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Seismic Vulnerability Assessment of the Municipality of Santo Domingo Este, Dominican Republic.

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Extended Abstract

The Dominican Republic has a high seismicity, due to the position of the Hispaniola Island, right in the interaction between the tectonic plates of North America and the Caribbean, more specifically, on the northern edge of the Caribbean plate where seismicity is especially intense, causing the entire island to be affected by a high seismic hazard [1][2]. Seismic risk reduction involves attacking one of the two factors that contribute to it: the hazard and/or the vulnerability. Regarding the first factor, the options are limited, since the hazard cannot be reduced, this implies that the only way to reduce the risk is by reducing the vulnerability of the built environment. The municipality of Santo Domingo Este (SDE) has been identified as one of the populations of priority interest for a seismic risk study, since it is one of the most populated municipalities in the country, with an area of 123 km2 and a population approximately 2.5 million inhabitants. Although a seismic vulnerability assessment at the scale of a large territory, as is the case of SDE, is very difficult to carry out taking into account the individual characteristics of each building, this study proposes a methodology that allows us to obtain the characterization of vulnerability as close to reality as possible. Unfortunately, in the Dominican Republic there is no updated database that quantifies or characterizes the construction typologies in the most important areas of the territory, being this a country with a very high seismicity. In order to cover this issue, a field survey and a visual analysis through images of the Street View Map were carried out to identify the construction typologies of the city. A significant percentage of the construction typologies of the city was obtained and different groups of construction typologies were identified, with the aim of extrapolating those sectors that were not sampled, with the information collected. The information collected was classified into a limited number of typologies that statistically represent the whole of the housing stock. An exposure database was generated that contains the geometries of the buildings, and attributes that influence their seismic performance, such as occupants, construction materials, height, function and area. Based on these attributes, a vulnerability model is assigned to the buildings, based on the HAZUS scale [3] which indicates how they will behave in the face of seismic shaking. This scale presents proposals for the classification of buildings that can be used for the American continent, in this case, the city of SDE. Regarding the exposure, the official data of the number of dwellings and population of each sector of the 2010 Census were taken as reference and through a comparison of satellite images from 2010 and 2021, a population growth factor was estimated, thus obtaining a population estimated to the year 2021. The data obtained has been taken to a geographic information system (GIS), where cartographies have been obtained with the distribution of construction typologies, vulnerability classes and exposed elements associated with each sector. All this information will be the input data for the seismic risk scenario.

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