



## Regional and Detailed Survey for Radon Activities in Soil-Gas and Groundwater in the Okchon Zone, Korea

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The Okchon zone in Korea provides a typical example of natural geological materials enriched in potentially toxic elements including uranium which is parent nuclide for radon gas. For the purpose of radon radioactivity risk assessment, making the map of radon risk grade from Okchon zone, regional and detailed field surveys were carried out during 3 years. The study area is located in the central part of Korea, called the Okchon zone (about 5,100 km<sup>2</sup>), which occur in a 80km wide, northeast-trending belt that extends across the Korean Peninsula. The Okchon zone is underlain by metasedimentary rocks of unknown age that are composed mainly of black slate, phyllite, shale, and limestone. The three research areas (defined as Boeun, Chungju, and Nonsan) for detailed survey were selected from the results of regional survey. Results of detailed radon survey indicated a wide range of radon activities for soil-gases (148-1,843 pCi/L) and ground waters (23-5,540 pCi/L). About 15 percent of soil-gas samples exceeded 1,000 pCi/L and 84 percent of ground water samples exceeded the MCL (maximum contaminant level) of drinking water, 300 pCi/L, which proposed by U.S. Environmental Protection Agency in 1999. For detailed survey, radon activities of soil-gas and ground water were classified as bedrock geology, based on 1/50,000 geological map and field research. For soil-gas measurements, mean values of radon activity from black slate-shale (789 pCi/L) were highest among the other base rocks. And for groundwater measurements, mean value of radon activities were decreased in the order of granite (1,345 pCi/L) > black shale-slate (915 pCi/L) > metasediments (617 pCi/L). Result of indoor radon measurement from detailed survey areas showed that about 50% of houses exceeded the indoor guideline, 4 pCi/L. For the radon risk assessment in indoor environment showed that probability of lung cancer risk from the houses located on the granite base rock ( $3.0 \times 10^{-2}$ ) was highest among the other base rocks. Finally, the maps of radon risk grade from detailed survey areas were developed by the application of field data and statistical simulation.