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Distribution and risk assessment of heavy metals in surficial sediments from Awash River Basin, Ethiopia

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Like many parts of developing nations, rapid population growth, high urbanization rate and poor waste management practices have been observed in Awash River Basin. On the other hand, no detail and systemic study was conducted to determine the status of sediment pollution with heavy metals in the basin. 138 samples from 46 sites were taken and tested for determination of heavy metals content, distribution, pollution level, possible sources of pollutants and associated ecological risk. Metals concentration and percentage of total organic carbon (TOC) were tested using inductively coupled plasma mass (ICP-MS) (Thermos X SERIES2) and solid TOC analyzer (Elementar, Germany) respectively. Enrichment factor, pollution load index, potential ecological risk index and sediment quality guideline were used to evaluate contamination levels and eco-toxicity. Multivariate statistical techniques were implemented to identify key environmental factors contributing for heavy metal pollution. The results indicated that the mean concentration of the elements had exceeded their respective background values except Pb and Hg. A comparison with similar studies revealed that sediments from Awash River Basin had highest average value for Cd. The mean enrichment factors of heavy metals were listed in increasing order as Hg<As<Pb< Ni<Cu<Cr<Zn<Cd. Multivariate analysis revealed that Ni and Cu had common sources while the other heavy metals were originated from different anthropogenic source. The pollution load index value of the study area was 2.94 indicating high ecological pollution. Sediment quality guidelines revealed that heavy metals like Ni, Zn and Cr were the major concerns in the study area. Potential ecological risk index of trace elements from Awash River Basin was 343.67, designating high potential toxicity response. Generally, the study indicated that surficial sediment in Awash River Basin were polluted by heavy metals and posing high ecological risks.

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