Federal Ministry
of Education
and Research

An Initiative of the Federal Ministry of Education and Research
GRoW
WATER AS A GLOBAL RESOURCE

MedWater – How to Manage Scarce Groundwater Resources in the Mediterranean Sustainably

Water as a Global Resource (GRoW)

Many parts of the Mediterranean have already been affected by water scarcity and the region is considered a hotspot of climate change. The region's population is also set to increase dramatically in the coming decades, with forecasts expecting the total number to reach as much as around 651 million people in 2030 – more than double the population recorded in the year 2000. Climate change, population growth and other extraneous factors such as increasing urbanization and changing land use patterns all present huge challenges for water resources and ecosystems in the Mediterranean. This has had a particularly strong impact on aquifers in hydrologically sensitive karst areas; large expanses of water soluble limestone are especially prevalent in the Mediterranean. MedWater is a joint research project which seeks to develop strategies and new management tools to ensure fair and sustainable availability of scarce water resources in Mediterranean karst areas.

Preserving Water Resources and Ecosystems

One of the 17 Sustainable Development Goals (SDGs) formulated by the United Nations in 2015 is to manage the available water resources sustainably. This goes beyond the water management concepts applied to date. Sustainable resource management as envisaged by the SDGs requires a holistic approach that takes not only people's water consumption into consideration but also the requirements of ecosystems as well as extensive and fair access to drinking water and water for socio-economic development.

The implication here is that, when utilizing water resources, the social and economic factors as well as the impact on the environment all play a role. Bearing the sustainability goals in mind, the primary objective of the MedWater joint project is therefore to develop tools that facilitate better management of the scarce water resources in the carbonate aquifers of the Mediterranean region. MedWater's regional focus is the Eastern Mediterranean (Israel and the Palestinian Autonomous Territories) as well as France and Italy.

Developing New Forecasting and Management Tools

Water from karst areas supplies approximately one quarter of the world's population. But karst groundwater is also particularly prone to contamination. Due to the many subterranean caverns, the groundwater generally reaches very high flow velocities. At the same time, due to their low storage capacity, carbonate aquifers also react immediately to precipitation. Effects of climate change therefore quickly become apparent in the behaviour of carbonate aquifers. Sustainable management of theses aquifers thus requires dedicated concepts.

The key components of the management tools developed in the MedWater project are forecasting models which map the behaviour of highly dynamic groundwater resources. These models enable us to predict the short- and long-term development of water resources and ecosystem services, factoring in extraneous factors such as land use, climate and technological developments. The researchers use model calculations to test different water use and water distribution scenarios. This enables them to determine the impacts of water use on water availability and water-related ecosystem services in a specific area, taking into consideration the water footprint of the import and export of foodstuffs, as well.

Groundwater recharge zone in a karst area

On this basis, the project partners are seeking to develop tools to optimize an integrated approach to water management which is tailored to specific geographic, social, financial and environmental conditions. These improvements take a wide range of factors into account including ecosystem services, biodiversity, water quality, costs, energy consumption and the availability of water resources. The project findings are also to be transferred to the global level using remote sensing data. This is done with the help of an evaluation matrix where different types of drainage area, soils and precipitation distribution patterns are grouped into areas where carbonate aquifers are present.

Ecosystems develop along small streams at the Dead Sea

Implementing Improvements in Practice

The main product of this joint project is a globally applicable web-based decision support system that provides water management proposals. This creates the foundation for increased water use efficiency and the preservation of water resources, securing access for all population groups at the same time.

To ensure that the system is used by local stakeholders in future, the project partners have involved key regional partners such as water supply companies, farmers, agricultural authorities and businesses located in the study regions at an early stage of the development. Dedicated training sessions and workshops are held to ensure knowledge transfer.

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