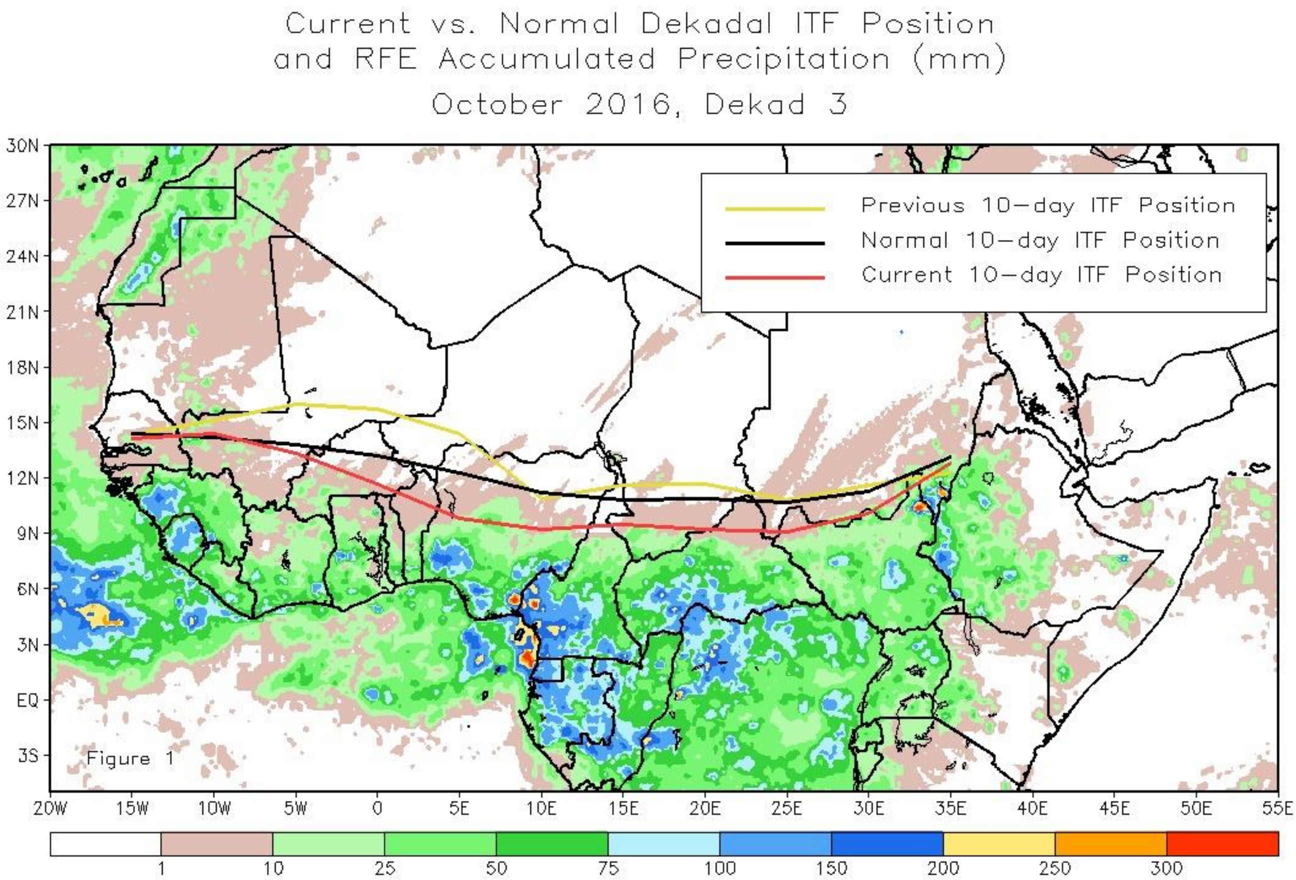
REPORT OF ACMAD STAKEHOLDERS CONFERENCE:
CASE STUDY/ISACIP
"FINAL PROJECT ASSESSMENT WORKSHOP"

Held from 15th – 16th December 2016, Accra - Ghana



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A. BACKGROUND

Institutional functional relationships must mirror the dynamics of climatic flux at various spatial scales namely, global, continental, sub-regional and national. It is well known that Africa is characterized by extreme climatic zones; from humid equatorial and tropical zones through the semi-arid to the arid North, creating about seven distinct hydro-climatic zones. Each year, the rainbelt, driven by the ITCZ, moves northwards up into sub-Saharan Africa (by around August), and then moves back southwards into sub-central Africa (by March). Equatorial Africa remains in the rainbelt throughout the year, which is why this region is the wettest part of the continent. It is a well-known fact that rainfall is distributed very unevenly in Africa with most areas receiving either too much rain or too little. Lack of coherent data and knowledge pose serious problems of prediction of these erratic rainfall variations, which are triggered by the movements of the Inter-Tropical Convergence Zone (ITCZ) over the continent. The seasonal rainfall amounts over Africa are basically attributed to the position of the Inter-Tropical Front coupled with the strengths of the southwesterly monsoons and the upper easterly air currents, and accentuated by local physiographic and orographic conditions.

The effectiveness of data collection networks for meteorological and hydrological processes must be measured by the efficiency of prediction of climate dynamics and water availability and the general reduction of the uncertainties inherent in the quantitative perception of the climate and water cycle elements. The information content of data is directly related to their time and space sufficiency and the longer the time series, the lower the variance and hence the more knowledge they contribute towards the understanding of the physical phenomenon. The main source of loss of knowledge is therefore that of sampling of hydroclimatic variables in both space and time over a given territory. This is primarily due to the contradiction between the mode of occurrence of the physical phenomenon and the mode of measurement used in practice. The problem of space sampling in general does not depend upon the type of instruments used but rather on the particular process under examination. For example, rainfall is a spatial process while the mode of measurement with a rain gauge is at a point and it is also still difficult and expensive to have continuous measurement of discharge in the form of the mostly needed time series. Such data collected are therefore sample data and only pertain to small areas or points within the territory. In the case of temporal sampling, the use of continuous monitoring instruments will overcome many of the problems of sampling in time. Due to inadequacies in data collection both in terms of spatial coverage and in the length of data time series, there is a general lack of knowledge on the hydroclimatic processes on which depends largely sustainable development. This continuous loss of knowledge leads to increased uncertainties in the assessment and prediction of vital elements of the climate processes and the hydrological cycle.

Statistical analysis may be required to assess the reliability of data in time and to synthesise and generate long-term records from a short period of measurement. Such deficiencies in data lead to two fundamental types of loss of knowledge in climatological and hydrological data collection practices, which can be considered as objective and subjective. Objective loss of knowledge would comprise the technological constraint of measuring spatial processes with point methods (e.g. Rainfall and evaporation) and short records due to late inception of measurement activities. On the other hand, sources of subjective loss of knowledge normally depend on the capacity of a given society to adequately confront the socioeconomic weight of running an adequate and efficient data collection network. The lack of adequate financial resources therefore brings about subjective loss of knowledge.

It is therefore imperative for African countries to harmonise and reinforce data collection networks that would be useful to the analysis of large-scale climatic anomalies and their possible teleconnections over the continent in order to confront the erratic nature of the climatic variations over the continent which invariably lead to uneven distribution of freshwater resources.

Up to date knowledge bases and modern technologies are needed for:

- the development of an integrated perception of the interconnected processes underlying the climatic fluxes and the hydrological cycle;
- the quantification of the elements of the weather and climate dynamics and the hydrological cycle at all scales and their interrelations, much needed for the planning, design and operation of water resources projects and for various applications in agricultural and environmental activities;
- hydrometeorological data collection, management and network design, and also for the monitoring of processes such as climate change, desertification, freshwater availability, environmental degradation and natural disaster prevention;
- information communication towards enhancing the growing role of the public in water decision making.

As at present, the National Meteorological and Hydrological Services (NMHSs) function in all countries in Africa as primary producers of data and weather forecasts with different levels of operational efficiency and under different legal institutional frameworks as either a service, agency or authority. The degree of their autonomy depends on their legal status which in turn defines their funding levels. There are also sub-regional climate institutions (RICs) and a continental institution, African Centre of Meteorological Applications for Development (ACMAD) which amongst others are responsible for sub-regional and regional synthesis of weather and climate information. ACMAD is presently in the process of forging functional relationship with its primary partners, the sub-regional centres and the NMHSs through a framework of complementarity and subsidiarity. ACMAD is also seeking legal and technical relationship with the African Union Commission (AUC), possibly through any organ of the AUC like the African Ministerial Conference on Meteorology (AMCOMET).

B. ACMAD STAKEHOLDERS CONFERENCE CASE STUDY/ISACIP
"Final Project Assessment Workshop"
December 15 to 16, 2016

The ever growing demand for timely and reliable weather and climate data and information due to the intensifying climate variability and change affecting many African countries is posing many challenges to meteorological and hydrological institutions at all levels. This dynamic situation in turn places a higher level of responsibility on the African Centre of Meteorological Applications for Development (ACMAD) as a continental institution, sub-regional weather and climate centres and National Meteorological and Hydrological Services (NMHS). ACMAD recognises the urgent need to establish a functional relationship with other weather and climate institutions in order to streamline activities and programmes across the continent with regard to operations, research and applications of meteorological data and information. A conscientious effort is also needed amongst all stakeholders to create a matrix of activities towards reduction of duplication of actions at various institutional levels. It is in this light that ACMAD convened the present stakeholders' conference to seek consensus on a proactive functional relationship across the climate-based value chain of activities and responsibilities within an institutional framework under which ACMAD could exercise its coordinating role. ACMAD can then position itself with respect to continental policy institution like the African Ministerial Conference on Meteorology (AMCOMET), the African Union Commission (AUC) and at the global level with the World Meteorological Organisation (WMO).

1. Objectives

The objective of the conference was to establish structures that will ensure functional complimenting roles between ACMAD and the other climate institutions on the continent on one hand, and to create an appropriate framework for the climate community to effectively engage the research and applications communities.

The specific objectives of the conference were to:

- ensure ACMAD establishes a mechanism to deliver demand driven services
- have institutions agree on structure/mechanism for working with ACMAD vis-à-vis their mandate, mission and vision
- have institutions agree on mechanism to implement structures that are currently not being implemented
- have the institutions clearly identify areas of potential competition and propose ways to transform them into complimenting roles.
- have institutions clearly identify areas of potential collaboration and propose appropriate structures for implementation
- have a clear structure on how the meteorological, applications and research communities should work at continental, regional and national levels.
- revisit governance and management structure of ACMAD

2. **Presentations and Discussion**

The conference was planned to cover two issues, namely functional relationship between ACMAD stakeholders and a final assessment of the Institutional Support to African Climate Institutions Project (ISACIP) financed by the African Development Bank (AfDB). Presentations centred around thematic and institutional aspects of functional relationships between regional, sub-regional and national dynamics of climate fluxes and institutions. After the presentations on the strengths and weaknesses in the implementation of the project ISACIP1 and the expectation for its continuation as ISACIP2, the conference was transformed into two Breakout Groups tasked to come out with two independent recommendations. After thorough examination and discussions, the leaders of the groups were charged to merge the two sets of recommendations into one document, taking into considerations the points raised by the plenary session. The conference finally adopted the final version of the recommendations and the resolutions therefrom as the final outcome of the conference.

I. The relationship between WMO, AMCOMET, ACMAD

The dynamic relationship between global climatic circulation and the climatic fluxes over the African continent sets the pace for a functional relationship between the World Meteorological Organisation (WMO) and continental climate and weather institutions in Africa, such as African Ministerial Conference on Meteorology (AMCOMET) and African Centre of Meteorological Applications for Development (ACMAD).

a. World Meteorological Organization (WMO)

The World Meteorological Organization (WMO) is an intergovernmental organization with a membership of 191 Member States and Territories. It originated from the International Meteorological Organization (IMO), which was founded in 1873. Established in 1950, WMO became the specialised agency of the United Nations for meteorology (weather and climate), operational hydrology and related geophysical sciences and is a member of the United Nations Development Group. It is the UN system's authoritative voice on the state and behavior of the Earth's atmosphere, its interaction with the oceans, the climate it produces and the resulting distribution of water resources.

The Organs of WMO comprise:

- The World Meteorological Congress which determines the policy of WMO and meets every four years. Each Member country is represented by a Permanent Representative with WMO. The Permanent Representative is in most cases the director of the National Meteorological or Hydrometeorological Service.
  - The Executive Council (EC) implements Congress decisions and meets once a year.
  - Six regional associations for addressing regional concerns
  - Eight technical commissions provide technical recommendations for WMO and the national services.
  - The secretariat headed by the Secretary-General coordinates the activities of WMO with a regular staff of more than 250 employees.

Functions of WMO

The World Meteorological Organization provides a framework for international cooperation in the development of meteorology and operational hydrology and their practical application and has been playing a unique and powerful role in contributing to the safety and welfare of humanity. Under WMO global leadership, National Meteorological and Hydrological Services contribute substantially to the protection of life and property against natural disasters, to safeguarding the environment and to enhancing the economic and social well-being of all sectors of society in areas such as food security, water resources and transport.

The WMO and United Nations Environment Programme (UNEP) jointly created the Intergovernmental Panel on Climate Change (IPCC). It is also directly responsible for the creation of the Global Atmosphere Watch (GAW). The IPCC has received the Nobel Peace Prize in 2007 "for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change." WMO promotes cooperation in the establishment of networks for making meteorological, climatological, hydrological and geophysical observations, as well as the exchange, processing and standardization of related data, and assists technology transfer, training and research. It also fosters collaboration between the National Meteorological and Hydrological Services of its Members and furthers the application of meteorology to public weather services, agriculture, aviation, shipping, the environment, water issues and the mitigation of the impacts of natural disasters.

WMO facilitates the free and unrestricted exchange of data and information, products and services in real- or near-real time on matters relating to safety and security of society, economic welfare and the protection of the environment. It contributes to policy formulation in these areas at national and international levels. In the specific case of weather-, climate and water-related hazards, which account for nearly 90% of all natural disasters, WMO's programs provide vital information for the advance warnings that save lives and reduce damage to property and the environment. WMO also contributes to reducing the impacts of human-induced disasters, such as those associated with chemical and nuclear accidents, forest fire and volcanic ash. Studies have shown that, apart from the incalculable benefit to human well-being, every dollar invested in meteorological and hydrological services produces an economic return many times greater, often ten times or more.]

WMO plays a leading role in international efforts to monitor and protect the environment through its programs. In collaboration with other UN agencies and the National Meteorological and Hydrological Services, WMO supports the implementation of a number of environmental conventions and is instrumental in providing advice and assessments to governments on related matters. These activities contribute towards ensuring the sustainable development and well-being of nations.

WMO Regional Office for Africa (Region I)

The WMO Regional Office for Africa (RA1) is part of the Development and Regional Activities Department. Many Africans live in areas that are prone to droughts, floods and famine or disease outbreaks. Climate-related impacts are likely to impose additional pressures on vital sectors such as agriculture, health and water, exacerbated by development challenges, limited funding and infrastructure, and ecosystem degradation. These, in turn, lessen Africa's adaptive capacity, increasing its sensitivity to projected climate change. Strengthening the National Meteorological and Hydrological Services (NMHSs) to provide better climate services will enhance the adaptive capacity of African countries to some of the projected impacts. Incorporating better climate risk management into development policies and strategies will enhance socio-economic development and improve the well-being of African peoples.

b. African Ministerial Conference on Meteorology (AMCOMET)

In response to major challenges related to the delivery of weather and climate services in Africa, the **African Ministerial Conference on Meteorology** (AMCOMET) was initiated as a permanent forum where African ministers convene every two years to discuss policy matters related to the development of meteorology and its applications and its contribution to the socio-economic development in Africa.

The First Conference of Ministers Responsible for Meteorology in Africa, took place in April 2010, in Nairobi, Kenya. The Conference established AMCOMET as a high-level policy mechanism and the intergovernmental authority for the development of meteorology and its applications in Africa, through the adoption of the Nairobi Ministerial Declaration. It is also noted that AMCOMET has been jointly established as a high-level mechanism by the World Meteorological Organization and the African Union (AU) to support its Member States in addressing the major challenges related to the delivery of weather and climate services in Africa for the development of meteorology and its applications on the Continent

While meteorology is known first and foremost for its contribution to safe and regular air and sea transport, it does have several other essential functions: it helps farmers to produce more and better, helps to combat diseases such as malaria and meningitis, and saves many human lives by disseminating early warnings of floods and droughts. The delivery of tailor-made weather, climate and water services is increasingly needed to ensure food security, improved water management, disaster risk reduction and better health. This is the rationale for the establishment of AMCOMET as the authority that fosters political will to strengthen National Meteorological Services to enable them to fully perform their roles as a fundamental component of the national development infrastructure and a major contributor to economic and social development.

AMCOMET's **key objectives** are to promote political cooperation and streamline policies at a pan-African level and advocate for sound decision-making based on robust science. AMCOMET will consolidate and build on previous achievements to further promote the effective use of weather and climate products and services that meet end-user requirements to help achieve the Sustainable Development Goals. The vision of AMCOMET is to create a framework to promote cooperation, security, socio-economic development and poverty eradication on a pan-African level through sound governance of the science of meteorology and its related applications. The mission of AMCOMET is to provide political leadership, policy direction and advocacy in the provision of weather, water and climate information and services that meet sector specific needs; i.e. agriculture, health, and disaster risk reduction to name a few.

In order to enhance its effectiveness and visibility on the continent, AMCOMET has set up a Task Force to align itself with the Specialised Technical Committees (STC) of AUC and to also advocate for the establishment of a sub-committee on Meteorology under the STC and suggest to add "Weather and Climate" in the title of the STC

c. African Centre of Meteorological Applications for Development (ACMAD)

ACMAD is the Weather and Climate Centre with African continental competence. It was created in 1987 by the Conference of Ministers of the United Nations Economic Commission for Africa (UNECA) and the World Meteorological Organisation (WMO). ACMAD has been operational in Niamey since 1992. ACMAD is composed of 54 Member States, the 54 countries of "Africa" continent. To ensure its mission, ACMAD functions primarily with meteorologists detached by its Members States.

Missions of ACMAD

ACMAD's mission is the provision of weather and climate information and for the promotion of sustainable development of Africa (notably within the context of national strategies for poverty eradication), in the fields of agriculture, water resources, health, public safety and renewable energy. ACMAD carries out its mission through; capacity-building for the 54 National Meteorological Services (NMSs) of its Member States, in weather watch and prediction, climate monitoring and prediction, transfer of technology (telecommunications, computing and rural communication) and in research. Moreover, ACMAD encourages the NMSs to prepare strategic development plans which integrate new African initiatives (NEPAD, regional integration) and the socio-economic conditions related to the changing global environment (post Rio Conventions, Kyoto Protocol). In the execution of its action programmes, ACMAD operates in synergy and in a network with its focal points, the National Meteorological Services of 54 African states and various partners, including regional economic communities, African and foreign weather and climate institutions.

To achieve its objectives, ACMAD:

- prepares and disseminates products and services;
- Ensures development and transfer of tools and technology to NMHSs;
- monitors communications with users notably in rural communities;
- networks with NMHSs and regional development aid institutions;
- provides a window to technology partners, under conditions which are typical of the African situation;
- supplements Member States' and partners contributions through a Resource Mobilisation policy;
- is a «nursery» for sustainable development of Africa;
- for ACMAD, weather, climate and the environment are resources for development;

II. African Framework for Functional Relationship between Climate Institutions

The existing climate institutions operate in discrete manner instead of the dynamic continuum flux of the continental air circulation. At best, they find their coordination externally within the governance structures and activities of the World Meteorological Organisation and sometimes through their participation in international projects.

a. The Issue: Functional Relationship

ACMAD needs to work with continent wide major climate stakeholders to ensure that the National Meteorological and Hydrological Services (NMHSs) make the desired impact in their respective countries. However, the various partnerships, framework or structures to ensure effective operations between ACMAD and the stakeholders are not well established and clear enough to all the partners. ACMAD is therefore spearheading a process to revisit its functional relationship with the partners. The primary partners are the sub-regional climate institutions such as the Network of North African climate centres, AGRHYMET (West Africa), Intergovernmental Authority on Development (IGAD) Climate Prediction and Applications Centre, ICPAC (East Africa), Southern Africa Development Community, SADC-CSC (Southern Africa) and Economic Community of Central African States (ECCAS) Climate Prediction and Applications Centre, ECPAC (newly established

Central Africa Centre) on one hand, the NMHSs on another hand and the users of weather and climate information on yet another hand. That is, ACMAD as continental service provider, the sub-regional service providers (RICs), the national service providers (NMHSs) and the users (e.g. AUC and ECA, RECs, Countries) at the different levels. Ideally, Africa should have its own plan and focus and donor-funded projects fit into the African plan. That is, it must be a win-win situation. In line with Africa having its own plan, the institutions must be working together in a framework that ensures complementarity and subsidiarity.

b. Conceptual Functional Relationship

It is therefore pertinent to develop a functional relationship which is based more on the scientific and technical attributes of the climatic fluxes over the continent and not on opportunities, wishes or choices. It is a common knowledge that climate dynamics are directly related to oceans and seas and the sub-regional climates are therefore differentiated amongst them by the oceans washing their coastlines. These oceans serve as energy sinks creating the energy gradients which give vent to the sub-regional air masses as northern, eastern, western and southern winds which in turn interacts with the ITCZ, creating the diverse climatic zones in Africa. Conceptually, ACMAD must develop a framework for an African Continental Climate Circulation Model (ACCCM) in which the sub-regional climate fluxes are dynamic components of the continental air mass. In this way, all weather and climate institutions at all levels can consider themselves as an indispensable part of a whole process. ACMAD will then be seen not as an institutional coordinator but rather as an integrator of composite climate processes. Such a framework can surely facilitate the vision of ACMAD to assume the role and responsibilities of a "mini WMO" in Africa, using the cascading process of the Severe Weather Forecasting Demonstration Project (SWFDP) as a conceptual example. This arrangement will also facilitate the overarching political role of AMCOMET, facilitating the adoption of ACMAD as the technical arm of the African Union for implementing their vision and policy actions. It will also be easier to couple operations, applications and research into the system with defined linkages. The World Meteorological Organization (WMO) and AMCOMET would play an important role in ensuring and developing legal instruments to ensure that all the actors are involved in a harmonious process to provide high quality services to national and regional communities. Moreover, both local and international projects will find their optimal expressions within an integrated climate framework.

Under the auspices of WMO and AMCOMET, the African Centre of Meteorological Applications for Development (ACMAD) should initiate the process of developing the conceptual framework of climate circulation over the continent and mainstreaming the missions and mandates of sub-regional climate centres as dynamic components of the continental model. Thus, creating a scientific basis for a disciplinary functional relationship among the existing Meteorological Centres taking into consideration their respective mandates vis-à-vis various development initiatives such as: (i) the AMCOMET Integrated Strategy on Meteorology (Weather and Climate Services); (ii) the ClimDev Africa Program; (iii) the outcome of the twenty-first session of the Conference of Parties (CoP 21) to the UNFCCC (Paris Agreement, 2015), (iv) UN Agenda 2030, (v) the AUC's Agenda 2063 and the AUC's Department of Rural Economy and Agriculture (DREA) 2014-2017 Strategic Plan, among others. It then becomes a matter of course to involve the needs and demands of users (applications and research) in a cause and effect mode.

c. The User-Interface (or Provider-User System) through Communication

In practice, decision-making could be for emergency management (requires weather information), operational management (requires both weather and climate) or policy/planning (requires climate and climate change information). The qualities of the system to be put in place should include:

1. The provider of a particular information is determined depending on the user, type and format of information, space and time scales and frequency at which the information is required
2. The information should be made useable if possible at all levels or at least at the appropriate level
3. There should be a structure or mechanism to collate different information for different sectors with regard to user needs, feedback from users regarding usefulness of products, among others. The system could then be evaluated and modified continuously.
4. Engagement of all the stakeholders to determine how for example, members would react before, during and after a given hazard, in the domain of emergency management.
5. Focal points for all institutions.
6. Clearly defined role for communicators: There is the need to ensure that the communicators deliver the right messages
7. Appropriate communication channels: The initiative could leverage on existing public channels such as mobile phones, television, newspapers, and community leaders. How the information is packaged will depend on which channel is used. For instance, if mobile phones are used, the NMHSs should sign MoUs with the Mobile phone companies. The NMHSs should not be charged since the companies stand to attract customers. If print media (newspapers) is used, some kind of training for the writers would be required.
8. Clearly defined role for Social Scientists: The evaluation requires social scientists. There is the need to work with them to formulate the questions. Else, it may be difficult to interpret and use the answers provided by the respondents. Thus, the Social scientists should be used right from the beginning of the evaluation. They should also be part of analyzing the responses from users.

d. Evaluation of Existing System

It is well known that systems already exist even at the country level. Some of these systems have challenges that need to be addressed. For instance, some countries have Disaster Management Organizations which is a multidisciplinary organization. The challenges include:

1) The way information is shared between producers and users. That is, articulation between information and action. This affects the effectiveness of the DRM systems.
2) How the national system works with the regional system? For instance, if the regional system has information that needs to be communicated to the national systems, how is it currently done? How effective is the current method?
3) The decision-making process among stakeholders is not simple. There is the need for a demonstration to test the various components of the existing system. The test should discuss methodologies, data being used, exchange initial products before issuing to the public, have routine virtual meetings, occasional meeting, among others. This could be considered as the pilot phase to implementing a fully functional system

e. Issues in Communicating Meteorological information

Generally, information regarding user needs for planning, design, operations and management is communicated by meteorologists to a class of specialists who understand specialised languages with an inherent expressions of uncertainty and non - completeness. However, in disaster management scientists must transmit their predictions to larger groups of recipients, including decision makers and operators of the mass media who are not conversant with the language of science. Moreover, the prediction of catastrophic events is never absolutely certain with the uncertainty of prediction expressed in some probabilistic figures. On the other hand authorities and user communities require from the scientists information on data and predictions which are certain. Here evolves a vicious cycle of uncertainties, involving scientific uncertainties in the prediction, uncertainties in the decision process and action on the part of the authorities and finally the uncertainties in the perception of the risk of the user communities and the public at large. Weather and climate scientists have a great responsibility in flood disaster prediction and mitigation as far as the society is concerned but they risk to be unheard or misunderstood, especially when the messages reach the public through mass communication systems. Scientists must bear in mind that hearing is one of the body's five senses, but listening is an art.

The world of mass communication and the world of science are two different social worlds. The members of these worlds have different values and beliefs. This makes interaction between journalists and scientists difficult. The result is poor information flow between them, especially from the latter to the former. There is no easy solution to the problem but there are possibilities for improvement if those in science change some of their behaviour in communicating with those in journalism. It has been suggested that a sociology of knowledge approach should be interested not only with the social basis of intellectual productions, but also the social consequences of knowledge. As such the conditions under which knowledge is produced, diffused and applied should be examined. It is, of course, more comfortable to blame the mass media for distorting a supposedly objective reality than to admit that such distortions may be the result of interaction between communicating social actors. To blame only the mass media, however, implies that the scientific community possesses a single, unquestioned and unquestionable truth that gets spoiled when it is communicated to the general public through the media. The latter, it is implied, purposefully distorts the information to provide sensational news.

It is therefore important to consider the scientific community and comparable mass communication social institutions as a culture of two worlds and to identify the factors that influence the kind of information flow that occurs between them. Analysis based on the culture of the two worlds shows the difficulty of transmitting scientific knowledge via the mass communication system. For example, the scientific world considers “What is relevant” from the point of view of “Regularities and universals” whilst the mass media reckons with the “Unusual and the different”. As regards knowledge root, the world of science looks for the link between the past and present whilst the mass media considers every story as discrete, unique and isolated. ACMAD must consider the communication of climate information as a social component of the conceptual climate circulation framework and engage sociologists and mass communication actors on a more permanent basis. Generally, specialised journalism is lacking in Africa and as such ACMAD must assume the formidable task of creating a capacity building strategic framework for the emergence of climate related environmental journalists through workshops and training programmes.

III. Relationship between GPC, ACMAD, RICs, NMHSs, Research, Application (e.g. Water)

The need to realign the working relations among the meteorological institutions themselves on one hand and how they together can meet the needs of the users requires a clear clarification on their mandate, vision and mission. For example, using the case of sub-Saharan Africa, the sub-regional climate institutions of AGRHYMET (1974), ICPAC (1989) and SADC-CSC (1990) were all established or planned before the continental center ACMAD became operational in 1992. Thus, despite the existence of these centers, it was found necessary to establish a continental center. It is important to have a functional relationship among these institutions to ensure the NMHSs make the desired impact in the countries. Other continents have strong national, regional and continental centers that are working together relatively effectively. For instance, in Europe, there are strong NMHSs but the European Centre for Medium Range Weather Forecast (ECMWF) is still a formidable institution; US has regional climate centers and national institutions such as the National Oceanic and Atmospheric Administration (NOAA) and University Corporation for Atmospheric Research (UCAR). NOAA comprises Ocean Service, National Weather Service (NWS), Fisheries, Satellite and Information, Research, Office of Marine and Aviation Operations (OMAO) and Office of Program Planning and Integration. The NWS which comprises nine centres of National Centre of Environmental Prediction (NCEP) and seven regional centres, among others. UCAR comprises the National Centre for Atmospheric Research (NCAR) and UCAR Community Programs (UCP). In addition, the US Department of interior has State Climate Centres (called Regional Climate Centers) and the US Department of Agriculture has climate hubs, yet all these work together relatively effectively. Asia has strong NMHSs yet the APEC Climate Centre (APCC) is very vibrant (http://www.apcc21.net/). These are in addition to WMO Global Producing Centers (GPCs) located in some of those advanced countries. The first step would involve having a brain storming meeting involving all the actors. The perceived functional relationship, although hierarchical should ideally be a two-way communication as follows: Global Producing Centres (GPC) through ACMAD to the sub regional centres.

There is also the urgent need for ACMAD, sub-regional climate institutions and the National Meteorological and Hydrological Services (NMHSs), to achieve a highly desired impact which requires collaborative efforts at all levels within a multi-level climatic framework, reflecting the spatial linkages of the climate dynamics over the continent. The formation and the political impetus of the African Ministerial Conference on Meteorology (AMCOMET), the implementation of the Global Framework for Climate Services (GFCS), the declarations of the 2013 African Climate Conference (ACC 2013) in Arusha Tanzania that has led to the formation of the Climate Research for Development in Africa (CR4D) and the UNECA Climate Change and Development in Africa initiatives are just the starting points. ACMAD has over the years implemented projects to improve essential infrastructure for gathering, sharing and processing observations, data and products and to enhance the skills of human resources. The new regional climate related structures and initiatives offer opportunities for all relevant institutions to work together to complement one another and avoid duplications that lead to a waste of resources. This will require that institutions that are the main actors should work out how they are going to take advantage of these initiatives to have greater impact at the regional, sub-national and national levels. The WMO Severe Weather Forecasting Demonstration Project (SWFDP), using a "Cascading Forecasting Process" serves as an example of a functional relationship based on the spatial dynamics of climatic flux from global to regional, to national.

a. Functional Relationship with User Communities

In short, the functional relationships should be such that, the Climate Centers complement each other and not compete with each other. The meteorological community as a whole should then work with the applications and research communities on appropriate functional structures at the continental, regional, national and even sub-national levels. In this regard, the African Centre of Meteorological Applications for Development (ACMAD) has to seek avenues to enjoin the climate – related activities of the African Union Commission (AUC), the United Nations Economic Commission for Africa (via African Climate Policy Centre), African Development Bank, all Regional Economic Commissions (RECs) including CILSS, the Regional Implementation Centres (RICs) or Regional Climate Centres and the National Meteorological and Hydrological Services (NMHSs) and a representation of WMO Regional Association I, to the newly evolving dynamic functional relationship as components of the continual framework guided and coordinated by ACMAD. In this way, it will be easier for user and research communities to adapt their needs and activities to the linkages within the conceptual climate system which in turn will find its place in the global climatic circulation system. Consequently, existing global and international projects can then be mainstreamed into the exigencies of the African continental climate system.

b. Global Producing Centres for Long-Range Forecasts

In 2006, the World Meteorological Organization (WMO) began a process to designate centres making global seasonal forecasts as WMO Global Producing Centres for Long-Range Forecasts (GPCLRFs). The only such centre in Africa is the South African Weather Service. This forms an integral part of the WMO Global Data-Processing and Forecasting System (GDPFS). Through this designation process, GPCLRFs adhere to certain well-defined standards, aiding the consistency and usability of:

- fixed forecast production cycles
- standard sets of forecast products
- WMO-defined verification standards (for retrospective forecasts).

A comprehensive set of standard verification measures has also been defined, and is known as the WMO Standard Verification System for Long-Range Forecasts (SVSLRF).
At minimum, the following are required from GPCLRFs:

- Predictions for averages, accumulations, or frequencies over 1-month periods or longer (typically anomalies in 3-month-averaged quantities is the standard format for seasonal forecasts, and forecasts are usually expressed probabilistically)
- Lead time: between 0 and 4 months
- Issue frequency: monthly or at least quarterly
- Delivery: graphical images on GPCLRF website and/or digital data for download
- Variables: 2m temperature, precipitation, Sea Surface Temperature (SST), Mean Sea-Level Pressure (MSLP), 500hPa height, 850hPa temperature
- Long-term forecast skill assessments, using measures defined by the SVSLRF.

c. WMO Severe Weather Forecasting Demonstration Project (SWFDP)

The Severe Weather Forecasting Demonstration Project (SWFDP) since its inception in 2006 has been successfully strengthening capacity of National Meteorological and Hydrological Services (NMHSs) in developing countries including least developed countries (LDCs) and Small Island Developing States (SIDSs) to deliver improved forecasts and warnings of severe weather to save lives and livelihoods, and protect property and infrastructure.

The project has proven to improve the lead-time and reliability for alerts and warnings about high-impact events such as heavy precipitation, strong winds and high waves. It has been strengthening engagement of NMHSs with users including media, disaster management and civil protection agencies and local communities for improved disaster risk reduction (DRR) and decision making process by users. The project is benefiting to various socio-economic sectors as well, including agriculture, fisheries, aviation, and marine transportation.

SWFDP is making contributions to the WMO Strategic Priorities for 2016-2019, especially in areas of DRR, GFCS (through climate change adaptation by building climate resilience) and Capacity Development. Through these contributions and owing to its potential operational support to Multi-Hazard Early Warning Systems (MHEWS) at regional and national levels, the SWFDP aims to support the UN 2030 Agenda for Sustainable Development (Sustainable Development Goals) and the Sendai Framework for DRR 2015-2030.

Countries participating in the project are able to benefit from advances in the science of weather forecasting, especially the dramatic development in Numerical Weather Prediction (NWP) including Ensemble Prediction Systems (EPS) which give guidance to weather forecasters in advance of potential hazardous weather conditions for issuance of alerts and warnings. SWFDP uses a "Cascading Forecasting Process" (global to regional, to national).

- *Global NWP* centres provide available NWP and EPS products, including in the form of probabilities for a specific time frame;
- *Regional Specialized Meteorological Centres (RSMCs)* interpret information received from global centres, prepare daily guidance products (1-5 day) for distribution to National Meteorological Centres (NMCs) and maintain the regional centre Web site;
- *National Meteorological Centres (NMCs)* issue alerts, advisories, severe weather warnings to public via the media and other dissemination channels; liaise with disaster management, and certain economic sectors, and contribute feedback and evaluation of the project.

The SWFDP is primarily built on the Global Data Processing and Forecasting System (GDPFS) programme, in collaboration with Public Weather Services (PWS) programme, and the Agricultural Meteorology (AgM) programme of WMO. It also engages other WMO programmes that concern the real-time prediction of hydro-meteorological hazards like Hydrology and Water Resources Programme (HWRP) for developing synergies and linkages with Flash Flood Guidance System (FFGS) in various regions including Southern Africa, South Asia and Central Asia etc. SWFDP was started in in 2006 and now it has now been rolled out in Eastern Africa, South Pacific Islands, South-East Asia, Bay of Bengal (South Asia) and Central Asia. The SWFDP activities are mainly financed through extra-budgetary resources. In future, depending upon the availability of funds, the project will be expanded to cover more areas in different regions of the world including West Africa, the Caribbean, South-East Europe and Southeastern Asia-Oceania. **T**he success of the SWFDP as a Flagship Project by Africa should spur on African countries to be involved in the project and make financial contributions to the SWFDP for the sustainability of the project.

d. **The Climate Database Management System (Climsoft**)

The World Meteorological Organization Regional Association 1 (RA1), which is for Africa, mandated ACMAD to be in charge of the continued development of the Climsoft Climate Database Management System (CDMS) that was started by three Africans from Zimbabwe, Kenya and Guinea National Meteorological and Hydrological Services, after the freezing of the development of CLICOM, an earlier CDMS supported by WMO. Currently, due to lack of funds from ACMAD, the activities of Climsoft is fully funded by the United Kingdom Meteorological Office (UKMO) on a voluntary basis through WMO. Much as the good will of the UKMO is appreciated, for how long will Africans sit back for international partners to virtually drive activities without any sign of the Africans attempting to build on the work of the international partners? The international partners expect Africans to take over and sustain projects they have started. Thus, the international partners are always requesting sustainability plans anytime they initiate projects. The UKMO decides on virtually everything such as when meetings could be held, who can be supported to attend the meetings, among others. It is important to note that a number of Climsoft meetings have been held with no representative from ACMAD because the UKMO funds was not enough to support anyone from ACMAD. The UKMO should not be blamed for that, as it is encouraging to see that ACMAD supports its participants to such meetings. It is in this regard that, ACMAD is bringing up the need for the development of Climsoft to be sustained by Africans with support from our international partners. We are grateful to the UKMO for their current role but Africans must be involved to make UKMO realize their effort has not been in vain.

e. Climate Services for Africa

"Climate Services for Africa," a European Commission side-event organized in partnership with the Global Framework for Climate Services (GFCS), brought together global providers and users of climate services. It shared insights into present and future solutions that will assist with events such as El Niño and enhance the ability to address the challenges of adaptation, mitigation and disaster risk reduction, in Africa and around the world.

The European Union has a number of climate service initiatives, including the pre-operational phase of new Copernicus climate change service, which will offer information and indices, open to the worldwide community free of charge. It has issued a 72 million Euro call for proposals for research on climate services under its Horizon 2020 programme on research and innovation.

“Different actors are already implementing different elements of climate services. By working together, we will ensure effective use of expertise and resources to enhance delivery of climate services and maximize the benefit of investments being made,” WMO is spearheading the Global Framework for Climate Services in partnership with many other organizations including the World Health Organization, World Food Programme and Food and Agriculture Organization. It aims to improve climate services like seasonal forecasts, especially for priority sectors of agriculture and food security, health, water management, disaster risk reduction and energy.

Observations of success include:

- WHO in Africa is starting to make better use of climate services for tackling climate-sensitive diseases like malaria and diarrhoea.
- WFP maintains that climate services are necessary to tackle a “very complicated future” given that climate change is an accelerator and multiplier of risk. The GFCS provides a united vision of the challenges and how to tackle them. The GFCS projects in Malawi and Tanzania were very helpful at the time of El Niño in addressing the needs of farmers. Having that project in place

made it possible to intervene early on and help farmers make the right choices about when and what to plant.

- Malawi and Tanzania are hosting two pilot GFCS projects, funded by the Government of Norway, to improve climate services and help climate adaptation.
- Thanks to GFCS support, Tanzania was now hosting three climate outlook forums per year to issue seasonal forecasts, involving both stakeholders and media.

f. The Role of Research and Projects

There are many untied knobs in the weather and climate value chain over the continent. But research in Africa is still not a default but rather an option and hence needs a very high level of motivation and inspiration, apart from urgent needs in human and technological innovation. Basic research which must be the prerogative of the universities in order to provide theoretical and conceptual insights into the weather and climate of Africa, is very minimal. It deals with the increase in knowledge, creating new methodologies and techniques. Applied research is concerned with adapting available methodologies to specific objectives and local conditions and hence facilitating their application by users. There is, however, no coherent and coordinated framework for the sparsely dotted applied research carried out by universities and research institutions and/or through projects on the continent. The goal must be to create an enabling environment with a well - defined capacity building framework which will lead to a culture of science that can be characterised as: - *When there is a culture of science, scientists are ready to learn from the wider culture and the wider culture learns to be science-friendly in its scale of priorities*.

The general characterization of the variability of the climatic flux over Africa is based on the continental air mass circulation controlled by the Inter Tropical Convergence Zone (ITCZ), coupled with the strengths of the southwesterly monsoons and the upper easterly and westerly air currents and accentuated by local physiographic and orographic conditions. Surveys on African rainfall have indicated a marked coherence of rainfall variations over large portions of the continent, a characteristic found to be especially strong in the semi-arid regions south of the Sahara. Various patterns of rainfall anomaly fields that illustrate a strong tendency for synchronous fluctuations along the tropical and temperate margins of the Sahara have been identified. The plethora of issues regarding the general characterisation of African climate and triggering mechanisms of extreme variability still remain complex and unresolved. It must be borne in mind that the African climatic circulation is not necessarily a scaled down process of the global climatic circulation. There are many climate related characteristics and problems that are African specific and must be confronted from basic physical and socio economic considerations. Some of the problematic issues include:

- Climate circulation at different spatial and time scales
- Regional and continental teleconnections of climatic anomalies
- Climate variability and change
- Hydroclimatic disaster risk reduction
- *Socio-economic uses and benefits of climate information*
- Hydrological cycle
- Land use and environmental change

The main problem of predictability of hydroclimatic processes is posed by the uncertainty inherent in the perception and understanding of the physical mechanisms triggering extreme variability in

climate and in the hydrological cycle over Africa due to the general lack of sufficient and reliable data in time and space.
Research can become a default only when an enabling environment is created with sustainable funding. ACMAD should liaise with the relatively new Climate Research for Development in Africa (CR4D) initiative to work out how funds could be mobilized, including getting key financial partners such as the African Development Bank involved, awareness regarding CR4D could be created among the operations and applications communities, existing structures could be leveraged upon to promote the objectives of CR4D. The oversight body of CR4D consists of WMO and African Climate Policy Centre (ACPC) with the CR4D secretariat hosted at ACPC.

The African Modelling Project
The current meteorological models used over Africa were all developed in the temperate regions. The models do not contain some of the essential physics of the weather systems over Africa. There is the need for the continent to have models that contain the physics of the weather systems as well as the appropriate soil types, land cover and various features pertaining to the continent that must be included in a modeling system. There is the need to however, identify the weather systems to be incorporated in the models, document the strengths and weaknesses of at least two common mesoscale models used over the continent and agree on a framework to have a coordinated modelling initiative for the short, medium and long term. The Weather Research and Forecasting Model (WRF) and the RegCM are two open-source mesoscale models used by most Africans.
The WRF model, a non-hydrostatic model, can be used for modeling at all space and time scales (Computational Fluid Dynamics, Weather and Climate modeling). A non-hydrostatic version of RegCM has also just been developed. The strengths and weaknesses of these models over the different parts of the continent must first be documented before any adopting of the models (i.e. tunning) begin. In considering which open source mesoscale models to tune over Africa, there is the need to select one or two Global Models to be used for weather, climate as well as seasonal prediction, bearing in mind the current trend of seamless prediction and the move towards Earth System Modeling. After all, the mesoscale models will have to obtain boundary/initial conditions from the global models. Secondly, teleconnections, predictors for seasonal climate prediction over the continent, among others could be better investigated. This modeling initiative requires all stakeholders (research, operations and applications community) on board. A draft concept note and implementation plan are available at ACMAD.

g. Applications of Climate Information

Climate plays fundamental and vital role in the evolution of human lives and societies. It has in fact shaped the cultures of all societies both directly and indirectly. Water which is considered as life itself is inextricably linked with climate. Generally, Africa is characterized by extreme climatic zones; from humid equatorial and tropical zones through the semi-arid to the arid North, creating about seven distinct hydro-climatic zones. The distribution of rainfall over Africa therefore exhibits extreme unevenness, both spatially and temporally. Most freshwater comes from seasonal rains, which vary with the climatic zones. A significant feature of water resources in Africa is the extremely low runoff in relation to rainfall. Major runoff characteristics of principal river basin systems in Africa show that the river Congo is the largest and has the highest annual runoff volume. Generally the amounts of surface and groundwater flows that are generated from rainfall within the sub-regions

are all low. At the continental level, the renewable water resources constitute only about 20 per cent of the total rainfall.
It must be noted that rainfall anomalies, both positive and negative, are very frequent over the continent which leads to hydometeorological extremes of floods and droughts. Weather and Climate information find their applications in many sectors including rain-fed agriculture, water resources management and disaster risk reduction.

Agriculture
The continent's land and water resources are important for agriculture which accounts for 34 per cent of Africa's GDP, 70 percent of its labour force and 40 percent of its exports. Most agricultural production is from rain-fed farming. The agricultural community most often suffers production losses in rain-fed agriculture due to the erratic variations in the onset and length of rainfall seasons coupled with uncertain dry spells. Due to the high moisture variability over Africa from the north to the south, agriculture production differs from sub-region to sub-region and even within sub-regions. It must be noted that there is no single sub region in which food security is guaranteed without recourse to food imports or external food aid. Yet, most African countries have not taken full advantage of the available arable lands for agricultural production.
In many parts of Africa, irregular weather patterns (drought, floods), isolation of agricultural regions and environmental degradation all contribute to significantly reducing the rate of growth of agriculture and food production. There are several factors explaining the persisting food insecurity problem in Africa. Amongst them are the following:

a) Unfavourable weather and climate conditions due to extreme climate variability and climate change;
b) Continuous rapid population growth;
c) Low agricultural productivity;
d) Environmental degradation; and
e) Weak science and technology infrastructure.

It is worth noting that despite the high levels of food insecurity in the region, most countries have substantially under-utilized their potential for irrigation expansion. The scope for expansion of irrigation is, therefore, considerable; however, it is apparent that there is an even greater scope for expansion of rain-fed agriculture if agriculture is to make the necessary contribution to Africa's socio-economic development. Timely and reliable seasonal climatic prediction and weather forecasts information to farmers will go a long way in improving not only rain-fed agricultural production but water use efficiency in irrigated farms.

Water Resources Management
Water finds use in all aspects of human lives and in socio economic development of all societies, including agriculture, water supply, hydro energy, health, transport and others.
While Africa uses only about 4 per cent of its renewable freshwater resources, water is becoming one of the most critical natural resource issues. The continent is one of the two regions in the world facing serious water shortages. Although it has abundant freshwater resources, there are high disparities in water availability and use within and between African countries because the water resources are so unevenly distributed.

For example, the Congo River watershed contains 10 per cent of Africa's population but accounts for about 30 per cent of the continent's annual run-off. Other contributing factors are the inadequate assessment and underdevelopment of water resources, the lack of technical and institutional infrastructure as well as the lack of investment in water resource development. There is also the ubiquitous problem of lack of reliable and sufficient meteorological and hydrological data and information. While the Sahelian countries have limited supplies of freshwater, most countries in the humid tropical zone have abundant water. The availability of water varies considerably, even within countries, and the situation is further complicated by frequent droughts as well as inappropriate water management programmes. The demand for water is increasing rapidly in most countries due to population growth and rising living standards due to ongoing economic development in many African countries.

Disaster Risk Reduction

Extreme hydrometeorological events such as floods and drought are common across Africa. The people of Africa are exposed to a wide range of disasters that seriously have aggravated the Continent's economic situation. Economic losses and human sufferings from floods, drought, desertification, locust infestation, infectious diseases and epidemics are the dominant disasters that African countries face, and they have rendered the population utterly vulnerable. Disasters have aggravated Africa's economic situation. The cumulative effect of disasters include loss of property, injury, death, mounting food import bills, health hazards, environmental degradation, backward economic development, displaced people, refugees, and nutritional deficiency

Most African countries also experience extremes of rainfall (seasonal floods or droughts). There is some evidence that both droughts and floods have increased in frequency and severity over the past 30 years. These natural events become disasters when large numbers of people or infrastructure are affected, due to high population growth rates, especially in urban centres and drought-prone areas. Most cities and population centres in Africa normally lie in flat terrains and hence are generally devoid of natural drainage systems. Urban drainage systems, where existent, are left unattended, rendering most parts malfunction, especially during long spells of droughts. One other important feature of the physiographic conditions of the population centres is that they are mostly surrounded by relatively highlands accentuated by sometimes unidentifiable and ungauged number of ephemeral stream channels which in times of intensive rainfall conduct torrential flash flows towards residential areas. The devastating effects of the floods caused by direct rainfall superimposed on the torrential flows in ephemeral stream channels on population centres constitute the main direct damages incurred in urban centres during extreme events. It must be noted that in terms of hazards, traditional hydrological forecasting methods are insufficient for flash floods and need to be augmented with advance meteorological forecasting.

Climatically, the rainfall pattern over Africa exhibits very high variabilities over time and are quite often accentuated with positive and negative anomalies. Positive anomalies occur when there are significant departures of rainfall above the long-term mean and negative when below. This variability assumes higher dimensions, especially in areas lying in the transition from tropical climate to the arid conditions of the North. The El Nino Southern Oscillation (ENSO) and the ongoing climate change processes are accentuating the frequency and magnitude relationship of floods and droughts with differential impacts in the sub-regions. For example, floods and droughts in Southern Africa are normally linked to the fluctuations in frequency-magnitude relationship of the climatic fluxes over the sub region, attributed to the anomalous behaviour of the ITCZ and SST's over the Indian Ocean, induced by the El Nino Southern Oscillation (ENSO). The El Niño Southern Oscillation (ENSO) causes significant climatic disturbances in most parts of Africa, either inducing drought or floods, or increasing sea surface temperatures leading to cyclones. Generally, Floods are caused by either extreme precipitation events, changes in drainage channel morphology or environmental changes or their combinations. Droughts on the other hand are considered as non-events controlled by regional or global large-scale atmospheric circulations coupled with environmental feedbacks. There is some evidence that both droughts and floods have increased in frequency and severity over the past 30 years across the continent of Africa.

The problem facing the scientific meteorological and hydrological communities is to properly identify the causative mechanisms for floods and droughts in order to reduce the uncertainties inherent in their predictions and forecasting. It becomes apparent that investigations into the behavioural patterns of rainfall must be directed toward the climatic and atmospheric mechanisms at both synoptic scales and mesoscales that could trigger this type of extreme anomalies. There is an obvious need to build knowledge on these phenomena in order to develop early warning systems based on timely forecasts of their occurrence and magnitude with less uncertainties with ample lead time, necessary for implementing mitigation interventions. El Nino/La Nina events commence 8-10 months prior to changes in the Atlantic and Indian Oceans and this can provide some long-range forecasting lead-time. Special attention must also be paid to a climatic feature involving spatial coherence of African rainfall anomalies which needs to be further enhanced in order to evolve some index of anomaly that could be employed as a predictor of possible anomalous rainy seasons based on the advance knowledge of rainfall anomalies in other climatic areas of the continent, with regard to possible intra and inter hemispherical teleconnections.

IV. ISACIP as case study (ISACIP: Objectives, Components, Key achievements, Challenges and Gaps, lessons learnt, etc.)

The African Development Bank funded **Institutional Support to African Climate Institutions Project (ISACIP**) that ended in December 2016, was used as a case study to examine the functional relationship between ACMAD and some sub-regional centres and how that could be improved. That is, the conference on ACMAD's functional relationship with partners had as a subset, ISACIP Project Final Assessment Workshop (PFAW). The output from the PFAW is intended to be used as input for the Project Completion Report (PCR) as well as a possible second phase of ISACIP (ISACIP II). The objective of the ISACIP project is to strengthen the capacities of African regional climate centers to generate and disseminate climate information to support economic development in the continent. To achieve this objective, the project was formulated with three main components as follows:

(i) Production of climate related information;
(ii) Institutional strengthening and
(iii) Project Coordination. The beneficiaries of the ISACIP project are ACMAD, AGRHYMET, ICPAC and SADCCSC

ACMAD as the continental center coordinated the overall project in addition to having its own activities. The ISACIP Project is an initial implementation of the ClimDev Africa Project. The Goal of the ClimDev Africa Project is to contribute to poverty alleviation by implementing climate-resilient development programs that mainstream climate change information at all levels in Africa. See Appendix 2 for more on ISACIP. The expected outcome from the PFAW is a detailed report analyzing lessons learnt, challenges encountered and recommendations for the way forward.

Objectives:

- To strengthen the capacities of African Regional meteorological centres to generate and make widely available relevant climate information to support development planning process in the continent.

Purpose (or specific aim):

- To improve production of climate related information
- To strengthen the capacity of African Climate Institutions with respect to infrastructure and human resources.

Expected Result:

- Capacities of African Climate Institutions strengthened

Project Components: **Southern Africa**

- Production of climate-related information
- Institutional Strengthening (infrastructure, on job training, workshops,)
- Project Coordination

- Institutional strengthening (buying vehicles, putting up new buildings, rehabilitation, etc.)
- Improved general purpose computing infrastructure for general service provision

Achieved/Will be achieved to compliment:

a) Fence wall for new ACMAD HQ completed
b) Construction of Administrative block to begin
c) Basic part of HPC to be purchased
d) Internet bandwidth improved

Difficulties:

1. Procedures for certain activities are long. For instance, request for non-objection from AfDB most often takes too long
2. Procedure for recruiting International consultant takes too long
3. Salaries were not competitive and led to the movement of staff.
4. Lack of forum for interaction among Heads of institutions as well as Project Coordinator/Focal Point

Project organization:

1. Composed of one continental institution (ACMAD) and three regional institutions (AGRHYMET, ICPAC and SADC)
2. Institutions have different rules, self-government of management; use different currencies, lack a framework for dialogue among the leaders of the four institutions.
3. ACMAD being the continental institution is the coordinator of the Project. Thus, the Director General of ACMAD is the Chief of the Project. The Deputy Director General is the Coordinator of the Project. The regional centres have Focal Points (acting as "coordinators").
4. Counterpart concept was used.

On the whole, the implementation of ISACIP has been considered successful with differential levels of achieving the targets of the participating institutions. A general constraint was the bureaucracy involving the request for "no objection" for every expenditure from the African Development Bank (AfDB) which took a little longer at times. In spite of this, there was an excellent collaboration with

AfDB on one hand and between the project coordinator, ACMAD, and the participating sub-regional centres on the other. It is therefore auspicious that the African Development Bank shall continue this initiative and launch the second phase of the Institutional Support to African Climate Institutions Project (ISACIP 2) as soon as practicable.

3. Conclusions and recommendations

The continental role of the African Centre of Meteorological Applications for Development (ACMAD) as an integrating coordinator of weather and climate services at different spatial levels is undisputable amongst the stakeholders. The need for a continent wide framework to formalise the functional relationship between ACMAD and sub-regional and national institutions is more urgent than ever and imperative. There is also the need to seek a functional relationship between ACMAD and the newly established African Ministerial Conference on Meteorology (AMCOMET), under the auspices of the African Union Commission (AUC), preferably as its meteorological technical arm.

There is also the urgent need for ACMAD, sub-regional climate institutions and the National Meteorological and Hydrological Services (NMHSs), to achieve a highly desired impact on user communities which requires collaborative efforts at all levels within a multi-level climatic framework, reflecting the spatial linkages of the climate over the continent. Under the auspices of WMO and AMCOMET, the African Centre of Meteorological Applications for Development (ACMAD) should initiate the process of developing a conceptual framework of climate circulation over the continent and mainstreaming the missions and mandates of sub-regional climate centres as dynamic components of the continental air mass circulation, to serve as a scientifically based functional relationship.

The success chalked by ACMAD, AGRYMET, ICPAC and SADC-CSC in the implementation of the African Development Bank funded Institutional Support to African Climate Institutions Project (ISACIP) can serve as an exemplary nucleus for the coordinating capacity of a functional relationship.

Weather and climate scientists have a great responsibility in flood disaster prediction and mitigation as far as the society is concerned but they risk to be unheard or misunderstood, especially when the messages reach the public through mass communication systems. ACMAD must consider the communication of climate information as a social component of the conceptual climate circulation framework and engage sociologists and mass communication actors on a more permanent basis and also to facilitate the emergence of climate related environmental journalists through workshops and training programmes

The problem facing the scientific meteorological and hydrological communities is to properly identify the causative mechanisms for floods and droughts in order to reduce the uncertainties inherent in their predictions and forecasting. There is an obvious need to build knowledge on these phenomena in order to develop early warning systems based on timely forecasts of their occurrence and magnitude with less uncertainties with ample lead time, necessary for implementing mitigation interventions.

ACMAD must spearhead efforts at improving weather and climate predictive tools in order to address advancements in seasonal to multi-decadal climate predictions and to spur their applications to decision-making in socio-economic sectors, including food, water, energy, health, tourism and development sectors.

4. **Recommendations of the ACMAD Stakeholder Conference and the ISACIP Project Final Assessment Workshop (PFAW)**

Accra – Ghana from 15th to 16th December 2016:

The ACMAD Stakeholders Conference Case Study/ISACIP "Final Project Assessment Workshop", organized by the African Centre of Meteorological Applications for Development (ACMAD) and the Ghana Meteorological Agency (GMet) in the framework of the African Development Bank (AfDB) funded Institutional Support to African Climate Institutions Project (ISACIP) in Accra, Ghana from 15th-16th December 2016;

Noting the undisputable continental role of the African Centre of Meteorological Applications for Development (ACMAD) and the need for a continent wide framework to formalise its functional relationship with sub-regional and national weather and climate institutions

Acknowledging that African Ministerial Conference on Meteorology (AMCOMET) has been jointly established as a high-level mechanism by the World Meteorological Organization and the African Union (AU) to support its Member States in addressing the major challenges related to the delivery of weather and climate services in Africa for the development of meteorology and its applications on the Continent;

Realising the urgent need to initiate a truly African process to develop a conceptual framework of climate circulation over the continent and mainstreaming the missions and mandates of sub-regional climate centres as dynamic components of the continental framework, to serve as a scientifically based functional relationship.

Noting the obvious need to build and develop knowledge bases for hydrometeorological extremes in order to develop early warning systems based on timely forecasts of their occurrence and magnitude with less uncertainties and with ample lead time, necessary for implementing mitigation interventions.

Noting with appreciation the African Development Bank funded Institutional Support to African Climate Institutions Project (ISACIP) and the WMO-initiated Severe Weather Forecast Demonstration Project (SWFDP) for setting the pace for functional relationship of climate institutions at different levels of operation;

Urging ACMAD finally to spearhead efforts at improving climate predictive tools in order to address advancements in seasonal to multi-decadal climate predictions and to spur their applications to decision-making in socio-economic sectors, including food, water, energy, health, tourism and development sectors.

Having exhaustively discussed the ACMAD presentation on the theme of the conference as regards Regional Coordinated Strategy for Functional Relationship between AMCAD and relevant Weather and Climate Institutions at International, Continental, Regional and National Levels with special emphasis on the following:

- Management and Governance
- Communication/Visibility and Marketing
- Dialogue platform
- Resource Mobilization

- Legal Commitment
- Capacity Building i.e. Infrastructure and Human Resource
- Management and Funding of African Modelling Project

WE, THE STAKEHOLDER PARTICIPANTS, HEREBY CALL ON AFRICAN CENTRE OF METEOROLOGICAL APPLICATIONS FOR DEVELOPMENT (ACMAD) TO IMPLEMENT THE FOLLOWING RECOMMENDATIONS AND ACTIONS:

The conference recommends that

Management and Governance

- ACMAD to be under the tutelage of AMCOMET, the governing board and WMO must take steps to facilitate the process of this tutelage of ACMAD.
- ACMAD to be under WMO through RA1 administered through an MOU
- ACMAD to define its relationship with NMHS's to avoid duplication of roles
- ACMAD should implement the Integrated African strategy on Meteorology (weather and climate services) initiated by AMCOMET, the regional centres should implement strategies developed.
- ACMAD to reposition itself as the AFRICAN leader and play role of watchdog to tackle weather, climate and environment issues both at international and continental levels.
- ACMAD to conduct scientific and technical research in collaboration with the research institutions to bring resilience issues to the population including trainings and meetings
- ACMAD should scan activities and schedule of meetings of players in the climate sector to align itself to the sector within which it operates.
- ACMAD remains at continental level for policy and decision making processes, RICs to do implementation.

Communication/Visibility and marketing

- ACMAD to have clear marketing and communication strategies with funding streams
- To have a regularly updated mailing lists to send communications to end users
- There is greater need for definition and identification of ACMAD users
- Create an open source website database where students and researchers can get information
- Need for a paradigm shift in reality with the current communication trends and channels

- Ensure that at regional level ACMAD has a desk or focal point which will take care of ACMAD interests.

Dialogue Platform

- There is need for ACMAD to do a study on the users' needs, such studies should be well documented to enable them to be of value (Need Assessment among the users)
- ACMAD can source and apply new technologies to potential end users. ACMAD could use Videos and impact images to demonstrate the use of technologies.
- There is need to map organizations in the continent with which ACMAD could have relationships
- Formalize current relationships and give objectives for sustainable partnership.
- Improve dialogue between ACMAD, regional centers, NMHSs and partners

Resources Mobilisation

- Strategy should involve working with all stakeholders on resource mobilization at international levels and partners, proposal writings and related arrangements
- ACMAD should tap resources from the renewable energy sector such as solar and wind energy information.
- ACMAD should consider endearing itself to Forecast based financing and realize that weather and climate information they relay in itself is a resource and can be relied upon.
- They should demonstrate the added value of their products
- ACMAD to get in touch with diplomatic missions in Niamey.
- ACMAD should diversify its partnerships to include non-climate institutions but consumers of their products like football federations.
- Elaborating and selling good projects.
- Adopt joint projects with other organizations
- Request for and receive Grants and lobby vigorously for donor funds.
- Revise the scheme in place to recovering dues from Member states and bring in more states
- Work on an incentive model for those who pay their dues in time
- Create a network of friends of ACMAD for funding
- Need to establish climate tax to support ACMAD/NMHSs /RICs

- ACMAD should be opened to other sectors to innovate new products and services dedicated to other sectors.
- Develop mechanisms for a platform for improved dialogue between NMHS and ACMAD with special regard to WMO RA1

Capacity Building

Capacity building in terms of Human Resource Development to be enhanced by entering into Memorandum of understanding with institutions of higher learning at local and regional levels to train students at masters and PhD levels

Acknowledgements

The workshop wishes to thank the African Development Bank and the government of Ghana for their support in organizing this Stakeholders conference and the final ISACIP Assessment workshop.

C. AGENDA

ACMAD STAKEHOLDER CONFERENCE CASE STUDY/ISACIP

"FINAL Project Assessment Workshop"

15th -16th December 2016 (Accra-Ghana)

N°	Time	Subject / Title of presentation	Presenter / comments
		DAY1: OPENING CEREMONY and ORIENTATION of the WORKSHOP	
1	0900-0930	OPENING CEREMONY:	Ghana Authorities/ ACMAD
2	0930-1000	Group photo and health Break	
3	1000-1015	Stakeholders conference with case study ISACIP: Workshop objectives	B. Lamptey (ACMAD)
		DAY 1: Session 1: Functional Relationship – Regional Coordinated Strategy **Chair/Moderator:** Prof. Muthama **Rapporteur: AUC**	
4	1015-1030	Presentation – Relationship between WMO, AMCOMET, ACMAD,	WMO
5	1030-1045	Presentation – Relationship between GPC, ACMAD, RICs, NMHSs, Research, Application (e.g. Water)	ACMAD
6	1045-1100	Presentation – ISACIP as case study (ISACIP: Objectives, Components, Key achievements, Challenges and Gaps, lessons learnt, etc.)	ACMAD
7	1100-1115	Breakout Groups (3) formation/Adoption of ToR focus on functional relationship	
8	1130-1300	BoG sessions - Functional Relationship	ACMAD
9	1300-1430	LUNCH BREAK	
10	1430-1500	Report of BoGs	
11	1500-1600	DISCUSSION/Recommendations	
12	1615-1630	Health Break	
13	1630-1645	Summary/Discussion	
14	1645-1715	- ISACIP 1 PCR Expectations	Consultant (PCR)
15		Presentation – Proposed ISACIP 2	Consultant (ISACIP 2)
16		END OF DAY Cocktail (venue to be determined)	
		▪ **DAY2: Session 2: ISACIP Case Study:** **Chair/Moderator:** ClimDev-Africa **Rapporteur: AfDB**	
17	0900-0915	Recap of Day 1	
18	0915-1015	BoGs ISACIP 1- ToR for PCR and recommendations	
19	1015-1030	- HEALTH BREAK	
20	1030-1130	Report from BoGs	
21	1130-1245	Discussion and consolidation	
22	1245-1300	Summary/Conclusions and recommendations	
23	1300-1315	Closing Ceremony/Way forward	
24	1315	LUNCH BREAK	
25		END OF DAY	

D. List of Participants

ACMAD STAKEHOLDER CONFERENCE CASE STUDY/ISACIP

"FINAL Project Assessment Workshop"

15th to 16th December 2016, ACCRA – GHANA

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