

Hydrogeochemical Assessment, Evaluation and Characterization of Groundwater Quality in Ore, South-Western, Nigeria

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Abstract : One of the objectives of the Millennium Development Goals is to have sustainable access to safe drinking water and basic sanitation. In line with this objective, an assessment of groundwater quality was carried out in Odigbo Local Government Area of Ondo State in November - February, 2019 to assess the drinking, domestic and irrigation uses of the water. Samples from 30 randomly selected ground water sources; 16 shallow wells and 14 from boreholes and analyzed using American Public Health Association method for the examination of water and wastewater. Water quality index calculation, and diagrams such as Piper diagram, Gibbs diagram and Wilcox diagram have been used to assess the groundwater in conjunction with irrigation indices such as % sodium, sodium absorption ratio, permeability index, magnesium ratio, Kelly ratio, and electrical conductivity. In addition statistical Principal component analysis were used to determine the homogeneity and source(s) influencing the chemistry of the groundwater. The results show that all the parameters are within the permissible limit of World Health Organization. The physico-chemical analysis of groundwater samples indicates that the dominant major cations are in decreasing order of Na⁺, Ca²⁺, Mg²⁺, K⁺ and the dominant anions are HCO₃⁻, Cl⁻, SO₄²⁻, NO₃⁻. The values of water quality index varies suggest a Good water (WQI of 50-75) accounts for 70% of the study area. The dominant groundwater facies revealed in this study are the non-carbonate alkali (primary salinity) exceeds 50% (zone 7); and transition zone with no one cation-anion pair exceeds 50% (zone 9), while evaporation; rock-water interaction, and precipitation; and silicate weathering process are the dominant processes in the hydrogeochemical evolution of the groundwater. The study indicates that waters were found within the permissible limits of irrigation indices adopted, and plot on excellent category on Wilcox plot. In conclusion, the water in the study area are good/suitable for drinking, domestic and irrigation purposes with low equivalent salinity concentrate and moderate electrical conductivity.

Keywords : equivalent salinity concentration, groundwater quality, hydrochemical facies, principal component analysis, water-rock interaction

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