

# **X-Ray Fluorescence (XRF) Analysis of Soil Heavy Metal Pollution From An Industrial Area - a case study of “Suame-Magazine” in Kumasi, Ghana.**

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## **Abstract**

The research is aimed to investigate the extent of heavy metal pollution in the surface soils at “Suame-Magazine” industrial area of Kumasi, and to verify any significant industrial impact. Concentrations of nine (9) heavy metals (Zn, Pb, Cr, Cu, Co, Ni, Cd, Hg, and As) were qualitatively and quantitatively measured and examined from six (6) sampling sites, using X-ray Fluorescence (XRF) analysis. Four (4) out of the six (6) sampling sites were selected from areas of high industrial impact due to the chemical and metallurgical activities highly embarked on at the area. Whereas, the other two (2) were residential communities relatively of low industrial activity selected in close proximity to the previous region. The results from locations of high industrial impact showed that, the mean concentration of zinc present in the soil ranges from 189.2- 908.6 mgkg<sup>-1</sup>, lead values were in the range of 133.7- 571.3 mgkg<sup>-1</sup>, Chromium concentration varies from 91.3 - 545.8 mgkg<sup>-1</sup>, the concentration of copper ranged from 62.9 - 334.6 mgkg<sup>-1</sup>, concentration values for cobalt, nickel, cadmium, mercury, and arsenic were respectively in the range 38.6 - 81.9 mgkg<sup>-1</sup>, 12.4 - 30.9 mgkg<sup>-1</sup>, 6.9 - 13.2 mgkg<sup>-1</sup>, 5.5 - 10.4 mgkg<sup>-1</sup> and 2.3 - 18.6 mgkg<sup>-1</sup>. Apart from nickel and arsenic, all the heavy metals recorded values extremely high above their respective threshold limit values (TLVs). However, comparing these concentrations with those obtained from locations of low industrial activity, relatively very low heavy metals were recorded, with chromium, cadmium and mercury being the heavy metals which were recorded in enhanced levels far above their TLVs. Considering all the heavy metals obtained at the study area, Zn, Pb and Cr dominated in all the investigated zones of high industrial impact. This is attributed to the indiscriminate disposal of industrial waste as well as anthropogenic point source contamination. The extremely high contents of the heavy metals generally recorded at the study area are terribly alarming in terms of environmental pollution. Therefore, the inhabitants (mostly children) and the numerous workers, who reside and work at such polluted environment, are at serious risk of heavy metal toxicity and awareness needs to be created as such.

**Keywords:** Heavy metals, Soil, X-ray Fluorescence (XRF), Pollution, Concentration, contamination, Toxicity, Threshold Limit Values (TLVs), “Suame-Magazine”, Toxicity, Environment.

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