

Assessment of Groundwater Potential Sampled in Hand Dug Wells and Boreholes in Ado-Ekiti, Southwestern Nigeria

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Abstract : Groundwater samples were collected randomly from hand-dug wells and boreholes in parts of the Ado Ekiti metropolis and were subjected to quality assessment and characterization. Physicochemical analyses, which include the in-situ parameters (pH units, Turbidity, and Electrical Conductivity) and laboratory analysis of selected ionic concentrations, were carried out following standard methods. Hydrochemistry of the present study revealed relative mean concentrations of cations in the order $\text{Ca}^{2+} > \text{Na}^+ > \text{Mg}^{2+} > \text{Cu}^{2+} > \text{Fe} > \text{Mn}^{2+}$ and that of anions: $\text{Cl}^- > \text{NO}_3^- > \text{SO}_4^{2-} > \text{F}^-$ respectively considering World Health Organisation Standard (WHO) range of values for potable water. The result shows that values of certain parameters (Total Dissolved Solid (TDS), Manganese, Calcium, Magnesium, Fluoride, and Sulphate) were below the Highest Desirable Level of the Standards, while values of some other parameters (pH Units, Electrical Conductivity, Turbidity, Alkalinity, Sodium, Copper, Chloride, and Total Hardness) were within the range of figures between Highest Desirable Level (HDL) and Maximum Permissible Level (MPL) of World Health Organization (WHO) drinking water Standards. The reduction in the mean concentration value of Total Dissolved Solids (TDS) of most borehole samples follows the fact that water had been allowed to settle in the overhead tanks before usage; we discussed and brainstormed in the course of sampling and agreed to take a sample that way because that represents what the people consume, it also shows an indication while there was slightly concentration increase of these soluble ions in hand-dug wells samples than borehole samples only with the exception of borehole sample seven BH7 because BH7 uses the mono-pumping system. These in-situ parameters and ionic concentrations were further displayed and or represented on bar charts along with the WHO standards for better pictorial clarifications. Deductions from field observation indices revealed the imprints of natural weathering, ion-exchange processes, and anthropogenic activities influencing groundwater quality. A strong degree of association was found to exist between sodium and chlorine ions in both hand-dug well and borehole groundwater samples through the use of Pearson's correlation coefficient; this association can further be supported by the chemistry of the parent bedrock associated with the study area because the chemistry of groundwater is a replica of its host rock. The correlation of those two ions must have begun from the period of mountain building, indicating an identical source from which they were released to the groundwater. Moreover, considering the comparison of ionic species concentrations of all samples with the (WHO) standards, there were no anomalous increases or decreases in the laboratory analysis results; this simply reveals an insignificant state of pollution of the groundwater. The study and its sampling techniques were not set to target the likely area and extent of groundwater pollution but its portability. It could be said that the samples were safe for human consumption.

Keywords : groundwater, physicochemical, parameters ionic, concentrations, WHO standards

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