

**Determination of background radio activity levels and elemental composition at Mkuju uranium deposit in Tanzania.**

**Dennis Amos Mwalonga.**

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This study has determined the baseline activity concentrations of naturally occurring radionuclides ( $^{238}\text{U}$ ,  $^{232}\text{Th}$  and  $^{40}\text{K}$ ) and heavy metal concentrations at Mkuju uranium deposit. The activity concentrations and heavy metals in soil, sediments and water samples were carried out using gamma-ray and x-ray spectrometry techniques, respectively. The average activity concentrations of radionuclides in soil samples varied from  $132.5 \pm 7.9$  -  $316.2 \pm 28.5$   $\text{Bqkg}^{-1}$ ,  $39.3 \pm 2.8$  -  $114 \pm 13.1$  and  $1169 \pm 93.6$  -  $1874 \pm 148$   $\text{Bqkg}^{-1}$  for  $^{238}\text{U}$ ,  $^{232}\text{Th}$  and  $^{40}\text{K}$ , respectively. On sediments sample the activity concentration ranged from  $352 \pm 39$  -  $492 \pm 55$ ;  $167 \pm 20$  -  $855 \pm 108$   $\text{Bqkg}^{-1}$ ,  $57 \pm 7.4$   $\text{Bqkg}^{-1}$  -  $1261 \pm 151$   $\text{Bqkg}^{-1}$  for  $^{238}\text{U}$ ,  $^{232}\text{Th}$  and  $^{40}\text{K}$ , respectively. The activity concentration in soil and sediments from Mkuju Uranium deposit were higher than the world average of 35, 30, and 500  $\text{Bqkg}^{-1}$  for  $^{238}\text{U}$ ,  $^{232}\text{Th}$  and  $^{40}\text{K}$  respectively. The activity concentrations in soil and sediments from higher than the world average of 35, 30 and 500  $\text{Bqkg}$  for  $^{238}\text{U}$ ,  $^{232}\text{Th}$  and  $^{40}\text{K}$ , respectively. The activity concentrations in water samples were comparable to control samples and other uranium mineralization areas reported in the literatures. The concentration of heavy metals in soil and sediments on Cr, Fe, Zn, Pb, Th and U were higher than the control samples. There were strong positive correlation between Th and Fe and Th and Pb, Fe and Pb and Pb with Cr. Uranium correlated with Th and Ni. The results from this study will provide a pre-mining background data on natural radioactivity levels and heavy metal concentration for future environmental pollution monitoring.