

Assessing the contamination level of soils with heavy metals and rare earth elements around a Pb/Zn abandoned mining site in the northeastern region of Morocco

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The lead-mining districts of the Upper Moulouya (Aouli-Mibladen, Zeïda) in eastern Morocco, were the largest Pb-Zn mining districts in Morocco during the last century. The operation at the mine Zeïda (1972-1985) generated locally about 12 million tonnes of treatment tailings. Measurement of metals total concentration in soils is a valid approach to study the degree and extent of contamination in the soil system (Li and Thornton, 2001), however, the use of different pollution indices and multivariate statistical techniques is required for assessing the potential harm of the measured concentrations on the environment (Varol, 2011, Kalender, 2013). The contamination assessment was performed based on the levels of Pb, Zn, Ba, Co, Cr, Nb, Ni, Sr, V, Zr, Sc, Y, La, Ce, Nd, Sm, Eu, Gd, Er, Yb, Th, Ga, Rb, Hf. The evaluation of the potential accumulation of chemical elements in soil layers was determined using the geo-accumulation index (I_{geo}), contamination factors (Cf), pollution load index (PLI) and the Potential ecological risk index (E^i_r), the statistical analyses were carried out using XLSTAT - 2014.5.03, and IBM SPSS statistics 22. Geochemical and contamination distribution maps were obtained using the software ArcGIS 10.3.