Tsunami Vertical Evacuation Sites: A case study of Shizuoka City

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(1) Introduction: The Nankai trough is a seismically active zone known to give big earthquakes (M8.1 in 1944 and M8.1 in 1946). The Japanese government is expecting since 2013 a M9.0 earthquake with an expected 34m high run up, affecting 8 prefectures in southern of Japan. This study aims to investigate the potential for vertical evacuation in the city of Shizuoka.

(2) Premise: Current evacuation sites in Shizuoka city are designated for every possible disaster. About one third of them are flat, open areas which constitutes them unsuitable for tsunami evacuation (Figure 1), especially in the event of a large scale tsunami. It is clear that there is need for more locations for the locals to evacuate to, and given Shizuoka’s urban structure, vertical evacuation in resilient buildings could greatly mitigate the impact of such a tsunami.

(3) Methodology: In order to assess the potential for vertical evacuation, two kinds of attributes are needed. The first kind is dynamic attributes such as population and water depth. This is due to the fact that population is not static throughout the day in a city, and buildings become full or empty based on the human activities. Moreover, the tsunami magnitude can be different in different scenarios. The second kind of attributes are static attributes such as accessibility or facilities of a building that do not frequently change over time. This study will estimate the population of each building in Shizuoka in hourly time slots within a day, and for different scenarios, recommending buildings that are resilient, not flooded, and with low amounts of people for vertical evacuation.

(4) Data: The data that are used in this study include the 2001 Person Trip data for Shizuoka city, the Zmap-TOWNII Zenrin data for 2008, the 2010 Census and Telepoint data, as well as other GIS data such as building footprints, topography etc, from the Geospatial Information Authority of Japan.

(5) Results: This study is still in early stages, however, we have managed to estimate the building by building daytime population for all buildings in Shizuoka and to conduct spatial investigations in two different tsunami scenarios.

(6) Future steps: We are currently configuring the data in order to finalize our geodatabase and estimate the building population of Shizuoka in an hourly basis. Then we can proceed into considering the static attributes of this research.

Figure 1: Current evacuation sites in Shizuoka city and their capacity (number of people that each site can accommodate), over a 34m run-up tsunami scenario. Basemap source: Google.