STUDY ON THE INFLUENCE OF ENVIRONMENT AND CONSTRUCTION MATERIALS ON ACCOMMODATION CONDITIONS IN FARMHOUSES

C. Leonte[1*], Doina Leonte[1], Lenuţa Fotea[1]

[1]*University of Agricultural Sciences and Veterinary Medicine Iasi, Romania*

Abstract

This paper presents some aspects of the construction actions on human life and health in relation to construction sites and quality of materials used to make the accommodation. The research was conducted by consulting bibliographical references to the influence of materials and location of the housing conditions of environment, following at the same time housing developments in rural areas after 1990 compared to urban housing. Specifics of the traditional rural landscape conjugated with the interest in the landspaces and recreational opportunities the rural environment provide are the main reasons that attract tourists from urban areas. Globally there is a tendency towards green housing in relation to the materials and technologies used in the construction of buildings. Main components a of green building are environment and "healthy" building materials. They can negatively or positively influence the lives and health of people. Radon and thoron contribute to over 50 % of natural background radiation. It is therefore necessary to monitor radon levels in homes to ensure public health through the use of appropriate building materials and ventilation measures. Exceeding the maximum permissible effective dose to the population is 1 mSv per year above natural background radiation (2.4 mSv) should be avouded.

Key words: rural tourism, ecological houses, radon, concrete

INTRODUCTION

This paper presents some aspects of the construction actions on human life and health in relation to construction sites and Quality of materials used to make the accommodation.

Rural areas, regardless of their geographical position (plains, hills, mountains, sea etc.) can be defined as a natural geographical environment healthy for living, both due to ambient environmental and landscape conditions, and the terms of social peace. [3].

The president of the Association of Construction Material Producers of Romania, Claudiu Georgescu said that Romania ranks first in terms of the number of green homes because 20% of the housing stock of the country is represented by houses built of adobe *(Alexandru Urzică).*

MATERIAL AND METHOD

The research was conducted by consulting bibliographical references to the influence of materials and location of the housing conditions of the environment, following at the same time housing developments in rural areas after 1990 compared to urban housing.

Made for a very long time from local materials : earth , natural stone , burnt earth , wood and other plant products, the house was well connected to the surrounding natural environment. Walls made of heavy materials, the roof with material thickness and significant slopes, were preventing sudden and sharp decline in indoor air temperature in the winter and excessive temperature growth in the summer.

The architecture of today has lost most of the traditional ways of building a house. The house is an enclosed area designed and constructed so as to cope with an environment increasingly hostile, being made of the new and modern building materials [2].

In 2002, in Romania there were 7.837 million homes, of which 3.272 million in rural areas, returning on average 3,4 people per dwelling, of which 3.35 persons / household in

*Corresponding author: famleonte@yahoo.com
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urban areas and 3.48 persons / household in rural areas[3].

At the census of 2011, in 5.105 million buildings there were 8.451 million conventional houses, with 22 741 000 rooms (Table 1).

Table 1 The structure of housing settlements

Specification	Total	Urban Area	Rural Area
Number of housing buildings *	5 104 662	1 364 897	3 739 765
Number of conventional dwellings	8 450 942	4 583 045	3 867 897
Number of inhabitable rooms	22 741 372	11 418 978	11 322 394

Source: National Institute of Statistics
*residential buildings, buildings with collective living space, conventional dwellings and non-residential buildings containing conventional dwellings

Table 2 presents the facilities and dependencies endowment levels on conventional housings.

Of all conventional dwellings, 66.7% have tap water (91.6% of the households and 37.2% of the rural).

At the country level, 84.6% of conventional dwellings are equipped with kitchen inside the home (93.6% urban and 73.9% rural).

Bathroom endowment levels are smaller, only three out of five homes have at least one bathroom inside the home (69.1%). There is a discrepancy between the high average, 88.0% of dwellings recorded in urban areas and only 31.0% of those in rural areas have bathrooms inside the house.

Table 2 Facilities and dependencies endowment levels on conventional housings

Housing has:	Conventional housings	
	Number	%
FACILITIES		
Tap water	5 638 465	66,7
Sewage[1]	5 504 450	65,1
Electricity	8 166 508	96,6
Central heating[2]	3 755 761	44,4
DEPENDENCIES		
Kitchen (inside)	7 146 931	84,5
Bathroom (inside)	5 230 511	61,9

Source: National Institute of Statistics
[1] Homes conected to a public sewer network or their own system
[2] Heating or central heating

RESULTS AND DISCUSSION

As the homes are newer, the natural materials used in the past have been largely replaced by synthetic materials that can pollute the air, water and soil.

The negative effects of synthetic building materials on human health are not known with precision [2].

Rural accommodation includes all forms of tourist accommodation from farms to rural hotels or guest rooms, directly and personally managed by the owners, individuals, associations or communities.

Agritourism uses as acomodations farms or agro hostels both in Romania and in the EU [2].

Our homes are significantly influenced by environmental factors and building materials.

Regarding the relations between the construction site and the cardinal points, the direction of prevailing winds and rainfall volume, the house will be oriented to balance free light and heat, avoiding openings of the north facade.

Also in close connection with the locations where the house will be built, the designer should request the results from measurements such as the emissions of radon

from soil, distance from slag dumps, dominant wind direction and the quality of ground and geothermal waters when they will be used in the household.

The use of construction materials without radioactive emissions, sealing the building against any unwanted contribution from soil gas, ventilation with reduced harm, and heating systems that don't have negative environmental effects are all "gold rules" *(Ion Diamandi).*

Natural radiation is represented by the cosmic rays and terrestrial radiation. Regarding the biological effect of radiation, tests on animals found that exposure to the smallest quantities over a long period of time are more dangerous than one time exposure to a high dose.

The intensity of cosmic radiation depends on the height above sea level, so the radiation is higher in the mountains with an average height to the seashore. Terrestrial radiations originate from radioactive elements in the surface layers of the soil.

In some building materials such as granite, schist, pumice, volcanic tuff, clay and gypsum chemical there are radioactive elements such as potassium, thorium and radium.

Radon gas presents a stronger radioactivity that occurs in radioactive decay of uranium and thorium in the lead (Figure 1) (www.cceg.ro).

The main sources of radon and thoron are the residential building materials and substrate characteristic of those sites, characterized by specific values. Cracks and crevices of building materials (the floor around plumbing pipes, etc..) are the main routes of penetration of radon in the home (Figure 2). All building materials (wood, brick, concrete, insulation materials, plastics, etc..) originate in the earth's crust and contain very low concentrations of natural radioactive elements in particular uranium, radium, and thorium.

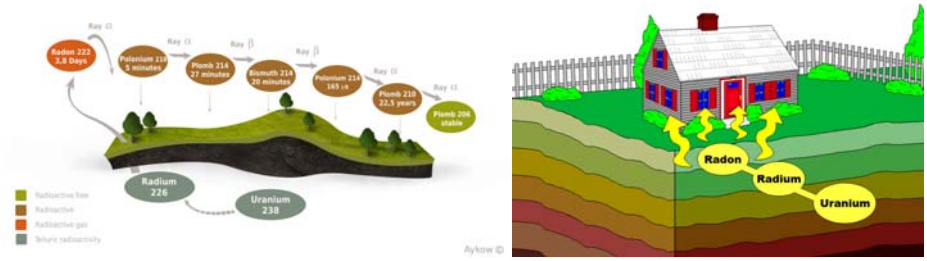

Fig. 1 Radioactive decay of uranium
(*Source:* https://www.google.ro/search?q=RADON&tbm)

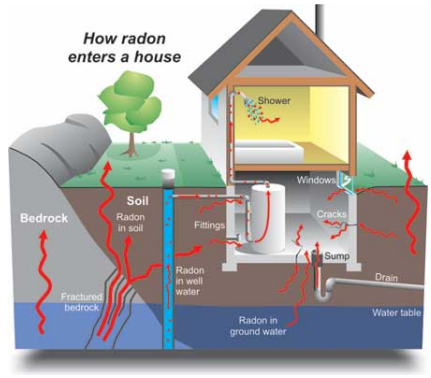

Fig. 2 Routes of penetration of radon in homes
(Source: https://www.google.ro/search?q=RADON&tbm*)*

Of building materials wood has the lowest content of radium (default radon content) and brick, concrete and ceramic tiles have the highest values (www.anpm.ro / natural and artificial sources of radioactivity).

Migration and transport of radon and thoron from soil and building materials to the air inside the house depends on the porosity of such materials, moisture, pressure differences between the air inside the house and outside, wind speed and air currents etc. (Figure 3).

Fig. 3 Factors that influence the rate of exhalation of the concrete radon
(Source: Carmen Adelina Apostu)

For a room made of cement concrete prepared with limestone and ash additions , research has shown that concentrations of radon is higher than with other types of concretes made with slag cement admixtures and cement limestone respectively slag, regardless of the age of the concretes studied.

A room made of concrete prepared with slag cement and superplasticizer additive, one year after pouring the concrete obtained the lowest radon concentration of about 14 Bq/m³.

The maximum value obtained for the concentration of radon indoors is 20 Bq/m³, the room made of concrete containing no additive with the cementitious ash and limestone with the age of one year.

If there are no entry routes for the radon in the soil and if the outside air has a concentration of 8 Bq/m³ (usual value outside) the building can result in higher radon concentration up to 28 Bq/m³ (Apostu Adelina Carmen).

Because most people stationed 75-80% of their time inside buildings (homes, offices, theaters or sports) they are partially protected from cosmic and terrestrial radiation, but are exposed to radon accrued in unventilated spaces or sealed (www.anpm.ro / natural and artificial sources of radioactivity)

The glazing technology has special role in construction sealing and it is widespread when it comes to construction and renovation of buildings.

The measurement of radiation doses that reach the body is in millisieverts (mSv). Experts of the American College of Radiology and the Radiological Society of North America argue that the maximum dose of radiation accumulated during a year shall not exceed 20 mSv / year (Table 3).

Table 3 Sources of radiation

Specification	Dose
Dental Radiography	0,02 mSv
Bone Densitometry	0,01 – 0,05 mSv
Mammography	1 – 2 mSv
CT Scanner CT (chest or pelvis)	4 – 8 mSv
CT Scanner CT completely	10 – 12 mSv
Radiation in the environment	3 mSv
Maximum permissible dose	**20 mSv/year**

Source (http://sanatate.bzi.ro 1-din-3 romani-este iradiat inutil)

In terms of equilibrium equivalent concentration, the effective dose limit for occupationally exposed workers from 20 mSv / year is given by a radon concentration of 1110 Bq/m³ = 30 pCi/l at equilibrium with its progeny (www.unibuc.ro/studies/Doctorate).

Based on the actions of actual measurement of radon with modern equipment (Figure 4). In different locations in our country, we calculated the average effective dose from this radionuclide time it hovering around an average of 1.41 mSv/year in rural areas and 1.22 mSv/year in urban areas. The concentration of radon in homes increases during the night when there is a strong accumulation through natural ventilation and significantly reduces in the morning when opening windows and doors. Radon enters the human body mainly through inhalation, but also through water and food. Being soluble in body fluids and tissues of the body, it becomes a potential risk factor for human health (www.anpm.ro/natural and artificial sources of radioactivity).

Fig. 4 Systems for measuring atmospheric radon and thoron (PYLON AB-5 and RN-20)

CONCLUSIONS

Radon and thoron contribute to over 50% of natural background radiation. It is therefore necessary to monitor radon levels in homes to ensure public health through the use of appropriate building materials and ventilation measures. Exceeding the maximum permissible effective dose to the population is 1 mSv per year above natural background radiation (2.4 mSv) should be avouded (www.anpm.ro/natural and artificial sources of radioactivity).

After smoking, radon is the second leading cause of airway cancer. Recent studies show that at least 10% of all cases of lung cancer, accounting for approximately 0.8% of all deaths are rooted in exposure to residential radon.

For Romania an annual number of 2,000 deaths from lung cancer are attributable to radon *(Cosma C., 2009).*

The dose received by the population as a result of the use and disposal of radionuclides in the environment (industrial research laboratories, nuclear medicine, etc.), Including nuclear power plants in normal operation is quite low, ranging from approx. 0.001 mSv per year. Exposure from other sources of radiation (high altitude airplane flight, luminescent dials of watches, TV screens, etc.) Is approx. 0.08 mSv per year.

Our population receives an annual effective dose of approx. 2.27 mSv of radiation of natural origin (natural background radiation), plus approx. 0.33 mSv per year from artificial sources. In total the Romanian population is receiving an

annual effective dose of approx. 2.6 mSv per year, 87.3% due to the natural background radiation (www.anpm.ro/natural and artificial sources of radioactivity).

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