

Geochemistry of trace elements and microbial assessment in groundwater contamination and soils (South-eastern Nigeria)

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Waste derived from anthropogenic activities like automobile industries and households contain toxic elements contaminating water bodies and soils, thereby endangering human health in developing countries like Nigeria. Some rural parts of Anambra State in South-eastern region of Nigeria, supply water from boreholes and hand-dug wells as common groundwater abstractions. The aim of the study was to investigate the deteriorating water quality and soils within densely populated area (slum) of automobile junk market in Obosi, and residential (in Onitsha) in Anambra, South-eastern Nigeria. An intensive seasonal physicochemical and hydrogeochemical assessment were carried out to examine the concentration of heavy metals in groundwater and soils, and determine the quality of the water for drinking and other domestic purposes. In addition, the fecal contamination of the water was assessed by evaluating for the presence of fecal coliforms using standard microbiological methods. Forty groundwater samples were collected in dry and wet seasons from boreholes and hand-dug wells. The samples were subjected to Atomic Absorption Spectrometry using standard field and laboratory techniques. The groundwater is slightly acidic to neutral, soft to moderately hard. Some of the toxic and trace elements (Fe, Cu, Ni, Zn, Mn, Pb and Cd) were found to be more than the desirable levels in drinking water (WHO guidelines, and the Nigerian Standards). There was absent of fecal but lower count (1.0×10^2 to 2.5×10^3 cfu/ml) of total coliform was observed. Higher heavy metals content in ppm (Pb and Cd varied 0 to 1.80 and 0 to 7.38 respectively, and Fe, Cu, Ni, Cr, Zn, Mn) was found in the soil (and permeable). Statistical results gave significant correlation differences (at 0.05) between EC and nitrate, EC and TH, BOD₅ and DO, and several other elements. The Contour maps for the trace elements displayed the spatial distribution (pollution pattern) and point source of contaminants. The study helps in the understanding of the chemistry of groundwater for long monitoring and management for the local community, as well as adopts remedial measures and controls pollution.