

Article

Identifying Sources and Assessing Potential Risk of Exposure to Heavy Metals and Hazardous Materials in Mining Areas: The Case Study of Panasqueira Mine (Central Portugal) as an Example

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Abstract: The Sn-W Panasqueira mine, in activity since the mid-1890s, is one of the most important economic deposits in the world. Arsenopyrite is the main mineral present as well as rejected waste sulphide. The long history is testified by the presence of a huge amount of tailings, which release considerable quantities of heavy metal(loid)s into the environment. This work assesses soil contamination and evaluates the ecological and human health risks due to exposure to hazardous materials. The metal assemblage identified in soil (Ag-As-Bi-Cd-Cu-W-Zn; potentially toxic elements (PTEs)) reflects the influence of the tailings, due to several agents including aerial dispersion. PTEs and pH display a positive correlation confirming that heavy metal mobility is directly related to pH and, therefore, affects their availability. The estimated contamination factor classified 92.6% of soil samples as moderately to ultra-highly polluted. The spatial distribution of the potential ecological risk index classified the topsoil as being of a very high ecological risk, consistent with wind direction. Non-carcinogenic hazard of topsoil, for children (1–6 years),