

Geochemical Assessment of Heavy Metals in Soil, Sediment and Surface Water of Abandoned Mercury Mine Area, Palawan, Philippines

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Palawan Quicksilver Mines Inc. (PQMI) is an abandoned mercury mine located 3 kms. away from Honda Bay (HB). Cases of mercury poisoning via exposure to the mine tailings around the PQMI pit lake have been reported among the residents living in the area. This study aims to determine concentration and possible contamination of heavy metals in soil, sediments and surface water in the vicinity of PQMI area. Forty (40) soil and sediments samples and 53 water samples were analyzed using Inductively Coupled Plasma Mass Spectrometry (ICP-MS) and Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES) respectively for heavy metals while Direct Mercury Analyzer was used for to determine the Hg values.

The average concentration of heavy metals in soil and sediment samples followed the order, Ni> Cr> Hg> V> Zn> Cu> Ba> Pb> As> Tl> Cd. The concentrations of Hg, Cr and Ni in the samples exceeds the soil quality standard (CEQG, 2002). Based on Enrichment Factor (EF), all samples have extremely high enrichment of Hg. The sediments from the Honda Bay coast, wharf and islands have very high enrichment of As while soil from PQMI area has very high enrichment of Cr and Ni. The study area appears to be extremely contaminated by Hg based on its Index of Geoaccumulation (I_{geo}). PQMI area is moderately contaminated by Cr and heavily contaminated by Ni while HB areas are moderately contaminated by As.

Mean concentration of heavy metals in surface water followed the order Fe> Mn> Ba> Ni> Cr> Zn> Cu> As> Pb> Cd> Hg in both wet and dry seasons. The Ba and Mn levels in hot spring and PQMI lake exceeds the recommending limits for drinking water (DENR, 2016) respectively. The Heavy Metal Pollution Index (HPI) of the surface water ranges from 43.85 to 69.86 in wet season and from 43.93 to 45.21 in dry season. Based on Metal Index (MI), water from PQMI lake, hot spring and HB wharf are strongly to seriously affected by metal pollution (MI> 1). The MI of Tagburos River changes from 5.07 upstream to 12.29 downstream because the nearby landfill dumps its untreated leachate (MI=147) to the river.

