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Characterization of heavy metal pollution in river sediment of Hanoi City and its downstream area by multivariate analyses

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ABSTRACT

In order to get a grasp of the current situation and characteristics of heavy metal pollution in the river environment of Hanoi City and its surrounding area, river sediment was sampled from the To Lich River (urban river) and the Nhue River (suburban/rural river) for three times during the period of October 2005 to June 2006 and analyzed for heavy metals. Accumulations of heavy metals in river sediment of the Nhue (in the suburban area of Hanoi) and the To Lich were found to have been progressing in the last 8 years due to wastewater discharge from the central part of Hanoi and urbanized areas along the rivers. Concentrations of As, Cr, Cu, Mn, Ni and Zn the in sediment of the Nhue were higher in the dry season than in the rainy season. However, multivariate analyses (principal component analysis and cluster analysis) revealed that, regardless of seasons, there were two characteristic areas with regard to heavy metal composition in river sediment: (1) the To Lich with high levels of Cd, Zn and TOC from anthropogenic origins, and (2) up- and down-stream parts of the Nhue with high concentrations of As, Mn and Pb derived from the Hong River, the headwater of the Nhue.

Keywords: Cluster analysis; Hanoi; Heavy metal; Principal component analysis; River sediment; Seasonal variation

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