

during Artificial Recharge of Aquifers – A tool to restore drinking water resources (ACWAPUR)

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BACKGROUND

Drinking water is a limited resource threatened by contamination with inorganic nutrients, pesticides, pharmaceuticals, and other micropollutants and in many regions additionally by a poor hygienic standard. The demand for clean drinking water is increasing and therefore the development of technologies for water treatment is urgent.

Artificial recharge of Aquifers (ARoA) is a commonly used technique to replenish overexploited aquifers and to improve water quality. Water unfit for drinking is infiltrated through soil and aquifer sediment thereby improving the water quality.

Although artificial recharge has been used for decades, the technique is often operated as a black box without knowledge of the microorganisms and the metabolic processes and pathways involved.

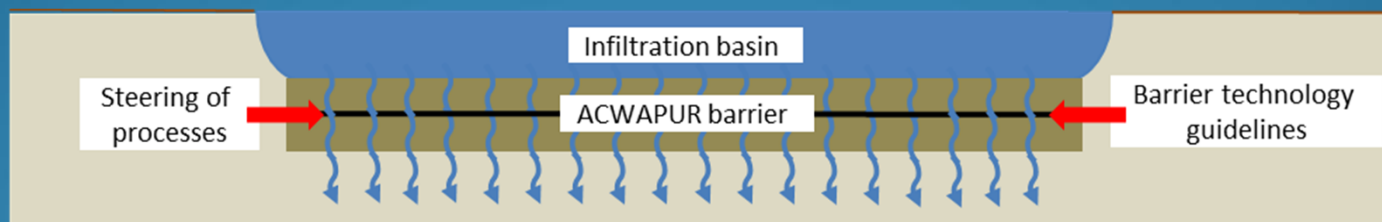
AIM

- to develop new technological applications, and management tools and guidelines to prevent leaching of pathogens, inorganic nutrients, organic pollutants, and their degradation products to underlying aquifers during ARoA
- ACWAPUR will improve the effectiveness of ARoA through the development of tailored and reliable barriers preventing the intrusion of organic chemicals, inorganic nutrients, and pathogens into groundwater aquifers.

IMPACT

The research will result in prototype ARoA-barrier systems that can be established and operated with low energy consumption, without use of chemicals, and at low cost, ready to be exploited at both existing and new ARoA facilities.

The ACWAPUR outcome will support water managers implementing the Water Framework Directive and other water management strategies.



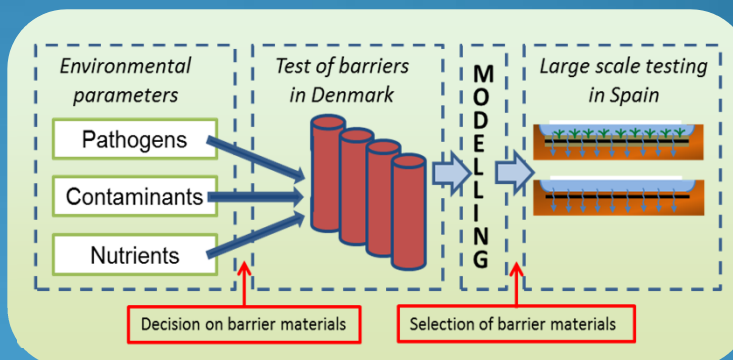
Principle of the ACWAPUR barrier

THE ACWAPUR BARRIER

The ACWAPUR barrier may consist of sand and clay mixed with e.g. vegetable compost releasing easily degradable organic matter, thereby creating series of redox conditions

THE ACWAPUR STEERING TOOL

- Stimulation of ammonium oxidizing bacteria degrading organic pollutants co-metabolically
- Supply of degrading bacteria and/or nutrients
- Addition of organic carbon to facilitate N removal
- Coating of barriers with iron oxides to facilitate for entrapments of pathogens
- Introduction of submerged plants provide oxygen and prevent clogging



Research flow in ACWAPUR

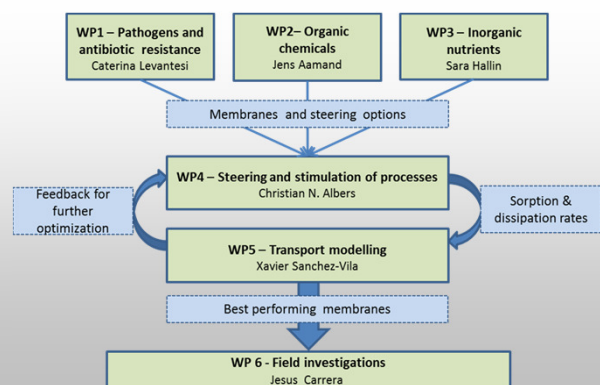
IMPLEMENTATION

The project will be structured in 6 well-integrated work packages. WP1, WP2, and WP3 aims at exploring the 'black box' of ARoA, providing in-depth knowledge about factors controlling the fate of pathogens/antibiotic resistance, organic chemicals, and inorganic nutrients during artificial recharge.

The knowledge gained will be exploited in WP4 to identify measures for optimal management and control of artificial recharge processes including the design of the most effective barriers.

In WP5, the research results will be integrated in mathematical modelling to evaluate technology performance and give feedback for further optimisation if necessary.

Based on the results from the modelling, the best performing barriers will be selected for further testing at field scale in WP6.



Project structure of ACWAPUR