

# Terrestrial background radiation study in Bathalegoda, North western province Sri Lanka

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# Introduction

## Bathalegoda- Sri Lanka



Location: longitudes 80.10190 East  
and latitudes 7.59950 North

North western province, Kurunegala,  
Sri Lanka

# Introduction ...

- The major source of radiation exposure for all organisms including humans is natural radioactivity in their surrounding environment.
- This comes from building materials (of their dwellings), air, water and food.
- The natural radioactivity in soil and building materials mainly due to  $^{40}\text{K}$ ,  $^{238}\text{U}$  series and  $^{232}\text{Th}$  series.

# Objectives

- To determine the radionuclide levels in soil samples of Bathalegoda area
- To determine common radiological indices in the area.

# Gamma spectroscopy

- Best method for measuring radioactivity in all metrics.
- Very good fundamental measuring technique for clear identification of radionuclides
- It has an ability to measure gamma emitting radionuclides both qualitatively and quantitatively without need of a chemical separation.
- Most important and universal methodology for identification of radionuclides.

# Method

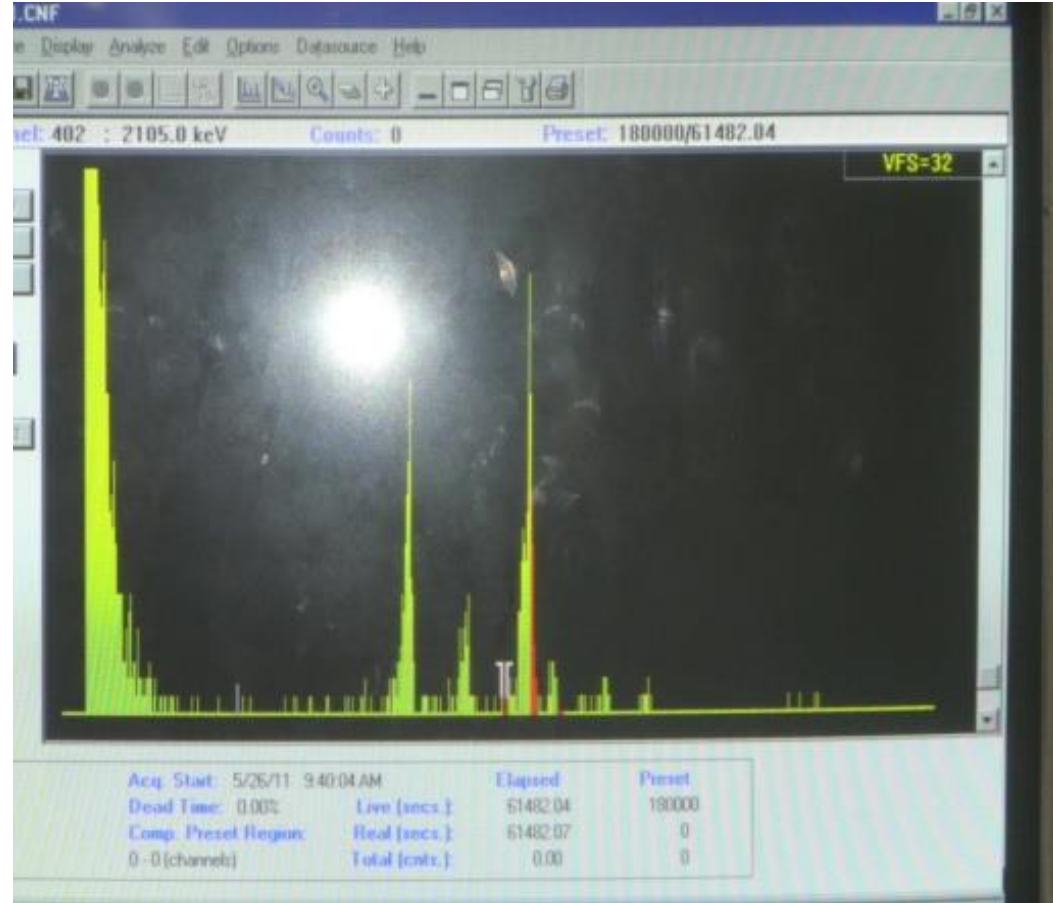
- 21 soil samples were analysed by gamma spectrometry.
- Top 2cm of soil was scraped off from a 1 m<sup>2</sup> area and 1 kg of soil samples were taken.



- The samples were immediately brought to the laboratory for analysis in sealed dark plastic bags.
- Samples were homogenized by hand mixing and allowed them to air dry.
- Then the samples were oven dried (40<sup>0</sup>C) in overnight (24 hours) to reduce moisture.
- Dried samples were sieved by using 2mm sieve and stored them in G1 geometry (8.4cm x2.9cm radon impermeable plastic containers).
- Water samples were stored in G2 geometry (11.8cm x 10.4cm)
- Samples were hermetically sealed and stored to achieve secular equilibrium for three weeks before analysis.

- The specific activities of the radionuclides  $^{40}\text{K}$ ,  $^{226}\text{Ra}$ ,  $^{232}\text{Th}$ ,  $^{210}\text{Pb}$  in the collected samples were measured in the hyper-pure germanium detector
- ❖ Model :(HPGe)(model: Gx3020) with a
- ❖ Relative efficiency of 32.6%
- ❖ Energy resolution of 1.84 keV at 1.3 MeV gamma line of  $^{60}\text{Co}$ .
- ❖ High voltage supply
- ❖ DSA1000 is responsible for spectra accumulation and it has 8192 channels
- ❖ Software : GENIE 2000 Canberra
- ❖ Soil 6 was used as a reference material
- ❖ The MDA of the radionuclides was determined from the background radiation spectrum obtained for the same counting time





# Results and Discussion

## Activity concentrations of radionuclides in soil samples

Variable	Bathalegoda N=21 Median (IQ range)
<sup>232</sup> Th Activity concentration (Bq/kg)	46.9 (30.6-67.5)
<sup>40</sup> K Activity concentration (Bq/kg)	1028.6(882.9-1213)
<sup>210</sup> Pb Activity concentration (Bq/kg)	27.9 (19.8-44.3)
<sup>226</sup> Ra Activity concentration (Bq/kg)	16.5 (11.8-20.8)

## Radiological indices (calculated by using the activity concentrations of radionuclides in soil samples)

- Radium equivalent activity= 130.8-192.5Bq/kg (< 370Bq/kg NEA).
- Criteria formula was less than 1 in all the soil samples.
- Median Activity Utilization Index (AUI) in the area was below the recommended limit.
- The median external hazardous index ( $H_{ex}$ ) in Bathalegoda area was below the recommended limit of 1 .
- Annual effective dose was within the safe limit of 1mSv/y .

# Conclusions

- Activity concentration of  $^{232}\text{Th}$  was higher than the world average of 30 Bq/kg
- Activity concentration of  $^{40}\text{K}$  was higher than the world average of 400Bq/kg.
- Radium equivalent activity below 370Bq/kg ,Criteria formula was less than 1 and Median Activity Utilization Index in the area was below the recommended limit indicating that the dose levels in the soil samples were safe for the environment.
- The median external hazardous index ( $H_{\text{ex}}$ ) in Bathalegoda area was below the recommended limit of 1 and the Annual effective dose was within the safe limit of 1mSv/y.
- Therefore Soil from this area is safe for human health.

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# THANK YOU

