

Assessment of Heavy Metal Contamination in Soils and Vegetation: A Case Study of Korle Lagoon Reclamation Site

EMMANUEL ADDAE

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ABSTRACT

This study investigated the concentration of heavy metals and vegetation around the Korle Lagoon Reclamation site in Accra (Ghana). The dispersion of heavy metals such as Pb, Hg, Cd, As, Zn, Sn, Ni, Cu and Cr within the soil profile from a depth of 0 - 60cm {at 20cm intervals} were assessed. A total of ninety (90) soil samples were taken from the e-waste zone (EW), central gardens zone (GZ), recreational zone (KD), reclaimed zone (RZ) and estuary zone (ES) and eighteen (18) soil samples were sampled from the control zone (CZ) at the Korle-Bu flats. Ten (10) samples of forage grasses (*Panicum maxima* and *Imperata cylindrical*) were also taken from each of the sampling zones and ten (10) samples each of lettuce (*Latuca sativa*) and bissap (*Hibiscus sabdariffa*) were taken from central garden zone (GZ) and the control zone (CZ). At the depth of 0 - 20cm, the ranges of heavy metal concentrations recorded were Hg «0.001 - 0.67), Pb (1.28 - 183.66), Cu (3.47 - 202.99), Zn (0.83 - 37.33), Cr (2.28 - 56.00), Cd «0.001 - 103.66), Ni (0.91 - 72.00), Sn (8.77 - 705.32) and As (0.04 - 3.67) in mg/kg. At the depth of 20 - 40cm, Hg «0.001 - 0.67), Pb (1.12 - 167.96), Cu (2.57 - 199.99), Zn (0.73 - 34.33), Cr (0.11 - 49.99), Cd (0.04 - 68.32), Ni (0.55 - 66.65), Sn (8.67 - 334.25) and As (0.21 - 15.66) in mg/kg. At the depth of 40 - 60cm, Hg (0.00 - 0.00), Pb (0.96 - 134.00), Cu (1.49-98.66), Zn (0.52 - 27.66), Cr (1.13 - 52.67), Cd (0.04 - 68.32), Ni (0.55 - 66.65), Sn (8.67 - 334.25) and As (0.21- 10.99) in mg/kg. The levels of Pb, Cd and As analyzed from some of the zones exceeded international thresholds for agriculture lands. The ranges of heavy metal concentrations in the vegetation were: Hg «0.001 - 0.08), Pb «0.001 - 36.72), Cd (0.16 - 1.64), Cr (0.24 - 3.84), Cu

(0.16 - 95.56), Zn (1.16 -34.92), Ni (0.40-7.00), As (0.001 - 0.32) and Sn (2.52 - 28.52) in mg/kg with Cu, Pb and Cd exceeding the acceptable limits of heavy metals in plants. The enrichment factor of the heavy metals had a general trend of $Cr = Ni < Zn < Cu < Hg < As < Pb < Cd < Sn$. The geoaccumulation index also had a general trend of $Cr < Ni < Zn < Cu < As < Cd < Pb < Hg < Sn$. The pollution index also recorded a general trend $Cr < Zn < Ni < As < Cu < Hg < Pb < Sn < Cd$. The presence of heavy metals in the vegetation from the other sampling zones may probably be due to frequent dumping of solid waste. The plants sampled are shallow rooted plants that absorb nutrient from the top soil. This might have contributed to the presence of heavy metals in their leaves since most of the heavy metals were within a depth of 0 - 20cm. The significantly high concentration of heavy metals such Cd, Pb and As in the soils and vegetation may have adverse effect on human health and grazing cattle from the Abossey Okai Zongo Community.

Supervisors

Prof. Frank K. Nyame

Dr. Benedicta Y. Fosu Mensah