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ECOLOGICAL RISK ASSESSMENT IN COMMUNITIES AROUND LUMWANA MINE IN NORTH WESTERN REGION OF ZAMBIA

Ecological risk caused by Naturally Occurring Radioactive Materials (NORM) and their decay products is a serious problem worldwide. The geology of Lumwana Mine in Zambia and the surrounding areas contains uranium mineralogy. The main aim of this study was to assess the ecological risk to communities around the mine. Higher radioactivity in environmental media is associated with risk to both humans and non-human biota. Soil, water and sediment samples were collected and analyzed using gamma spectrometer and the results were input parameters for Residue Radiation Biota (ResRad) computer code to estimate the total absorbed doses, evaluate the radiological risk, identify the biota at risk and the most prominent radionuclides. The summed absorbed dose rates for all the sites ranged from 0.46 mGy/d to 1.28 mGy/d. The calculated non-human biota hazard ratio (HQ) for all sites ranged from 0.01 to 0.14 and the hazard index (HI) for all sites ranged from 0.15 to 0.29. The estimated relative radiological risk for the sites were 6.02% (terrestrial plants), 9.77% (Aquatic Animals), 34.59% (Riparian Animals) and 49.62% (terrestrial animals). The most prominent radionuclide contributing to relative radiological risk was Th-232 (54.02%) followed by Ra-226 (45.01%) and K-40 (0.97%). All sites within the study area had hazard index (HI) of less than unity (1). Therefore, the presence of radionuclides in the study area does not pose a significant risk to non-human biota. Periodical monitoring of radionuclides in these areas is recommended.

Key words: Naturally occurring radioactivity material, ecological risk, absorbed dose rate, hazard ratio

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