

THE REQUIREMENT FOR THE REHABILITATION OF RESIDENTIAL BUILDINGS IN ROMANIA

B. CHIRIL¹ I. ERB NOIU²

Abstract: *In 1990, the year that followed the fall of Communism in Romania, 85% of the existing dwellings were those built after 1945, a fact that currently represents a true challenge from the point of view of maintaining this consistent fund of buildings in the process of obsolescence. As a result of government programs and existing information, it has been found that so far a small number of buildings have been consolidated. The legacy left by the socialist era is composed of a very large number of degraded buildings and whose resistance structure no longer meets the current requirements. It is necessary to identify optimal solutions from the point of view of the social component, the costs and the final result.*

Key words: *dwellings, strategy, rehabilitation, expertise.*

1. The Age of the Housing Fund in Romania

In 1990, the year that followed the fall of communism in Romania, 85% of the existing dwellings were those built after 1945, presenting a challenge in terms of maintenance of this consistent pool of buildings in the aging process.

Most residential buildings in use today were built in the second half of the 20th century. The socialist period (1961-1980) was the most prolific for housing construction, as shown in Figure 1.

The current urban housing stock is characterized by the predominance of dwellings built between 1971 and 1990. The share of dwellings built after 1990 is about 5% for the quintile with the lowest income (generally explained by the construction of new social housing) and 1-3% for all the other income quintiles [1].

The housing stock in rural areas is older than the urban one, most houses being built between 1946 and 1970 in all revenue quintiles. However, there seems to be a much higher percentage of households in rural areas occupying newer dwellings in all revenue quintiles.

Approximately 35% of residential units in Romania are multifamily buildings (apartment blocks), 63% are individual dwellings and 2% are dwellings of another type. Bucharest and Southeastern Romania are considered the most vulnerable areas to seismic activity due to the proximity to the Vrancea fault.

¹ Technical University "Gheorghe Asachi" of Iasi, Faculty of Civil Engineering and Building Services.

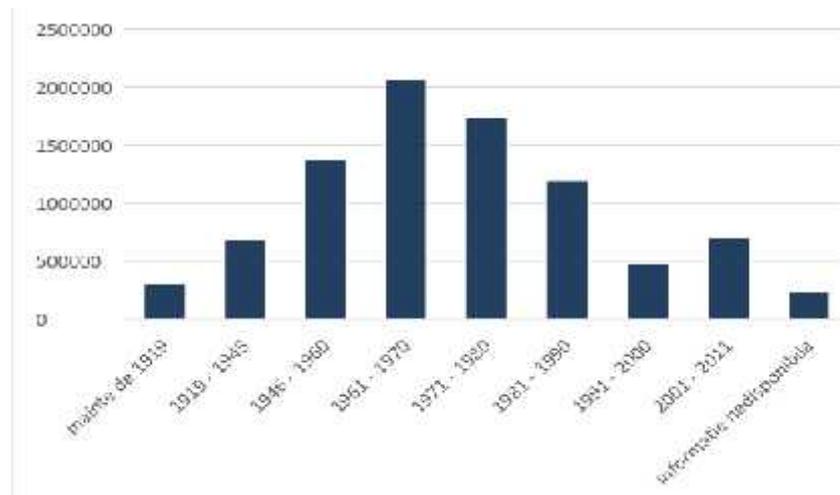


Fig. 1. *The housing stock according to the construction period (National Institute of Statistics (RPL 2011) World)*

According to the World Bank analysis (2004) and the research reports of Romanian and foreign scientists, in Bucharest, the highest seismic risk among all European capitals is estimated and is one of the 10 most vulnerable cities in the world.

According to the 2011 RPL data, there are 8,722,398 conventional dwellings at national level. These are defined as functionally distinct units, consisting of one or more living rooms, generally provided with attachments, (kitchen, bathroom) and / or other service spaces (storerooms, closets), independent of other dwellings or spaces, with separate entrance, whether occupied or not occupied.

At the end of 2015, according to the INS "Housing Fund" publication, the number of dwellings registered 8,882,100 million dwellings.

The size of an average dwelling in terms of its useful surface varies depending on the territory on which it is located, so the average useful area is found to be higher in Ilfov, Timiș, Satu Mare and Constanța counties (52-66 m² per dwelling). The smallest average useful areas are recorded in Brila, Cluj and Vaslui, Teleorman and Mehedinți (39-41 m² per dwelling).

Characteristics of conventional dwellings according to residence environments Table 1

		TOTAL	MUNICIPALITIES AND CITIES	COMMUNE
Number of dwellings		8 722 398	4 764 257	3 958 141
Average number of rooms per house		2.7	2.5	3.0
The average surface of the living quarters (Square meters) for:	Dwelling	45.9	47.4	46.7
	Room	17.3	18.8	15.7

2. National Strategy on Building Rehabilitation [2-4]

Within the Ministry of Regional Development and Public Administration there are three building consolidation programs.

The annual programs are elaborated by the Ministry of Regional Development And Public Administration on the basis of the priorities established by the county councils / the General Council of the Municipality of Bucharest and endorsed by the county committees for emergency situations.

With regard to the **multi-storey dwelling building consolidation program**, Romania is the only country in the world where the state has been involved in the rehabilitation of the old, privately-built fund, by allocating amounts from the state budget for the design and execution of consolidation works of the multi-storeyed residential buildings, which are classified as Class I of seismic risk and pose public danger.

The First Emergency Response Program for vulnerable and publicly vulnerable buildings aims at removing the danger of collapsing of building elements and limiting the effects of landslides. Buildings of particular importance that have the value of a historical monument are included in the program (for example: health buildings, schools, city halls) that are subject to other risks such as landslides that may affect some urban communities. This program is funded by the Ministry of Regional Development and Public Administration.

The Risk mitigation project, in the event of natural disasters, for emergencies - Component B - Seismic Risk Reduction is multi - sectoral and is an ex - ante project, being a premiere in adopting a strategic approach which would be oriented towards actions to prevent and mitigate the effects of natural disasters and strengthen the institutional and technical capacity for the management of crisis situations in the event of such calamities.

As a result of the aforementioned government programs and the information published on the Ministry of Regional Development and Public Administration website and on the local government websites, it has been found that up to now, 84 buildings which were classified by technical expertise in seismic risk class I have been consolidated, most of them being from Bucharest.

3. The Need for Intervention on Residential Buildings in Romania

The maintenance of the real estate fund has become an important topic of debate in the post-socialist period in Romania. The privatization of the real estate fund and the restitution of the nationalized houses have transferred the responsibility for their maintenance to the owners who, in most cases, do not have the necessary financial means to finance the relatively costly rehabilitations and structural consolidation projects.

Structural stability has been subject to some assessments after 1990, but a reassessment may be necessary as standards have been updated since then [4].

At present, the technical expertise of the buildings is carried out in accordance with the framework content provided in the technical regulation "Seismic design code - Part III - Provisions for seismic assessment of existing buildings", indicative P 100-3 / 2008, which establishes four classes of seismic risk:

- **Rs I Class**, of which the high risk collapse buildings are part, in the event of an earthquake of magnitude corresponding to the ultimate limit state;

- **Rs II Class**, where we can frame buildings that may suffer major structural degradations under the effect of the earthquake, but where loss of stability is unlikely;
- **Rs III Class**, which includes structures that, under the effect of the projection earthquake, may present structural degradations that do not significantly affect structural safety but where non-structural degradation may be important;
- **Rs IV Class**, corresponding to the constructions where the expected seismic response is similar to that obtained in the constructions designed on the basis of the existing regulations [5,6].

According to the data published by the Ministry of Regional Development, Public Administration and European Funds (MDRAP) and by the local public administrations, a number of approx. 3582 buildings that have been surveyed (Figure 2) and assigned a seismic risk class or emergency category have been identified [3].

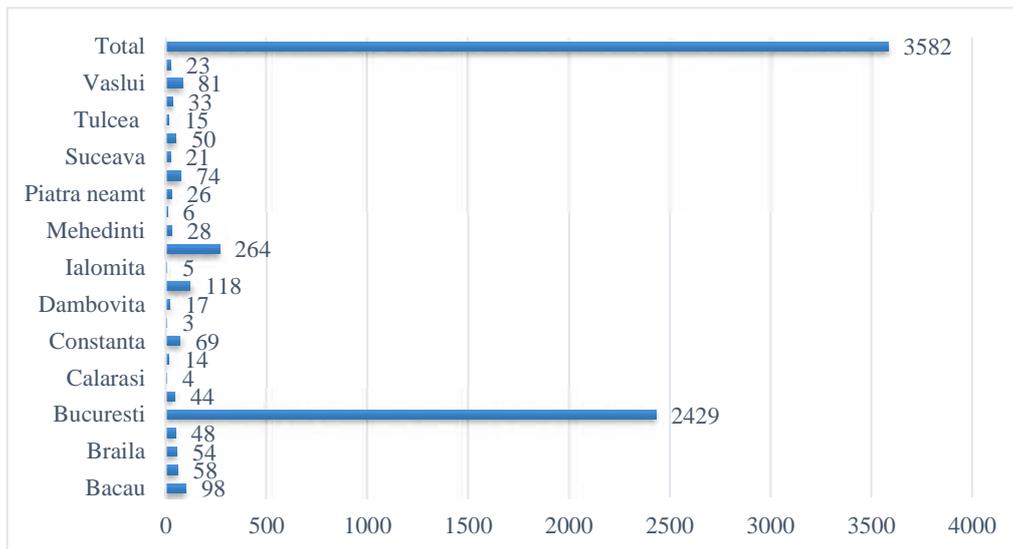


Fig. 2. *The number of buildings that have been surveyed*

Figure 3 shows that a number of 2401 buildings were identified as requiring urgent structural consolidation, being classified as Seismic Class I and II or Emergency Class U1 and U2, indicating that these buildings require total or partial consolidation work or even demolition.

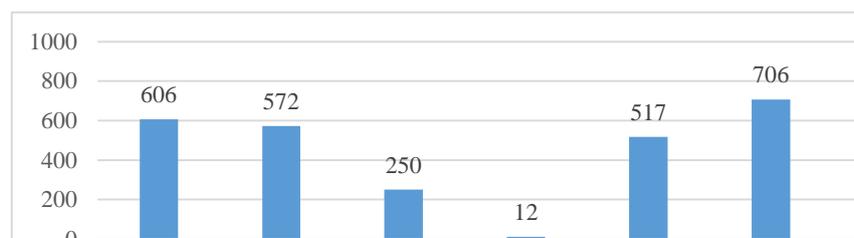


Fig. 3. *The number of buildings that have been tested and assigned to a particular class of seismic risk, or in an emergency category.*

Much of the expertise was carried out between 1992 and 1998, since then and until now many of the technical regulations have changed, for which now the buildings that were classified as seismic risk class II, III or the emergency category U2 or U3 should be reassessed as there is a risk that they fall into a lower class, with consolidation work being needed.

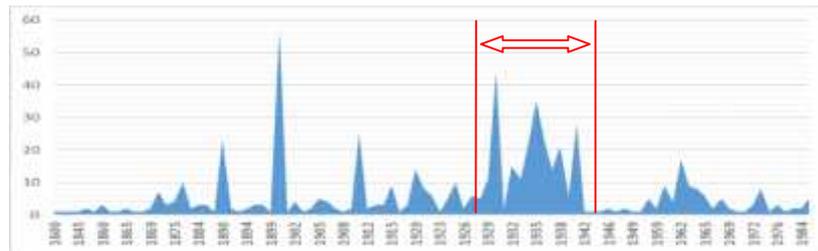


Fig. 4. *The number of buildings that have been surveyed and classified as seismic risk class I, grouped according to the year of their construction*

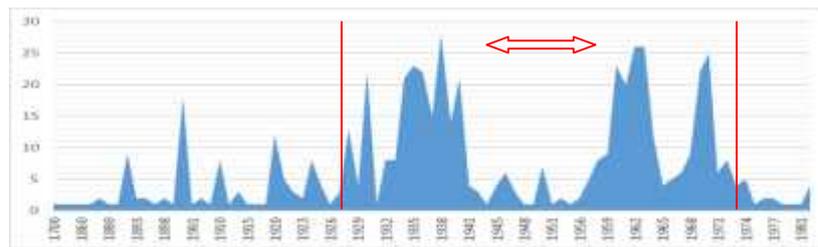


Fig. 5. *The number of buildings that have been surveyed and classified as seismic risk class II, grouped according to the year of their construction*



Fig. 6. *The number of buildings that have been surveyed and classified as seismic risk class III, grouped according to the year of their construction*



Fig. 7. *The number of buildings that have been surveyed and classified as seismic risk class IV, grouped according to the year of their construction*

Analyzing the graphs presented in Figures 4, 5, 6 and 7 we can draw the following conclusions:

- buildings classified as seismic risk class I are generally buildings built before the 1940s;
- buildings classified as seismic risk class II are generally buildings built between 1930 and 1970;
- buildings classified as seismic risk class III are generally buildings built between 1960 and 1980.
- buildings classified as seismic risk class IV are generally buildings built after the 1970sb [6].

4. Conclusions

The legacy left by the socialist era is composed of a very large number of degraded buildings and whose resistance structure no longer meets the normative requirements and the current design codes.

At present, the only official information on the technical condition of existing residential buildings is given by the technical expertise made especially during the period 1992-1998 at the command of the local public administrations.

Since then and until now, the state of existing buildings has deteriorated, the norms and design codes have been updated, becoming increasingly restrictive along with the new information obtained from further research.

In order to address these shortcomings, it is necessary to draw up a feasible strategy on the expertise and rehabilitation of the existing building stock, identifying optimal solutions in terms of social component, costs and final result.

References

1. Anohie, E.,: *Ingineria costurilor (Cost engineering)*, Academic Society "Matei-Teiu-Botez Publishing Iasi, ISBN 6065820059, 2011.
2. Bica, M.,: *Vulnerabilitatea seismică a fondului construit din România la acțiunea cutremurelor Vrancei (The seismic vulnerability of the built fund in Romania to the earthquakes in the Vrancea region)*, Phd thesis, 2003.
3. Budescu, M., Ciongradi, I., Ibrănuș, N., Gavrilă, I., Ciupala, M., Lungu, I.: *Reabilitarea construcțiilor (Rehabilitation of buildings)*, Ed.Vesper Iasi, ISBN 973-96589-9-7, 2001.
4. Hagiu, V., *The management of the execution of construction projects*, Dosoftei Publishing Iasi, 2003
5. *** P100-1:2008: *Cod de evaluare seismică a clădirilor existente (Seismic assessment code of existing building)*, Technical University of Construction Bucharest, Contract nr.216 from 08.11.2005.
6. <http://www.mdrap.ro/constructii/siguranta-post-seism-a-cladirilor/programe-de-prevenire-a-riscului-seismic>