

Stable Isotopes and hydrochemistry to infer groundwater quality in overexploited aquifers of NCR, India

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Abstract

Economic aspiration which led to urbanization, industrialization and migration of population to urban center has affected groundwater quality in many Asian megacities. Millions of people in these urban settlements rely on groundwater for fulfilling daily water needs due to lack of public water supply and infrastructure. Many of these megacities are situated on alluvial plains which are more susceptible to contamination. Inadequately controlled pumping to meet daily requirements and change in landuse/landcover pattern has affected groundwater quality in these regions. One such region is National Capital Region, Delhi-India's largest and the world's second largest agglomeration of people and economic hub of Northern India. The present study includes National capital territory, Delhi, Gurgaon and Faridabad. In the present study different graphical plots, Piper plot, saturation index values (using PHREEQC), stable isotopes ($\delta^{18}\text{O}$ and δD) and GIS is used to create the database for analysis of spatial variation in respective water quality parameters as well as to decipher the hydrogeochemical process occurring in the area. It was observed that groundwater weathering is governed by carbonate weathering and reverse ion-exchange, however due to semi-arid climate evaporation is also playing a major role in groundwater chemistry and salinity of the area. $\delta^{18}\text{O}$ and δD regression line of groundwater samples of the study area is below the LMWL also suggest from non-equilibrium fractionation during evaporation.

Due to limited availability of surface water supply, no pricing exists for groundwater extraction; groundwater overexploitation has resulted in a widespread decline in the water table and intermixing of fresh and contaminated water. The freshwater crisis in this area can be managed by the strict enforcement of regulatory measures restricting unplanned and indiscriminate water abstraction and fertilizer application as well as waste disposal from industries.

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