

Impact of Mining and Ore Processing on Soil, Drainage and Vegetation in the Zambian Copperbelt Mining Districts: A Review

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The regional environmental–geochemical surveying of the long-term impacts of mining and ore processing on a large part of the Zambian Copperbelt mining districts was carried out in the period 2002–2024. This included the characterization of various sources of contamination, the extent of contamination of soils and crops, and the degree of contamination of river water and sediments. Solid speciation studies of potentially harmful chemical elements (PHEs) isotope studies of Cu and Sr and plant and human bioaccessibility studies were used to assess the pathways of PHE cycling in terrestrial and aqueous systems and their impacts on human health. Ores of the Zambian Copperbelt mining districts are mined for Cu and Co, but a number of other trace elements (Pb, As, Cd, Hg, Pb, Zn) gradually accumulated in soils and stream sediments. It was concluded that the most important environmental problems are due to dust fall out from tailing facilities and emissions from smelters. Moreover, leakages of solutions from tailing dams cause a local contamination of water courses and deposition of metal(loids) in stream sediments. We also recommend measures that could contribute to minimizing the impact of ore mining and processing on the environment and the health of local population. The measures include a rigorous implementation of current legislation, long-term monitoring of air and water conditions, and, in particular, improving the quality of the EIA reports. Moreover, the capacity building of state organizations should be accompanied by close cooperation with academic and research centers that can provide excellent background knowledge to assess the pathways of the contaminants' dispersal and their attenuation. Last but not least, the strengthening of interest of the local population and local administrations in improving the environment and establishing non-governmental interest groups that would force mining companies to fulfill their environmental obligations. Public awareness of environmental issues should be promoted, especially in local schools, parishes, and communities.

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