



## Resolving of environmental problems caused by the processing of copper ore

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Constant and increasing need of raw materials for industry and energetic require to perform new geological studies and exploitation of ores. Various mining resources find application in different sectors of manufacturing, construction, transport, and human development. However, intensive mining and processing of minerals have negative impact on pedosphere. This paper deals with effects of technical and biological reclamation of storage for Industrial Waste Products (IWP) from copper ore.

The study examines "Elshitsa" tailing pond, located in the village of Elshitsa, Panagyurishte municipality, Bulgaria. The site and adjacent areas are characterized by porphyry copper ore manifestations, pyrite and copper-pyrite mineralization with volcano-hydrothermal origin. The vegetation is represented by forest communities formed by *Quercus cerris* L., *Q. frainetto* Ten. and *Q. dalechampii* Ten. Negative impact of tailing pond on the environmental components is result of toxic characteristics of the IWP (tailings). The analyses showed that both the presence of tailing in soils and the influence of wind dust caused changes in soil properties and characteristics, expressed in strongly decreased pH and concentrations of Cu, Fe, and Cd in RSGs which exceeded the Limit of Permissible Concentrations (LPC). The copper content in studied soils ranged from 14.5 to 154.5 mg kg<sup>-1</sup>, which exceeds 20 times the content of this element in natural reference soil groups in Bulgaria. Zinc showed slightly increase compared to the average levels for Bulgaria. In depth of the soil profile differentiation is not apparent. In studied soils zinc ranged from 15.5 to 107 mg kg<sup>-1</sup>. Cadmium content varied between 1.0 – 2.5 mg kg<sup>-1</sup>.

Restoration of damaged and contaminated sites was carried out in two stages – engineering-technical reclamation and biological reclamation. Combined usage of sludge from Plovdiv Treatment Plant for Waste Water, encapsulation of tailing surface with a polymer - Soil Cement and appropriate selection of grass species formed a tightly sealed cover.

The assessment of reclaimed site showed that the strong anthropogenic pollution of the environment components is stopped quickly with effective technological solution for reclamation. There is no negative impact on surface runoff and there are no pollutants to be controlled. The analysis of crop production from the site (grass mixture grown on reclaimed terrain) shows that levels of heavy metals in plant materials are within safe concentrations.