressed interesting viewpoints and mentioned related projects they had worked on. Most participants came from higher education and research institutes. Altough most participants were satisfied with the content, the overall satisfaction of the event was not as high as expected. Participants stated that they were interested in regulations/legislations related to MAR and water quality aspects of MAR.

Fig.2. First training aired at the premises of MBFSZ.

Fig.3. Zoom webinar presentation with possibility to interact by prticipating stakeholders.

Webinars will be available on YouTube:
https://www.youtube.com/channel/UCh3Iw3sFH_lpSw_YSzZ4mXg

Conducted trainings!

POLAND
Online webinars via My Own Conference
1st training 15/10/2020
2nd training 22/10/2020

58/38
PARTICIPANTS

SLOVAKIA
Online webinars via Cisco-Webex
1st training 14/10/2020
2nd training 20/10/2020

20/23
PARTICIPANTS

At the first training, the comprehensive information were presented about the MAR principles and its relevance in tackling climate change impacts. The participants learnt about the implemented MAR practices in Europe and worldwide as well as about the implemented principles of MAR applications in partner countries, as pilot studies for project.
At the second training, the decision support toolbox and 4-step evaluation process of MAR suitability were presented. The participants learnt about the methods and related general and specific selection criteria for potential MAR locations in CE as well as how to identify potential MAR sites based on selection criteria.
At the meetings, there was an opportunity to ask questions and discuss them in active chat. After all presentations had been shown, the final open discussion started. We can conclude that the discussions concerned mainly regional problems in Poland, i.e. use MAR in order to reduce water pollution or legal matters concerning the application of the proposed methods of groundwater recharge as well as benefits resulting from them. Local aspects are connected with mining and the use of post-mining waters. These were also broadly discussed.
The meeting was attended mainly by the representatives of the scientific community, representatives of small private geological and environmental protection companies and service providers.

Both trainings were organized online through CISCO-WEBEX from 1.00 p.m. to 2.30 p.m. Recordings in

Majority of participants were from academic and research sectors, followed by representatives of agriculture, small enterprises, state and local administration.
The 1st training was focused on MAR principles and possibility of their implementation, factors influencing feasibility and performance of MAR, and best practice examples of MAR installations in Europe and worldwide and introduction of pilot area and opportunity for MAR scheme installation.
The 2nd training was oriented at the introduction of the decision support toolbox, general and specific selection criteria for location of 6 selected MAR types and these criteria application in Slovak conditions.
The participants expressed appreciation to be informed about MAR topic which was new for some of them.

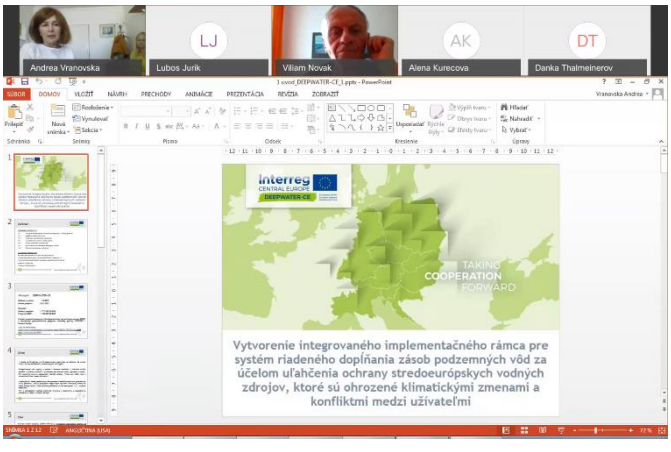

Fig.4. 2nd training – Introduction.

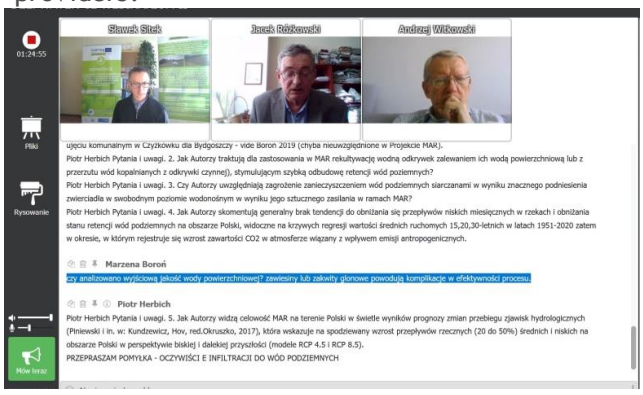

Fig.5. During the 2nd webinar discussion(POLAND)

Conducted trainings!

CROATIA
1st training in Croatian Hall, Vis
22 October 2020,

18
PARTICIPANTS

1st National training session was held in a form of a personal stakeholders meeting carried out on 22 October 2020 in the Croatian pilot area – the island of Vis. A small but highly dynamic group of stakeholders attended the training, such as local NGO's, local action groups, water supply company, local agronomists, and university researchers and professors. Opening words were held by Josip Terzić, Head of the Department of Hydrogeology and Engineering Geology. Topical presentations were carried out by Matko Patekar and Staša Borović, covering the following topics:

- Historical development of MAR and benefits
- MAR methods and water sources
- European and global perspectives
- First Croatian pilot – Gradole spring in Istria
- Methodology for MAR suitability investigation in karst; regional climate changes
- Results of 1-year investigations on the island of Vis: geophysical, hydrogeological, hydrochemical and structural investigations
- Upcoming activities and continuation of DEEPWATER-CE

Workshop and training attendees were very interested in the discussed topics and an interesting discussion took place. The main topic was a record low rainfall on the island of Vis this year, resulting in very low groundwater levels and a higher risk of seawater intrusion into the island's aquifer. Generally, the interest of local community towards DEEPWATER-CE and its results is increasing countinuously. Therefore, the objective to secure the local water supply and sustain seasonal touristic pressures urges call for action to all researches and different sectors in order to provide sustainable and safe water supply. Hence, MAR and other alternatives are most promising concepts and research for their feasibility continues within DEEPWATER-CE.

Fig.6. During the meeting (Croatia).

Fig.7. Welcom to our training! (Croatia).

WORK PACKAGE 2

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

The transnational decision support toolbox for designating potential Managed Aquifer Recharge (MAR) locations in Central Europe is the result of WP T2. The transnational decision support toolbox is presented in form of a handbook to evaluate MAR suitability in Central Europe. It includes three major components:

1. climatological selection criteria, to find out where MAR schemes are needed or will be needed in the future, which were developed in the A.T2.2.;
2. geological and hydrogeological selection criteria, to identify areas where MAR is possible, which were developed in the A.T2.2; and
3. the sensitivity of MAR systems to sequential and combined effects of climate extremes, to evaluate where and how MAR schemes can be applied if extreme climatic situations occur (such as dry or wet periods) as well as the identification of related potential risk, which were developed in the A.T2.3).

These selection criteria, aimed at identifying potential MAR sites, are presented in form of checklists within the toolbox. By applying the selection criteria, suitability maps for MAR can be created. Those can be used prior to carrying out field investigations in order to show the potential of an area or site for the pursposes of the MAR schemes. After a suitable area for MAR application had been identified, further aspects have to be analyzed to evaluate the feasibility of MAR schemes. These aspects include, among others, water demand and supply, appropriate technical solutions, and costs and benefits – all of which will be subject of ongoing project work (WP T3).

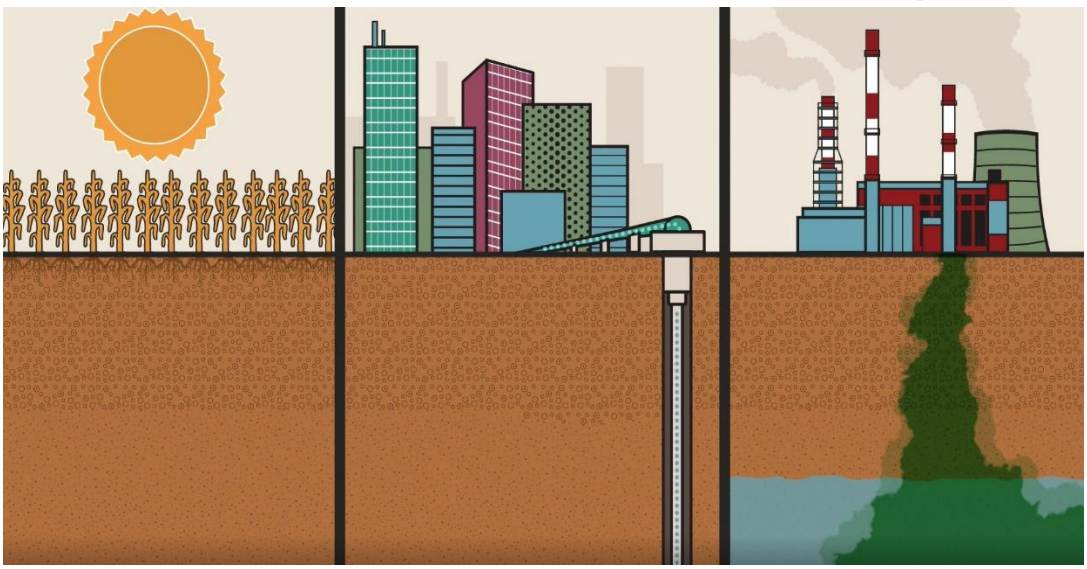

Fig.8. Video tutorial (TUM).

Link to handbook and video: https://www.interreg-central.eu/Content.Node/DEEPWATER-CE.html

WORK PACKAGE 2 (TOOLBOX)

A four-step procedure is proposed to identify the suitability of a MAR scheme.
First fo all, the exposure of central European areas is calculated based on climatic water balance.

During the second and third step, the MAR type and the MAR site selection is conducted. Information about hydrogeology and geology are taken into account to identify suitable pilot sites. On the general screening level a pilot area is identified whereas with specific screening with a more specific parameter set is applied in order to identify suitable pilot sites for a specific MAR scheme in the defined pilot area.
During the fourth step, the sensitivity of the MAR scheme to climate extremes is investigated.

The guidelines developed in WP T3 will also include the aspects of costs and benefits, regulatory framework, feasibility of technical solutions and acceptability of associated risks: field measurements and monitoring and water demand and supply.

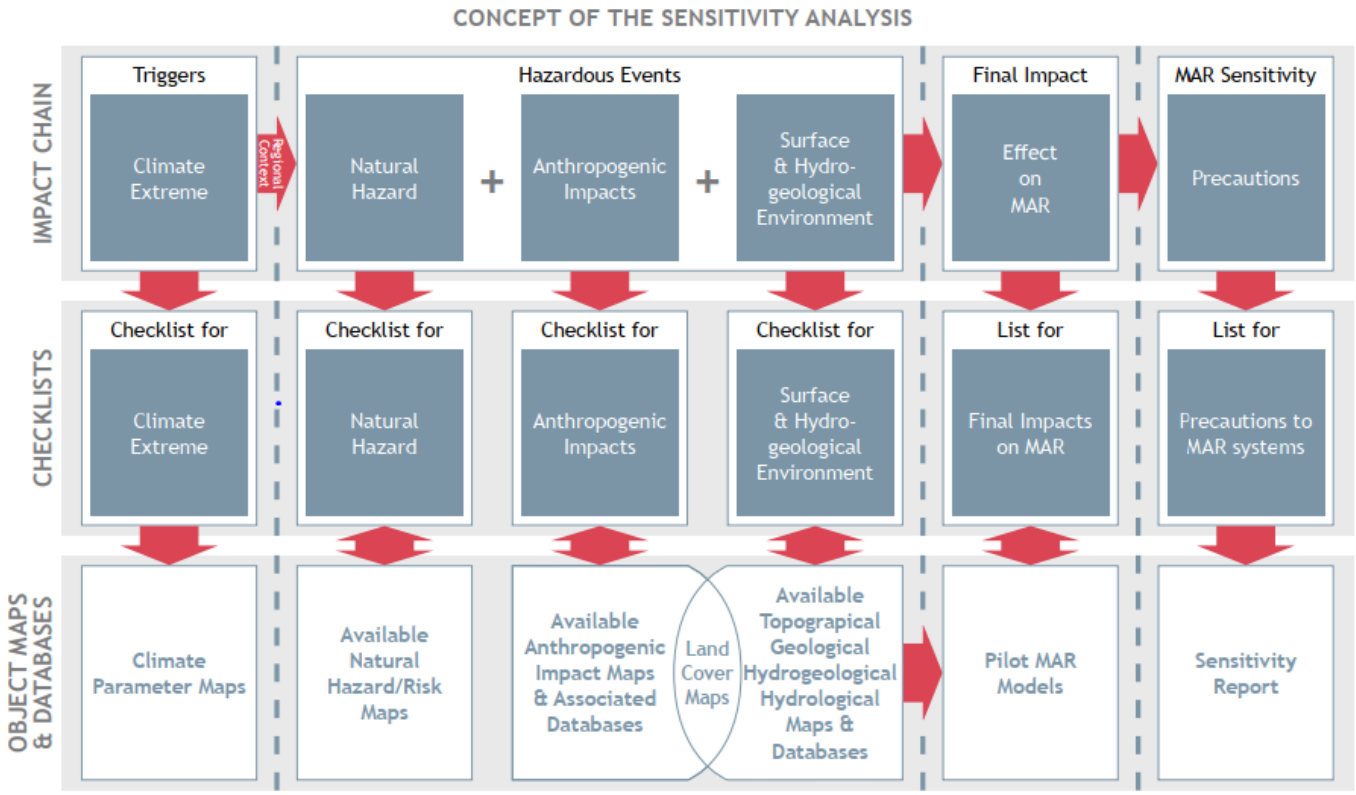

Fig.9. Proposed methodology of analysing the sensitivity of MAR systems to climate extreme events.

WORK PACKAGE 3

Development of a transnational assessment methodology for decision-making on MAR locations in CE - pilot feasibility studies carried out in 4 countries

In four pilot sites different hydrological, hydrogeological and geophysical measurements will be carried out to designate the best locations for MAR establishment and prepare feasibility studies based on a commonly developed methodology. Field research will be carried out at the selected pilot sites here throughout hydrological seasons to ensure enough data to be collected.

The results of pilot feasibility studies will be used to prepare policy recommendations in order to channel MAR solutions in national river basin management plans and water management strategies. Policy recommendations will be drafted with the support of cross-sectoral stakeholders to ensure that the documents mirror the integrated environmental needs, including social, economic and ecologic aspects variables.

Research areas:

Maros alluvial fan, Hungary
study on the covered paleo-channels of Maros River.

Tarnów Waterworks, Poland
study on the porous aquifers which are located near industrial sites that pose a serious threat for the quality of water in shallow aquifers.

The Žitný ostrov, Slovakia
The pilot site area is delineated by canals with technical possibilities for water flow control, i.e. creating Recharge Dam MAR type.

Island of Vis, Croatia study on karst semiarid hydrogeologic conditions is being deployed.

Analysed MAR types for Central Europe in the DEEPWATER-CE

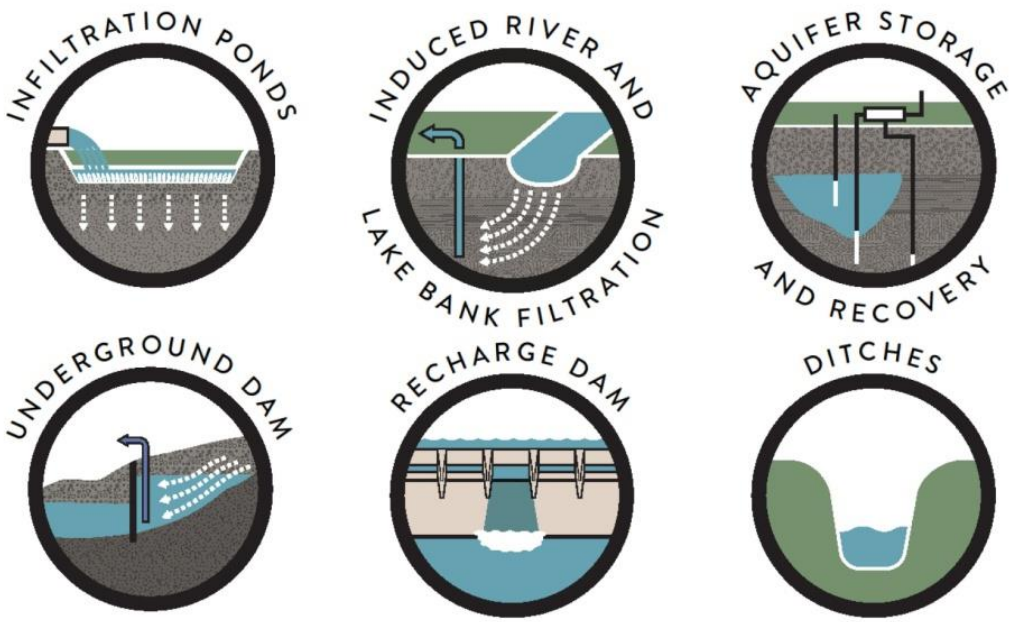

Fig.10. MAR types (TUM).

WPT 3 PILOT

Maros alluvial fan, HUNGARY

The Hungarian pilot area of the DEEPWATER-CE project is located in the South-Eastern part of the country, on the Maros alluvial fan between two major rivers: Körös and Maros. The Maros river, originating from the Carpathian Mountains in Romania, has a 51.2 km long Hungarian section. The flow direction of the river has been changing significantly in the last 5,000 years, which resulted in its recent location outside and far from the earlier deposited alluvium. Our pilot area is situated on this alluvial fan of the ancient Maros River.

The location (circa 1,800 km^2) was selected based on the results of climate models, as well as geological and hydrogeological factors. The region is uniquely suited for agricultural purposes. Most of the area is covered by agricultural land (about 93%), while the land covered by settlements is relatively small (less than 5%). Its 4-5 urban settlements, characterized by large outskirts, have a relatively small population number (circa 30,000 people).
The area has a low relief with a limited river network, and it is one of the warmest regions in Hungary during the summer period.
The summer heat is expected to further intensify because of the climate change. For this reason, the demand for irrigation is ever-increasing, and irrigation water cannot be supplied from current sources in the long term. Due to intensive abstractions, hydrogeological models detected a small groundwater level decline (0.5-1.0 m) which is expected to intensify by 2027 (2-4 m). If water abstraction for irrigation purposes takes place in an uncontrolled way or in an excessive manner, it can endanger the drinking water supplies in the long run.

In this region, the main source of water for irrigation is generally surface water, supplemented by groundwater. Irrigation water should be increasingly gained from locally stored rainwater or groundwater abstracted from shallow and not from deeper aquifers which being used as drinking water reserves. In this way, sustainable water use can be achieved, especially with regards to agricultural water withdrawal during periods of water scarcity thus contributing to the protection of the vulnerable drinking water storage aquifers.

Fig. 11. Agricultural land on the Maros alluvial fan.

WPT 3 PILOT
Research work that we have already carried out!

HUNGARY

The aim of the pilot study is to select a suitable area for underground dam MAR solution: a subsurface wall will be constructed to reduce groundwater flow, resulting in an increased amount of the groundwater stored behind the dam.
In order to find an optimal location for this underground dam, we are going to apply a two-step GIS based site selection methodology. First of all, we carry out a national level screening to find perspective regions. Then, we will proceed to the mapping of one perspective region to identify highly suitable places within it, by using a 3-level classification for ranking locations of low, moderate and high suitabilities. During this characterization proces, different parameter maps (surface characteristics including river network, geological and hydrogeological settings) are compared through GIS based Multi Criteria Decision Analysis (MCDA) combined with Multi Influence Factoring (MIF) method. One of the key tasks is to explore and select paleo-channels of the ancient Maros River, which can form sediment bodies with an excellent groundwater storage capacity.

At the selected pilot site, a detailed investigation of the aquifer will be carried out through field measurements (geophysical measurements, groundwater sampling, pumping tests), and conceptual and numerical groundwater flow models will be developed too. The final result of this pilot study will be incorporated in the preliminary feasibility study, examining the viability of the selected managed aquifer recharge system. This will provide recommendations for the future implementation of the underground dam, which can help ensure a larger available amount of irrigation water for local farming communities.
This pilot activity will also provide comprehensive information supporting subsurface water retention methods and will be utilized for laying the foundations of an enabling policy framework which can give a kick-start to other water deficit alleviating projects in Hungary.

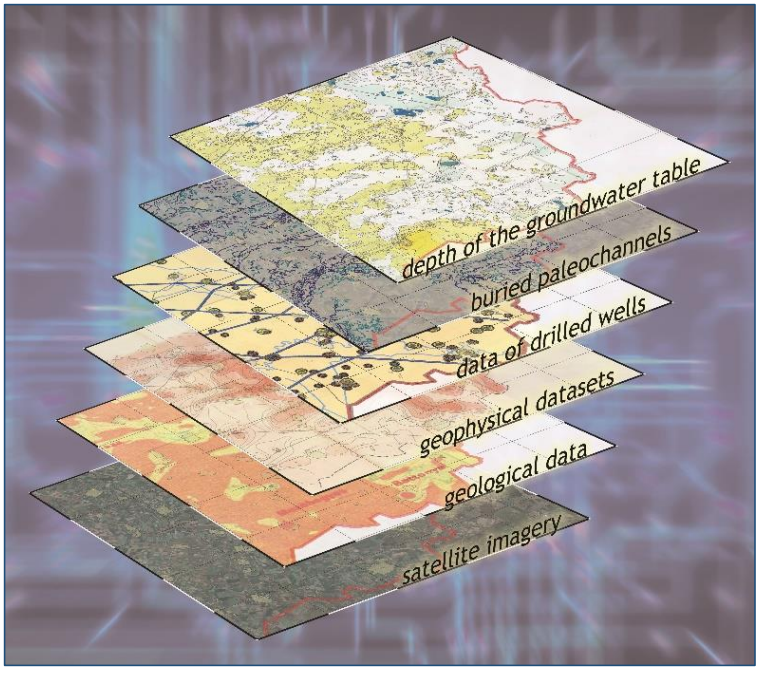

Fig. 12. Conceptual structure of a GIS-based dataset.

WPT 3 PILOT

Vis Island, CROATIA

Vis is a small remote island on the Adriatic Sea and belongs to the group of the Middle Dalmatian islands. With an area of 89.7 km2, the island is mostly composed of karstified carbonate rocks and belongs to Dinaric karst region, *locus typicus* for karst landforms. Vis is not connected to the mainland by submarine water pipeline so it has autonomous water supply due to favorable geological and hydrological conditions which enabled the formation of excellent karst aquifers.

Island's landscape can be described as three hilly chains separated by two valleys. The northern valley is relatively narrow, tectonically predisposed and in this valley the island's most important water supply source - the Korita pumping site. Southern valley is wider and karst *poljes* are developed.

All populated places on the island are connected to public water supply. The island of Vis has water supply from its own karst aquifer (drilled wells in location Korita and costal spring Pizdica). Pumping capacity of Pizdica is 3.3 L/s. In Korita pumping site the capacity is around 40 L/s. The main problem concerning water supply from island karst aquifers is high possibility of seawater intrusion. However, karst poljes, together with infilled rock mass below them, serve as a barrier to seawater intrusion from southern direction into the central island karst aquifer. Western boundary is geologically clear and represented by volcanic-sedimentary-evaporite total barrier. That prevention of seawater penetration from two major sides is geological reason for such a high quality aquifer on this karstic island.

The type of MAR will include well/basin infiltration into karst aquifer from accumulation structure on the surface. In order to assess suitability and technical feasibility, further aquifer characterization is needed, hence, the research will include geophysics, hydrochemistry, monitoring of salinity and water levels as well as modeling of the fractured zone of the aquifer.

Fig. 13. **Vis Island, Croatia.**

RELATED PAGES:

Vis water supply company:
https://vio-otokvis.hr/

UNESCO Geopark Vis Archipelago:
https://geopark-vis.com/en/

WPT 3 PILOT
Research work that we have already carried out!

Vis Island ,CROATIA

Field investigations on the island of Vis have been conducted since September 2019. More than a year of on-going research include:

- Determination of hydraulic parameters of the karst aquifer – water levels, aquifer dynamics
- Monitoring of hydrochemical parameters – EC, pH, temperature, oxygen content, and basic ion composition
- Groundwater and spring water sampling
- Stable and unstable isotope analyses – hydrogen, oxygen, and sulphur
- Geophysical research - seismic, magnetotelluric and electrical resistivity tomography methods
- Structural measurements – detailed fault and fracture network analyses
- Initial steps for 3D model – conceptual model.

Fig.14. Field work in Croatia:
A - water chemistry
B - electrical resistivity testing
C. groundwater table measurement

WPT 3 PILOT

Tarnów Waterworks, Świerczków, POLAND

Tarnów Waterworks is responsible for supplying the Tarnów agglomeration (200 000 inhabitants) with drinking water based on surface and groundwater resources. From among two groundwater well fields in operation, the Świerczków well field was selected for a project pilot site since it applies two different MAR systems.

At the Świerczków site, groundwater is extracted from the unconfined Quaternary porous aquifer of an average thickness of 4-6 m. The average hydraulic conductivity is 3x10-4 m/s. The static water level is approximately 3,5-5 m below the ground surface. Nearly 7,500 m3/d is extracted from the aquifer supported with 2 MAR schemes, which represents about 25% of the total water production for the Tarnów agglomeration.

Two types of MAR are used in the Świerczków well field: induced riverbank filtration and surface-spreading method. 17 wells (2-3 of them are temporarily inactive) are recharged by the system of 3 infiltration ditches with a total length of about 620 meters and by the riverbank filtration.
The small thickness of the aquifer and the need to increase the efficiency of the intake and improve groundwater quality by reducing the inflow of water from the industrial zone caused the need to use MAR systems.

Tarnów is a good example of a research area because it has some of the largest nitrogen plants in Europe, which may pose a potential threat to the groundwater intakes located there. For this reason, our research team wants to adapt an appropriate method of increasing groundwater resources, but also aim to develop an early warning monitoring system that will ensure safety and good quality water for the city's inhabitants. Using the intake in Tarnów as an example, we want to prove that additional water supplies can also be used in areas threatened by deterioration of groundwater quality due to neighboring industrial plants.

RELATED PAGES:

Tarnów water supply company:
https://www.tw.tarnow.pl/

Fig. 15. Świerczków well field, Tarnów (K.Stachniak)

WPT3 PILOT
Research work that we have already carried out!

Tarnów, POLAND

The developed methodology facilitating the selection of locations for one of the six MAR types in Central Europe is currently being implemented in pilot areas. In Poland, detailed research focuses on the possibility of applying two methods, i.e. infiltration ditches (ID) and induced river/lake bank filtration (IRLBF).
The map (Fig.16) below is an example of result of general mapping, based on that, we concluded that more than 12% of the entire area (Dunajec catchment) can be classified as regions where this type of MAR can be potentailly applied. On the basis of the conducted works we managed to select 3 areas where IRLBF has the greatest potential to be implemented.

One of these three areas has undergone extensive research. In Tarnów and the surrounding area, specific field studies are currently being continued, including detailed recognition of hydrogeological conditions in order to collect input data for hydrological and hydrogeological model investigations.
The conducted works include geophysical, hydrological and hydrogeological measurements, water and soil sampling for laboratory tests.
The research will allow us to determine the benefits of MAR and its usefulness from economic and environmental point of view.

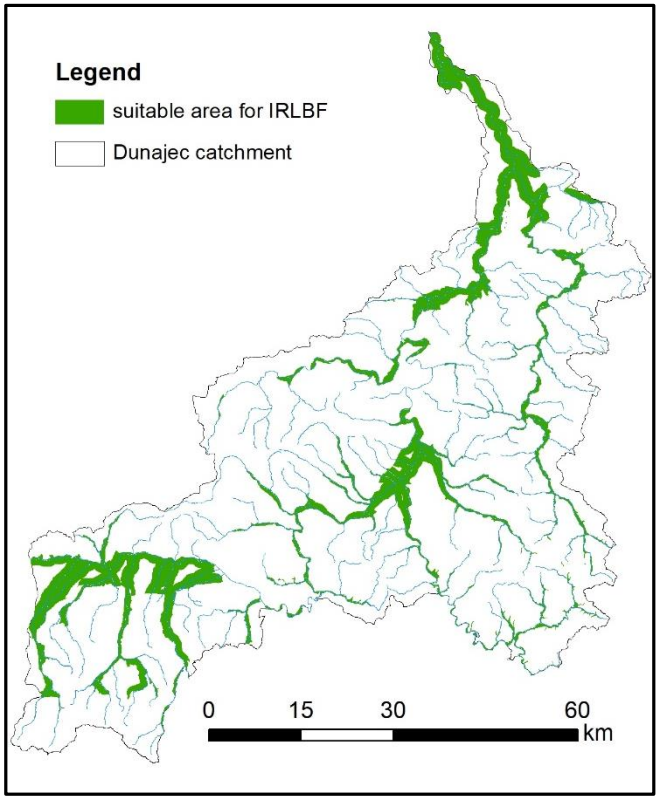

Fig.16. Suitability map for induced river/lake bank filtration in Dunajec catchment area.

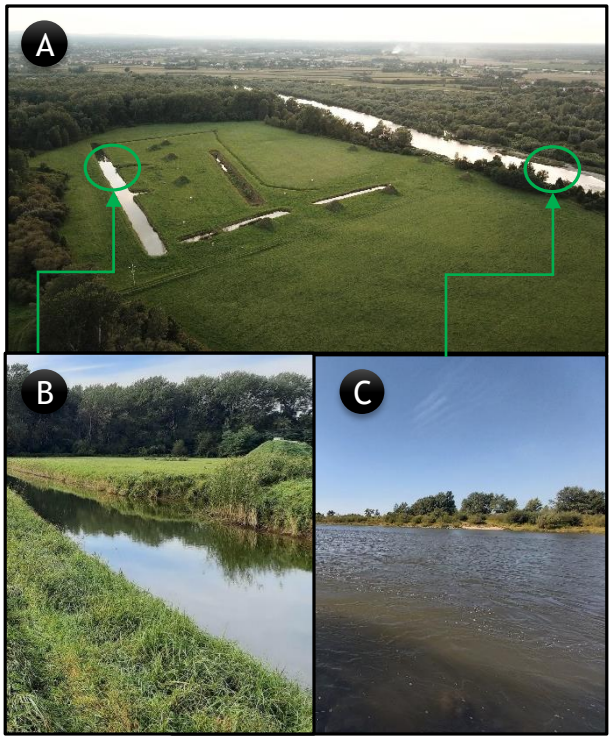

Fig.17. Research area of detailed investigation in Tarnów.
A - „Świerczków" wellfield (M. Sołtysiak)
B - infiltration ditch (S. Jakóbczyk-Karpierz)
C - Dunajec river (S. Sitek)

WPT3 PILOT

Žitný Ostrov, part of Podunajska Lowland SLOVAKIA

Žitný Ostrov area is located in the SW Slovakia. Geographically it is the part of Podunajska Lowland. From geological viewpoint it is characterized by fluvial Quaternary sediments with a thickness up to 200–500 m. The hydrogeological conditions are influenced by the great thickness of the Quaternary sandy gravels.

Depending on the grain composition of aquifers, the values of hydraulic conductivity of rocks forming aquifers ranges from 10-2 to 10-6 $m.s^{-1}$. The Danube River is the source of constantly replenishing groundwater supplies.

The current hydrological conditions are strongly influenced by the construction of the Gabčíkovo Water Structure. Hrušov Reservoir (upper part of Gabčíkovo Water Structure) causes new possibilities of water uptake from left-hand seepage canal. This canal supplies the canal network of Žitný Ostrov consisting of six main partially interconnected canals which are intersected by small canals.
The land use of the area is devoted mainly to agricultural purposes. Podunajska Lowland area is supposed to suffer from droughts according to long-term predictions.

The pilot site area is delineated by Gabčíkovo-Topoľníky, Vojka-Kračany and Šuľany-Jurová canals with technical possibilities for water flow control, i.e. creating Recharge Dam MAR type.

The main purpose of the pilot site measurements is to investigate the hydraulic properties of rocks, relationship between surface water and groundwater, and its lateral range of influence. Based on the field research data, the future conditions will be evaluated by mathematical modelling (MODFLOW and HYDRUS models). Furthermore, the potential amount of infiltrated water is supposed to be estimated. Based on these investigations, the feasibility study on managed aquifer recharge for agricultural purposes will be prepared.

Fig. 18. Žitný ostrov - Vojka-Kračany (A. Vranovská).

WPT3 PILOT
Research work that we have already carried out!

Podunajska Lowland, SLOVAKIA

Slovak pilot site is situated in porous aquifers in agricultural landscape. The aim of the feasibility study is to study the possibilities of recharge groundwater in shallow aquifers by water from canals, to store it in aquifers and search for benefits in using it in water shortage periods.

The field research is carried out by the Water Research Institute and the Slovak University of Technology in Bratislava.

The aim of the field research is to investigate the hydraulic conditions of the rocks surrounding the canals and in the canals (bottom and banks) that allow recharging the groundwater. Soil hydraulic conductivity is an important parameter for identification of the soil type. Knowing specific soil type is the crucial input parameter to HYDRUS model. To this end, two methods used to determine hydraulic conductivity of soil will be - the auger hole method (performed in the field) and soil sampling by Kopecky cylinder to determine the soil hydraulic conductivity (performed in laboratory). The samples by Kopecky cylinder will be taken also from bottom and banks of canals. The field investigations are in process, the results have not been available yet.

Furthermore, an experiment to measure real volume of surface water recharging groundwater resources will be conducted in a selected section of canal between two sluices, i.e. creating recharge dam. This will be verified by calculation of potential water infiltration based on hydraulic properties of the rocks.

Colleagues from the Slovak University of Technology have already started field works, in order to fulfil the main goal of the DEEPWATER-CE project. The field measurements will analyze the interaction in surface and subsurface flow in Žitný ostrov region where more than 2500 km of drainage canals exist. The first measurements were made at the beginning of October 2020 continuing till November 2020.

Field measurements dealt with natural state (no technical interference) and artificial state (using sluices) of water level and discharge regime in a part of Žitný Ostrov region. These measurements will provide data to set boundaries and determine initial condition for numerical modelling of the surface and groundwater flow interaction, calibration of model related to surface water levels as well as for creation scenarios of possible groundwater recharge in pilot area via technical regulation. FLO-MATE and FLOW-TRACKER devices were used for discharge measurements.

Fig. 19. Measurement of saturated hydraulic conductivity of soil by auger hole method (D.Vrablíková).

Fig. 20. Water flow measurements (A.Šoltész).

VIRTUAL SQUARE!

As part of the our activities, we have launched the NATIONAL VIRTUAL SQUARE on LinkedIn!

What is a NATIONAL VIRTUAL SQUARE?

The Virtual Square (VS) is a place for everyone who is interested in hydrogeological topic, who wants to learn more about Managed Aquifer Recharge (MAR) and who wants to share their opinion and knowledge about MAR systems with us.

The VS is an internet platform using LinkedIn possibilities, aiming at facilitating cooperation within cross-sectoral stakeholder groups (CSSGs).

A stakeholder can be a person, a group of people or a representative of an institution being interested in DEEPWATER-CE topics and obtained results that can be implemented in the future in our country.

Our publications on VIRTUAL SQUARE worth paying attention to!

- D.T2.1.2 COMMON METHODOLOGY FOR THE ASSESSMENT OF GEOLOGICAL CONDITIONS FOR MAR LOCATION PREPARED
- D.T2.1.3 SET OF SELECTION CRITERIA OF HYDROGEOLOGICAL CONDITIONS FOR MAR LOCATION COMMONLY DEVELOPED
- D.T2.2.1 COMMON REPORT ON EXISTING CLIMATIC MODELS AND SCENARIOS TO DETERMINE BEST MAR LOCATIONS
- D.T2.2.2 SET OF SELECTION CRITERIA OF CLIMATIC SCENARIOS BASED ON MODELS FOR MAR LOCATION
- D.T2.3.1 COMMONLY DEVELOPED SENSITIVITY ANALYSIS FOR EXTREME SITUATION CASES
- D.T2.3.2 SET OF SELECTION CRITERIA OF EXTREME SITUATION CASES FOR MAR LOCATION
- D.T2.4.3: „ TRANSNATIONAL DECISION SUPPORT TOOLBOX FOR DESIGNATING POTENTIAL MAR LOCATIONS IN CENTRAL EUROPE“.

National Virtual Squares

HUNGARY GERMANY POLAND SLOVAKIA CROATIA

Transnational Virtual Square

European Union

Interreg
CENTRAL EUROPE

DEEPWATER-CE

CONTACT US:

Coordinator

ANIKÓ HORVÁTH

horvath.aniko@mbfsz.gov.hu

Lead Partner

MBFSZ Mining and Geologic Survey of Hungary

Deepwater-ce

At our official website, you can find more information about the aims of the project, the partners involved, project news and events, and our outputs.

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

PARTNERS

This newsltter is edited by DEEPWATER-CE PARTNERS.
For more information, please contact with PP4:
KATARZYNA STACHNIAK - Project Communication Manager
UNIVERSITY OF SILESIAIN KATOWICE, POLAND
katarzyna.stachniak@us.edu.pl

FUNDING
Our project is funded by the Interreg Central Europe Programme that encourages cooperation on shared challenges in Central Europe.

PHOTOS: DEEPWATER-CE partners
COVER GRAPHICS for free use from
PIXABAY: Frank Winkler z Pixabay; JUAN FERNANDO YECKLE z Pixabay; Image by Alexandra_Koch from Pixabay.