Analysis of an effective reconstruction process after the 2002 Molise earthquake in Italy

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Introduction

On the 31st October 2002 the Molise Region in Italy was struck by a relatively moderate magnitude earthquake (M_w=5.7) that, nonetheless, caused the death of 27 children, due to the collapse of a primary school and a severe level of damage in several villages and towns.

The extensive damage to buildings, observed in Molise, was attributed mostly to poor quality construction practices and materials. Many of the buildings that suffered extensive damage or collapse (including the collapsed school) were not adequately engineered to withstand the seismic forces, due to the lack of seismic regulations for construction in Molise Region (EERI 2003). The collapse of the public school, that killed the children, hit profoundly the public opinion and become the symbol of local government failure to oversee strategic constructions that should protect the public interest. Consequently, at national and regional level, the focus of attention was concentrated on earthquake risk and on the need for mitigation strategies. This promoted in Molise an effective post-disaster reconstruction process that aimed to built a more resilient community, while reducing the seismic vulnerability and risk.

Firstly, the reconstruction process was speed up by an effective emergency management and response. Immediately following the main shock, the structural and non-structural damage assessment of public and private buildings and infrastructures was conducted in order to establish their safety and usability. More than 23,000 buildings were inspected by means of the AeDES form, ''Building Operability and Damage during the Post-Earthquake Emergency''. The form facilitated the decision-making about the post-earthquake building usability allowing to identify: 1) possible short-term use of buildings; 2) possible and safely use of buildings in case of aftershocks; 3) emergency countermeasures to be taken to reduce the risk for the population; 4) the direct economic loss, in order to establish the governmental financial contribution for reconstruction (Goretti 2001). Decisions on the long-term use of the buildings were postponed for an engineering evaluation during the reconstruction process, with the aim of speeding up the overall field survey and hence the reconstruction process.

Secondly, a comprehensive and coordinated regulatory, policy and technical framework was set up in order to guarantee the effectiveness and fairness of all the repair/reconstruction interventions on structures and infrastructures.

From the legislative point of view, a new seismic code was enacted at national level few months after the 2002 earthquake, to fulfil a lack accumulated in the previous years both in term of seismic classification of the territory and in term of design prescriptions for building seismic protection. Regional laws were enacted requiring: 1) to bring buildings into compliance with the new national seismic design provisions while reconstructing and repairing; 2) to structurally evaluate, all public buildings in Molise (damaged and undamaged) and to prepare a formal plan for bringing them into compliance with the new seismic design provisions; 3) to conduct a seismic microzonation of the entire regional territory to identify the characteristics of the subsoil.

A policy process was established to rule the fund allocation for the repair/reconstruction of both public and residential buildings. For the former, technical-scientific criteria ruled the identifications of priorities, while, for the latter, the damage experienced by the buildings and the social needs of the inhabitants prioritised the allocations of funds. Three different typologies of repair/reconstruction interventions were established ranging from "functional repair" (for building suffering low an moderate damage levels), to "rehabilitation inclusive of strengthening and retrofitting" or "complete reconstruction" (for building severely damaged or collapsed).

As a first step of the reconstruction process, consulting engineers and technicians were asked to prepare the preliminary design and the quantity survey for each one of the building requiring repair or reconstruction.

As a second step, governmental experts, assessed and verified all the preliminary designs and quantity surveys, in order to establish the general plan for the intervention and for the funding process.

Design guidelines and best-practices were defined and provided to the stakeholders and practitioners to assist them with the executive design of the repair/reconstruction interventions and to prevent technical mistakes, usually induced by the "reconstruction anxiety". The design guidelines included:

- an excel spreadsheet allowing the seismic analysis of the main collapse mechanisms;
- a methodology for the assessment of the mechanical characteristics of different masonry typologies;
- guidelines for the identification of the most suitable retrofit interventions and for the assessment of their efficacy in reducing the seismic vulnerability while minimising the costs;
- overview of the main retrofit techniques for vertical, horizontal and roof structures.

References

EERI (2003). *Preliminary Observation on the October 31-November 1, 2002 Molise, Italy, Earthquake Sequence*. EERI Special Earthquake Report. Available at www.eeri.org

Goretti, A. (2001). Post-earthquake building usability assessment, Technical Report SSN/RT/01/03 (in Italian).

Author's Biography

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Sonia is a Research Engineer in the Department of Civil Engineering at the University of Canterbur y working under the Resilient Organisation Research Programme . Sonia received her Laurea degree in Civil Engineering at the University of Genoa and a Ph.D. in "Risk Management of Natural and Man Induced Hazards" at the Technical University of Braunschweing , Germany, and University of Florence, Italy. Sonia main research interests comprise of : natural and man -induced hazard risk analysis, including vulnerability analysis, damage scenario and risk modelling at territorial scale and within GIS -based (Geographi cal Information System based) environment ; and risk reduction including mitigation strategies, emergency management and resilience enhancement . Sonia has worked on these topics either as a researcher assistant, for national and international multi -task projects, as well as an external consultant for local government authorities and for private companies

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