

Ecological Risk Assessment of Informal E-Waste Processing in Alaba International Market, Lagos, Nigeria

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Abstract : Informal electronic waste (e-waste) processing is a crude method of recycling, which is on the increase in Nigeria. The release of hazardous substances such as heavy metals (HMs) into the environment during informal e-waste processing has been a major concern. However, there is insufficient information on environmental contamination from e-waste recycling, associated ecological risk in Alaba International Market, a major electronic market in Lagos, Nigeria. The aims of this study were to determine the levels of HMs in soil, resulting from the e-waste recycling; and also assess associated ecological risks in Alaba international market. Samples of soils (334) were randomly collected seasonally for three years from fourteen selected e-waste activity points and two control sites. The samples were digested using standard methods and HMs analysed by inductive coupled plasma optical emission. Ecological risk was estimated using Ecological Risk index (ER), Potential Ecological Risk index (RI), Index of geoaccumulation (Igeo), Contamination factor (Cf) and degree of contamination factor (Cdeg). The concentrations range of HMs (mg/kg) in soil were: 16.7-11200.0 (Pb); 14.3-22600.0 (Cu); 1.90-6280.0 (Ni), 39.5-4570.0 (Zn); 0.79-12300.0 (Sn); 0.02-138.0 (Cd); 12.7-1710.0 (Ba); 0.18-131.0 (Cr); 0.07-28.0 (V), while As was below detection limit. Concentrations range in control soils were 1.36-9.70 (Pb), 2.06-7.60 (Cu), 1.25-5.11 (Ni), 3.62-15.9 (Zn), BDL-0.56 (Sn), BDL-0.01 (Cd), 14.6-47.6 (Ba), 0.21-12.2 (Cr) and 0.22-22.2 (V). The trend in ecological risk index was in the order Cu > Pb > Ni > Zn > Cr > Cd > Ba > V. The potential ecological risk index with respect to informal e-waste activities were: burning > dismantling > disposal > stockpiling. The index of geo accumulation indices revealed that soils were extremely polluted with Cd, Cu, Pb, Zn and Ni. The contamination factor indicated that 93% of the studied areas have very high contamination status for Pb, Cu, Ba, Sn and Co while Cr and Cd were in the moderately contaminated status. The degree of contamination decreased in the order of Sn > Cu > Pb >> Zn > Ba > Co > Ni > V > Cr > Cd. Heavy metal contamination of Alaba international market environment resulting from informal e-waste processing was established. Proper management of e-waste and remediation of the market environment are recommended to minimize the ecological risks.

Keywords : Alaba international market, ecological risk, electronic waste, heavy metal contamination

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