Geophysical Research Abstracts
Vol. 15, EGU2013-4591, 2013
EGU General Assembly 2013

Overview of groundwater management approaches at salinisation risk

Maurizio Polemio (1) and Livia Emanuela Zuffianò (2)
(1) CNR-IRPI, Bari, Italy (m.polemio@ba.irpi.cnr.it), (2) CNR-IRPI, Italy (l.zuffiano@ba.irpi.cnr.it)

All natural waters contain dissolved minerals from interactions with atmospheric and soil gases, mixing with other solutions, and/or interactions with the biosphere and lithosphere. In many cases, these processes result in natural waters containing solute or salinity above concentrations recommended for a specified use, which creates significant social and economic problems.
Groundwater salinisation can be caused by natural phenomena and anthropogenic activities. For the former case, we can distinguish terrestrial and marine phenomena. Approximately 16% of the total area of continental earth is potentially involved in groundwater salinisation. Seawater intrusion can be considered to be the primary phenomenon to be studied in terms of groundwater salinisation.
Three schematic approaches to the protection of groundwater via salinisation mitigation and/or groundwater salinity improvement are described based on the classifications of the primary salinisation sources and focusing on the effect of seawater intrusion. The complexity of these approaches generally increases due to difficulties caused by groundwater quality and quantity degradation and increased demand for quality water. In order from the lowest to the highest complexity, these approaches are the engineering approach, the discharge management approach, and the water and land management approach. The engineering approach is realised on the local or detailed scale with the purpose of controlling the salinisation, optimising the well discharge with specific technical solutions and/or completing works to improve the quality and/or quantity of the discharged fresh groundwater. The discharge management approach encompasses at least an entire coastal aquifer and defines rules concerning groundwater utilisation and well discharge. The water and land management approach should be applied on the regional scale. Briefly, this approach becomes necessary when one or more need creates an overall framework of high-quality water scarcity. These conditions, sometimes combined with an awareness of negative environmental effects, force people to accept new water saving practices and land use modifications. As the natural effects of salinisation can be enhanced by a multiplicity of human actions, the discharge management approach and the water and land management approach should generally be applied by water authorities or institutional and governmental organisations that are responsible for groundwater quality and availability.
The practical study of Apulian karstic coastal aquifers is discussed in detail. Previously experienced management difficulties are described, as well as a proposed multi-methodological approach based on monitoring networks, the spatiotemporal analysis of groundwater quality changes, and multiparameter well logging. The core of this approach is the definition of the salinity threshold value between pure fresh groundwater and any fresh and saline groundwater mixture. The basic or single tools were defined to be simple, quick and cost-effective to be applicable to the widest range of situations.