

Safeguarding the water reserves of Cyprus

Water management is a growing issue in Cyprus. On the background of an analysis of the water supply issues and the legal and policy framework in Cyprus, partners in the EU H2020 project '**SUBSOL – bringing coastal SUBsurface water SOLutions to the market**' have developed a set of recommendations to safeguard the future supply of freshwater.

RECOMMENDATIONS

- The water policy in Cyprus needs to focus on secure and sustainable measures for additional sources of supply. Subsurface Water Solutions (SWS) are capable of addressing the water management issues of Cyprus, and they are low-cost and low-tech and fit the local institutional capacity.
- The implementation of SWS schemes requires an efficient strategy for collecting sufficient amounts of reclaimed water for recharge. Further, as SWS schemes work by controlling groundwater, implementation requires more data on hydrology and enforcement of more stringent rules about illegal groundwater extraction.
- Documentation of water quality is important for stakeholders when making decisions about groundwater recharge – and even more when using reclaimed water. Also, a large-scale implementation of SWS schemes should be accompanied with continuous monitoring of the water quality.
- In order to provide documentation of the efficiency of SWS schemes and of the resulting water quality – and in order to adjust a potential implementation of SWS schemes to the geology, water use, needs and legal framework of Cyprus – it is recommended to develop a pilot project.
- As several aquifers are shared between the areas of the Republic of Cyprus in which the government of the Republic of Cyprus exercises effective control and the areas in which it does not exercise effective control, implementation of SWS schemes – whether on a pilot- or large scale – will benefit from partnerships encouraging some level of cooperation between the two areas.



WATER SUPPLY CHALLENGES IN CYPRUS

Rising demands for water has caused water scarcity in Cyprus for decades and water stress is currently the highest of any country in Europe. Often, the Cypriot government imposes emergency measures including the reduction of domestic water supply. The climate in Cyprus is semi-arid and the island has no perennial streams. Thus, the main water source is groundwater bodies and dams, but overexploitation of groundwater, among other things from irrigation, causes salinization from seawater intrusion. Consequently, many wells in Cyprus' western aquifers have been abandoned due to saline contamination. In addition, urbanization and agricultural activities have led to excessive nitrate concentration. As a consequence, approximately one quarter of the groundwater bodies is at risk. Basically all sectors are affected by water scarcity with agriculture suffering the most.

In Cyprus' larger urban areas, most water is supplied by desalination, and the sewerage board of Nicosia utilises treated wastewater for irrigation which is economically competitive. Water for agricultural purposes is mostly retained in private small-scale reservoirs. In 2016, a freshwater pipeline from Turkey has been delivering freshwater to the areas of the Republic of Cyprus in which the government of the Republic of Cyprus exercises effective control and in the long run, the pipeline may also affect water supply in the rest of the Republic of Cyprus.

Subsurface storage pilot projects have been performed on the island, e.g. in South-Eastern Mesaoria (Kokinochoria) aquifer. It was not successful, though, due to lack of sources for recharge. The planned source for recharge – reclaimed wastewater produced at Agia Nappa-Paralimni treatment plant – was all used for irrigation.

SUBSURFACE WATER SOLUTIONS

Subsurface Water Solutions (SWS) offer a series of solutions to freshwater resources problems in coastal areas by means of advanced groundwater management (pumping, infiltrating, controlling) which enables protection, enlargement and sustainable utilization of fresh water resources. Combinations of wells extracting brackish water and infiltration (ponds) or injection (wells) of fresh water are used to control the position of the interface between fresh and brackish water, thereby creating a barrier against further saltwater intrusion and securing the freshwater wells inwards. Moreover, it enables storage of large volumes of run-off or recycled water in the underground in order to ensure a stable water supply year-round, irrespective of seasons and shifting levels of exploitation, e.g. from agriculture and tourism.

SWS systems address all of the main water issues of Cyprus. Moreover, while SWS systems work by stimulating natural infiltration to secure the availability of clean water during the dry season, and as they require little energy to run compared to for example desalination technologies, they provide environmentally sustainable and low-cost alternatives for water management. Finally, as SWS systems require little operation and maintenance, and they can be easily implemented with the existing institutional and economic capacities of authorities in Cyprus.

PERSPECTIVES FOR THE UPTAKE OF SWS SYSTEMS

Finding solutions to groundwater scarcity and saline water intrusion is high on the agenda of local authorities. With the 2010 Law for Water Management, the legal framework for various activities of the Water Development Department (WDD) was established. The WDD is present in the whole life-cycle of water management as authority and as the consultant to local and regional authorities. The main objective of water policy implemented by the WDD is to enhance the national development and sustainable management of water resources in Cyprus. The law harmonised the Cyprus legislation with the European Water Framework Directive which aims to protect all reserves of freshwater by certifying reduction and control of pollution. Consequently, the legal and policy context seems conducive to implementation of SWS schemes in Cyprus.

There are, however, some obstacles that require attention:

- Due to the current tension between the areas of the Republic of Cyprus in which the government of the Republic of Cyprus exercises effective control and the areas in which it does not exercise effective control, there is a lack of cooperation to share data between both sides. This might be a challenge regarding implementation of a pilot project as some of the relevant areas are joint aquifers.
- One main barrier for the implementation of SWS schemes is the lack of sources for recharge. Since rainwater is already used very efficiently, the only available sources of water for aquifer recharge in Cyprus would be treated wastewater or desalinated water from temporary overproduction in certain operation periods of the desalination plants.
- There is a persistent stakeholder opposition to groundwater recharge due to concerns about water quality and pollution. In addition, farmers (who possess the majority of the SWS relevant areas) mistrust the official water quality guarantees, and they have refused to inject treated wastewater into their aquifer. Because of the opposition, reclaimed water not used for irrigation in the winter period is currently being discharged to the sea. SWS could help in this regard with soil passage treatment.
- No particular conflicts between water users and authorities have been identified. However, issues of economic feasibility in the long-term planning might potentially give rise to conflict.

On this background, the recommendations for exploring and implementing SWS solutions in Cyprus involve four main issues:

Strategy for collection of reclaimed water, more data and legal enforcement

An implementation of SWS schemes will require an efficient strategy to collect sufficient amounts of reclaimed water for recharge. Specific areas with availability are to be identified and feasibility studies elaborated laying a focus on water quality criteria. Moreover, controlling the groundwater levels will require more in depth monitoring studies and enforcement of stringent rules to make use of the resources more efficiently.

Documentation and monitoring of water quality

In order to take stakeholder concerns about water quality into account, and in order to provide the required information in order to get access to the SWS relevant areas mostly owned by farmers, it is important to document the water quality of reclaimed water, both before and after infiltration. A pilot project would prove useful for this. Also, a large-scale implementation of SWS schemes should be accompanied with continuous monitoring of the water quality.

Encourage cooperation

As several aquifers are shared between the areas in the Republic of Cyprus in which the government of the Republic of Cyprus exercises effective control and the areas in which it does not exercise effective control, implementation of SWS schemes – whether on a pilot- or large scale – will benefit from partnerships encouraging some level of cooperation between the areas.

A pilot SWS project

In order to provide documentation of the efficiency of SWS schemes and of the resulting water quality – and in order to adjust a potential implementation of SWS schemes to the geology, water use, needs and legal framework of Cyprus – it is recommended to develop a pilot project based on an extensive feasibility study. The project should be formulated by site partners, local authorities and stakeholders. The pilot project should involve a participatory stakeholder involvement approach including a stakeholder workshop in order to ensure that the project addresses the issues of importance and concern for local authorities, users and other stakeholders, and to identify potential issues of importance to the implementation of a large-scale project.

The SUBSOL project

SUBSOL targets a market breakthrough of SWS as robust answers to freshwater resources challenges in coastal areas, by demonstration, market replication, standardization and commercialization. The route to market includes business cases, market scans, capacity building and adaptive solution development in selected regions in Europe (Mediterranean, Northwestern Europe) and worldwide (USA, Brazil, China, Vietnam). SUBSOL will share experiences and outcomes with stakeholder groups through an online platform which will be linked to existing networks, including EIP on Water.

The SUBSOL consortium combines knowledge providers, technology SMEs, consultants, and end-users from across Europe. Our ambition is to introduce a new way of thinking in terms of water resources management, promoting the sustainable development of coastal areas worldwide. This will stimulate economic growth by ensuring a safe and cost efficient water supply.

Credits and disclaimer

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CONTACT:

Gerard van den Berg
KWR Watercycle Research Institute
Gerard.van.den.Berg@kwrwater.nl

www.subsol.org

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