



AFRICAN CENTRE OF METEOROLOGICAL APPLICATIONS FOR DEVELOPMENT (ACMAD)

<https://acmad.org/>

ACMAD's role in AMHEWS as the Continental Multi-Hazard Advisory Centre

DECEMBER 06, 2023, 6:15 PM, DUBAI- UAE, WMO PAVILION AT COP 28

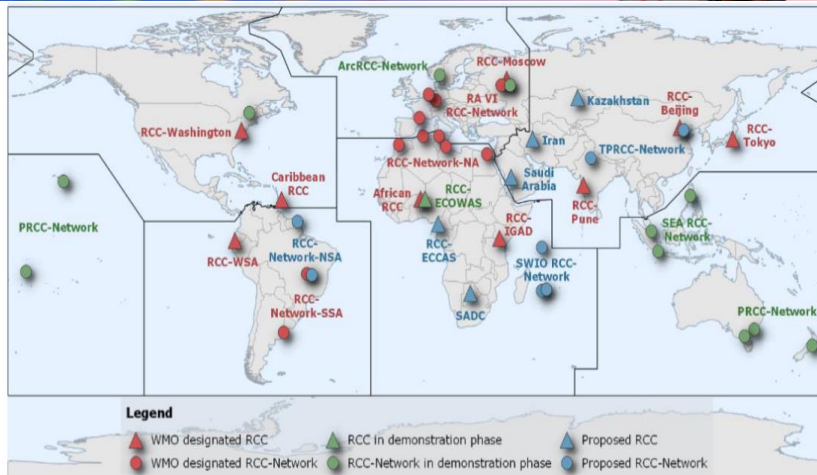
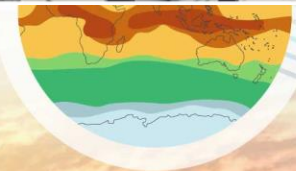


Figure 5: Established Regional Climate Centres (WMO, 2022)



An initiative of the Organisation of African, Caribbean and Pacific States funded by the European Union

OUTLINE



I

CONTEXT AND EARLY WARNING VALUE CHAIN

II

**FLOODS ADVISORIES AND WATCHES ,
DISASTER SITUATION REPORTS**

III

LESSONS LEARNT and WAY FORWARD

© U.S. Navy, NGA, GEBCO
and/or Copernicus

BRIEF ON ACMAD MISSION



Created through resolution 540 of the UNECA Conference of Ministers in April 1985 **following the droughts of the 70s and 80s , ACMAD is established in Niamey-Niger since October 1992**

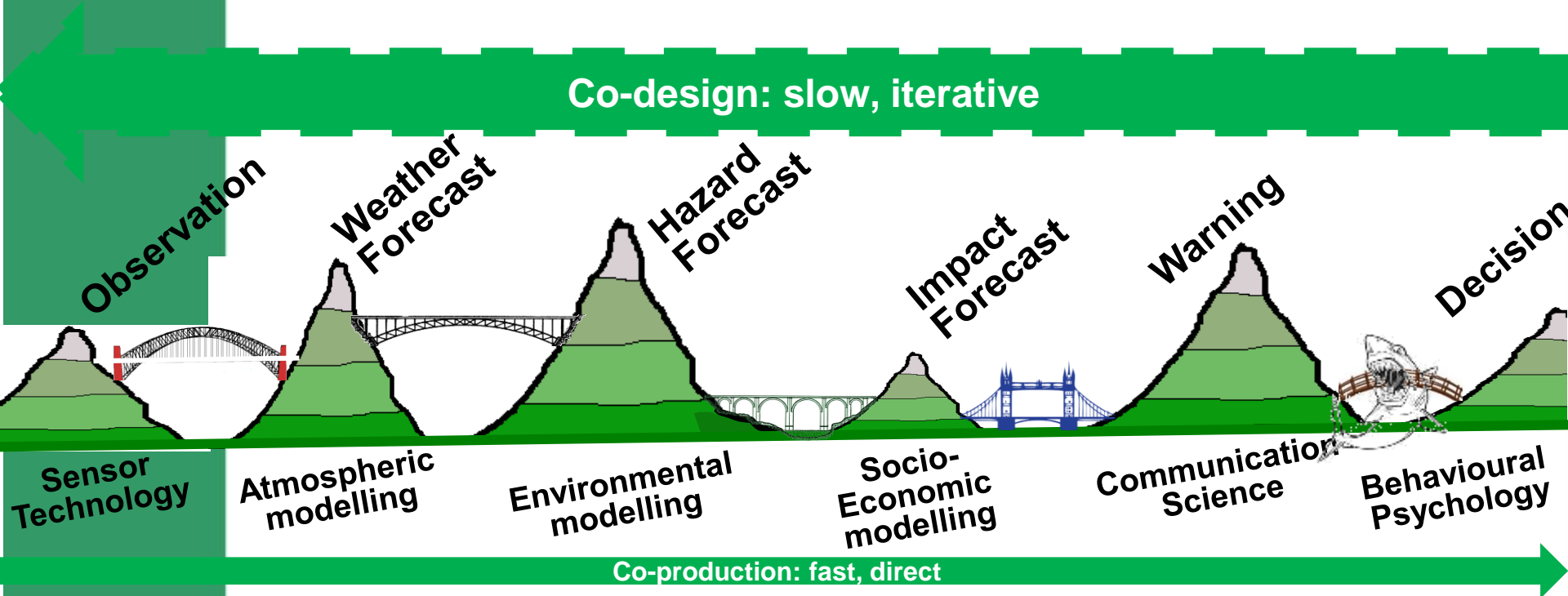
Continental Weather and Climate Watch Centre for Africa **with Monitoring, forecasting and early warning for droughts, floods, tropical cyclones and other extreme events as functions .**

ACMAD is a WMO designated RCC since Congress in May 2015 and a Continental MultiHazards Advisory Centre since October 2022

Institution of excellence for the Applications of meteorology for sustainable development **with capacity building, methods, tools and products development, contribution to global weather and climate programs, promotion of database , research and innovation as functions**



Where is AMHEWAS on the warning value chain?
We will how the value chain performed with Somali floods, Cyclone FREDDY and storm Daniel in Libya

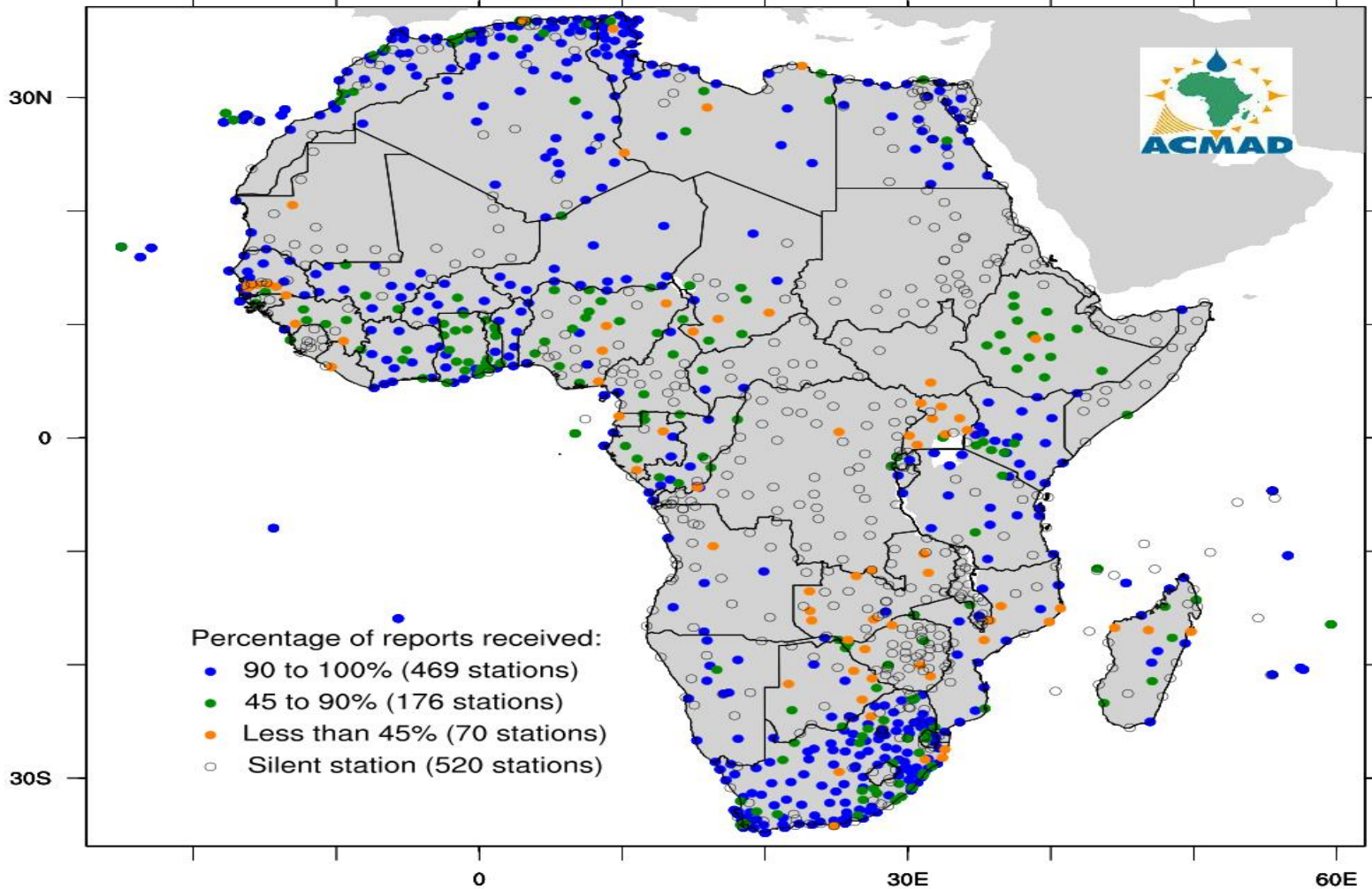


Bridges represent necessary Partnership
Mountains are needed expertise to operate warnings



STATUS OBF BASIC SURFACE OBSERVATIONS FOR GLOBAL
NUMERICAL WEATHER PREDICTION . NETWORK IS QUITE INSUFFICIENT TO DETEC
CITY SCALE FLOODS

Monthly monitoring of SYNOP reports for June-2023



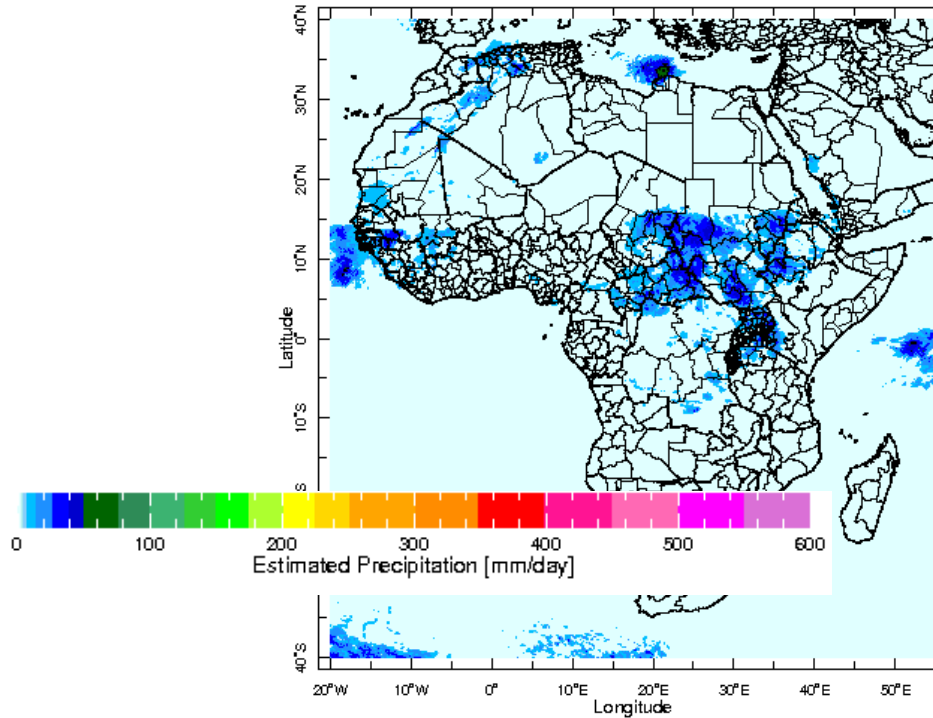
Continental daily extreme rainfall monitoring Services CASE OF STORM DANIEL

STORM DANIEL AND EXTREME RAINFALL IN THE MEDITERANEAN REGION

MORE THAN 10 thousands reported missing by Libyan Red Cross,

Satellite underestimated rainfall

Investments in GBON is essential for EW4All



10 Sep 2023



ACMAD vigilance products a few days ahead FOR STORM DANIEL

1- Libya's National Meteorological Centre said the storm peaked in north-eastern Libya on 10 September, 2023 with **strong winds** of 70 - 80 km/h.

2- Impacts: Communications interruption, the fall of electricity towers and trees (**from disaster situation reports**).

3- Torrential rains of between 150 - 240 mm caused **flash floods** in several cities, including Al-Bayda, which recorded 414.1 mm (from 10 Sep 8am to 11 Sep 8am, a new rainfall record).



MULTI-HAZARD OUTLOOK

Validity: 2023-09-10

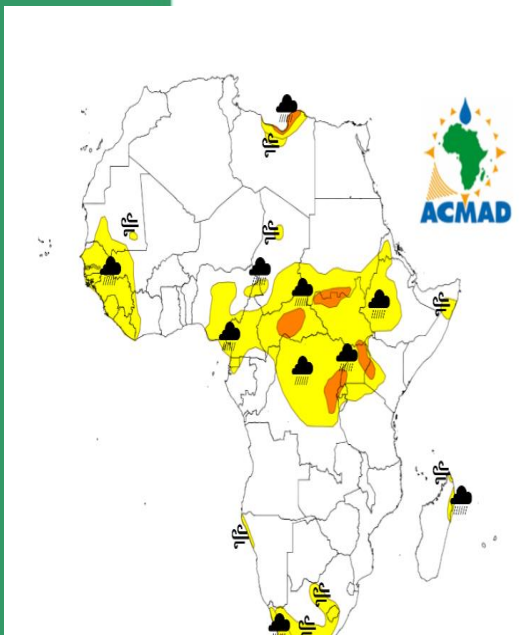
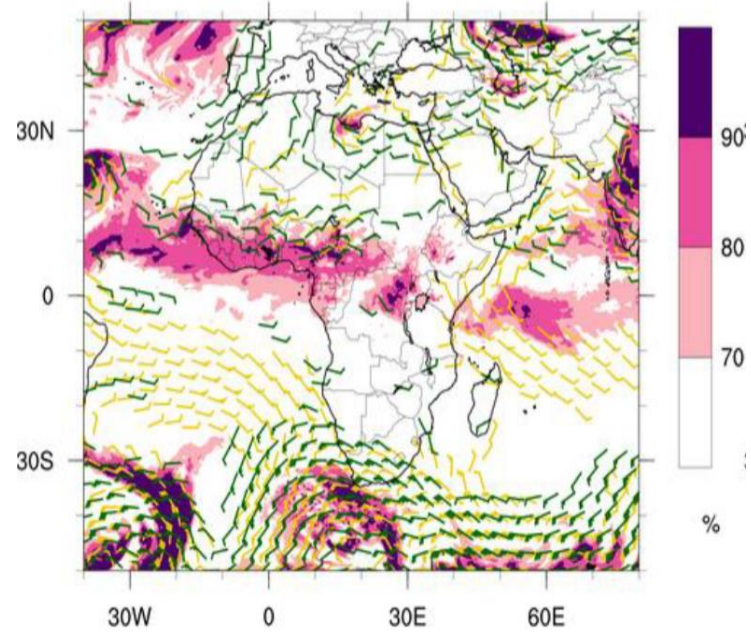
issued on 2023-09-07

| Rain | Wind | Dust | Meningitis |
|-----------------------|-------------------------------------|---------------------------------------|-------------|
| Very heavy >100mm | Very strong >80kmh ⁻¹ | Very heavy >1000µg m ⁻³ | Very likely |
| Heavy 50-100mm | Strong >65kmh ⁻¹ | Heavy >600µg m ⁻³ | Likely |
| Moderate 10 - 49mm | Moderate >50kmh ⁻¹ | Moderate >400µg m ⁻³ | Less likely |
| Light 1 - 10mm | Light <50kmh ⁻¹ | Light <200µg m ⁻³ | |

Wind (925 and 700 hPa), RH (Integrated in 925-600hPa layer)

Init Date: 20230907-00UTC

Valid: 20230910-12UTC

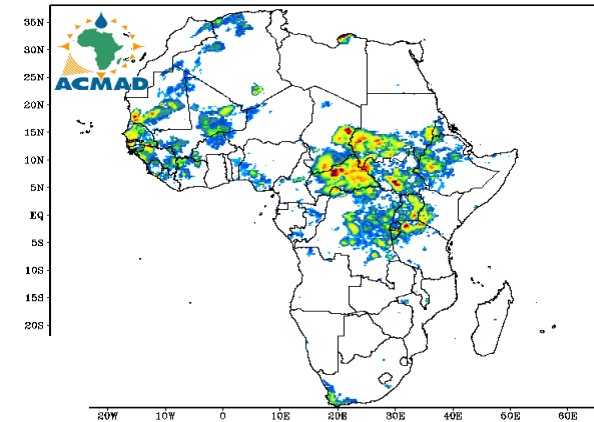




HEAVY RAINS AND STRONG WINDS 3 days AHEAD ASSOCIATED WITH **STORM DANIEL** (THE DEADLIEST MEDITERANEAN CYCLONE) SEPT 2023)

HIGH RESOLUTION OBSERVING NETWORK AND Km SCALE FORECASTING SYSTEMS, IMPACT OUTLOOK, RISK ANALYSIS, BESPOKE WARNING, ANTICIPATORY DECISIONS AND ACTIONS WERE MISSING AND ARE CHALLENGES AHEAD

1-day accumulated precipitation [mm] on 10-09-2023
(data source: GSMAP JAXA Realtime Rainfall)

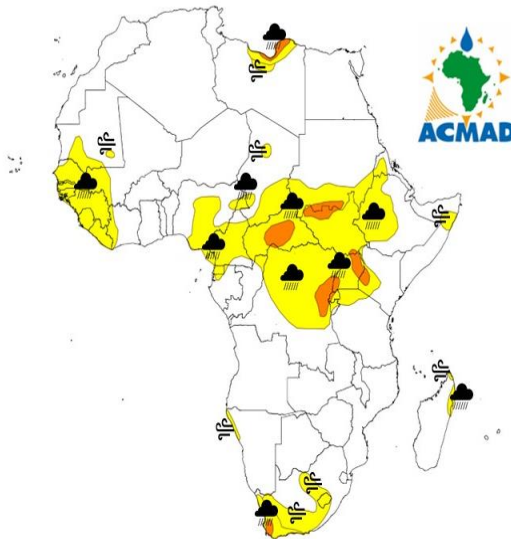


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| Light 1 - 10mm | Light <50kmh ⁻¹ | Light <200µg m ⁻³ | |





OPERATIONAL SERVICE CO-DESIGNED AND CO-DEVELOPED WITH UNHCR AND WMO COORDINATION, Heavy rains related to storm Daniel expected days ahead Little information on expected impacts and risk, anticipatory action preventing implementation of risk reduction measures

WMO Coordination Mechanism (WCM)



WCM Regional HydroMet Weekly Scan | Sudan

Issued on 07 September 2023 12:00 UTC, Validity: 08 September - 14 September 2023

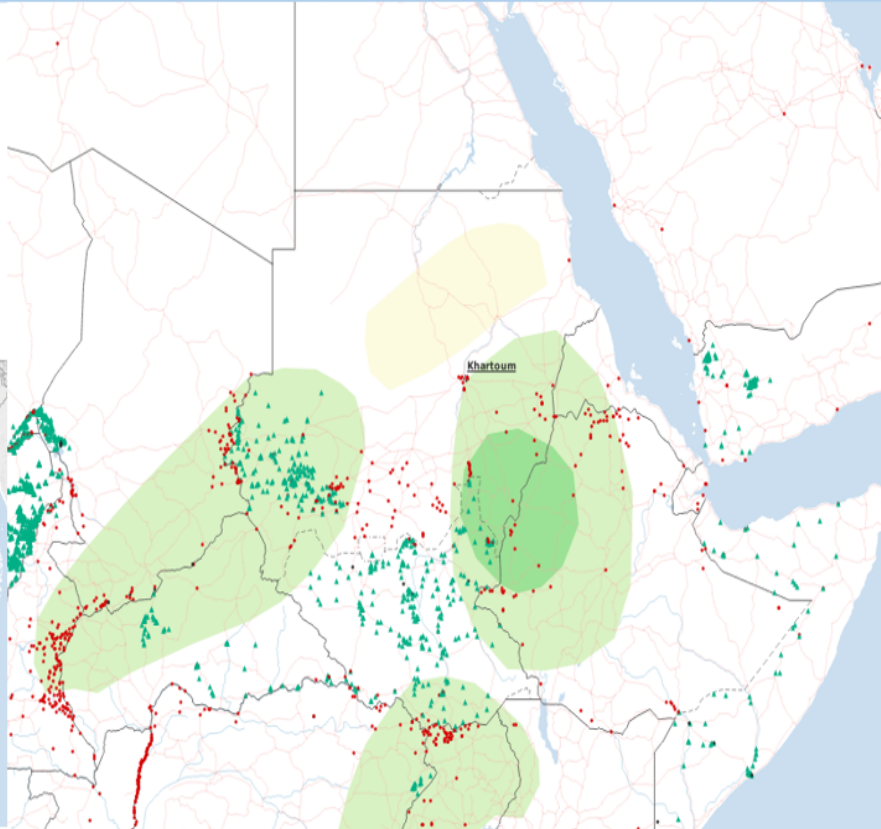
Considered hydromet events: DROUGHT, HEAT WAVE, COLD WAVE, LANDSLIDES, HEAVY RAIN, FLOODS, FLASH FLOODS, STORM, STORM SURGE, TORNADO, VIOLENT WIND, TROPICAL CYCLONE. Legend: Past track, Forecast track, Cone of uncertainty. Icons: UNOCHA

Current situation and possible evolution

Possibility of **well above average** rainfall is very likely for next 7 days (08 to 14 September 2023) over south-eastern Sudan, north-eastern South Sudan, and western Ethiopia, while **above average** rainfall is expected over western Sudan as well as eastern Sudan.

Possibility of **below average** is expected over central and north-eastern Sudan.

Moderate to severe heat wave conditions are likely to persist for 3 days consecutive ($\geq 45^{\circ}\text{C}$) more with varied severity over most of **north-eastern Sudan**, which will **increased likelihood** of heat illness symptoms in people who are either exposed to sun for a prolonged period or doing outside heavy work.



On-going or Potential impacted areas over the next 7 days. No guarantee is provided about these areas (completeness, geographical extent, etc.). Source: Human expertise.

UNHCR: Locations of forcibly displaced persons. Legend: IDPs (green triangle), Refugees (red circle), Asylum-seeker, Returnee (black circle).

ACMAD: Precipitation outlook for the upcoming week. Legend: Well Above Average (dark green), Above Average (light green), Average (white), Below Average (yellow), Well Below Average (orange).

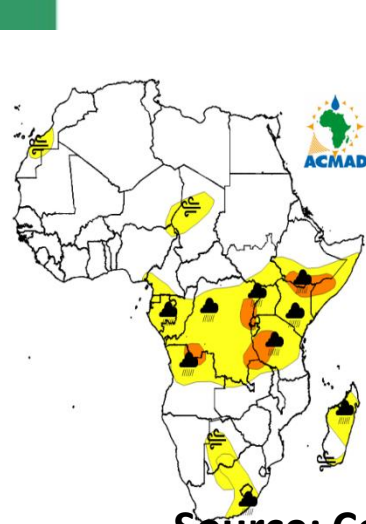
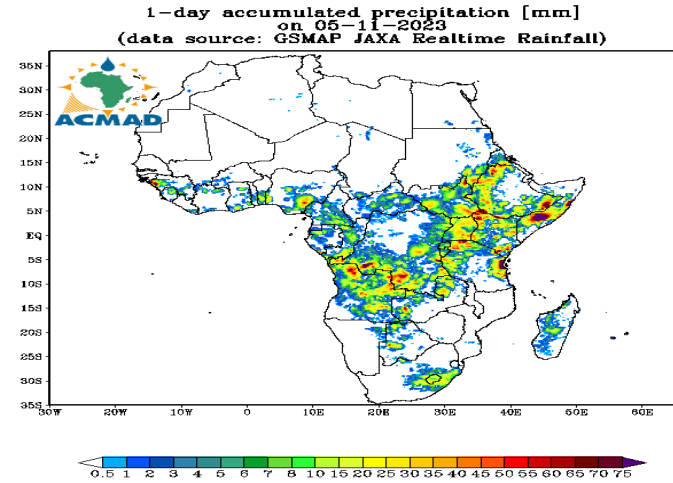
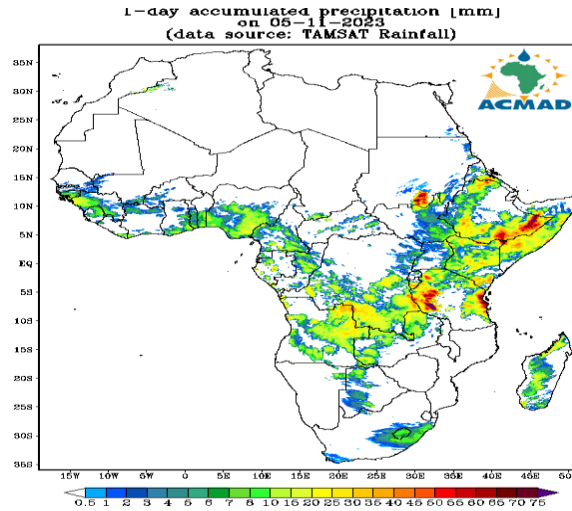
Sources: ^(a)NMHSs, ^(b)WMO, ^(c)ECMWF, ^(d)ACMAD, ^(e)UNHCR, ^(f)NaturalEarth

With contribution from ACMAD

Disclaimer: This product highlights HydroMet events which may be of interest to humanitarian agencies. WMO makes no warranty in respect of the correctness or completeness of this information, nor does this information represent the official view of WMO. This information does not replace the advice and guidance provided by the official meteorological services for these regions. For official national guidance please refer to the national hydromet and disaster management agencies. The designations employed in this map are in conformity with United Nations practice. The presentation of material therein does not imply the expression of any opinion whatsoever on the part of WMO concerning the legal status of any country, area or territory or of its authorities, or concerning the delimitation of its borders. The depiction and use of boundaries, geographic names and related data are not warranted to be error free nor do they necessarily imply official endorsement or acceptance by WMO.

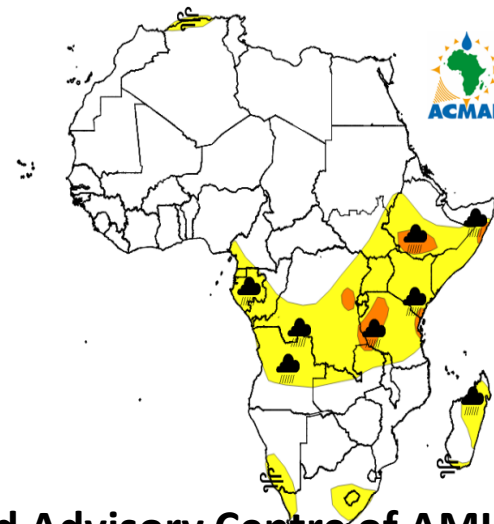


Advisories 3 to 4 days ahead of **recent Somali floods**. Moving along the value chain to impact outlook, warnings, anticipatory decision and action implementation is still a challenge. Ad hoc briefings with DRR and humanitarian actors is a requirement to operationalize DRR platforms



MULTI-HAZARD OUTLOOK
Validity: 2023-11-06
issued on 2023-11-02

| Rain | Wind | Dust | Meningitis |
|-----------------------|-------------------------------------|---------------------------------------|-------------|
| Very heavy >100mm | Very strong >80kmh ⁻¹ | Very heavy >1000µg m ⁻³ | Very likely |
| Heavy 50-100mm | Strong >65kmh ⁻¹ | Heavy >600µg m ⁻³ | Likely |
| Moderate 10 - 49mm | Moderate >50kmh ⁻¹ | Moderate >400µg m ⁻³ | Less likely |
| Light 1 - 10mm | Light <50kmh ⁻¹ | Light <200µg m ⁻³ | |



MULTI-HAZARD OUTLOOK
Validity: 2023-11-05
issued on 2023-11-02

| Rain | Wind | Dust | Meningitis |
|-----------------------|-------------------------------------|---------------------------------------|-------------|
| Very heavy >100mm | Very strong >80kmh ⁻¹ | Very heavy >1000µg m ⁻³ | Very likely |
| Heavy 50-100mm | Strong >65kmh ⁻¹ | Heavy >600µg m ⁻³ | Likely |
| Moderate 10 - 49mm | Moderate >50kmh ⁻¹ | Moderate >400µg m ⁻³ | Less likely |
| Light 1 - 10mm | Light <50kmh ⁻¹ | Light <200µg m ⁻³ | |

Source: Continental Multi Hazard Advisory Centre of AMHEWAS at ACMAD



OPERATIONAL SERVICE CO-DESIGNED AND CO-DEVELOPED WITH UNHCR AND WMO COORDINATION FOR THE RECENT SOMALI FLOODS, some exposure with refugees or displaced people camps

WMO Coordination Mechanism (WCM)



WCM Global HydroMet Weekly Scan for UNHCR

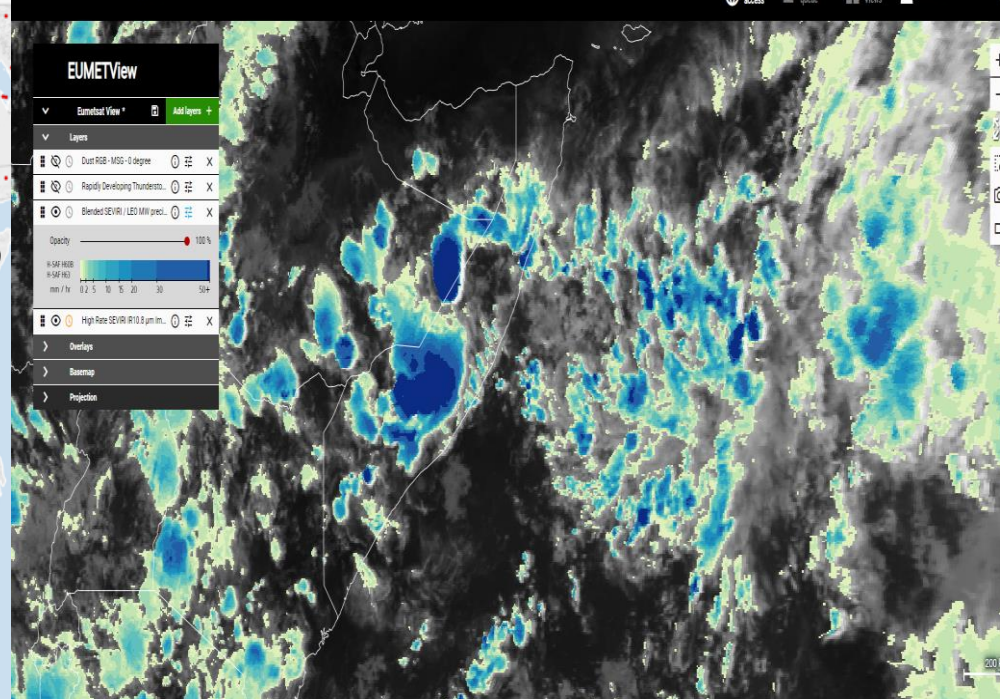
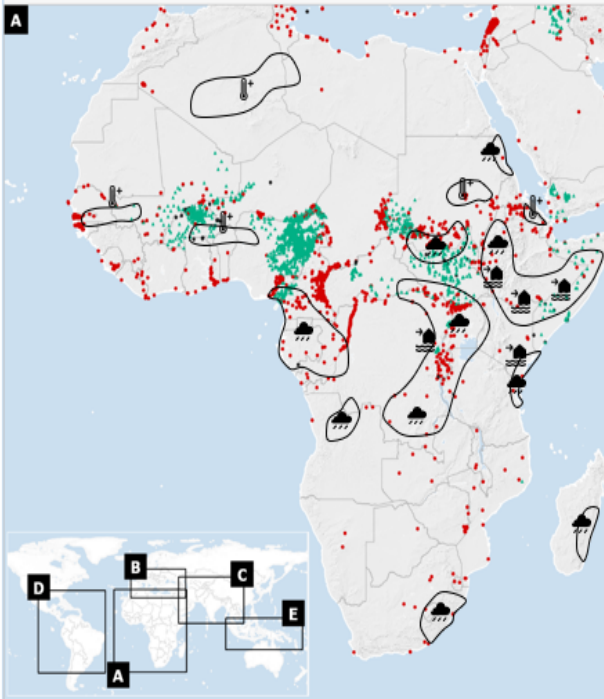
Issued on 02 November 2023 12:00 UTC, Validity: 03 November – 09 November 2023

Considered hydromet events: DROUGHT, HEAT WAVE, COLD WAVE, SNOWFALL, SNOW AVALANCHE, LANDSLIDES, HEAVY RAIN, FLOODS, FLASH FLOODS, STORM, STORM SURGE, TORNADO, VIOLENT WIND, TROPICAL CYCLONE

UNHCR Locations of forcibly displaced persons: ▲ IDP, ● Refugee, ● Asylum

EUMETSAT DATA SERVICES

API access, Download queue, My Views, Login



HYDROMET SIGNIFICANT EVENTS: ON-GOING (with new potential impact) & POTENTIALLY UPCOMING

A In the next 7 days (03 November to 09 November), **Very Heavy rainfall greater than 150mm** is expected over most of eastern Africa and central Africa such as S. Ethiopia, N. Somalia, S. Cameroon, Equatorial Guinea, Gabon, Congo and N. Angola, E. D.R.C, N. Kenya; there is a high chance of flooding over E. D.R.C, S. Ethiopia, N. Somalia, and N. Kenya. **Heavy to moderate** rainfall is expected over S. Congo, W. D.R.C, S-E South Africa, Burundi, Rwanda, W. Tanzania, Uganda, South Sudan, S-E. C.A.R., N. Angola, and E. Madagascar, while **light rainfall** is expected over S. Sudan, N. South Sudan, and E. Sudan. Hot conditions with persistence for 3 days consecutive ($\geq 45^{\circ}\text{C}$), are expected in the next 7 days over E. Senegal, S. Mali, S-E. Burkina Faso and N-W. Nigeria, C. Algeria, E. Sudan, and N-E Ethiopia.

- C** < Text - contribution Area C - Max 5 lines>
- D** < Text - contribution Area D - Max 3 lines>
- E** < Text - contribution Area E - Max 2 lines>

Sources: ^(A)NMHS, ^(B)WMO, ^(C)UNHCR, ^(D)BSMC/TCWCs, ^(E)ECMWF, ^(F)NaturalEarth.

With contribution from ACMAD, BMKG, DWD, MeteoSwiss

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Vigilance Services from The Continental Multi hazard Advisory Centre days ahead of the half a billion \$ of damages Cyclone FREDDY. Impact outlook (not quantified) and proposed anticipatory actions provided with low resolution. no effective operational and better coordinated resources mobilization mechanisms



VIGILANCE MAP AND POLICY BRIEF FOR HEAVY RAINFALL AND STRONG WINDS

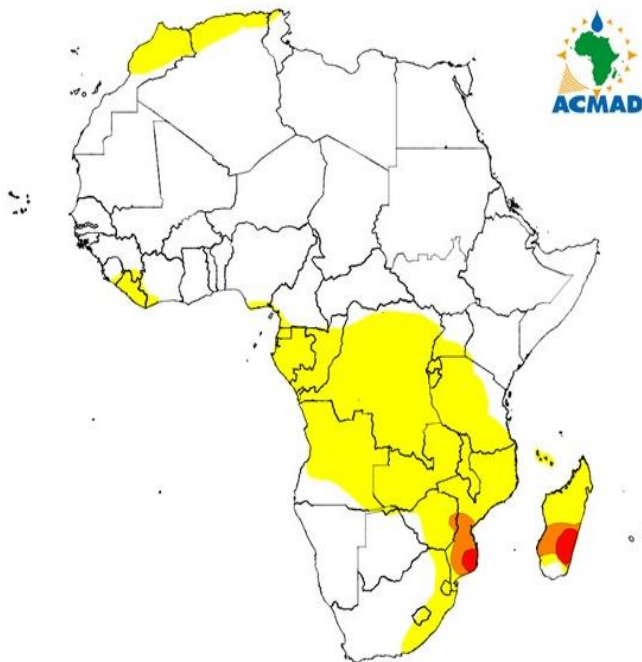
Valid From February 21 to 25, 2023

Issued on February 20, 2023



HIGHLIGHT: Tropical Cyclone FREDDY is expected to landfall along the south-eastern coast of Madagascar on Tuesday night , 21st February and will generate extreme heavy rainfall and strong wind, it is expected to reach the coast of Mozambique on Thursday 24th February 2023.

Heavy rainfall is expected in Mozambique, Zimbabwe and Madagascar



| Phenomenon | Hazard | Potentials Impacts | DRM Measures / Advices |
|---|---|---|--|
| In next 5 days accumulated rainfall (50-100mm) is likely, | Moderate rainfall, flash flood, riverine flooding, landslides, soil erosion and lightning likely | Displacements of people due to floods, outbreak of water borne diseases, damage of infrastructures (roads, bridges, ...) | DRM authorities to keep informed about the development of the meteorological situation and raise awareness, taking action is more likely, the situation needs to be monitored closely with NHMS |
| In next 5 days accumulated rainfall (100 – 150mm) is very likely, | Heavy rainfall, flash flood, riverine flooding, landslides, soil erosion and lightning, strong winds, | Displacements of people due to floods, outbreak of water borne diseases, damage of infrastructures (roads, bridges, ...) | Update Flood contingency plans, Improve water management in reservoirs and dams, DRM authorities be ready to take adequate actions, DRM to be continuously in touch with NHMS to be informed of the detailed expected meteorological conditions. |
| In next 5 days accumulated rainfall (>150mm) is very likely, | Extreme heavy precipitation, flash flood, riverine flooding, landslides, soil erosion and lightning, strong winds, severe thunderstorms | Loss of lives, Injuries, Displacements of people due to floods, outbreak of water borne diseases, damage of infrastructures (roads, bridges, ...) | Madagascar and Mozambique's Civil Protection service and DRM authorities to activate Tropical Cyclone contingency plan for disaster preparedness and emergency response (awareness, assistance to victims, search & rescue operations), and be in close touch with NHMS for further accuracy at the national. |

Disclaimer: The presentation of country boundaries on the map does not imply any opinion whatsoever on the part of ACMAD concerning the legal status of any country, territory or area, or concerning the delimitation of frontiers or boundaries.

IMPACT BASED FORECAST-ACTIONABLE INDICATORS

ACMAD-UNOCHA West and Central Africa office



CONTINENTAL
BRIEF FOR POLICY AND DECISION MAKERS BASED ON
SIGNIFICANT WEATHER AND CLIMATE EVENTS UPDATE.
VALID FOR: JULY TO OCTOBER 2022

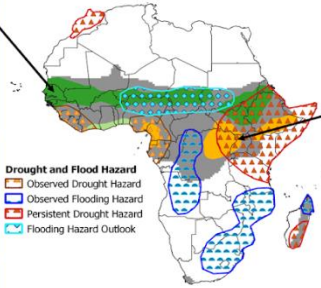


CLIMATE ANOMALIES
Wetter than average season very likely
Heavy rainfall with reported flooding events

HAZARDS
Heavy rainfall events may lead to flash flood, riverine flooding, landslides and soil erosion. High chance of lightning, hail formation and stormy weather are expected

POTENTIAL IMPACTS
Waterlogging, pest and diseases infestation, Outbreak of water borne diseases damage to infrastructures(dams, reservoirs, bridges, roads...) Displacement of people due to floods.

MEASURES
Select excess moisture tolerant crops, wide tree planting campaigns Develop new and rehabilitate the existing drainage structure, Update and implement flood contingency plans improve water management in reservoirs and dams



CLIMATE ANOMALIES
Drier than average season very likely
Prolonged drought with reported persistent impacts

HAZARDS
Weak to Moderate drought, dry spells, near average to late onset very likely.

POTENTIAL IMPACTS
Moisture stress, decreased river discharge, reduced rain-fed crop yield prospect, degradation of pastures and high food prices.

MEASURES
Develop and implement policy to support drought tolerant and short cycle crops, soil and water conservation practice, maximize full irrigation farming. Use watershed based in-situ water harvesting structures Develop and implement policy in support of weather based insurance and dam management



WEST AND CENTRAL AFRICA Flooding Situation: Hotspot Countries

As of 9 September 2022

OUTLOOK

Countries with the highest risks of floodings based on the rainfall forecast for July to October 2022 include Chad, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea Bissau, Mali, Niger, Nigeria, Senegal, and Sierra Leone. Hotspot countries have a significant number of people residing in areas with high flood exposure and are thus expected to receive "normal to above average rainfall" or "above average rainfall" during the 2022 rainy season^{1,2}.

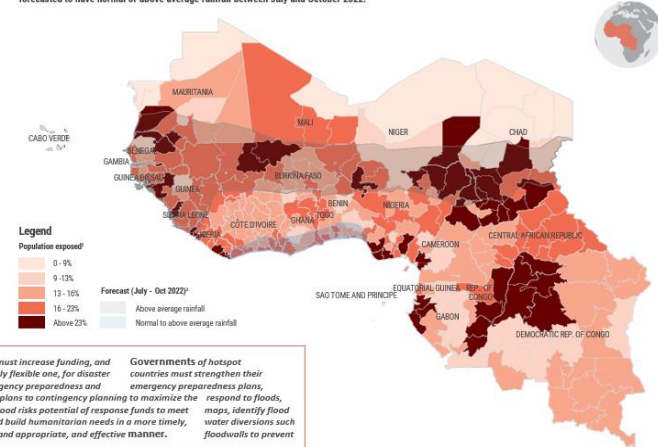
In 2021, hotspot countries included Chad, Niger, Nigeria, The Gambia, and Guinea, with floods killing 172 persons, affecting 820,000, and displacing 311,000.

¹ Analysis was carried out by OCHA

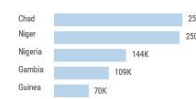
² Flood risk exposure map was created by World Bank (https://www.researchgate.net/publication/341407592/figure/fig/1/figure-fig1/1517222002724)

³ Forecast was done by according to African Centre of Meteorological Application for Development (ACMAD)

Percentage of populations exposed to high flood risks overlaid with regions forecasted to have normal or above average rainfall between July and October 2022.



Countries most affected by floods between July and October 2021



Humanitarian and development organizations must develop and implement contingency preparedness plans as these are critical to mitigate the risk of humanitarian impact of floods in "at-risk" countries.

Donors must increase funding, and particularly flexible one, for disaster and emergency preparedness and contingency planning to maximize the response to floods, develop flood risks potential of response funds to meet maps, identify flood zones, and build humanitarian needs in a more timely, and appropriate, and effective manner.

Governments of hotspot countries must strengthen their emergency preparedness plans, maximize the response to floods, maps, identify flood zones, and build humanitarian needs in a more timely, and appropriate, and effective manner.



1,567
People killed

4,401
People injured

517k
Houses destroyed

1.6M
Affected fields

8.5M
People affected

3.2M
People displaced

GLOBAL FIGURES IN 2022

| Country | People affected | People displaced |
|--------------------------|-----------------|------------------|
| Nigeria | 4.5M | 2.4M |
| Chad | 1.5M | 281k |
| RDC | 946k | 300k |
| Congo | 327k | 23k |
| Niger | 317k | 65k |
| Cameroon | 120k | 25k |
| Central African Republic | 85k | 1k |
| Liberia | 79k | 1k |
| Mali | 75k | 1k |
| Mauritania | 54k | 36k |
| Gambia | 53k | 7k |
| Guinea | 48k | 35k |
| Senegal | 25k | 8k |
| Togo | 19k | 6k |
| Côte d'Ivoire | 17k | 3k |
| Sierra Leone | 16k | 9k |
| Burkina Faso | 13k | 13k |
| Ghana | 15k | - |
| São Tomé-and-Príncipe | 350 | - |

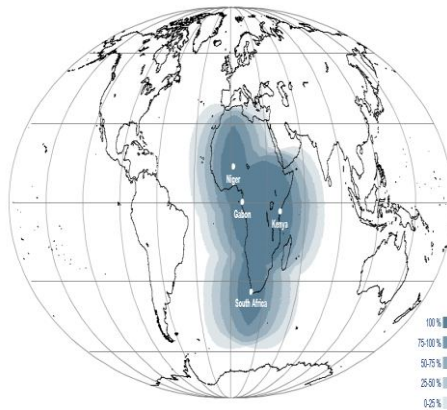
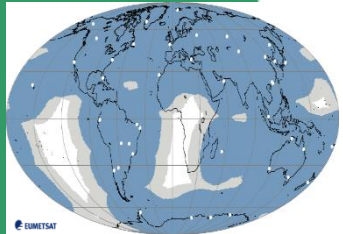


ACMAD SUPPORT PROVISION OF LEO DATA FOR ASSIMILATION IN HIGH RESOLUTION REGIONAL AND GLOBAL NWP

4 Regional Advanced Retransmission System for low earth orbiting satellite data contributing to implementation of **WMO and Africa space strategies and programmes**, RARS data may unlock source of **predictability in global and limited area models**

Contribute to research and development of Satellite Applications products for detecting, **tracking and forecasting severe thunderstorms**

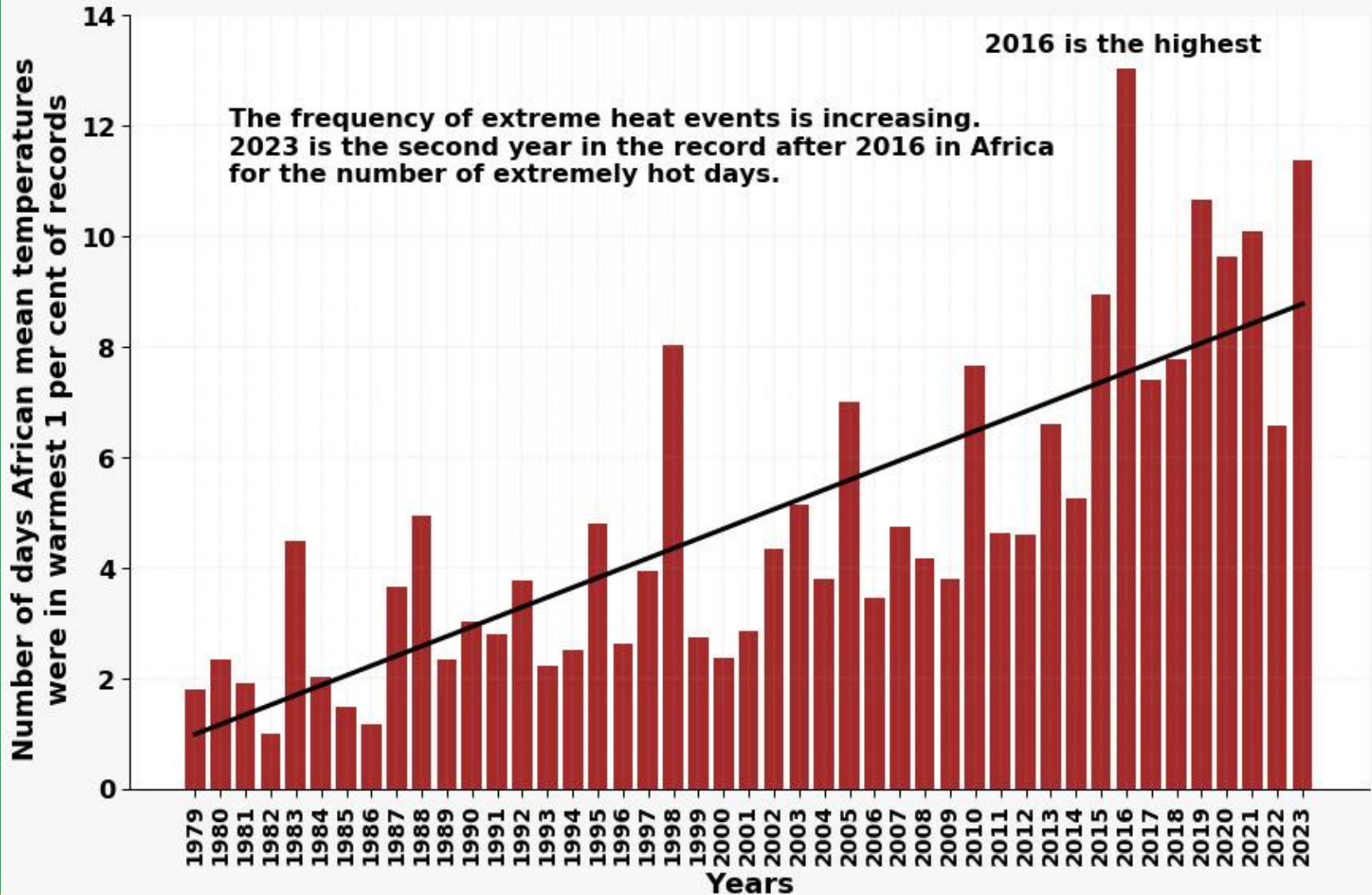
Upcoming **AMSAF** is key for country level and local precise warnings to trigger evacuation and protection of exposed assets



OUTPUT OF ABOUT 5 Million Euros AfDB Funded resilience building project



EXTREME TEMPERATURES AND HEAT WAVES SHOULD BE A PRIORITY FOR AFRICA MULTHAZARDS EARLY WARNING AND ACTION SYSTEM.



CHALLENGES AND OPPORTUNITIES



1. *Limited expertise to cover all types of Hazards (e.g land and mud slides) in different sectors (e.g Health, agriculture, infrastructure)*
2. *Address the huge capacity and capability gaps (e.g establishing and operating situation rooms to generate and share information on hazards, impacts, preparation, anticipatory actions and response)*
3. *Assessment and management of compounding and cascading disasters*
4. *Prioritize training and operation of impact forecasting, warning, decision making and action as well as benefits assessments*
5. *Build on achievements of past projects including SAWIDRA for modernizing national warnings*
6. *Useful Predictability up to five days ahead for heavy rain events , tropical cyclones and storm tracks, disruptions on the start of season and spells*
7. *Assessment and management of Compounding and cascading disasters*



LESSONS LEARNT AND WAY FORWARD

- 1. Routine exchange of local impact data between communities, national, regional and continental stakeholders to accelerate impact forecasting and improve the production of the State of Climate for Africa supporting African Climate Negotiators on Loss and damage***
- 2. Operate the MultiHazards Advosiy Centre (staff including research and studies, internet, indirect costs \$200 to 300 thousands) considering that Observation, data management , research, modelling and prediction/forecasting are funded components***
- 3. Capacity development with testbed and forecast demonstrations, ad hoc and regular briefings and debriefings at the situation room including with humanitarian and DRR communities***
- 4. Partner with ClimSA, AMSAF, HYDROMET For coordination***
 - Train forecasters and DRR experts on tools and products***
 - Support countries establish and operate national early warning Information system/centres***



THANK YOU