

Evaluation of Surface Water and Groundwater Quality in Parts of Umunneochi Southeast, Nigeria

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Abstract : Water cannot be optimally used and sustained unless the quality is periodically assessed. The study area Umunneochi and environs are located in south eastern part of Nigeria. It stretches geographically from latitudes 50501N to 60000N and longitudes 70201E to 70301. The major geologic formations in the area include the Asu River group, Nkporo Shale, and Ajali Sandstone. The aim of this study is to evaluate the hydrochemical characteristics of surface and ground water sources in parts of Umunneochi and environs in order to establish portability of the water sources for drinking, domestic and irrigation purposes. A total of 15 samples were collected randomly from streams, springs and wells. The samples were analyzed for physicochemical parameters and heavy metals using handheld digital kits, photometer, titration method and Atomic Absorption Spectrophotometer (AAS) following acceptable standards. The obtained analytical data were interpreted, and results were compared with World Health Organization (WHO) standard. The concentration of pH, SO₄²⁻ and Cl⁻ range from 5.81 mg/l - 6.07 mg/l, 41.93 mg/l - 142.95 mg/l and 20.00 mg/l - 111 mg/l respectively, while Pb and Zn revealed a relative low mean concentration of 0.14 mg/l and 0.40 mg/l, which are all within (WHO) permissible limits except pH. About 27% of the samples are moderately hard. This is attributed to the mining activities in the areas. The abundance of cations and anions in the area are in the order of K⁺>Na⁺>Mg²⁺>Ca²⁺ and SO₄²⁻>Cl⁻>HCO₃⁻>NO₃⁻, respectively. Chloride, bicarbonate, and nitrate are all within the permissible limits. 13.33% of the total samples contain Sulphate above the standard permissible limits. The values of calculated Water Quality Index (WQI) are less than 50 indicating excellent water. The predominant water-type in the study area is Na-Cl water type and mixed Ca-Mg-Cl water type based on the sample plots on the Piper diagram. The Sodium Adsorption Ratio (SAR) calculations showed excellent water for consumption and also good water for irrigation purpose with low sodium and alkalinity ratio respectively. Government water projects are recommended in the area for sustainable domestic and agricultural water supply to ease the stress of water supply problems.

Keywords : groundwater, hydrochemical, physicochemical, water-type, sodium adsorption ratio

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