

Investigation of the joint use of hydrothermal resources for greenhouse heating and irrigation in southern Tunisia

Context and objectives

In arid zones, water resources management is particularly challenging due to strong pressures on water resources and overlapping challenges regarding water quantity and quality. It is increasingly recognized that sustainable management of water resources has to take into account the multiple interactions among water, food and energy sectors, often referred to as the nexus approach. We offer two MSc thesis possibilities that analyze such interactions in a study area in southern Tunisia where groundwater is crucial resources for domestic water supply, irrigation and geothermal energy use. This MSc project will focus on joint use of hydrothermal resources for heating of greenhouse and irrigation, while a second one deals with the effect of irrigation on the regional groundwater quality (see separate description). The main objective of the thesis is to investigate the functioning of the hydrothermal system of the region and to evaluate the potential for a joint use of groundwater for heating and irrigation. The project will focus on a zone in southern Tunisia with hydrothermal resources associated to the large Northwestern Sahara Aquifers System (SASS). In this zone, hydrothermal resources are already currently used for heating greenhouses in winter and irrigation. However, it is not well known how large the potential for such applications is without causing overexploitation and to what extent the quality of hydrothermal waters can restrict their use for irrigation.

Research approach and methodology

The student will develop the detailed research strategy. It will likely include the following: (a) development of geological and hydrogeological conceptual model of the hydrothermal system in the region, (b) use of hydrochemical and isotope methods to evaluate the relationship between different hydrothermal zones, to estimate reservoir temperatures and to assess the suitability of the water for a joint use for irrigation and heating, (c) to evaluate what fraction of the overall potential is currently used and to explore the risks associated with an increasing use of heating/irrigation.

Partners and collaboration

The project will be supervised by Prof. D. Hunkeler, Prof. P. Brunner and Marie-Louise Vogt. It will be carried out in close collaboration with Prof. Rachida Bouhlila (Ecole Nationale d'Ingénieurs de Tunis), who is a leading expert on the hydrogeology of Tunisia. A field campaign in the region will be planned in collaboration with her group. The student will spend some time at her laboratory in Tunis to discuss the hydrothermal systems of the area and consult related documents. In addition, some interactions with the Sahara and Sahel Observatory ("OSS"), an independent international organization based in Tunis that focuses on combating desertification and mitigating drought in Africa, are also planned to put the study in a broader context.

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