

Examination of suitable desalination processes for injection of desalinated water into saline aquifers as mixed hydraulic barriers

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ABSTRACT

Saltwater intrusion is a serious global issue regarding the great significance of groundwater use at coastal areas. Intensive water demand, changes in land-use, climate change and sea-level fluctuations belong to the most contributing factors leading to saltwater intrusion. In order to counteract saltwater intrusion and associated problems, various strategies have been investigated by different researchers. One option is the application of positive and negative barriers. Hydraulic barriers are used to artificially alter the hydraulic gradient leading to an increased (positive) or decreased (negative) groundwater table and respective flow directions. Especially in (semi-)arid regions, the application of positive hydraulic barriers is limited by the shortage of freshwater for injection. One solution to counter the freshwater shortage may be the utilisation of the saline water from negative barriers in a mixed barrier system.

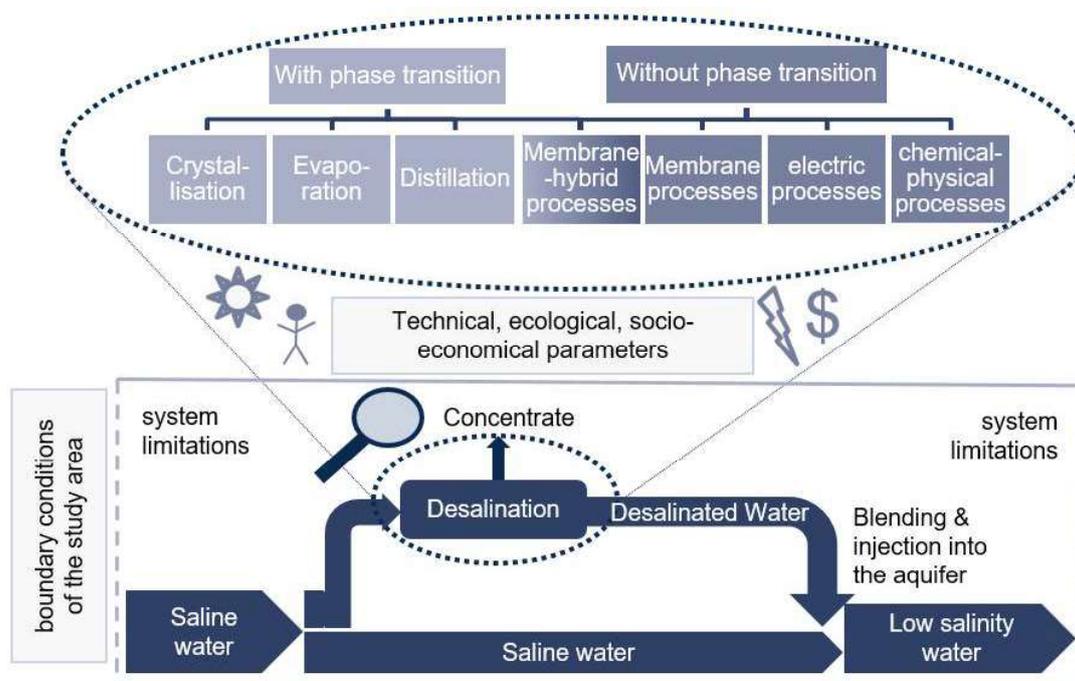


Figure 1. Overview of determined parameters for the application of desalination processes and boundary conditions of the proposed tool.

The saline water quality may differ widely and is dependent on the saltwater intrusion, water-rock interaction and anthropogenic activities, and has thereby a high influence on type, dimensioning, efficacy, flow rates and sustainability of treatment plants. The suitability of certain desalination processes for treatment of extracted saline water is furthermore depending on applicable techniques, energy resources, ecological objectives and socio-economic conditions of certain areas affected by saltwater intrusion. Therefore, different desalination processes need to be evaluated.

The aim of this project is to develop a tool which considers the most suitable desalination systems according to the specific regional parameters. This tool should provide the possibility to calculate the yield and the quality of desalinated water for blending and infiltration purposes. Further, this tool should be able to be combined with a groundwater flow and transport model to calculate the effective flows between the negative and positive hydraulic barriers to optimise the control of the saltwater intrusion for different hydrogeological conditions.