

Status, source identification, and health risks of potentially toxic element concentrations in road dust in a medium-sized city in a developing country

ABSTRACT

This study aims to determine the status of potentially toxic element concentrations of road dust in a medium-sized city (Rawang, Malaysia). This study adopts source identification via enrichment factor, Pearson correlation analysis, and Fourier spectral analysis to identify sources of potentially toxic element concentrations in road dust in Rawang City, Malaysia. Health risk assessment was conducted to determine potential health risks (carcinogenic and non-carcinogenic risks) among adults and children via multiple pathways (i.e., ingestion, dermal contact, and inhalation). Mean of potentially toxic element concentrations were found in the order of $Pb > Zn > Cr(IV) > Cu > Ni > Cd > As > Co$. Source identification revealed that Cu, Cd, Pb, Zn, Ni, and Cr(IV) are associated with anthropogenic sources in industrial and highly populated areas in northern and southern Rawang, cement factories in southern Rawang, as well as the rapid development and population growth in northwestern Rawang, which have resulted in high traffic congestion. Cobalt, Fe, and As are related to geological background and lithologies in Rawang. Pathway orders for both carcinogenic and non-carcinogenic risks are ingestion, dermal contact, and inhalation, involving adults and children. Non-carcinogenic health risks in adults were attributed to Cr(IV), Pb, and Cd, whereas Cu, Cd, Cr(IV), Pb, and Zn were found to have non-carcinogenic health risks for children. Cd, Cr(IV), Pb, and As may induce carcinogenic risks in adults and children, and the total lifetime cancer risk values exceeded incremental lifetime.

Keyword: Health risks; Road dust; Source identification; Toxic element; Urban area