Community mapping as a means to building resilience

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The greatest threat to the people, property and economy of Malawi is represented by natural hazards. Since 1946 of all the 298 times the country has been impacted by hazards, 89% of those have been natural hazards while the remaining 11% have been human-generated events [1]. Disaster records for the last 100 years indicate that Malawi has experienced about 20 droughts while in the last 36 years alone, the country has experienced 8 major droughts which have affected over 24 million people [2].

In Malawi, quite a number of districts are hit by floods almost every year. Households and infrastructures such as roads, schools and praying houses are affected in much the same way as cultivation fields. These disasters impact negatively on the socio-economic growth of the communities involved and the country at large to some extent. For example, MacOpiyo [2] pointed out that in 2015 Malawi experienced a once-in-500-years flood which impacted more than 1.1 million people. Therefore, this study aimed at collecting exposure data which was used for production of flood risk maps which were in turn used for flood risk Atlas production.

Primary and secondary data were used in this study. Primary data which was exposure data such as buildings, toilets, roads, bridges and schools among others was collected using handheld Global Positioning System (GPS) devices with an accuracy of 3m. To ensure precision on features captured using the handheld GPS devices and to easily identify features captured on the ground, collected coordinates of exposure data was overlaid with satellite imagery in Java OpenStreetMap (JOSM) software when digitizing, creating attributes for that data and uploading the digitized layers into OpenStreetMap. Secondary data came from the disaster profile (database) of the Department of Disaster and Management Affairs (DoDMA) in Malawi which helped in identifying flood prone areas. Choice of this data was based on how it impacts the socio-economic activities of the concerned communities. Before each mapping activity, workshops were organized in each of the 15 districts. Participants with different backgrounds (cartographers, water resource managers, academicians, surveyors, IT personnel) were trained in the use of GPS, JOSM and Geographic Information Systems (GIS) in general.

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One of the outcomes of this research was maps highlighting some statistics of the exposure data under study. These statistics show captured features on the ground and the extent to which the hazard (flood) affected the communities. Such statistics were generated by performing some analysis through InaSAFE, an extension of the QGIS software - a popular open-source GIS with advanced capabilities. The maps and the underlying analysis helped to answer questions like: in an event of floods in a particular area, how many households, people, and infrastructures will be affected?

Such statistics will help in terms of planning, recovery and even response to the floods. The maps also help along the same lines of planning, response and recovery. The maps also help communities come up with contingency plans, including evaluating the needs and cooperating quickly. Because of the maps, the communities build resilience as the maps display areas where they can settle or not. The flood hazards are displayed on the map by their spatial location. The maps also also show the impact of the floods; as a result people are made aware of the threats and hence build resilience.

From the study, it was noticed that there are little interventions on the ground to help in reducing the root cause of floods in most parts of the country. There are a number of reasons for the causes of floods in the affected areas. Siltation in rivers causes river beds to rise-up which in-turn causes floods. Living in low lying areas in search for fertile land is another element that was found from communities to be heavily affected by floods. Another problem that was observed during the course of this study is the lack of knowledge and information on disaster risk management, which has resulted in communities being affected when flood disasters strike. The study contributed towards some best practices in carrying out community mapping exercises as well as freely distributing results on OSM and spatial data portals like the Malawi Spatial Data Platform (MASDAP) for further studies and/or decision making. Thus, the study focused on preparing for mapping – what to map, how to map and how to record the data; the mapping exercise itself; the download and digitization of data in map production; and the use of maps to aid decision making. The flood risk maps and the Atlases are a form of awareness to the communities and the country at large about flood risk within their vicinity; as a result, they help build resilience among the communities.

As a way forward, the study proposes that the government and other stakeholders provide communities with long-term interventions in building their capacities and resilience to reduce vulnerabilities. This might be in the form of building of dykes along river banks to contain floods or the enforcement of proper construction standards when putting up infrastructures. Communities are also encouraged to build permanent dwelling houses with strong foundations based on standard guidelines for safer housing and construction.

References

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