

LAMU COUNTY EMERGENCY OPERATION CENTRE

A county of 144,000 people threatened by at least six natural hazards

Lamu County, on the northeastern coast of Kenya, faces a range of natural hazards that significantly impact the local community:

1. **Flooding:** Causing displacement of people, and the loss of lives, homes, livestock, and farmland.
2. **Droughts:** Water scarcity from insufficient rainfall, affecting agriculture and water security.
3. **High Temperatures:** Extreme heat affecting agriculture, health, and livelihoods.
4. **Bushfire:** Fierce, unpredictable fires that impact ecosystems, habitats, and communities.
5. **Strong currents:** Rough waters and strong tides have caused fatal boat accidents.
6. **Pest and Disease Outbreaks:** Impacting crops, livestock, and human health.

Climate change will continue to make these hazards more intense and frequent, and their impacts greater. Historically, Lamu County has faced recurrent flooding due to heavy rains and overflowing rivers associated with warming of the west Indian Ocean (positive Indian Ocean Dipole) and central and eastern tropical Pacific Ocean (El Niño). In 1996, floods destroyed 45% of Lamu's infrastructure; in 2017, 500 families were displaced, and 2600 livestock lost; in 2019, 1,000 families were displaced without food or medical aid; in 2020, 600 families and their homes were flooded, and 6,700 livestock lost.

Lamu County is low-lying, with a mostly coastal population: 15% of land but 38% of buildings (n=19,306) are ≤ 10 m above sea level, while 45% of land but **86% of buildings (n=43,247) are ≤ 20 m a.s.l.**

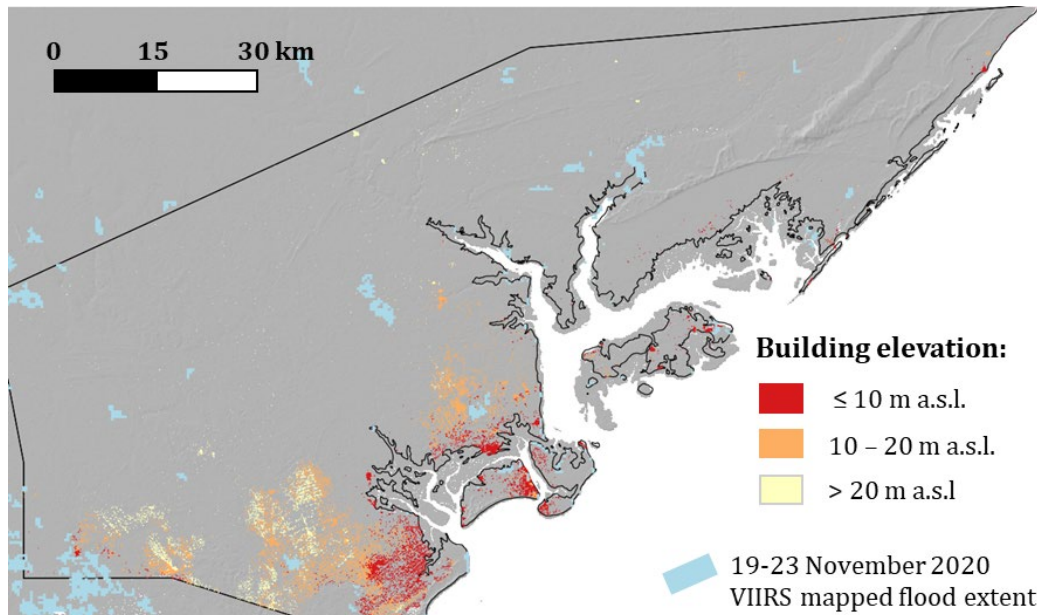


Figure 1: Hillshade Digital Elevation Model (SRTM 90m) of Lamu County, with mapped Google Open Buildings [1], coloured by their elevation above sea level, and the VIIRS 29-23 November 2020 mapped flood extent [2]. The black border marks Lamu County.

THE INTERVENTION: Emergency Operation Centre, from waves to walls

A series of avoidable maritime disasters in the years leading up to 2016 highlighted the need for a unified emergency operation centre. In 2016, a county government boat was converted into a floating Emergency Operation Centre (EOC). Its focus was on averting marine disasters by identifying dangerous channels

and providing early warnings to prevent people entering the seas. Following the success of the EOC boat in averting marine disasters between 2016 and 2020, an EOC building was completed in 2020 that co-ordinates and houses multi-agency operations for planning, response, and recovery so that the time between early warning and response is reduced. The centre deals with at least 15 different types of terrestrial *and* marine hazards, and has **averted at least 5 major disasters since its creation**, by:

1. Co-ordinating across agencies to provide early warnings through a new communication system tailored to the local community.
2. Carrying out mitigation interventions, such as unblocking drainage systems, planting trees, and digging drainage channels to reduce flood hazard.
3. Running awareness campaigns.
4. Opening communication channels between communities and EOC personnel to exchange information and reduce the threat from terrorism.

COUNTERFACTUAL: November 2023 flooding

Between October and December 2023, flooding and a cholera outbreak exacerbated an existing humanitarian crisis, as the region emerged from the worst drought in four decades [3]. Heavy rainfall advisories were issued by the Kenyan Meteorological Department on 8 September and 1 November 2023. Preparatory actions by the EOC included dispatching tailored information to the community, identifying and stocking 12 evacuation centres, evacuating 4,900 at risk families (~18,000 people), and transporting 20,000 livestock and property items to higher ground. The evacuation was completed 21 days before the floods; evacuees were supported with shelter, food, water, healthcare, and other amenities throughout.

During the floods, damage to the major connecting highway cut Lamu County off from the rest of Kenya, disrupting the flow of goods and medical aid to evacuation centres. An unanticipated influx of displaced persons from other counties put pressure on available resources in Lamu County, which was resolved by mobilising support for additional shelters and supplies from national and international agencies. **No human or animal lives were lost in the floods.**

With this counterfactual, we are considering the impact of the November 2023 floods in Lamu County had they occurred in the absence of the Emergency Operation Centre.



Figure 2: Lamu Emergency Operation Centre, and its activities during the November 2020 floods. All photos courtesy of Lamu County Emergency Operation Centre.

There are 50,339 mapped buildings in Lamu county [1]; almost 6% (n=2,993) were inundated by the 5-day maximum flood water extent visible in satellite imagery from 19-23 November 2023 [2]. Assuming that each building represents one household (an underestimate in areas where multiple homes are attached and under one roof, or building footprint), and considering that each family has on average 3.7 people per household [4], **evacuations saved all c.11,100 people from being flooded.**

The mortality rate due to flooding is mostly a function of flood intensity; in the absence of mapped flood intensity for the 2023 floods, we assume the averaged flood mortality rate for Africa of 0.98% (from a positively skewed distribution with a long tail towards larger values) [5]. Thus, **EOC evacuations saved the lives of 109 people** (with a wide 95% confidence interval from 0 to many thousands of people). Given the larger number of livestock evacuated, it is reasonable that a larger number of livestock were saved (flood fatality rates for livestock are not available). The EOC also prevented homelessness for at least the 11,100 evacuated people in Lamu County and an unknown number of refugees from neighbouring counties. Flood-induced loss of homes can heighten the risk of intercommunal violence, and with Kenya experiencing widespread cost of living protests through 2023 [6], EOC actions may also have also curtailed escalations in protests and conflict.

WHAT NEXT?

The EOC are currently mitigating the ongoing 2023-2024 El Niño floods, which included rescuing 22 international sailors blown off course by Cyclone Hidaya in early May. Challenges facing Lamu in responding to potential disasters include population growth and immigration, with associated ethnic conflict; limited funding; increased pressures on resources, infrastructure, and services; under-developed and poorly maintained infrastructure; inadequate supplies of piped and fresh water; food insecurity; insecure land tenure; restricted access to healthcare and education; constraints on capacity building; and limited exposure to advanced disaster management techniques [7].

In the face of these challenges, and while responding to and mitigating ongoing potential disasters, the EOC are also looking to expand their activities. This includes permanently relocating flood prone villages to higher land, incorporating more national and international agencies into the EOC, developing hazard-specific standard operating procedures, and transferring knowledge and information from established EOCs in other countries to develop best practice at Lamu Country EOC.

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References

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