

Groundwater Suitability for Domestic Use and Quest for a policy strengthening on Aquifer Management in Owerri, Nigeria

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The paucity of reliable information and strategies for effective groundwater governance across major urban cities in Nigeria has given rise to the proliferation of shabbily constructed private boreholes have continued to pose imminent health risks to exposed individuals. Bi-seasonal sampling of 356 private boreholes to evaluate the implications of a weak institutional framework on groundwater quality and public health in the city of Owerri, South East Nigeria, was carried out. Samples were analysed for ions and heavy metals using ion chromatography (IC), and the ICP-MS respectively. An investigation (Vertical Electric Sounding) of the underlying sub-surface for groundwater vulnerability to surface contamination was carried out using the Schlumberger configured OHMEGA-500. Sample area coordinates were measured with a hand-held GPS map 62 unit and locations were mapped within the Arc Map version 10.5. Water Quality (WQI) and Synthetic Pollution (SPI) index techniques were employed to assess the suitability of groundwater for human consumption. Results suggest dilution and evaporation effects on groundwater quality as NO_3^- exceeded the health-based maximum concentration limit (MCL) of $50\mu\text{g/mL}$ in c.12% and 26% of sampled boreholes in the rainy season and dry seasons respectively. Groundwater nitrate concentrations trend appeared consistent with the urban density pattern to suggest anthropogenic influence. Concentrations of Pb and Cd exceeded the MCL by about 1.6% and 0.25% respectively. Approximately 13% and 43% were classified as good water in the rainy and dry seasons respectively, based on the SPI. Similarly, WQI shows that 23% (34.0 – 49.3) and 33% (27.5 – 45.2) of the groundwater are considered of good quality and suitable for drinking only after disinfection in the respective seasons. However, only about 10% of sampled sites in the dry season showed water fit for drinking while others either require treatments or unsafe for consumption. Health risk assessment indicates susceptibility to groundwater nitrate pollution higher in children than adults. Hence, this study proposes strategies for sustainable groundwater governance as a panacea to the perennial drinking water challenges. Furthermore, an Integrated Vulnerable Zone Management (IVZM) framework is also recommended to regulate indiscriminate drilling of urban boreholes and groundwater pollution especially within environmentally sensitive areas.