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Sediments toxicity in the rivers draining Ibadan metropolis, Southwestern Nigeria

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The drainage structures in Ibadan Metropolis are depocenter for both industrial and domestic wastes/effluents influenced by cultural practices and land use activities. These acts of man are often major contributors of potentially harmful elements (PHE) not only into the stream sediments but also the environment. These elements have their attendant health implications on man and the entire ecosystem as a whole. This study therefore examine the trace metal content in the sediments and evaluate their origin, pollution status and the bioavailability of these trace metals in the environment. Two hundred and thirty three (233) samples systematically collected from Agricultural, Industrial; old city and new city zones (zone 1, 2, 3, 4) respectively. These were analyzed using XRD and inductively coupled plasma-mass spectrometry (ICP-MS) and sequential leaches in the sediments as absorbed ions on clay, organic compounds, amorphous Mn and Fe, sulphide and residue after digestion. XRD data revealed the dominant minerals as kaolinite, illite, montmorillonite and quartz. Potentially harmful metals concentrations range from Cu (18.30-513.00), Pb (40.30-5140.00), Zn (80.90-2450.00), As (0.20-7.10), Cd (0.08-24.40), Cu-Pb-Zn-Cd revealed highest concentrations in the old city (densely populated) and industrial areas of the city respectively, Geochemical maps revealed the densely populated zones as hotspots for the PHE's. Pollution Load Index (PLI) values for zones 1 to 4 include PLI-127, 471, 582, 512 respectively indicating polluted sediments and metal sources link to human and land use activities. Percentages of Pb, Zn and Cd ranged correspondingly from 26.4-43.5; 25.5-36.9 and 17.0-51.0 in the exchangeable fraction indicating their bioavailability to the environment. Cu, Pb, Zn, Cd and Ni concentrations in all the zones exceeded the threshold values in the sediment quality guidelines (SQGs) suggesting that the sediments were polluted. Metals concentration and degree of contamination has been linked to high population density, urbanization and increased human activities in the river channels.

Biography

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