

Assessment of Potentially Harmful Elements in Floodplain Soils and Stream Sediments in Ile-Ife Area, South-Western Nigeria: Using Geographic Information System and Multi-Variates Approaches

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Abstract : The enrichment of potentially harmful elements (PHEs) in stream sediments (SS) and floodplain soils (FS) poses great environmental hazards to water bodies and other parts of the ecosystem. The aim of this research was to assess the distribution pattern of selected PHEs (Cu, Pb, Zn, Co, Mn, As, Cd, V, Cr, Ni, Th, Sr, and La) in SS of selected rivers that drain Ile-Ife area and their adjacent FS, to ascertain the pollution status of these elements in the study area. 60 samples (40 SS and 20 FS) were purposely collected for this study; the samples were air-dried at room temperature, disaggregated, sieved with > 63 µm and digested with modified aqua regia (1:1:1 HCl:HNO₃:H₂O) and were analysed with ultra-trace inductively coupled plasma mass spectrometry method (ICP-ES). The geochemical results showed decreasing trend of average contents of PHEs studied Mn > Zn > V > Cr > Pb > La > Sr > Cu > Ni > Co > Th > As > Cd for both SS and FS. Floodplain topsoil in ppm, Cu range from 10.0-180.0; mean, 71.1, Pb, 17.1-255.0; 93.5 and Zn, 83.0-3122.2; 826.0. Also, floodplain sub-soils, Cu range from 30.0-203.1; mean of 76.6, Pb, 16.0-214.0; 77.9 and Zn, 59.1-2351.0; 622.3. Similarly, SS results for Cu, 22.1-257.0; 70.3, Pb, 15.0-172.0; 67.3 and Zn, 65.0-1285.0; 357.8, among other PHEs, suggesting significant level of PHEs enrichment in the studied geo media. Elemental association showed positive and/or negative correlation among the PHEs and also showed different sources of metal enrichment to be largely anthropogenic with some geogenic. Geoaccumulation and metal ratio indexes indicated that FS and SS studied have received significant PHEs of between moderately to strongly polluted, which implies significant environmental implications in the study area.

Keywords : aqua regia, enrichment, GIS, Ile-Ife, potentially harmful elements

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