Assessment of levels of natural radioactivity in surface soils around titanium mines in Kenya

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Abstract:

All human beings are exposed to radiation from naturally occurring radionuclides in soil and other environmental materials. Some of these exposures are not amenable to control and they are usually referred to as background radiation. Some work activities such as conventional mining inadvertently produce large quantities of naturally occurring radionuclides, which can result in additional and/or elevated levels of radiation exposure of people in the areas around the mining sites. Such exposures - induced or enhanced by human activities - are subject to control by regulatory authorities. In some instances there may be contributions from the two types of exposures and they must be separated before applying regulatory control. In this study, natural radioactivity levels in surface soils around the proposed titanium mines in Kwale district were determined from measurements of 78 samples of surface soils randomly sampled from two villages within the proposed mining area by using a hyper pure germanium (HpGe) gamma-ray spectrometer. The values of radioactivity concentrations in the soils and the likely radiation doses from contact with these soils were determined and are reported in this thesis. The radiological implication of these levels is discussed with regards to the impending mining operations in the area. The ranges and mean of radioactivity concentrations (Bgkg-l) obtained are. 8.4±0.4-43.6±1.5 (_27.6±1.7) for 232Th; 7.4±0.6-40.6±1.4 .(20.9±1.5) for 226Ra and 31.9±1.3-114.1±1.4 (69.5±3.2) for 40K, respectively. The likely absorbed dose rates in air above these soils were calculated from these radioactivity concentrations and found to be 8.5±0.5-36.9±1.1 nGyh-1 with a mean of 25.2±1.4 nGyh-1. The corresponding effective dose rates are 21.0±1.2-90.8±2.6 mSvy--1 with a mean of 62.0±3.5 uSvy--1, which are lower than the global average of 0.46 mSvy 1 and therefore of little radiological risk to the environment of the study subject.