Global Dynamic Exposure and the OpenBuildingMap - Communicating Risk and Involving Communities

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Detailed understanding of local risk factors regarding natural catastrophes requires in-depth characterization of the local exposure. Current exposure capture techniques have to find the balance between resolution and coverage. We aim at bridging this gap by employing a crowd-sourced approach to exposure capturing, focusing on risk related to earthquake hazard. OpenStreetMap (OSM), the rich and constantly growing geographical database, is an ideal foundation for this task. More than 3.5 billion geographical nodes, more than 200 million building footprints (growing by ~100'000 per day), and a plethora of information about school, hospital, and other critical facilities allows us to exploit this dataset for risk-related computations.

We are combining the strengths of crowd-sourced data collection with the knowledge of experts in extracting the most information from these data. Besides relying on the very active OpenStreetMap community and the Humanitarian OpenStreetMap Team, which are collecting building information at high pace, we are providing a tailored building capture tool for mobile devices. This tool is facilitating simple and fast building property capturing for OpenStreetMap by any person or interested community. With our OpenBuildingMap system, we are harvesting this dataset by processing every building in near-realtime. We are collecting exposure and vulnerability indicators from explicitly provided data (e.g. hospital locations), implicitly provided data (e.g. building shapes and positions), and semantically derived data, i.e. interpretation applying expert knowledge. The expert knowledge is needed to translate the simple building properties as captured by OpenStreetMap users into vulnerability and exposure indicators and subsequently into building classifications as defined in the Building Taxonomy 2.0 developed by the Global Earthquake Model (GEM) and the European Macroseismic Scale (EMS98). With this approach, we increase the resolution of existing exposure models from aggregated exposure information to building-by-building vulnerability.

We report on our method, on the software development for the mobile application and the server-side analysis system, and on the OpenBuildingMap (www.openbuildingmap.org), our global Tile Map Service focusing on building properties. The free/open framework we provide can be used on commodity hardware for local to regional exposure capturing, for stakeholders in disaster management and mitigation for communicating risk, and for communities to understand their risk.

Keywords: Seismic Hazard and Risk, Exposure, Citizen Science, Big Data

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