IWRM Action Hub

CASE STUDY

# Tanzania: YouthMappers for enhancing disaster preparedness and early warning response

**Summary**

SMCoSE YouthMappers, a YouthMappers chapter at Sokoine University of Agriculture with a vision of cultivating a generation of young people to become leaders and empowering them to define their world by mapping it. SMCoSE YouthMappers have been addressing flash flood challenges in Morogoro region through the use of Geographical Citizen Science where non-professionals participate in scientific projects.

SMCoSE Youthmappers have been using open-source technologies and collaborative mapping through a bottom-up approach, to enhance the availability, accessibility, and usability of updated data to inform decision makers for disaster preparedness and early warning response.

**Background**

One of the world's most dangerous weather-related disasters is floods. The United Nations report, "The Human Cost of Weather-Related Disasters", revealed that from 1995 to 2015, floods have affected more than 2.3 billion people which accounts for 56% of all those affected by weather-related disasters considerably more than any other type of weather-related disaster. On the other hand, it is realized that among the factors that trigger flooding are (1) climate change, (2) urbanization, and uncontrolled population growth. These factors are interconnected, and their synergies can lead to more severe problems. For example, urbanization is primarily caused by population growth, which in turn causes climate change due to the production of greenhouse gasses, resulting in heavy rainfalls that flood nations. Based on this, it is concluded that uncontrolled and unmanaged urbanization is like the triggered bomb that is waiting to explode.

The current urbanization of the majority of cities in developing countries has far more threatened the onset of flooding, notably flash floods. According to the World Meteorological Organization (WMO), flash floods are defined as floods of "short duration with a relatively high peak discharge". Flash floods of any nature increase the vulnerability of humans, livestock, and aquatic resources (Paavola, 2008). The United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA) reported flash flood events in South Africa, Congo DRC, and Uganda. In Tanzania, Dar es Salaam, Tanga, and Morogoro have been reported as well.

Morogoro Urban is among the fastest growing regions in Tanzania, similarly to other regions in developing countries, Morogoro region notably Morogoro municipality and Ifakara town

council have been reporting rampant flash floods (Chamwali, 2000), (Msoka, 2016) and (Kimambo et al, 2019). These events are mostly driven by heavy rainfall patterns and a range of non-climatic factors such as unplanned settlements, blockage of storm drains with solid waste as well as river sedimentation due to human activities near rivers (Mafuru and Guirong 2018). Such factors are resolved by disregarding the data-driven decision support. Hence, there is a need to improve access to updated datasets and ready-to-use maps to the local community, disaster management teams, and urban planners to enhance disaster preparedness and early warning response.

One of the project philosophies was that local people have a far deeper understanding of their environment than no one. The project used geographical citizen science as a platform for data collection where through collaborative mapping, local citizens who have been impacted by floods collaborated with university students, local governments, and other stakeholders to enhance the availability, accessibility, and usability of data for improved disaster preparedness and response as well as an early warning system.

**Actions taken**

It is well known that for the successful implementation of any project, a government buy-in is mandatory. The young researchers of SMCoSE Youthmappers had to ensure that the initiative secured all the blessing from the local government that has the jurisdiction in the study area i.e., Morogoro Municipality Council and its divisions and sub-divisions. The researchers of this initiative used the bottom-up approach through a series of outreach activities to sub ward and ward levels aimed at describing what the initiative is trying to solve so that they can acknowledge if what the initiative is addressing is their problem. The Municipality level followed where the researchers of this initiative undertook the meetings with the disaster and environmental department to give them a full understanding of what data was going to be collected, who will have to collect it, how will be used and who will be using, this had also provided a room for collaborative development of data collection methodologies.

Technically, the initiative was born as a result of the synergy of the activities from the three projects.

The first project (2020-2021) aimed at enriching the government with data for flood resilience i.e., waste collection points and household flood experience information. Flood vulnerable areas were identified and this project also managed to develop cost-effective routes to help the municipal transport waste from households to the disposal sites.

The second project (2021-2022) aimed at enriching more data notably the distribution of plastic bottles and siltation level in the storm drainage systems, to help the government with the effective and efficient allocation of resources for storm drainage refurbishment purposely to enhance the flow of water during the flooding events. This project will also create a baseline machine learning model that will be used to estimate the potential of flash floods in Morogoro.

The current project (2022-2023) aims at scaling what has been conducted in the previous two projects and replicating it in other vulnerable areas in Morogoro region. This project titled "Mapping Flood protection zones and evacuation routes to improve preparedness and response capabilities to flash floods in local communities" both in Morogoro municipality and Ifakara Town Council shall ensure availability, accessibility, and usability of data to

other vulnerable areas in Morogoro i.e., Ifakara Town Council. Apart from that, this project is also developing evacuation routes and enriching more data to the baseline machine learning model that estimates the potential of flash floods in Morogoro.

Furthermore, the initiative has been using open-source tools i.e., mobile phone technologies i.e., Kobo collect to collect georeferenced imagery datasets from the field, python programming language for data cleaning and modeling, and Quantum GIS and its associated plugins for map generation. On the other hand, University students have been the main field experts under the supervision of senior researchers from Sokoine University of Agriculture, disaster management experts from the government, and the local people residing in the study area.

The initiative is strongly grounded in knowledge management and exchange strategies where all the collected data, the process of data collection, presentation, and validation have been documented and shared with the strategic stakeholders i.e., research institutions (academicians and senior researchers), government, private sector (NGOs, CBOs, FBOs) and the general public. For example, all the collected data was shared with the government and we are witnessing the timely refurbishments of storm drainage which was once a challenge.


**Outcomes**

The initiative aimed at collecting more than 30,000 data points, with variables that address key challenges for enhanced disaster response and early warning systems. Up to now, the initiative has collected a total of about 16,000 data points from two projects and all data have already been shared with the government for informed decision making.

The outcome of the previous projects and the ongoing project intends to strengthen and transform the youth's thoughts towards addressing challenges and delivering sustainable solutions to their communities. Through training and outreach programs conducted by SMCoSE YouthMappers, more than 500 youth in universities have been enlightened and equipped with opportunities to practically use open-source tools to contribute to humanitarian developmental efforts in vulnerable communities worldwide.

The projects had equal gender inclusiveness between females and males. Since it was a community project, also marginalized groups were involved the project as well.

As the chapter, we acknowledge the power of collaboration, especially on community projects.  From our continuous efforts we have managed to drive in key players to act to flash flood challenges in Morogoro municipal and we were granted a chance to out scale these efforts to neighboring communities which face similar challenges. We extend our gratitude to the Global Water Partnership (GWP) and World Meteorological Organization (WMO) for helping Youth lead projects where we can share knowledge with youth and transform our communities through data-based decisions


**Lessons Learned**

Open-source geospatial tools have proved to be reliable and effective in the collection of Community-based data to address challenges and solutions in our local communities hence to enhance data-based decisions in Africa; organizations should see the need to involve

decision makers so that our local communities can thrive in climate-related challenges such as floods.

Youth are the future and, in our projects, they have proved to be capable, energetic, and innovative in conducting projects that can not only address challenges but also change the perceptions of decision makers on how to address and solve climate-related disasters in our communities.

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Youth Mappers Tanzania

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United Republic of Tanzania (the)

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Africa

**Thematic Tagging**
Climate , Ecosystems/Nature-based solutions , Gender , Private Sector , Transboundary , Urban , Water services , Youth
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**Supporting Materials**
Solid Waste (Plastics) and Siltation Level in Storm Drainage Data Collection Feedback..pdf
Flood Vulnerability Mapping - Erick Tamba Mnyali, SMCoSE Youthmappers
Devolved Microgrant Project by SMCoSE Youthmappers

**Related IWRM Tools**
Integrated Flood Management Plans, Geographic Information System, Youth Engagement and Empowerment

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