

## Study of Natural Radioactive and Radiation Hazard Index of Soil from Sembrong Catchment Area, Johor, Malaysia

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**Abstract :** Radiation exposure to humans and the environment is caused by natural radioactive material sources. Given that exposure to people and communities can occur through several pathways, it is necessary to pay attention to the increase in naturally radioactive material, particularly in the soil. Continuous research and monitoring on the distribution and determination of these natural radionuclides' activity as a guide and reference are beneficial, especially in an accidental exposure. Surface soil/sediment samples from several locations identified around the Sembrong catchment area were taken for the study. After 30 days of secular equilibrium with their daughters, the activity concentrations of the naturally occurring radioactive material (NORM) members, i.e.  $^{226}\text{Ra}$ ,  $^{228}\text{Ra}$ ,  $^{238}\text{U}$ ,  $^{232}\text{Th}$ , and  $^{40}\text{K}$ , were measured using high purity germanium (HPGe) gamma spectrometer. The results obtained showed that the radioactivity concentration of  $^{238}\text{U}$  ranged between 17.13 - 30.13 Bq/kg,  $^{232}\text{Th}$  ranged between 22.90 - 40.05 Bq/kg,  $^{226}\text{Ra}$  ranged between 19.19 - 32.10 Bq/kg,  $^{228}\text{Ra}$  ranged between 21.08 - 39.11 Bq/kg and  $^{40}\text{K}$  ranged between 9.22 - 51.07 Bq/kg with average values of 20.98 Bq/kg, 27.39 Bq/kg, 23.55 Bq/kg, 26.93 Bq/kg and 23.55 Bq/kg respectively. The values obtained from this study were low or equivalent to previously reported in previous studies. It was also found that the mean/mean values obtained for the four parameters of the Radiation Hazard Index, namely radium equivalent activity (Raeq), external dose rate (D), annual effective dose and external hazard index ( $H_{\text{ex}}$ ), were 65.40 Bq/kg, 29.33 nGy/h,  $19.18 \times 10^{-6}\text{Sv}$  and 0.19 respectively. These obtained values are low compared to the world average values and the values of globally applied standards. Comparison with previous studies (dry season) also found that the values for all four parameters were low and equivalent. This indicates the level of radiation hazard in the area around the study is safe for the public.

**Keywords :** catchment area, gamma spectrometry, naturally occurring radioactive material (NORM), soil

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