

Assessing the Influence of Excavation Practices on Background Radiation Levels: A Case Study of the A-Cap Uranium Mining Lease Area in Botswana

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Mining exploration usually involves drilling and sometimes excavations to visually core. The study assessed whether excavations at the A-Cap Uranium mine lease area had the potential to cause a rise in background levels within the mining site. The Inspector 1000 digital multichannel handheld survey meter and the Mobile Radiation Detection Unit - a LaBr₃(Ce) detector in a backpack geometry, developed by iThemba LABS were both used to measure radiation levels at and around previously excavated sites. The absorbed dose rates varied widely, from 34.3 nGy/h to 1171.4 nGy/h, with an average of 194.5 nGy/h, which is higher than the global average of 59 nGy/y. The Annual Effective Dose Equivalent at previously excavated sites was 2.38 ± 0.36 mSv/y, while surrounding areas averaged 0.49 ± 0.13 mSv/y. The cumulative lifetime cancer risk in these areas was estimated to be 0.0083 ± 0.0055 and 0.0017 ± 0.0005 respectively. Elevated radiation levels were observed at previously excavated sites. These findings suggest that the excavation activities may have led to the observed fivefold increase in radiation pollution at excavated sites compared to the surrounding areas. The findings suggest that more radiological assessment of soil samples is required to determine radionuclide identification and concentration of the soil, with the view to assess possibilities of causing internal exposures from surface runoff and other transport mechanisms.

Primary author: CHIKA, SANKWASA (Botswana International University of Science and Technology)

Co-authors: Dr JONES, Pete (iThemba LABS); Dr MULLINS, Simon (Botswana International University of Science & Technology); Prof. HILLHOUSE, Gregory (BIUST)

Presenter: CHIKA, SANKWASA (Botswana International University of Science and Technology)

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