

## **Radon Hazard in Central Italy: Comparison among Areas with Different Geogenic Radon Potential**

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Radon is a natural radioactive gas formed in rocks and soil by the decay of its parent nuclide (<sup>238</sup>-Uranium). The rate at which radon migrates to the surface, be it along faults or directly emanated from shallow soil, represents the Geogenic Radon Potential (GRP) of an area. Considering that the GRP is often linked to indoor radon risk levels, we have conducted multidisciplinary research to: (i) define local GRPs and investigate their relationship with associated indoor Rn levels; (ii) evaluate inhaled radiation dosages and the associated risk to the inhabitants; and (iii) define radon priority areas (RPAs) as required by the Directive 2013/59/Euratom.

In the framework of the EU-funded LIFE-Respire project, a large amount of data (radionuclide content, soil gas samples, terrestrial gamma, indoor radon) was collected from three municipalities located in different volcanic districts of the Lazio region (central Italy) that are characterized by low to high GRP. Results highlight the positive correlation between the radionuclide content of the outcropping rocks, the soil Rn concentrations and the presence of high indoor Rn values in areas with medium to high GRP. At the scale of the municipality, there is a good correspondence between the highest GRP areas and the highest indoor radon concentrations and gamma dose values, thus confirming that geology affects at least the lowest levels (e.g., ground and basements) of a building. In several cases, the radiation dose received by people due to indoor radon is higher than the level for which some mitigation actions are required or recommended. For the purposes of a preliminary assessment of the radiological risk, the Lazio GRP map shows a good correspondence with the distribution of lung cancer cases, as shown by the incidence rate map (out of 100,000) of the cases found in the Lazio region. These areas can be considered as the Radon Priority Areas, where municipal administrations can carry out monitoring activities at a detailed scale and adopt ad hoc remediation systems as needed. Data confirm that the Cimini–