

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



## WHAT WE DO

Have you ever wondered where the water in your tap comes from? Did you know that good quality water resources are continuously decreasing due to climate change and user conflicts? In fact, the depletion of drinking water is a huge problem in almost all parts of the globe.

Seven **DEEPWATER-CE** partners are working together to build a joint water resource management strategy for **MANAGED AQUIFER RECHARGE (MAR)** solutions. They will focus on the retention of excess water from rainfall and surface water that can be used to recharge groundwater. The recharged water can then be harvested at times of need and used for drinking or irrigation. The project will include four pilot sites to investigate the potential of MAR in Central Europe.

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PROJECT PARTNERS

1.766.210,96

EURO PROJECT BUDGET

5

COUNTRIES

TAKING COOPERATION FORWARD



## ABOUT DEEPWATER-CE

The project activities have been structured to develop an integrated implementation framework for Managed Aquifer Recharge solutions to facilitate the protection of Central European water resources endangered by climate change and user conflict.

**MANAGED AQUIFER RECHARGE (MAR)** is a viable approach for collecting excess surface water and precipitation in periods when they are abundant, and storing them in aquifers to be used during dry periods.

## FACTS AND FIGURES



## WHO WE ARE

Partners from five Central European countries have teamed up to develop integrated environmental management schemes which can be applied by responsible public actors. A comprehensive transnational approach will be implemented for water resources management and the adoption of MAR solutions in Central Europe, with the aim of tackling climate change induced water scarcity and decreasing user conflicts between social and economic sectors.

### Hungary

- Mining and Geological Survey of Hungary
- Geogold Kárpátia Ltd.

### Poland

- University of Silesia in Katowice

### Croatia

- Croatian Geological Survey
- Split Water and Sewerage Company Ltd.

### Slovakia

- Water Research Institute

### Germany

- Technical University of Munich

### Funding

Our project is funded by the Interreg CENTRAL EUROPE programme, which encourages cooperation on shared challenges in Central Europe. With a funding of 246 million Euros from the European Regional Development Fund, the programme helps institutions across borders work together to improve cities and regions in Austria, Croatia, Czech Republic, Germany, Hungary, Italy, Poland, Slovakia, and Slovenia.

## DISCOVER MORE ABOUT DEEPWATER-CE

LinkedIn discussion platforms:

Hungary



Germany



Poland



Slovakia



Croatia



Transnational Virtual Square



Contact US

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





**CROATIA**  
MAR in aquifers located  
in semiarid karst areas



**HUNGARY**  
MAR solutions in floodplain  
alluvial systems



**POLAND**  
MAR in aquifers near  
industrial sites



**SLOVAKIA**  
MAR in areas used for  
agricultural purposes

## PILOT ACTIONS

In four pilot sites, different hydrological, hydrogeological, and geophysical measurements will be taken to select the best locations for establishing MAR and to prepare feasibility studies with a commonly developed methodology. Field studies will be carried out at the designated pilot sites over a period of one hydrologic season, to ensure a sufficient amount of data is collected.

### Island of Vis, Croatia

A study on karst semi-arid hydrogeological conditions for fluctuating seasonal water demand.

### Maros alluvial fan, Hungary

A study on water retention using paleo-channels of the Maros River.

### Podunajska lowland, Slovakia

A study on a network of irrigation channels with water flow control.

### Tarnów Waterworks, Poland

A study on porous aquifers located near an industrial zone.

The Croatian pilot site is located on the small and remote island of Vis in the Adriatic Sea, a part of Middle Dalmatia. The island's water supply is autonomous and fed by groundwater from karst aquifers. Karst poljes, together with underlying karst rock mass, serve as a barrier to the groundwater flow as well as a means of protection to the island's central aquifers from seawater intrusion. Still, there is a risk of saltwater intrusion during periods of high water demand (overexploitation). Therefore, to reduce the likelihood of this occurring, the water infiltration MAR technique will be implemented, consisting of infiltration ponds and wells. This will allow to improve both the water quality and water quantity on the island.



**CROATIA**  
Island of Vis, Stiniva Cove

The Hungarian pilot area is located in the southeastern part of the country, on the Maros alluvial fan situated between two rivers: the Körös and the Maros. While the region has exceptional agricultural conditions, the potential of water supply for irrigation is far from realized. Today, this water is extracted from deep aquifers that are also used for drinking water, when they could be replaced by alternative sources such as stored rainwater and shallow aquifers. Our goal is to discover paleo-channels of the Maros river that are suitable for groundwater retention and the installation of underground dams. The stored water can then be used for agricultural purposes during dry periods. The planned investigations include geophysical measurements, water sampling, and pumping tests.



**HUNGARY**  
Maros alluvial fan

The Polish pilot area is located in the southeastern part of the country and includes the urbanized and industrialized section of Tarnów. The investigated aquifer is composed of sands and gravels within the valleys of the Dunajec and Biala rivers. The work will focus on optimizing the preexisting managed aquifer recharge schemes. The feasibility study will include geophysical measurements, water quality analyses, and modelling. The application of MAR solutions will help find methods for improving groundwater quality and limiting the inflow of industrial water to extraction well fields.



**POLAND**  
Tarnów Waterworks

The Slovakian pilot area (Žitný Ostrov) is located in the Podunajska lowlands, in the southwestern part of the country. The local geology is characterized by fluvial Quaternary sediments, which determine the hydrogeological conditions. The hydrological conditions are strongly affected by the construction of the Gabčíkovo waterworks. The pilot area consists of a vast network of irrigation channels. Goals for this area include to enhance groundwater availability for irrigation use by the construction of recharge dams. Our research will include geophysical measurements and modelling. The main purpose of the measurements is to investigate the relationship between the water levels in the channels and the groundwater levels.



**SLOVAKIA**  
Podunajska lowland

## Pilot Studies

### Outputs



Knowledge transfer on MAR solutions and their environmental and economic benefits (sets of webinars, training sessions).



A transnational decision support toolbox for designating potential MAR locations in Central Europe (in the form of a handbook).



A pilot feasibility study of MAR schemes that uses an integrated environmental approach. The four pilot areas are in Hungary, Poland, Slovakia (porous hydrogeological conditions), and Croatia (karst geological conditions).



Policy recommendations and national action plans for adopting MAR solutions in national water management regulations in Central Europe.