

Assessment of Metal Dynamics in Dissolved and Particulate Phase in Human Impacted Hooghly River Estuary, India

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Abstract : Hooghly river estuary (HRE), situated at the north eastern part of Bay of Bengal has global significance due to its holiness. It is of immense importance to the local population as it gives perpetual water supply for various activities such as transportation, fishing, boating, bathing etc. to the local people who settled on both the banks of this estuary. This study was done to assess the dissolved and particulate trace metal in the estuary covering a stretch of about 175 Km. The water samples were collected from the surface (0-5 cm) along the salinity gradient and metal concentration were studied both in dissolved and particulate phase using Graphite Furnace Atomic Absorption Spectrophotometer (GF-AAS) along some physical characteristics such as water temperature, salinity, pH, turbidity and total dissolved solids. Although much significant spatial variation was noticed but little enrichment was found along the downstream of the estuary. The mean concentration of the metals in the dissolved and particulate phase followed the same trend and as follows: $Fe > Mn > Cr > Zn > Cu > Ni > Pb$. The concentration of the metals in the particulate phase were much greater than that in dissolved phase which was also depicted from the values of the partition coefficient (K_d) ($ml\ mg^{-1}$). The K_d values ranged from 1.5×10^5 (in case of Pb) to 4.29×10^6 (in case of Cr). The high value of K_d for Cr denoted that the metal Cr is mostly bounded with the suspended particulate matter while the least value for Pb signified its presence more in dissolved phase. Moreover, the concentrations of all the studied metals in the dissolved phase were many folds higher than their respective permissible limits assessed by WHO 2008, 2009 and 2011. On the other hand, according to Sediment Quality Guidelines (SQGs), Zn, Cu and Ni in the particulate phase lied between ERL and ERM values but Cr exceeded ERM values at all the stations confirming that the estuary is mostly contaminated with the particulate Cr and it might cause frequent adverse effects on the aquatic life. Multivariate statistics Cluster analysis was also performed which separated the stations according to the level of contamination from several point and nonpoint sources. Thus, it is found that the estuarine system is much polluted by the toxic metals and further investigation, toxicological studies should be implemented for full risk assessment of this system, better management and restoration of the water quality of this globally significant aquatic system.

Keywords : dissolved and particulate phase, Hooghly river estuary, partition coefficient, surface water, toxic metals

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