Beira-Mozambique, After the Storm. A GIS-based application of multisource data collection and Tropical Cyclone Idai damage assessment

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On the 14th of March 2019 Tropical Cyclone Idai hit the coast of Beira, in the Southwest Indian Ocean, Mozambique, later being renamed <<Global South strongest hit>>. The damages caused by the event were devastating and contributed to increase pre-existing vulnerabilities of a highly fragile country, characterized by a complex planning system, dynamics of informality and climate vulnerability. The interdisciplinary master thesis laboratory of Polytechnic of Turin, along with the partnership of the Community of Sant 'Egidio has launched a master thesis laboratory aimed at studying the event and presenting future scenarios for the city of Beira. As a young urban planner, with personal interest in hazardous events and emergency mapping, multiple questions started to arise while investigating the event and getting to learn about it. Mostly one over the others on how to provide a reliable spatial analysis of the Cyclone's impacts through the multitude of data available spread among the different platforms. For instance, the city of Beira along with the Government of Mozambique have long-time cooperated with a conspicuous variety of international stakeholders – United Nations (UN) and United Nations for Training and Research (UNITAR), World Food Programme (WFP), Humanitarian OpenStreetMap Team (HOT), Red Cross, Earth Observation (EO) Browser and Copernicus Emergency Management Service, whose presence and sustain is unquestionably fundamental during emergency assessment and post-disaster assistance. Nevertheless, the multitude of actors necessarily results in a multitude of different intervention' approaches, hence various platforms for data collection and geospatial products per-cluster finalized.

Aim of this study, multi-source data collection and geospatial analysis is therefore the integration of existing analyses and results carried out by humanitarian agencies within a unitary and more reliable repository of data using geographic information systems, particularly ArcGIS software. According to OCHA Evaluation over Beira multi-lateral intervention, the international humanitarian body struggled to develop a user-friendly system to collect, analyse, and communicate the assessment and monitoring of data needed to guide decision-making, causing important delays and eventually acknowledging consistent data gaps and restrictions. The latter particularly involved data concerning the most rural areas, increasing socio-economic inequalities and accessibility to humanitarian assistance and resources. The study has also been supported by a detailed analysis over the hazardous events that generate in the so-called Mozambican Channel, located forth the coast of Beira and the district of Buzi. Assumptions that emerged from this inquiry mainly evoke a strong connection between environmental conditions necessary for a tropical cyclone to generate and the effects of climate change, which somehow contribute to the increase in Tropical Cyclones genesis. The country of Mozambique has indeed faced several of these phenomena in its history, therefore a specific timeline has been reconstructed, crossing multitemporal studies and elaborations, and then extra data involving the struck of Cyclone Eloise1 during January 2021 has been added and elaborated. As reported in the International Journal of Climatology, over 14% of global total tropical systems generate in the South West Indian Ocean (12 to 13 cyclones each year) (Matyas, 2015-03); an enhancement in the preventive measures is therefore necessary. The current study hence intends to overcome these gaps throughout the collection of multiple climate-related phenomena, as well as the assessment of the spatial impacts over the whole system of infrastructures and built environment, without any data limitations.

The result is a deeper analysis that portrays a wider context and examines also “minor” infrastructural bodies, namely secondary or tertiary roads, that characterize the urban pattern of less urbanized areas. The informal district of Buzi indeed has been highly damaged by the event, yet very poor and inconsistent data has been considered and put available. In addition, one of the most interesting assumptions that emerged throughout this survey reveals the great fragility and exposition of this informal settlement not only in relation to Tropical Cyclone Idai, though also as regards to previous hazardous events, eventually confirmed in the assessment of 2021 Tropical Cyclone Eloise. In this respect, new investigations could be undertaken over the socio-urban connotations featuring the district of Buzi and analysed as intrinsic form of potential major vulnerability in comparison with the planned environment. This question would undoubtedly require deeper investigations concerning climatology, climate-related events, urban morphology and annex climate resilience, along with studies and juxtaposition of data along with case studies from different contexts.

In conclusion, the harmonization of multi-formats and multi-events data could eventually speed-up the processes of humanitarian response to disastrous events, support the identification of safe spots in emergency assessment and assistance, as well as outline potential replicability of these phenomena over land, providing a commonly shared, hence reliable tool to examine future scenarios for climate vulnerable cities.