

Structural survey and empirical seismic vulnerability assessment of dwellings in the historic centre of Cusco (Peru)

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ABSTRACT

Seismic prevention and mitigation of cultural heritage have gained a central position within earthquake engineering topics. The seismic vulnerability assessment can be performed at different levels and rapid methods based on engineering judgments can be used. These evaluations should be given for those structural characteristics that contribute positively or negatively to the building response, so to get a vulnerability index for each structure and to predict the damage scenarios.

Based on these premises, the seismic vulnerability assessment of the historic centre of Cusco (Peru), an important UNESCO world heritage site, was carried out. First, its historical development was studied through an in-depth research about its transformation over time, from the Inca empire to modern days. Then, an extensive in-situ survey activity allowed to collect several information about the main structural features concerning ordinary residential buildings. They are mainly composed by adobe masonry walls, organized on 2 or 3 floors above ground. However, mixed structures characterized by the addition of reinforced concrete elements are also widespread.

Based on these data, an empirical method calibrated on Italian historic centres from the authors was applied. It allowed to obtain Damage Probability Matrices and fragility curves for different earthquake intensities, analysing the probability to exceed a certain damage level when a seismic event occurs.

Based on these predicted damage frequencies, it is possible to avoid irremediable losses and to propose retrofitting interventions which can lead to a potential seismic vulnerability mitigation.