

Soil Heavy Metal Pollution along Subin River in Kumasi, Ghana; Using X-Ray Fluorescence (XRF) Analysis.

K. Kodom^{1*}, J. Wiafe-Akenten¹, D. Boamah².

¹**Department of Physics, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.*

²*Geochemistry & Laboratories, Geological Survey Department, Accra, Ghana.*

Abstract

This study is aimed to analyze and assess the existence of heavy metal pollution in the surface soils along Subin River in the Kumasi metropolis, using X-Ray Fluorescence (XRF) analysis. Twenty (20) soil samples were collected along the River at regular interval of 5m (covering entire area of about 100 m²), with the aid of a core sampler. The samples were suitably packaged and conveyed into the laboratory for sample preparation and analysis. The concentration of nine (9) heavy metals of interest (Cr, Cu, Pb, Hg, Ni, Zn, Tl, V and Cd) were measured and quantified (mgkg⁻¹) after the elemental analysis using XRF spectrometry, and their respective average concentrations (121.89 mgkg⁻¹, 49.24 mgkg⁻¹, 80.84 mgkg⁻¹, 2.52 mgkg⁻¹, 17.01 mgkg⁻¹, 148.08 mgkg⁻¹, 3.21 mgkg⁻¹, 84.40 mgkg⁻¹, and 4.05 mgkg⁻¹) were attained.

According to these results, the presence of heavy metals such as (Pb, Cd and Hg) present in the soil, were highly recorded above their threshold limit values (TLVs) by an amount of 60.84 mgkg⁻¹, 3.05 mgkg⁻¹ and 1.52 mgkg⁻¹ respectively. These metals are highly toxic even in very low concentrations, and their toxicity and poisoning in living organisms often occur through exchange and co-ordination mechanisms in the soft tissues. These high excess concentration values alarmingly depict that, the study site is highly polluted with those metals, and the Subin river-body and the inhabitants who reside closely to the polluted river, are at serious risk. The extent to which the study area is polluted, was successfully and statistically analyzed from the standard deviation (σ) and difference between the average concentration values recorded, and the TLVs.

Keywords: Soil, Heavy metals, X-Ray fluorescence (XRF), Pollution, contamination, Toxicity, Threshold Limit Values (TLVs)

*Correspondence. Tel: +23324 4868221.

E-mail: (kwakingko@yahoo.co.uk),