Comparative Study of Heavy Metal Contamination in Sediments of Yamuna river, Agra

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ABSTRACT

The comparative account of contamination levels of different heavy metals in sediments of Yamuna at Agra are compared with other river basin from worldwide and India. The concentration of heavy metal (Cr, Cu, Ni, Pb, Zn & Cd) are higher in the present study than the other sites, but Mn, Co, Fe is comparable to others. But comparison with lowest effect level (LEL) and probable effect level (PEL) shows that concentrations of all the metals are above these values and they may create any epidemic to aquatic biota and environment. Results of correlation matrix clearly indicate a moderate correlation between Cr/Pb, Fe/Cr, Cd/Cr, Cr/Cu, Cr/Zn and Cr/Ni, Pb/Mn, Mn/Fe, Mn/Ni, Pb/Zn, Pb/Ni, Cu/Fe, Fe/Ni, Zn/Cu, Zn/Ni and very strong correlation between Cu/Mn, Fe/Pb and a strong correlation was noticed between Zn/Mn, Pb/Cu. This correlation clearly indicates their possible common sources from heavy minerals or from urban centers as well as their common sink in stream sediments. Environmental risk assessment for metals was also calculated by evaluating anthropogenic factor, metal enrichment factor, pollution load index (PLI), sediment pollution index (SPI), geo-accumulation index (GAI).High metal enrichment factor was identified for cadmium. The EFm of metals in sediments were found in the order Cd>Pb>Cu>Zn>Cr>Ni>Co>Fe>Mn. High Efm values indicate the degrading quality of sediment. GAI (Geo Accumulation Index) was observed in the order Cd>Pb>Cu>Zn>Cr, while Mn, Fe, Co, Ni were found in class 0 indicate their background level. AG-9which is an agricultural site was found moderately polluted site according to sediment pollution index. But all the other sites were found highly to dangerously polluted. Hence, GAI and SPI clearly illustrate that sediment of Agra is moderately to dangerously polluted with these metals. Anthropogenic factors were calculated for each metal. It is estimated that 67% Cr, 80% Cu, 85% Zn, 79% Pb and 95% Cd were derived from anthropogenic input in the total heavy metal concentration. These values clearly explain that metals could easily enter to the bio cycle and could threat the lives of consumers at each level.

Keywords: Metal Enrichment Factor (EFm), Anthropogenic Fraction, Sediment Pollution Index (SPI),Pollution Load Index (PLI), Geo Accumulation Index (GAI).

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