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Baseline radioactivity of soil in Sri Lanka

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The objective of the present study was to determine the radioactivity concentrations of ^{40}K, ^{226}Ra, ^{232}Th and ^{137}Cs in soil from baseline areas, to assess any possible radiological hazard with high ^{226}Ra and ^{232}Th, to determine the outdoor gamma radioactive dose rate in air and to assess the annual effective dose in soil. Concentrations of radioactivity of surface soil in the areas along the national road network [route 1: (45 samples from Avissawella, Ratnapura, Ambilipitiya, Hambantota, Kataragama, Thalamalwila, Balangoda), route 2: (29 samples from Colombo, Kalutara, Galle, Matara, Mathugama, Ingiriya) and route 3: (30 samples from Haputhale, Wellawaya, Monaragala, Siyabalaannduwa, Pottuwil, Kumana)] in Sri Lanka were measured using a high-resolution gamma spectrometer based on a shield p-extended type HPGe detector. The measured range of concentrations obtained for ^{40}K, ^{226}Ra, ^{232}Th and ^{137}Cs are expressed in Bq kg^{-1} as 19 to 1378, 5 to 761, 9 to 1166 and 0.2 to 7, respectively and the obtained average activity concentrations are 429, 45, 111 and 1.38 in dry weight, respectively. The average value of ^{226}Ra (45 Bq Kg^{-1}) and ^{40}K (429 Bq kg^{-1}) are less than the corresponding typical world average of 50 and 500 Bq Kg^{-1}. However, the average value for ^{232}Th (111 Bq kg^{-1}) is significantly greater than the typical world average value of 50 Bq kg^{-1} The Gamma ray absorbed dose due to ^{40}K, ^{226}Ra, and ^{232}Th in soil samples varied in the range 14 to 1101 nGy/h, with an average value of 111 nGy/h, which is higher than the world average value of 55 nGy/h (UNSCER, 1988). The Annual effective dose equivalent estimated using the outdoor occupancy factor and dose conversion factors (UNSCEAR 1988) were found to be between 4 – 281 µSv in soil samples with an average value of 28 µSv. Measured values of ambient air dose**,** background gamma radiation (by a gas filled detector) level ranged from 30 to 1240 nSv h^{-1} with an average value of 118.98 nSv h^{-1}. The findings compare well with the outdoor Annual effective dose equivalent and any deviations are due to the moisture contained in the soil, ^{137}Cs and cosmic rays in addition to ambient dose rate equivalent of ^{40}K, ^{226}Ra and ^{232}Th. Cluster analysis ^{232}Th and ^{226}Ra activity concentrations of soil fractions were measured using the MINITAB package Inc. 1998. The Dickwella area showed high radioactivity concentrations qualitatively, largely due to monazite in the surface beach. Also, this cluster analysis showed the presence of high concentrations of ^{226}Ra and ^{232}Th in Beralapanathara, Panadura, Uragasmanhandiya etc.

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