An overview of key water-related risks in Africa

South Sudan Crisis Response Plan 2022
https://crisisresponse.iom.int/response/south-sudan-crisis-response-plan-2022

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31.01.23

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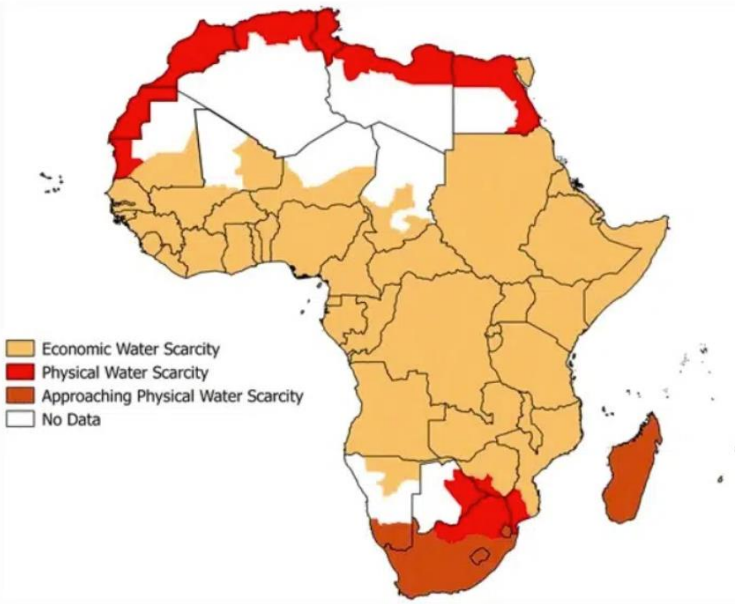
Outline

1. Cross-cutting water challenges in Africa.
2. Climate risks are water risks.
3. State of water and climate in Africa.
4. A focus on water-risks.
5. A focus on floods.
6. A focus on droughts.
7. A focus on socio-economic impacts.
8. A focus on displacement.
9. IOM in East Africa and South Sudan.

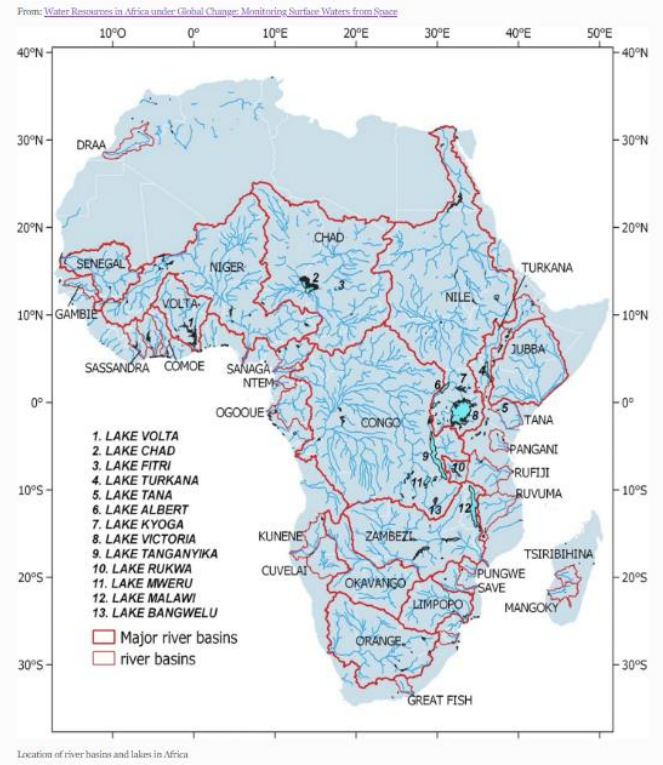
Reaching those most Vulnerable Amid Floods and Conflict in South Sudan
https://reliefweb.int/report/south-sudan/reaching-those-most-vulnerable-amid-floods-and-conflict-south-sudan

Cross-cutting water-related challenges in Africa

- High spatial and temporal variations in rainfall
  - Mean annual rainfall like other continents but evaporation is higher, and distribution and variability is very high across space and time.
- High number of people living with water scarcity
  - Around 500 Million people living in 19 countries with severe water insecurity.
- Population growth
  - Current population is around 1.3 Billion and it is expected to double by 2050.
- Low development of water resources
  - Water scarcity is not only physical but economic (due to low levels of development and exploitation of water resources).
- Water depletion
  - Pollution, salinization, overexploitation are depleting available water resources.
- Strong dependence on agriculture
  - 60% of population are smallholder farmers, and about 23 % GDP comes from agriculture.



https://earth.org/water-scarcity-in-africa/



https://link.springer.com/article/10.1007/s10712-022-09700-9

Water in Africa
https://www.ascleiden.nl/content/webdossiers/water-africa

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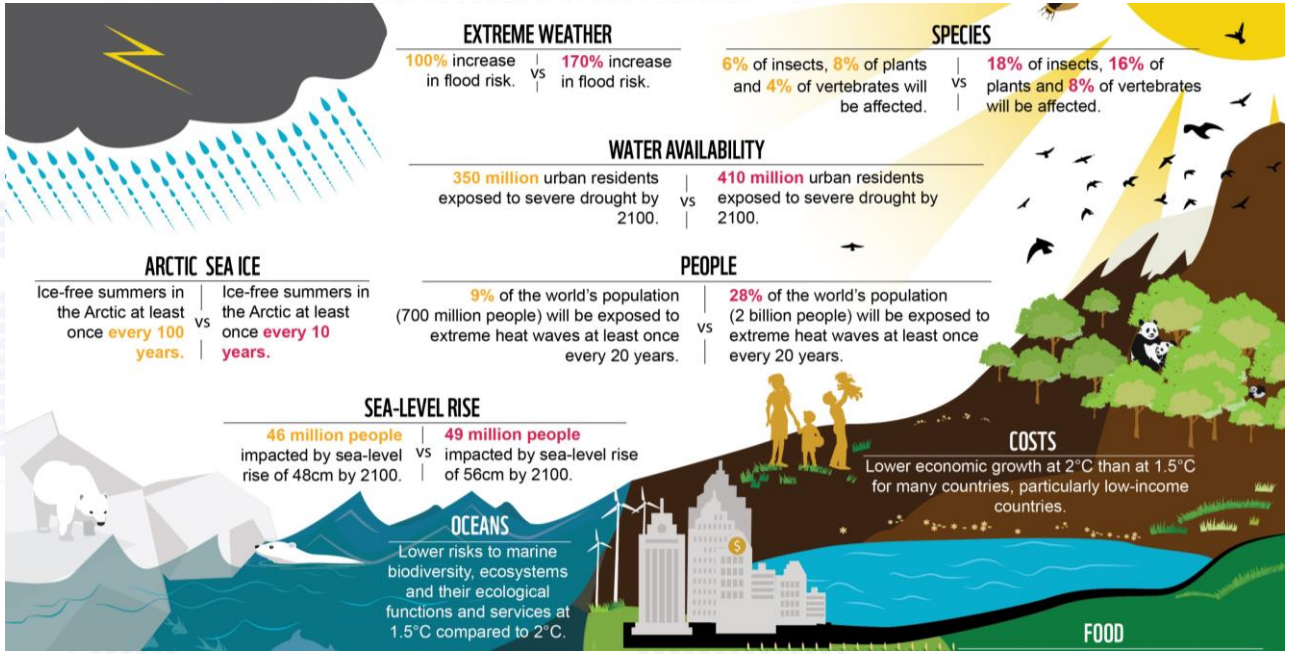
Climate risks are water risks

- Climate change is likely to exacerbate both the severity and unpredictability of weather events.
- Climate risks are crosscutting and affect water, health, livelihoods, food security, human security and economic growth
- The impacts related to climate change and variability has increased in recent decades and are projected to increase with global warming.
- Water is the first resource impacted by climate change, which is exacerbating other environmental, economic and social problems that threaten the development of economies and people's livelihoods.
- Climate-related water crises are ranked the highest among the top 10 global risks in terms of impact and likelihood.



Climate risks: 1.5 °C vs 2 °C global warming (WWF, 2018)
https://wwf.panda.org/wwf_news/?336701/Let-us-maintain-global-warming-at-15C-to-save-Madagascar

Climate Change Adaptation and Integrated Water Resources Management
https://www.unepdhi.org/climate-change-adaptation-and-integrated-water-resources-management/

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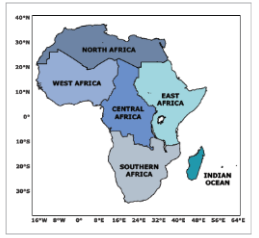
State of Water and Climate in Africa

- The temperature across six sub-regions continues to increase with an average increase of approximately 0.3 °C.
- North Africa has recorded the largest temperature increase.
- Increasing water consumption combined with more frequent droughts and heat events will increase water demand and put additional pressure on already scarce water resources.
- Disruptions in water availability will impede access to safe water.
- Limited water availability and water scarcity are expected to trigger conflicts among people who are already contending with economic challenges.



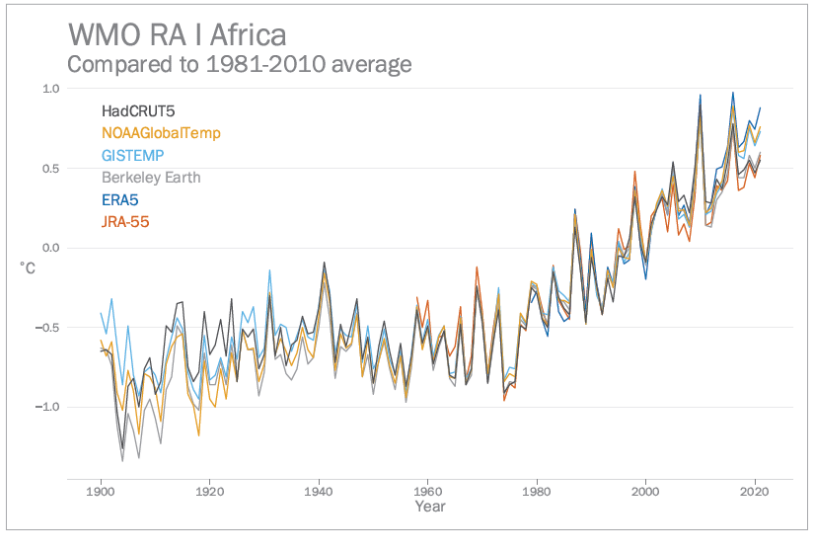


Figure 3. Temperature difference in °C with respect to the 1981–2010 climatological period for Africa (WMO Regional Association I) based on six data sets, including observational data sets (HadCRUT5 [black], NOAAGlobalTemp [yellow], GISTEMP [light blue], and Berkeley Earth [grey]) and reanalyses (ERA5 [dark blue] and JRA-55 [orange]).
Source: Met Office, United Kingdom

State of the Climate in Africa 2021
https://library.wmo.int/doc_num.php?explnum_id=11304

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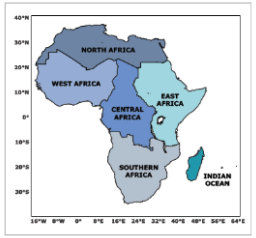
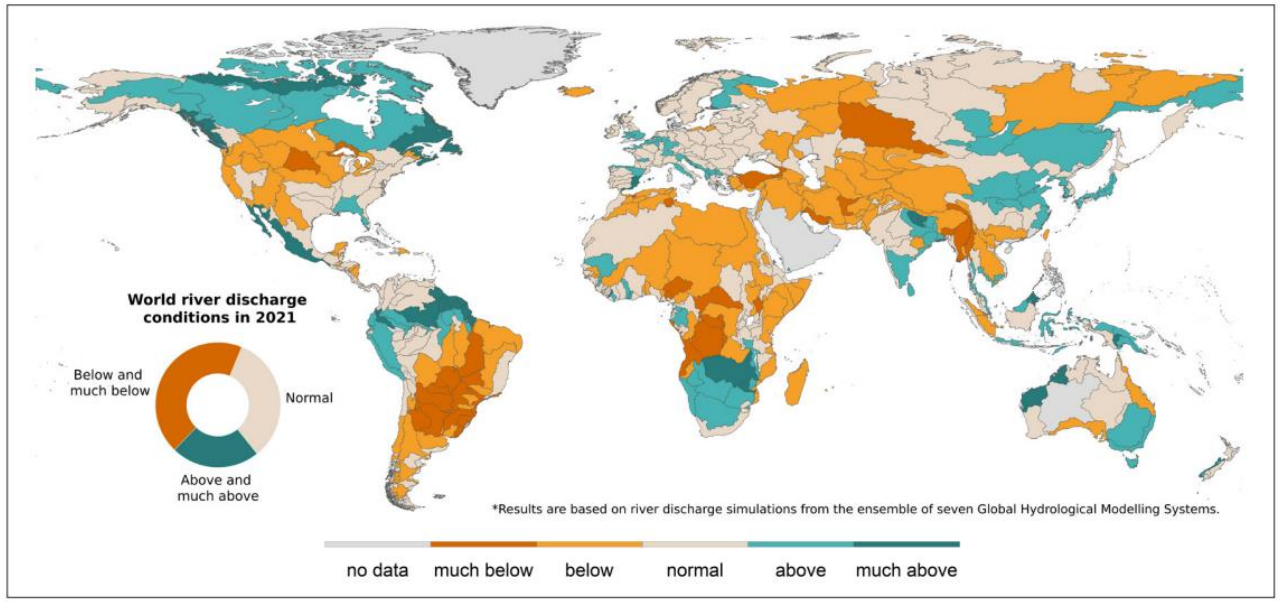
State of Water and Climate in Africa

- East Africa suffered the effects of cumulative failed rainy seasons.
- High food prices impeded food availability and access, leaving more than 58 million people in conditions of acute food insecurity.
- Tropical cyclones severely affected the Southern African region. Over 43 000 people were internally displaced.
- The total surface area of Lake Chad shrunk from 25000 km2 in the 1960s to 1350 km2 in the 2000s; it has remained stable from the 2000s to the present.
- Increased temperature has contributed to a 34% reduction in agricultural productivity growth in Africa since 1961. This is more than any other region.





State of the Climate in Africa 2021
https://library.wmo.int/doc_num.php?explnum_id=11304

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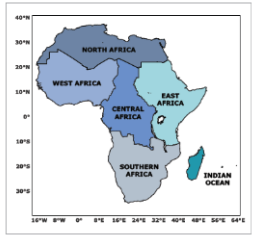
A focus on temperature

- All six African sub-regions experienced an increase in the temperature trend from the period 1901–1930 to the period 1991–2021.
- In 2021, most of African countries recorded temperatures above the 1981–2010 average.
- The highest temperature anomalies were recorded across North Africa, followed by West Africa.



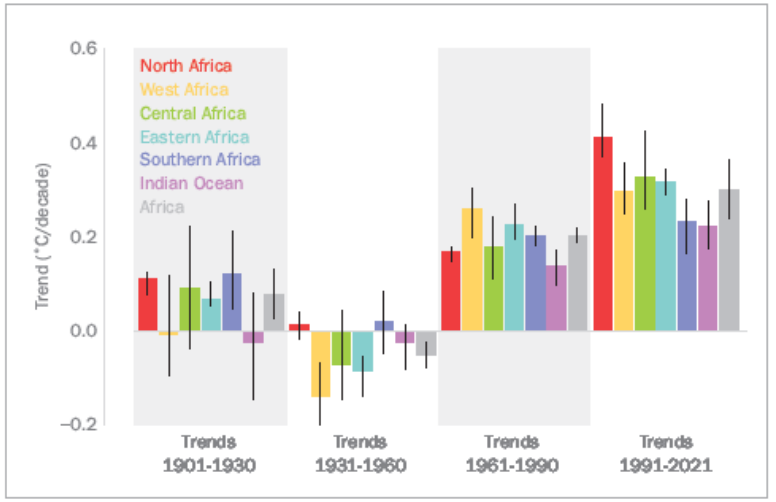


Figure 5. Trends in the area average temperature in °C/decade for the six African sub-regions: North Africa (red), West Africa (yellow), Central Africa (green), East Africa (light blue), Southern Africa (dark blue), and Indian Ocean island countries (purple), and the whole of Africa (grey) over four 30-year sub-periods: 1901–1930, 1931–1960, 1961–1990, and 1991–2021. The trends were calculated using different data sets, [5] including observational data sets (HadCRUT5, NOAAGlobalTemp, GISTEMP, and Berkeley Earth) and reanalyses (ERA5 and JRA-55). The black vertical line indicates the range of the six estimates.[6]
Source: Met Office, United Kingdom

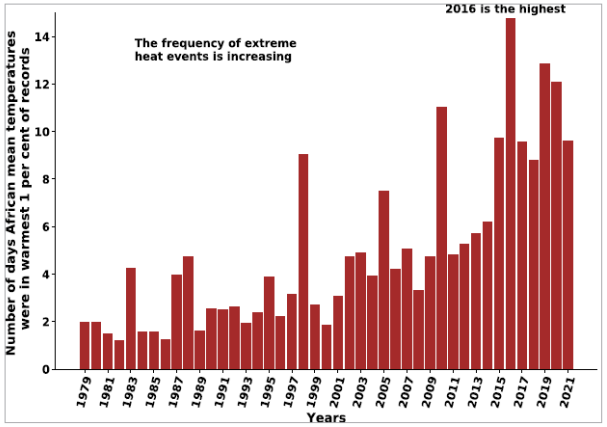


Figure 7. Annual number of extreme warm days in Africa from 1979 to 2021.
Source: African Center of Meteorological Applications for Development (ACMAD), based on ERA5

State of the Climate in Africa 2021
https://library.wmo.int/doc_num.php?explnum_id=11304

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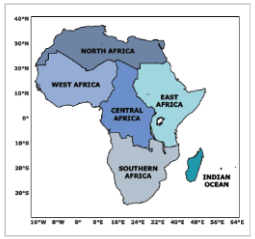
A focus on precipitation

- In 2021, rainfall patterns continued to show large variability across time and space.



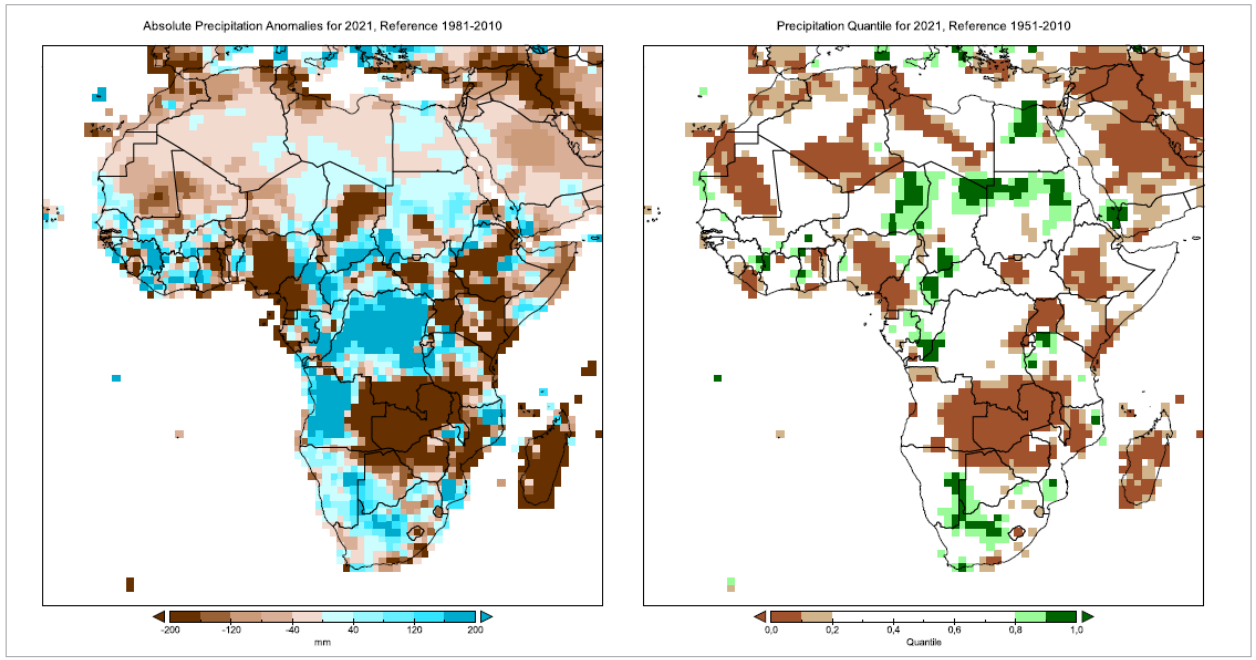


Figure 8. Absolute precipitation anomalies in mm for 2021 (left): Blue areas indicate above-average precipitation, while brown areas indicate below-average precipitation. The reference period is 1981–2010. Precipitation quantiles for 2021 (right): Brown areas indicate abnormally low precipitation totals (light brown indicates the lowest 20%, and dark brown indicates the lowest 10% of the observed totals). Green areas indicate unusually high precipitation totals (light green indicates the highest 20%, and dark green indicates the highest 10% of the observed totals). The reference period is 1951–2010.
Source: Global Precipitation Climatology Centre (GPCC), Deutscher Wetterdienst (DWD), Germany

State of the Climate in Africa 2021
https://library.wmo.int/doc_num.php?explnum_id=11304

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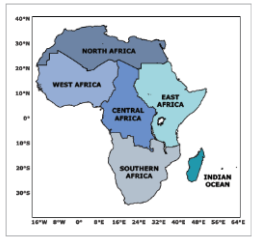
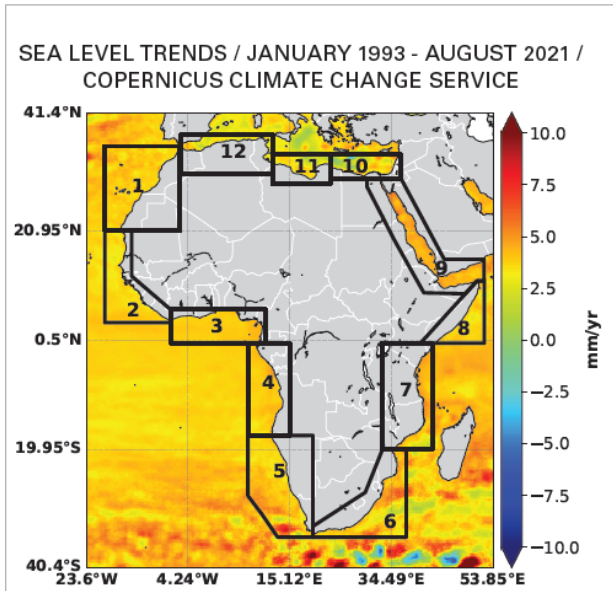
A focus on coastal sea level

- Since 1990, global mean sea level has risen around 8 cm and it is accelerating.
- The highest rate of sea-level rise is along the coastal areas of the Red Sea.
- Sea-level rise increases the frequency and severity of coastal flooding in coastal areas.
- By 2030, 108–116 million people in Africa are expected to be exposed to sea-level rise risk.



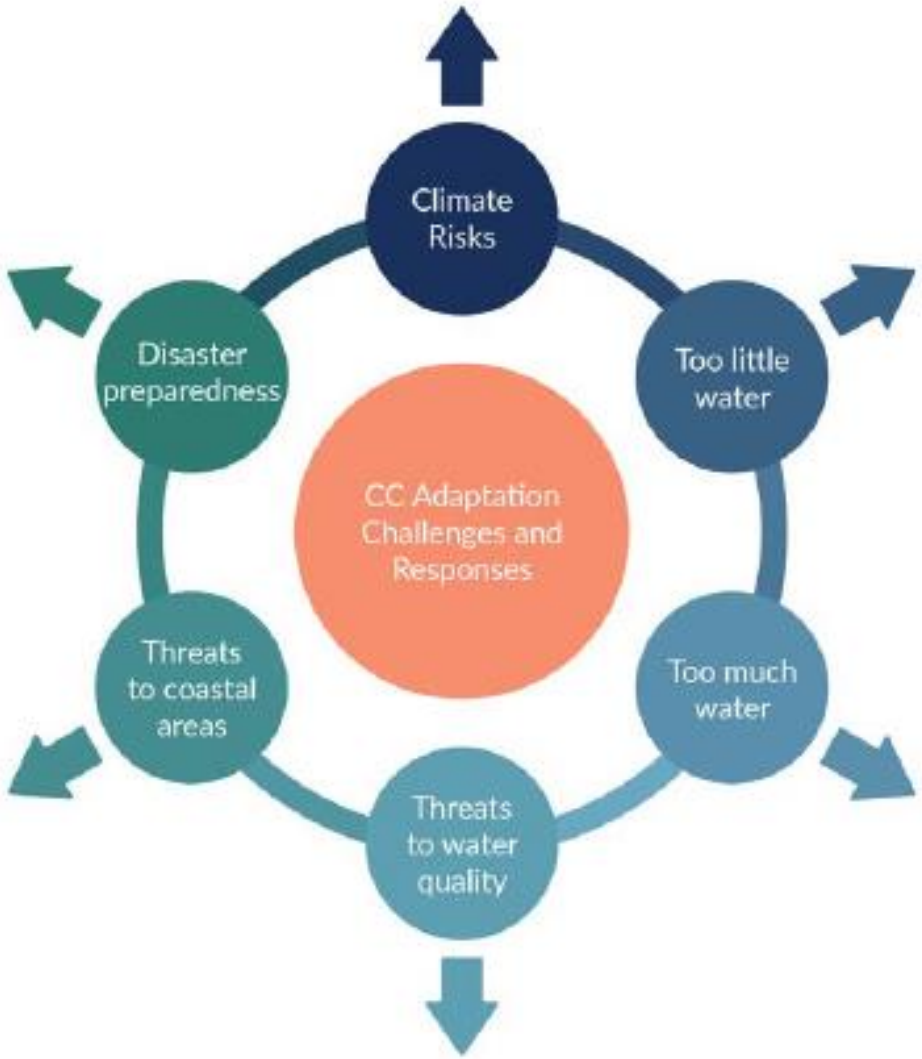


Ocean	Box number	Rate of sea level rise (mm/yr)
North Atlantic	1	3.66 ± 0.1
Tropical Atlantic	2	3.31 ± 0.1
	3	3.64 ±0.1
South Atlantic	4	3.62 ± 0.1
	5	3.78 ± 0.1
Indian Ocean	6	3.92 ± 0.1
	7	3.98 ± 0.2
	8	3.66 ± 0.2
Red Sea	9	4.42 ± 0.2
Mediterranean Sea	10	3.06 ± 0.1
	11	3.13 ± 0.2
	12	2.47 ± 0.2
Global	-	**3.3 ± 0.4**

Figure 9. Left: Sea-level trends at the 12 coastal regions of Africa covering the period from January 1993 to August 2021: the North Atlantic (1), the Tropical Atlantic (2 and 3), the South Atlantic (4 and 5), the Indian Ocean (6, 7, and 8), the Red Sea (9), and the Mediterranean Sea (10, 11, and 12). Right: Table indicating the sea-level rise in mm/yr for the 12 coastal regions of Africa and the global ocean.
Source: Copernicus Climate Change Service (C3S). See C3S Climate Data Store for more information on the data sets and methodology used to measure sea-level rise.

A focus on water-related risks

- Key water-risks can be categorized under four themes.
  1. Too little water (water scarcity, droughts).
  2. Too much water (storms, floods).
  3. Poor water quality.
  4. Sea-level rise.



Climate change adaptation challenges related to water.
https://www.unepdhi.org/climate-change-adaptation-and-integrated-water-resources-management

Climate Change Adaptation and Integrated Water Resources Management
https://www.unepdhi.org/climate-change-adaptation-and-integrated-water-resources-management/

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Too little water

- The changing variability of rainfall patterns and rising temperatures associated with climate change are expected to contribute to increased frequency of water scarcity and droughts.
- Water scarcity is also caused by unsustainable resource use, irrespective of natural factors.
- Increasingly competing demand and over-abstraction of water resources are common causes of water scarcity.

Weak goats are transported on a cart pulled by donkeys as a family in Kenya leaves their home in search of water. A prolonged drought in the country's north has created food and water shortages, pushing pastoralist communities and their livestock to the brink.
PHOTOGRAPH BY ED RAM, GETTY IMAGES

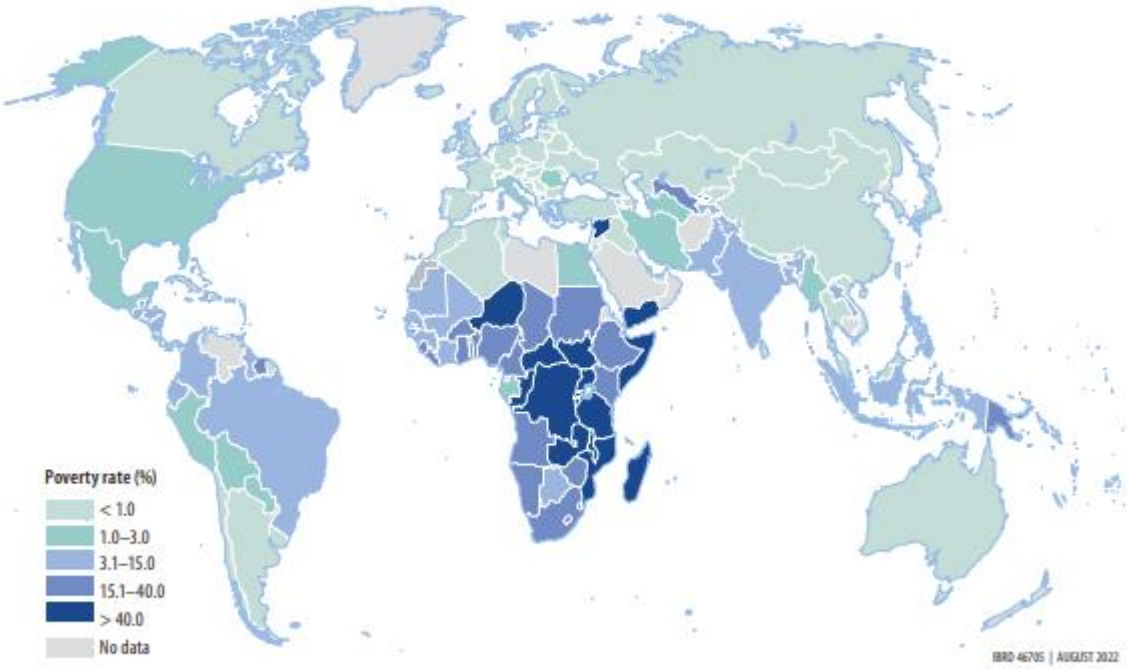
https://www.nationalgeographic.com/environment/article/historic-drought-looms-for-20-million-living-in-horn-of-africa

Too much water

- Global warming is expected to contribute to increased intensity of rainfall in some areas, and increased variability of seasonal distribution of rain.
- Communities will have to adapt to riverine floods, flash floods, urban floods and sewer overflows.
- The immediate impacts and damage of flooding depend on many factors, from physical to socio-economic.

MAP 1.1

In 2019, countries with the highest poverty rate at the US$2.15-a-day poverty line were mostly in Sub-Saharan Africa



Source: World Bank, Poverty and Inequality Platform, https://pip.worldbank.org.
Note: The map shows each economy's poverty headcount rate at the US$2.15-a-day poverty line for 2019. Economies without survey data available in the Poverty and Inequality Platform are shown in gray.

Poor water quality

- Drivers of water-quality degradation include the increasing frequency of floods and droughts combined to the impacts of human activity - which remains the primary cause of water-quality degradation.

- As a result of climate change, the higher-intensity rainfall can contribute to increased nutrient leakage and consequently eutrophication of waterbodies.

Photo Story: Flood Response In Bentiu, South Sudan
https://eastandhornofafrica.iom.int/stories/photo-story-flood-response-bentiu-south-sudan

Climate Change Adaptation and Integrated Water Resources Management
https://www.unepdhi.org/climate-change-adaptation-and-integrated-water-resources-management/

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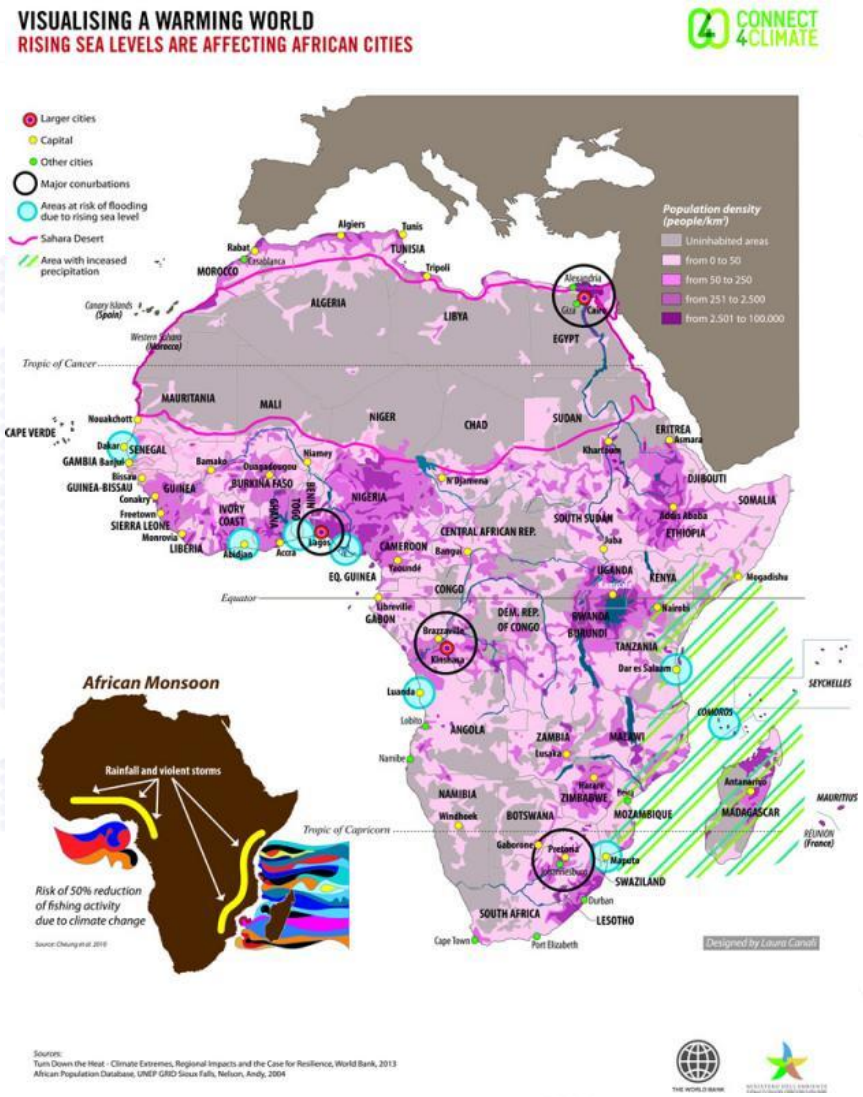
Sea-level rise

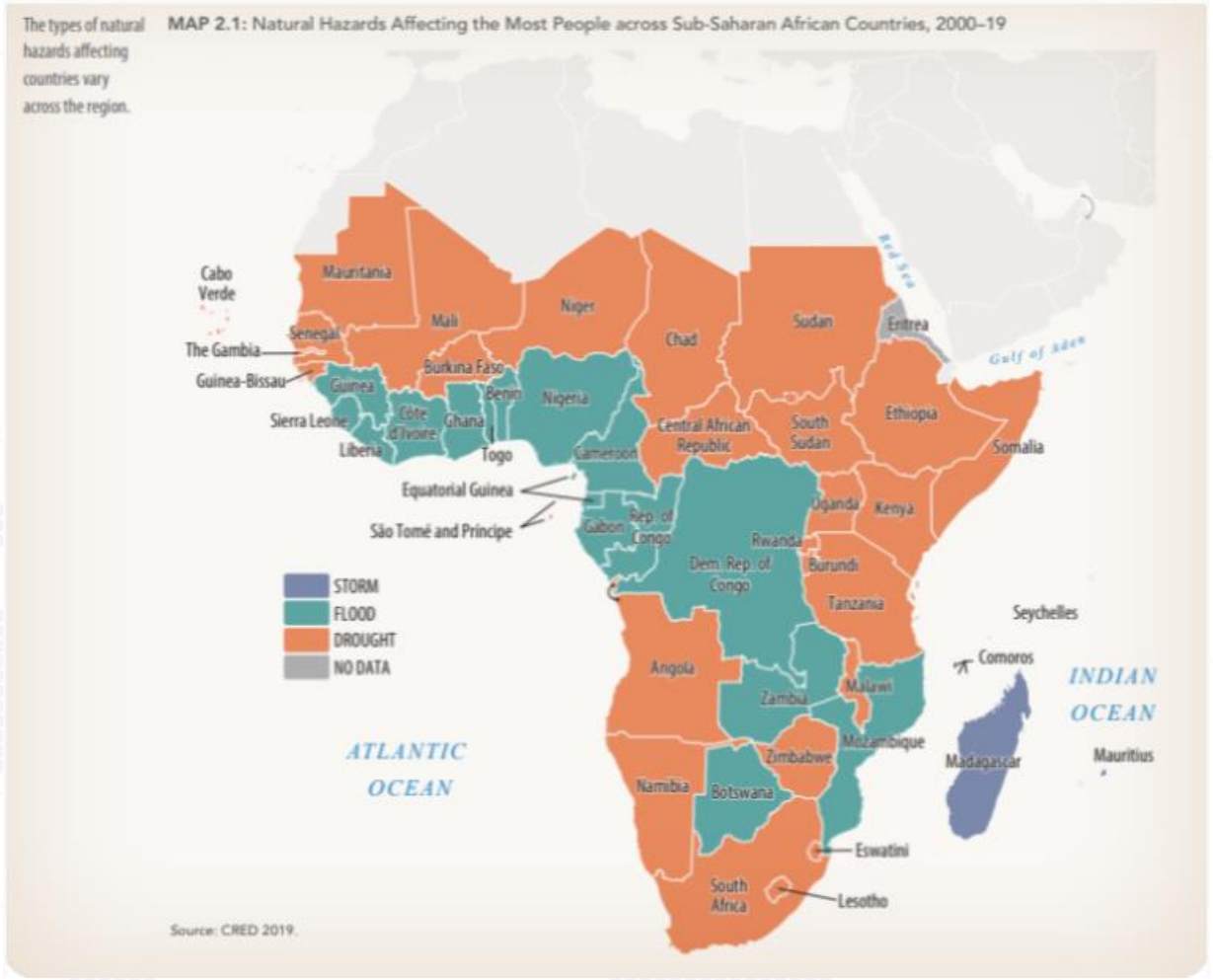
- Coastal areas are home to some of the most populated and economically significant cities in the world, with growing density and size, and are often particularly exposed due to high population density and low-lying areas.
- Coastal communities are particularly at risk of climate-change-induced sea-level rise and extreme weather events caused by extreme conditions in the sea – including coastal storms and cyclones and high tides.
- With increasing sea levels, the risks of tidal flooding are particularly high, and existing defenses are more prone to be breached, causing severe flood damage.



https://www.connect4climate.org/infographics/visualising-warming-world

Water-related disasters

- Largest share of natural disasters in Africa, causing the deaths of thousands of people, and annual economic damage of billions of dollars.
- Floods and droughts affect more people than any other hazard.
- Climate change is expected to exacerbate these losses, due to increased severity and frequency of floods and droughts, storms and sea-level rise.
- In the last 10 years, climate-related disasters have caused US$1.4 trillion of damage worldwide.
- In the last 10 years, water-related disasters (floods and droughts) accounted for almost 90% of the most disastrous events.



Increasing droughts and floods on the African continent
https://www.brookings.edu/blog/africa-in-focus/2021/10/08/increasing-droughts-and-floods-on-the-african-continent//

Climate Change Adaptation and Integrated Water Resources Management
https://www.unepdhi.org/climate-change-adaptation-and-integrated-water-resources-management/

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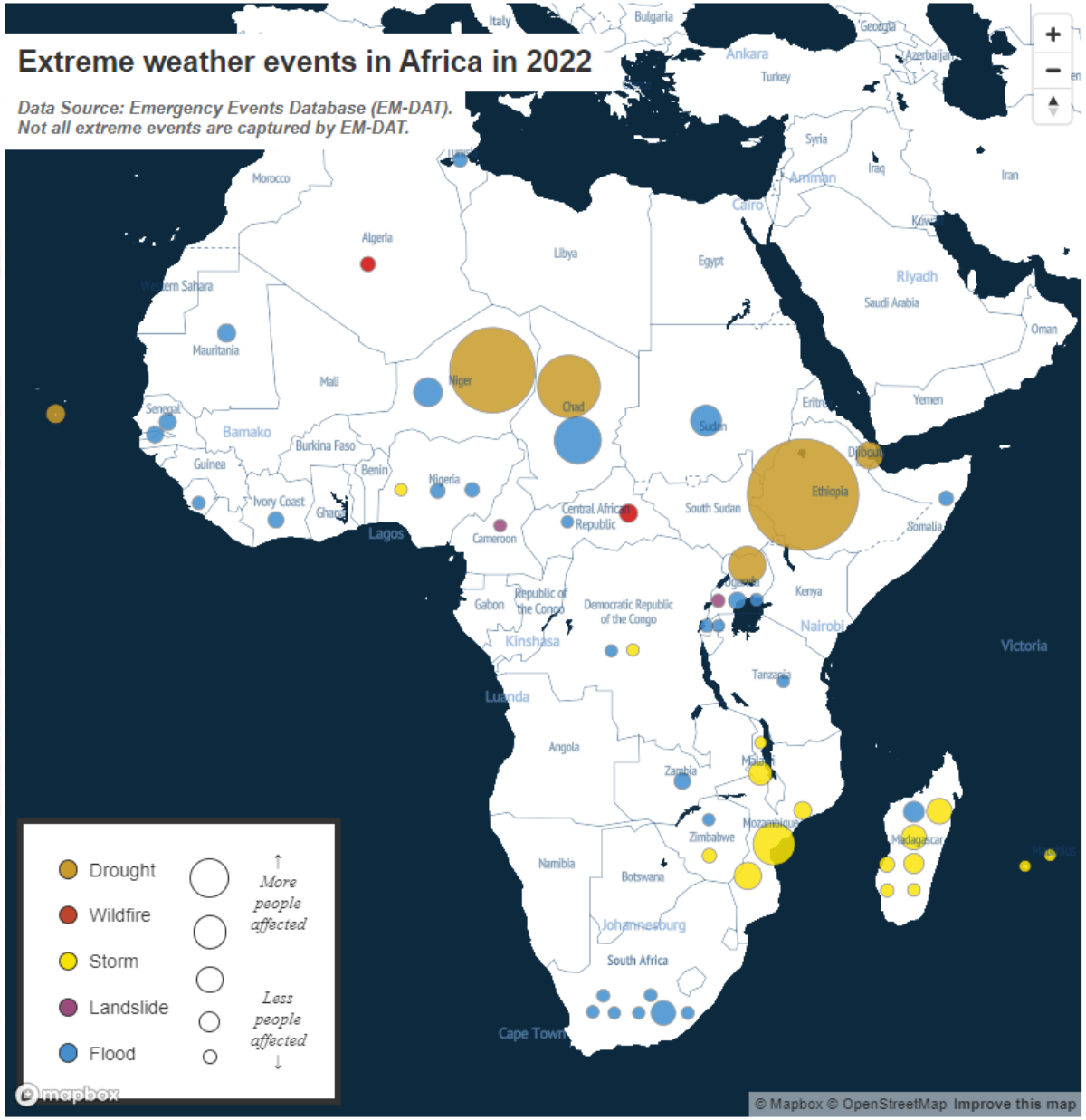
Africa’s unreported extreme weather events in 2022

- Many of Africa’s most extreme and life-changing weather events went largely unreported in global-north media.
- Extreme weather events in Africa have killed at least 4,000 people and affected a further 19 million since the start of 2022.
- However, the impacts of African extreme events often go unrecorded and so the true figures are likely to be much higher.



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https://www.preventionweb.net/news/analysis-africas-unreported-extreme-weather-2022-and-climate-change

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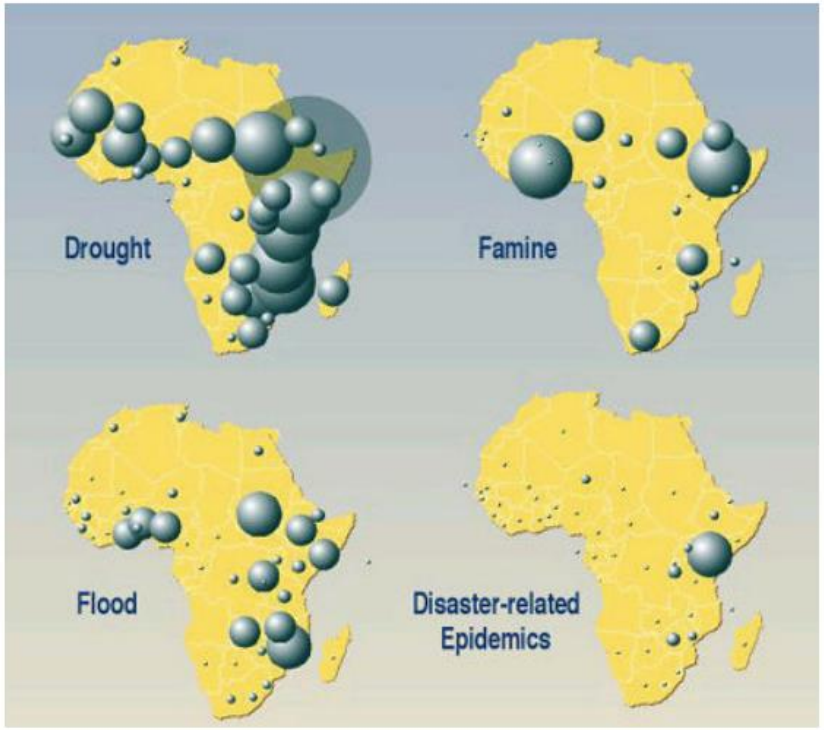
Floods and Droughts in Africa

- Based on the number of people affected, over the past 30 years, floods and droughts are the two natural hazards that have the largest humanitarian impacts in Africa.
- In the past decade, across Africa, floods have overtaken droughts in terms of the number of people that they impact.
- Most cities and urban centres in Africa are now regarded as flood disaster risk hotspots.
- The unplanned urbanisation in Africa and the associated increase of people living in floodplains have led to an increase in the number of fatalities related to floods in African cities.

Figure 1: People Affected by Natural Disasters, 1971-2000



Sources: Office of U.S. Foreign Disaster Assistance (OFDA); Centre for Research on the Epidemiology of Disasters (CRED); International Disaster Database, www.cred.be/emdat , Université Catholique de Louvain, Belgium.

Disaster Risk Reduction in the Sub-Saharan Africa Region
https://www.unisdr.org/files/2229_DRRinSubSaharanAfricaRegion.pdf

Climate Change Adaptation and Integrated Water Resources Management
https://www.unepdhi.org/climate-change-adaptation-and-integrated-water-resources-management/

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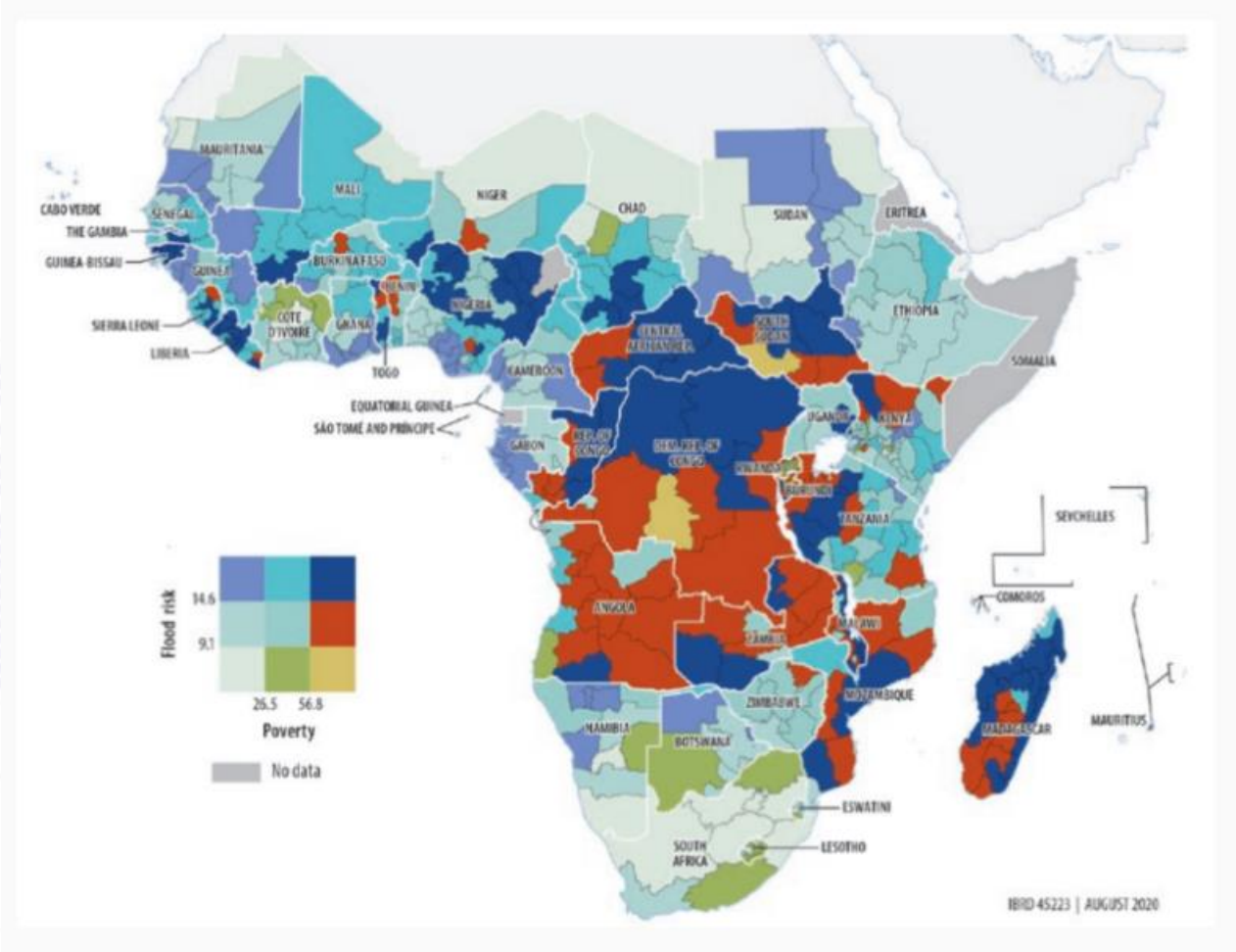
A focus on floods

- Flooding has been the most common type of natural disaster in the last 20 years, accounting for 47% of all recorded natural disasters and affecting 2.3 billion people worldwide.
- Floods are the deadliest of all forms of natural disaster, responsible for 43.5% of all deaths from natural disasters in 2019.
- Climate change is projected to increase the number of people exposed to floods due to more variable precipitation and rising sea levels.
- Vulnerability to the consequences of floods is highly dependent on the adaptive capacities of countries or regions.
- Low-income countries experience more than three quarters of the global mortality burden caused by natural disasters.



Flood exposure vs poverty in Africa.
https://www.brookings.edu/blog/africa-in-focus/2020/10/29/figure-of-the-week-flood-risk-and-poverty-in-sub-saharan-africa/

Epidemiology of floods in sub-Saharan Africa: a systematic review of health outcomes
https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-022-12584-4.

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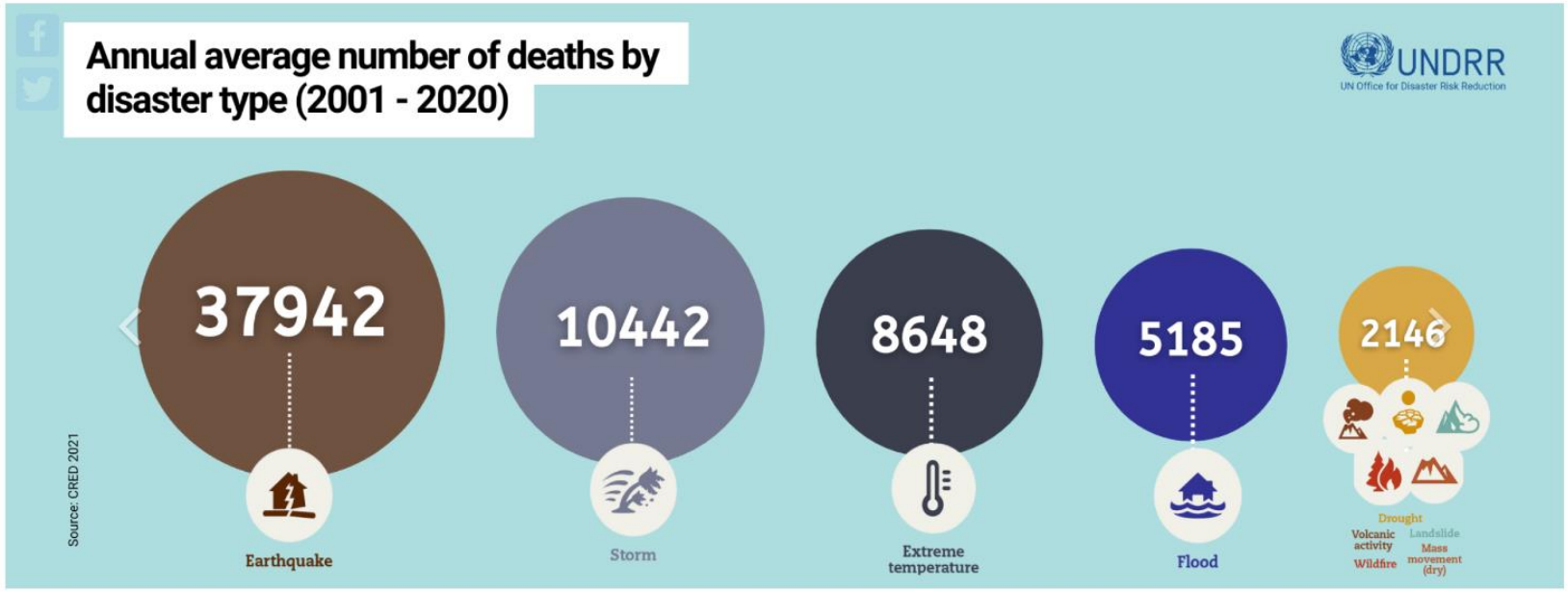
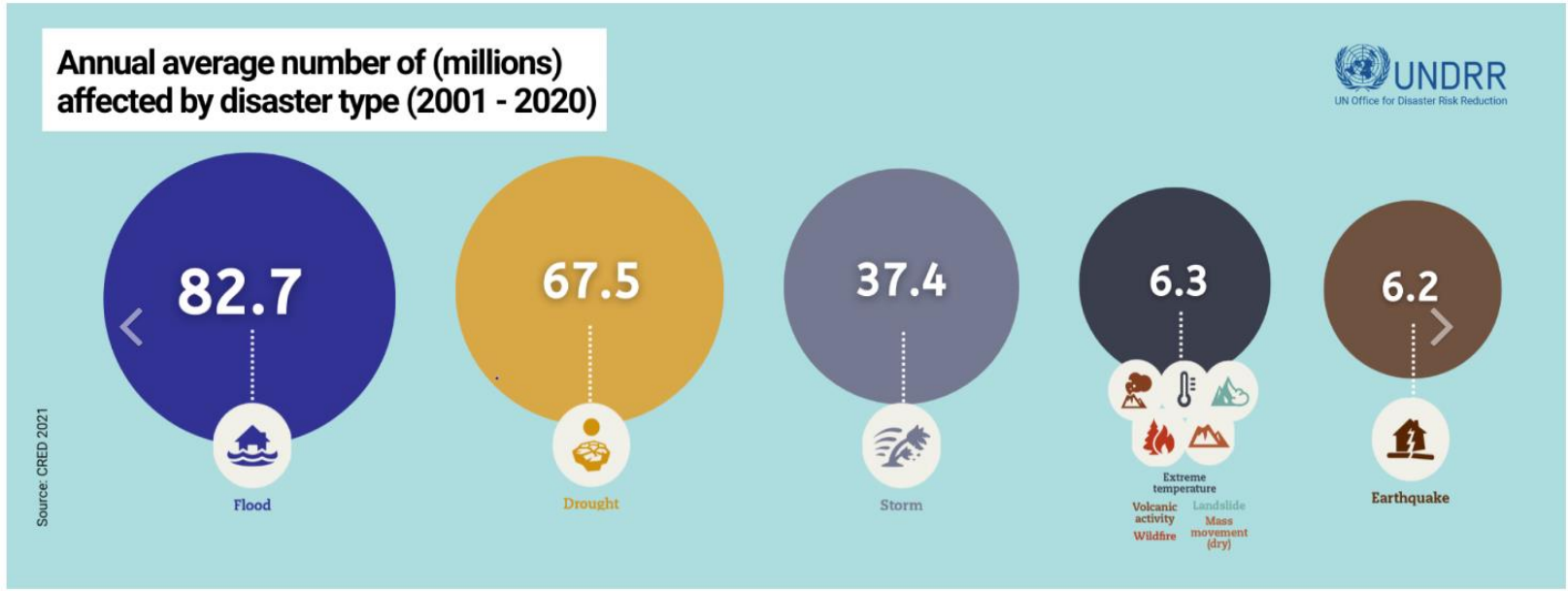




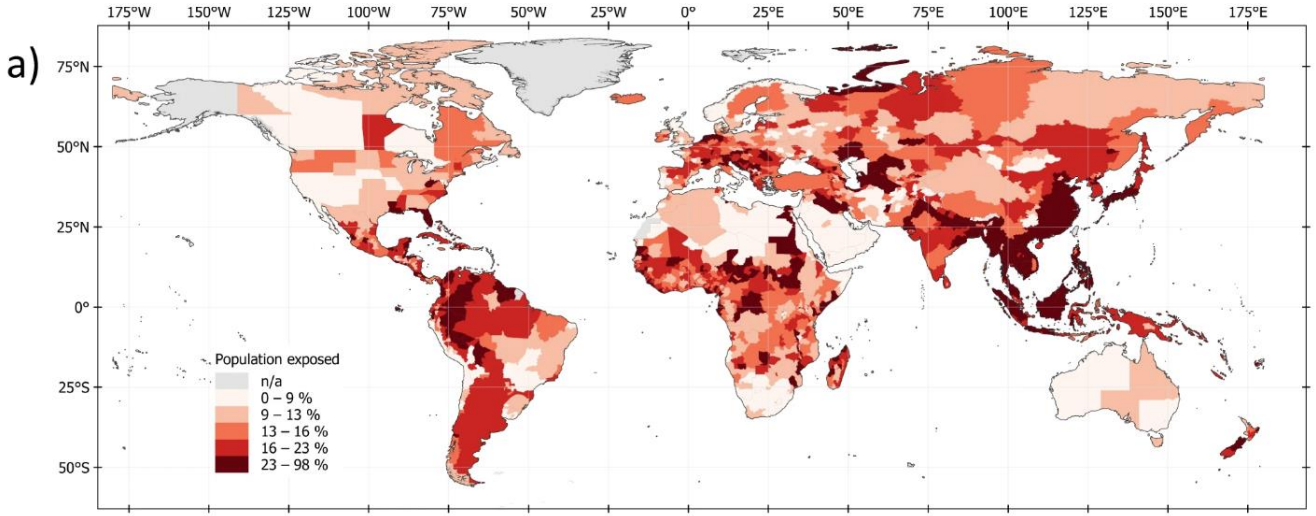
https://www.undrr.org/

Floods and health

- Floods are related to an increased risk of water-borne diseases, among others, cholera and malaria.
- Long-term health effects, specifically on mental health, non-communicable diseases and pregnancy, remain understudied.
- Pre-existing health challenges are exacerbated under flood conditions.
- Damaged or destroyed water and sanitation infrastructure may lead to drinking water contamination from sewage, agricultural waste, industrial waste or chemicals.

Fig. 2: Population exposed to floods.

From: Flood exposure and poverty in 188 countries



Flood exposure in 188 countries
https://www.nature.com/articles/s41467-022-30727-4/figures/2

Epidemiology of floods in sub-Saharan Africa: a systematic review of health outcomes
https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-022-12584-4.

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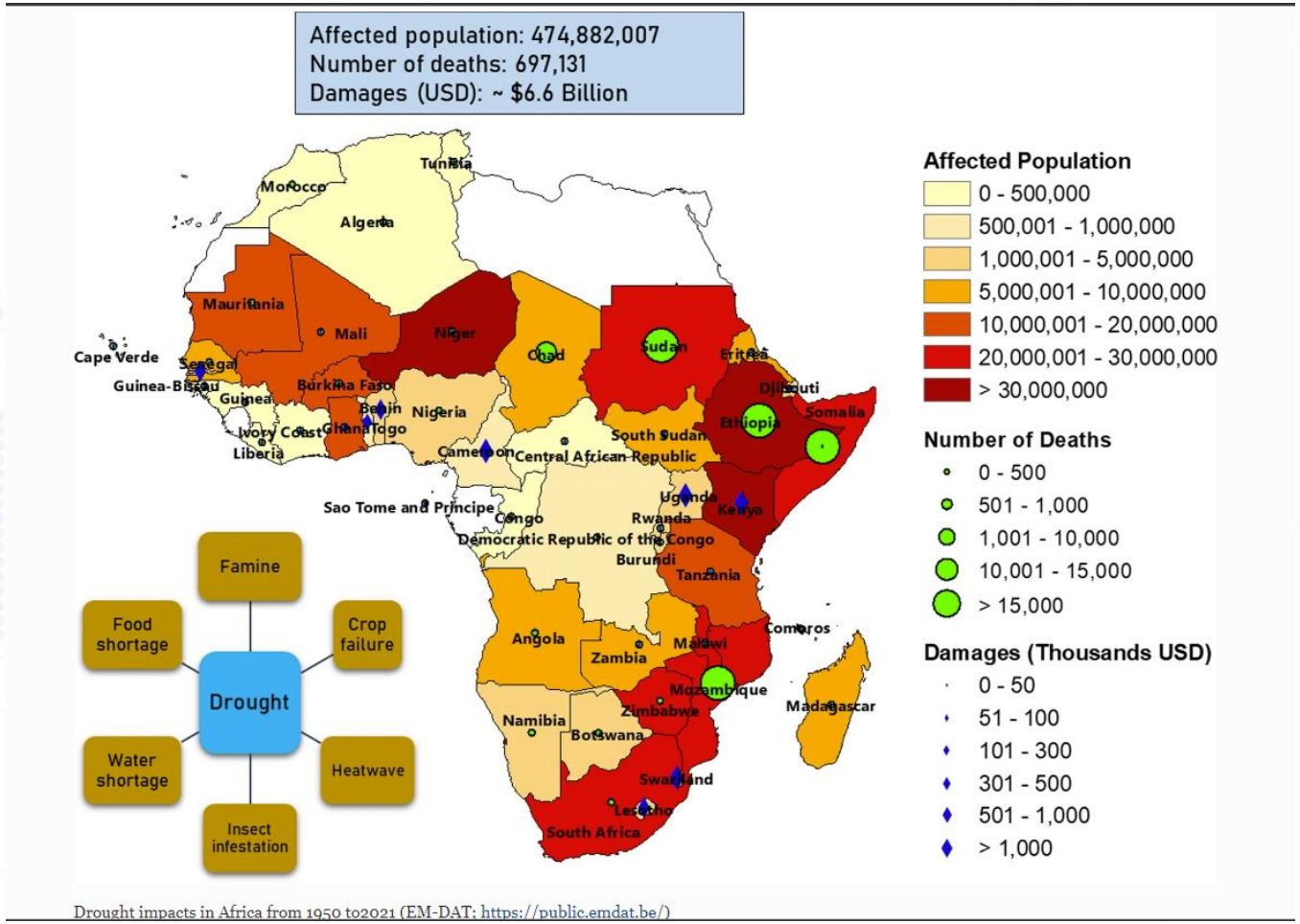
A focus on droughts

- Climate change will continue to intensify droughts with 700 Million at-risk by 2030.
- This is especially the casein arid and semi-arid regions.
- Key impact is the decline of agricultural activities and water resources and the environmental degradation across all subregions.
- Drought frequency has increased over northern sub-Saharan Africa.
- Population growth increases drought risk and augments natural resources scarcity and food insecurity in Africa.



Drought impacts in Africa from 1950 to2021 (EM-DAT: https://public.emdat.be/)

Review of Meteorological Drought in Africa: Historical Trends, Impacts, Mitigation Measures, and Prospects
https://link.springer.com/article/10.1007/s00024-022-02988-z#Tab1

Review of Meteorological Drought in Africa: Historical Trends, Impacts, Mitigation Measures, and Prospects
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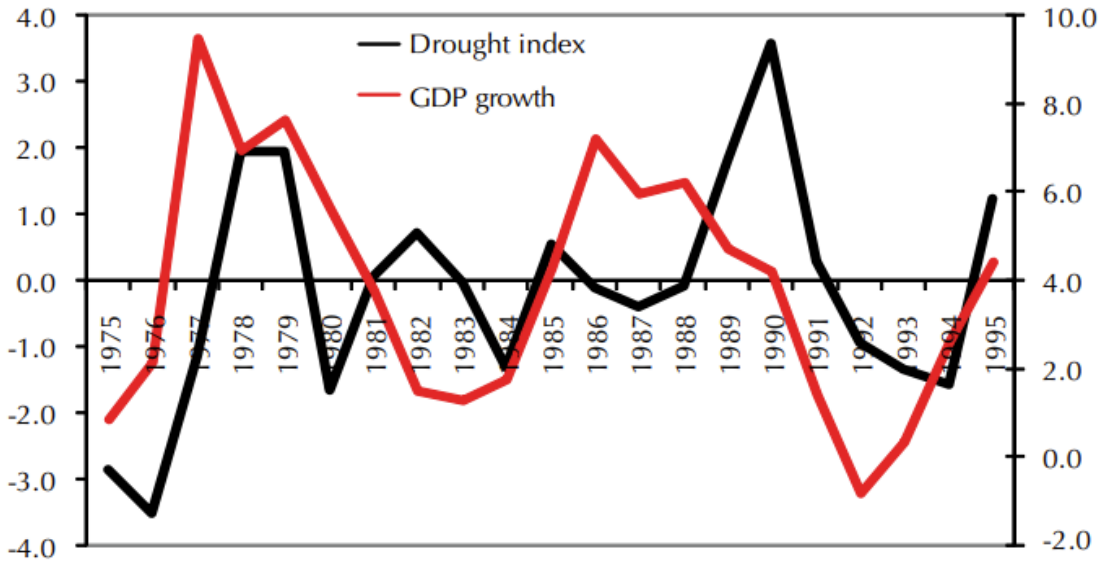
A focus on droughts

- If no climate change adaptation is implemented, unprecedented drought hazard and risk is likely to occur.
- Impacts are remarkable in countries with high dependency on agriculture.
- The Ethiopia/Sudan drought of 1974 and the Sahel drought of 2007 were among the worst natural disasters of the world, and resulted in 450,000 and 325,000 deaths, respectively.
- The 2010–2011 drought in the Greater Horn of Africa affected 12 million people and resulted in massive migration, extreme famine, and mortality of over 260,000 people.
- The Horn of Africa is currently experiencing a severe drought with at least 58 million people affected.



Source: IFPRI (2006).

Figure 5. *Linkage between the Palmer Drought Severity Index (PDSI) and GDP growth, Kenya, 1975–1995.*

Future drought risk in Africa: Integrating vulnerability, climate change, and population growth

https://: www.sciencedirect.com/science/article/abs/pii/S0048969719303213

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Droughts and health

- Drought-related health effects:
  - Prevalence of malnutrition (reduced body size, stunting and underweight, anemia, disabilities and mortality).
  - Prevalence of diseases due to microbial contamination of water including cholera, diarrheal diseases, scabies, vector-borne diseases and malaria-related mortality.

https://www.nrc.no/news/2022/april/ngos-warn-of-possible-famine-in-somalia-as-drought-worsens-urgent-action-required/

The adverse health effects associated with drought in Africa
ttps://www.sciencedirect.com/science/article/abs/pii/S0048969721035725

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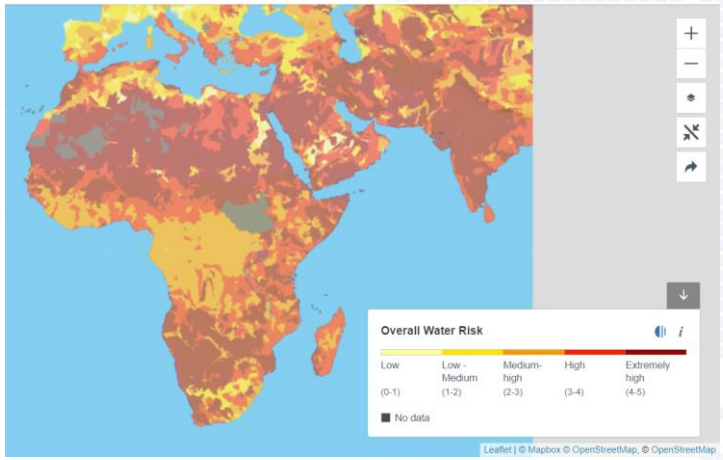
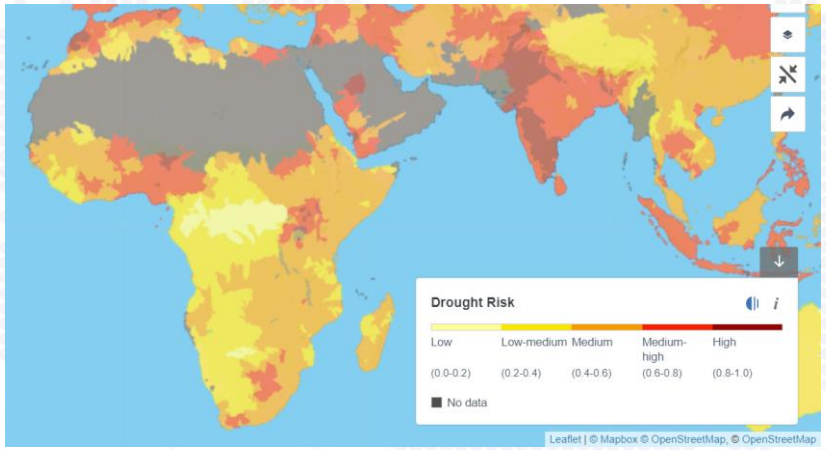
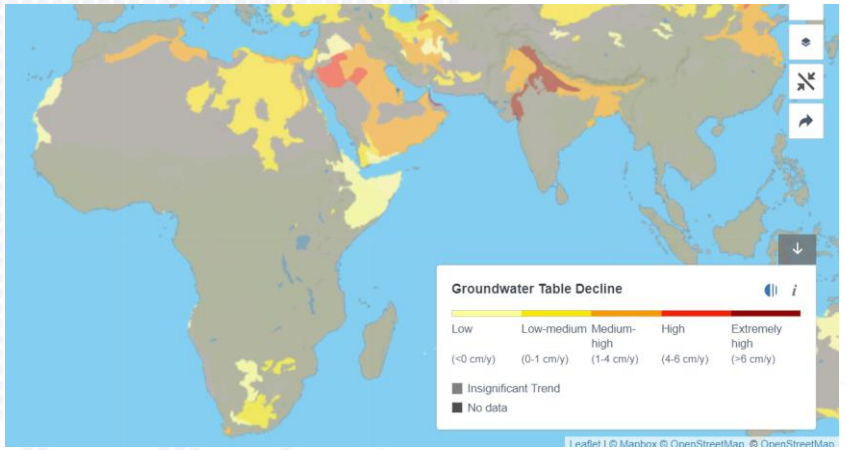
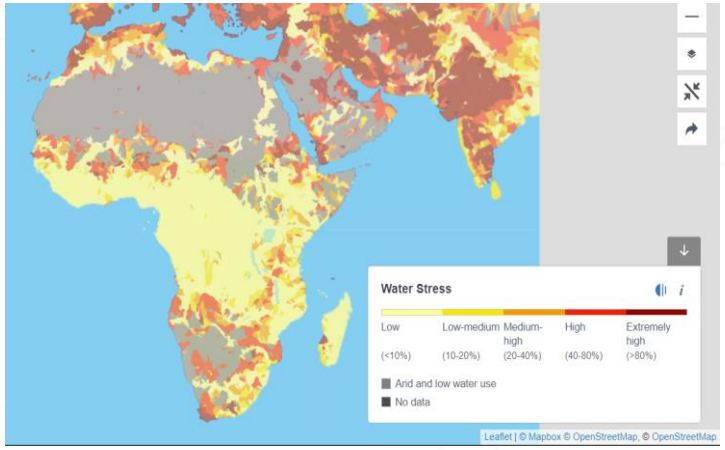
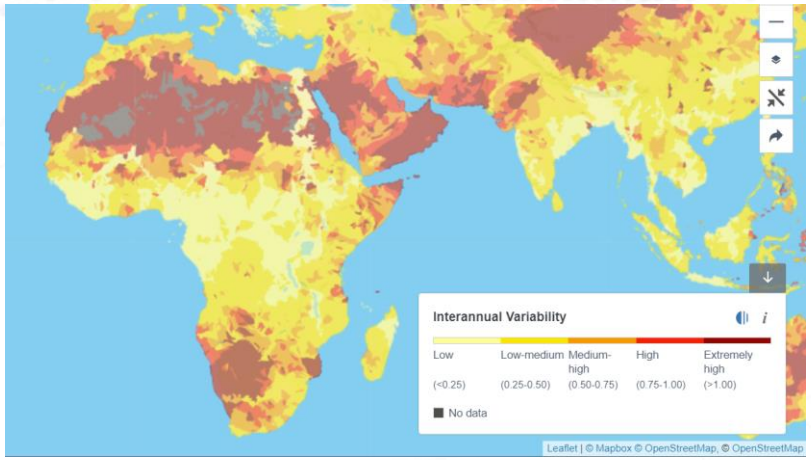
1. Water-risks with Aqueduct

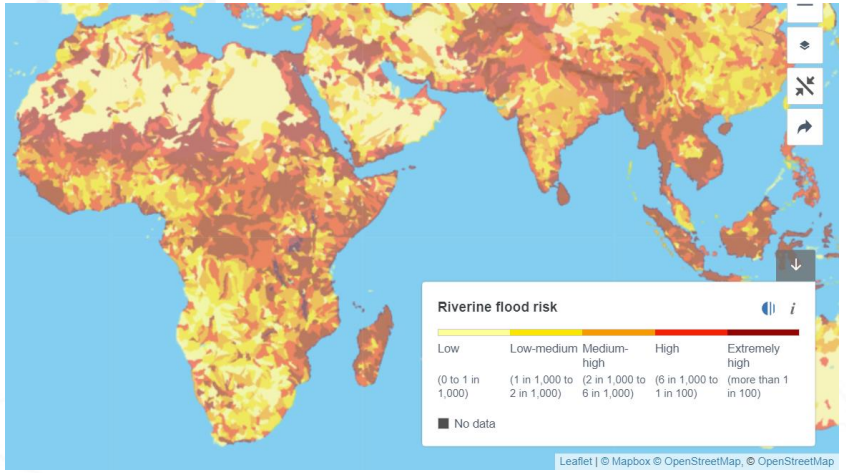












https://www.wri.org/aqueduct/

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A focus on socioeconomic impacts

- Extreme and high-impact weather events affect agriculture and food security, water resources, population displacement, health, and transportation.
- Hunger and malnourishment is increasing.
- East Africa, in particular Ethiopia, Somalia, and Kenya, faced an exceptionally long drought as a result of three consecutive below-average rainy seasons since 2020.
- Water-related climate impacts are delaying and hindering progress on the continent in achieving economic prosperity (SDGs 1, 8, and 11), eradicating poverty and hunger (SDGs 1 and 2), and ensuring healthy lives (SDGs 2, 3, and 6).

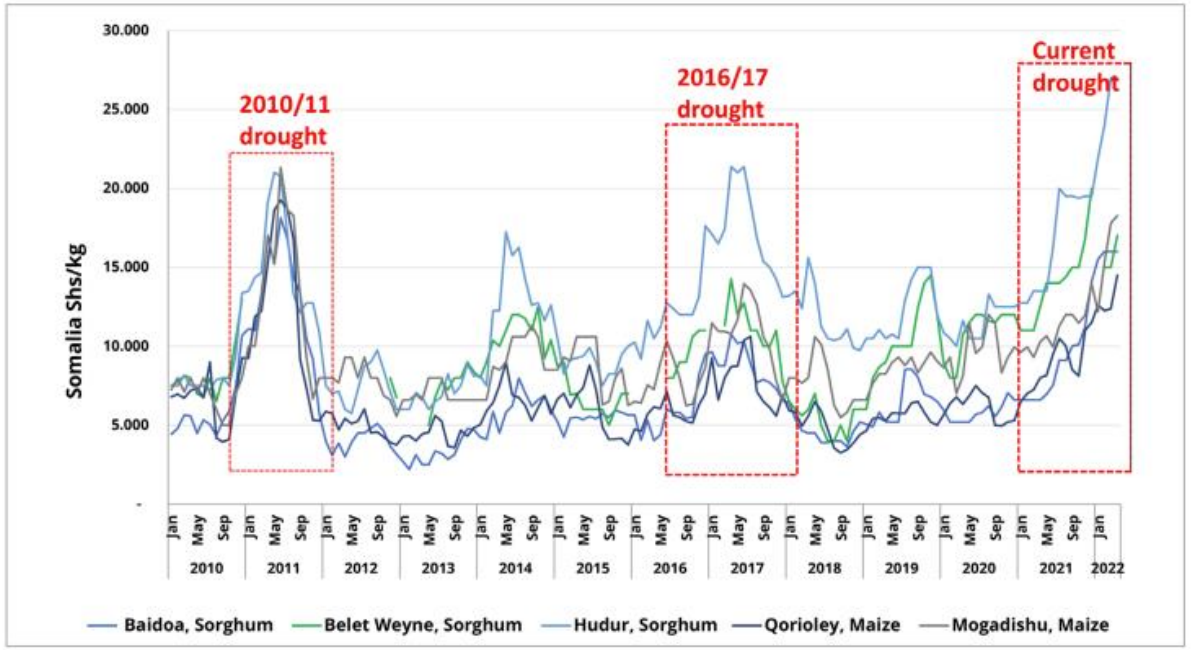

Figure 22. Time series of sorghum and maize prices in Somali shilling (the official currency for Somali) per kg for selected markets in Somalia (Baidoa, Qorioley, Belet Weyne, Hudur, and Mogadishu) from January 2010 to January 2022.
Source: World Food Programme (WFP)

State of the Climate in Africa 2021
https://library.wmo.int/doc_num.php?explnum_id=11304

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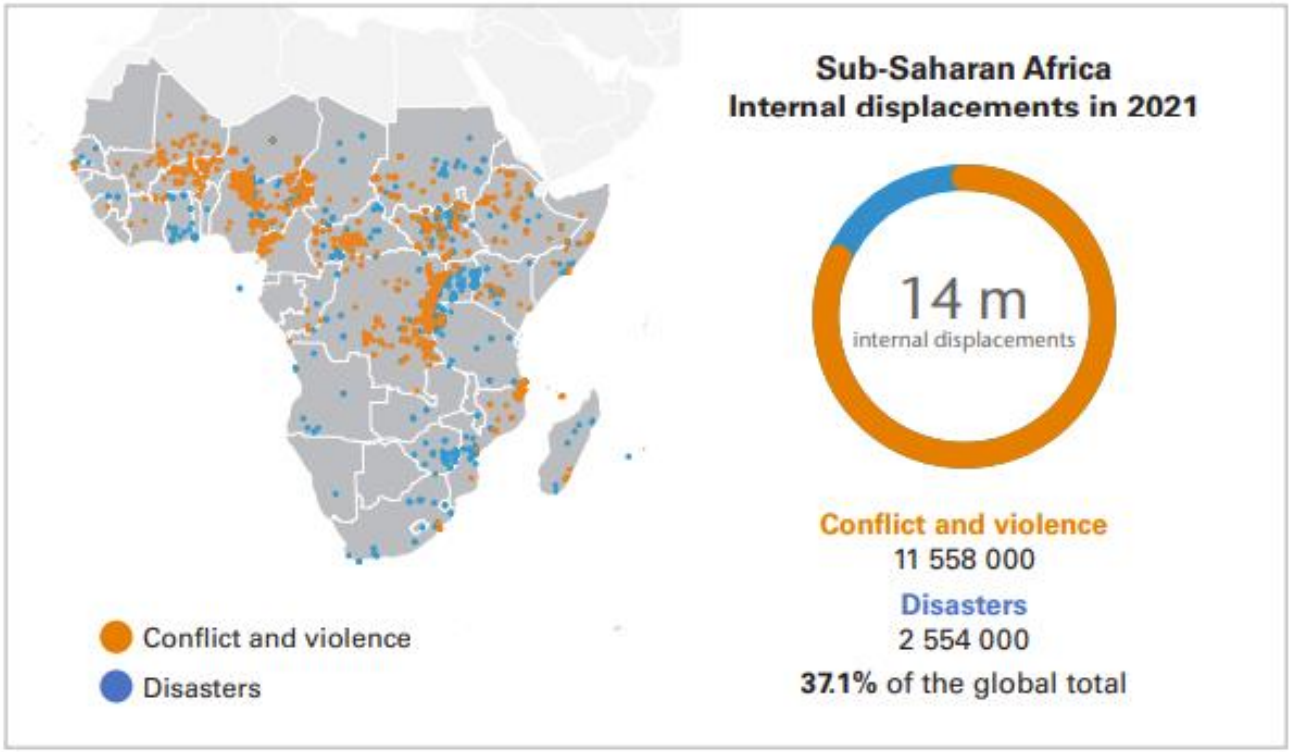
A focus on displacement

- Drivers of displacement are complex and multi-faceted, and climate change is one of many interacting risk factors.
- Chronic floods and droughts, sea-level rise, and extreme weather events are all major drivers that influence displacement patterns within borders and across international borders.
- High water stress is estimated to affect about 250 million people in Africa.
- Climate-induced migration is likely to increase population density, create overcrowded areas, and contribute to the growth of informal settlements.
- These factors escalate the risk of tensions and intercommunal conflicts.



State of the Climate in Africa 2021
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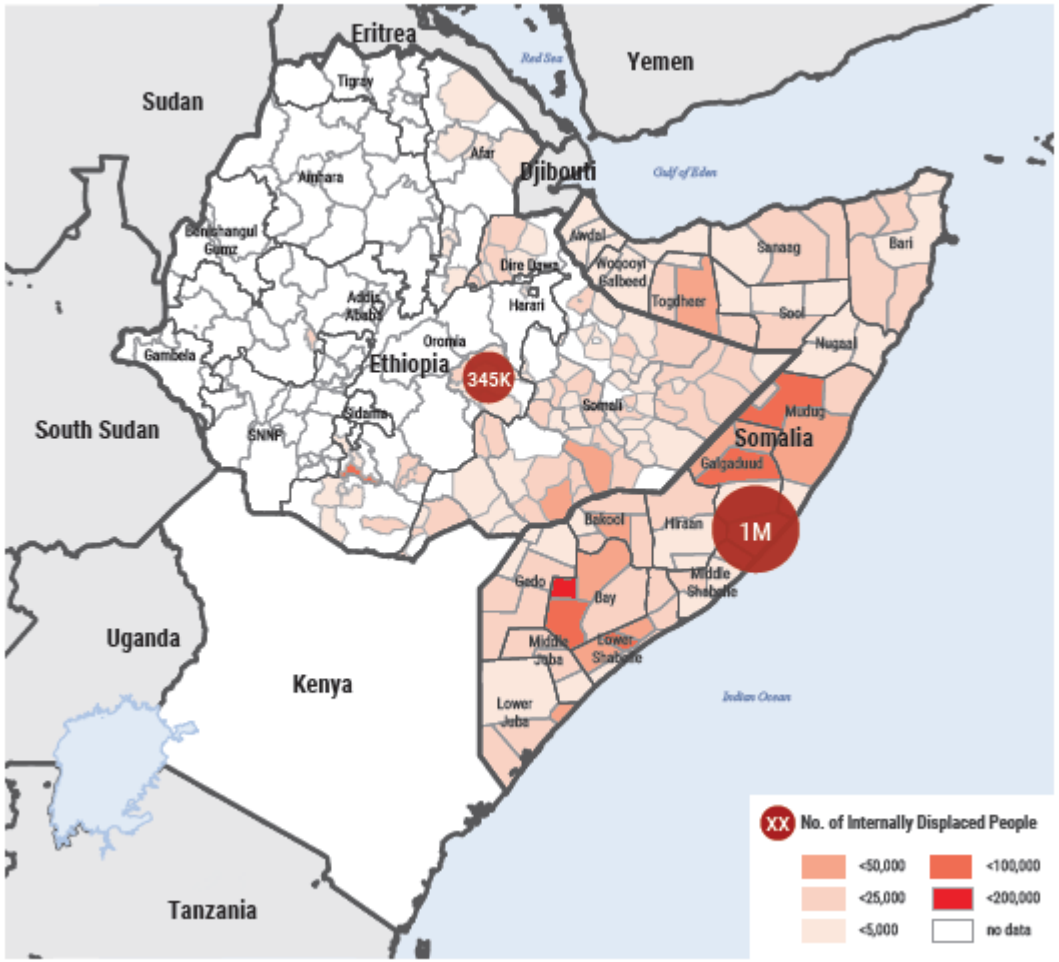
A focus of displacement in the Horn of Africa

- Since January 2021, over 1 million people in Somalia have been displaced
- In Ethiopia, over 345,000 people were forced from their homes between October 2021 and June 2022 due to the worsening drought, especially in Somali Region (175,000) and Southern Oromia (163,000).
- In the ASAL region of Kenya, resource-based and inter-communal tensions and conflict are rising, and migration to cities is increasing in search of new livelihoods and assistance.

Drought Induced Internal Displacement



Horn of Africa Drought: Regional Humanitarian Overview & Call to Action
https://reliefweb.int/report/ethiopia/horn-africa-drought-regional-humanitarian-overview-call-action-revised-21-september-2022

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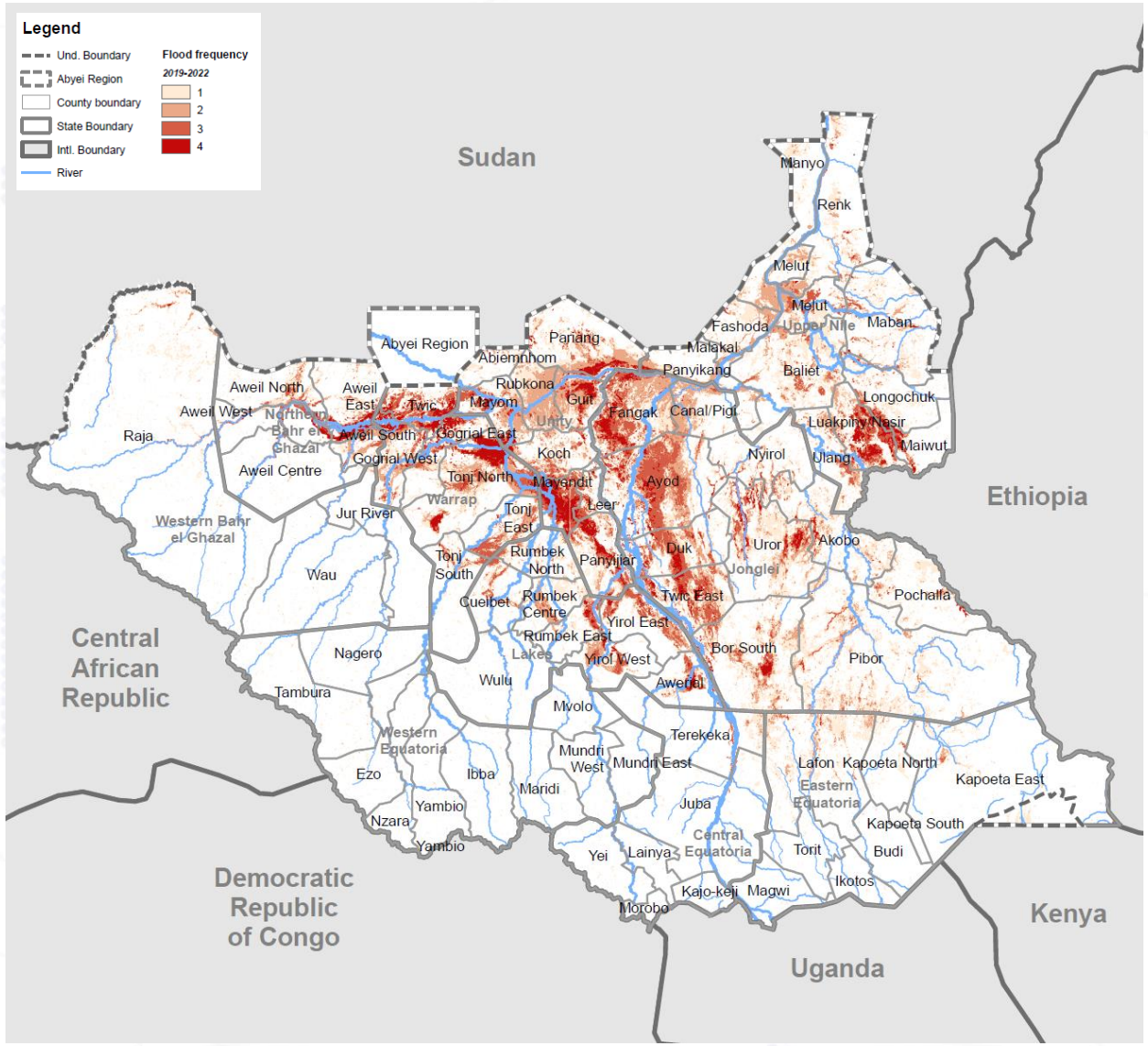
IOM in South Sudan

- Two third of the country were affected by flood since 2019-2022. Jonglei, Unity, Upper Nile, Northern Bahr el Ghazal, Lakes and Warrap States are the most affected states.
- Over 1 million people affected by flood and displaced over 400,000.
- During the dry season, the Equatorian area suffered from drought that seriously impacted the season crop production.



Flood extents map (2019-2022)

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IOM in South Sudan

- It is essential to invest more in disaster risk reduction (DRR), adaptation, and climate resilience, including supporting the implementation of the Sendai Framework for Disaster Risk Reduction and the Global Compact on Migration (GCM).
- Flood Risks Mitigation projects being implemented in South Sudan to achieve the following outcome:

1. **Strengthened Knowledge Base Engagement**
   - Increased availability of robust research and studies available for stakeholders
   - Strengthened engagement and ownership of communities, government and partners through consultative process
   - Strengthened knowledge management through engagement of academia and degree programs offered in DRR
2. **Strengthen CBDRM and Early Warning**
   - Establishment of Payam and County Disaster Risk Management Committees (DRMCs)
   - Policy and advocacy efforts strengthened at the National, State and County levels
   - Communities and local land authorities capacitated to equitably and transparently resolve land and property-related disputes
3. **Enhanced Flood Management Initiative**
   - Internal resilience to storm water (local rainfall) and sheet flow (inland rainfall)
   - Strengthened capacities for Nile river water level monitoring and gathering upstream rainfall data
   - Urban spatial planning integrated for sustainable development
   - Strengthened ecosystem-based climate-smart livelihoods assets building, flood mitigation infrastructures, environment protection toward building community resilience

Flooding in Bentiu

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Thank you
for your attention

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An overview of key water-related risks in Africa

South Sudan Crisis Response Plan 2022
https://crisisresponse.iom.int/response/south-sudan-crisis-response-plan-2022

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