

Assessment of Heavy Metal Contamination for the Sustainable Management of Vulnerable Mangrove Ecosystem, the Sundarbans

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Abstract : The present research investigates the distribution and contamination of heavy metals in core sediments collected from three locations of the Sundarbans mangrove forest. In this research, quality of the analysis is evaluated by analyzing certified reference materials IAEA-SL-1 (lake sediment), IAEA-Soil-7, and NIST-1633b (coal fly ash). Total concentrations of 28 heavy metals (Na, Al, K, Ca, Sc, Ti, V, Cr, Mn, Fe, Co, Zn, Ga, As, Sb, Cs, La, Ce, Sm, Eu, Tb, Dy, Ho, Yb, Hf, Ta, Th, and U) have determined in core sediments of the Sundarbans mangrove by neutron activation analysis (NAA) technique. When compared with upper continental crustal (UCC) values, it is observed that mean concentrations of K, Ti, Zn, Cs, La, Ce, Sm, Hf, and Th show elevated values in the research area is high. In this research, the assessments of metal contamination levels using different environmental contamination indices (EF, Igeo, CF) indicate that Ti, Sb, Cs, REEs, and Th have minor enrichment of the sediments of the Sundarbans. The modified degree of contamination (mCd) of studied samples of the Sundarbans ecosystem show low contamination. The pollution load index (PLI) values for the cores suggested that sampling points are moderately polluted. The possible sources of the deterioration of the sediment quality can be attributed to the different chemical carrying cargo accidents, port activities, ship breaking, agricultural and aquaculture run-off of the area. Pearson correlation matrix (PCM) established relationships among elements. The PCM indicates that most of the metal's distributions have been controlled by the same factors such as Fe-oxy-hydroxides and clay minerals, and also they have a similar origin. The poor correlations of Ca with most of the elements in the sediment cores indicate that calcium carbonate has a less significant role in this mangrove sediment. Finally, the data from this research will be used as a benchmark for future research and help to quantify levels of metal pollutions, as well as to manage future ecological risks of the vulnerable mangrove ecosystem, the Sundarbans.

Keywords : contamination, core sediment, trace element, sundarbans, vulnerable

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