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Toxic Metals in Soils Contaminated by Landfill Leachate in Gohagoda Dumpsite, Kandy, Sri Lanka

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ABSTRACT

Landfill leachates contain toxic metals posing a potential risk to water and soils in the environment. The aim of this study is to characterize the availability and mobility of heavy metal ions (Zn, Cu, Pb, Ni, Cr and Cd) in the soils contaminated by the Gohagoda leachate to aid in decision making on any remedial measures. The characterization includes determination of total, exchangeable and bio-available heavy metal concentrations, cation exchange capacity (CEC), zero net proton charge (pH_{zpc}) and specific surface area determination. Leachate contaminated soils from 0.5 m above bed rock and closer to bed rock at Gohagoda municipal solid waste dump site were used for analysis. When the total metal concentration is considered, the soils above the bed rock layer contain heavy metal ions in high concentration showing significant leaching patterns indicating heavy contamination of the soil by the landfill for a long period of time. Furthermore, heavy metal ions recorded in exchangeable and bio-available fractions in considerable amounts suggest that those have been removed to the mobile aqueous phase in large quantities. The recorded CEC; 49.09 meq/100g, pH_{ZPC}; 4.64, specific surface area; 9.25 m^2/g and material characteristics led to the conclusion that the soil is rich in kaolinite and poor in organic matter. These findings suggest that the heavy metal retention capabilities of the landfill are decreasing, thus, a considerable amount of heavy metal can penetrate into the surrounding environment by passing through soils to ground water and surface water. Consequently, mitigation of this serious threat to the environment requires urgent remedial measures.