

Assessment of Environmental Mercury Contamination from an Old Mercury Processing Plant 'Thor Chemicals' in Cato Ridge, KwaZulu-Natal, South Africa

Authors : Yohana Fessehazion

Abstract : Mercury is a prominent example of a heavy metal contaminant in the environment, and it has been extensively investigated for its potential health risk in humans and other organisms. In South Africa, massive mercury contamination happened in 1980s when the England-based mercury reclamation processing plant relocated to Cato Ridge, KwaZulu-Natal Province, and discharged mercury waste into the Mngceweni River. This mercury waste discharge resulted in high mercury concentration that exceeded the acceptable levels in Mngceweni River, Umgeni River, and human hair of the nearby villagers. This environmental issue raised the alarm, and over the years, several environmental assessments were reported the dire environmental crises resulting from the Thor Chemicals (now known as Metallica Chemicals) and urged the immediate removal of the around 3,000 tons of mercury waste stored in the factory storage facility over two decades. Recently theft of some containers with the toxic substance from the Thor Chemicals warehouse and the subsequent fire that ravaged the facility furtherly put the factory on the spot escalating the urgency of left behind deadly mercury waste removal. This project aims to investigate the mercury contamination leaking from an old Thor Chemicals mercury processing plant. The focus will be on sediments, water, terrestrial plants, and aquatic weeds such as the prominent water hyacinth weeds in the nearby water systems of Mngceweni River, Umgeni River, and Inanda Dam as a bio-indicator and phytoremediator for mercury pollution. Samples will be collected in spring around October when the condition is favourable for microbial activity to methylate mercury incorporated in sediments and blooming season for some aquatic weeds, particularly water hyacinth. Samples of soil, sediment, water, terrestrial plant, and aquatic weed will be collected per sample site from the point of source (Thor Chemicals), Mngceweni River, Umgeni River, and the Inanda Dam. One-way analysis of variance (ANOVA) tests will be conducted to determine any significant differences in the Hg concentration among all sampling sites, followed by Least Significant Difference post hoc test to determine if mercury contamination varies with the gradient distance from the source point of pollution. The flow injection atomic spectrometry (FIAS) analysis will also be used to compare the mercury sequestration between the different plant tissues (roots and stems). The principal component analysis is also envisaged for use to determine the relationship between the source of mercury pollution and any of the sampling points (Umgeni and Mngceweni Rivers and the Inanda Dam). All the Hg values will be expressed in $\mu\text{g/L}$ or $\mu\text{g/g}$ in order to compare the result with the previous studies and regulatory standards. Sediments are expected to have relatively higher levels of Hg compared to the soils, and aquatic macrophytes, water hyacinth weeds are expected to accumulate a higher concentration of mercury than terrestrial plants and crops.

Keywords : mercury, phytoremediation, Thor chemicals, water hyacinth

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