World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:18, No:04, 2024

Human Health Risk Assessment of Mercury-Contaminated Soils in Alebediah Mining Community, Sudan

Authors : Ahmed Elwaleed, Huiho Jeong, Ali H. Abdelbagi, Nguyen Thi Quynh, Koji Arizono, Yasuhiro Ishibashi

Abstract : Artisanal and small-scale gold mining (ASGM) poses substantial risks to both human health and the environment, particularly through contamination of soil, water, and air. Prolonged exposure to ASGM-contaminated soils can lead to acute or chronic mercury toxicity. This study assesses the human health risks associated with mercury-contaminated soils and tailings in the Alebediah mining community in Sudan. Soil samples were collected from various locations within Alebediah, including ASGM areas, farmlands, and residential areas, along with tailings samples commonly found within ASGM sites. The evaluation of potential health risks to humans included the computation of the estimated daily intake (AvDI), the hazard quotient (HQ), and the hazard index (HI) for both adults and children. The primary exposure route identified as potentially posing a significant health risk was the volatilization of mercury from tailings samples, where mercury concentrations reached up to 25.5 mg/kg. In contrast, other samples within the ASGM area showed elevated mercury levels but did not present significant health risks, with HI values below 1. However, all areas indicated HI values above 1 for the remaining exposure routes. The study observed a decrease in mercury concentration with increasing distance from the ASGM community. Additionally, soil samples revealed elevated mercury levels exceeding background values, prompting an assessment of contamination levels using the enrichment factor (EF). The findings indicated that farmlands and residential areas exhibited depleted EF, while areas surrounding the ASGM community showed none to moderate pollution. In contrast, ASGM areas exhibited significant to extreme pollution. A GIS map was generated to visually depict the extent of mercury pollution, facilitating communication with stakeholders and decision-makers.

Keywords : mercury pollution, artisanal and small-scale gold mining, health risk assessment, hazard index, soil and tailings, enrichment factor
Conference Title : ICEPR 2024 : International Conference on Environmental Pollution and Remediation
Conference Location : New York, United States
Conference Dates : April 22-23, 2024