Characterisation of soil quality and mobility of Cd, Cu, Pb and Zn in the Baia Mare area Northwest Romania following the historical pollution

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Abstract

The paper presents a characterisation of the soil quality and mobility of Cd, Cu, Pb and Zn in the Baia Mare city, northwest Romania, historically polluted with airborne particulate matter resulted from non-ferrous ores processing. Although the impact of the ores smelters on the environment is relatively limited today, Baia Mare is still a highly polluted site with Cd, Pb, Cu and Zn. The concentration ranges of metals in soil were (mg kg^{-1}): 1.9-25.4 Cd, 87.7-9880 Pb, 78.3-962 Cu, 109-11500 Zn, of which in (%): 1.3-80; 2.2-40; 2.0-34 and 0.3-21 as mobile species in 0.005 mol L^{-1} diethylenetriaminepentaacetic acid (DTPA). Baia Mare is more polluted with Cu, Pb and Zn than Copsa Mica and Cu, Pb than Zlatna, other smelter centres in Romania. Also, pollution is higher compared to similar centres in Europe. Cd, Pb and Cu are the most severe contaminants as available species for plants and should be considered in the soil remediation strategy. The PCA on metal contents following aqua regia mineralisation and DTPA extraction allowed the identification of anthropogenic origin from three sources associated with the Flotation Station (residual species), Cuprom plant (Cu, Cd and Zn mobile species) and Romplumb plant (Pb mobile species). The car traffic as anthropogenic source does not modify the pollution pattern caused by industrial activity since no association between Pb

and Zn was found. On the other hand, an affinity between Cd and Zn as well as between Cu and Pb were also identified. A particular case is that of Cu, for which the PCA revealed an interference of polluters. Statistics are in agreement with the distribution maps of contaminants.

Keywords: soil contamination; historical pollution; heavy metals; DTPA extractable metals, PCA