Spatial variations of selected heavy metals in water and sediment in Negombo lagoon, Sri Lanka

P Indrajith[1] and K A S Pathiratne*
Department of Chemistry, University of Kelaniya, Kelaniya

With rapid industrialisation and urbanisation, Negombo lagoon is being polluted with hazardous materials including toxic metals especially due to various effluents from multiple sources. The present study was carried out to assess the total levels of eleven metals (Pb, Cu, Hg, Cd, Cr, Mn, Zn, Ni, Sn, Mo, and V) in water and sediment of Negombo lagoon. Water and sediment were sampled from twelve sampling locations representing north (N), east (E), west (W) and south (S) sides of the lagoon in 2003. The levels of Hg in water and sediments were analysed by cold vapour atomic absorption spectrometry whereas the other metals were analysed by flame and/or graphite furnace atomic absorption spectrometry. Out of the eleven metals investigated, the concentration ranges (in $\mu g\ L^{-1}$) of the detected seven dissolved metals in water were: Zn (40.3-180.4), Ni. (1.1-7.4), Pb (1.0-5.7), Cu (0.6-2.5), Cr (0.9-1.2), Cd (0.6-2.1), Mn (0.6-0.9). No significant spatial differences were however found in four sides of the lagoon with respect to Zn and Cr in water. The levels of the other detected five metals in water of the lagoon followed the decreasing order: Pb, N > E > S ≈ W; Cu, N > E > W > S; Cd, N ≈ E ≈ W > S, Ni, N > E ≈ W > S; and Mn, N ≈ E ≈ W > S. The sediment associated metals in the lagoon (in $\mu g\ g^{-1}$ dry weight) showed irregular distribution of metal contamination reflecting many individual metal inputs: Mn (121.9-792.6), Zn (119.5-207.4), Cr (19.2-73.5), Ni (9.2-34.7), Cu (5.3-24.2), Pb (4.8-20.0), Sn (0.6-3.9), Hg (0.3-2.2), Cd (0.03-0.22), and V (0.97-9.46). Sediment bound metals in the four sides of the lagoon followed the decreasing order: Pb and Mn, N < E ≈ W ≈ S; Cd, E ≈ W ≈ S < N; Zn, N ≈ S < E ≈ W; V, N ≈ E ≈ < W. No significant spatial difference was found with respect to the sediment bound Cu, Hg, Ni, Sn and Mo. The present study revealed that except for Zn, the levels of other metals in Negombo lagoon water have not exceeded the maximum tolerance limits of dissolved metals laid down by the international regulatory authorities for aquatic life in estuarine water. However, sediment bound Cr, Cu, Hg, Zn, and Mn at several locations have exceeded the guide levels specified by the international regulatory authorities for sediment dwelling organisms.

[1]*Present address: SGS Lanka laboratory Services, 141/7, Vauxhall street, Colombo 2*

*kaspathi@kln.ac.lk Tel: 011-2914486