AFRICAN CENTRE OF METEOROLOGICAL APPLICATIONS FOR DEVELOPMENT (ACMAD)

https://acmad.org/

IMPROVING WARNING SYSTEMS AND ADATATION MEASURES IN WEST AFRICA

SEPTEMBER 28, 2023

HYBRID EVENT HOSTED BY WASCAL PROGRAMME IN THE UNIVERSITY OF LOME TOGO

IMPLEMENTATION OF THE CONTINENTAL MULTIHAZARD ADVISORY CENTRE AT ACMAD : ACHIEVEMENTS, CHALLENGES AND LESSONS LEARNT

Prepared by: ACMAD Team

Presented by : Andre KAMGA FOAMOUHOUE / DG

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

BRIEF ON ACMAD MISSION AND VISION

- Created trough 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 to act as:

- 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

VISION: an Africa where all people benefit from world class operational continental meteorological Centre to become more resilient to extremes and able to reduced CC impacts

OUTLINE

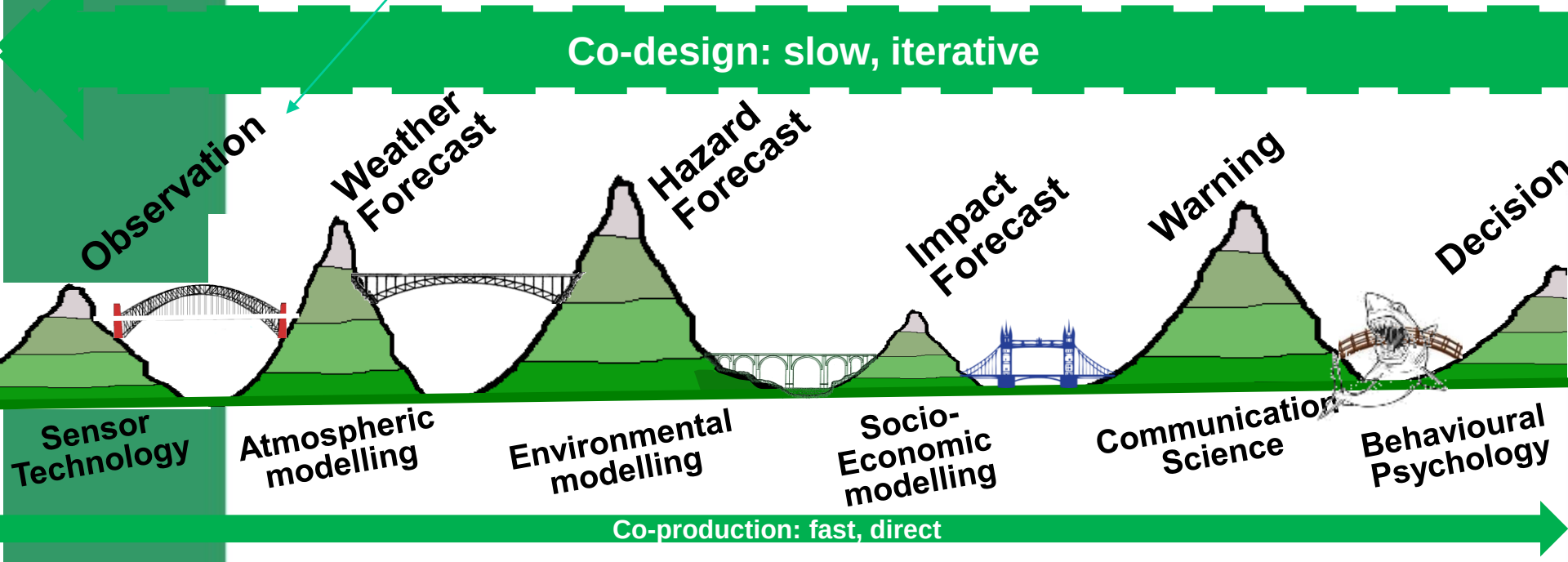
I CONTEXT AND PROGRESS

II *CHALLENGES AND OPPORTUNITIES*

III *LESSONS LEARNT and WAY FORWARD*

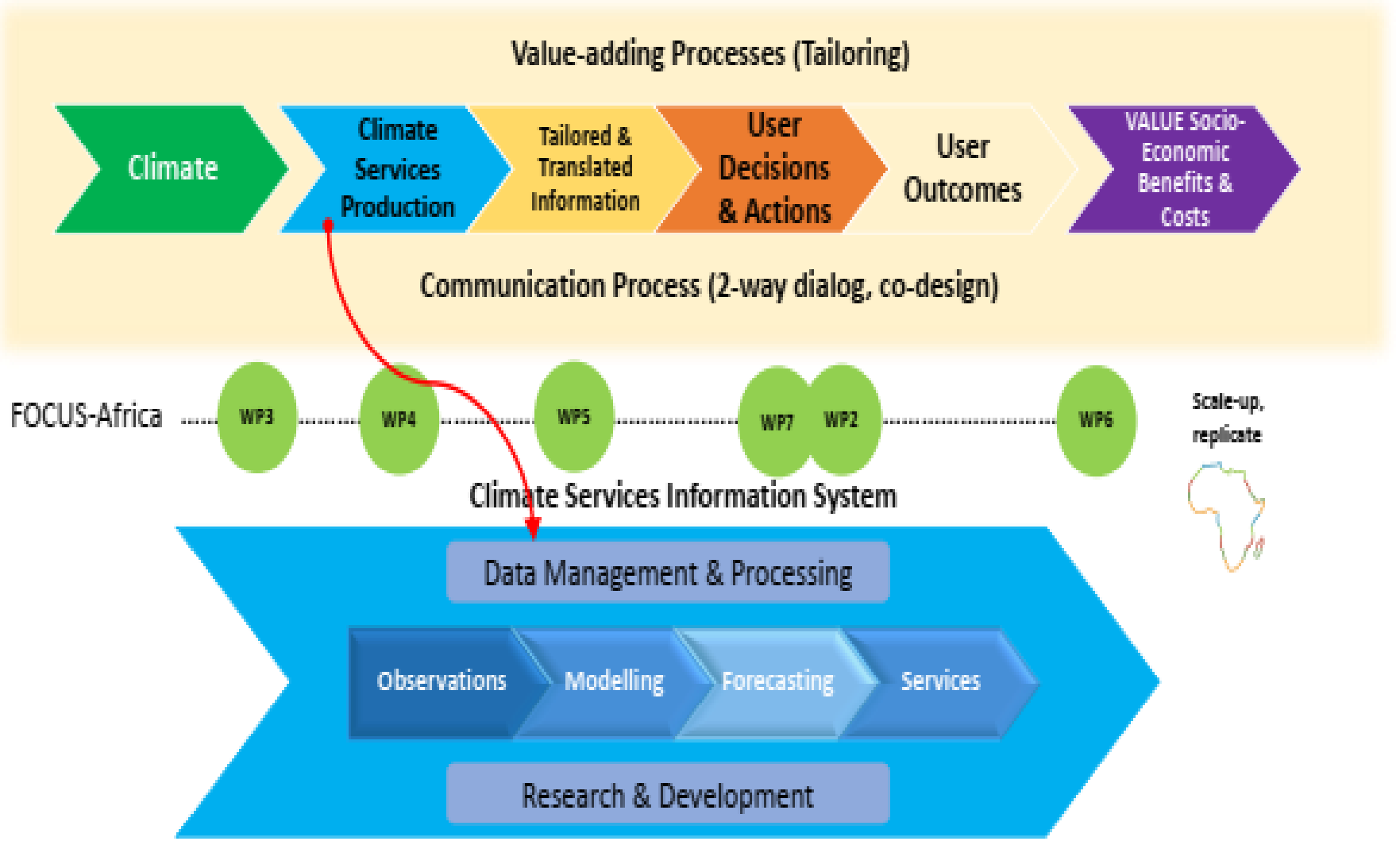
Along the warning value chain

Synoptic Network to rehabilitate- Urgent for local thresholding

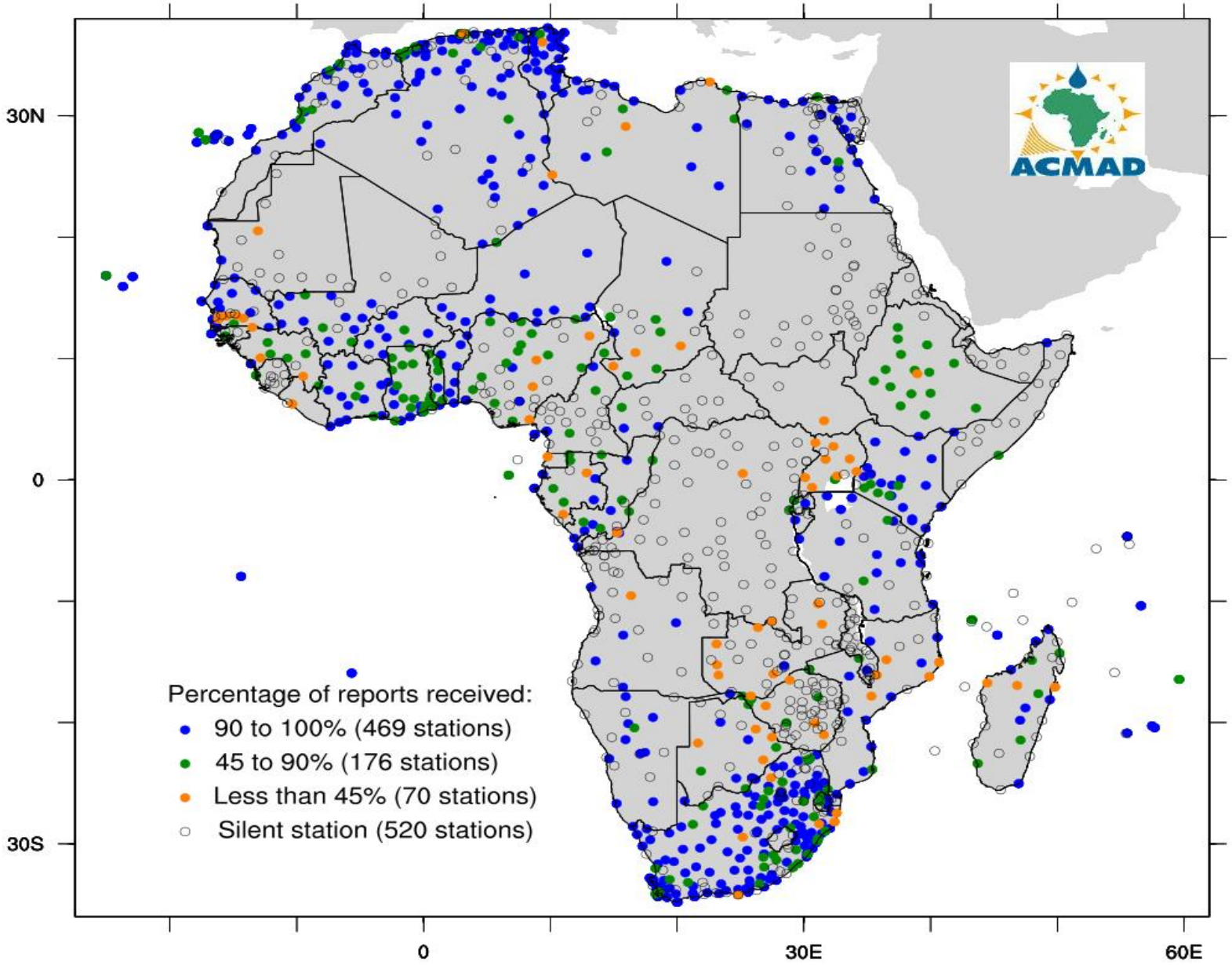


Bridges represent necessary Partnership
Mountains are needed expertise to operate warnings

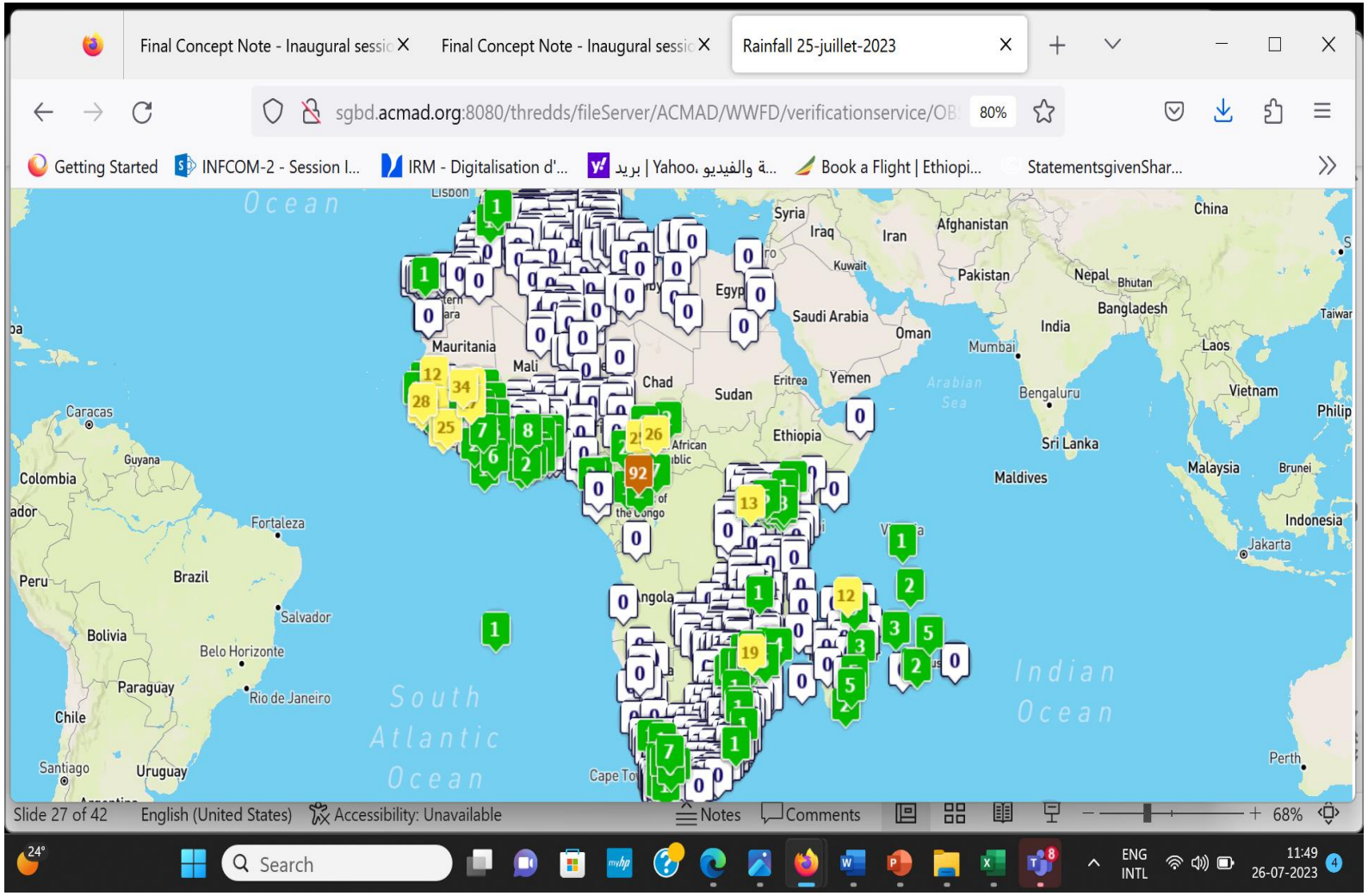
Climate Services: The Value Chain



Monthly monitoring of SYNOP reports for June-2023



Stations used for continental analyses and forecasts, for regional forecasts regional networks are required and even higher number of stations for downscaling at national level to detect local phenomena with impacts limited in communities



CONTEXT

- ✓ ***Provide hazards , impact ,warning, decision/action, benefits and costs information;***
- ✓ ***facilitate its use to raise awareness of stakeholders on threats and impacts through situation rooms and other platforms (GCEAO, UIPs,…);***
- ✓ ***build capacity to act ;***
- ✓ ***measure benefits of actions Using disaster managers platforms to prepare sustainability***

Weather and Climate Services Requirements for early warning

- **Hazards intensity, frequency, location including locations for impacts analyses and assessment, risk profiling, resilience and adaptation planning (support Risk Knowledge)**

- **Hazards observations, monitoring, understanding and modeling, prediction, forecasting**

- **Hazards and impacts outlooks, advisories, vigilance, watches and warnings for communication, emergency preparation, anticipatory action and response**

- **Risk Communication, Anticipatory Action planning and implementation**

IMPACT BASED INFORMATION (from Bulletin of the American Meteorological Society) – THIS IS WHAT WE WANT IN THE MEDIUM TO LONG TERM SUBSTANTILAL INVESTMENT IN RESAERCH IS A PRIORITY

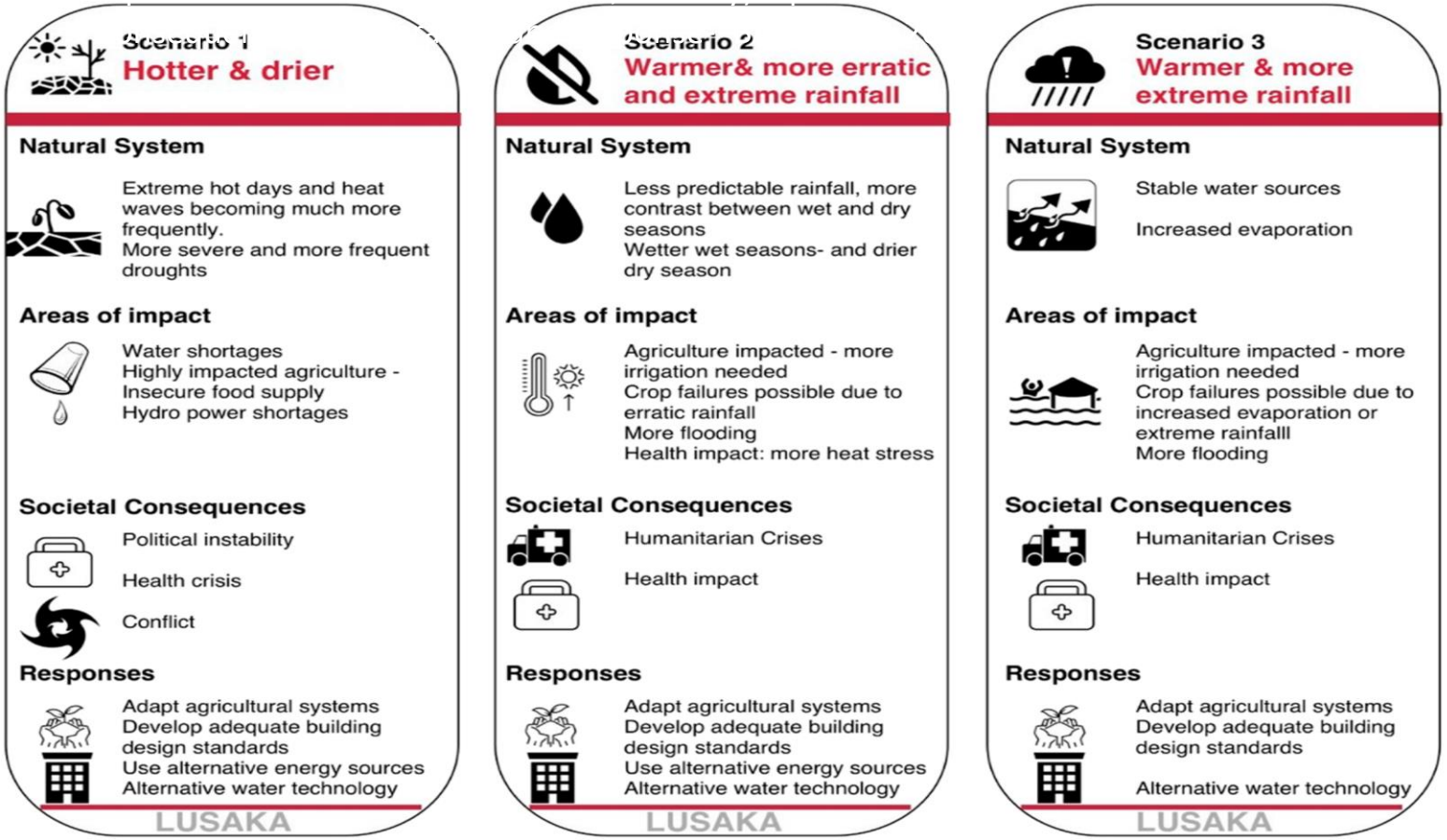


Fig. 5. Infographic summarizing three plausible future climate scenarios for Lusaka along with some key impacts, possible societal consequences, and responses.

We shall provide weather, climate data, information, Knowledge, understanding
Ensure that information is used to make decisions and act to reduce negative impacts and exploit opportunities

Principles and success measures

Ensure that all stakeholders are *aware* of threats and mitigation actions

Measure of success: evidence that fewer surprises occur, or fewer poor decisions are made due to inadequate information.

Make society *aware* of our science

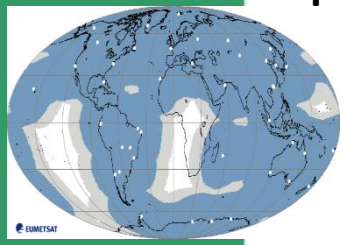
Measure of success: evidence that capacity building and training include various groups in society. Increase the number of public engagement events. Conduct successful citizen science initiatives

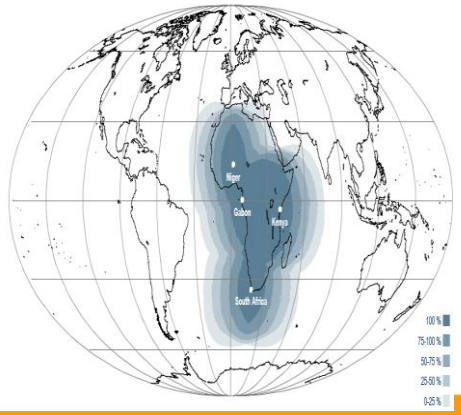
1. *. Measure of success: workshops designed with scientists, forecasters and decision makers to raise awareness on new tools and provide training to make their work more effective.*

Ensure that stakeholders are *aware* of each other's work for coordination:
Measure of success: projects or initiatives started/continued with partners

ACMAD SUPPORT PROVISION OF LEO DATA FOR ASSIMILATION IN HIGHJ 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 *tracking convection, MCS, strong winds, heavy rain rates, severe lightening and dust storms, very low visibility, air pollution, detecting severe thunderstorms***
- **AMSAF is key for country level and local warnings to trigger evacuation and protection of exposed assets**



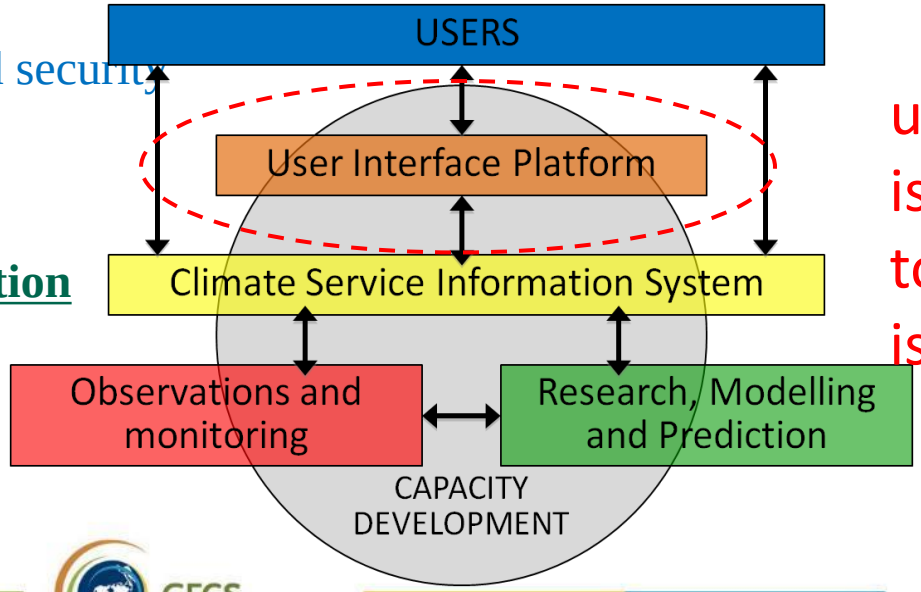


Global Framework for Climate Services (GFCS)

Vision: enable society to manage better the risks and opportunities arising from climate variability and change, using science-based climate information

Priority areas:

- Agriculture and food security
- Water management
- Health
- **Disaster risk reduction**
- Energy

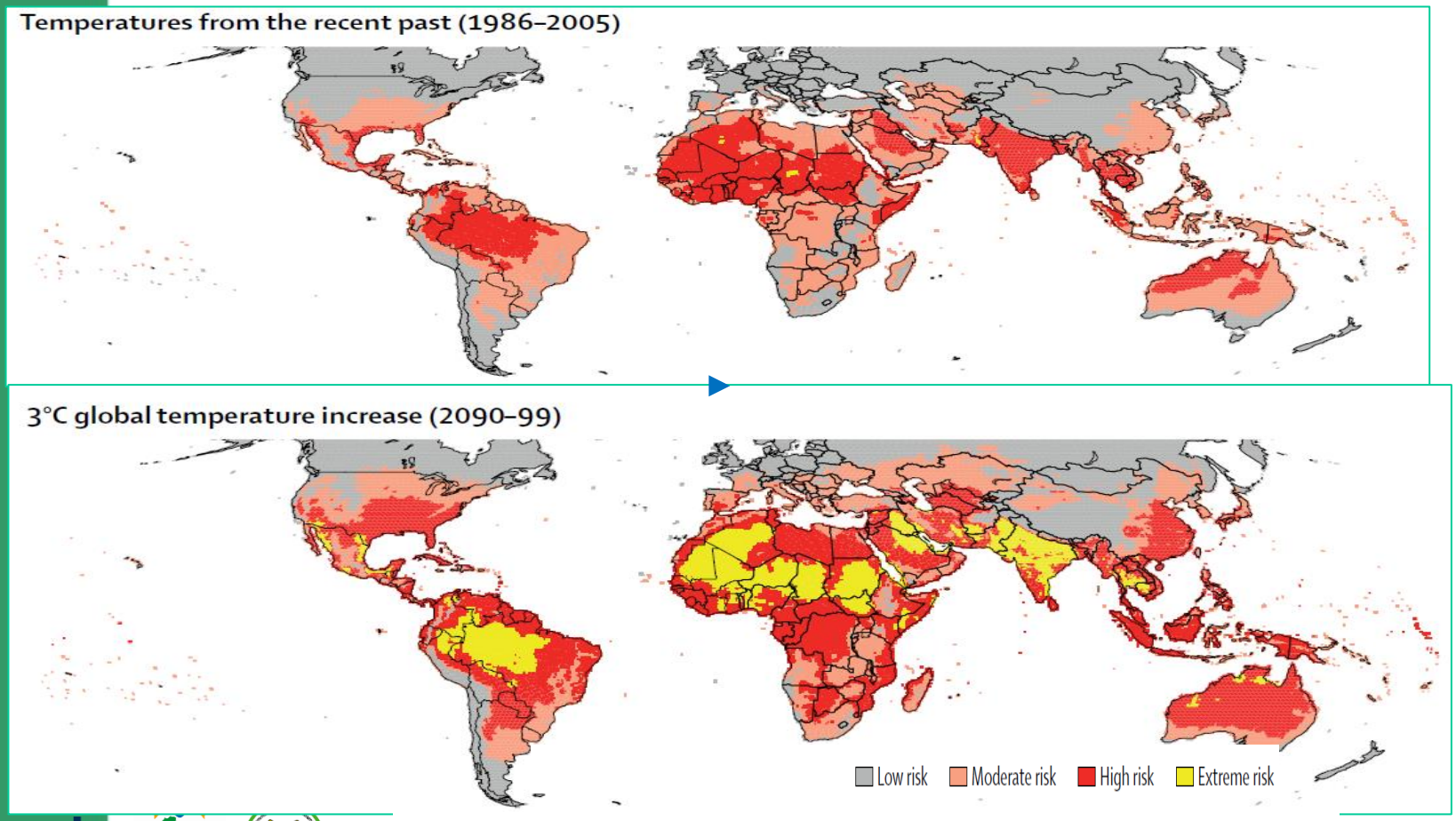


user engagement is key and Science to accelerate this is pivotal

GFCS GLOBAL FRAMEWORK FOR CLIMATE SERVICES

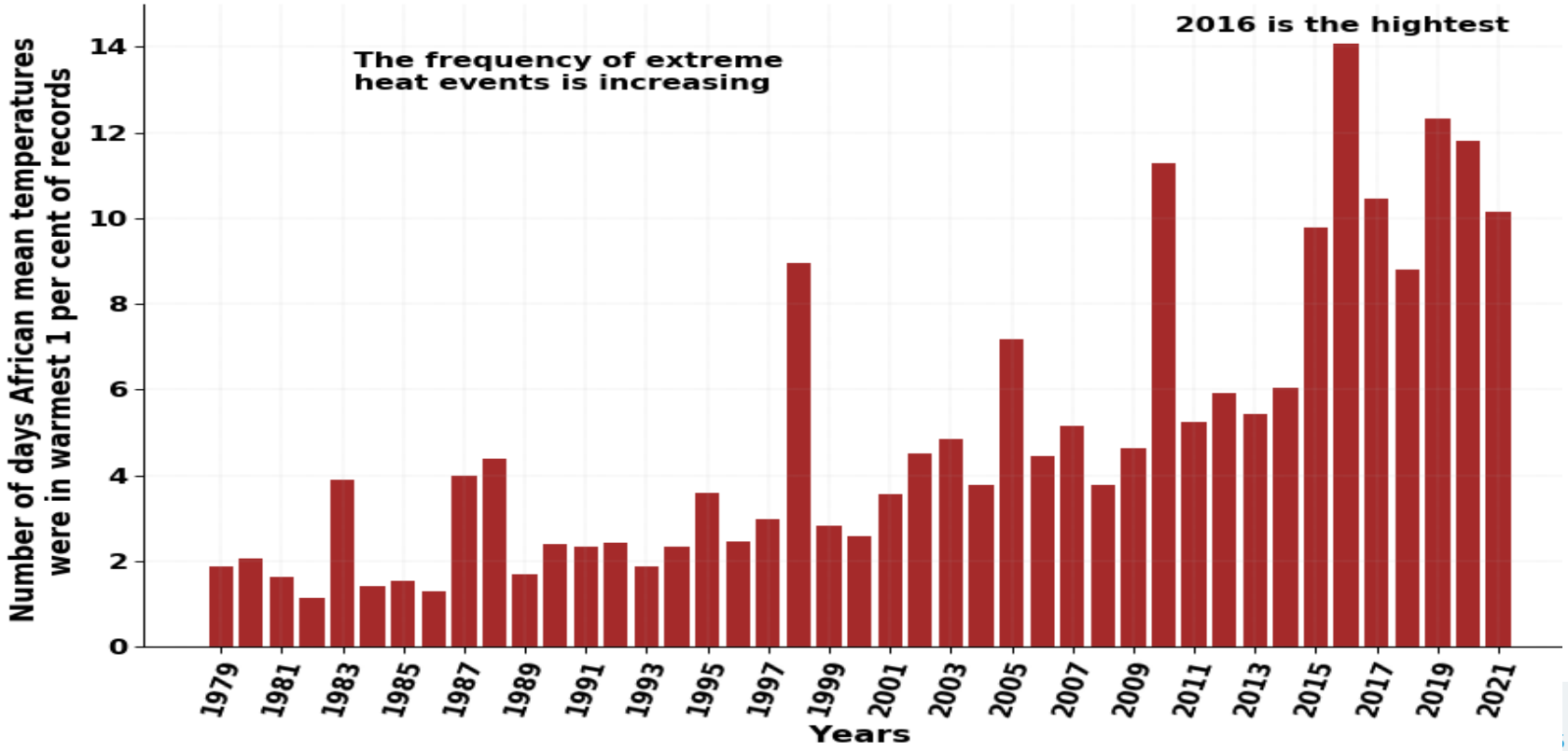
From WMO, 2014 and Hewitt et al., 2012

A MAJOR PROBLEM FOR URBAN AREAS IN THE FUTIRE IS RELATED TO INCREASE IN URBAN HEAT STRESS
UCLIP IS AN INFORMATION PLATFORM TO SUPPORT PLANNING AND ACTION FOR SUSTAINABLE AND SMART CITIES USING ECOSYSTEM BASED ADAPTATION SOLUTIONS



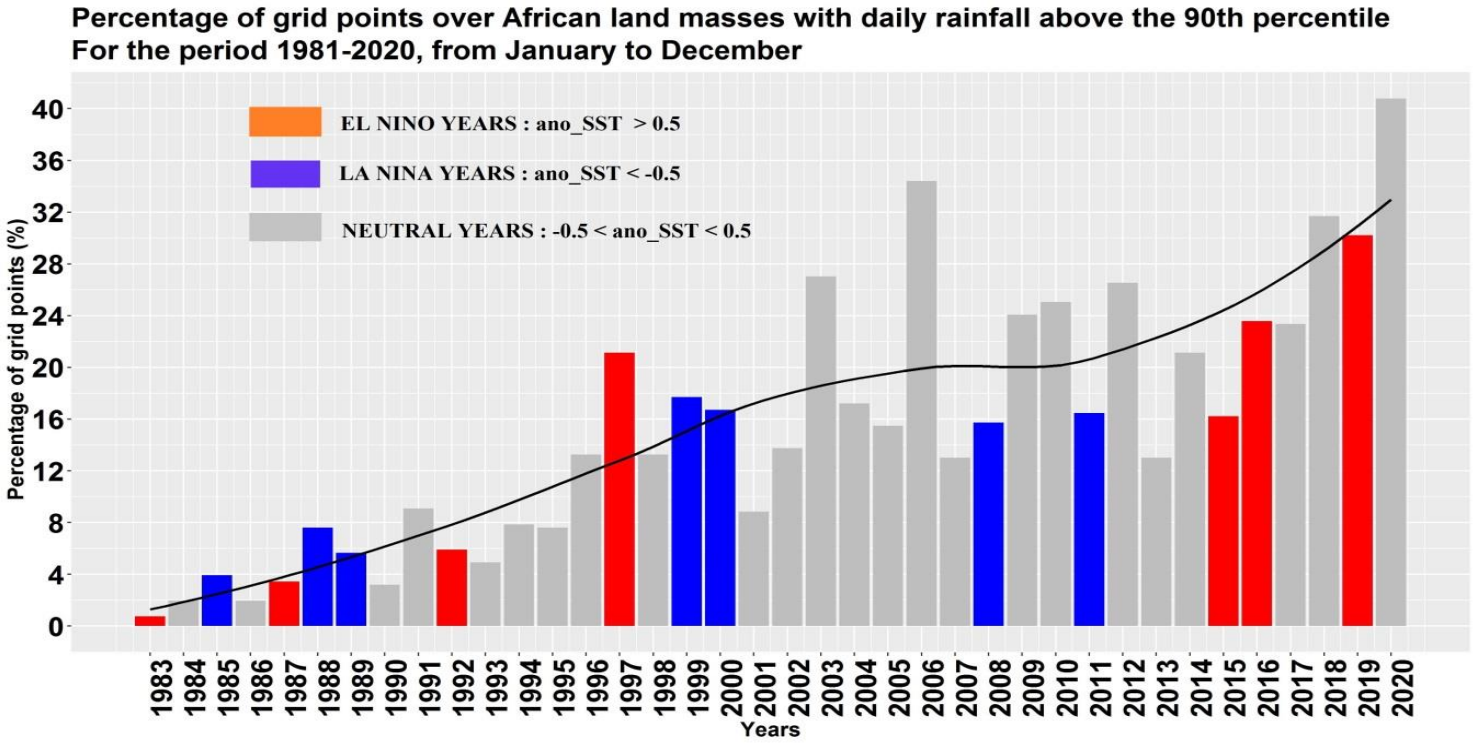
Rohat et al., 2019. Projections of human exposure to dangerous heat in African cities under multiple socio-economic and climate scenarios. Earth's Future, 7, 528–546.

Trends on number of extreme hot days across Africa. 2016 was the warmest year on record globally. *Research on high frequency of very warm days impacts on agriculture, energy, infrastructure, health, water scarcity, disasters is a priority for sustainable development planning*

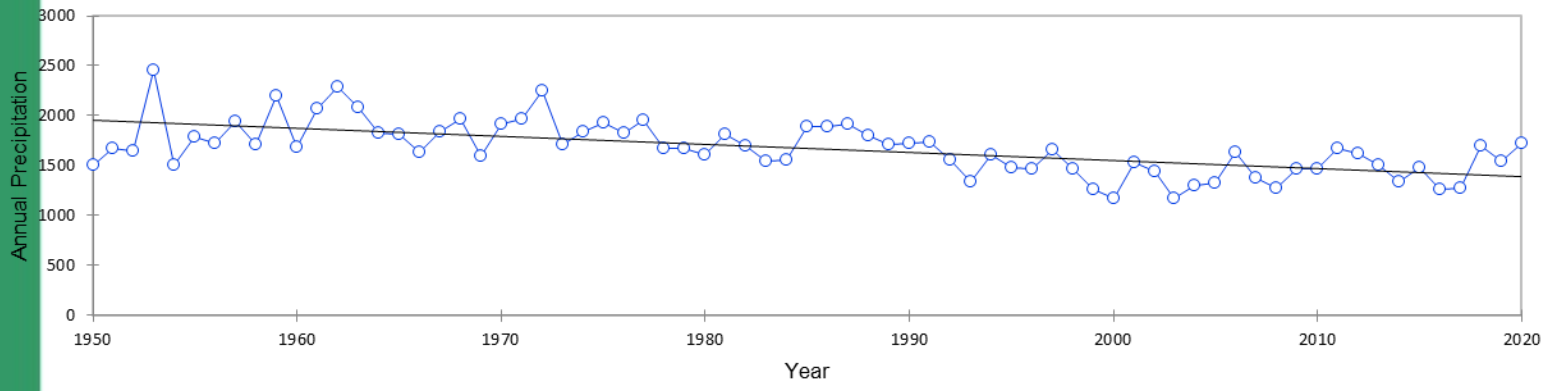


06

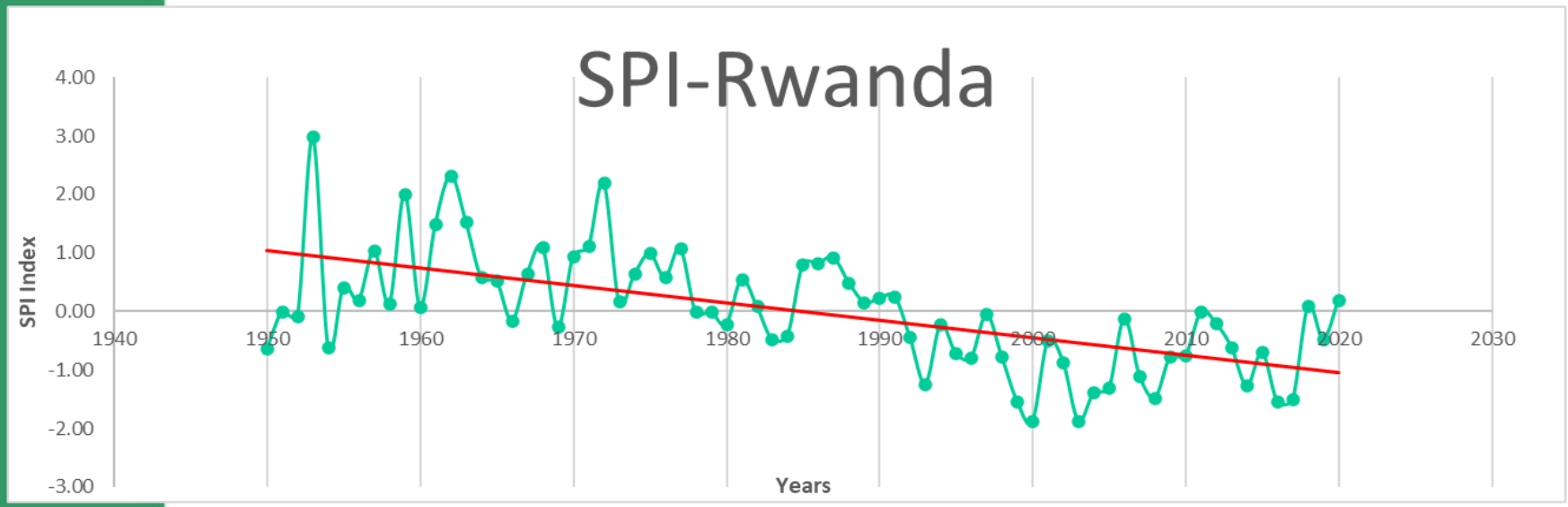
Trends on the surface hit by heavy rainfall. A research on impacts of heavy rains at regional/local levels with emphasis on losses and damages to infrastructure, crops, major assets particularly in cities is essential for resilient development planning



Annual Precipitation-Rwanda

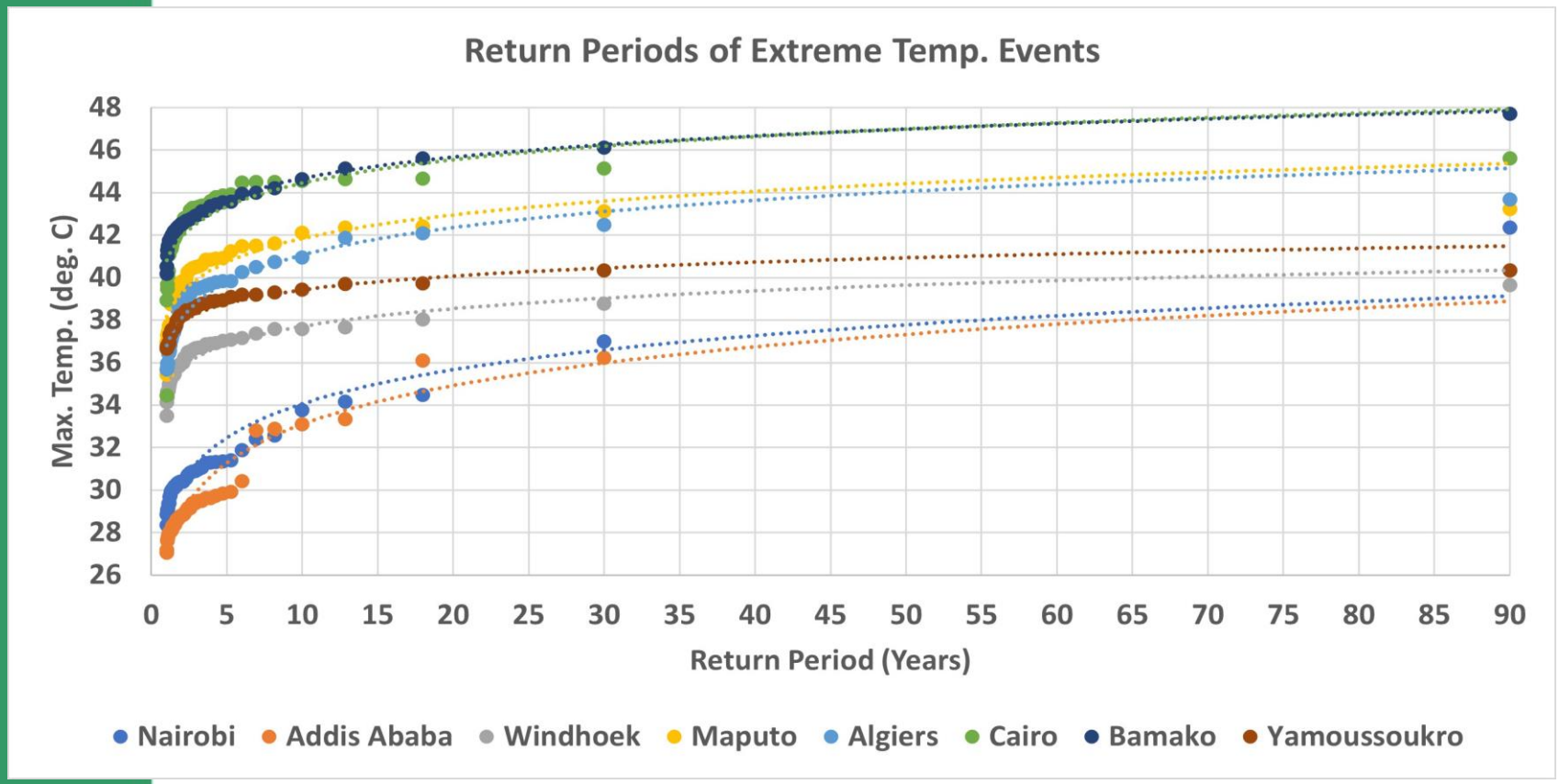


Drought monitoring Service with more actionable indicator



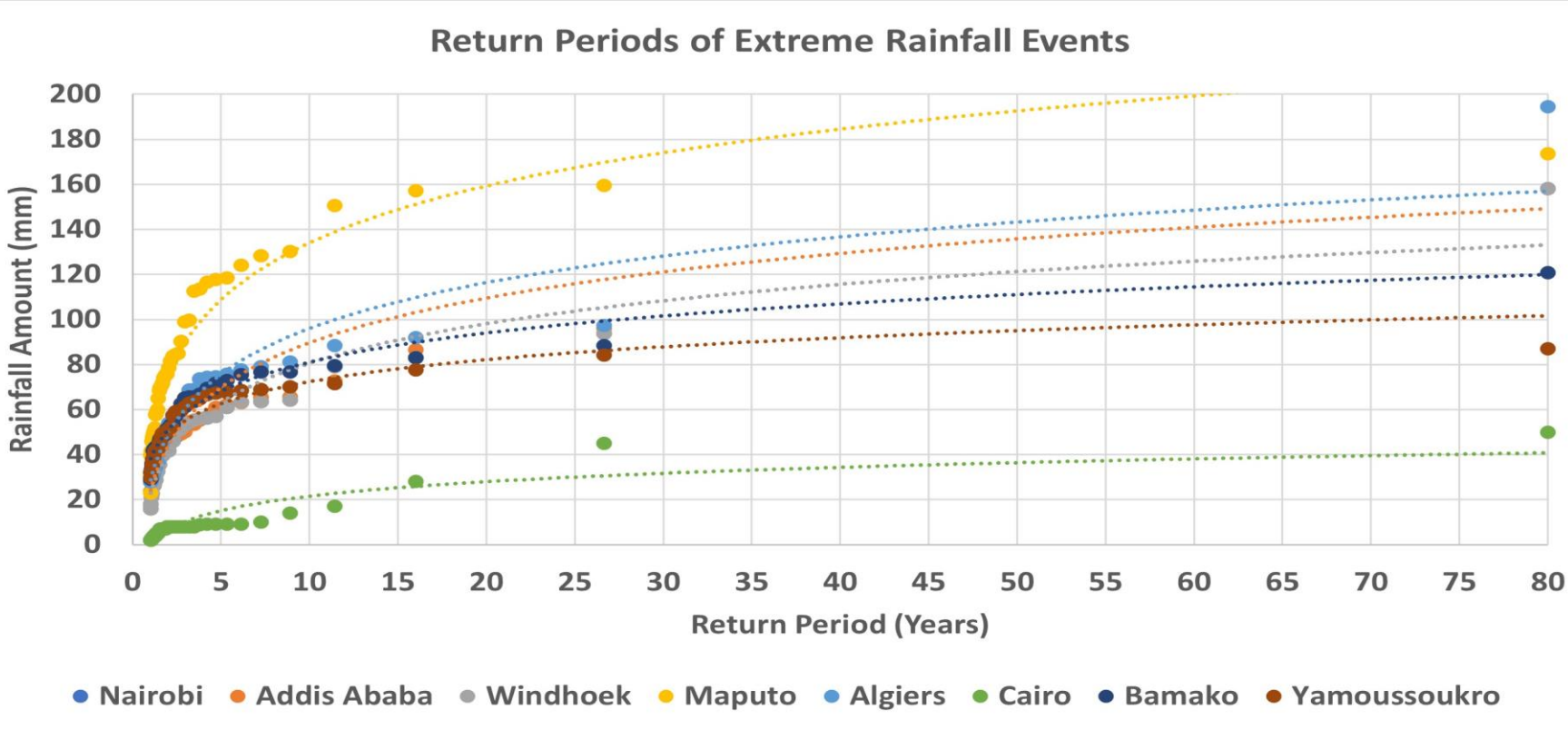
– Actionable Climate indicators for resilient infrastructure design

Early warning for high temperatures, and wildfires urgent in North Africa (Cairo) and Sahel (Bamako)



2.2 Output 2: Continental and Regional support Services at ACMAD

Only Cairo is not highly vulnerable to heavy rains and floods



PROGRESS

1. *Continental watches and disaster situation report*

1. *Coordinated ad hoc briefings with NMHSs, Regional Severe Weather and Climate Centres for impact forecasting and harmonization of hazards and impact information*

3. *Trained forecasters and disaster experts on operation of risk knowledge, outlook, advisory, watch, warning and disaster management centers and situation rooms*

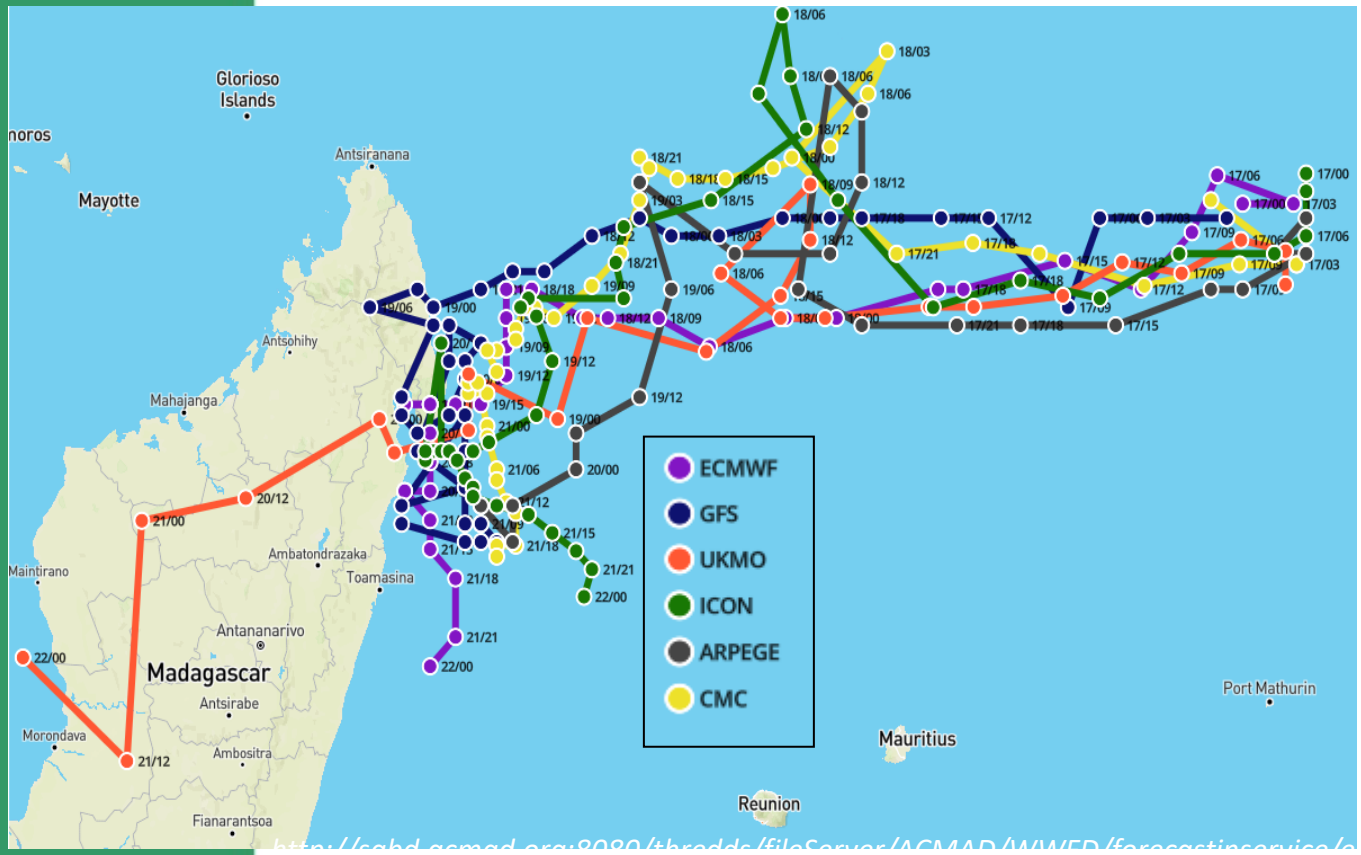
4. **Special briefings and statements for AWGDRR, GECEAO,UNOCHA, WMO with UNHCR**

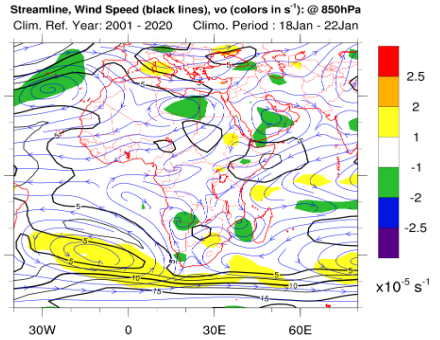
4. *Better Access to data , Research and innovation*

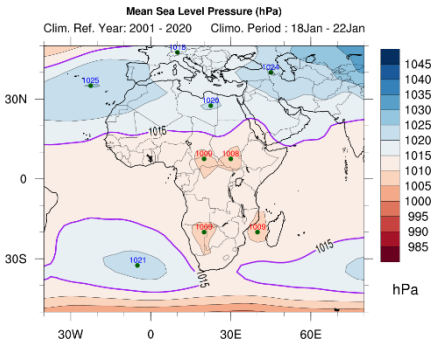
Tracks from: 17-01-2023, 00UTC to 22-01-2023, 00UTC

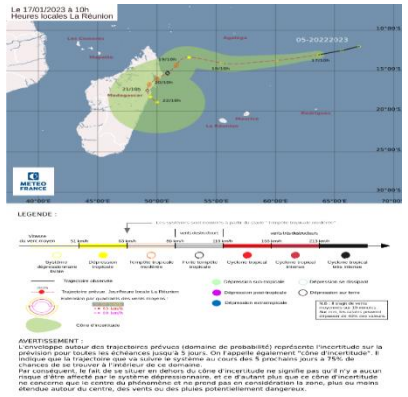
(Global deterministic models : ARPEGE, CMC, ECMWF, ICON, GFS and UKMO) – **Climatology of the forecast period** favors evolution towards the Mozambican channel

Need training on interpretation

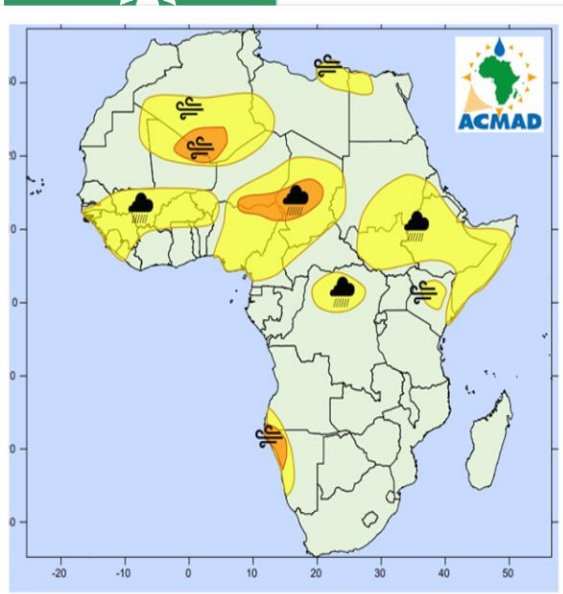








Heavy rain forecast 3 days and 1 day ahead

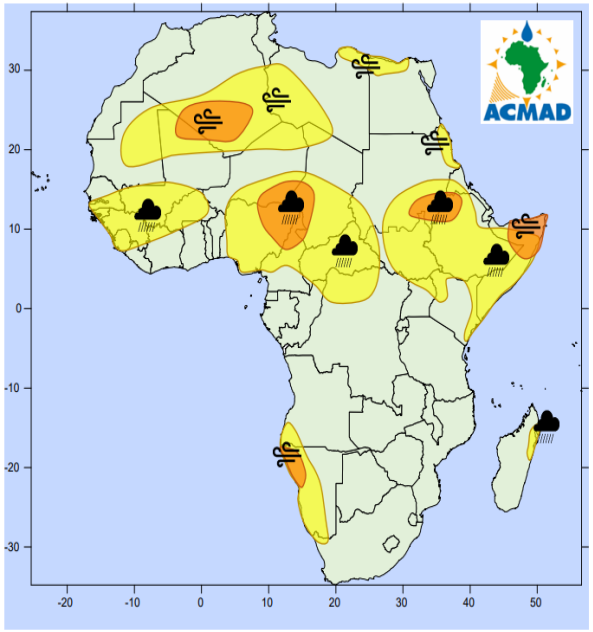


MULTI-HAZARD OUTLOOK

Validity: 2022-07-15

issued on 2022-07-11

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: 2022-07-15

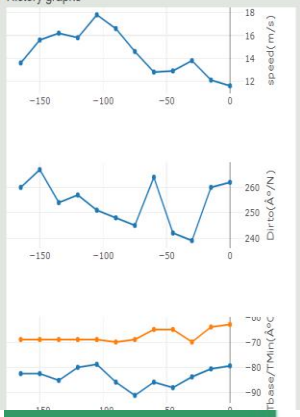
issued on 2022-07-14

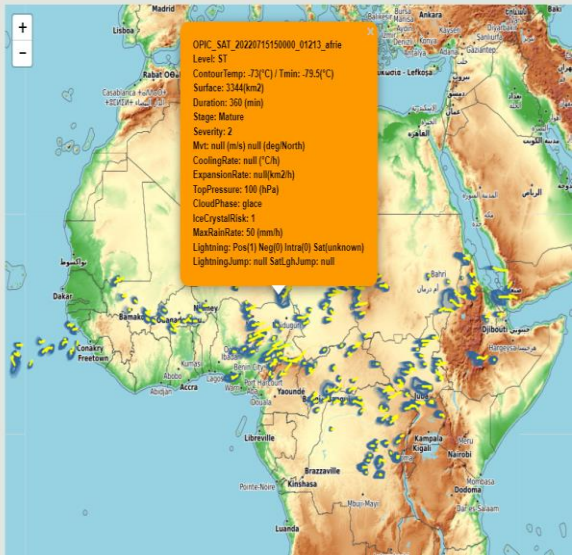
Rain	Wind	Dust	Meningitis
Very heavy >100mm	Very strong >80kmh^{-1}	Very heavy >1000µg m^{-3}	Very likely
Heavy 50-100mm	Strong >65kmh^{-1}	Heavy >600µg m^{-3}	Likely
Moderate 10 - 49mm	Moderate >50kmh^{-1}	Moderate >400µg m^{-3}	Less likely
Light 1 - 10mm	Light <50kmh^{-1}	Light <200µg m^{-3}	

MSG 2022-07-15T15:00:00Z : RDT-CW_v515__

METEO FRANCE ACMAD

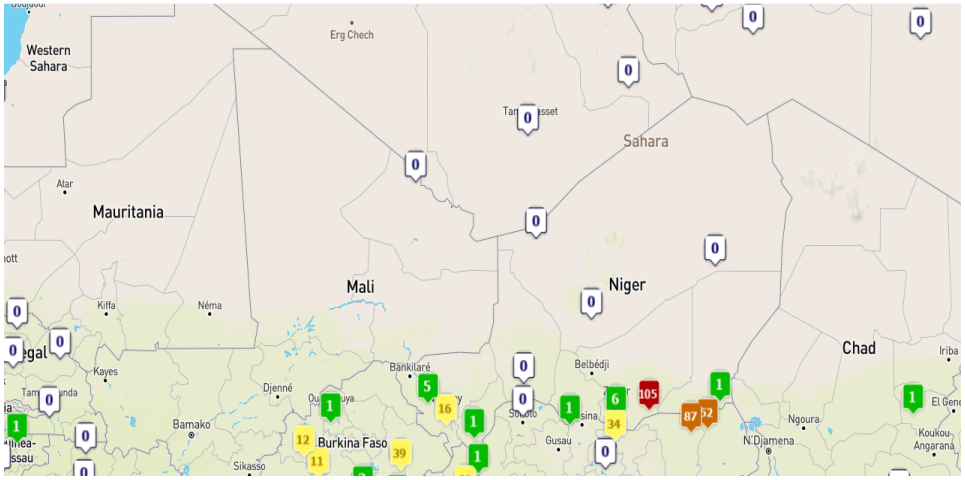
History graphs



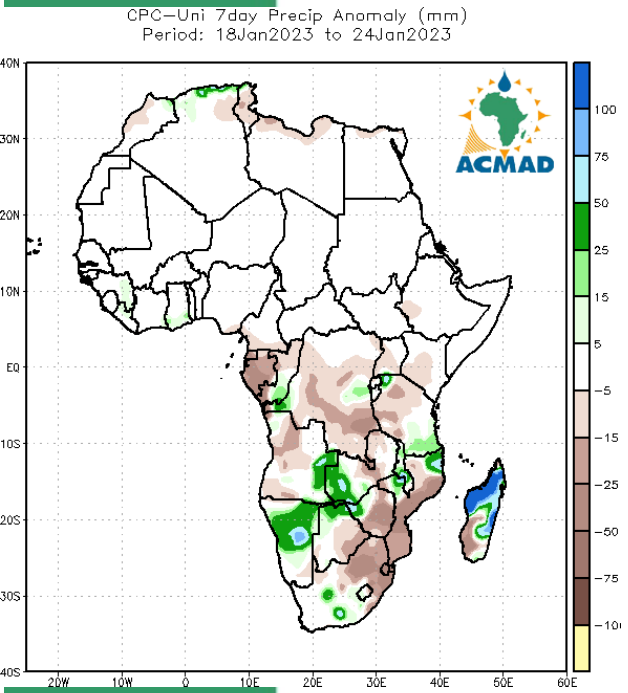


Observed daily rainfall (mm) on: 16-juillet-2022

ACMAD



VIGILANCE FOR HEAVY RAINFALL FOR THE NEXT 5 DAYS. POTENTIAL IMPACTS AND PREPARATION/RESPONSE MEASURES VERIFICATION WITH RAINFALL DATA ON THE LEFT



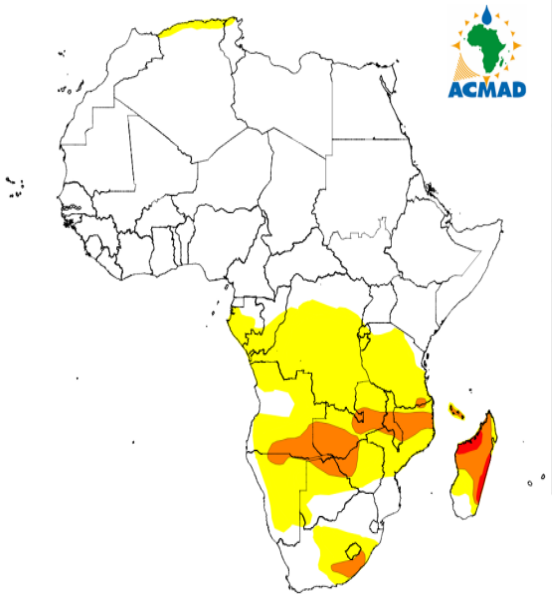
VIGILANCE MAP AND POLICY BRIEF FOR HEAVY RAINFALL AND STRONG WINDS

Valid From January 20 to 24, 2023

Issued on January 19, 2023

HIGHLIGHT: Extreme Heavy rainfall associated with the Tropical Storm CHENESO is expected over North-western and eastern Madagascar

Heavy rainfall is expected over Tanzania, Mozambique, Malawi, Zambia, Angola, Namibia, Botswana, Zimbabwe, Comoros and Madagascar

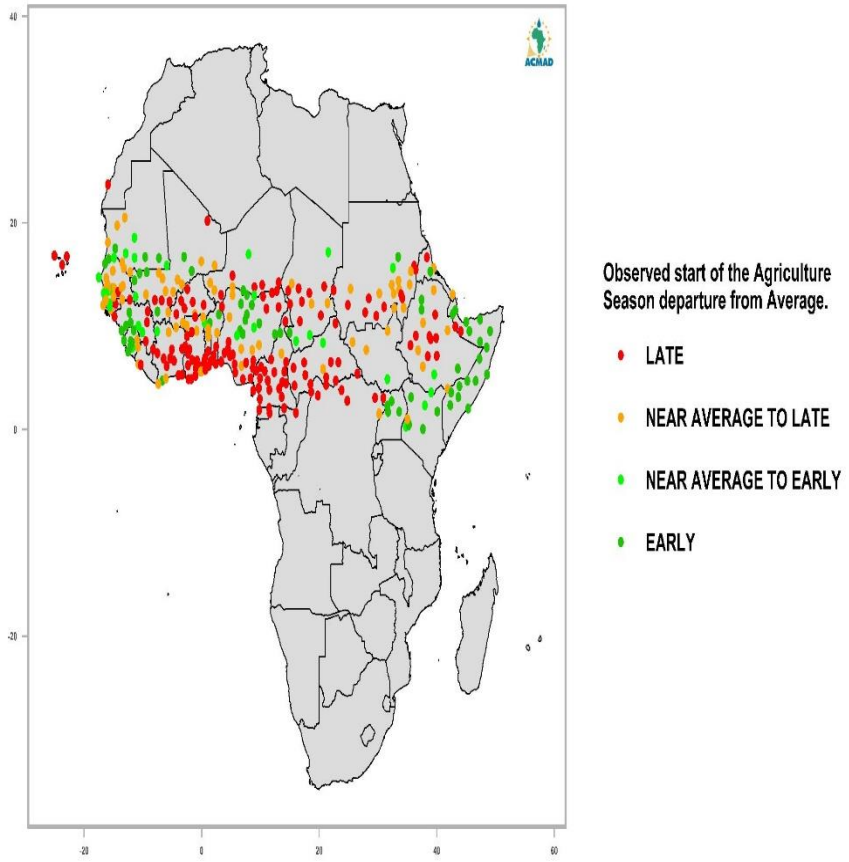


	Phenomenon	Hazard	Potentials Impacts	DRM Measures / Advices
	In next 5 days accumulated rainfall (50-100mm) is likely,	Moderate rainfall, flash flood, riverine flooding, landslides, soil erosion and lightning likely	Displacements of people due to floods, outbreak of water borne diseases, damage of infrastructures (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 NHMSs
	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 NHMSs 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, ...)	Civil Protection services and DRM authorities to activate flood contingency plans for emergency response (assistance to victims, search & rescue operations), and be in close touch with NHMS in case the situation becomes worst.

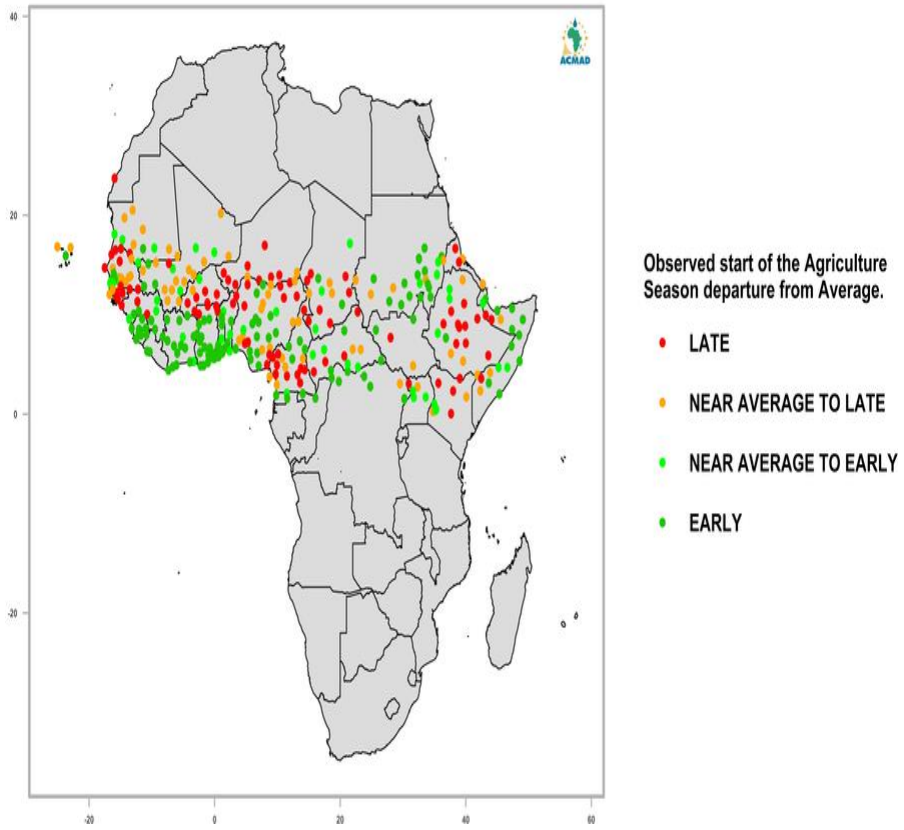
Disclaimer: The presentation of country boundaries on the map does not imply any opinion whatsoever on the part of ACMAD concerning the legal status of any country, territory or area, or concerning the delimitation of frontiers or boundaries.

Research and innovation is promoted to intercompare Start of season definitions, products and compare with perceptions and findings of extension workers and subsistence farmers. Observations of disruptions on the start of season, processes and phenomena driving this event. Its predictability are essential research priorities for the African agriculture sector

START OF THE AGRICULTURE SEASON FROM JANUARY TO JULY IN 2020 OVER SUB-SAHARAN AFRICA.

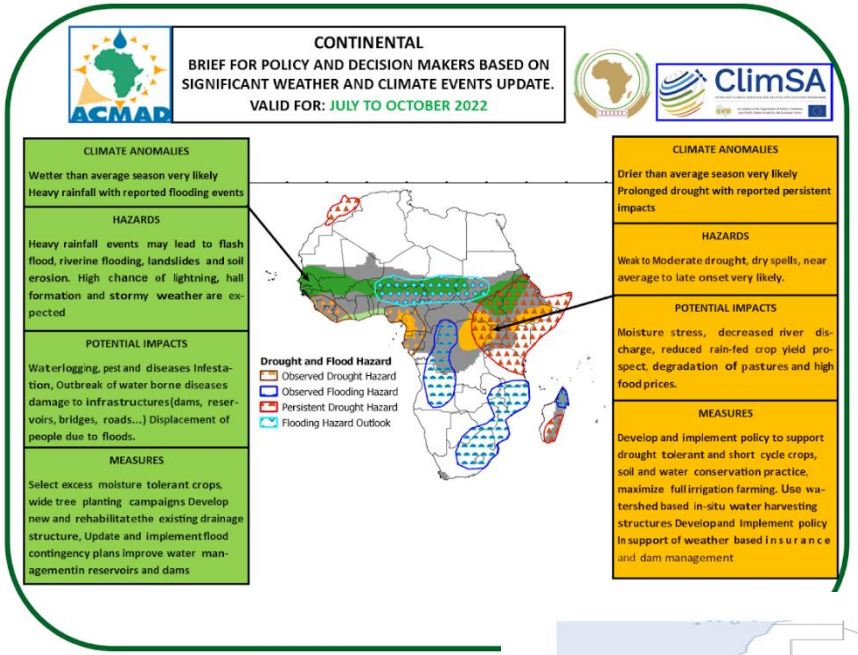


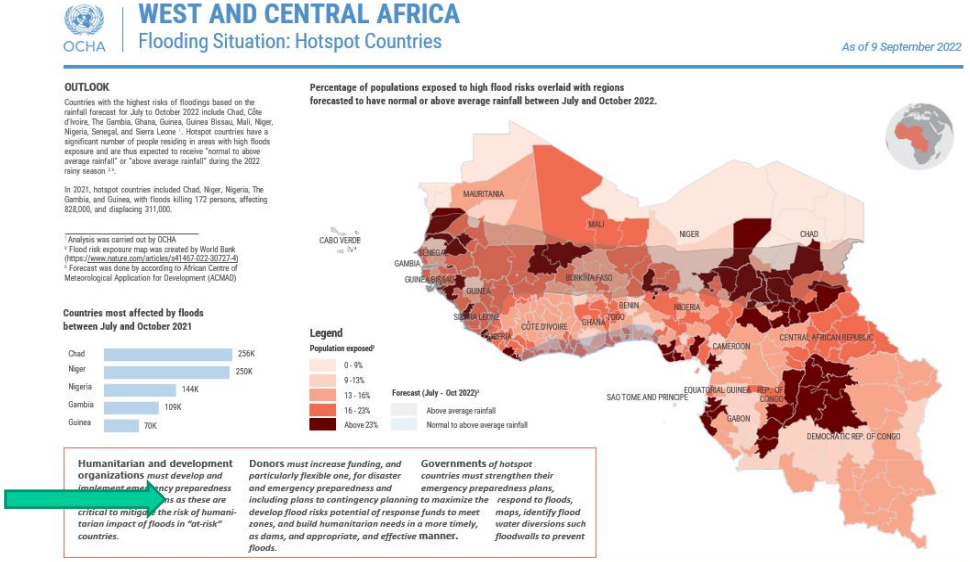
START OF THE AGRICULTURE SEASON FROM JANUARY TO JULY IN 2021 OVER SUB-SAHARAN AFRICA.

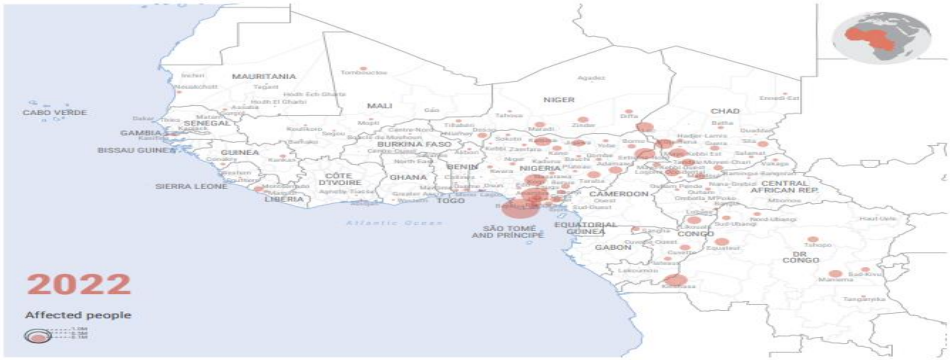


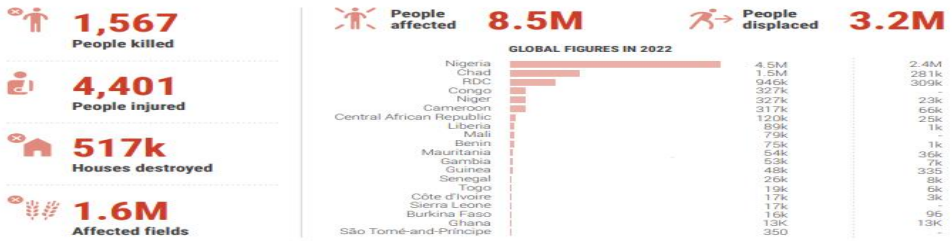
IMPACT BASED FORECAST-ACTIONALBLE INDICATORS

ACMAD-UNOCHA West and Central Africa office

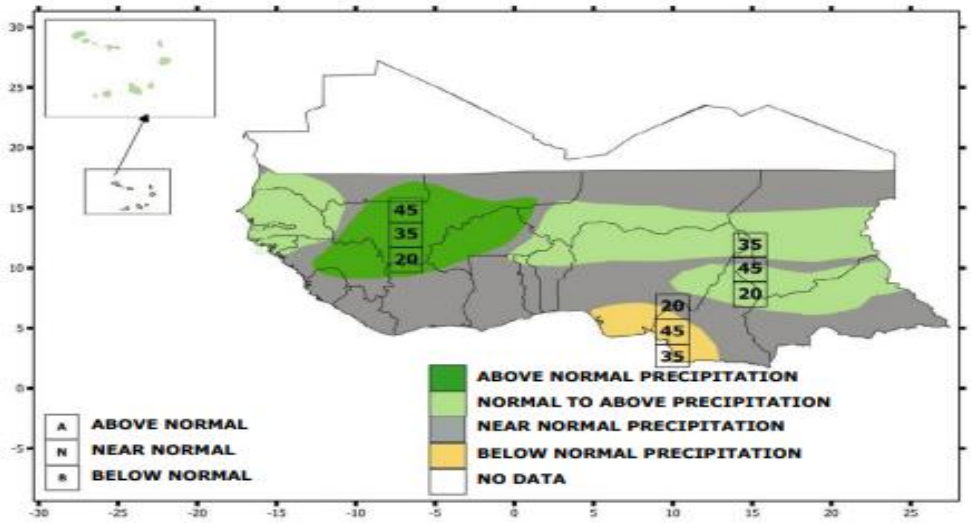




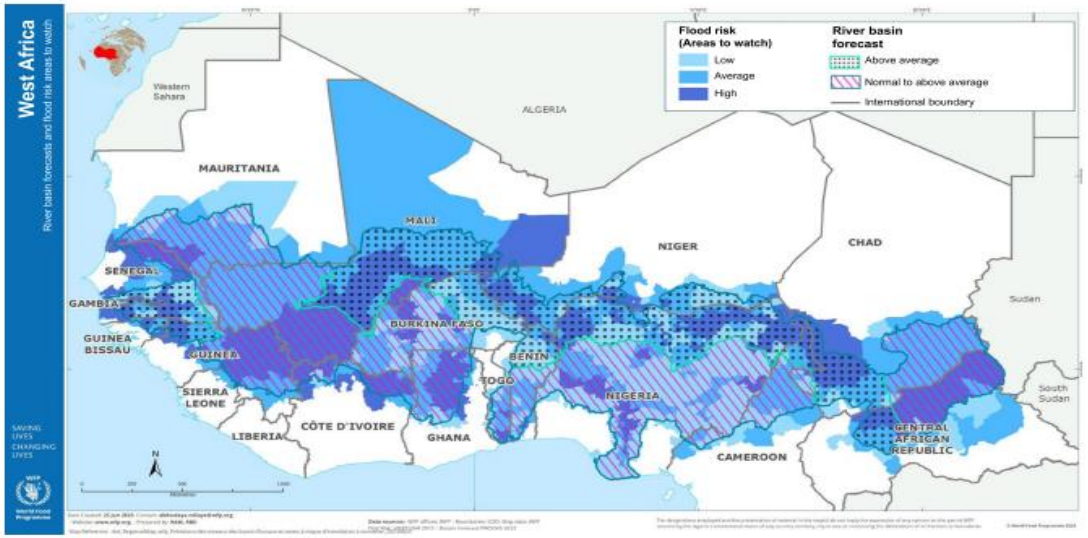




Seasonal precipitation forecast for the Sudano-Sahelian region valid for July-August-September 2023
Elaborated June 7, 2023



Humanitarian impact analysis



RECOMMENDATIONS FOR 2023 SUMMER FLOODS PREPAREDNESS. IFRC, OCHA Governments and NGOs to develop proposal for FbF.

Recommendations for flood risk preparedness and response

- **Identify existing warning mechanisms and how they work:** be aware of alert levels and establish dissemation procedures to ensure that alerts reach people at risk.
- **Update risk analysis and strengthen monitoring mechanisms** in areas exposed to between "normal" and "above normal" levels of rainfall and flood risk, involving all key players (local authorities, humanitarian and development players, national hydrological and meteorological services, research institutes, etc.). These are as follows:
  - Administrative areas with "medium" or "high" flood risk, located in river basins with expected levels above average;
  - Administrative areas at "high" risk of flooding, located in river basins with average or above-average expected levels;
  - All other areas identified as being at "high" risk of flooding.
- **Launch of anticipatory actions to mitigate and prevent the impact of flooding** on households, property, livelihoods, and health, by triggering pre-positioned funds.
- **Identification of priority multi-sectoral preparedness and response actions** to be implemented both immediately and in the event of an emergency, including aspects relating to coordination, needs analysis and information management, anticipation of access-related risks, communication, etc.
- **Activation of preparedness mechanisms within the various intervention sectors** (health, food security, protection, education, etc.) and reinforcement of contingency stocks available at country level, in high-risk areas with a high risk of experiencing restricted access in the event of an emergency response.
- **Capacity building for all players,** to ensure effective assistance.
- Strengthen **communication and awareness-raising activities** with local communities in at-risk areas, in collaboration with local media and existing community-based early warning systems.
- **Pre-identify funding opportunities** available at country and regional level for emergency preparedness and response activities.

CO-DEVELOPMENT OF BESPOKE CONTINENTAL HAZARDS OUTLOOK SERVICES FOR UNHCR

WMO Coordination Mechanism (WCM)

WORLD METEOROLOGICAL ORGANIZATION

WCM Regional HydroMet Weekly Scan | Sudan

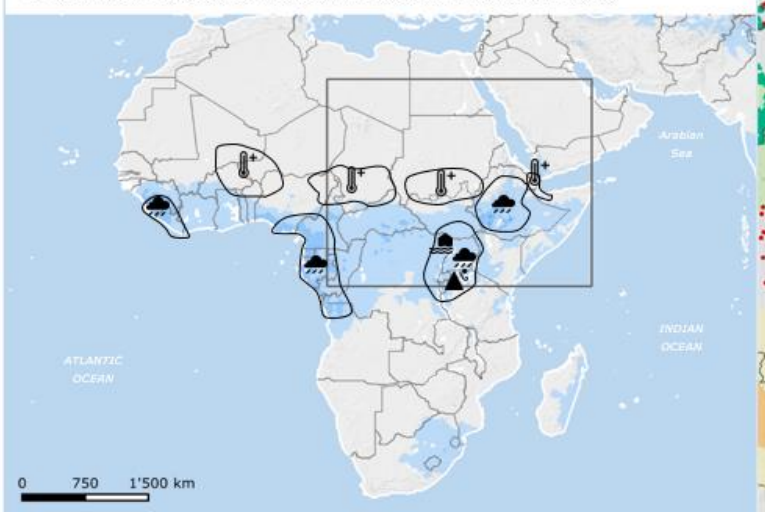
Issued on: < example > , Validity: < example >

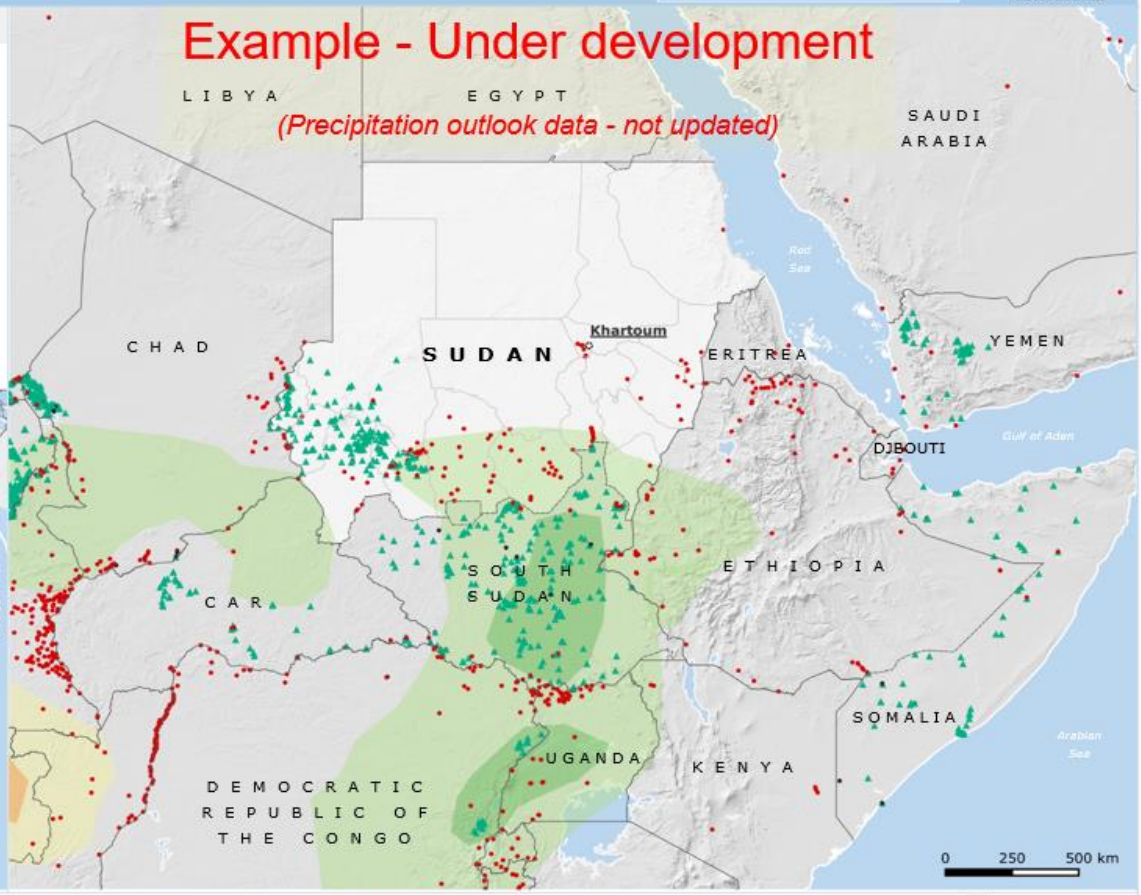
Hydromet events considered — Past — Forecast — Icons Description OCHA Icons

Current situation and possible evolution

- Possibility of accumulated heavy rainfall of more than 100mm is very likely during the next week (5-11 May). Flash floods, riverine floods, landslides and strong wind gusts may occur.
- Moderate heat wave conditions are likely to persist for 3 days or more with varied severity. Increased likelihood of heat related illness symptoms in people who are either exposed to high temperatures for a prolonged period or doing heavy work at peak sun hours.

Sources: African Centre of Meteorological Applications for Development (ACMAD)





Precipitation Next 7 days accumulation — *ECMWF-HRES (04 May 2023 00 UTC)* — 0 10 50 100 250 500 mm

On-going or Potential impacted areas over the next 7 days — *Only the zones inside the black polygons could be impacted. No guarantee is provided about these areas (completeness, geographical extent, etc.). Source: Human expertise.*

UNHCR Locations of forcibly displaced persons — IDPs; Refugees; Asylum-seeker, Returnee

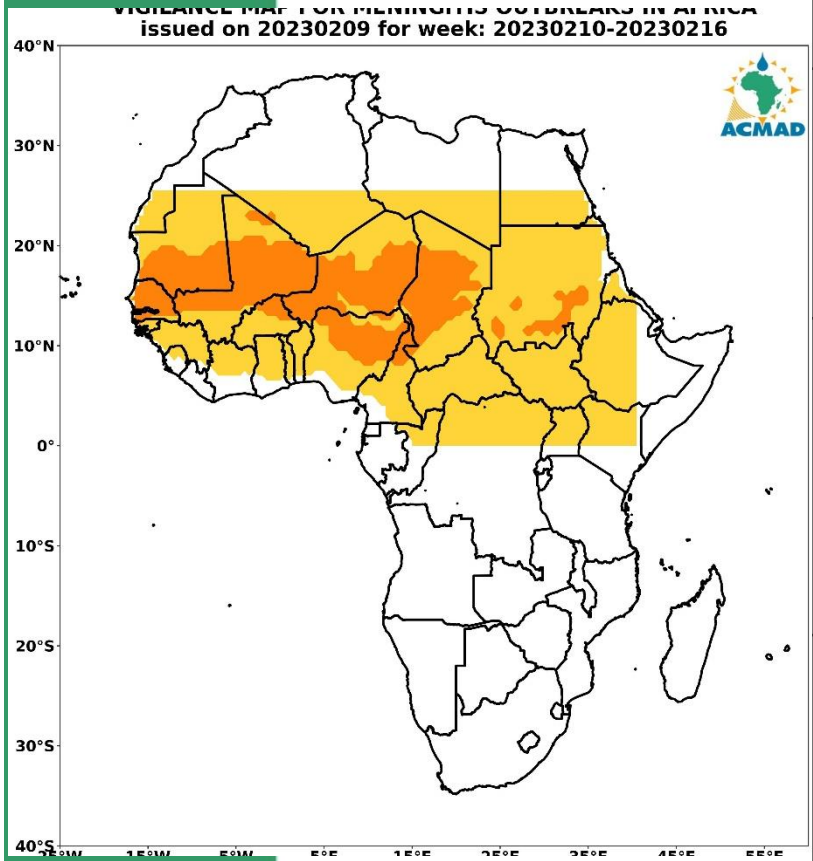
ACMAD Precipitation Outlook for the upcoming week — Well Above Normal; Above Normal; No Signal; Below Normal; Well Below Normal

Sources: [a]NMHSs, [b]WMO, [c]ECMWF, [d]ACMAD, [e]UNHCR, [f]HDX, [g]NaturalEarth

IMPACT FORECASTING AND MEASURES FOR MENINGITIS DISEASE CONTROL BY WHO IN AFRICA WITH WMO GLOBAL MEDIUM RANGE DETERMINSTIC AND S2S PRODUCTS CENTRES

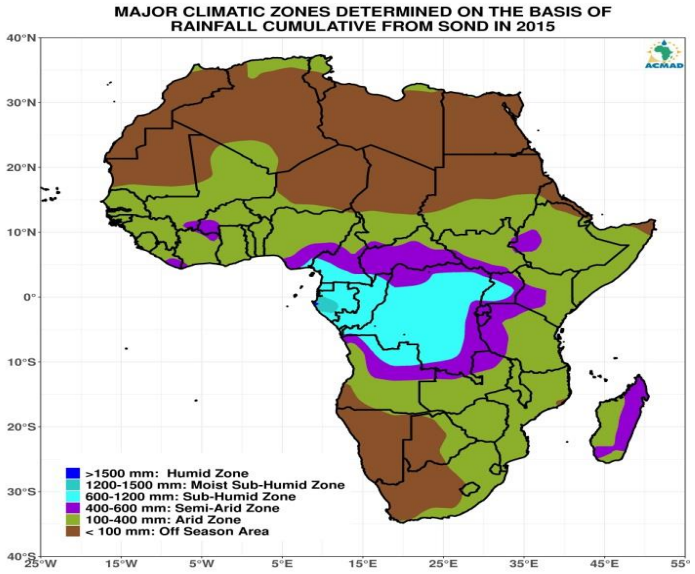
Valid From 10 to 16 February 2023

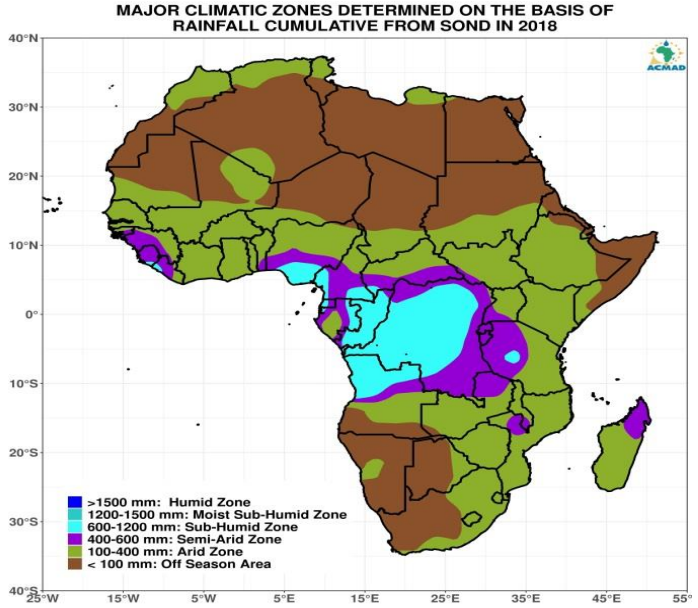
HIGHLIGHT: Meningitis cases likely in Mauritania, Senegal, Mali, Algeria, Niger, Burkina Faso, Nigeria, Cameroon and Sudan.

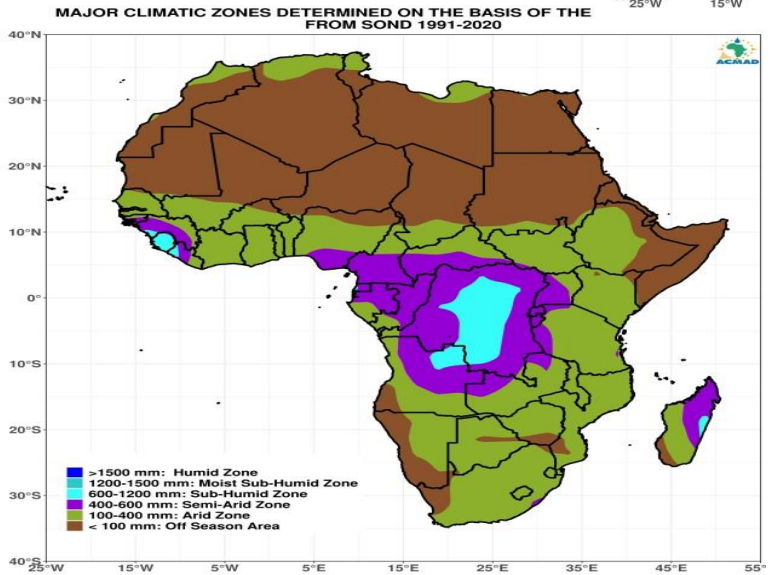


	Phenomenon	Hazard	Potentials Impacts	Advisory / Measures
	- Dust concentration below 150µg/m^3 - Relative humidity above 40% - Temperature below 27°C	Emergence of Meningitis cases not likely	Potential pressure on the health system	Routine surveillance systems at regional and national levels
	- Dust concentration between 150 to 400µg/m3 - Relative humidity between 20 & 40% - Temperature above 27°C	Emergence of Meningitis cases very likely	Loss of life, pressure on the health system	Activation of surveillance systems at regional and national levels
	- Dust Concentration at least 400µg/m3 and above - Relative humidity less than 20% - Temperature above 30°C	Emergence of Meningitis cases very likely and epidemic status possible	Loss of life, increased pressure on the health system	Strengthen and increase meningitis surveillance systems at both regional and national levels

INCREASE ON EXTEND OF OFF SEASON LAND AREAS IN SOUTHERN AFRICA DURING RECENT EL NINO YEARS







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. *EW4ALL*

4. *Assessment and management of compounding and cascading disasters*

5. *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*

6. *System change to update crop yields forecasts as soon as the disruptions on the start of the agriculture season is observed (e. g Burkina Faso)*

7. *Raising Awareness for policy makers to invest more and better in hazards and impact forecasts modernization, budgeting and financing Anticipatory action*

8. *Building capacity of DMAs to mainstream preparation and Anticipatory action in National budget*

LESSONS LEARNT AND WAY FORWARD

1. *Useful Predictability up to five days ahead for heavy rain events , tropical cyclones and storm tracks, disruptions on the start of season and spells*
2. *Assessment and management of Compounding and cascading disasters*
3. *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*
4. *Operate the MultiHazards Advisory 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*
5. *Capacity development with testbed and forecast demonstrations, ad hoc and regular briefings and debriefings at the situation room including with humanitarian and DRR communities*
6. *Partner with ClimSA, AMSAF, HYDROMET …. For coordination*
7. *Prioritize training and operation of impact forecasting, warning, decision making and action as well as benefits assessments*
8. *Build on achievements of past projects including SAWIDRA for modernizing national warnings*

LESSONS LEARNT AND WAY FORWARD

- Provide ***multimodel ensemble and deterministic high resolution*** Analysis and forecasts supporting briefings preparation by countries
- ***Nowcasting and synoptic technical notes*** supporting operational forecaster's briefings at National level to facilitate anticipation and response to national emergencies
- ***Train forecasters and DRR experts on tools and products***
- Support countries ***establish and operate national early warning Information system/centres*** and DRR or humanitarian platform for emergency planning and implementation
- ***Support disaster managers*** from continental to local levels to receive and give feedbacks on ***impact information*** for strong winds, heavy rains, dust storm, high temperatures outlooks, drought ...
- Support measures to ***reduce risks or exploit opportunity*** trough forecast based *integrated* emergency **planning** , **budgeting, financing** and **implementation**

THANK YOU