

Nutrient chemistry and salinity mapping of the Delhi aquifer, India

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ABSTRACT

Present study is an effort to distinguish between the contributions of natural weathering and anthropogenic inputs towards high salinity and nutrient concentrations in the groundwater of National Capital Territory (NCT) Delhi, India. Apart from the source identification, the aquifer of entire territory has been characterized and mapped on the basis of salinity in space and water suitability with its depth. Major element chemistry, conventional graphical plots and specific ionic ratio of Na^+/Cl^- , $\text{SO}_4^{2-}/\text{Cl}^-$, $\text{Mg}^{2+}/\text{Ca}^{2+}$ and $\text{Ca}^{2+}/(\text{HCO}_3^- + \text{SO}_4^{2-})$ are conjointly used to distinguish different salinization sources. Results suggest that leaching from the various unlined landfill sites and drains is the prime cause of NO_3^- contamination while study area is highly affected with inland salinity which is geogenic in origin. The seasonal water level fluctuation and rising water level increases nutrients concentration in groundwater. Mixing with old saline sub-surface groundwater and dissolution of surface salts in the salt affected soil areas were identified as the principle processes controlling groundwater salinity through comparison of ionic ratio. Only minor increase of salinity is the result of evaporation effect and pollution inflows. The entire territory has characterized into four groups as fresh, freshening, near freshening and saline with respect to salinity in groundwater. The salinity mapping suggests that in general, for drinking needs, groundwater in the fresh, freshening and near freshening zone is suitable up to a depth of 45, 20 and 12m, respectively, while the saline zones are unsuitable for any domestic use. In the consideration of increasing demand of drinking water in the area; present study is vital and recommends further isotopic investigations and highlights the need of immediate management action for landfill sites and unlined drains.