COLLECTING DATA FOR EXPOSURE AND VULNERABILITY ASSESSMENT: A CASE STUDY IN GUATEMALA CITY

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ABSTRACT

Seismic risk assessments require information on proportions of types of buildings in a study area, and their structural vulnerability to earthquake shaking. Urban areas are formed of a large quantity of diverse buildings, unique in age, location, height, and other structural characteristics, hence it is a major challenge to gather accurate and reliable building data at scale. Moreover, the data collection process is costly; fraught with errors, biases, and heuristics; time consuming, and; in some circumstances, unsafe. Therefore, assumptions or shortcuts are required, in tandem with statistical techniques, to arrive at acceptable results for proportions of building types and information of a quality suitable for assessing vulnerability. This paper explores and tests methods to understand the balance between cost, time-taken, and accuracy of collecting building data.

First, the data requirements are identified for: (1) classifying buildings according to well-known taxonomies, and (2) assessing seismic vulnerability according to several published methodologies. A range of available data collection methods are examined to assess their potential for collecting the required building data. A number of building data collection methodologies are tested in Guatemala City, allowing an understanding of the proportions of building typologies, an estimate of the cost of collecting building data using different methodologies, a better understanding of the types of data able to be collected, and tests of the accuracy of data collected.

The results show that local experts, local engineering students, and foreign experts have a similar level of accuracy when completing rapid visual surveys, however the local engineers tend to rely

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on local knowledge to answer less obvious survey questions, however, importantly, they also tend to be overconfident. When compared with the rapid visual survey results, the census data compete well, with concrete roofs and masonry walls dominating, however there are significant discrepancies between the different types of masonry (brick or block).

The cost of the building data is estimated, including allowances for collection and analysis time, and any required equipment, transport, and specialist software. The cost estimates range from £0.002 to £359 per building, for housing census data and detailed internal surveys, respectively. The relationship between the cost and accuracy of data collected using a range of methodologies is examined.