

Software-Methodological Support for Soil Radon Monitoring and Radiation-Safe Siting of Infrastructure Objects

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Abstract

Radon exhalation from soil remains an under-addressed factor in the design and siting of new buildings, despite its recognized contribution to public radiation exposure. This study aimed to develop integrated software-methodological support for soil radon monitoring capable of informing radiation-safe decisions during the construction of infrastructure objects, using the Kyiv agglomeration as a case study. Field measurements of soil-gas radon activity were carried out at 50 observation points across a 95 km² area and used, together with granulometric and gamma-spectrometric analyses of soil samples, to parameterize an analytical diffusion-generation-decay model for different geological units. The resulting physical description was implemented in dedicated monitoring software automating data acquisition, quality control and hazard classification, and was linked to a construction-oriented Radon Index procedure harmonized with Directive 2013/59/Euratom and current European technical standards. Applying this methodology to the study area classified the entire territory as low radon risk and defined the corresponding minimum protective measures for new construction. The developed software-methodological system provides a scientifically substantiated, standards-aligned tool for radiation-safety assessment at the pre-design stage of infrastructure development, applicable beyond the studied region.