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Ecological and Health Risk Assessment of the Heavy Metal Contaminant in Surface Soils around Effurun Market

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Abstract : Heavy metal contaminations in soil have received great attention. Anthropogenic activities such as vehicular emission, industrial activities and constructions have resulted in elevated concentration of heavy metals in the surface soils. The metal particles can be free from the surface soil when they are disturbed and re-entrained in air, which necessitated the need to investigate surface soil at market environment where adults and children are present on daily basis. This study assesses concentration of heavy metal pollution, ecological and health risk factors in surface soil at Effurun market. 8 samples were collected at household material (EMH), fish (EMFs), fish and commodities (EMF-C), Abattoir (EMA 1 & 2), fruit sections (EMF 1 & 2) and lastly main road (EMMR). The samples were digested and analyzed in triplicate for contents of Lead (Pb), Nickel (Ni), Cadmium (Cd) and Copper (Cu). The mean concentration of the Pb mg/kg (112.27 ± 1.12) and Cu mg/kg (156.14 ± 1.10) were highest in the abattoir section (EMA 1). The mean concentrations of the heavy metal were then used to calculate the ecological and health risk for people within the market. Pb contamination at EMMR, EMF 2, EMFs were moderately while Pb shows considerable contamination at EMH, EMA 1, EMA 2 and EMF-C sections of the Effurun market. The ecological risk factor varies between low to moderate pollution for Pb and EMA 1 has the highest potential ecological risk that falls within moderate pollution. The hazard quotient results show that dermal exposure pathway is the possible means of heavy metal exposure to the traders while ingestion is the least sources of exposure to adult. The ingestion suggested that children around the EMA 1 have the highest possible exposure to children due to hand-to-mouth and object-to-mouth behaviour. The results further show that adults at the EMA1 will have the highest exposure to Pb due to inhalation during burning of cow with tyre that contained Pb and Cu. The carcinogenic risk values of most sections were higher than acceptable values, while Ni at EMMR, EMF 1 & 2, EMFs and EMF-C sections that were below the acceptable values. The cancer risk for inhalation exposure pathway for Pb (1.01E+17) shows a significant level of contamination than all the other sections of the market. It suggested that the people working at the Abattoir were very prone to cancer risk.

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