



Groundwater aquifer recharge with treated wastewater in Egypt: technical, environmental, economical and regulatory considerations

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ABSTRACT

The economic development in Egypt and the rapid growth rate in various development sectors are dependent on the availability of water resources. Surface water is used to supply approximately 82% of the Egyptian water demand, while the groundwater is used to supply about 12%. The remaining about 6% comes from the reuse of agriculture drainage water and treated wastewater. Increasingly, Egypt has turned to use the groundwater to satisfy the growing demand, at the expense of exceeding the safe yield and overexploiting the aquifer systems in some areas, such as the western Nile Delta and along the desert fringes in the Nile Valley. Egypt has launched the Environmental Management of Groundwater Resources program which include examination of the feasibility of artificial recharge for the augmentation of groundwater supply. Through this program a detailed study has been carried including an investigation of potential sites for an artificial recharge experiment using treated wastewater. Through this pilot project, a detailed hydrogeological investigation and engineering design were carried out. Many scenarios for the aquifer storage and recovery were evaluated for technical environmental, economical and regulatory consideration. Results indicated that artificial recharge of the groundwater aquifer using treated wastewater is promising. However, more detailed studies are needed to assess how aquifer characteristics influence the recharge with treated wastewater. The health risks associated with wastewater recharge are a function of the physical and chemical conditions prevailing in the aquifer, the limited adsorption capacities of the aquifer materials and the rate of microorganisms die off and toxic pollutants degradation to other toxic compounds.

Keywords: ASR; TSE; Groundwater; Infiltration; Recharge; Artificial recharge; Unsaturated flow; Egypt

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