https://www.researchgate.net/publication/254805146_Dimensionalizing_Cultures_The_Hofstede_Model_in_Context (date of access: 23.01.2021).

Mac-Donald Prince (Ghana), Adams B. (Ghana),
S.V Smirnov (Russia), K. Abdullina

Tomsk Polytechnic University, Tomsk

Scientific Advisor: Yakovleva V.S

IMPACT OF RADON AND THORON LEVELS ON TECHNOSPHERE OBJECTS IN THE TOTAL URBAN ENVIRONMENT

Abstract

Thoron and radon exhalation from earth's crust is the most important source of atmospheric radioactive gases, along with its daughter products present in the soil is one of the major contributors to the external gamma dose in the atmosphere, since its distribution in the earth's crust is important for controlling the production of 220Rn and 222Rn. In this study trace amount of 232Th, 238U permeate almost all soils and rocks, in part due to the influence of buildings from which radioactive gas can emanate over geological time scales. Results obtained from this study indicate that the region has background radioactivity levels within the natural limits and a detailed discussion of the results is presented in the work.

Introduction

Radon and its decay products are the major contributors to human exposure from natural radiation sources [1]. Because radon and thoron are members of different decay chains, their concentrations depend in part on the uranium and thorium levels in local soils, building materials and brick construction which is very popular for family houses, building materials, contribute significantly to indoor radon and thoron in Russia, Tomsk [2]. In view of the fact that radon, thoron and their progeny concentrations contribute the most to the natural radiation dose to general populations, large scale and long-term measurement of radon, thoron and their progeny concentrations has been receiving considerable attention [3]. Even though measurement of radon, thoron and their progeny concentrations were done over the past 50 years in many countries, with the improvement of experimental apparatus and technical formulation, the same is going on till today. With these improvements,

monitoring of radon, thoron and their progeny concentrations are well correlated with the prediction of earthquakes [4].

The object of study is to find the total activity of thoron and radon in densely built-up city areas and to carry out analysis for different buildings to help determine the contribution of technospheric objects on our environment. Evaluation of the impact of technospheric objects on the total radon and thoron levels in the urban environment will solve the problems of low doses of radiation. Technosphere is that part of the environment that is made or modified by humans for use in human activities and human habitats.

Description and Methodology of Research

In this research we employed the use of an Alpharad-plus Radiometer. The equipment allows us to monitor: the content of radon and thoron in the air, water and ground surface and also to monitor the volumetric activity of radon and thoron in the air as well. Also an alpha particle detection block BDKG-03 designed was used to measure alpha particle flux density from contaminated surfaces in the range of 50 keV to 3 MeV energy range.. The BDKG-03 is a scintillation-based intelligent gamma-ray detector device that can scan for, track, and locate ionizing radiation. It is made up of a Cs137 source that has a sensitivity of 350 impulses per second (imp/sec) and a measurement unit of Sv/ hr. It can also be used to calculate ambient power equivalent dose and gamma radiation dose.

Map of Research Area

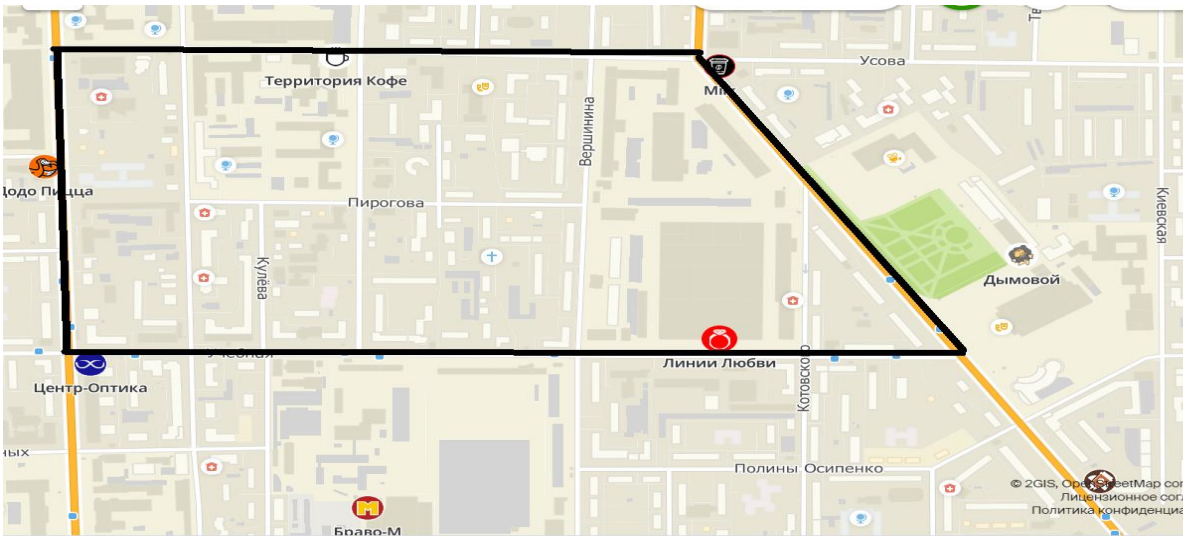

Figure 1. Area of measurement

There was approximately 182 houses with an area of 590,180 square metres where measurement of the thoron flux density from the surface of buildings and the ground was evaluated.

Experiment

Measurement readings for this research was conducted from August 2020 to March 2021. The effect of windows and openings on the building was taken into account during the evaluation process for radioactive gas from structures, as these emit negligible amounts of radiation. The location for this experiment was chosen based on the materials used to construct the structures, as well as if it was near manufacturing facilities, as factory waste affects and adds to background radiation. There is also a densely built-up environment in the city. To calculate radon flux density from the ground surface we employed the formular:

$$q = D_e \cdot K_e \cdot A_{Ra} \cdot \rho_s \cdot (1-\eta) \cdot \left(\sqrt{\left(\frac{\upsilon}{2 \cdot D_e}\right)^2 + \frac{\lambda}{D_e}} + \frac{\upsilon}{2 \cdot D_e}\right), \quad (1)$$

If $\upsilon = 0$, then:

$$q = D_e \cdot K_e \cdot A_{Ra} \cdot \rho_s \cdot (1-\eta) \cdot \sqrt{D_e \cdot \lambda} \quad (2)$$

Radon flux density of building material we employ the formular:

$$q_m = A_{Ra} \cdot \rho_s \cdot \sqrt{\frac{D_e \cdot \lambda}{\eta}} \cdot \tanh\left(d \cdot \sqrt{\frac{\eta \cdot \lambda}{D_e}}\right), \quad (3)$$

Where d - half the thickness of the material layer, m;

Table 1

Physical and geological characteristics of building materials

Material	d, m	ρ, kg/m3	η	D_e, m2/s	K_e ,%	A_{Ra} ,Bq/kg	q_m, mBq m-2 ·s-1
Concrete with crushed stone	0,175	2350	0,25	8 ·10-8	9,53	1,65	1,3
Concrete with gravel	0,175	2350	0,25	8 ·10-8	9,53	1,87	1,5
Slag	0,3	2000	0,05	2 ·10-7	0,93	0,83	1,0

Result and Discussion

Table 2

Measurement results

S total, m2	S building, m2	S soil, m2	S asphalt, m2	A building, mBq	A soil, mBq	A asphalt, mBq
590,180	131,688	458,493	305,662	6.48*1010	8.72*1011	3.43*1010

Total activity of (Soil, Building, Asphalt) = 3.90*1011 mBq. It was estimated that the Percentage of radon and thoron activity in the atmosphere from buildings is 16% whereas from asphalt is 10% and Percentage in the atmosphere from soil is 74%.

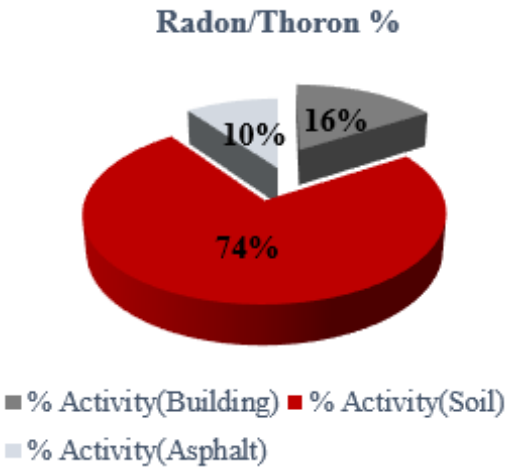

Figure 2. Distribution of Total Activity

Figure 3. Building made of wood in Аникино

The results were compared to a rural settlement (Аникино) where the construction materials was mostly made from wood.

Conclusion

A literature review was conducted and the area of Measurement was selected which revealed information about the buildings, such as: height, total surface area and type of material from which the building was built. In the measured area, the percentage of atmospheric activity from buildings is 16% and the percentage of atmospheric activity from soil is 74% whereas Asphalt recorded 10%. The data obtained was compared with a less built-up area, where the build-up is 1.1% less than in the measured area, therefore the activ-

ity in the atmosphere from buildings is not significant. Firstly, because the building density is low, and secondly, because most of the buildings are made of wood. It was also discovered that the amount of activity in the atmosphere from buildings is directly proportional to the type of material from which the building is made. Hence the study indicate that the region has background radioactivity levels within the natural limits.

REFERENCES

1. Measurements of radon (222Rn) and thoron (220Rn) exhalations and their decay product concentrations at Indian Stations in Antarctica Rama Prajith, R. P. Rout, D. Kumbhar Rosaline Mishra, B. K. Sahoo, B. K. Sapra. pp1
2. Geochemical Peculiarities of Soils In Tomsk Areas Of Industrial Enterprises Locations L.V. Zhornyak, N.A. Osipova, E. G. Yazikov, K. E. Demidova, K. Yu. Osipov.
3. Mayya, Y. S., Eappen, K. P. and Nambi, K. S. V. (1988). Methodology for mixed field inhalation dosimetry in Monazite areas using a twin-cup dosimeter with three track detectors. Rad. Prot. Dosim., 77, 177-184.
4. Lalmuanpuia V., Measurement of Radon, Thoron and Their Progeny Concentrations In Mizoram With Special Reference To Aizawl, Champhai And Kolasib Districts.

Mack Quiroa C.A.

Kazan (Volga) Federal University,
Institute of Management, Economics and Finance

Scientific advisor – senior assistant professor Nigmatullina A.F.

GARBAGE RECYCLING AS A BUSINESS AND HOW RUSSIA CAN BE PART OF THE GAME

Recycling is one of the most important topics in the modern world. As a business it can be affordable, sustainable and friendly to our planet giving us the opportunity to live in a cleaner, more sustainable and preserving the diversity of animals and plant world. The purpose of our study is to emphasize how a simple aluminum could be the source of money for us, and how Russia can be part of this garbage recycling business game which is a multibillionaire one. Countries like USA, UK, Germany and Scandinavian countries are part of this promising game helping our environment, reducing costs, volatili-