

Seismic risk assessment of building classes

(Proposer: Francesca da Porto)

Background.

Seismic risk mitigation represents a key point in disaster risk reduction, which has generated a strong interest from institutions, local administrations and involved stakeholders. In March 2015, the United Nations (UN) adopted the *Sendai Framework for Disaster Risk Reduction*, setting as a primary concern disaster risk prevention and reduction policies for resilience.

Specifically, Italy is a country characterised by high seismicity, where past earthquakes have had dramatic consequences, with very high social and economic costs.

Mitigation and resilience policies for the building asset must be effectively planned and fulfilled to enhance safety of users, reduce economic losses, and preserve communities. Risk evaluations at a large scale are therefore required to address seismic risk reduction policies.

In this framework, the estimate of consequences of a seismic event is a crucial point. Consequence relationships should be deepened investigated to evaluate the impact of earthquakes on building stocks, in terms of direct economic losses, population assistance and casualties. Data collected during past seismic events will be fundamental for this purpose. In addition, the identification of appropriate mitigation interventions and the estimation of their costs are equally fundamental aspects to define effective mitigation strategies.

Aim.

The final aim of this research is to provide a rational and science-based framework to support the definition of mitigation strategies and resilience policies for building assets at national scale, with specific focus on Italy. For this purpose, refined fragility models for typical building macro-classes, will be derived.

Earthquake losses will be investigated through both empirical data and numerical simulation, with the aim of proposing economical models or tools to evaluate the impact of seismic events, consistent at a national scale. Cascading effects, such as landslides, debris-flow and others that might be triggered by a seismic event, could be eventually included in the study.

Based on these findings, mitigation strategies will be investigated at national scale. Novel mitigated fragility models will be developed to evaluate the effect of structural risk reduction policies. The evaluation of effectiveness of the analysed strategies will be based on impact reduction, cost/benefit analyses and resilience enhancement, also exploiting multi-criteria decision-making (MCDM) approaches. Non-structural risk reduction actions, to enhance resilience and improve preparedness and emergency planning, will be also eventually proposed.

Expected results.

- Development of fragility models for national building assets.
- Development of consequence relationships to evaluate the impact of earthquakes.
- Devising mitigation and resilience strategies and evaluating their impact on seismic risk.
- Development of an operational framework for cost/benefit analyses of these strategies.

Funding: Progetto ReLUIIS 2022-2024; DA_P_FINA21_01, Agreement with the Municipality of Padova

Possible Collaboration: ReLUIIS –Laboratories University Network of Seismic Engineering; DPC – Department of Civil Protection; Municipality of Padova.