



## Recovering abandoned mine area under semi-arid conditions with Technosols: a pilot assay in São Domingos legacy site

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In Portugal, there are numerous abandoned mines, many of them derived from an intense activity in massive sulfides. These areas have several environmental problems associated to extreme physicochemical characteristics of their wastes and leachates.

In São Domingos mine, there is an additional environmental problem derived from the percolation of acid mine drainage over the slopes. This measure, used in environmental management of waters, contributed to the total degradation of the edaphic system and enrichment of bedrock in potentially toxic elements (PTE). A sustainable strategy for environmental recovery using Technosols, designed specifically for each contaminated or degraded material, has been evaluated in this scenario. A pilot area, with 1.5 ha, was rehabilitated by applying a 40 cm layer of Technosol with alkaline and eutrophic properties. A biodiverse plant system with herbaceous and shrubs was applied. The efficiency of the Technosol was evaluated at short-medium term by: a) several indicators associated to plant development (visual signs of phytotoxicity or nutritional deficiency, percentage of plant cover and height) after 15 days, 1, 3 and 6 months, and b) the maintenance of soil properties after 6 months. An area without Technosol application was used as control.

In Control area, plant cover was low, with maximum values of 8.8% in the third month and height <10 cm. However this vegetation cover was not with the sown plants but only native species, like *Spergularia purpurea* (dominant species identified) that already existed in the area.

In the area with Technosol application, the plants did not show visible signs of phytotoxicity or nutritional deficiency. The percentage of plant cover increases rapidly. After 15 days plant cover was 10–30% and between first and third month, when there were warmer and dry conditions, the coverage increased to 70% and 90%, respectively. After 6 months, coinciding with a change in the vegetative cycle and very dry and hot period from summer, the vegetation only decrease ≈10%.

The height varied between 40 to 60 cm, reaching these maximum values in the third month. The plant development remained during the monitoring period. This plant evolution shows the significant water-holding capacity and fertility of the Technosol.

After 6 months, Technosol samples maintained the alkaline and eutrophic properties and physico-chemical characteristics (pH 7.5–7.8, 85 g C/kg, 6 g N/kg, Capacity of cation change 54.3–73 cmol+/kg). In the Technosol was not verified an enrichment by PTE, due to its direct contact with acidic and contaminated material. In Control area, the substrate maintained acidic reaction conditions (pH 3.5–3.6), very low fertility and high concentration of several elements.

Application of the Technosol contributed to the environmental recovery of mine areas, with very acid material with multielementar contamination where it is inexistent an edaphic system. This green technology is an effective solution to the conversion non-productive areas to productive areas.

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