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ASSESSMENT OCCUPATIONAL EXPOSURE TO NATURAL RADIONUCLIDES DUE TO MINING ACTIVITIES IN KENTICHA TANTALUM MINING

Human beings are always exposed to background radiation that comes both from natural and man-made sources[1]. Natural radioactivity is widespread in the earth environment and it exists in various geological formations such as earth's crust, rocks, soils, plants, water and air. Mining has been identified as one of the potential sources of exposure to naturally occurring radioactive materials (NORM)[2][3]. However, mining activities are not being monitored and regulated for NORM in Ethiopia. Most of the NORM industries such as mining and mineral processing are located in developing countries such as Ethiopia[4][5]. The Kenticha mine is a large tantalum mine located in the southern part of Ethiopia. It represents one of the largest tantalum reserves in the country, having estimated reserves of 116 million tons of ore grading 0.02% tantalum[6], [7]. The Tantalum mine is associated with uranium and currently undertakes only surface mining and the process produces large volumes of tailings and waste that may contain NORM.
A radiological hazards to members of the public and workers from exposure to natural radioactivity as a result of mining activities from Kenticha Tantalum Mines have been studied through several exposure pathways using direct gamma spectrometry to determine 238U, 232Th, 40K, in tantalum ore, soil, waste, waste tailing and. The external radiation dose component is obtained directly from the results of the personal monitoring program for designated mining employees operated at the ore dying facility.
To assess the radiological hazard of soils, solid waste, the radiological hazard indices such as absorbed dose rate, annual effective dose equivalent (outdoor), external and internal hazard indices (Hex and Hin), gamma activity index (Iɣ) and estimated excess life time cancer risk (ELCR) are calculated. Gamma spectrometry technique was used to analyse for Uranium, Thorium and K-40 in soil and waste samples from the mining environment. A total of 22 soil samples from the mining site and 10 solid waste samples from tailing dam were analyzed. Moreover 14 mining employee working in ore dying facility used OSL personal dosimeter[8], [9].

The corresponding average external dose rate at 1m above the ground in air for tantalum ore, soil and solid waste samples were 81.14 nGy/h, 65.71 nGy/h, 96.24 nGy/h, respectively which were above the worldwide average value of 59 nGy/h [1], [10], [11].
The annual effective dose limit of 20 mSv and 1 mSv for occupationally exposed workers and the public, respectively; and all-hazard indices, as well as the radium equivalent activity, were within internationally accepted limits. Based on a radiological point of view, it is concluded that all workers within the mine are not exposed to any significant radiological hazard. However, there is a need for constant and systematic monitoring of the environment.

Speakers email

eshetutilahun86@gmail.com

Speakers affiliation

Ethiopia Radiation Protection Authority

Name of Member State/Organization

Ethiopia Radiation Protection Authority

Primary author: Mr ZEGE, Eshetu (Ethiopia Radiation Protection Authority)

Presenter: Mr ZEGE, Eshetu (Ethiopia Radiation Protection Authority)

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