

Groundwater Flow Dynamics in Shallow Coastal Plain Sands Aquifer, Abesan Area, Eastern Dahomey Basin, Southwestern Nigeria

Authors : Anne Joseph, Yinusa Asiwaju-Bello, Oluwaseun Olabode

Abstract : Sustainable administration of groundwater resources tapped in Coastal Plain Sands aquifer in Abesan area, Eastern Dahomey Basin, Southwestern Nigeria necessitates the knowledge of the pattern of groundwater flow in meeting a suitable environmental need for habitation. Thirty hand-dug wells were identified and evaluated to study the groundwater flow dynamics and anionic species distribution in the study area. Topography and water table levels method with the aid of Surfer were adopted in the identification of recharge and discharge zones where six recharge and discharge zones were delineated correspondingly. Dissolved anionic species of HCO₃⁻, Cl⁻, SO₄²⁻ and NO₃⁻ were determined using titrimetric and spectrophotometric method. The trend of significant anionic concentrations of groundwater samples are in the order Cl⁻ > HCO₃⁻ > SO₄²⁻ > NO₃⁻. The prominent anions in the discharge and recharge area are Cl⁻ and HCO₃⁻ ranging from 0.22ppm to 3.67ppm and 2.59ppm to 0.72ppm respectively. Analysis of groundwater head distribution and the groundwater flow vector in Abesan area confirmed that Cl⁻ concentration is higher than HCO₃⁻ concentration in recharge zones. Conversely, there is a high concentration of HCO₃⁻ than Cl⁻ inland towards the continent; therefore, HCO₃⁻ concentration in the discharge zones is higher than the Cl⁻ concentration. The anions were to be closely related to the recharge and discharge areas which were confirmed by comparison of activities such as rainfall regime and anthropogenic activities in Abesan area. A large percentage of the samples showed that HCO₃⁻, Cl⁻, SO₄²⁻ and NO₃⁻ falls within the permissible limit of the W.H.O standard. Most of the samples revealed Cl⁻ / (CO₃⁻ + HCO₃⁻) ratio higher than 0.5 indicating that there is saltwater intrusion imprints in the groundwater of the study area. Gibbs plot shown that most of the samples is from rock dominance, some from evaporation dominance and few from precipitation dominance. Potential salinity and SO₄²⁻ / Cl⁻ ratios signifies that most of the groundwater in Abesan is saline and falls in a water class found to be insuitable for irrigation. Continuous dissolution of these anionic species may pose a significant threat to the inhabitants of Abesan area in the nearest future.

Keywords : Abesan, Anionic species, Discharge, Groundwater flow, Recharge

Conference Title : ICCMG 2020 : International Conference on Coastal and Marine Geology

Conference Location : London, United Kingdom

Conference Dates : March 12-13, 2020