

## **Total and Leachable Concentration of Trace Elements in Soil towards Human Health Risk, Related with Coal Mine in Jorong, South Kalimantan, Indonesia**

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**Abstract :** Coal mining is well known to cause considerable environmental impacts, including trace element contamination of soil. This study aimed to assess the trace element (As, Cd, Co, Cu, Ni, Pb, Sb, and Zn) contamination of soil in the vicinity of coal mining activities, using the case study of Asam-asam River basin, South Kalimantan, Indonesia, and to assess the human health risk, incorporating total and bioavailable (water-leachable and acid-leachable) concentrations. The results show the enrichment of As and Co in soil, surpassing the background soil value. Contamination was evaluated based on the index of geo-accumulation,  $I_{geo}$  and the pollution index,  $PI$ .  $I_{geo}$  values showed that the soil was generally uncontaminated ( $I_{geo} \leq 0$ ), except for elevated As and Co. Mean  $PI$  for Ni and Cu indicated slight contamination. Regarding the assessment of health risks, the Hazard Index,  $HI$  showed adverse risks ( $HI > 1$ ) for Ni, Co, and As. Further, Ni and As were found to pose unacceptable carcinogenic risk ( $risk > 1.10 \times 10^{-5}$ ). Farming, settlement, and plantation were found to present greater risk than coal mines. These results show that coal mining activity in the study area contaminates the soils by particular elements and may pose potential human health risk in its surrounding area. This study is important for setting appropriate countermeasure actions and improving basic coal mining management in Indonesia.

**Keywords :** coal mine, risk, trace elements, soil

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