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Managed aquifer recharge (MAR) in coastal aquifers, in brackish and saline groundwater

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Summary

Managed aquifer recharge (MAR), the intentional recharge of water into an aquifer, has been generally shown to work in different geological settings – in soft and hard rock aquifers, porous and fractured media, and under confined and unconfined conditions. The origin of the source water for MAR applications depends on local water availability, and to date many successful MAR schemes apply water from alternative sources, for example, desalinated seawater or treated sewage effluent. An adequate treatment of the water prior to recharge, and hydrochemical mixing reactions and water–rock interactions within the aquifer after recharge have to be considered for all MAR applications regardless of their scope. The application of MAR for water storage in coastal aquifers in saline or brackish groundwater poses additional challenges: The mixing of the recharge water with native brackish and saline groundwater, either in the aquifer or during abstraction may render the abstracted water unfit for most intended purposes. Therefore, the aim of MAR applications under such conditions must be to recover the recharged water with little mixing.

Members of the SUBSOL project – bringing subsurface water solutions to the market – financed by the European Commission, have modified conventional MAR techniques to make them more efficient in saline or brackish groundwater settings. The so called subsurface water solutions (SWS) provide different building blocks to minimize the mixing of freshwater with the native groundwater: Multiple partially penetrating wells can be used to control the upward movement of freshwater bubbles caused by buoyancy, smart configurations of interception wells can be applied to prevent upcoming of saltwater during freshwater abstraction, and automated control units are utilized to optimize pumping schemes.

In the framework of the SUBSOL project, further exchanges have been developed between the SUBSOL consortium and institutions from GCC countries. The GCC countries are one of seven regions where so called "regional assessments" were conducted to evaluate the potential of SWS. Besides hydrogeological and technical matters, a number of other issues are included in these studies. One aspect is the regional perspective, whether subsurface solutions are considered as suitable tools in the repertoire of the water management schemes. Another aspect is the regulatory framework, especially the legislation on water – for example, regulations on injection, abstraction and quality of water. Based on preliminary assessments, first positive results give way to the hope that the regional studies in the GCC countries will help to establish a solid base for common future projects.

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