Coordination mechanism of data exchange at the continental and regional level

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Acronyms:

ACMAD	African Centre of Meteorological Application for Development
AMM	Africa Media Monitor
AUC	The African Union Commission
CW	Continental Watch
CEN–SAD	Community of Sahel–Saharan States
COMESA	Common Market for Eastern and Southern Africa
DCPC	Data Collection or Processing Center
DRM	Disaster Risk Management
EAC	East African Community
ECCAS	Economic Community of Central African States
ECOWAS	Economic Community of West African States
EOC	Emergency Operations Center
EWEA	Early Warning for Early Action
GFCS	Global Framework for Climate Services
ICPAC	IGAD Climate Prediction and Application Center
IGAD	Intergovernmental Authority on Development
IFRC	International Federation of Red Cross
IPCC	Intergovernmental Panel on Climate Change
MHEWS	Multi Hazard Early Warning System
MS	Member States
RCC	Regional Climate Center
RDT	Rapid Developing Thunderstorm
REC	Regional Economic Communities
RSMC	Regional Specialized Meteorological Center
SADC	Southern African Development Community
SDG	Sustainable Development Goals
SoD	Standing Orders on Disasters
UMA	Arab Maghreb Union
WMO	World Meteorological Organization

1.0 Introduction and Background:

The core component of improving disaster risk management governances is inextricably linked to the outflow of the exclusive level of climate extreme and disaster risk information exchange and coordination at multiple levels by establishing a robust coordination mechanism. Given that African context of climate extreme and impending multi-hazards are being interacted with rapid on-set disaster events over the diverse landscape and doing the colossal level of damage to life, livelihoods and eventually to jeopardize the food security with quite a larger extent. The extreme climatic phenomena continue to exacerbating as IPCC project that Africa already exceeded 2°C by the last two decades of this century and over the end of the century Africa will be falling in between 3°C and 6°C1 and it is very likely that the land temperatures over Africa will rise faster than the global land average, particularly in the more arid regions, and that the rate of even increase in minimum temperatures will exceed that of maximum average temperatures today. The nature of incremental pace of changing climates and subsequently intensity of multi-hazard events is more often being characterized as catastrophes over the past decades. Given that circumstances, the comprehensive management of disaster events required a holistic level of participation in risk screening, information exchange & repository, management & process, development of informed tools to instrumentalizing risk integrated planning from central to the local level.

The frameworks approach over to inclusive emergency information service deliveries with coherent horizontal and vertical coordination mechanisms of the information exchange among national governments, focal points, institutional, stakeholders, users' level for dealing with disaster emergencies and target to achieve SDG 2030 and beyond.

However, activating an integrated multi-hazard early warnings system and delegating the most time-critical and accurate level of forecast and prediction of extreme weather is a more critical job, which required multi-faceted functionaries and coordinated mechanisms for effective and interactive service deliveries.

1.1 Purpose of the Multi-hazard Early Warning Data Coordination Mechanism

In the process of effective early warning system the need is meteorological, socio-economical and, environmental data for impact assessment , impact management for risk assessment and the current situation is characterized by meteorological and those impact data are not interoperable . This coordination mechanism to facilitate exchange of data between all situation rooms.

The most important ingredients for developing impact-based early warnings are encompassing comprehensive observation and analysis of extreme weather parameters, another rapidly developing weather system (e.g. RDT), etc., which are very essential for developing extreme weather forecasts. To develop impact based multi-hazard Everly warning tool, the given forecast needs to be further analyzing with spatial analytical tools (GIS software). Principally, the more precision level early Warnings, the more appropriate level of early actions (EWEA). Impact-based forecasting can

[1] IPCC

effectively be informed organizations and communities to formulate understandable and actionable messages and take respective preparedness and response measures.

Considering the inflow and outflow of datasets & information, the African Union Commission (AUC) undertaken initiatives aligning the Sendai Framework & Global Framework for Climate Services (GFCS) approach based paradigm of developing MHEWS, dissemination, and integrating with the risk-informed decision-making process at the local level.

The main goal of MHEWS is to leverage the best practices, innovative methodologies, and existing tools to share actionable early warnings and build sustainability for climate information and early warning systems initiatives. The African Union Commission (AUC) needs to solicit disaster risk data from member states.

This coordination mechanism is expected to be providing the way forward for the collection and management, usage of the data and products and the rights of the data providers specify the roles and the contacts of the responsible data holders and providers. These mechanisms will be able to set synergies for data exchange coordination amongst the core stakeholders e.g. Africa Union Commission (AUC), Regional Economic Communities (RECs), and Member States (MS), and other relevant stakeholders.

1.1 Objectives of the Data Coordination & Exchange Mechanism

The objectives of this exclusive coordination and exchange mechanism are to strengthen the AUC's pivotal roles in establish and improve the coordination mechanism of plugging in all inputs of on-going multi-hazard dissemination of severe weather forecasts, facilitate interactive and effective communication, coordination for exchange of disaster emergency data and information on on-set disaster events at the local level, and subsequently preparing an event situation report on the occasion of disaster being declared by the Member states.

Improving the disaster risk management governance at multiple levels following through the top-down & bottom-up approach with the following technical objectives :

a) **Delegating programme, strategies to RECs, MS , Focal points, NHMS organizations (**Disaster Management, Met Agency, vulnerable sector departments, hydrological organizations, local governments) **on conducting multi-hazards risk & vulnerabilities analysis, the repository of multi-hazard risk database & corresponding GIS Map at the all administrative level.**

   AUC to delegate and propagate strategy, process, and activities to conduct comprehensive risk and vulnerability assessment at national, regional/provincial/district, and lowest administrative level before developing risk repository and informed tools which essentially required for having risk scenario/phenomena, GIS multi-hazard risk & vulnerability distribution map readily available in hand. This mandatory tool would effectively be complementing the most precise level of projection of forecasting extreme weathers complying with the background check of the prevailing risk context of the vulnerable countries.

b) **Delegating the job to the Situation room (ACMAD & ICPAC) for developing severe weather forecasts, and multi-hazard situation reporting:**

As a regular interval, the AUC to delegate responsibilities to two regional WMO designated Regional Climate Centers (ACMAD & ICPAC) for developing two products "Continental Watch" on severe weather forecasting on the ahead of 5 days and giving the threshold of 5 days amount of precipitation accumulation with the projection of rainfall color coded level of warnings and advisories on probable consequences and also the advisories of strong winds.

c) **Implying policy advocacy on multi-hazard risk screening, assessment to disaster damage and needs, data capture, information coordination**

- Implying policy advocacy to Member States(MS), RECs, National hydro-meteorological service providers(NHMS), and beyond to remain operational in risk screening, data & information capture, and coordinating the datasets, and information to AUC situation room.
- Putting a participatory open-ended policy in place and delegating member states of taking stock of all information of disaster incidence, disaster damage and loss profile (picture, videos), assessment report, documentaries, humanitarian response, response gaps, post-disaster impacts on sectors, economies, livelihoods, public health and building back better approach.
- Putting policy regulation to MS to establish coherent coordination mechanism under standing orders on disaster (SoD) for exclusive engagement of DRM stakeholders & actors, the private sector, NGOs, social services organizations, and the civil society, etc., as partners for incorporating inputs(feedback) to MHEWS as a way to ensure risk informed and sustainable development .

d) Improving Africa Media Monitor (AMM) Structures, Procedures, and Service automation process

1) Underpinning the most prioritized action of upgrading AMM web portals so that it can crawl and grab relevant disaster event information from all new outlets and develop a repository for easy access.
2) Specialized Web portal development for exclusively disseminating and interacting disaster event information. Taking into account the centralized role as AUCs as a continental body, this organization undertakes advocacies of disseminating severe weather forecasting tool "continental watch" at sub-organs, regions, and member states level and beyond level.
3) Developing a disaster event database on past disasters
4) Develop a digital library of disaster event information.

e) Developing interactive forum over the social networks

1) Utilize the social networking platform for inclusive interactive participation of audiences.
2) Taking feedbacks from stakeholders, focal points, vulnerable communities for further customization and improvement of products and services for meeting the demand.
3) The development, access, and use of the best science and new technologies underpin all components of multi-hazard early warning systems.
4) Feedbacks that learning from good practices of understanding & receiving early warnings by the vulnerable community from the remote & hard-to-reach areas.
5) Strengthening the Early Warning for Early Action (EWEA) chain, taking on an impact-based forecasting approach in early warning to enable organizations and communities to

formulate understandable and actionable messages and take respective preparedness and response measures.

6) Upgrading web portal of Africa Media Monitor for customization to capture disaster event information at the up-to-date level.

2.0 Proposed Structures of Coordination Mechanism for Data Exchange

Following through a participatory, inclusive, and open-ended platform which is expected to leverage both ways effective communication and the robust coordination mechanism. The target goal of AUC led process is to develop extreme weather risk-informed tools CW and event situation report for delivering multi-hazard risk early warnings effectively. Partnership development among the continental and regional level (RECs & beyond) must appropriate operational institutional bodes to generate, exchange and disseminate information. The principles of the MHEWS mechanism are to routinely collate, store and process information about past, present, and future extreme weather events. The typical architecture of coordination mechanism to simultaneously function both way traffic of information dissemination and exchange. Primarily myDEWETRA can be accessed by web at https://www.mydewetra.world for downloading and customization multi-hazard risk, analyzing weather parameters for developing specific products, and running with this open-source systems through https://test.mydewetra.world .

The implementation strategy of mechanism encompasses a multi-tiered structure that of AUC delegated and collaborative process to ensure continental and regional level coordination and data exchange facilitating the CW and event situation reports are generated, exchanged, and disseminated:

a. Continental level through a range of advanced continental bodies;
b. Regional level through RECs;
c. Member states level through the national network of entities with national and local level ;
d. Nationally and locally by National Meteorological and Hydrological Services (NMHSs), vulnerable sectors, humanitarian actors.

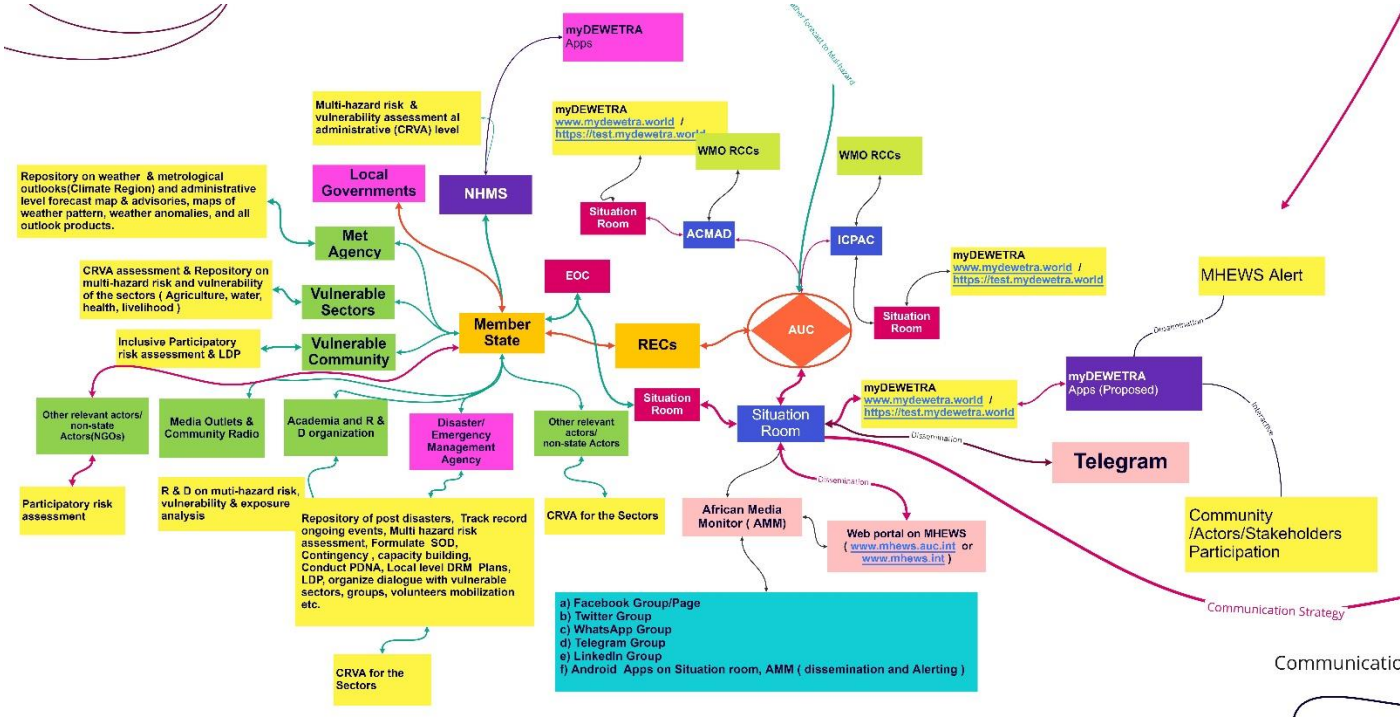


Figure 1: Typical Structures of Coordination of Data Exchange Mechanism

2.1 Actionable coordination Mechanism for Data Exchange

Table: Actionable coordination Mechanism for Data Exchange

Entity Types	Coordination Action	Data / information requirements		Exchange mechanism	
		Date required for Multi-hazard risk mapping	Date required for Event Situation Reporting	Inbound data & information services	Outbound data & information services
AUC Situation Room	1) AUC to delegate Policy, strategy, program, action plan, etc., to Organs and Sub-organs, Member states for functioning the coordination mechanism of data exchange 2) Delegating the RECs level authority of mechanizing the coordination for data exchange by providing MS level strategy on how they create interconnectedness of top-to-down & bottom-up level actors so that outflow of multi-hazard risk and vulnerability information automatically occurred. 3) Coordination mechanism and data exchange with other UN Agencies (WFP, FAO, UNDP, UN-OCHA, UNHCR), GFDR, UN-SPIDER, African Risk Capacity	• As a continental body, AUC to delegate and empower RECs so that they can push a policy to MS perform the following tasks; 1) MS should be obelized to provide all those damages, losses, the extent of areas are impacted by the ongoing disaster and immediately to provide all those information to the continental situation room 2) MS National hydrometeorological Services (NHMS) organizations, emergency management authority, country focal points, local governments agencies at the last mile should be obliged to provide disaster/climate risks & vulnerable assessment information to RECs & continental situation room.	• AMM to develop a repository on all collected information supply to situation rooms for preparing customized maps, situation reports, and advisories on ongoing multi-hazard events	• Information Repository on multi-hazard events	• Weekly 2 Continental Watch bulletins • Event situation report

Entity Types	Coordination Action	Data / information requirements		Exchange mechanism	
		Date required for Multi-hazard risk mapping	Date required for Event Situation Reporting	Inbound data & information services	Outbound data & information services
	(ARC), International NGOs (Africa), IFRC, RIMES Africa, CREW Initiatives and other relevant hubs. 4) Putting Member States under strong coordination mechanism with and creating an obligation to data exchange with situation rooms. 5) Delegate an executive order to all Emergency Operations Center (EOC), Disaster Control Rooms, Humanitarian actors (OCHA, IRC) at country level to coordinate disaster emergency preparedness, post disaster damage, loss and needs information, with situation rooms.	3) MS level Met Agencies to be well connected with RECS & Continental Situation Room to exchange information about localized forecasts and provide maps on rainfall distribution of the past seasons, weather parameter anomalies (rainfall, temperatures etc.), seasonal variation of essential weather parameters, track record extreme weather events, multi-hazards et., and 4) provide all the profile, maps, weather outlooks, bulletins to RECs & continental situation room. 5) Database of historical disasters and multi-hazards events of the country.			
ACMAD Situation Room	• As a continental meteorological body, ACMAD shall be well-coordinating with WMO regional data hub (Africa) for exchange meteorological products and services of their focused regions. • Establish coordination mechanism of exchanging regional & sub-regional climate outlook forum for getting update products. • Establish coordination with country level met agencies for accessing country level meteorological forecast, weather outlooks (seasonal variation, anomalies, precipitation index etc.) for analyzing and mapping country specific multi-hazard risks and vulnerabilities. • Establish both way communication with regional data hubs, Climate service providers (NHMS) for data exchange.	• A google earth kmz file on drawing polygon of the extent of the areas impacted, point the location where human casualties occurred, location of infrastructure & other elements damaged by taking information from disaster focal points • Downloading GIS Shapefile(TIFF) from myDEWETRA platform on heavy rainfall accumulation for upcoming 5-10 days(GFS) for preparing CW. • Download satellite image on Fastest on-set weather parameters (with nowcasting) e.g. Rapidly Developing Thunderstorm (RDT), Tornadoes, dust-storm, heavy rainfall, etc. • Access to Tropical Cyclone Center at La Reunion for having access to tracking information of west Indian ocean depression (Tropical Cyclone) and developing early warning maps. • Access to AMM alert message for other fastest-onset disasters earthquakes, volcanos, tsunami, etc.)	• Events hotspot location map	• Inputs weather parameters dataset • Regional weather outlooks products, information services	• Continental watch (CW) • Different range forecasting products, weather outlooks, climate change impact models, maps, and datasets. • Climate information and services
ICPAC Situation Room	• As a regional specialized climate center (East African countries) ICPAC needs to establish coordination mechanism of all regional members countries, so that NHMS organizations provide hazard / climate risk and vulnerabilities assessment (CRVA) report on regular basis for analyzing multi-hazard risk & vulnerabilities maps. • Coordinate and exchange tailor-made multi-hazard and climate information services to AUC, ACMAD, and other regional stakeholders. • Coordination with other UN Agencies WFP, FAO, UNDP, UN-OCHA, GFDR, Rimes, CREW	• Extreme weather paraments (heavy rainfall, strong wind, high temperature, etc.) • Fastest on-set weather events (nowcasting) e.g. Rapidly Developing Thunderstorm (RDT), Tornadoes, dust-storm, heavy rainfall, etc. • Country level multi-hazard risk profile, risk and vulnerability information at administrative level. • Climate outlooks (monthly, seasonal, yearly) •	• Access to Tropical Cyclone Center at La Reunion for having tracked early information on west Indian ocean depression (Tropical Cyclone) and remains to be alerted for developing situation reporting. • For flooding incidence having hotspot location • Firsthand damage, loss information on immediately after the disaster in first 1- 12 hours and 24 hours. • Post-disaster damage loss and needs	• Input data of multi-hazard risk and warning mapping	• Disaster event situation report • Risk informed tools for the stakeholders and sectors

Entity Types	Coordination Action	Data / information requirements		Exchange mechanism	
		Date required for Multi-hazard risk mapping	Date required for Event Situation Reporting	Inbound data & information services	Outbound data & information services
	Initiatives, UN-SPIDER, African Risk Capacity (ARC).		assessment (PDNA) report.		
RECs	○ Delegate policy, strategy, an action plan to MS for Multi-hazard and Climate Risk & vulnerability (CRVA) assessment. ○ Delegating plan of action so that Standing orders on Disaster(SoD), Disaster Risk & Emergency Management Plan, at national & local level. ○ Delegate plan of action so that MS communicates all updates (damage info, pictures, video clips to situation room) for event situation reporting. ○ Providing risk-informed sustainable development strategies to the member countries (MS). ○ Establish effective communication with AUC, ACMAD, ICPAC and develop strategy, policy, programs, action plan on climate change and disaster risk management, action plan for combating desertification, ○ Delegating plan of action for formulating risk-informed local development planning. ○ Coordinate and delegate actions plan for MS for consensus-building of data and information exchange on multi-hazards. ○ Coordination mechanism with MS level information clearing desk (Ministry of information) , national mass communication department so that they automatically supply disaster event information to Situation rooms.	Coordination and communication with MS so that local weather stations' synoptic weather station data by Met agency regularly updates NHMS organizations and other relevant stakeholders.	Coordinate MS for activating EOCs (led by Emergency management departments, Met agency, humanitarian actors) and update situation rooms with impending, ongoing hazard information.	Receive multi-hazard early warnings, information services, and advisories REC and MS level policy planning desks.	Disseminate multi-hazard early warnings, information services to MS and REC level policy planning desks.
Member States	○ Member States to develop strategy and policy for engagement of relevant stakeholders in multi-hazard risk management, risk assessment, information collection, repository development, etc. ○ Establish a coordination mechanism with local actors for tracking the multi-hazard events, collect disaster damage, loss, and needs information for developing emergency repose and recovery planning. ○ Member States to remain with RECs, AUC, ACMAD, and ICPAC Situation room's disposal for updating country-level multi-hazard risk information to situation rooms. ○ Delegating plan of actions to sector departments formulating	○ Local-level whether data acquired by Met agency, NHMS organizations. ○ Big data from social media platform and analyze key information for reporting. ○ Kmz file to locate disaster hotspot	Local-level whether data acquired by Met agency, NHMS organizations.	Receive multi-hazard early warnings, information services, and advisories.	Disseminate multi-hazard early warnings, information services, and advisories to state and non-state actors.

Entity Types	Coordination Action	Data / information requirements		Exchange mechanism	
		Date required for Multi-hazard risk mapping	Date required for Event Situation Reporting	Inbound data & information services	Outbound data & information services
	risk-informed local development planning. ○ Coordination mechanism with local media outlets(radio, newspaper, TV, community radios, radios) through a consensus-building for information exchange on multi-hazards events with situation room. ○ Coordination mechanism with local humanitarian actors group, NGOs, volunteer groups, student bridge, community level volunteers so that they can perform as social journalism, develop a polygon shape/points of disaster hotspot file with google earth and send kmz file to social media and contribute disaster event information to social media groups				

2.2 Roles of AUC for the coordination

AUC with its centralized roles to delegate responsibilities to two situation rooms (Regional RCC) e.g. ACMAD & ICPAC for developing two products "Continental Watch" on the severe weather forecast on the ahead of 5 days giving warnings based on the threshold of 5 days amount of precipitation accumulation with a projection of rainfall severity of the color-coded level of warnings and advisories on probable consequences.

Based on impact-based early warnings, AUC needs to invoke the process of event situation reporting to be formulated by ICPAC & ACMAD on the occasions of impending disaster, disaster events just occurred, and ongoing at the ground.

2.3 Roles of RECs Level coordination

In the light of the 1980 Lagos Plan of Action for the Development of Africa, the Abuja Treaty[2] proposed action for the creation of RECs as the basis for wider African integration, with a view to regional and eventual continental integration. The RECs are increasingly involved in coordinating AU Member States' interests in wider areas such as peace and security, development and good governance, and promoting climate risk governance to the member countries.[3]

AUC having 8 Regional Economic Communities (RECs) at the regional level. RECs can play important role in delegating disaster risk information repository and exchange with the respective member states (MS) and situation rooms at the country level.

The AU recognizes eight RECs :

[2] https://pmg.org.za/committee-meeting/67/
[3] https://au.int/en/organs/recs

1) Arab Maghreb Union (UMA)
2) Common Market for Eastern and Southern Africa (COMESA)
3) Community of Sahel–Saharan States (CEN–SAD)
4) East African Community (EAC)
5) Economic Community of Central African States (ECCAS)
6) Economic Community of West African States (ECOWAS)
7) Intergovernmental Authority on Development (IGAD)2
8) Southern African Development Community (SADC).

2.2 Roles of ACMAD level

ACMAD's primary role is to provide continental watch (weather forecasting) from its newly installed continental situation room to AUC. ACMAD as a continental body can incentivize the multiple meteorological products and services for tailoring to support policy and planning desk for the risk-informed development planning process for the continental actors. UNDRR established situation room for developing customized weather information and services data sources to make publicly available to interoperable formats.

ACMAD can further play an important role to encourage the member countries to incentivized the spatial risk information by the regional, national, and local authorities with higher-level or data desegregation for sectoral risk analysis and developing the coherent institutional linkage and within the guideline of Sendai Framework.

For institutional strengthening process;

- ACMAD coordination mechanism with other WMO designated RSMC/RCC for data sharing.
- Establish coordination mechanisms for data exchange with Data Collection or Production Centre (DCPC) e.g. Casablanca
- Coordination with WMO Information System (WIS) for developing and sharing global catalog services on weather information service, data exchange, management, and processing.
- Establish coordination EUMETCast for improving access to nowcasting services.
- Establish coordination with Regional Climate Outlook Forums (RCOFs) to produce consensus-based, user-relevant climate outlook products in real-time to reduce climate-related risks and support sustainable development.

2.3 Roles of ICPAC level

ICPAC already a WMO designated regional climate center and provides customized climate services to AUC and 11 East African Countries and regions deeply affected by climate change and extreme weather.

2.4 Roles of Member States :

Given that RECs policy and programming nexus with MS, the all countries remains to be as most vital forefront executing entity in undertaking policy, strategy, programming, project development , risk

informed local development planning, sector preparations in risk screening, assessment, and to invoke country-level state and non-state actors to remain operational and collect, collate and provide information on preparedness planning/contingencies of impending disasters and systematically conduct post disasters damage, need the information to MHEWS. MS to recurrently maintain contacts with national focal points, humanitarian actors, and focal points for getting regular updates and concurrently to update to RECs and AUC.

2.5 Proposed coordination mechanism with WMO designated RSMC/RCC :

ACMAD is being performed as the central continental body for coordinating the WMO level extreme weather information, effectively integrate scientific and technical inputs, and producing CW at regular intervals. Every RSMC/RCC/WIS/DCPC in Africa having particular focuses over their region. As per WMO guidelines, ACMAD remains to be communicated with those centers for getting regional outlooks and weather updates.

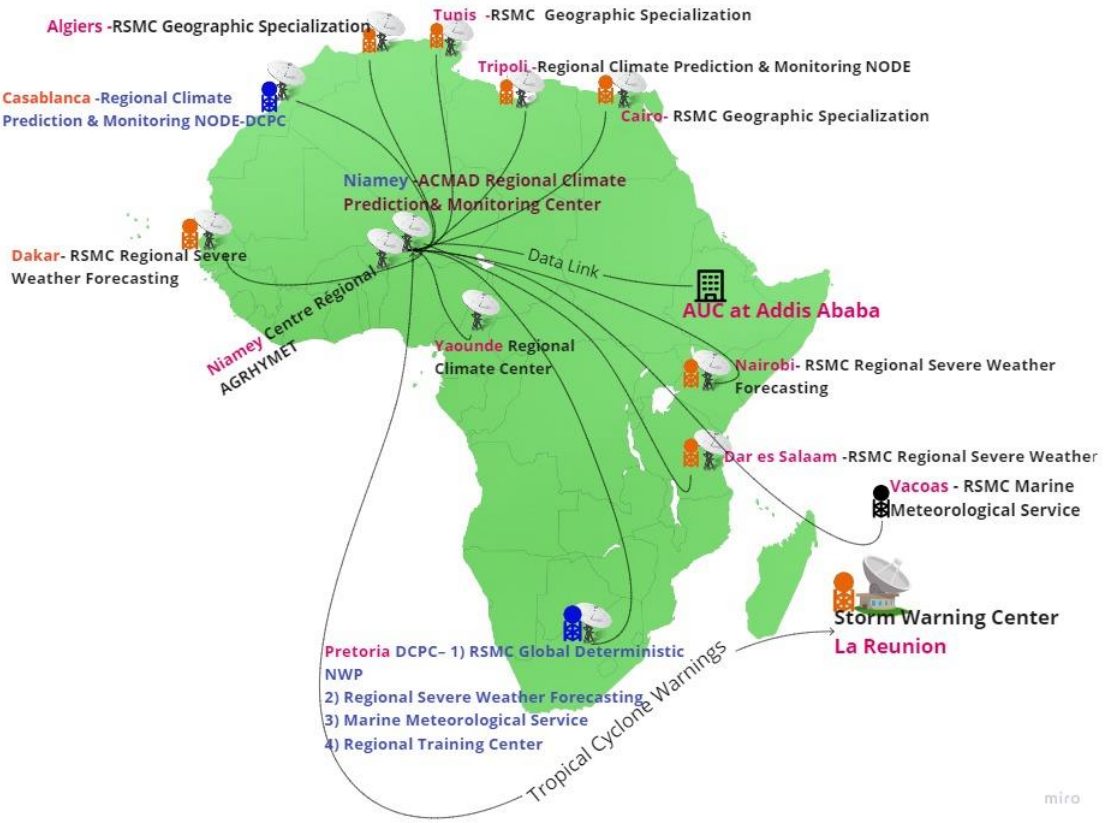


Figure 2: Proposed linkages among the WMO Regional Specialized Meteorological Centers

2.6 Principle of Coordination mechanism of data exchange

- Develop a highly professional-looking and most integrative web portal complementing the MHEWS dissemination (www.mhews.auc.int or www.mhews.int) which to be administered, content being regularly updated by AUC Situation Room/EOC at AUC.
- Disseminate most understandable, accurate, and timely CW & event situation report to designated authority and keeping it simple.

- Making messages and tools easily understandable to stakeholders and letting users provide feedback with social media.
- Situation rooms at AUC, ACMAD, ICPAC continue to support other Situation Room/EOC at RECs & Member State level
- AUC AMM to use interactive social media tools (Social media, e.g. Facebook, Twitter, WhatsApp, telegram, etc.) for a big data repository (picture, videos, description of damage). By analyzing that information, provide an accurate set of information of ongoing disaster events for reporting and next-level response planning.
- Activating and effective communication among the AUC, ACMAD, ICPAC, RECs, Member states by using email, social media communication tools, and keeping constant contact.
- Create an understandable extreme weather severity level with color-coded threshold and types of alerts, e.g. Red, Orange, Yellow for a wide range of users.
- AUC , ACMAD, ICPAC , RECs, MS, and other relevant stakeholders to remain Integrated with other alerting systems (i.e. earthquake, volcano, dust storm, drought, forest/bush fire, and health alerts) for complementing MHEWS.

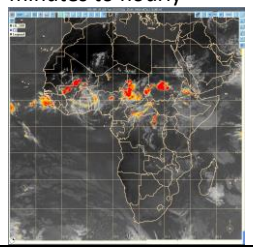
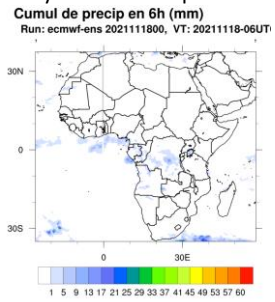
3.0 ACMAD Products and Services for Disaster Risk Management (DRM)

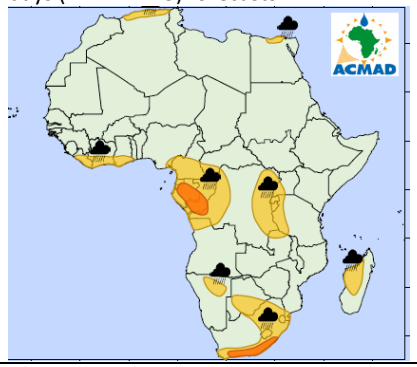
ACMAD continental watch, weather forecast products, and services provide early warning services and facilitating humanitarian response. The improved forecasts producing different range real-time and different range of forecasts (RDT, Short-range, medium-range, long-range, decadal, monthly, and seasonal) and outlooks. Standardized products having high demand of the stakeholders.

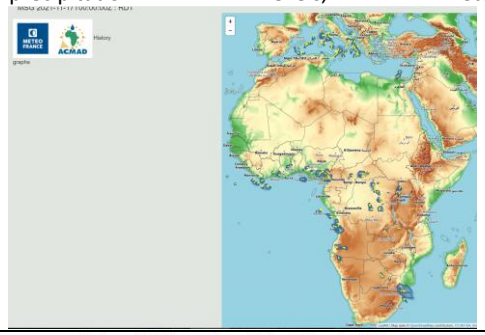
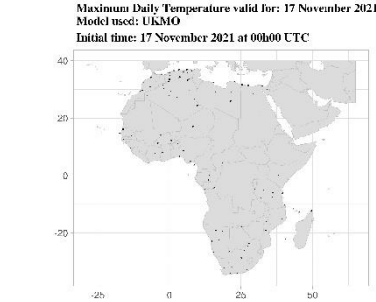
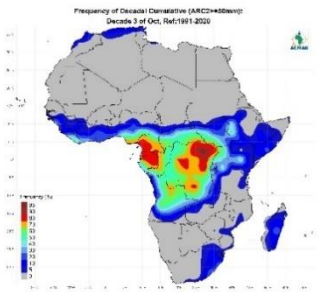
ACMAD launched continental which is impact-based forecasts for the DRM decision making. For the customized multi-hazard early warnings, a situation room is now under implementation which would be operational round the clock for DRM decision making.

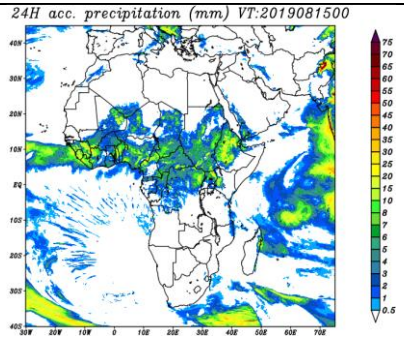
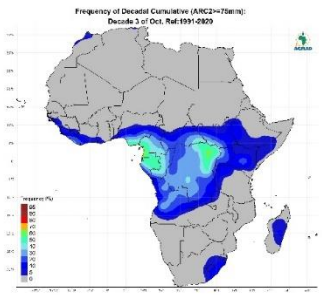
3.1 ACAMD Products and services for coordinating multi-hazard preparedness planning:

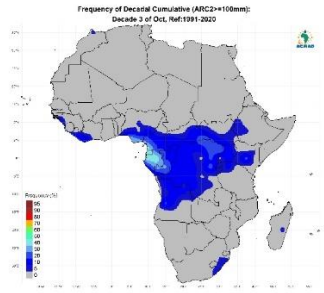
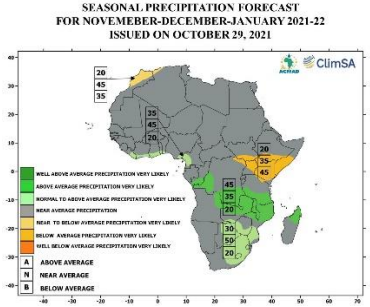
Table : ACMAD Products and services.

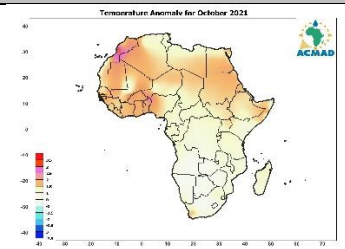
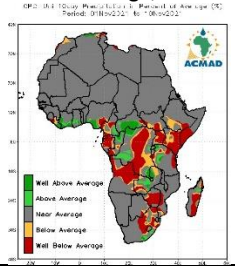
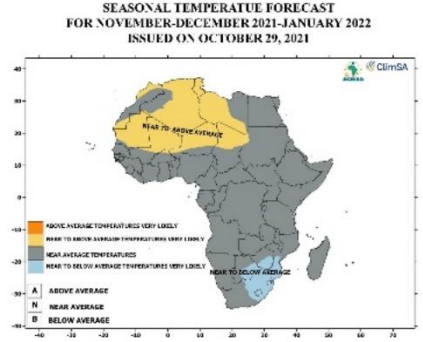
SL	Product/service types /category	Products	Description	DRM Perspective	DRM end-users
1)	**Short range forecasting (Rainfall observation of Nowcasting, Daily, Weekly)**	Nowcasting	• Observation of weather parameters in every 15 minutes to hourly 	• Every 15 minutes to hourly weather forecasting	• Local Community • Local Sectors • Local Humanitarian actors
2)	**Short rage forecasting (Rainfall observation of Nowcasting, Daily, Weekly)**	Global multimodal ensemble forecasting systems (GFS, APPAGE, UKMO, ECMWF, ICON, AVERAGE)	• Every 6-72 hours updates weather updates 	• Multi-hazard early warning, multi-hazard preparedness, contingency planning.	• IFRC, • UN-OCHA, • UN Agencies • National Disaster Operations Center, • national Disaster Management Organizations(NDMO) • Emergency Operations Center(EOC), • National Meteorological & Hydrological Services(NMHS), • Humanitarian Actos • Vulnerable sectors, • vulnerable community

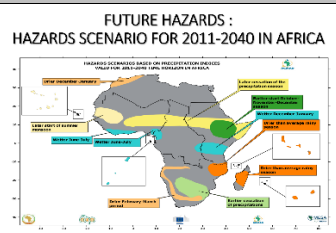
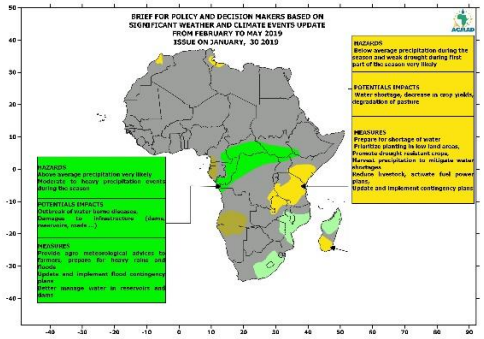
SL	Product/service types /category	Products	Description	DRM Perspective	DRM end-users
		Daily observed rainfall	 24 hours of observation of rainfall from WMO synoptic stations.	Flood/flash flood forecasting	• Facilitate IFRC, UN-OCHA for flash flooding preparedness • Met Agency to forecast on thunderstorm with special weather bulletin • National Disaster Management Organizations(NDMO) , Emergency Operations Center(EOC) for the issue early warning and preparedness. • National Meteorological & Hydrological Services(NMHS) for flash/riverine floods warning. • Humanitarian Actos for pre-positioning the reliefs • Vulnerable sectors(Agriculture, water, health, livelihood) for early preparedness vulnerable community for early preparedness
		Numerical Weather Prediction (NWP) model outputs (D1, D2 and D3 rain accumulation forecast), ITD positions (D1 up D3), and other relevant outlooks.	• Ensemble various models and develop daily, 3 days (D1+D2+D3) forecasts 	Important forecast for DRM actors with weather bulletin on precipitation amount, temperature, relative humidity.	• Facilitate IFRC, UN-OCHA for flash flooding preparedness • Met Agency to forecast on thunderstorm with special weather bulletin • National Disaster Management Organizations(NDMO) , Emergency Operations Center(EOC) for the issue early warning and preparedness. • National Meteorological & Hydrological Services(NMHS) for flash/riverine floods warning. • Humanitarian Actos for pre-positioning the reliefs • Vulnerable sectors(Agriculture, water, health, livelihood) for early preparedness vulnerable community for early preparedness
		Rapidly Developing Thunderstorm (RDT) and rapid on-set weather events.	• Tracking rapid on-set weather systems (Rapidly Developing Thunderstorm (RDT) , projected	Daily forecast on thunderstorm\ High convective with overshooting top , August month	• Facilitate IFRC, UN-OCHA for flash flooding preparedness • Met Agency to forecast on thunderstorm with special weather bulletin • National Disaster Management Organizations(NDMO) , Emergency Operations Center(EOC) for the issue early warning and preparedness. • National Meteorological & Hydrological Services(NMHS) for flash/riverine floods warning. • Humanitarian Actos for pre-positioning the reliefs

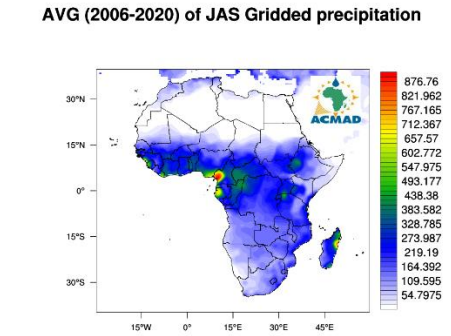
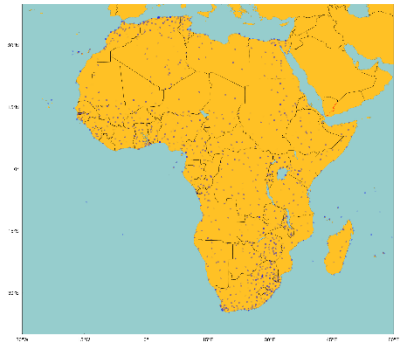
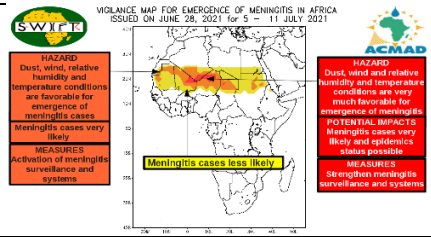
SL	Product/service types /category	Products	Description	DRM Perspective	DRM end-users
			precipitation levels, etc. 		• Vulnerable sectors (Agriculture, water, health, livelihood) for early preparedness • vulnerable community for early preparedness
		Maximum daily temperature		Map on maximum temperature distribution for projecting heatwaves	• Vulnerable sectors (Agriculture, water, health, livelihood) for early preparedness • vulnerable community for early preparedness
		Short range forecasting (Rainfall observation of Nowcasting, Daily, Weekly) :	Frequency of Decadal Cumulative (ARC2>= 50mm) reference period 1991-2020  Map showing the % frequency of rainfall incidence above 50mm	Area of extent under identified where rainfall goes over 50mm for the 10 days and undertake preparedness.	• IFRC, • UN-OCHA, • UN Agencies • National Disaster Operations Center, • national Disaster Management Organizations(NDMO) • Emergency Operations Center(EOC), • National Meteorological & Hydrological Services(NMHS), • Humanitarian Actos • Vulnerable sectors, vulnerable community

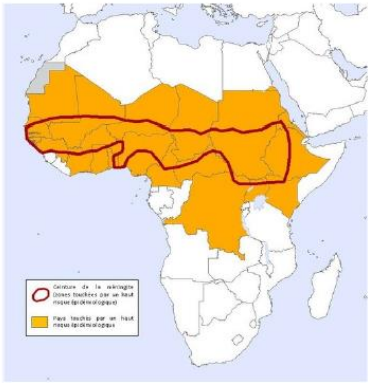
SL	Product/service types /category	Products	Description	DRM Perspective	DRM end-users
3)		Heavy Rainfall/Flash Flood Bulletin #349		Heavy Rainfall distribution map expected to be supporting preparedness and contingency planning	• Facilitate IFRC, UN-OCHA for flash flooding preparedness • Met Agency to forecast on thunderstorm with special weather bulletin • National Disaster Management Organizations(NDMO) , Emergency Operations Center(EOC) for the issue early warning and preparedness. • National Meteorological & Hydrological Services(NMHS) for flash/riverine floods warning. • Humanitarian Actos for pre-positioning the reliefs • Vulnerable sectors(Agriculture, water, health, livelihood) for early preparedness • vulnerable community for early preparedness
4)		Rainfall variability	Frequency of Decadal Cumulative (ARC2>= 75mm) reference period 1991-2020  Map showing the % frequency of rainfall incidence above 75mm	Area of extent under identified where rainfall goes over 75mm and undertake preparedness and contingency planning.	• Vulnerable sectors(Agriculture, water, health, livelihood) for early preparedness • vulnerable community for early preparedness
5)		Rainfall variability	Frequency of Decadal Cumulative (ARC2>= 100mm) reference period 1991-2020	Area of extent under identified where rainfall goes over 100mm and undertake preparedness and contingency planning..	• Vulnerable sectors(Agriculture, water, health, livelihood) for early preparedness • vulnerable community for early preparedness

SL	Product/service types /category	Products	Description	DRM Perspective	DRM end-users
			 Map showing the % frequency of rainfall incidence above 100mm		
6)		Seasonal Precipitation Forecast for Nob-Dec-Jan 2021-22	Seasonal precipitation forecast for Nov-Dec-Jan 2021-22  Map showing the % rainfall incidence over the period	Identify risk of agriculture, health, water, natural resource and environment resource sectors.	• Vulnerable sectors(Agriculture, water, health, livelihood) for early preparedness • vulnerable community for early preparedness
7)		Monthly temperature anomaly	Temperature anomaly for October 2021	Identify risk of agriculture, health, water sectors.	• Vulnerable sectors(Agriculture, water, health, livelihood) for early preparedness • vulnerable community for early preparedness

SL	Product/service types /category	Products	Description	DRM Perspective	DRM end-users
			 Map showing the % rainfall incidence over the period		
8)	Medium-range Forecasts	10-days climate diagnostic bulletin	• CPC 10 Days Precipitation % of average – Period 01 November – 10 November 2021. Map showing the distribution of rainfall over the continent well above average, above average, near average, below average, well below average. 	Map showing rainfall variability of 10 days and identify the regions where it is less and impacting the sectors and livelihoods . Identify risk of agriculture, health, water, natural resource and environment resource sectors.	• Vulnerable sectors(Agriculture, water, health, livelihood) for early preparedness • vulnerable community for early preparedness
9)	Long range forecast product for Africa Valid for October -Nov-Dec 2021 / Dec- Jan 2022	Seasonal Temperature forecast for Nov-Dec 21/-Jan – Feb 2022	Temperature forecast  Map showing near above average temperature	Temperate anomaly that can Impact agriculture, health, water sectors.	• Vulnerable sectors(Agriculture, water, health, livelihood) for early preparedness • vulnerable community for early preparedness

SL	Product/service types /category	Products	Description	DRM Perspective	DRM end-users
10)	Future hazard map of Africa	Hazard scenario for 2011 -2040 in Africa	 Map showing the drier and wetter	Map showing drier part areas, season delay areas, early season rainfall, drier than average rainy season, drier period , cessation of precipitation, wetter areas.	• Vulnerable sectors(Agriculture, water, health, livelihood) for early preparedness • vulnerable community for early preparedness
11)	Hazard map of Africa	No of Rainy days Frequency of heavy rainfall 20m - 50mm Daily rainfall		Understanding the rainfall pattern , frequency of rainfall occurring which expected to be understing the reinfall regime what understanding the water dependent sectors could be impacting.	• Vulnerable sectors(Agriculture, water, health, livelihood) for early preparedness
12)	Policy Brief statements for the region and sub-regions	Rainfall anomaly map			• Vulnerable sectors(Agriculture, water, health, livelihood) for early preparedness • vulnerable community for early preparedness

SL	Product/service types /category	Products	Description	DRM Perspective	DRM end-users
13)		Gridded Precipitation		Precipitation distribution map	• Vulnerable sectors(Agriculture, water, health, livelihood) for early preparedness • vulnerable community for early preparedness
14)		ARC2 seasonal cumulative rainfall, onset & distribution			• Vulnerable sectors(Agriculture, water, health, livelihood) for early preparedness • vulnerable community for early preparedness
15)	Long Range Map	Meningitis vigilance Map		Identifying the area of extent falling under emergency meningitis infection	• Health Sector • Vulnerable Community • IFRC, • UN-OCHA,

SL	Product/service types /category	Products	Description	DRM Perspective	DRM end-users
16)	Long Range Map	Meningitis vigilance Map	 FIGURE 1 – African Meningitis Belt.	Identifying the area of extent falling under emergency meningitis infection	• Health Sector • Vulnerable Community • IFRC, • UN-OCHA, •
17)	Other Long range forecasting	a) Monthly bulletin b) seasonal precipitation forecast , c) Seasonal temperature forecast map, d) African seasonal precipitation average map (125%), e) African seasonal precipitation average map (75%), f) Seasonal climate forecast bulletin (RCC), g) Monthly Climate Diagnostic bulletin for Africa (RCC), h) Ten Day Climate Watch Bulletin (RCC) i) Accumulated Rainfall Forecast	1) Seasonal precipitation forecast map, Seasonal temperature forecast map, African seasonal precipitation verge map, Significant weather and climate events map, climate hazards map, seasonal precipitation and temperature forecast map, significant weather and climate event expected map, seasonal map of the performance of precipitation 2) Observed Decadal precipitation map in percent of average, 3) observed and forecasted week ahead for precipitation (precent of average from week -1 to week -4 and dekad -1 to dekad -3 with the latest models forecast), 3. precipitation map in percent of average from 1 to 2 months		• IFRC, • UN-OCHA, • UN Agencies • National Disaster Operations Center, • national Disaster Management Organizations(NDMO) , • Emergency Operations Center(EOC), • National Meteorological & Hydrological Services(NMHS), • Humanitarian Actos • Vulnerable sectors, •vulnerable community

SL	Product/service types /category	Products	Description	DRM Perspective	DRM end-users
			4) weekly and monthly sst anomaly observation and forecast, 5) week1, 2 and 3 Velocity potential anomalies, precipitable weather and anomalies forecast, 6) Hove Moller diagram of velocity potential anomalies, 7) MJO observation and forecast, 8) OLR anomalies, 9) Streaming function and anomalies observed weeks -1, -2, -3, and -4 and forecast week1, 2, 3 and 4, 9.mean sea level pressure and anomaly map, 10) Observed mean geopotential at 500 hPa and anomaly map, 11) The mean position of ITD, CAB and ITCZ map, 12) Mean wind at 700 hPa, 850 hPa and 500hpa with geopotential, 13) Dekadal dust loading map, 14) Surface dust concentration map, 15) Mean wind at 200 hPa, observed and forecast for week 1, 2 and 3 ahead for relative humidity and anomaly at 700 hPa and 850, 16) Winds and geopotential forecast at 850, 700 and 500hpa for weeks 1 and 2, 17) Forecast map divergence for week 1 and 2, 18) weekly precipitation forecast maps 'week1 and moisture change, 19) Past weeks 1-, 2- -3 -4 velocity potential and anomalies and total precipitable water anomalies, 20, Cumulative precipitation time series up to current date and forecasts for 3 weeks ahead or 21 days ahead with means GEFS, mean ECMWF S2S ensembles, total deterministic medium to long range forecast		
18)	Other Customized products	1) Continental Seasonal Climate Forecast Bulletin (Long Range Forecast Bulletin)			• IFRC, • UN-OCHA, • UN Agencies • National Disaster Operations Center,

SL	Product/service types /category	Products	Description	DRM Perspective	DRM end-users
		2) Continental drought watch bulletin 3) Brief Summary for policy and decision makers on climate watch 4) Summary for policy and decision makers on drought watch 5) Regional climate outlook statements and fora reports 6) Technical note on Drought monitoring and continental seasonal forecasts 7) Drought monitoring and continental seasonal climate forecast bulletin for DRR 8) Annual Significant weather and climate events 9) Climate outlook verification 10) African Monsoon 11) Mean wind at 200 hPa 12) Precipitation in percent of average			• national Disaster Management Organizations(NDMO) • Emergency Operations Center(EOC), • National Meteorological & Hydrological Services(NMHS), • Humanitarian Actos • Vulnerable sectors, • vulnerable community

4.0 Data Dissemination & Feedbacks Receiving Mechanism

The most important element of communication for coordination mechanism data exchange and to reaching out to target stakeholders and remaining them with the coordination and exchange loop. The African continental multi-hazard contexts are so diverse in terms of landscape, extreme weather phenomena, risks, and vulnerabilities, diverse and most erratic weather system of the globe. As a result, the extreme weather events over the continent are highly rapid on-set, recurrent and larger extent of damages being done. Stakeholders and vulnerable communities remain to be hopeless in addressing the multi-hazards trauma.

Accurate and timely access to impact-based multi-hazards early warnings can minimize loss and damage at the local level. The process is reiterative, interactive, and opened ended nature of the modality for keeping last-mile informed and interactively being learned lessons from them, and being informed by them how to formulate forecast-based appropriate intervention response planning. Understanding community vulnerabilities are a difficult process because of the diverse landscape and topographical context. However, the myDEWETRA platform provided input datasets that can easily be interpreted with GIS software for community and other multiple levels of vulnerabilities. The platform having the interface of a multi-hazard **alerts system** for the larger audiences, and that can be utilized for the dissemination of the MHEW information.

4.1 The necessity of launching MHEWS web portal

To date, AUC not having a classified MHEWS web portal for disseminating only the multi-hazards, their impacts, and advisories for the decision-making desks, which is now an urgent requirement. The highly programmatical web portal will be able to capture the feeds information from local level actors. Proposed web portal address e.g. www.mhews.auc.int or www.mhews.int

4.2 Social journalism/Citizen through social media

Using the social media platform for ensuring inclusive participation in the hybrid feeding back processes through the social journalism media model that consists of a wide range of contributors and readers in the network. The social journalist can be involved to capture the photographs and videos of the on-set disaster events and to post the social network (Facebook group/page, Twitter group, Telegram, LinkedIn Group, etc.) as big data for further analysis and decision making.

4.3 Messaging with Telegram Apps

This app user can provide feeds back to the circulated early warnings. AUC media monitor and situation room to create the user group for disseminating information and taking feedbacks.

4.4 Instance Messaging, voice /video calling :

These are the most important and useful tools for live chatting and watching the ground-level disaster damage and impact scenarios by using WhatsApp group, Facebook group, Telegram group, and other

IM tools. Those tools are expected to be enabled media monitors to capture remote and hard-to-reach area information.

4.5 Uses of national media outlets and Community Radio

This is the most comprehensive and affordable means of communication are the national radio, Television, cell broadcasting, cell phone Interactive voice response (IVR), and most importantly Community radios, which can be called as lifeline of the information accessing modality. Member States can vastly rely on Community radio for bridging the last mile information dissemination gaps.

4.6 Some simplified users of MHEWS

Policy Makers. This group is comprised of RECs policy desks, MS level national and local governments, sector departments, NHMS, and other relevant policy intuitions.

Local vulnerable communities: This group is comprised of smallholder farmers, vulnerable communities, etc.

Farmers: This target group is comprised of crop farmers, smallholder farmers, industrialized farmers, pastoralists (livestock herders), fishermen, and rural enterprises. This target group has multiple needs for weather and climate information. It can save lives, contain losses, increase productivity and reduce risk. Reaching rural farmers is a challenge, Internet communication is virtually impossible, literacy is low, and there are regional and village-level cultural and language differences. (community radio could be useful)

Private Sector. Private sector enterprises benefit from tailored weather information to protect human and physical resources and make climate-smart business decisions, they can also play a role in disseminating messages.

4.7 Recommendations

In addition to the proposed coordination mechanism, the necessity of need-based and impact-based MHEWS is mounting with the given changing erratic weather pattern. MHEWS It is an essential instrument to keep the relevant audiences informed about the impending hazards. The following can be considered for making CW and event situation reporting and issuing MHEWS at a robust level;

1. Establish effecting coordination mechanism (as of figure 1) for accessing the extreme weather parameters and developing standard CW and effective communication with focal points for accessing local level disaster event, damage & loss, and humanitarian needs information for making an event situation immediately after a disaster occurs and anticipated impending event of disasters
2. ‘Networking all EOCs, NHMS organizations, Met Agencies and create linkage for data exchange
3. Networking country level national medias, Radio, Community Radios, TV and linking with AMM for news feeding on disaster events.
4. Establish myDEWETRA platform for developing impact-based forecasting products (CW), alerting.
5. Establish Coordination among WMO regional centers (as of figure 2) for region-specific extreme weather information exchange with AUC and other situation rooms.

6. Develop a Disaster risk management (DRM) and MHEWS framework on how to complement an actionable MHEWS for stakeholders.
7. Develop online portal on MHEWS
8. Develop social media platform for information dissemination and coordination.
9. Delegating the job to RCCs(ACMAD & ICPAC) for developing severe weather forecasts, multi-hazard situation reporting.
10. Implying policy advocacy of multi-hazard risk screening, data capture, information coordination
11. Improving Africa Media Monitor (AMM) Structures, Procedures, Service automation
12. Establishing and functioning interactive social networking platform for inclusive participation and information exchange, the early warnings dissemination process
13. Implying policy advocacy of multi-hazard risk screening, data capture, information coordination
14. Putting policy regulation to member states to establish coherent coordination mechanism under standing orders on disaster (SoD) for exclusive engagement of DRM stakeholders & actors, the private sector, NGOS, social services organizations, and the civil society as partners for incorporating inputs to MHEWS as a way to ensure their long-term sustainability.
15. Improving Africa Media Monitor (AMM) Structures, Procedures, Service automation
16. Developing a disaster event database on Africa on past disasters
17. Develop a digital library of disaster event information.
18. Establishing and functioning interactive social networking platform for inclusive participation and information exchange, the early warnings dissemination process