Application of field portable XRF for in-situ screening of heavy metal contamination of Jamaican soils

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Lead poisoning cases in Jamaica have been primarily associated with backyard lead smelting of used lead-acid batteries. The Mona Commons squatter community, located in Kingston, St Andrew is a lead-smelting residential community that was severely contaminated with lead over the past decades. Lead has been found in yard soils at concentrations up to 30,000 mg/kg. Over seventy children were found to be lead-poisoned in 2004 and have received medical intervention.

A follow-up study was initiated in 2009 to determine the extent of the lead contamination and evaluate the potential risk to residents. The methodology for field-screening of lead was based on the EPA Method 6200 and included analysis of in-situ and ex-situ soil samples. Soil and house dust samples were collected from the community and numerous interviews were conducted with residents.

Soil and dust samples were analysed with the hand-held NITON XL3t XRF analyzer using the Fundamental Parameters Bulk Sample Analysis Mode. The in-situ screening of the study area (300x200m) provided rapid semi-quantitative assessment of lead and other heavy metal contamination boundaries. Samples for ex-situ analysis were collected in plastic bags, air-dried and sieved to <2mm to produce homogeneous and representative samples.

The data obtained were used to generate a GIS map of lead distribution in the study area. The map indicated that the initial lead contamination, concentrated around the former smelter, has spread over the past 5 years in a much wider area. Approximately 1/3 of the residential soils are above the safe limit for lead in soil set by the US EPA. The results obtained were used to design a mitigation campaign which includes soil encapsulation, medical intervention and public education on lead safety and health protection.