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Terrestrial Background Radiation in Norochcholai in the North Western Coast of Sri Lanka

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Radiation from natural sources can be broadly classified into two, namely, terrestrial radiation and extra-terrestrial radiation. Terrestrial radiation originates from natural radio-nuclides present in rocks, soils, atmosphere, and the hydrosphere. Extra terrestrial radiation or cosmic radiation having very high energy originates from the sun. In most of the cases radiation exposure from natural sources is not harmful to humans but health protection measures need to be considered. The objective of this study was to assess background radiation in soil, water and air in a Sri Lankan population (in Norochcholai) living in close proximity to the nuclear power plant in Kudankulam, India for future monitoring of potential radiation leaks.

This study assessed radiation levels in soil, water and air in the Norochcholai area situated in the north western coast of Sri Lanka. Background radiation levels at 1m height were recorded using a survey meter (automess dose rate meter 6150AD). Superficial soil samples from 23 locations and water samples from 15 locations were analysed by Gamma spectrometry. The activity concentration of natural radionuclides in the soil and water samples were measured by using a HPGe detector having a relative efficiency of 32.6 % with G1 geometry (diameter of 8.4cm and a height of 2.9cm) at ISO 17025:2005 accredited Gamma spectrometry laboratory of the Sri Lanka Atomic Energy Board. The radioactivity concentrations of ^{232}Th , ^{40}K , ^{226}Ra and ^{210}Pb radionuclides in the soil and water samples were measured.

The median radioactivity concentrations (range) of ^{232}Th , ^{40}K , ^{226}Ra and ^{210}Pb were 56.0 Bqkg^{-1} ($16\text{-}256 \text{ Bqkg}^{-1}$), 96 Bqkg^{-1} ($62.5\text{-}294 \text{ Bqkg}^{-1}$), 24 Bqkg^{-1} ($0.7\text{-}83 \text{ Bqkg}^{-1}$) and 27 Bqkg^{-1} ($13\text{-}81 \text{ Bqkg}^{-1}$) respectively. Mean background radiation level was $0.1 \mu\text{Sv h}^{-1}$. The gamma ray absorbed dose rates due to ^{232}Th , ^{40}K and ^{226}Ra in soil samples varied between 13.9 nGyh^{-1} and 202.8 nGyh^{-1} with an average of 61.0 nGy h^{-1} which is higher than the global average of 57 nGyh^{-1} . The mean effective dose was $74.9 \mu\text{Sv.y}^{-1}$. Radium equivalent activity ranged from $30.3\text{-}458.4 \text{ Bqkg}^{-1}$ and the mean was 136.5 Bqkg^{-1} . In one soil sample the radium equivalent activity was above 370 which is the cutoff value set by the NEA group of experts as safe to be used in building materials. The absorbed dose rate did not correlate with the background radiation levels detected ($p=0.727$). The annual effective dose due to terrestrial radiation (0.074 mSv.y^{-1}) was less than the worldwide average of annual effective dose from natural background radiation due to terrestrial gamma radiation (0.46 mSv.y^{-1}). No radioactivity was detected in any of the water samples.

The soil from this study area is safe for use in construction of human dwellings. No radioactivity was detected in water sample.

Country/Organization invited to participate

Sri Lanka

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