SELECTING BUILDING VULNERABILITY FUNCTIONS FOR EARTHQUAKE LOSS ESTIMATION STUDIES

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ABSTRACT

In many cases, earthquake loss estimation (ELE) studies are conducted by selecting existing seismic vulnerability models (fragility/vulnerability functions) that had been originally derived for similar building typologies in other parts of the world rather than to develop customized functions that address the peculiar structural and non-structural characteristics of the respective building stock. The reasons for this are either to reduce the calculation efforts, especially when studies are conducted for large portions of the building stock, lack of available resources, or lack of information that would allow a detailed survey and data acquisition.

The present work illustrates the strength of the fragility/vulnerability functions' representativeness on the outcomes of ELE studies. Based on a test bed located in a seismically exposed region a comparison study between existing (collected, assigned) and user-defined (generated, customized) vulnerability functions is conducted.

INTRODUCTION

Vulnerability functions, which are one of the major component of earthquake loss estimation (ELE) studies, represent the structural capacity and behaviour of a certain building typology and define the probability of suffering a certain level of damage along a given ground motion intensity parameter.

In many cases, ELE studies are conducted by selecting existing vulnerability functions that had been originally derived for similar building typologies in other parts of the world rather than to develop customized functions that address the peculiar structural and non-structural characteristics of the respective building stock. The reasons for this are either to reduce the calculation efforts, especially when studies are conducted for large portions of the building stock, lack of available resources, or lack of information which does not allow for a detailed survey and data acquisition (D'Ayala and Meslem, 2013).

However, the selection of vulnerability functions that represent the peculiarities of the building stock can be the most challenging task in order to ensure a reliable earthquake loss assessment. For instance, HAZUS vulnerability functions (FEMA 2003) that were derived for buildings in the U.S. only, have been used in conducting ELE studies in many parts of the world: Romania (Vacareanu et al., 2004), India (Gulati, 2006), Algeria (Boukri et al., 2013), Venezuela (Bendito, 2014), among others. Typically, differences in