

Mapping Shallow Aquifers Intruded by Saltwater in the Coastal Area of Benin River in Western Niger Delta from Dar-Zarrouk Parameters

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Abstract

Shallow aquifers are the major source of groundwater to the inhabitants of the coastal area of the Niger Delta. Groundwater is harnessed by hand-dug wells because they are easier and inexpensive to construct compared to boreholes. The closeness of groundwater water table to the surface encourages the construction of dug wells. The coastal area under investigation is faced with acute groundwater quality and assessment problems arising from saltwater intrusion. Dar-Zarrouk parameter comprising of longitudinal unit conductance(S) and transverse unit resistance (T) were coupled with resistivity to discriminate freshwater from saltwater zones. S across the area ranged from 0.03 to 2.96 Siemens and T from 1.4 to 790 Ωm^2 . S values greater and lesser than 0.3Siemens were considered as saltwater and freshwater zones respectively, while T values that ranged from 1.32 to 161.33 Ωm^2 were regarded as saltwater zones. Resistivity high of 185 Ωm to 1511.58 Ωm was assigned freshwater zones. The resistivity data considered showed evidence of freshwater at depth of 27.6m and saltwater at 34.3m. The lateral interface between saltwater and freshwater is situated at 565m from the sea. The intrusion revealed by the study does not suggest over-withdrawal of groundwater because of the small population of inhabitants but to natural hydrodynamic forcing connected with aquifer adjacent to the sea. However, the tendency of upcoming of saltwater into the freshwater aquifer is probably at the depth of 3.9 to 12.3m by over-withdrawing of groundwater may not be ruled out in the future. Induced polarization is suggested as a follow-up investigation to unravel ambiguity that may be associated with resolution of resistivity data.

Keywords: Benin River, Niger Delta, Saltwater intrusion, Dar-Zarrouk Parameters, longitudinal unit conductance, transverse unit resistance.

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