RAD 7

BOOK OF ABSTRACTS

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Sample design for radon concentration investigation in Bulgarian caves

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As a very mountainous country, Bulgaria has a lot of caves, but only some of them are developed, managed and available for tourist visits. The main sources of radon are rocks and a high concentration can be measured in caves. Caves have been of interest because radon concentration in these environments may sometimes reach high values. A rather large number of investigations have been carried out all over the world, from the point of view of both researches on radon behavior in a cave environment and radiation protection. There are no systematic investigations of radon in the caves in Bulgaria in order to assess the health risk. The paper presents the sample design of the radon concentration survey in Bulgarian caves for the evaluation of the health risk of people. The sample design covers the method of selection, the sample structure and the plan for analyzing and interpreting the results. The method selected to define the representative sample corresponds to the following criteria: it covers all types of caves in different mountains in Bulgaria; it is consistent over time; it includes changes to the definition over time; it constitutes the selection of the sample design for the caves and organization of survey. The samples of caves are defined on the basis of mountains in Bulgaria in order for the definitions to remain constant over time. Groups of caves according to the mountains are: caves in Stara Planina, caves in Rhodope Mountains and caves in other mountains. The design of the samples of caves is built around a random selection from the most visited caves in Bulgaria. According public information, there are 65 of these caves. The calculated sample size for a confidence level of 95% and a margin of error of 30% is 10 caves. The numbers of samples have been weighed according to the percent of the caves in the groups with 5 per cent precision at 95 per cent confidence. The way of the selection of the sample and the measurement method is presented in the paper.

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The sampling frame definition of the buildings with public access to radon concentration surveys

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This study discusses the sampling frames of the buildings with public access to radon concentration surveys on the territory of Bulgaria in order to assess the health risk for the population. The sampling frame is the list from which the sample is selected, so the quality of the sampling frame affects the quality of the sample. The general list of different types of buildings with public access has been prepared in accordance with the list of the Ministry of the Regional Development and Public Works in Bulgaria and international experience in the field of radon investigation. The types of buildings with public access have been classified in nine general groups. These groups of buildings with public access are defined as follows: educational institutions; buildings for commerce and/or services; health and social care buildings; buildings in the field of culture; sports facilities; buildings in the field of transport; prisons; cult and religious buildings and post offices. Multicriteria analysis was applied to select the types of buildings in order to assess the health risk from radon exposure in buildings with public access. The main criteria for the analysis are: the probability of high radon concentration; time spent in building and the number of people accessing the place. For the purpose of the precise definition of the target buildings, it is necessary to ensure that the all the places where the population could be exposed to radon are adequately covered. To define the whole list of the target buildings, the official available information has been used from: the Ministry of Education and Science for the schools and universities; Ministry of Health for the hospitals and polyclinics; Ministry of Culture for the theatres, cinemas and museums and the Ministry of Tourism for hotels, caves, etc.

Keywords: Radon concentration, buildings with public access, schools, hospitals, caves, Bulgaria