Geo-accumulation index and contamination factors of heavy metals (Zn and Pb) in urban river sediment

ABSTRACT

The aim of the present study was to appraise the levels of heavy metal contamination (Zn and Pb) in sediment of the Langat River (Selangor, Malaysia). Samples were collected randomly from 15 sampling stations located along the Langat River. The parameters measured were pH, redox potential, salinity, electrical conductivity, loss of ignition, cation exchanges capacity (Na, Mg, Ca, K), and metal ions (Zn and Pb). The geo-accumulation index (I_{geo}) and contamination factor (C_f) were applied to determine and classify the magnitude of heavy metal pollution in this urban river sediment. Results revealed that the I_{geo} of Pb indicated unpolluted to moderately polluted sediment at most of the sampling stations, whereas Zn was considered to be within background concentration. The I_{geo} results were refined by the C_f values, which showed Pb with very high C_f at 12 stations. Zinc, on the other hand, had low to moderate C_f values. These findings indicated that the sediment of the Langat River is severely polluted with Pb. The Zn concentration at most sampling points was well below most sediment quality guidelines. However, 40% of the sampling points were found to have a Pb concentration higher than the consensus-based probable effect concentration of 128 mg/kg (concentrations above this value are likely to cause harmful effects). This result not only highlights the severity of Pb pollution in the sediment of the Langat River, but also the potential risk it poses to the environment.

Keyword: Geo-accumulation index; Heavy metal; Lead (Pb); River sediment; Zinc (Zn); Sediment quality guidelines