Sources and Potential Ecological Risks of Heavy Metals in the Sediment Samples From Coastal Area in Ondo, Southwest Nigeria

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Abstract : Heavy metals are released into the sediments in aquatic environment from both natural and anthropogenic sources and they are considered as worldwide issue due to their deleterious ecological risks and food chain disruption. In this study, sediments samples were collected at three major sites (Awoye, Abereke and Ayetoro) along Ondo coastal area using VanVeen grab sampler. The concentrations of As, Cd, Cr, Cu, Fe, Mn, Ni, Pb, V and Zn were determined by employing Atomic Absorption Spectroscopy (AAS). The combined concentrations data were subjected to Positive Matrix Factorization (PMF) receptor approach for source identification and apportionment. The probable risks that might be posed by heavy metals in the sediment were estimated by potential and integrated ecological risks indices. Among the measured heavy metals, Fe had the average concentrations of 20.38 ± 2.86, 23.56 ± 4.16 and 25.32 ± 4.83 lg/g at Abereke, Awoye and Ayetoro sites, respectively. The PMF resulted in identification of four sources of heavy metals in the sediments. The resolved sources and their percentage contributions were oil exploration (39%), industrial waste/sludge (35%), detrital process (18%) and Mn-sources (8%). Oil exploration activities and industrial wastes are the major sources that contribute heavy metals into the coastal sediments. The major pollutants that posed ecological risks to the local aquatic ecosystem are As, Pb, Cr and Cd ($40 B Ei \leq 80$) classifying the sites as moderate risk. The integrate risks values of Awoye, Abereke and Ayetoro are 231.2, 234.0 and 236.4, respectively suggesting that the study areas had a moderate ecological risk. The study showed the suitability of PMF receptor model for source identification of heavy metals in the sediments. Also, the intensive anthropogenic activities and natural sources could largely discharge heavy metals into the study area, which may increase the heavy metal contents of the sediments and further contribute to the associated ecological risk, thus affecting the local aquatic ecosystem.

Keywords : positive matrix factorization, sediments, heavy metals, sources, ecological risks

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