Pollution level, distribution and health risk assessment of some potentially harmful elements in road dust from steel-industry city, China

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The road dust samples were collected from Panzhihua City, Sichuan, Southwest China and analyzed for chromium, nickel, copper, cadmium and lead. The pollution level of the road dust was assessed by geo-accumulation index (I_{geo}), ecological risk (E^i_r) and potential ecological risk index (PRI). The health risk of human exposed to potentially harmful elements was evaluated by hazard index (HI) and carcinogenic risk (RI). The results indicated that the mean concentrations of Cd, Cr, Cu, Ni and Pb in road dust samples were 2.29, 700.20, 163.74, 83.50 and 272.00 mg/kg, respectively.

The spatial distribution maps of potentially harmful elements revealed that steel industrial district and heavy traffic could serve as the contamination hotspots. The calculated I_{geo} for the potential harmful elements ranged from uncontaminated to serious contaminated levels. The findings of E^i_r showed that low (Cd, Cr and Ni) to moderate (Cu and Pb) risks, while those of PRI indicated 64% and 36% samples with low and moderate risks, respectively. The HI values of Cr (3.81) and Pb (1.13) for children were higher than the safe level 1, indicating that children are facing excessive threats of Cr and Pb. Conversely, the RI values of Cd, Cr and Ni fell within the threshold value range of 1E-04 - 1E-06, indicating that children and adults are at acceptable or tolerable risk of potentially harmful elements.