



## **Sustainable geoengineering projects for the remediation of mine site**

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A large number of soils are contaminated by heavy metals due to mining activities, generating adverse effects on human health and the environment. In response to these negative effects, a variety of technologies have been developed. In situ immobilization by means of soil amendment is a non-intrusive and cost effective alternative that transforms the highly mobile toxic heavy metals to physico-chemically stable forms. Limestone filler is a good selection for such a purpose, because of its characteristics. In addition, the use of this amendment could revalorize the residues, reducing the costs of the process. The objective of this work was to evaluate the effectiveness of an immobilization technique in sediments contaminated by heavy metals. Two experimental areas, approximately 1 Ha each one, were selected, and technosols were developed as follows: original sediments, sediments mixed with limestone filler in a 1:1 proportion, gravel to avoid capillary and natural soil to allow plant growth. After the remediation technique was applied, monitoring was done in 18 points collecting samples (sediment and water) during a 4 years period at two month intervals. The pH and electrical conductivity as well as the heavy metal (Zn, Pb, Cd, Cu and As) contents were measured. Microtox bioassay was also applied. Sediments before the remediation technique showed acidic pH, high EC values and high trace elements content. The results obtained after the immobilization showed that sediment samples had neutral pH (average value of 8.3) low electrical conductivity (1.32 dS m<sup>-1</sup>) and low trace elements concentration. It can be concluded that the use of limestone filler is an excellent option in sediments polluted because of the risk for human health or ecosystem disappears or is decreased in a large extent. In addition, the designed experience allows stabilizer proportion to be optimized and may suppose a big cost-saving in the project in areas affected by mining activities.