INFLUENCE OF GEOLOGICAL PARAMETERS ON THE CONCENTRATION OF INDOR RADON IN THE CITY TREBINJE

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Introduction

During 2018/2019 years an extensive study in Republic of Srpska was carried out on indoor radon (Rn) measurements in 82 buildings i.e., 54 schools and 22 kindergartens [1].

In the area of Trebinje City, the Rn concentrations (CBqm3) in four schools (elementary schools Jovan Jovanovic Zmaj, Vasilije Ostroski and Vuk Karadzic, respectfully) and musical school, showed higher Rn (Bq/m3) than the maximum reference level for workplaces of 300 Bqm3 according to Euroatom Council Directive 2013/59 [2].

Thus the paper deals with the investigation on potential link between the geological parameters with these high concentrations taking into consideration of assessing the soil beneath these buildings as the main source of indoor radon.

Indoor Radon measurements

Long term measuremnets of Rn Concentrations were measured by devices based on CR 39 detectors, supplied and etched by National Institute of Health, Rome, Italy.

The detectors were deployed 12 months in the 13 premises of four schools where children and teacher staff accomodate.

The Geological Characteristics of the sites

The area where the city of Trebinje and its surroundings issituated represents the southeastern parts of the **„***High Karst Overthrust*", i.e. *Ljubovo Anticlines*, a smaller tectonic structure separated within this geotectonic unit. The „*High Karst Overthrust*" is characterized by the general spreading of layers northwest-southeast, relatively slight general decline to the northeast, laying down of wrinklesto the southwest, banded arrangementof sediments andfaults of different type, intensityand time of origin. The northern and northeastern parts of the wider surroundings represent the southwestern wing of the Leotar anticline, and the western, southwestern and southern parts of the wider surroundings represent the part of the northeastern wing of the Ljubovo anticline.

In addition to the longitudinal faults that separate individual tectonic units and along which the horizontal movements were performed with riding in thesouthwest direction, and through transverse and longitudinal faults. Three fault systems of different origin and intensity are observed. These are northwest-southeast fault (the oldest), the northeast-southwest faults (small length) andthe faultsof the generalnorth-south direction (a system of parallel faults along which tectonic units split).

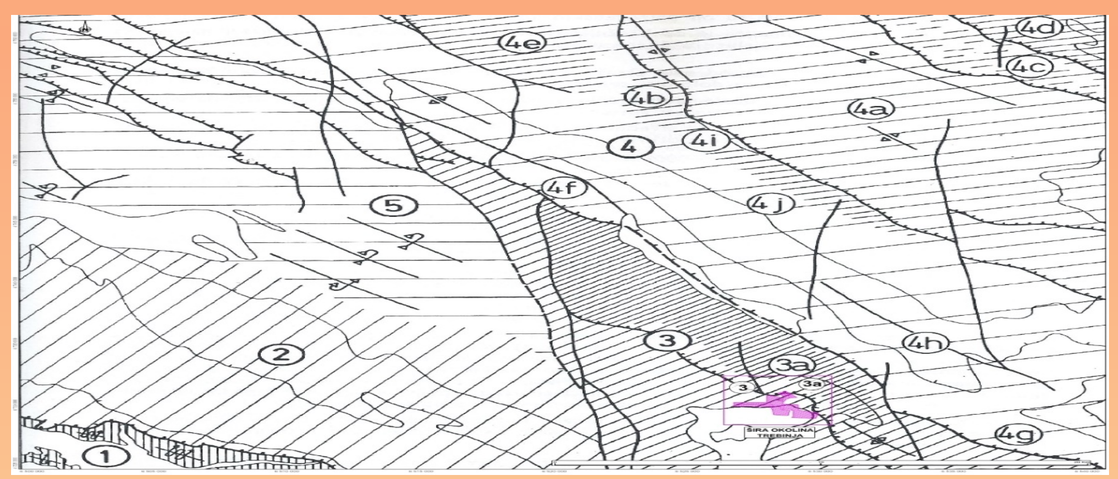

Figure 1. Generalized tectonic map of Trebinje sheet

Lithostratigraphic structure of the terrain

1. Elementary School Jovan Jovanovic Zmaj Trebinje is situated in the southwestern part of the urban city center. The terrain structure of the immediate location includes alluvial deposits (al) deposited over the limestone and dolomite packages with chondrodonta ($^2K_2^2$) – Middle Turonian.

2.Elementary School Vasilije Ostroski Trebinje is situated north of the urban city center. The terrain of the immediate location includes deluvial deposits deposited over the Lower Cretaceous Valendin - barem ($^1K_1$) massive, scarce banked dolomites with smallerlensesor layers ofgray-bluish and brown dolomite limestone in the lower horizons.

3. Elementary School Vuk Karadzic in Trebinje is situated in the eastern part of the urban city center. The terrain structure of the immediate location includes alluvial deposits (al) deposited over the limestone and dolomite packages with chondrodonta ($^2K_2^2$) – Middle Turonian.

4.Elementary School Trebinje is situated in the southwestern part of the city. The terrain structure of the immediate location includes alluvial deposits deposited over the limestone and dolomite packages with chondrodonta ($^2K_2^2$) – Middle Turonian.

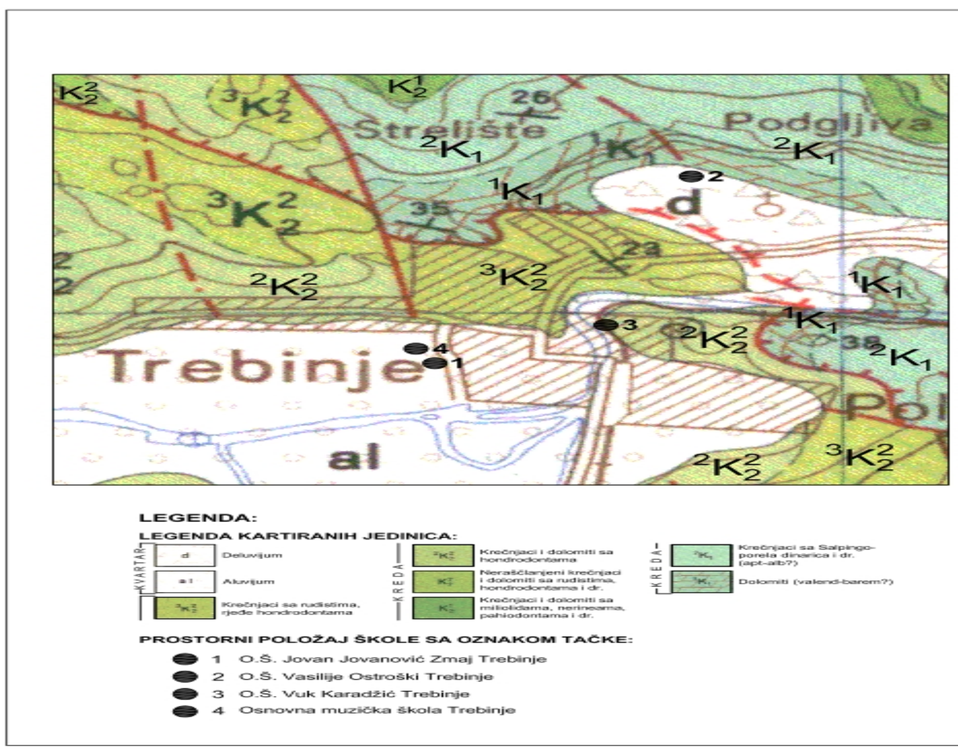

Figure 2. Lithostratigraphic structure of the terrain locations of schools

Resultas

Tabela 1. Descriptive measurement stastistics 4 schools

Statistic	Rn
Minimum (Bq/m3)	75
Maximum (Bq/m3)	4244
Median (Bq/m3)	472
Arithmetic mean(AM) (Bq/m3)	978
Standard deviation (SD) (Bq/m3)	1193
Geometric mean (GM)	511
Geometric standard deviation (GSD)	3,41

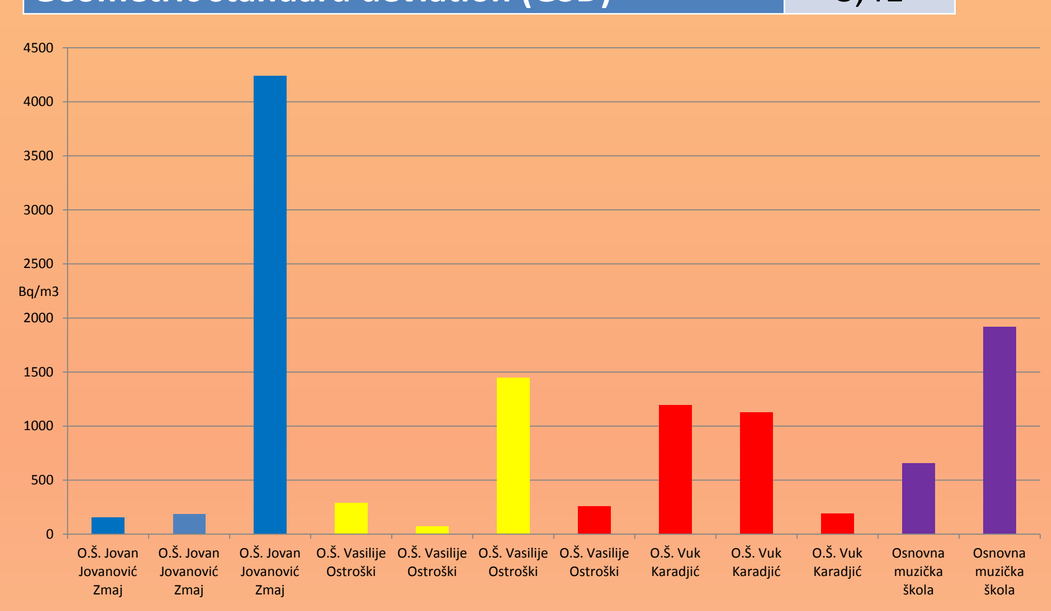

Figure 3. Measurement plot

Conclusion

This paper links the high indoor radon concentrations to the geological substrates beneaththe measurement facilities. When analyzing the geology ofthe measured area, the dominance of limestone and dolomite packages with chondrodonta ($^2K_2^2$) – Middle Turonian is observed, as well ashigh karst overthrust and faultsof different types give answers about high radon concentrations in all schools. It is known that radon concentrations vary from room to room in the same building, which was also determined in other studies (3). This phenomenon is also confirmed in this paper where we have a very pronounced variability of concentrations. This phenomenon requires the measurement of radon concentrations in each of thepremises of the facility in order to properly demonstrate the risk of the geogenic potential of the area. The results of these measurements indicate the need to analyze radionuclides of the materials from which the facilities were built to determine their impact in total concentrations. All data from this research should be taken into account during the construction of such and similar facilities in the area of the city of Trebinje.

References:

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