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Heavy Metal Contamination in Negombo Estuary: A Study on Water and Sediment

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Abstract

As a result of industrialization and urbanization, the Negombo estuary has become polluted with domestic waste and various hazardous chemicals including heavy metals, causing serious health concerns. The water enters the Negombo lagoon from the southern part through the Dutch Canal, Ja Ela, and Aththanagalu Oya rivers. The present study was performed to assess the levels of eight heavy metals, Cr, Mn, Fe, Cu, Zn, Cd, Pb & As in estuarine water and sediment samples collected from 11 and 4 sampling sites respectively, using Inductively Coupled Plasma-mass Spectrometry (ICP-MS). All the estuarine water and sediment samples were collected in the dry season of 2021 (December). Heavy metal levels in sediment samples were greater than in the respective water samples. The highest and the lowest levels of Mn in water were reported in sites 7 and 11 respectively ($p=0.052$), indicating marginal significance. The comparison between the highest and the lowest concentrations of all other tested metals in water was not statistically significant ($p>0.05$). Moreover, the highest levels of Cr, Cu and Pb were found in the water samples collected from the Northern side while Mn, Zn and Fe were found in elevated levels in water samples collected from the Southern region. The distribution of Cd and As in estuarine water did not show any particular trend. In sediment samples, except As, all other seven heavy metals analyzed were higher in the Eastern region (site 6) of the estuary than in the Northern region (sites 2,3 and 5). The highest and the lowest levels of Zn in estuarine sediment were reported in sites 6 and 2 respectively ($p<0.05$), indicating statistical significance. The variation in the distribution of heavy metals in the Negombo estuary indicates the influence of domestic and municipal solid waste and the discharge of industrial effluents to the estuarine environment. Additionally, sediment characteristics like fine particle size contributed to enhanced heavy metal accumulation in specific regions. Despite compliance with Sri Lankan water quality standards, it is important to prevent the excessive entry of heavy metals into the lagoonal environment. Therefore, implementing proper treatment facilities for industrial waste is necessarily important.

Keywords: *Heavy metals, Negombo estuary, Inductively coupled plasma-mass Spectrometry*