



Salinization and desalinization of groundwater in arid climate region

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Changes in the salinity of groundwater impact both groundwater quality and soil fertility, particularly in arid climate regions. Remediation of the salinity changes in these natural resources, if possible, is expensive and time consuming. Here we report data of groundwater salinity and level changes from the United Arab Emirates that show variable patterns in different regions. The range of salinity variations may reach to 150 mg/L and as high as 250000 mg/L while the groundwater level variability is within ± 20 m. In most mountainous regions along the eastern and northeastern parts, salinity and level of the groundwater are slightly fluctuated during the last 10 years. The pattern of change along the coastal regions indicates severe increase in the salinity and deepening of groundwater level depending on the location. Coastal parts along the Oman sea suffer less salinity increase than the coastal area along the Arabian Gulf. The inland regions show variable patterns of salinity changes where some parts suffer from sever increase in salinity of up to 100% while in other areas there could be a decrease of salinity. The causes for the salinity and level changes of groundwater in the coastal areas are related to overexploitation, seawater intrusion and intensive farming. In addition to overexploitation, increase in salinity of groundwater in the inland areas is strongly linked to agricultural practices that result in salt pollution through a combination of fertilization and dissolution of sulfate and carbonate minerals. Extensive urbanization and use of building materials (cement in concrete) may also have added further salt pollution to the groundwater. The salinity pollution is also associated with buildup of calcrete and gypcrete layers in the soil during the hot summer season leading to deterioration of soil fertility and formation of perched water table. In some of the inland areas, there has been a desalinization of groundwater which is sometimes associated with shallowing of the groundwater level. The causes of the desalinization are likely related to extensive natural recharge and/or use of potable water in agriculture and landscaping. The desalinization process leads to creation of disequilibrium conditions between the rather salty soil and the groundwater and thereby enhances mineral dissolution and soil subsidence. Additional effects that are associated with the groundwater salinity changes include corrosion of building fundamentals and roads, enhanced mobilization of contaminants from the soil into groundwater and expansion of sabkha areas both along the coastal regions and inland. The issue of salinization and desalinization of groundwater requires rapid and specific attention to avoid irreversible impacts on soil fertility, agriculture and natural water resources in the region.