

Title: Review of Environmental Radioactivity in Mkuju, Manyoni, and Bahi Uranium Deposits in Tanzania

Uranium deposits in Tanzania, particularly at Mkuju, Bahi, and Manyoni, have attracted increasing attention due to their economic potential and environmental implications. Over the past two decades, numerous studies have investigated activity concentrations of naturally occurring radionuclides, including uranium-238, thorium-232, and potassium-40, as well as associated radiological hazards. However, these studies remain scattered, limiting a spatial pattern, methodological consistency, potential environmental and public health implications. This paper aims to systematically review and synthesize published studies on natural radioactivity in the Mkuju, Bahi, and Manyoni uranium deposits. The findings reveal that activity concentrations in soil for ^{238}U (21 to 846 Bq/kg), ^{232}Th (12 to 107 Bq/kg) and ^{40}K (38 to 791 Bq/kg) in Manyoni indicating moderate to high variability depending on sampling location. In contrast, Mkuju exhibits the highest radioactivity levels, particularly within concession areas where ^{226}Ra reaches extremely elevated values of 2430 – 4200 Bq/kg, accompanied by increased ^{232}Th (130 – 220 Bq/kg) and ^{40}K (up to ~1466 Bq/kg). Bahi deposit shows comparatively lower to moderate ^{226}Ra concentrations (9.19 – 69.38 Bq/kg), but relatively high ^{40}K levels, reaching up to 1384.75 Bq/kg. Despite these observations, inconsistencies in sampling strategies and limited longitudinal studies hinder reliable comparisons and comprehensive trend analysis. This review emphasizes the need for standardized methodologies, long-term environmental monitoring, GIS-based mapping, geochemical fingerprinting and expanded studies on radionuclide transfer through environmental pathways. This review provides a comprehensive perspective on radioactivity measurements in Tanzanian uranium deposits and serves as a benchmark for future investigations in radiation safety and sustainable uranium exploitation in Tanzania.

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