

Environmental Assessment of an Active Tailings Pile in the State of Mexico (Central Mexico)

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Abstract: As part of the assessment of an active tailings pile, water and sediment samples were collected in different locations (10 in water, 8 in tailings and 5 in sediments across the El Ahogado River) in dry and wet season of the years 2005, 2006 and 2007 to determine acid mine drainage pollution (AMD). Chemical composition of water differentiate between two zones: 1) Zone of influence of AMD (inner zone), where water is highly acidic (pH 2.5), metals (in mgL^{-1}) such as As (0.095-0.1), Cd (0.04-0.2), Fe (0.35-88.56), Mn (0.06-12.81), Pb (1.47-5.6), Zn (0.48-46.2), as well as sulfates (up to 4880 mgL^{-1}) are above the maximum permissible limits (MPL) for human consumption and 2) zone out of influence of AMD (outer zone), where waters are from less acidic to alkaline (pH 3.54-8.76), and metals such as As (0.1-0.2), Cd (0.36-0.9), Fe (0.03-18.8), Mn (0.03-39.5), Pb (0.13-5.02), Zn (0.06-307), as well as sulfates (up to 4650 mgL^{-1}) still exceed the MPL also. In the outer zone, chemical pollution can be related to natural weathering of rocks in the study area. On the other hand, two methods were applied to calculate sediment pollution: 1) Enrichment Factor (EF), which indicates that Fe and Ba were the metals in pollutant levels, while As, Zn, Cu and Pb were in lower concentrations in unpolluted sediments (P1, P2, P3, and P4) located upstream the tailings pile. 2) The geoaccumulation index (I_{geo}), indicates that there is null pollution with respect to Ba, while metals such as As, Cu, Pb and Zn showed null to moderate capacity to pollute superficial water. Only Fe showed to be consistent with the first method (EF) and has moderately capacity to pollute. This method is more reliable than the former, due to the fact that it considers local background levels.

Key words: Sediment pollution, enrichment factor, geoaccumulation index, El Ahogado River