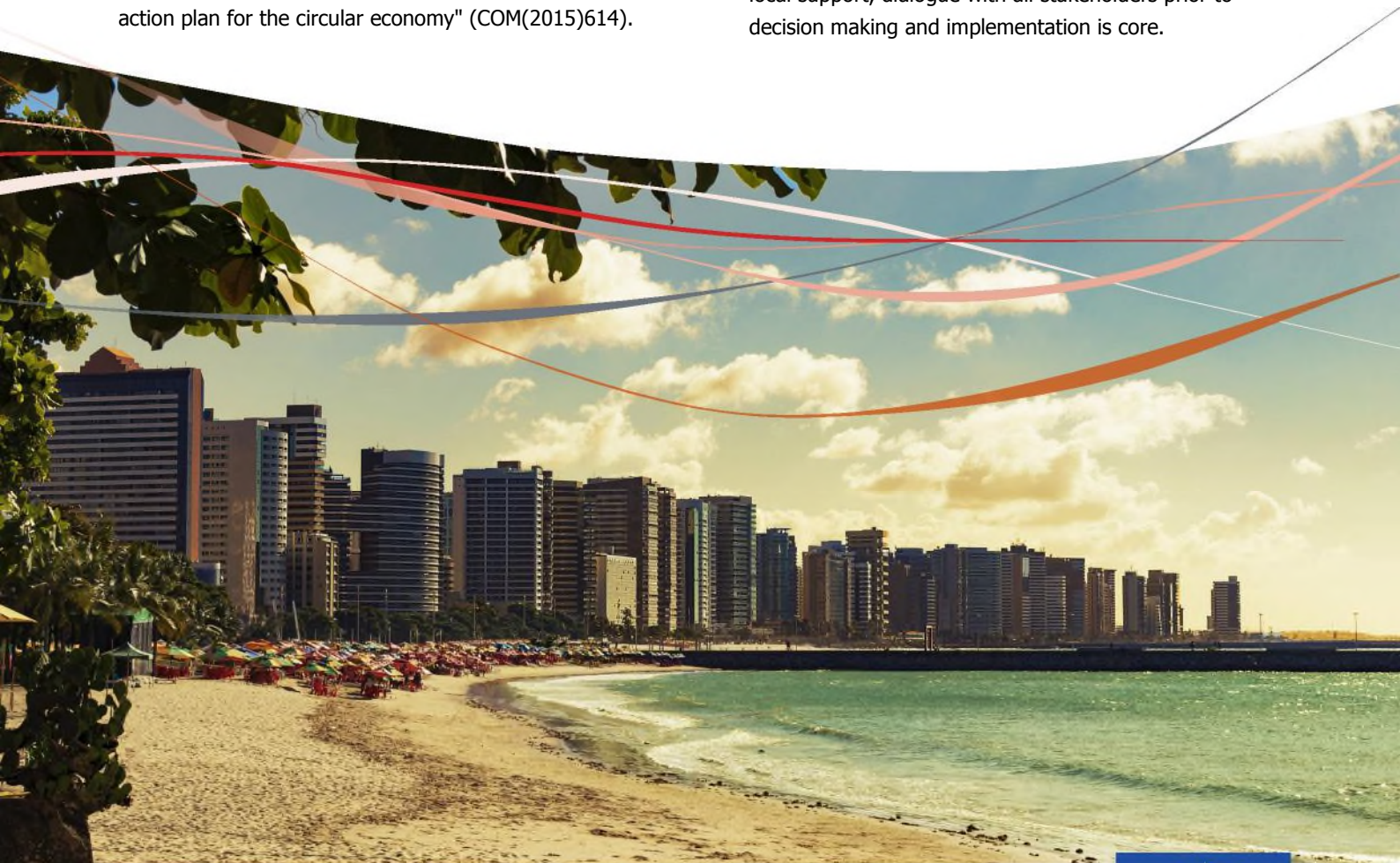


Safeguarding the water reserves of Europe

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

RECOMMENDATIONS

- Subsurface Water Solutions (SWS) are capable of addressing the water management issues in coastal areas of Europe. Moreover, they are low-cost, low-tech and fit the local institutional capacity of Member States.
- SWS implementation assists the European Commission in realizing its agenda to safeguard Europe's water resources and secure freshwater supply, in line with EU communications "A Blueprint to Safeguard Europe's Water Resources" (COM(2012)673) and "Closing the loop – An EU action plan for the circular economy" (COM(2015)614).
- The European WFD and GWD provide the overarching legal framework for SWS. Each Member State converts these directives into their own national legislation following their local insights and interpretations. This may lead to considerable differences in the way SWS is valued in policies and regulations in different Member States.
- Reducing uncertainty about the effects on groundwater quality is key to the acceptance of SWS. It is crucial to actively involve local policy makers in demonstration. In order to ensure an efficient and legitimate process with local support, dialogue with all stakeholders prior to decision making and implementation is core.



WATER RESOURCES CHALLENGES AND ACTIONS IN EUROPE

Coastal areas are the most densely populated, productive and economically dominant regions of the world. The associated high water demand, however, puts tremendous pressure on the freshwater resources and the coastal ecosystems. Securing freshwater supply – at all times – is vital for economic activities such as energy production, industry, agriculture and tourism, for nature and to guarantee safe and sufficient drinking water.

The European Commission has been taken action to secure freshwater supply in Europe. Communications such as "A Blueprint to Safeguard Europe's Water Resources" (COM(2012)673) and "Closing the loop – An EU action plan for the circular economy" (COM(2015)614) have been setting the water agenda in the past decade. Developing and promoting solutions for integrated sustainable water resource management are important actions.

Advanced groundwater management can enable water reuse, as demonstrated at the SUBSOL replication site in Dinteloord, the Netherlands¹. Reuse water from a sugar factory is made available for greenhouse farmers following aquifer storage and recovery (ASR) to balance water demand and supply in time. Agricultural irrigation and aquifer recharge have been identified as main potential sources of demand for reclaimed water, and the Commission is drawing up legislative frameworks on artificial recharge of reclaimed water. Experiences from the SUBSOL project, summarized in this policy brief, support this process.

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 many of the water issues in coastal areas in Europe. Moreover, while SWS systems work by stimulating natural infiltration to secure the availability of freshwater at all times, 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 Europe.

¹Zuurbier et al., 2018. Guide on using ASR-Coastal with treated wastewater for irrigation. SUBSOL deliverable D2.6. www.subsol.org

European policy and directives on infiltration

Infiltration and temporal storage of freshwater, e.g. harvested rainwater, surface water or reuse water, is an essential element of Subsurface Water Solutions (SWS) concepts. The EU Water Framework Directive (WFD) and the underlying Groundwater Directive (GWD) provide the overarching legal framework. Current and future SWS applications have to comply with the GWD and its 'prevent and limit' principle. Infiltration can contribute to the achievement of WFD objectives, as long as the water is of sufficient quality. Neither the WFD nor the GWD excludes, in principle, a direct injection of alternative water sources for managed aquifer recharge.

Each Member State, however, has converted these overarching directives into their own national legislation following local insights and interpretations. This has led to considerable differences in the way infiltration is valued in policies and regulations in different Member States. For example, in the Netherlands there is a positive mindset towards aquifer recharge, resulting from the long-term application of aquifer recharge in the coastal dunes to supply cities like Amsterdam and The Hague with high-quality drinking water. In contrast, in Flanders, where similar salinization problems occur as in the Netherlands, authorities are hesitant towards aquifer recharge and thus towards granting permits for SWS, even for pilots. Differing policies amongst different Member States is a barrier for the effective rollout of SWS across Europe.

Brackish water interception and disposal

Brackish groundwater is an alternative freshwater resource with great potential. It is widely available in coastal areas and generally of excellent quality, except for the relatively high salinity levels. Reverse osmosis of brackish groundwater (BWRO) is available at acceptable capital and operational (energy) costs, comparable to costs for purification of surface water.

Interception of brackish groundwater is applied in the SWS Freshkeeper concept, as an effective remedy against water well or aquifer salinization. Disposal of this water, or its BWRO concentrate when subsequent desalination is applied, is the Achilles heel of this concept. Direct (piped) disposal to sea has the lowest environmental impact, but may involve high costs for construction of pipelines. Deep-well injection is a low-cost alternative with relatively low environmental impact compared to, for example, discharge to surface waters or wastewater treatment plants.

The WFD and GWD provide a legal instrument to allow for deep-well injections. Individual exemptions may be granted, provided that the injected water is of similar quality as the receiving groundwater body, and that adequate monitoring is applied. Following these guidelines, many temporary permits have been granted for BWRO concentrate deep-well injections in the Netherlands. However, debate on legislation and permitting is ongoing. It is clear that disposal through deep-well injection is not feasible at every place and in every groundwater system. There is a strong need to further develop policy guidelines, at national and European levels, building on experiences from SUBSOL reference sites and other locations in the Netherlands.

Piloting and policy development go hand-in-hand

Reducing uncertainty about the effects on groundwater quality is key to the acceptance of SWS by authorities and other stakeholders. 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 local hydrogeology, water use, needs and legal framework – it is recommended to further develop pilot projects across Europe. It is crucial to actively involve local and national policy makers in these demonstration, to assure that questions related to policy and regulations are addressed from the very beginning. Piloting and policy evaluation and development must go hand-in-hand.

Proper process

In order to ensure an efficient and legitimate process with local support and cooperation, and in order to ensure that the solution and particular details of implementation address the actual local needs, resources and institutional framework, it is vital to have a proper, inclusive process prior to decision making and implementation. That is, that all stakeholders and decision makers are properly informed about the alternatives and their pros and cons, that their concerns are addressed with proper information, and that they are involved in a debate about solutions. This may also prevent or reduce potential conflicts, for example about charging additional fees on users for irrigation water. Participatory Technology Assessment (pTA) is an efficient methodology to align water solutions with local needs and capacities and obtain the required dialogue.

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 and capacity building 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 on-line 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 and will create market opportunities and jobs for the European industry and SMEs.

Credits and disclaimer

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