

ICFM WEBINAR NO.13
African Floods of 2023

EMERGING ISSUES IN THE MANAGEMENT OF FLOODS IN AFRICA.

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PRESENTATION OUTLINE

- Overview of floods in Africa
- Why Sahel and sub-Saharan Africa
- Flood occurrences in the sub-Saharan region of Africa
- Contributing factors to flooding in Africa
- Development drivers limiting effective flood management in Africa
- Emerging issues in flood management
- South Sudan's case study.
  - Hydrological findings
  - Numerical simulation findings

OVERVIEW OF FLOODS IN AFRICA

- Globally, floods are rated second most common and destructive among natural hazards after wildfires. The intensity and severity of occurrence has been increasing over the years.
- Countries within the Sahelian and sub-Saharan Africa have been worst hit by both flash, riverine and tidal flooding.
- Floods are expected to increase in most parts of Africa especially the cities; however, the impact flooding varies from country to country which guided by various factors governing flood occurrence.
- According to ifrc evaluation of hydrological hazards floods account for 38%, cyclones at 6% and storms at 4%

WHY SAHELIAN AND SUB-SAHARAN AFRICA…..

The Sub-Saharan Africa is estimated to have an approximate population of about 71 million people living under extreme poverty and high flood risk (https://www.ifrc.org/doc/appeals)

Its fundamental to note that ¾ of Africa are prone to natural hazards, the Sub-Saharan Africa covers more than 2/3 of Africa.

Moreover, the effects of climate change are projected to be more acute within the sub-Saharan Africa where most of the global poor are located, this increases their vulnerability to natural hazards leading to severe food insecurity and economic instability.

It goes without saying that Africa's contribution to global greenhouse gas emission has been between 2-4% for the last 50 years, yet the effects and impacts of climate change are already evident across Africa (https//www.jbarisk.com)

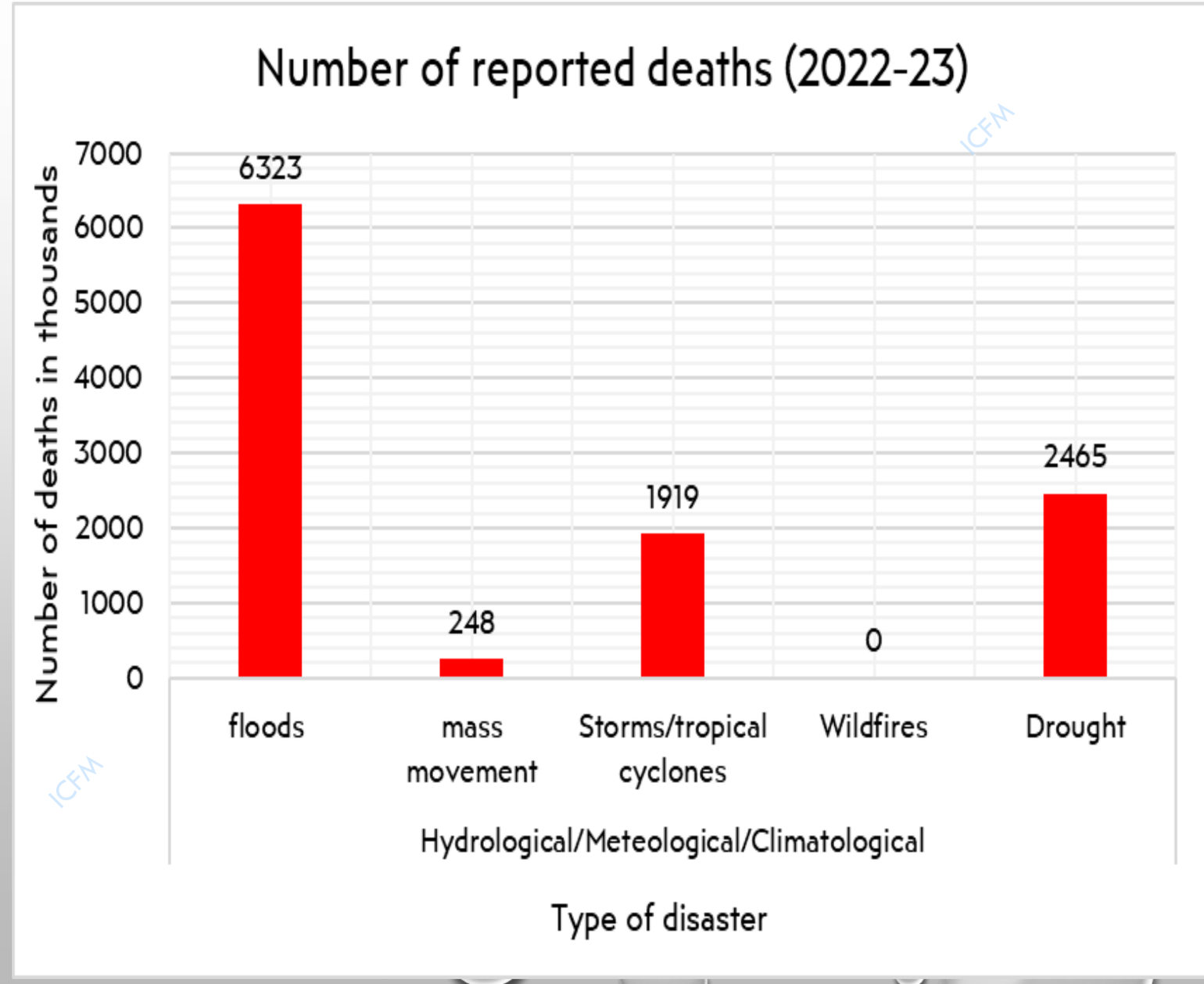
Hazard is a product of exposure and vulnerability, most of the African countries have a population that is vulnerable and exposed to natural hazards.

FLOOD OCCURRENCES AND DAMAGES IN THE SUB-SAHARAN REGION OF AFRICA

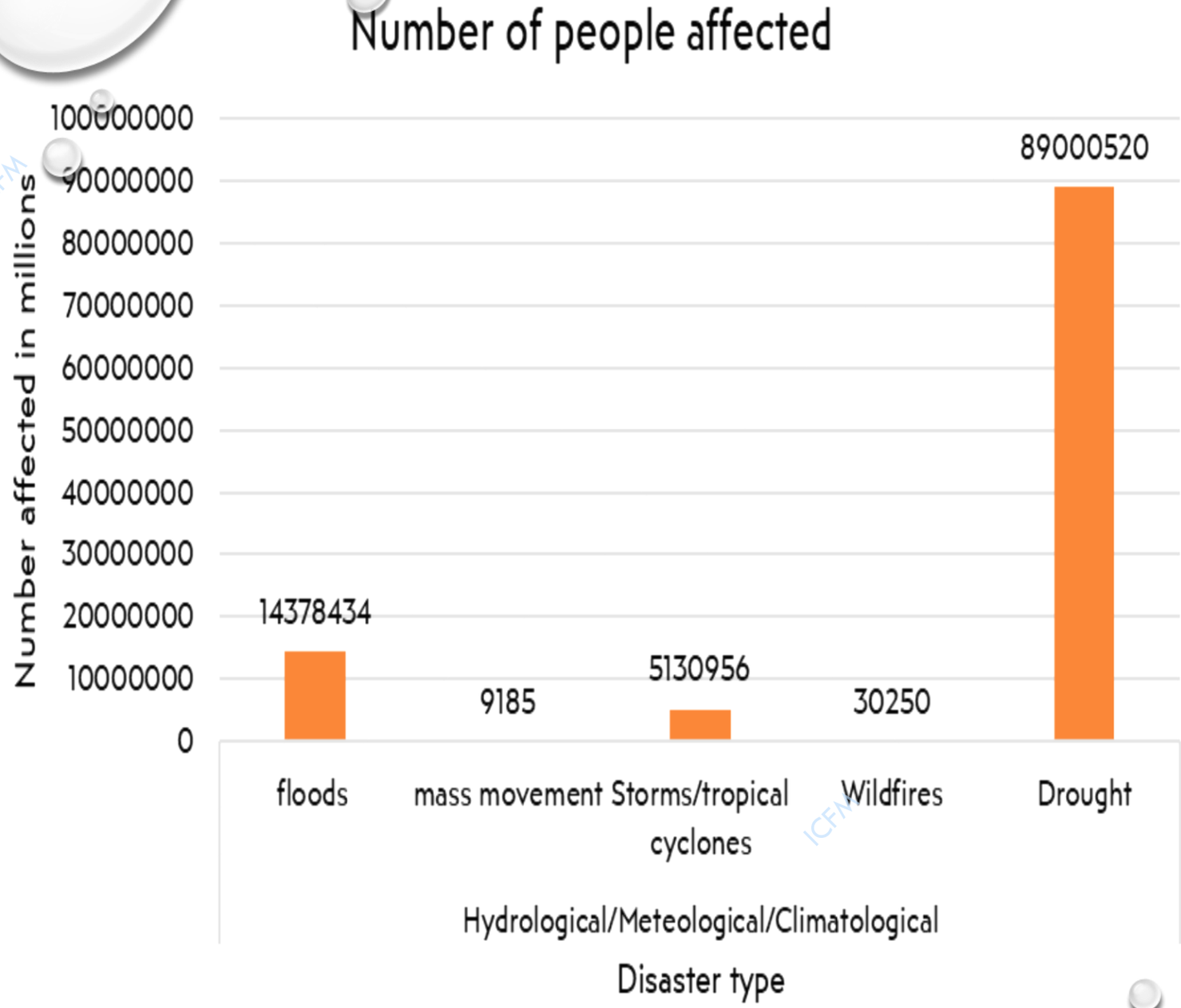
- Floods have been the most reported of all disaster events in Africa. According to the international disaster database (EM-DAT) which provides disaster data from 1960, Somalia has been prone to floods from the Juba-shebelle River basin which is transboundary water resource between Ethiopia and Somalia.
- This has bee been a recurring phenomenon not only for Somalia but form most African Countries. Sudan and south Sudan on the other hand has suffered from riverine floods from the Juba river, the blue and White Nile, respectively.
- Nigeria, Ghana, Mozambique have also suffered from frequent tidal flooding as well as torrential cyclones both of which are climate induced.
- Precipitation is projected to increase at mid and high latitudes, in the tropics, whereas precipitation is projected to decrease over many sub-tropical areas (North Africa and northern Sahara).

DAMAGES IN TERMS OF DEATHS

- The International disaster database (EM-DAT) provides data for all global disasters as they occur, from obtained and analyzed data, floods caused the highest number of deaths in 2022-23 floods.
- This was followed by droughts, storms and mass movements, respectively.
- It was noted that there were no reported deaths under wildfires



POPULATION AFFECTED BY NATURAL HAZARDS



- On the affected population in the sub-Saharan Africa, droughts affected a larger number of people as compared to floods, however, the frequency of occurrence, floods occurred more often.
- In 2022-23, 89 million people were affected by droughts while floods affected 14 million people.

Factors contributing to high flood vulnerability in Africa

- Impacts of flooding are generally becoming more severe. In particular while rainfall is declining the impact in terms of death tolls due to floods and storms is increasing.
- Most of the population within the sub-Saharan Africa are poor and occupy the river riparian reserves which are prone to high river flows.
- There is a disconnection in the end-to-end user early warning system, this compromises the response on the downstream dwellers leading to loss of life and property when a disaster occurs.
- There is lack of systematic and well tested prediction structures to warn people of impeding floods.
- There is lack of well integrated risk management model towards addressing the safety awareness, evacuation needs and psychological awareness.
- Poor urban development.

Development drivers limiting effective flood management in Africa

- The intensity and severity of natural hazards (floods and droughts) make it difficult for developing countries to effectively build resilience against floods.
- Unplanned urban sprawling, the rate at which rural-urban migration occurs exceeds that which the cities can effectively accommodate.
- Underdeveloped disaster risk management plans, disaster management departments are neither fully developed nor funded to handle emergencies as they occur.
- Poor urban drainages within most African city's compromises surface runoff flow.
- Lack of anticipatory and contingency actions to reduce adverse effects brought about by hazards.

EMERGING ISSUES ON FLOOD MANAGEMENT

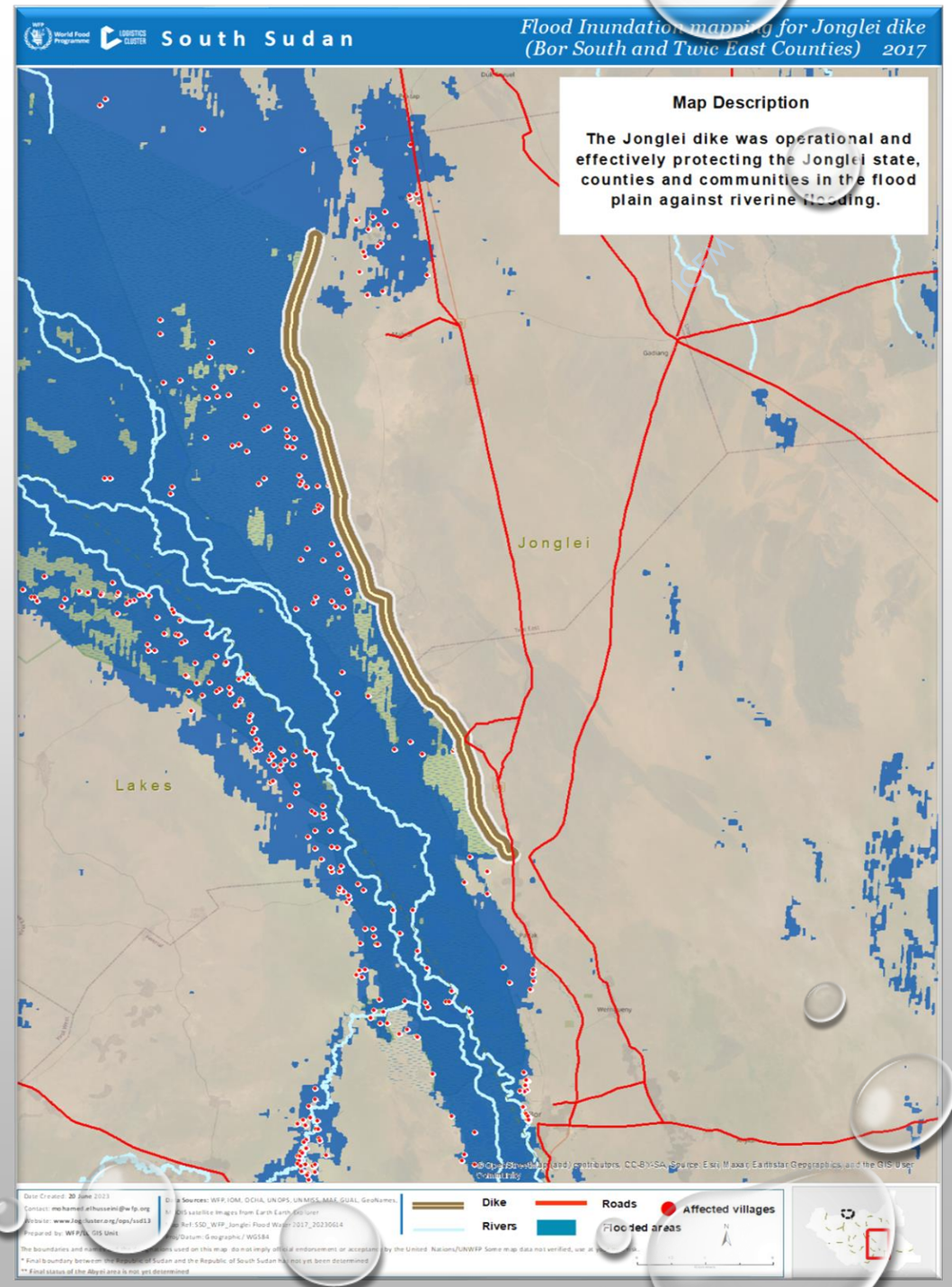
- Conflicting mandates in the implementation and management of floods amongst state corporations and agencies.
- Lack of corporation amongst concerned line ministries (there is a disconnection amongst ministries, especially data sharing, issuance of early warnings) this brings a lot of confusion and limits operational flood management.
- Unreviewed disaster management policies and frameworks for efficient disaster mitigation and management.
- Lack of better understanding on the interaction between floods and societies (Vulnerability, exposure, hazards and response)
- Statistical approaches in flood estimation should be complemented with causal mechanisms as well as the dominant processes within the atmosphere (B. Merz et al., 2014).
- There is a lack of well-integrated risk management model towards addressing the safety awareness, evacuation needs and psychological needs of potential victims (D.K. Ahadzie & D.G. Proverbs, 2011)

SOUTH SUDAN'S A CASE STUDY

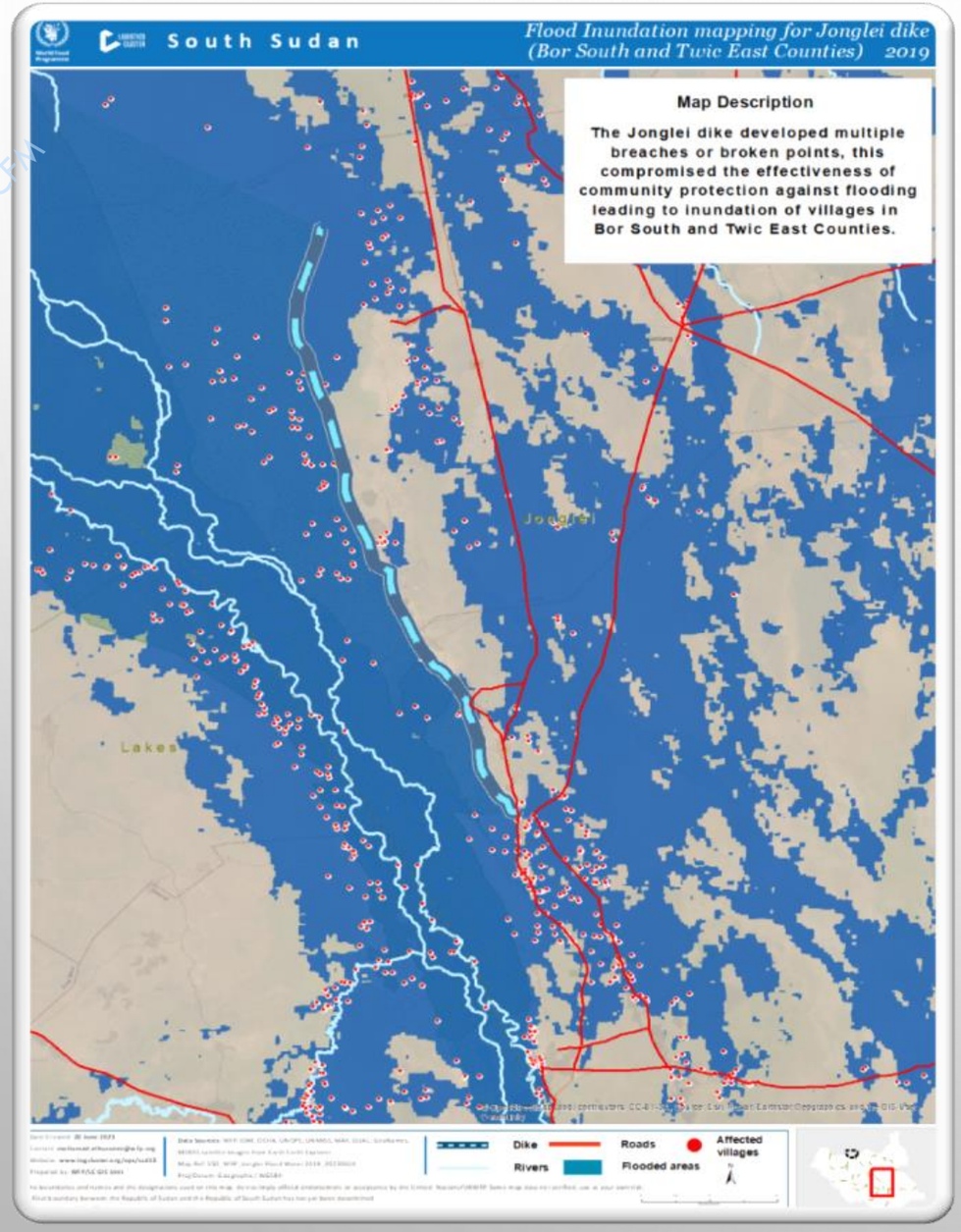
- South Sudan is the youngest Country in Africa, but the worst hit with multiple natural hazards (Floods and droughts).
- In 2018, the horn of Africa recorded above normal rainfall which affected most Countries, this increased river flows within the Nile river. High discharges within the Nile compromised the dike Embankment leading to multiple broken points.
- More than 2,600sq km of arable land within the flood plain of Jonglei state in South Sudan was inundated for over 4 years. Communities within Bor South and Twic East counties were adversely affected with more 200 thousand people displaced, communication and transport lines were equally destroyed.
- To address rehabilitation of the broken dike, the UN World food program adopted a scientific approached, undertook hydrological assessment for the dike coupled numerical simulations and satellite Imagery (radar and MODIS) for flood extends and depth computations.

HYDROLOGICAL STUDY FINDINGS

- MODIS satellite image acquired in 2017 when the dike embankment was in place, showed the Jonglei flood plain was well protected from the White Nile river flow.
- The land surface water index was computed, and the results were as indicated in the figure on the right.
- Remote sensing has proven to be an effective tool in the assessment and monitoring of different features on the earth surface.
- From the image, the road infrastructure and settlements were all functional.



HYDROLOGICAL FINDINGS CONT.'



- The classified 2019 MODIS image showed the entire land was inundated.
- The roads and all settlements were compromised due to broken dike.
- From the 2 satellite images it was evident that structural measures are vital in flood disaster prone floodplains such as the Jonglei state in South Sudan.

NUMERICAL SIMULATION FINDINGS

- The rainfall runoff inundation model (RRI) a two-dimensional model capable of simulating flood inundation and runoff at the same time (sayama et al., 2012) was utilized in the study.
- The study showed long-term inundation period water level depth at 1.5m while the shorter one was 1.8 meters.
- There were slight variations in the water depth and area flooded by satellite images and that from the numerical simulation.
- Design discharge was used in the design of the dike rehabilitation works.

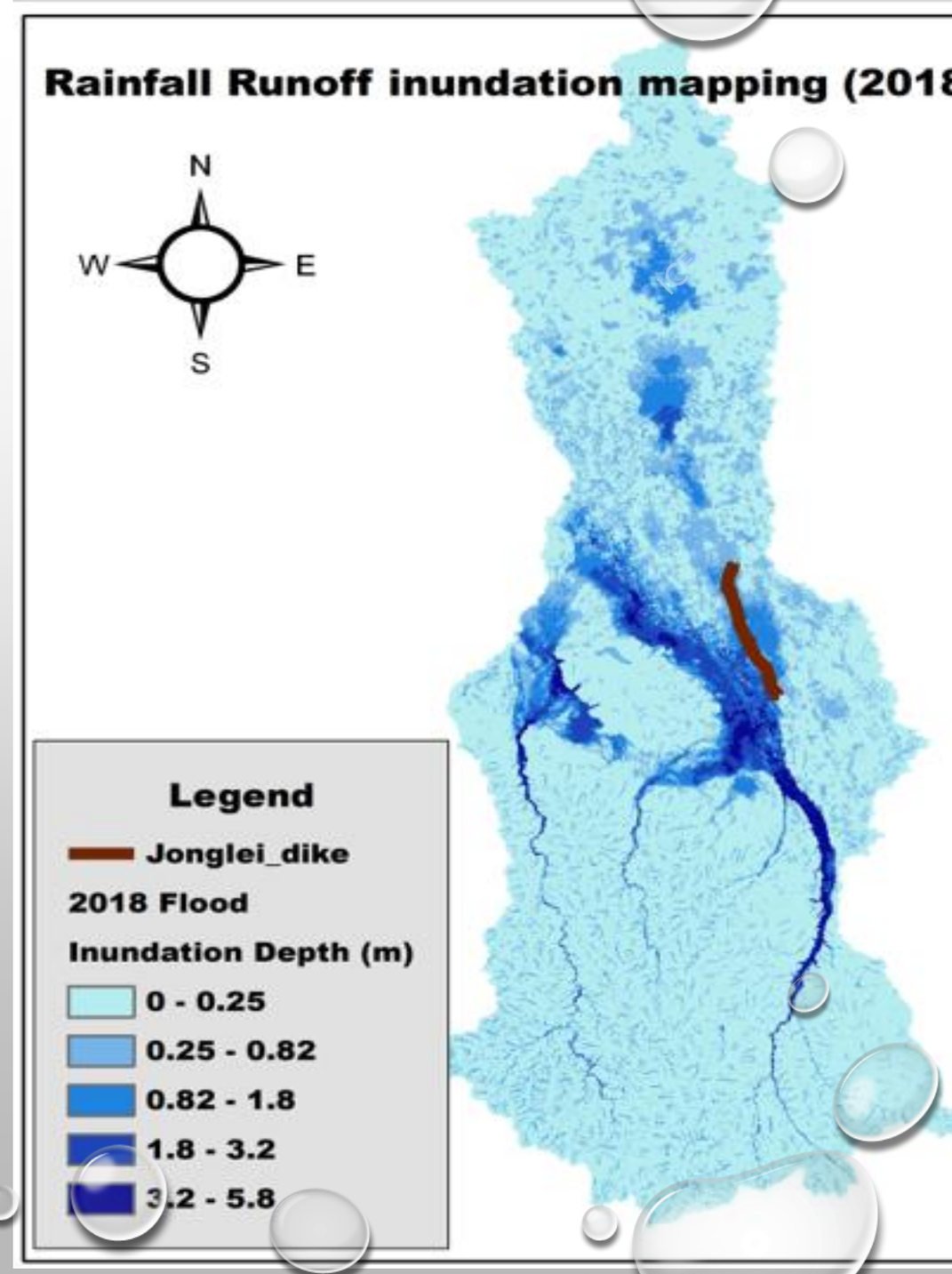


IMAGE OF FLOODED STRUCTURES

VIDEO OF ONE OF THE BREACHED POINT ALONG THE DIKE

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