

Effect of increasing groundwater use for irrigation on the water quality in a desert region 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 the 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 a crucial resource for domestic water supply, irrigation and geothermal energy use. This MSc project will focus on interaction among domestic water supply and agriculture, while a second one deals with irrigation and geothermal energy use in agriculture (see separate description). The main objective of this thesis is to investigate how the increasing use of groundwater for irrigation influences the groundwater quality and thus affects the suitability of groundwater for domestic water supply. The project will focus on the Tozeur area, a desert zone in southern Tunisia where groundwater from the large Northwestern Sahara Aquifers System (SASS) discharges, leading to the formation of oases. In this region, an increase in the salinity of the pumped water has been observed in parallel with increasing groundwater extraction for agriculture. A central question of the MSc thesis will be to investigate the causes of the increased salinity of groundwater and its implication for groundwater use.

Research approach and methodology

The detailed research strategy will be developed by the student. It will likely include the following: (a) Characterization of hydrogeological conditions in the Tozeur region and its relationship to the SASS, (b) sampling of irrigation/water supply wells and evaluating of the hydrochemical and stable isotope composition of groundwater, (c) evaluation of the contribution of different salinity sources, and (d) use of simplified modeling approach to test some of the hypothesis regarding origin of the salinity of the groundwater.

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 and of arid zones in general. A field campaign in the Tozeur region will be planned in collaboration with her group. In addition, the student will spend some time at her laboratory in Tunis to discuss the hydrogeology of the area and consult related documents. In addition, some interactions with the Sahara and Sahel Observatory ("OSS"), an independent international organization in Tunisia that focuses on combating desertification and mitigating drought in Africa, are also planned to put the study in a broader context.

Contact for further information: Daniel.Hunkeler@unine.ch

