

## **Health risk assessment of heavy metal in urban surface soil (Klang district, Malaysia)**

### **ABSTRACT**

Urban environmental quality is vital to be investigated as the majority of people live in cities. However, given the continuous urbanization and industrialization in urban areas, heavy metals are continuously emitted into the terrestrial environment and pose a great threat to human. In this study, a total of 76 urban surface soil samples were collected in the Klang district (Malaysia), and analyzed for total and bioavailable heavy metal concentrations by inductively coupled plasma-optical emission spectrometry. Results showed that the concentrations of bioavailable heavy metals declined in the order of Al, Fe, Zn, Cu, Co, Cd, Pb, and Cr, and the concentrations of total heavy metals declined in the order of Fe, Al, Cu, Zn, Pb, Cr, Co, and Cd. Principal component analysis (PCA) showed that heavy metals could be grouped into three principal components, with PC1 containing Al and Fe, PC2 comprising Cd, Co, Cr, and Cu, and PC3 with only Zn. PCA results showed that PC1 may originate from natural sources, whereas PC2 and PC3 most likely originated from anthropogenic sources. Health risk assessment indicated that heavy metal contamination in the Klang district was below the acceptable threshold for carcinogenic and non-carcinogenic risks in adults, but above the acceptable threshold for carcinogenic and non-carcinogenic risks in children.

**Keyword:** Bioavailable; Health risk assessment; Heavy metal; Total; Urban surface soil