CHARACTERIZATION OF MINE WASTES AS A POTENTIAL SOURCE OF HEAVY METALS PROPAGATION TO NEARBY SOILS (CASE OF THE FORMER KIPUSHI CONCENTRATOR)

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This paper is the result of a research study to characterise the tailings piles of the former Kipushi concentrator in D.R. Congo, stocked for more than 50 years in an opened park, as a potential source for the dissemination of heavy metals in the surrounding soils.

Heavy metals, once introduced into the environment by a particular method, can spread to different environmental components (soils, water, sediments, plants, undergrounds) which can be caused by the type of interactions occurring in this natural system and they can interact chemically or physically with the natural compounds, which changes their forms of existence in the environment [1]. The stockpiled tailings at Kipushi (DR Congo) contain pyrite and metal sulfides and pose a constant risk of physico-chemical instability and leakage, which is reflected in the degradation of the surrounding environment such as rivers, soil, groundwater levels, etc. In addition, the dispersion and dispersion of trace metal elements (TME) such as cadmium, cobalt, arsenic, iron, copper, lead and zinc lead to erosion and runoff phenomena in the rainy season and the formation of particles in the air in the dry season. They have undergone partial oxidation [2]. The main purpose of this paper is to characterise the contamination of the soil by the presence of the studied mine deposits and to make its own assessment. It will also be very important to make a characterization of the distribution of copper, cobalt, and other metals in the soil to evaluate the risks and consider accurate ways of prevention. To achieve these objectives, systematic stratified sampling, good sample preparation, characterization of rock loading, chemical analysis and statistical analysis have been carried out to better assess the spread of metals from mine waste to nearby natural soils. The results show that the average concentrations of the metals in the soils gradually decrease as one moves further away from the waste park. In the three layers studied (bare sediments, scattered and compacted vegetation patches) we had an average copper concentration of 1291.3 mg/kg for the first layer, 1200.3 for the second and 187.2 mg/kg for the third. For cobalt, values were 76.79 mg/kg, 61.58 mg/kg, and 32.48 mg/kg, respectively. For lead, the average concentration varied between 767.7 mg/kg and 574.5 mg/kg for the first two layers and dropped to 29.5 mg/kg for the third layer.

This work makes it possible to assess the impact of copper, cobalt, and other metals from the second tailings pile of the old Kipushi concentrator on the natural surrounding grounds to evaluate the risks for environmental pollution.
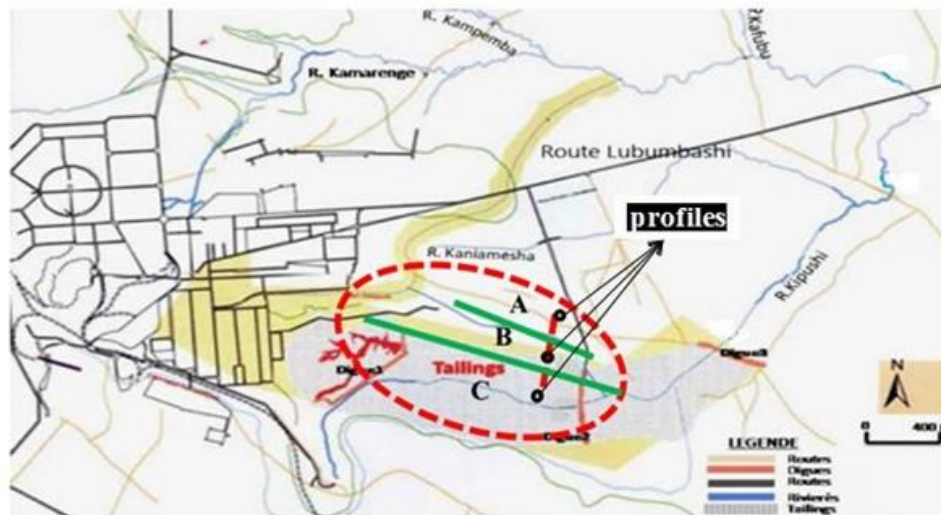
Рис. 1. Sampling site location [3]

1. A. Dube, R. Z, Adsorption and Migration of Heavy Metals in soils. Polish Journal of Environmental Studies Vol. 10. 1-10 (2001).
2. W. Kitobo, Detoxification and utilisation of sulphide mining waste from Katanga (case of tailings from the former Kipushi concentrator. Liege. (2009).
3. N.W. Muyumba, K. K, Contribution of trace metals in water from the underground mining of Kipushi in Kafubu river (DR Congo). International Journal of Innovation and Applied Studies. 864-871 (2016).