CURRENT SEISMIC RISK AND VULNERABILITY OF BUILDINGS IN ROMANIA: GOING ALL THE WAY BACK TO POST-COMMUNIST LEGISLATIVE VULNERABILITY SOURCES

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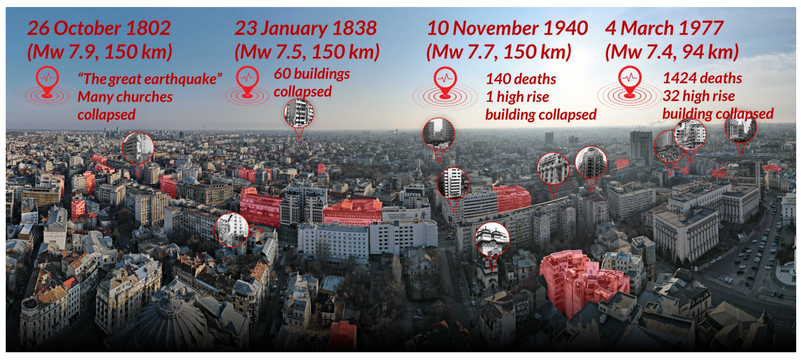
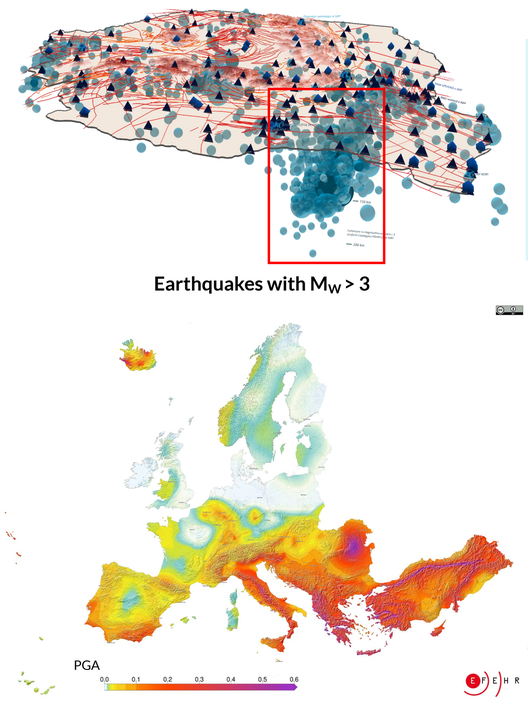
SETTING THE SCENE

Romania is subject to earthquakes originating in the Vrancea Seismogenic Zone. This high-level seismic hazard overlaps deeply rooted physical and socio-economic vulnerability conditions.

Part of the current physical vulnerability of the building stock can be traced back to the legal framework that regulates seismic risk reduction.

In this context, Romania serves as an ideal case study for for delving into the essential role of legislative vulnerability in shaping various other dimensions of vulnerability.





Earthquake hazard map of Europe, **10% in 50 years exceeding probability** (Danciu et al. 2021)

AIM

The aim of this study is two-fold:

1) to identify the most prominent vulnerability sources in the post-communist Romanian legal framework that regulates the evaluation of seismic risk of buildings in Romania,
2) to correlate them with both present-day urban realities in Bucharest and other urban centres, and advances in the Romanian scientific literature concerning seismic risk and vulnerability.

METHODOLOGY

REVIEW OF LEGAL FRAMEWORK	ELICITATION OF VULNERABILITIES	REVIEW OF LITERATURE	LEVERS OF CHANGE
1990-2023 27 normative acts (laws, ordinances, resolutions)	Extract legislative vulnerabilities Insights on their effects	**2000-2023** 25 scientific papers on seismic vulnerability	Identification of opportunities to integrate scientific results into policy

RESULTS

General framework for reducing the seismic risk of buildings

1. Identification and inventory of vulnerable buildings

Responsibility of: building owners (1990-1997)
county commissions (1997-2006)
mayors (2006-2023)

2. Technical evaluation of vulnerable buildings

- Assigns seismic risk classes to buildings
  - Rs I, Rs II, Rs III, Rs IV
- Includes an intervention solution
  - A. Consolidation works
  - B. Demolition (not properly regulated)

3. Implementation of the intervention solution

- Implies the evacuation of the population from the building
- The relocation is provided by the state
- Interdiction to perform economic activities in the building until its full consolidation

Done by technical evaluators (2) and construction professionals (3) , hired and paid by:

- owners for residential and non-residential buildings owned by natural and legal persons;
- local authorities for public utility buildings

Since 2023, the technical evaluations of the buildings enrolled in national programmes for seismic risk reduction can be paid for from the state budget. For the other buildings, the costs are supported by owners or owner associations.

Prominent legislative vulnerabilities

- The identification of vulnerable buildings was done following questionable instructions, or using low-quality data on buildings.
- The state offered limited (but increasing) funding support for the technical evaluations and subsequent consolidation works for vulnerable buildings.
- The technical evaluation reports were not peer reviewed.
- The deadlines established for completing the above said tasks were frequently disregarded (by both owners and authorities), and no motivating actions were taken to extend them.
- The initiatives to reduce the seismic risk of the building stock were not accompanied by actions aiming to estimate and reduce social vulnerability.
- Many aspects related to seismic risk reduction were regulated "on the go", which caused significant delays and made the process ineffective.
- The sanctions imposed for failing to implement seismic risk reduction actions or for disregarding the set deadlines were shallow and lacked impact.

Progress in seismic risk reduction

1990-1994 Early transition confusion	1994-2019 25 years of ineffectiveness	2019-2023 Recent hopefulness
Funding of seismic risk reduction • private properties: self-funding, insurance, long-term bank loans • public utility buildings: state/local budget	**Funding of seismic risk reduction** • private properties: self-funding (economic agents), reimbursable state/local transfers (natural persons and later economic agents) • public utility buildings: state/local budget	**Funding of seismic risk reduction** • private properties in the new national program: non-refundable state/local transfers • other private properties: own funds • public utility buildings: state/local budget
Contraventions and sanctions • no list of contraventions • general, ineffective sanctions	**Contraventions and sanctions** • 2006: introduction of contraventions and (low-level) penalties • progressive increase in the no. of contraventions and penalties amount	**Contraventions and sanctions** • new contraventions and (medium-level) penalties 2022: significant sanctions, transparent control and application
	National programme • introduced in 2001 • partially funded from state/local budgets	**National programme** • new programme in 2022 • more financial support from the state

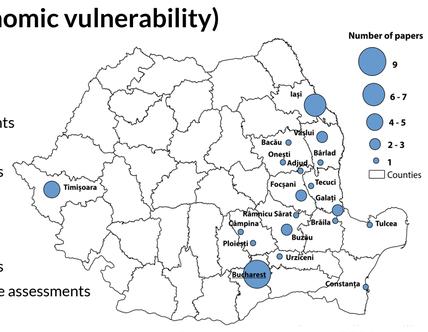
How can science step in?

Maps of the spatial classification of buildings with seismic risk

Studies on the seismic vulnerability (physical, social, economic vulnerability)

of buildings: 11 papers
Building by building assessments
Identification of clusters
Semi-quantitative assessments

of cities: 14 papers
Deterministic assessments
Semi-quantitative assessments
Comparative semi-quantitative assessments

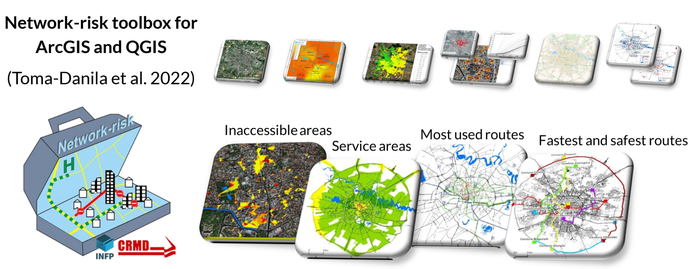


(Albulescu and Armas 2023)

Framework for the identification of travel times for various post-seismic scenarios

Network-risk toolbox for ArcGIS and QGIS

(Toma-Danila et al. 2022)



Studies on seismic risk perception

(Armas et al. 2017, Albulescu et al. 2021, Ionescu et al. 2021)

KEY TAKEAWAYS

- The numerous modifications to the legal framework regulating seismic risk reduction transformed it into a cumbersome, hard to apply instrument.
- The identified legal vulnerabilities represent the root of the current physical vulnerability conditions.
- The normative acts of the last four years instil optimism for seismic risk reduction.
- The Romanian scientific community significantly contributed to the investigation of seismic vulnerability, but the results have not been integrated into policymaking to date.

ACKNOWLEDGEMENT

This research work was powered by the EU PARATUS project, receiving funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101073954.

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