QUANTITATIVE ASSESSMENT OF BUILDINGS EXPOSURE TO LANDSLIDES USING BASIC CENSUS UNITS

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Purpose: The quantitative assessment of exposure of the different types of elements at risk in areas prone to natural hazards is still a challenge considering a quantitative risk assessment framework, as well the transfer of this knowledge to improve regional emergency operations' protocols and to support decision for spatial planners. Regionally, a quantitative assessment of exposure and potential losses is dependent on reliable buildings information, namely the location accuracy and the characteristics of individual buildings. In this study, we explore the potential of the Portuguese Census data to quantitatively assess buildings exposure to landslides in one of the most prone areas in the Lisbon northern region.

Methods: The Information Value statistical method was used to assess landslide susceptibility. Two susceptibility models were constructed according to the slide depth (shallow vs deep-seated) and classified in five classes: very high; high; moderate; low; and very low. The upper limit of each class was defined by the proportion of study area necessary to include the following cumulative landslide area of the landslide validation group: 50; 70; 85; 95; and 100 %. The areas classified with high and very high susceptibility, for both shallow and deep-seated slides, were selected to assess the buildings exposure and the probability of having these very high and high susceptibility (Sp) areas inside a basic census unit (BCU) is given by dividing the BCU area classified with these levels of susceptibility by the total BCU area. Regarding the built environment, through the 2011 Census data it was possible to determine the number of buildings of each type within each BCU. The building type probability (Bp) is obtained by dividing the number of buildings of a given type within a BCU by the total number of BCU buildings. The final probability that a certain building of a certain construction type may be included in an area of high to very high susceptibility to shallow or deep-seated landslides is then given by Sp*Bp.

Results: For simplification, only some preliminary results of the most (RCS - reinforced concrete structure) resistant exposed buildings are presented. In the BCU with more RCS buildings (59 buildings of 64), the area classified with high and very high susceptibility to shallow slides corresponds to 9.6% and to deep-seated slides to 10.6 %. The probability of an RCS building being located over areas classified as more susceptible to shallow or deep-seated slides is therefore 0.09 and 0.10, respectively.

Conclusions: The quantification of the different buildings construction types distribution over hazardous areas remains an ongoing task, particularly for regions where reliable buildings databases are not available. Even considering the uncertainty related to the building's location, the use of the smallest Census units provides a possible way to quantitatively assess regional exposure to landslides of these elements at risk and estimate damage resulting from buildings vulnerability.

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