

## Visual Modeling of Radon Concentrations in Muğla Province (Southwestern Turkey)

Radon ( $^{222}\text{Rn}$ ) is a carcinogenic, inert noble gas that is undetectable indoors by human senses due to its odorless, colorless, tasteless, and silent nature.

This study aims to (1) measure the Indoor Radon Concentration (IRC) in 840 Mosque-Minarets (MMs) across Muğla Province (13 districts) in Southwestern Turkey, (2) examine the relationship between IRC and Soil Radon Concentration (SRC) in relation to underlying geological formations, building materials, and active faults, and (3) compare IRC values with the European Indoor Radon Reference Value (EIRRV) of 200 Bq/m<sup>3</sup> to identify high-risk areas (> 200 Bq/m<sup>3</sup>) for human health, particularly lung cancer.

IRC measurements were conducted using the RadonEye device, while SRC measurements were taken with the Markus 10 device, both employing the active method. These measurements were carried out in Muğla Province between 2018 and 2020. The results, along with geological formations and active fault data, were visualized and analyzed using the ArcGIS program.

The highest IRC (2809 Bq/m<sup>3</sup>) was recorded in an MM in the Muğla-Marmaris district, constructed from uranium-rich volcanic rocks. In the Muğla-Bodrum district, the highest SRC (120,000 Bq/m<sup>3</sup>) was found in alluvium derived from uranium-rich volcanic rocks near active faults. Conversely, the lowest SRC (1000 Bq/m<sup>3</sup>) was detected in the Muğla-Datça district, in alluvium originating from partially serpentinized peridotite.

Analysis revealed that 10% of MMs in Muğla Province exceeded 200 Bq/m<sup>3</sup>, 30% exceeded 300 Bq/m<sup>3</sup>, and 40% exceeded 400 Bq/m<sup>3</sup>. The study emphasizes the need for regular and systematic IRC measurements in buildings worldwide, with relevant institutions ensuring levels remain below 200 Bq/m<sup>3</sup>. If IRC exceeds this threshold, immediate mitigation measures should be implemented to reduce radon exposure and associated health risks.

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