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THE RADIOLOGICAL HAZARD DUE TO NATURALLY OCCURRING RADIONUCLIDES IN SOIL AROUND THERMOELECTRIC POWER PLANT

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Introduction



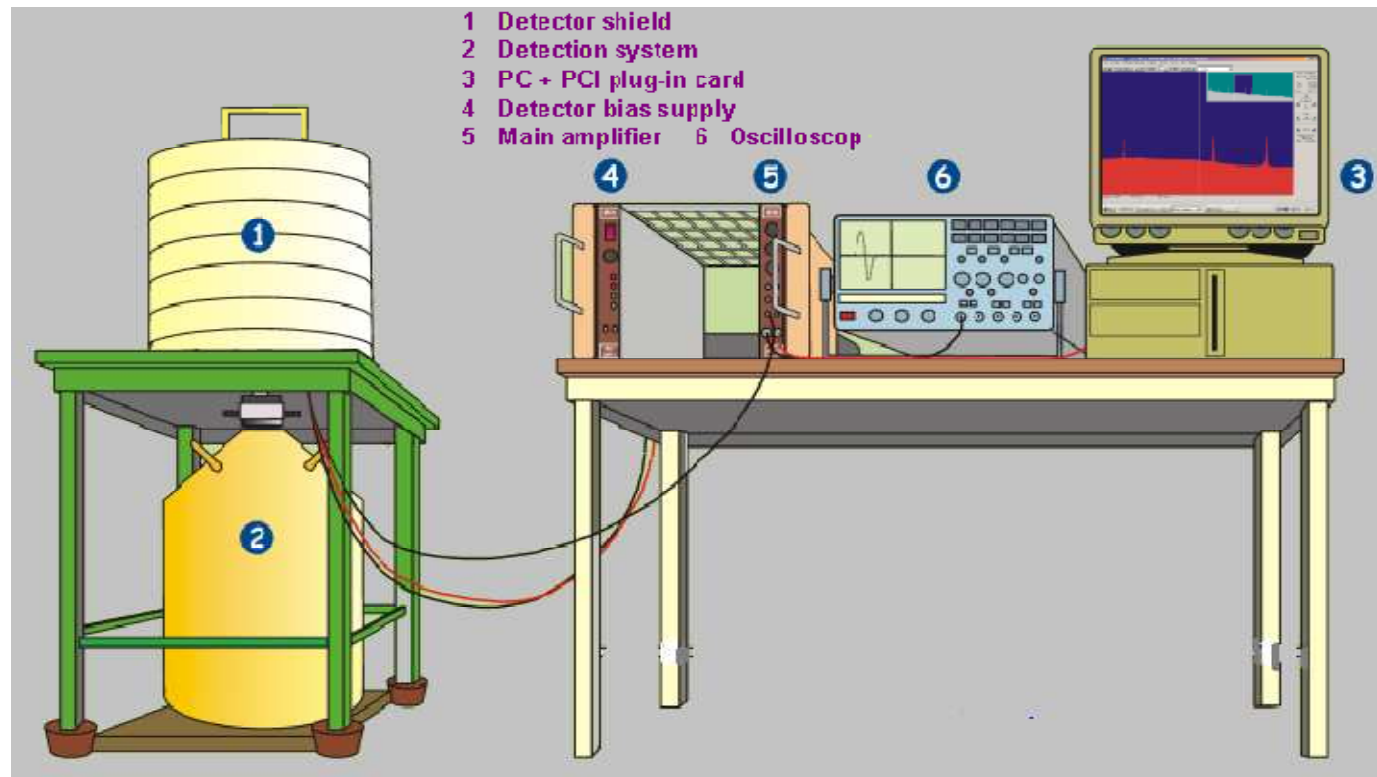
During coal combustion, organic compounds are converted into gases, while inorganic elements, which include the naturally occurring radionuclides, are concentrated in the ash.

Why we are doing this?



- Because we want to investigate is there a radiation risk to population.
- It is useful to set standards and national guidelines in accordance with international recommendations.
- It is interesting to research...

Experimental



- 72 samples of undisturbed soils
- Gamma spectrometry was used
- U-238: gamma-ray lines of Th-234
- Th-232: gamma-ray lines of Ac-228
- K-40: its gamma-ray line at 1460.8 keV
- Gamma-ray spectra were analysed using Gamma Vision 32 MCA emulation software.

Experimental

- The total absorbed dose rate in air

$$\dot{D} = 0.462A_U + 0.604A_{Th} + 0.042A_K$$

- The annual effective dose

$$H = \dot{D} \times 0.7 \times 0.2 \times 8760$$

- The external hazard index

$$H_{ex} = \frac{A_U}{370} + \frac{A_{Th}}{259} + \frac{A_K}{4810}$$

- Excess lifetime cancer risk outdoors

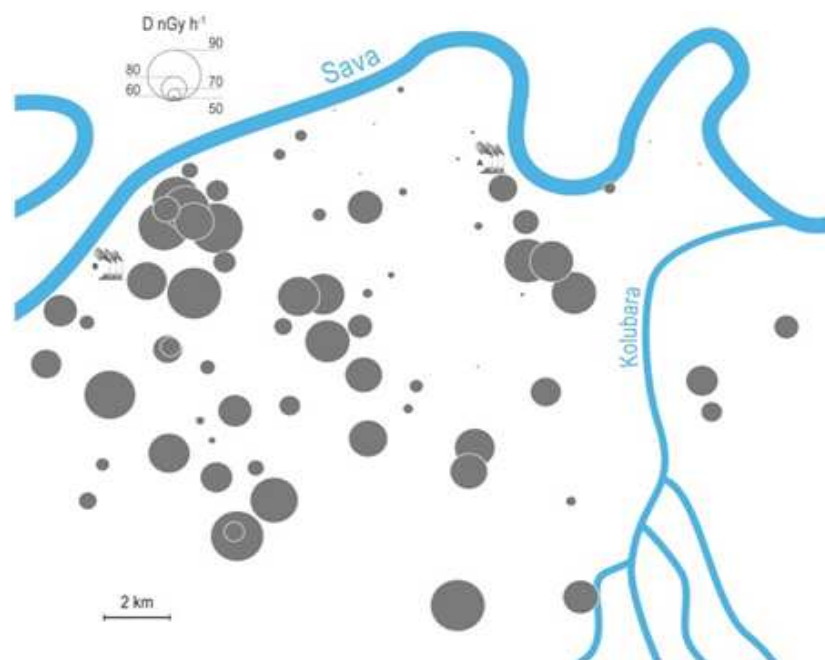
$$ELCR_{outdoor} = H \times LS \times PC$$

Results

The activity concentrations range: 21 to 82 Bq kg⁻¹ for ²³⁸U; 15 to 61 Bq kg⁻¹ for ²³²Th; 275 to 751 Bq kg⁻¹ for ⁴⁰K

| Descriptive statistics | \dot{D} (nGy h ⁻¹) | H (μ Sv) | Hex | ELCR $\times 10^{-4}$ |
|------------------------|-------------------------------------|------------------|------|-----------------------|
| Mean | 76.3 | 93.6 | 0.4 | 3.6 |
| Range | 51.1 | 62.7 | 0.3 | 2.4 |
| Sd. deviation | 11.2 | 13.7 | 0.06 | 0.5 |
| Minimum | 41.9 | 51.4 | 0.24 | 2.0 |
| Maximum | 93.1 | 114.2 | 0.54 | 4.4 |

| Country | \dot{D} (nGy h ⁻¹) |
|---------------------|----------------------------------|
| Serbia [this study] | 76.3 |
| China [11] | 75.2 |
| China [12] | 86.6 |
| Turkey [13] | 53.9 |
| Hungary [14] | 89.2 |
| Spain [15] | 58.0 |
| Greece [16] | 62.0 |



The spatial distribution of total absorbed gamma dose rates arising from members of terrestrial radionuclides from the uranium and thorium decay chains and by ⁴⁰K in the soils of the study area.

¹¹ L. Dai et al. Environ. Res. vol. 104, pp. 201-208, 2007.

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¹³ H. Aytekin and R. Baldik. Turkish. J. Eng. Env. Sci. vol. 32 pp. 101-105, 2008.

¹⁴ Z. Papp et al. J. Environ. Radioact. vol. 59, pp. 191-205, 2002.

¹⁵ E. Charro et al. J. Environ. Radioact. vol. 124, pp. 84-92, 2013.

¹⁶ A. Parmaksiz et al. Radiat. Prot. Dosim. vol. 147, pp. 548-554, 2011.

Conclusions

Based on estimated dose rate and hazard index of γ -ray radiation in the area surrounding TEPP can be concluded that its operation has no significant negative impact to population living in its surrounding.

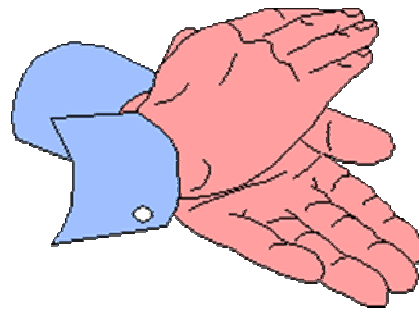
„Radiation protection is not only a matter for science.
It is a problem of philosophy, and morality, and the utmost wisdom.“

L. S. Taylor, 1956

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