Evolution of humanitarian mapping within the OpenStreetMap Community

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Since 2010 organized humanitarian mapping has evolved as a constant and growing element of the global OpenStreetMap (OSM) community. In the last few years, several researchers have analyzed humanitarian mapping practices [1, 2, 3], however most of this work was either event-driven or focused on specific time periods and regions. The OSM ecosystem and the actors involved in it are constantly changing and emerging, for instance also due to the mapping activities of corporates [4]. In our work we analyze the history of almost 10 years of humanitarian mapping in OpenStreetMap using the OSM Tasking Manager (tasks.hotosm.org). We conduct a comprehensive quantitative analysis on a global scale and long term perspective in order to depict more than just snapshots of individual events. We show how humanitarian mapping was impacted by major mapping disaster response events, but also widened its application to other domains such as disaster preparedness. Our approach follows two paths. One focuses on the mapping itself. The other focuses on the composition of the humanitarian mapping community.

Our analytical approach is characterized by the combination of the following data sets: for general OSM mapping and user characteristics we use the whole history of OSM object versions and edits provided by the OSHDB framework [5]. We were provided with a HOT Tasking Manager database dump covering the time between 11/2012 until 12/2019. Our method uses spatio-temporal time series analysis based on a hexagonal grid for all areas humanitarian mapping activity has been conducted. We investigate the evolution of humanitarian mapping with respect to several attributes including number of OSM contributions (created, modified, deleted OSM objects), percent of tasks mapped and validated in the Tasking Manager and number of OSM contributors involved. We set our findings and the geographical distribution of our results in context to the overall OSM mapping and user characteristics.

Humanitarian mapping has grown almost linear with respect to the numbers of projects, unique users, tasks mapped and OpenStreetMap contributions, while at the same time it got more diverse in terms of spatial distribution of mapping activities and organizations involved. In 2018 more than 100 organizations were running projects on every

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inhabited continent except Australia. Peaks in mapping activities in the first quarter of 2015 and the third quarter of 2017 are reflecting activations of the community in responses to the Gorkha earthquake as well as to the hurricanes Harvey, Irma and Puebla earthquake. Although the number of mappers is growing, the humanitarian community lacks long term commitment. Almost 70% of humanitarian mappers contribute one day only. Another 10% drops out after ten days of being active. However the number of one day only contributors is steadily rising, whereas mappers involved on 5 or more days seem to be saturated since 2017. Nonetheless, the one day only contributors have a considerable impact on the data. They account for 10% of all edits, whereas contributors involved on 100 or more days account for 50%. This pattern is reflected by the composition of user actions as well. The number of mapping activities is growing almost linear, whereas the amount of validators stagnate. However, different organisations have varying degrees of success in recruiting new validators. The American Red Cross for instance accounts for 30 to 50% of all first time validators in the last 12 months.

Humanitarian mapping via the tasking manager now exists for more than seven years. In terms of scale it is definitely a success story. We have shown edits, users, projects, geographic diversity, almost all of these have experienced linear growth. But with respect to the numbers of user commitment and validation efforts we conclude that the humanitarian mapping community still faces huge challenges to achieve sustainability. Only a small proportion of users contribute regularly and an even smaller fraction does validation. But this very phenomenon is nothing new for OSM in general. Nevertheless, we have seen that some organisations and communities are more successful than others in recruiting and retaining users. Our results may support decisions for future strategies on user engagement. However to what degree this community composition affects data quality remains open. Within our work our definition of humanitarian mapping is rather narrowed. Our insights about humanitarian mapping in OSM provide only an incomplete picture which lacks an on-the-ground perspective and neglects other remote mapping tools.

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