

Title: Pioneering study of radioactivity in soil near the Payra 1320 MW Thermal Power Plant, the largest coal-fired thermal power plant in Bangladesh

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Abstract: Coal combustion increases atmospheric radioactivity, harming those live in the periphery of coal-fired thermal power plants (CFTPPs). A pioneering study has been performed using a high-purity germanium detector by analysing 30 soil samples collected from distances of 50, 600, 1200, and 3000 metres in the periphery of the largest 1320 MW CFTPP, Payra, Bangladesh. The activity concentrations of ^{226}Ra , ^{232}Th and ^{40}K ranged from 19–32, 31–90, and 420–870 Bq/kg, respectively, with most of the samples show ^{232}Th and ^{40}K levels above global averages. Elevated levels of ^{232}Th and ^{40}K in soil around Payra thermal power plant stem from natural minerals, granitic rocks, ash disposal, coal combustion residues, and environmental factors. Radiological hazard indices, including dose rates and cancer risk, exceed global averages, indicating unsafe radiation exposure for coal miners and locals. These findings are crucial for planning coal-fired power plants and stress the need for municipal regulation of fly ash and health monitoring to mitigate risks for workers and residents.

Keywords: Radioactivity, Soil, HPGe, Radiological hazard, Hazard index, Payra 1320 MW Thermal Power Plant

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