

Designing the Data Infrastructure with Macro and Micro Sensing for Building Disaster Resilience

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Abstract: Disaster relief requires quick decision making and responses to reach the emergent needs based on the most updated and reliable data and information. Currently rescue teams collect or receive the data and information of the affected areas from both ground survey by local authority and the observation and analysis from the external players including the volunteer crowdsourcing crisis mapping activities such as Humanitarian OpenStreetMap Team. These available data & information are increasing rapidly upon the development of information & communication technologies, especially the expanded use of social media by citizens, and growing number of observation data by multiple sensors such as small satellites and drones. Many data contribution initiatives or platforms for emergency or disaster response have been launched such as the satellites constellation observations for post-disaster assessment, and data & information provided by them have become a kind of “big geospatial data” which if effectively used could contribute to the quick and evidence-based disaster risk reduction (DRR) activities. Furthermore, not only the emergency observation data after disasters, but also the volume of archive data have been freely available and provided online by open platform being developed by government and space agencies such as European Copernicus or Japanese Tellus (open & free government satellite data platform being developed by the Ministry of Economy, Trade and Industry). These datasets would enable time-series analysis to understand the historical record of disasters patterns and potential risks of hazards as well as predicting the incoming disaster risks by analyzing the real-time changes of weather or geophysical conditions of the affected areas. However, this kind of integrated application has not been fully developed because it requires integration of separated and different types of datasets. More importantly, the mechanisms of how effectively such datasets contribute to the decision making or strengthening resilience has not been studied sufficiently. Therefore this paper proposes the expected system architecture design for the data & information collection and augmentation comprised of crowdsourced remote sensing, open data platform, and so-called “citizen sensing” micro data collected by local people as well as the geo-tagged social media data, all of which could contribute to the geospatial awareness over the disaster-prone areas, consequently improve the preparedness, then enhance the resilience capacities of the community through the pre and post disaster events. The ultimate goal of this integrated system architecture is to

continuously evolve and update the datasets, which would work as a “data infrastructure” which underpins the sustainable development of the target area. Some case studies were conducted for the past disasters to show the workability of such integrated system: e.g. volcanic eruption of Mount Mayon in Philippines, where combination of macro and micro data could have contributed to quick and wider coverage of observations hence might contribute to more efficient disaster relief.

Keywords: Remote Sensing, Citizen Sensing, Open Data, Resilience, Disaster Relief