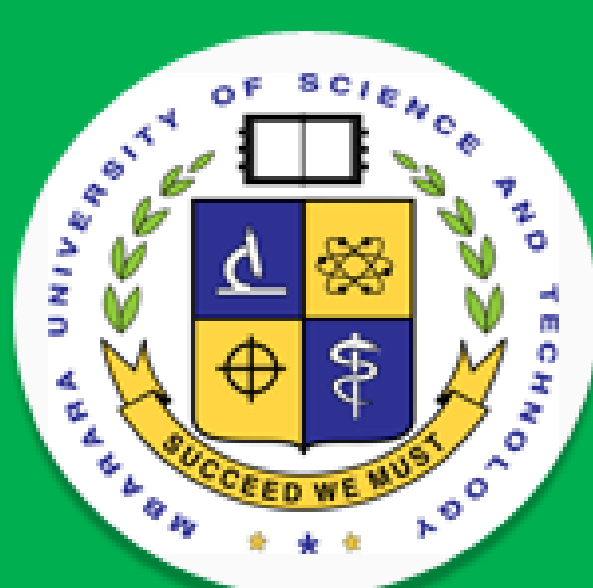




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Urban exposure to toxic metals in rapidly growing African cities: Evidence from street dust in Mbarara City, Uganda



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Introduction

Dust is a mixture of pollutants such as particulate matter, potentially toxic elements (PTEs), fly ash and micro-nanoplastics. [1]

Speciation provides a more accurate measure of PTE's mobility, bioavailability, and potential toxicity by distinguishing between easily exchangeable and tightly bound metal fractions [2].

Methods

Street dust (n = 36) were sampled from three streets of Mbarara city, Uganda (**Figure 1**).

The total concentration and speciation of ten PTEs were determined using Energy Dispersive X-ray Fluorescence spectroscopy and Inductively Coupled Plasma-Optical Emission Spectrometry. [3]

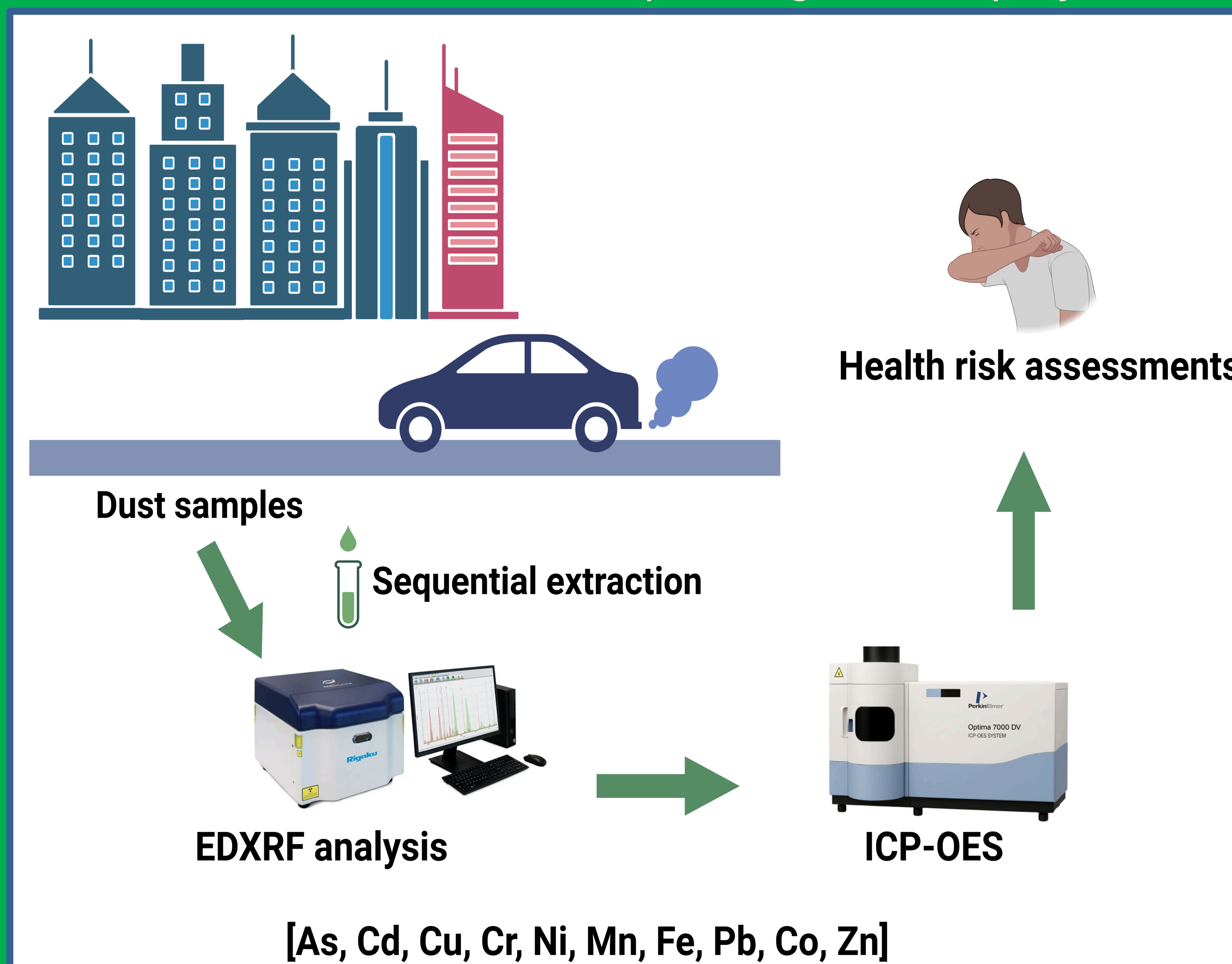


Figure 1. Analytical workflow followed in the present study

Results

Total concentrations of PTEs in dust ranged from 0.27 mg/kg for Cd to 36,401.50 mg/kg for Fe ($P > 0.05$). Cd, Pb, Co and Zn were 1.5 to 6.8 folds higher than their average concentrations in the global shale and (upper) continental crust.

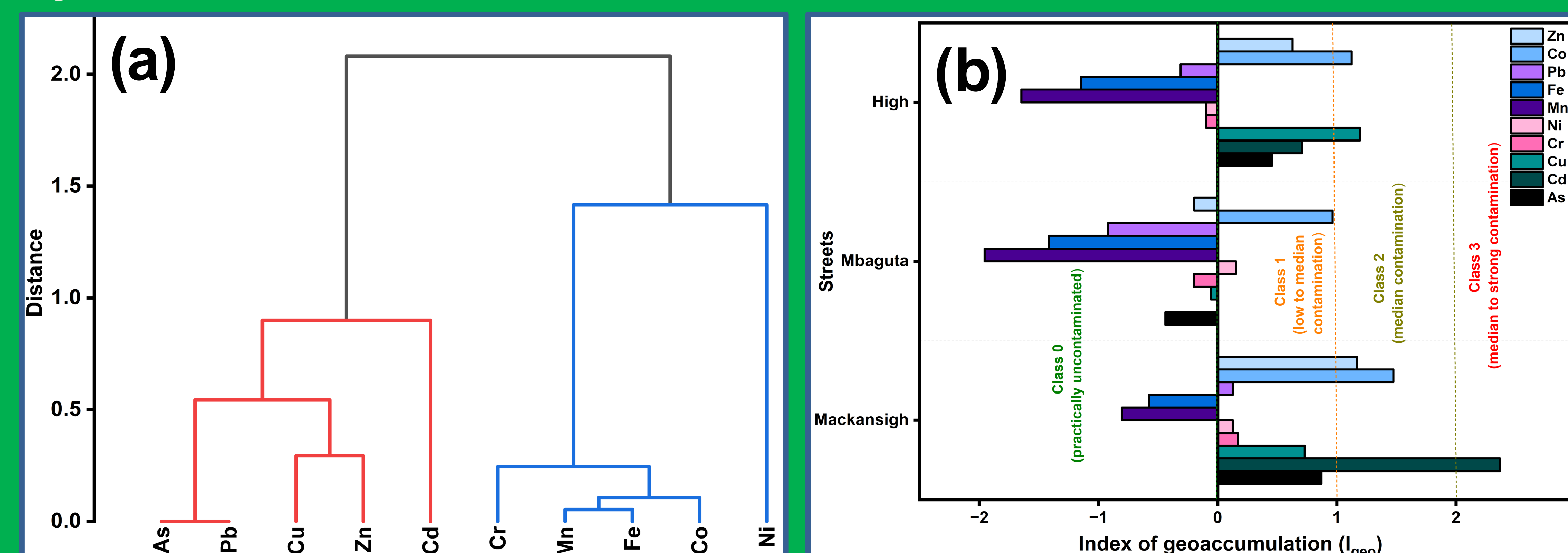


Figure 2. (a) Dendrogram showing the clustering of PTEs, and (b) the Index of geoaccumulation, showing enrichment of PTEs in dust.

Non-carcinogenic health risks (due to Fe and Co) and carcinogenic health risks (due to As, Cr, Ni, Cd and Pb) could be associated with the ingestion of dust by both adults and children, and children, respectively.

Conclusions

There is a combined influence of anthropogenic and geogenic sources on PTE concentrations in street dust. Future research should focus on temporal dynamics of PTEs in the street dust, and the evaluation of control measures such as street cleaning and urban greening.

