**Monte Carlo-Based Cancer Risk Assessment of Radon Contamination in Groundwater of Artisanal Mining Areas of Southwest Nigeria**

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Radon contamination in groundwater poses a significant environmental and public health concern, particularly in regions with intensive artisanal mining activities that disturb the natural geological formations. This study investigates the levels of radon (²²²Rn) in groundwater sources within the artisanal gold and gemstone mining communities in Southwest Nigeria and assesses the associated lifetime cancer risks using a Monte Carlo probabilistic approach. The activity concentration of 222Rn was determined in groundwater samples using a potable RAD7 electronic radon detector. The measured activity concentration of 222Rn ranged from 0.44 – 117 Bq/L with an overall mean value of 13.8 Bq/L. The mean radon value is higher than the international safety standard of 11.1 Bq/L set by the United State Environmental Protection Agency. Cancer risk assessment performed based on the United States Environmental Protection Agency (USEPA) model for ingestion and inhalation pathways indicate a non-negligible radiological health risk to local populations relying on the untreated groundwater for drinking and domestic use. This study will serve as a valuable baseline data for Nigeria’s radiological safety efforts and will also support the global discourse on groundwater protection in mining-impacted areas.