

Hydrogeochemical quality and suitability studies of groundwater in northern Bangladesh

ABSTRACT

Agriculture, rapid urbanization and geochemical processes have direct or indirect effects on the chemical composition of groundwater and aquifer geochemistry. Hydro-chemical investigations, which are significant for assessment of water quality, were carried out to study the sources of dissolved ions in groundwater of Dinajpur district, northern Bangladesh. The groundwater samples were analyzed for physico-chemical properties like pH, electrical conductance, hardness, alkalinity, total dissolved solids and Ca^{2+} , Mg^{2+} , Na^+ , K^+ , CO_3^{2-} , HCO_3^- , SO_4^{2-} and Cl^- ions, respectively. Based on the analyses, certain parameters like sodium adsorption ratio, soluble sodium percentage, potential salinity, residual sodium carbonate, Kelly's ratio, permeability index and Gibbs ratio were also calculated. The results showed that the groundwater of study area was fresh, slightly acidic (pH 5.3-6.4) and low in TDS (35-275 mg l^{-1}). Ground water of the study area was found suitable for irrigation, drinking and domestic purposes, since most of the parameters analyzed were within the WHO recommended values for drinking water. High concentration of NO_3^- and Cl^- was reported in areas with extensive agriculture and rapid urbanization. Ion-exchange, weathering, oxidation and dissolution of minerals were major geochemical processes governing the groundwater evolution in study area. Gibb's diagram showed that all the samples fell in the rock dominance field. Based on evaluation, it is clear that groundwater quality of the study area was suitable for both domestic and irrigation purposes.

Keyword: Aquifer; Hydro geochemistry; Ion-exchange; Water suitability; Weathering