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REPORT OF THE 2ND SESSION OF THE AU CONFERENCE OF MINISTERS ON METEOROLOGY (AMCOMET), VICTORIA FALLS, ZIMBABWE, 15-19 OCTOBER 2012

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I. Introduction

1. The Second Session of the African Union Conference of Ministers responsible for Meteorology/African Ministerial Conference on Meteorology (AMCOMET) was held in Victoria Falls, Zimbabwe from 18-19 October 2012. The meeting was preceded by the meeting of the Experts' segment from 15-17 October 2012.

II. Participation

2. The following 38 African countries participated in the Conference: Algeria, Angola, Benin, Burundi, Cameroon, Central African Republic, Chad, Congo, Congo Democratic Republic, Cote d'Ivoire, Djibouti, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mozambique, Namibia, Nigeria, Rwanda, Seychelles, South Africa, South Sudan, Sudan, Swaziland, Togo, Tunisia, Uganda, United Republic of Tanzania, Zambia and Zimbabwe.

3. The following agencies, organizations and institutions also participated: African Centre of Meteorological Application for Development (ACMAD), African Development Bank (AfDB), African Union Commission (AUC), Africa Risk Capacity (ARC), European Organization for the Exploitation of Meteorological Satellites (EUMETSAT), IGAD Climate Prediction and Applications Centre (ICPAC), United Nation's International Strategy for Disaster Reduction (UNISDR), Southern African Development Community (SADC), World Meteorological Organization (WMO), China Meteorological Administration (CMA), Korea Meteorological Agency (KMA) and United Kingdom Meteorological Office (UKMO), UN World Food Program (WFP).

III. Opening Ceremony

4. Opening Statements were made successively by Hon. Chirau A. Mwakwere, MP, EGH, Minister for Environment and Mineral Resources of Kenya, Chair of AMCOMET; Mr Michel Jarraud, Secretary-General of the World Meteorological Organization; H.E. Mrs Rhoda Peace Tumusiime, African Union Commissioner for Rural Economy and Agriculture; Hon. Minister Dr O Muchena, Acting Minister of Transport, Communications and Infrastructural Development of Zimbabwe; Hon. Mamadou Coulibaly, Minister of Equipment and Territory Arrangement of Mali and First Vice-President of AMCOMET; and Hon. Mrs JTR Mujuru, Vice President of the Republic of Zimbabwe who officially opened the Session.

IV. Election of the Bureau

5. The following were elected as the AMCOMET Bureau representing the five African regions:

a) Zimbabwe **Chair**;
b) Central African Republic **First Vice-Chair**;
c) Tunisia **Second Vice-Chair**;
d) The Gambia **Third Vice-Chair**; and
e) Uganda **Rapporteur**

V. Presentation and Consideration of the Report of the Expert Segment

6. The Ministers adopted the Report of the Experts' Segment and made the following observations and decisions:

a) The Session noted the Addis Ababa Declaration in support to the implementation of Global Framework for Climate Services (GFCS) in Africa, which was signed by the AUC, Regional Economic Communities and the Secretariat of the Africa, Caribbean and Pacific Group of States, under the auspices of the Ethiopian Minister of Water and Energy;

b) The Session further acknowledged the strong political support to the implementation of GFCS in Africa and requested its consideration in the development of the Implementation Plan for the Integrated African Strategy on Meteorology (Weather and Climate Services);

c) The Session agreed that Africa has been greatly affected by different types of hydro-meteorological disasters resulting in critical human and economic loss impeding national development progress, while National Meteorological and Hydrological Services still operate with a lot of constraints and data scarcity in Africa;

d) The Session urged governments to enhance investment in hydro-meteorological observations, infrastructure and forecast and early warning systems that would enhance preparedness and mitigation;

e) The Session noted with appreciation the willingness and commitment of development partners to collaborate with the WMO and the AUC in the implementation of the AMCOMET process as well as the Integrated African Strategy on Meteorology (Weather and Climate Services);

f) The Session considered AMCOMET in the Context of a Specialized Technical Committee (STC) of the African Union Commission. In this respect AUC Representative briefed the session on the relevant AU Assembly Decisions relating to this matter namely: Assembly/AU/Dec. 227 (XII) of the African Union Assembly at its twelfth ordinary session on the Specialized Technical Committees (STCs), in February 2009; and Assembly/AU/Dec.365 (XVII) of the African Union Assembly at its seventeenth ordinary session held in Malabo Equatorial Guinea, in July 2011;

g) The Session considered the implications of these decisions on the operational aspects of AMCOMET and also noted the comments of other AUC STCs on the same. The session decided to establish a Task Force to consider all the issues involved taking into consideration the roles of AUC and WMO and report to the Third Session of AMCOMET;

h) **Decision 02/1:** Constitution and the Rules of Procedures

i) The Ministers noted that the draft Constitution and Rules of Procedures needed further consultations and review with Member States', Regional Economic Communities, African Union Commission and WMO legal counsels;

ii) The Ministers decided to establish a Task Force[1] to consider all comments and prepare the revised drafts of the Constitution and Rules of Procedure. The Task Force was requested to meet by June 2013 to finalize its work; and

iii) The Ministers requested the AMCOMET Bureau to meet in August 2013 to consider the final drafts of the Constitution and Rules of Procedure for submission to the Third Session of AMCOMET.

i) **Decision 02/2:** Consideration of the Establishment of a Regional Climate Centre for Central Africa

i) The Ministers noted the message from the Economic Community of Central African States (CEMAC) to the Second Session of AMCOMET, stressing the need for a regional climate centre in Central Africa to enable them to serve the interest of the region;

ii) The Ministers urged WMO, in collaboration with the African Union Commission, and partners to take all necessary steps to establish a regional climate centre in Central Africa.

j) **Decision 02/3:** Compliance with International Civil Aviation Organization (ICAO) Requirements on Quality Management Systems

i) The Ministers noted that in the continent, only five countries had certified their Services one month before the ICAO deadline on 15 November 2012 for lack of resources, the ministers took a decision that, as a matter of urgency, all necessary steps should be taken to ensure that African National Meteorological Services meet the ICAO requirements regarding QMS in the shortest time possible. Where it is completely impossible, they should notify the ICAO Council as this is compulsory under Article 38 of the Convention;

ii) The Ministers requested Member States to take all the necessary steps to ensure that African National Meteorological

[1] *Task Force Members to be confirmed following consultations*

Services meet the ICAO requirements regarding Quality Management Systems.

k) **Decision 02/4:** Integrated African Strategy on Meteorology (Weather and Climate Services)

i) The Ministers adopted the Integrated Strategy on Meteorology (Weather and Climate Services);

ii) The Ministers invited the African Union Commission and the WMO to submit the adopted Integrated Strategy on Meteorology (Weather and Climate Services) to the relevant AU and WMO organs for endorsement; and

iii) Established a Task Force[2] to draft the Implementation Plan for the Integrated Strategy on Meteorology (Weather and Climate Services) with detailed annual operational plans and also draft the Resource Mobilization Strategy for the Implementation Plan and to submit its findings for consideration during the Third Session of AMCOMET.

l) **Decision 02/5:** Feasibility of an African Regional Space Program

i) The Ministers noted that it is time for Africa to develop an African Regional Space Programme to enhance data availability from remote and inaccessible areas; and

ii) Established a Task Force [3] to investigate the feasibility of developing an African Regional Space Programme and to submit its findings for consideration during the Third Session of AMCOMET.

VI. Date and Venue of the Third Session of AMCOMET

7. The Session accepted with appreciation the offer of Benin to host the Third Session of AMCOMET in 2014.

VII. Presentation and Adoption of the Report of the Second Session of AMCOMET

8. The Session expressed its appreciation to the Government of the Republic of Zimbabwe for hosting the Second Session of AMCOMET and providing excellent facilities for the success of the Conference.

9. The Second Session of the African Union Conference of Ministers responsible for Meteorology/African Ministerial Conference on Meteorology concluded with the adoption of the report of the session and the Chair of AMCOMET closed the conference.

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[2] *Task Force Members to be confirmed following consultations*
[3] *Task Force Members to be confirmed following consultations*

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Annex

DRAFT INTEGRATED AFRICAN STRATEGY ON METEOROLOGY

(WEATHER AND CLIMATE SERVICES)

AMCOMET

AMCOMET-2/Expert/Doc. 10
English, Version 12

DRAFT INTEGRATED AFRICAN STRATEGY ON METEOROLOGY (WEATHER AND CLIMATE SERVICES)

Second Session of the African Ministerial Conference on Meteorology (AMCOMET)

FOREWORD

More than ever the winds of change are blowing rapidly across our beloved continent. Our countries have never been more vulnerable than at present to the impacts of weather and climate, forcing us to continually adjust our national development programmes, often at huge costs. Virtually every country or sub-region is increasingly prone to floods, droughts and food shortages. Water for economic activity, drinking and livestock is increasingly becoming scarce. Dust storms are increasing in frequency with attendant health problems. There has been a resurgence of diseases in some countries and an increase in the geographic spread of epidemics like malaria and cholera. In addition the rift valley fever which was eradicated over fifty years ago is now reoccurring. These changes are occurring against the backdrop of increasing populations. With agriculture being the mainstay of most of Africa's economy, of which over sixty percent of our citizens directly depend on for their day- to- day living, our farmers, who mainly rely on rainfall, are now confused about what and when to plant as climate change and variability impact upon the effectiveness of the traditional agricultural and crop-weather calendarsare changing and the past is no longer a reliable indicator of the future. We are now witnessing population movement in search of better pastures. For eastern Africa and southern Africa, the wildlife are searching for new migratory routes and even encroaching into already populated areas resulting in inevitable conflicts.

I have deliberately dealt with the situation obtaining on our continent to highlight the need for AMCOMET to take cognisance of the magnitude of the problems and challenges facing us and reaffirm, as political leaders entrusted with the responsibility for Meteorological and Hydrological services in our respective countries, the vital role we can play in helping to address some of these issues. It is becoming increasingly clear that weather and climate services have a strategic role to play in our countries and even regionally. It is incumbent upon us to change the role we have been viewing our National Meteorological Services by empowering and capacitating them so that they are able to help us address our societal and development concerns. This African Strategy on Meteorology (Weather and Climate Services) is aimed at laying the foundation for what we need to do to allow our communities to further benefit from the investment our governments make in meteorology. It is clear that there are gaps to be filled. For example, the weather observation stations in most countries are not of the required density to inform research, policy solutions and decisions at the detail that we as policy-makers require. Weather forecasts and climate predictions can be improved to meet the increasing demand from almost every socio-economic sector, including the transport sector, not least the Aviation sector that needs our urgent attention. Whilst the Global Framework for Climate services provides a new and unique opportunity to help us address speedily implement our strategy, we are called on to provide decisive leadership to help guide our respective National Meteorological services to make a meaningful contribution to meeting the needs of users, not least us as policy-makers. By 1 December 2013 we need to demonstrate that our aeronautical meteorological personnel also meet international standards. These challenges and opportunities can only be met by us all working in concert using our existing sub-regional mechanisms such as the Regional Economic Groupings to work in partnership.

AMCOMET presents a great opportunity for us to work together as a collective to address our own challenges, agree on strategies, funding mechanisms etc. Charity begins at home, we are often told, thus creation of our own funding mechanism such as a Trust Fund and its governance mechanism, which not only show our commitment to the AMOCOMET process but also provide a beacon for our technical and development partners to join in and support our efforts.

I wish to thank the World Meteorological Organisation, the African Union Commission, the AMCOMET Bureau Members as well as the AMCOMET Task Force for the support and input leading to the drafting of the African Strategy for Weather and Climate Services. I would like to dedicate this Strategy to the late founding Chair of AMCOMET, **Honourable John N Michuki, MP, EGH**, the illustrious and ambitious son of Kenya who tragically passed on 21 February 2012. I am sure where ever he is; he is resting in eternal peace and smiling at us as we forge ahead with the development of our National Meteorological Services. I would like to express my profound gratitude to all my colleagues for demonstrating your willingness to ensure that AMCOMET succeeds. I look forward to your suggestions on the way forward.

To quote a famous WMO scientist, “alone we can go fast, but together we can go far”.

Hon. Amb. Chirau Ali Mwakwere
EGH, FCILT, MP
Minister of Environment and Mineral Resources and Chair of AMCOMET

PREFACE

The African continent is witnessing increased weather and climate variability and climate change. The weather and climate related natural disasters have become all too frequent, prolonged, more extreme in intensity and devastating. For example, the continent has witnessed alternating floods and drought, high incidents of lightning and strong winds, the spread of dust storms increasing desertification, scarcity of fresh water, changes in the weather patterns and disruption to agricultural production. These disasters are hindering economic development as development funds are diverted to respond to them. This is already threatening Africa's desire to attain the Millennium Development Goals.

The African Ministerial Conference on Meteorology (AMCOMET), as a key African Union institution, is thus being called upon to lead planning and response efforts. AMCOMET can ensure that the contribution of National Meteorological and Hydrological services in Africa, working in close partnership with other stakeholders such as the World Meteorological Organisation (WMO) and other African Union organs such as the African Ministerial Conference on the Environment (AMCEN), the African Ministerial Council on Water AMCOW, among others, so that together we **lessen** the impact of desertification, drought, , extreme weather, water and climate events, and their associated pests and diseases. These actions will have a positive impact on agricultural production and activities essential to food security and industrial production, thereby contributing to the eradication of extreme poverty and hunger. In addition, we should **mitigate** the impact of weather- and climate-sensitive epidemics, thereby helping to reduce child mortality (MDG Goal 4), improve maternal health (Goal 5), and combat HIV/AIDS, malaria and other diseases. We also have to **monitor** the environment to assess and reduce the impact of climate change and help countries, especially the least developed, to adapt, thereby helping to ensure environmental sustainability. Another important factor is the need to e**ncourage** the participation of women in science, and recognize and support the special needs of rural women and of women involved in water management and disaster response, to apply weather, water and climate information and services effectively, thereby contributing to the promotion of gender equality and the empowerment of women (Goal 3).

Lastly, mindful that weather and climate patterns and behaviour do not recognise political boundaries, cooperation among countries, within regions and throughout the word is highly recommended if not inevitable. This dependence of countries on each other for weather, climate and water information and services is the principal reason for the existence of WMO and its Regional Associations and Technical Commissions. These groupings provide the mechanisms for acquisition and exchange of data, the setting of norms and standards, the transfer of technology and expertise and the sharing of knowledge. This Integrated Strategy on Meteorology (Weather and Climate Services) underscores the urgent need for the upgrading of meteorological services, including the enhancement of observing networks, enhanced capacity to receive, share and transmit observed data, improved capacity to produce timely and accurate weather forecasts and climate predictions as well as other decision support tools. All the above will only succeed if

AMCOMET provides the collective leadership to meet the objectives of the Conference, including ensuring the availability of resources to implement the strategy and action plans driven first by national investments and augmented by other sources of funding, taking into account the Global Framework for Climate Services (GFCS) implementation in Africa.

WMO SG

LIST OF ACRONYMS

ACMAD	African Centre of Meteorological Applications for Development
AGRHYMET	Centre Regional de Formation et d'Application en Agrométéorologie et Hydrologie Opérationnelle
AMESD	African Environment for Sustainable Development
ASECNA	Agency for the Safety of Aerial Navigation in Africa
AUC	African Union Commission
CEMAC	Economic and Monetary Community of Central Africa
CLIMDev	Consultative Group to Review the Climate for Development Africa
COMESA	Common Market for Eastern and Southern Africa
EAC	East African Community
ECOWAS	Economic Community of West African States
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
GFCS	Global Framework for Climate Services
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICPAC	IGAD Climate Prediction and Applications Centre
ICT	Information and Communication Technology
IGAD	Intergovernmental Authority on Development
IPCC	Intergovernmental Panel on Climate Change
LDCs	Least Developed Countries
MASA	Meteorological Association of Southern Africa
MDGs	Millennium Development Goals
NEPAD	New Partnership for Africa's Development
NGOs	Non-Governmental Organizations
NMHSs	National Meteorological and Hydrological Services
NMSs	National Meteorological Services
PR(s)	Permanent Representative(s)
RECs	Regional Economic Communities
RTCS	WMO Regional Training Centres
SADC-CSC	Southern African Development Community-Climate Services Centre
SWOT	Strengths, Weaknesses, Opportunities and Threats
UMA	Union du Maghreb Arabe
UN	United Nations
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations Strategy on Disaster Reduction
UNCCD	United Nations Convention to Combat Desertification
WMO	World Meteorological Organization

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EXECUTIVE SUMMARY

During the past decade there has been general improvement in the capacity and capabilities of African National Meteorological and Hydrological Services. Through collaboration with various institutions and development partners, capacity development and training has been undertaken to improve technical skills needed to deliver weather and climate services.

Technical skills for weather service personnel include surveillance, forecasting and warning, supply and maintenance of equipment and data collection and management (including processing, storage, access and exchange of near real-time weather data). Technical skills for climate services personnel include collection of, archiving, quality control and management of historical climate data, supply and maintenance of equipment, analyses of climate data, and capability for seasonal and inter-annual predictions and climate change projections (scenarios).

Despite the progress made, much remains to be done to bring many National Meteorological and Hydrological Services (NMHSs) up to the level that will ensure they can meet their mandates and serve their nations effectively. The current capacity at the national level varies greatly between NMHSs. Most NMHSs in the region operate with poor infrastructure and limited capability. Their climate services are generally poorly developed and in a number of countries basic climate services are only available from external sources.

NMHSs can contribute to underpinning economic growth and sustainable development in the African continent. The weather and climate services provided by NMHSs significantly contribute to the safety and well-being of the African people and communities and support key economic areas including agriculture, aviation, forestry, fishing, water resources, energy industries, transportation and tourism. In addition, these services are crucial to enhancing resilience to and reducing vulnerability from, natural hazards and the effects of climate variability and climate change.

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 and the application of the science of meteorology and its related applications. The Integrated African Strategy for Meteorology (Weather and Climate Services) has been developed to enhance the cooperation between African countries and to ensure that NMHSs have the capacity to fulfil their responsibilities including in the implementation of the Global Framework for Climate Services (GFCS).

The Strategy identifies five key pillars for action:

- Increase political support and recognition of National Meteorological and Hydrological Services and related Regional Climate Centres

- Enhance weather and climate service delivery for sustainable development
- Improve access to meteorological services for in particular for Marine and Aviation Sectors
- Support the provision of weather and climate services for climate change adaptation and mitigation
- Strengthen partnerships with relevant institutions and funding mechanisms

The Strategy sets out priority actions that can be undertaken at national, regional and global levels.

These priority actions are supported by a set of institutional partnerships that bring together AMCOMET and development partners to support meteorological (weather and climate) services in the African continent.

INTRODUCTION

In April 2010, the Nairobi Ministerial Declaration from the First Conference of Ministers Responsible for Meteorology in Africa established the African Ministerial Conference on Meteorology (AMCOMET) as a high level mechanism for the development of meteorology and its applications in Africa. African Ministers recognized that weather and climate are central to the socio-economic development of any country, and as such deserve strong support at the highest possible level of government. Ministers further recognize that sound governance of the science of meteorology and its related applications must be streamlined in national development agendas to promote cooperation, security, socio-economic development and poverty eradication on a pan-African level. By establishing AMCOMET, the Ministers committed themselves to[4]:

- Strengthen and sustain National Meteorological Services by providing them with the resources and appropriate institutional frameworks to enable them to execute their functions, particularly in observations, forecasting and applications;

- Recognise the role of meteorological services as a fundamental component of the national development infrastructure and ensure that meteorological information is a permanent parameter and feature in national current and future plans, programmes and policies in the key sectors of the country's economy;

- Regard national meteorological services as strategic national assets which contribute to national security, principal of which are transport, food, water, energy and health in addition to being vital to sustainable development particularly poverty reduction efforts, climate change mitigation and adaptation and disaster risk reduction;

- Ensure that all sub regions of the continent are active and are adequately resourced.

Furthermore, they agreed to develop an African Strategy on Meteorology (Weather and Climate Services). This Strategy was developed in partnership with the World Meteorological Organization (WMO), which engaged a team of two consultants to prepare a draft through consultations with the African Union Commission (AUC), Regional Economic Communities (RECs), Member States, Regional Climate Centres, and other relevant stakeholders. Several consultations, iterations and inputs from relevant WMO scientific and technological departments led to a draft strategy which was discussed and finalised by the Expert Segment of the Second Session of AMCOMET held in October 2012 in Victoria Falls, Zimbabwe.

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[4] See Annex 1 for the Nairobi Ministerial Declaration

After a SWOT and stakeholder analysis, this Strategy focuses on five (5) interrelated strategic pillars:

- Increase political support and recognition of National Meteorological and Hydrological Services;
- Enhance weather and climate service delivery for sustainable development;
- Improve access to meteorological services for the aviation sector;
- Support the provision of weather and climate services for climate change adaptation and mitigation;
- Strengthen partnerships with relevant institutions and funding mechanisms.

Priority areas of action of the strategic pillars are identified with a view to promoting the production and incorporation of science based weather and climate information and services into Africa development policy, planning and programmes. For purposes of commitment and deliverables, the Strategy has a time window of 2013 – 2017. It is envisaged that the implementation plan will be approved by the Third Session of AMCOMET in 2014, and be immediately operational. In the same vein, resource mobilisation should commence immediately.

THE CONTEXT

Africa is most vulnerable to climate variability and change. Out of its 54 countries, 34 are categorised by the United Nations as Least Developed Countries (LDCs) which constitutes two-thirds of all LDCs in the world. Drought, desertification, floods, pests and Tropical Cyclones further increase the level of vulnerability of the region to weather, climate and hydrological hazards. The political disturbances and attendant civil strife in some of the countries further worsen the socio - economic development and slow the fight against poverty. The resulting effect is the slow development of many African countries and a negative implication in their achievement of the Millennium Development Goals.

There is an increasing need for the delivery of sector specific weather, climate and water services to ensure food security, improved water resource management, disaster risk reduction and better health. To enable the provision of these services, the density of the observation network in Africa must be improved as through capacity building efforts and technology transfer. Despite covering a fifth of the world's total land area, Africa has the least developed land-based observation network of all continents, and one that is in a deteriorating state, amounting to only 1/8 of the minimum density required by the World Meteorological Organization (WMO). Most services have a stagnant pool of human and financial resources, and obsolete technologies limiting their capabilities to produce the best services needed by policy makers and other decision-makers.

Accurate and timely weather forecasts and climate analyses and predictions will further improve human safety, prosperity and livelihood and preserve precious natural resources to the benefit of communities, especially the most vulnerable. This is the rationale behind the Global Framework for Climate Services (GFCS), developed by the WMO in conjunction with the broader United Nations system and other relevant partners.

It is also the rationale for the creation of AMCOMET, which aims to provide political leadership, policy direction and advocacy in the provision of weather, water and climate information and services that meet societal and sector specific needs, including agriculture, health, water resource management and disaster risk reduction to name a few. Its key objectives are to help promote security, socio-economic development and poverty eradication on a pan-African level through sound governance of the science of meteorology and its related applications.

Below is an overview of the challenges experienced which provides a rationale for the provision of accurate and timely weather and climate services:

- **Food security:** Many African economies rely on subsistence agriculture and fishing as a means of livelihood. Subsistence farmers and fishers are very vulnerable to external shocks, including natural hazards such as severe weather events and the impacts of climate change. Their thin margin for error can mean one event plunges them into catastrophic losses. People living at a subsistence level are easily trapped in poverty because they cannot recover

from such shocks as readily as those with greater economic resources. Sound information on storms, extreme rainfall, floods and drought events can help reduce these impacts.

- **Health:** Most infectious diseases have seasonal cycles that include spatial and temporal changes in prevalence and the seasonality of the diseases is driven by changes in rainfall, temperature and humidity. The protection of public health from an increasingly variable and changing climate is a priority for the health sector. Partnering with the meteorological community to ensure that weather and climate information is available and appropriate for health decisions is a key step in the process to managing climate risks.

- **Water Resource Management:** Weather and climate forecasts and warnings are an essential ingredient for water resource management. The water sector is strongly influenced by, and sensitive to, changes in climate (including periods of prolonged climate variability). About 25% of the contemporary African population experiences high water stress while 69% of the population lives under conditions of relative water abundance. The impacts of climate change are expected to have severe consequences for the availability of water in Africa. A 3°C temperature increase could lead to 0.4 – 1.8 billion more people at the risk of water stress.

- **Coastal Environment:** The increase in water temperature has detrimental effects on the physiology of marine organisms and promotes the establishment of thermophilic species. These effects are especially noticeable on the breeding habits of certain species. Low-lying cities located on lagoons, estuaries, deltas or large river mouths, such as Alexandria, Cotonou, Dar es Salaam, Lagos, Maputo, Mombasa and parts of Cape Town, are particularly vulnerable to extreme weather events caused by climate change. They are likely to experience storm surges, sea-level rises, increased flooding, (semi-) permanent inundation, coastal erosion, landslides, and the increase of water-borne diseases, which may all have devastating effects on human settlements. African cities will also experience more severe and frequent flooding and these flooded areas and ditches, latrines and septic tanks are key reservoirs that perpetuate cholera, malaria, dengue and yellow fever in urban areas.

- **Land Management and Biodiversity:** Many countries in Africa face major problems of land degradation, deforestation and bio-diversity, some as a result of climate variability and increasing human pressure on marginal lands. Application of weather and climate data, including emerging climate change scenarios is fundamental in the development of sustainable land and bio-diversity policies.

- **Urbanization**: Rapid rates of urbanization in Africa are associated with problems of poverty, inadequate water supply, increased vulnerability to diseases and natural disasters, as well as environmental degradation.

- **Disaster Risk Reduction:** Globally, ninety per cent of disasters are caused by weather-, climate- and water-related hazards such as cyclones, storm surges, extreme temperatures, landslides and wildfires. Between 1980 and

2010, some 9 600 disasters took the lives of over 2.5 million people and produced economic losses of US$1.3 trillion[5]. The financial cost of disasters caused by natural hazards, when calculated as a percentage of GDP, is 20 per cent higher in poorer than in richer countries[6].

- **Vulnerability and resilience:** Africa is one of the most environmentally fragile regions on the planet, prone to natural disasters and the effects of climate change. There is an intrinsic relationship between poverty and the vulnerability of communities to natural disasters and climate variability. Timely information on extreme weather events (through early warning systems and climate outlooks) can support resilience through reducing loss of life and property.

- **Climate Change:** Climate variability, climate change and future sea level rise can have significant impacts in terms of food and fresh water security, human health and investment in infrastructure. As the region is very much affected by extreme events, there is a strong need for climate data / information, which raises the expectation that NMHSs will provide the required climate services, particularly to policy makers to enable them to take appropriate action.

- **Economic development and trade:** Key economic sectors such as agriculture, forestry, fishing, water resources, energy, transportation and tourism depend on reliable weather forecasts and climate services to manage their activities effectively. They are also highly vulnerable to natural hazards and the impacts of climate change. High quality and reliable weather information and forecasts, and seasonal to annual climate prediction are crucial for these sectors, in particular for aviation.

At the pan-African level, institutions exist that can support the objectives of AMCOMET. Regional Economic Communities (RECs)[7] are the building blocks of the African Union Commission (AUC) and facilitate the sub-regional development and implementation of AUC supported programmes and mechanisms. As AMCOMET brings political support, it is critical to establish cooperation with the RECs, and to ensure that they are part of the AMCOMET process to harmonise the development of meteorology through regional approaches and minimise duplication of efforts among NMHSs. It is also necessary to imbed the Integrated African Strategy for Meteorology (Weather and Climate Services) within RECs operations to help promote inter-regional cooperation for socio-economic development within the context of climate and weather.

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[5] http://www.wmo.int/pages/publications/showcase/documents/1080_en.pdf

[6] http://www.wmo.int/pages/publications/showcase/documents/1080_en.pdf

[7] Arab Maghreb Union (UMA), Common Market for Eastern and Southern Africa (COMESA), Community of Sahel- Saharan States (CEN-SAD), East African Community (EAC), Economic Community of Central African States (ECCAS), Economic Community of West African States (ECOWAS), Intergovernmental Authority on Development (IGAD), Southern Africa Development Community (SADC), Comité permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel (CILSS), Commission de la Communauté Economique et Monétaire de l'Afrique Centrale (CEMAC), Indian Ocean Commission (IOC)

The investment and financial flows needed to support the delivery of weather and climate services to address the challenges of climate change in Africa are substantial. We acknowledge that the African Development Bank as the premier financial institutions will play great role in providing necessary financial support for the implementation of the African Integrated Strategy on Meteorology. As far as resource mobilization is concerned, there is a need to further consult and approach the Bank in order to tap into the existing funding mechanisms within the Bank.

Other established institutions are the Regional and Sub-Regional Climate Centres[8] which help NMHSs deliver better climate services, strengthen their capacity to meet local climate information needs, and improve their capability to deliver such services to their end-users, without replacing or duplicating the national mandate and authority of NMHSs.

[8] African Centre of Meteorological Application for Development (ACMAD), AGRHYMET Regional Centre, IGAD Climate Prediction and Applications Centre (ICPAC) and Southern African Development Community Climate Services Centre (SADC- CSC)

SWOT ANALSIS OF WEATHER AND CLIMATE SERVICES DELIVERY

The Strengths, Weaknesses, Opportunities and Threats of weather and climate services delivery by the National Meteorological Services of Africa are presented in Table 1 below:

Table 1: SWOT Analysis

Strengths	**Weaknesses**
- NMHSs are sole designated national authorities and chief advisers to governments on matters relating to meteorology, climatology and water resources; - NMHSs own and operate the basic observing systems according to international standards, which when exchanged, yield the information required for global, regional and national understanding of weather, water and climate phenomenon; - Availability of global, regional and sub-regional centres to help enhance product quality, human capital and infrastructural development; - Meteorology and hydrology play a key role in the national security (food security, water resources, energy) of a country; - Meteorological and hydrological information are essential part of National Plan; - Climate information at various time scales is required for adaptation.	- Low funding of NMHSs from government and the development partners for development and maintenance of infrastructure, observing systems, forecasting tools, staff competencies, and service delivery mechanisms; - Low capacity of NMHSs to undertake the continuous modernization resulting from rapid advances in the science and technology; - Lack of a defined framework for mainstreaming meteorology in national development; - Limited recognition of the socio-economic value of NMHSs and their services; - Lack of effective mechanisms for collaboration between public and private sectors and across scientific disciplines and technical domains; - Lack of legal frameworks for establishment of NMHSs in many Member countries; - Lack of communication skills - 34 LDC's are in Africa and have the least capacity to deliver services.
Opportunities	**Threats**
- Increasing relevance in the political and socio-economic development of the region (Millennium Development Goals, NEPAD, etc.); - Growing awareness of the public and the decision makers on the value added of and growing demand for weather and climate services; - Existence of development partners and funding agencies as a potential source of resources; - Climate change is a high level political and developmental issue at national, regional and international levels; - Existence of regional and sub-regional institutions to strengthen partnerships and coordination; - Emergence / existence of south-south cooperation and partnerships.	- Continued lack of visibility and inadequate financial support from governments; - Emergence of alternative sources that issue climate and weather information not built on international scientific consensus and the without contributions to the national observations infrastructure; - Globalization of weather issues through international media and research institutions without proper attention to national or local requirements; - Brain drain and high staff turn-over; - Political instability in some countries.

STAKEHOLDER ANALYSIS

The stakeholder analysis identifies the key partners that are directly or indirectly essential to the implementation of concrete activities. Those partners also have important roles to play at the level of formulation of appropriate policies that are relevant to the goals and aspirations of Members. Partners are also critical at the level of facilitating the delivery of weather-, climate-, and water-related products and services. These partners include Regional bodies, Sub-Regional Economic Communities, research, training and policy related institutions, non-governmental organizations, academia, media and communications, parliamentarians and United Nations agencies operating in the Region.

The key issues to be dealt with, by and large, revolve around the following building blocks:

- Cooperation with national and international stakeholders to enable adequate delivery of weather, climate and water related information and services;
- Development of human and institutional resources in NMHSs;
- Engagement of relevant stakeholders especially policymakers, in the development of the multifarious infrastructure necessary for achieving the goals set forth in the Strategy, and
- The issues surrounding risk management, early warning, climate change and climate variability with greater emphasis on investing in the meteorological and climatological infrastructure, as well as products and services.

In order for weather and climate services in Africa to be effective and developed, there are important and critical players that must work together. **Annex 2** illustrates, among others, the main stakeholders at national, regional and international levels and their relevance to the Strategy.

PURPOSE AND OBJECTIVE OF THE STRATEGY

The **overall purpose** of the strategy is to correctly position weather and climate services as an essential component in national and regional development framework and sustainable development in Africa, particularly in poverty reduction efforts, climate change adaptation and disaster risk reduction.

The **objective** of the Strategy is to enhance cooperation between African countries and to strengthen the capabilities of their National Meteorological Services.

The Strategy **further aims** to serve as a framework for integrated and coordinated mechanisms, which will provide strategic direction to Member States and other

stakeholders in streamlining policies that address challenges and opportunities associated with the development of adequate weather and climate services at the national and regional levels.

Guiding Principles of the Strategy

The Strategy should:

- Be collectively owned by Africa;
- Be programme oriented as per identified regional and continental priorities;
- Be focused on actionable policies with measurable outcomes and positive impacts on national economies as well as addresses societal and sectoral needs and challenges at regional, national and community levels; and
- Concentrate on benefiting Africa while contributing to global efforts.

INTENDED STRATEGY OUTCOMES

The expected outcomes of the Strategy are as follows:

- **Increased recognition of NMHSs role at political level.** It is vital for Africa's governments and policy makers to take on board the contribution of NMHSs to socio-economic planning and development, integrate them in national development programmes and accord the necessary financial support; In so doing, all weather dependent organisations, institutions and individuals have appropriate range and level of meteorological services as per their requirements;
- **Improved climate risk management for the protection of life and property.** Increased and timely availability of meteorological information, warnings and forecasts leads to reduced loss of life, safer infrastructure and reduced vulnerability of society;
- **Increased safety on land, on water and in the air.** Improved use of sector-specific meteorological products and services such as forecasts for road and rail transportation, lake navigation, ocean cruising and aviation industry to reduce associated risks;
- **Enhanced quality of life.** Communities and institutions are better informed and educated on the societal values of meteorological information leading to sustained socio-economic growth, including reduced health problems, improved food security, reduced disaster and climate risk, and better quality of life;

- **Enhanced cooperation among African countries** to strengthen NMHSs and address trans-boundary weather and climate impacts and contribute to regional and global initiatives, networks and climate change scenarios.

STRATEGIC PILLARS

The Strategy is a collective endeavour designed to address challenges and problems faced by Africa as identified by regional and continental organs and stakeholders. It focuses on highlighting feasible and actionable policies that have measurable outcomes and positive impacts on national development and economy through five (5) Strategic Pillars (SP). These are the Strategic Pillars, their rationale and main areas of emphasis are as follows:

SP1: Increase Political Support and Recognition of NMHSs and related Regional Climate Centres

This aims to increase the recognition of the role of National Meteorological and Hydrological Services (NMHS) within the political decision-making arena through the integration of meteorological services' contribution to various economic sectors and in national development programmes. It further aims to increase the active participation of relevant inter-governmental officials and other stakeholders in establishing adequate weather and climate services, both at the national and regional levels, aligned with policies that address development challenges and opportunities.

In many African countries, the Ministers responsible for meteorology have a virtually hands-off approach to and have little interaction with their NMSs. This is one of the main reasons for the low level of visibility and funding of NMSs. Accordingly, AMCOMET and other related policy makers might not have an insight of how NMSs operate and lack appreciation of the magnitude of the gaps that exist between the services in their countries and those in more advanced countries.

Below are the areas of action:

- Formulate policies and provide the necessary legislation to ensure that National Meteorological Services participate actively in the government structures and are adequately financed to fulfil their mandates and able to embark on, and benefit from, cost recovery beginning with aeronautical and where applicable, maritime services;

- Ensure that NMHSs develop strategic plans and service charters aligned with their governments' development agenda and priorities;

- Facilitate regular meetings with policy makers to inform them of NMHS activities and plans as well as demonstrate their relevance of their services to socio-economic development;

- Facilitate close cooperation from Regional Economic Communities (RECs) and other relevant African institutions to support the production and delivery of weather and climate services;

- Undertake study tours of a few developed and developing countries, beginning with AMCOMET Bureau and Task Force members.

SP2: Enhance the Production and Delivery of Weather and Climate Services for Sustainable Development

Acknowledging that NMHSs are the main providers of weather and climate services in Africa, this pillar aims to improve the effectives and efficiency of the production and delivery of such services enabling appropriate responses to the changing needs of government, society and sectoral users through suitable structures and working mechanisms.

One of the fundamental elements to achieving this is to fill the weather and information observation gap as well as to facilitate data exchange among relevant institutions. Furthermore, there is an urgent need to strengthen NMHS scientific and technological capacities to improve the delivery of tailored products and services to communities, with a view to enhancing agricultural production, minimising the spread of climate-sensitive diseases, improving water resources management and improving disaster response, among others.

It has already been stated that African Nations have, on average, eight times fewer land-based weather stations than the minimum number recommended by the WMO, yet the continent is highly vulnerable to natural disasters and weather extremes such as floods, droughts, tropical cyclones and forest fires. The stations are so far apart that their data cannot be extrapolated to the local level as there are varying terrain and altitudes. In addition, there has to be continuous monitoring and appropriate forecasting of these events. Presently, Africa is utilising numerical weather prediction and satellite derived products provided from outside the continent with limited involvement in the design of these products. The continent should not only be a consumer of these products, but also an owner and an operator.

Below are the areas of action:

- Invest more in weather and climate monitoring infrastructure (observation networks), such as automatic weather stations, meteorological radars, and rain and water gauges;

- Collectively engage manufacturers of meteorological equipment, accessories and consumables for the lowering of costs, rendering the equipment more affordable in an effort to improve station density and sustainability;

- Enhance telecommunications systems, within and among the countries;

- Enable human capacity development necessary for Climate Research, Modelling and Prediction

- Improve Service Delivery Mechanisms, particularly early warning and awareness systems, Climate Services Information Systems (CSIS) and Climate User Interface Programme (CUIP);

- Ensure that funding needed to sustain and develop NMHSs and sub-regional climate centres through appropriate national and regional mechanisms, including their possible transition into semi-autonomous entities, where and when appropriate;

- Ensure that all sub–regions of Africa are equitably considered, including the establishment of a sub-regional climate monitoring institution for sustainable development in Central Africa;

- Ensure the implementation of a structured GFCS at regional (i.e. continental) level, based on the input provided in Annex 6, on the understanding that the regional GFCS implementation will facilitate links between national and global GFCS implementation activities;

- Improve channels of communication to enable prompt and informed decision making, taking into consideration the highly perishable nature of most weather products such as forecasts, warnings and advisories;

- Create national and regional fora that facilitate and encourage continuous interaction among meteorological experts, national meteorological advisers, sectoral stakeholders and government policy makers at the appropriate governmental levels;

- Establish national GCOS Coordinators to facilitate availability and exchange of climate observations needed for the GFCS at national, regional and global levels;

- Invest in ground systems, training and analytical tools to make best use of existing satellite and model information available from international partners; and in parallel;

- Engage with international partners on the design of numerical weather prediction and satellite derived products to better address African requirements; and

- Ensure that the African requirements on satellite derived products are channelled through the regional WIGOS and the WMO Space programme on the one hand and, on the other hand, through the African Union Commission, who is mandated to explore feasibility of an African Space Agency and associated space policy and programmes, in order to ensure that these meteorological requirements are properly taken into account

SP3: Improve Access to Meteorological Services in particular for Marine and Aviation Sectors

The International Civil Aviation Organisation (ICAO) requires that meteorological authorities should supply operators, flight crew members, air traffic service units, search and rescue service units, airport management and related aviation stakeholders with meteorological information that meets the needs of international air navigation. The latest is the deadline for meteorological services to be certified by November 2012 leading to ISO-9000 certification. In addition, competences of personnel for these services should meet international standards by 2016. The equipment should also have calibration certificates and readings be regularly verified. AMCOMET is urgently required to facilitate the availing of national funds to ensure that the countries meet these deadlines and comply with ICAO requirements.

Below are the areas of action:

- Develop Quality Management Framework leading to ISO certification for certain sectors like aviation.
- Support the certification of NMHSs by November 2012, or soon after, leading to ISO-9000 certification;
- Ensure that competencies of relevant personnel meet international standards by 2013 and qualifications for the 2016 deadline;
- Ensure relevant equipment have calibration certificates and regularly verified readings for continuous compliance; and
- Facilitate to the extent possible, the availing of funds to ensure that the countries meet these deadlines and comply with ICAO requirements; And
- Facilitate the deployment of buoys, where necessary.

SP4: Support the Provision of Weather and Climate Services for Climate Change Adaptation and Mitigation

Africa is one of the most vulnerable regions of the world to the impacts of climate change. The majority of the continent's disasters are meteorological and hydrological related. These disasters pose a serious threat to the continent's ability to attain the Millennium Development Goals and sustainable development. The While impacts vary across the continent, it is generally agreed that the climate is becoming more extreme; and as such, the overall future of the African continent is bleak unless adequate preparations are made and sufficient mitigation as well as risk reduction measures are put in place against the anticipated droughts and sea-level rises.

Accordingly, it is crucial that AMCOMET, in collaboration with relevant African institutions, be actively involved in the African communities' position on climate change into the

international negotiations, including the African Ministerial Conference on Environment (AMCEN), the African Ministers Conference on water and the Conference of African Heads of States and Government on Climate Change (CAHOSCC). In addition, AMCOMET will partner the African Ministerial Conference on Science and Technology (AMCOST) in the research design and operation of appropriate technology.

Below are the areas of action:

- Ensure that, at the national level, at least 5% of budgets allocated to National Meteorological Services and associated research institutions are for research and development;

- Formulate legislation designating the national meteorological services as the leading authority on climate change science-based projections. This is meant to ensure that country's climate –sensitive sectors do not use climate change scenarios that come from different sources with different projects and so creating confusion;

- Involve mainstream economic, trade and finance ministries and the development community, comprising donors, research institutions and a broader range of stakeholders than environmental interests is essential. Thus, AMCOMET should galvanise greater engagement between the climate communities and the development community;
- Liaise with African Ministerial Conference on Environment AMCEN, African Ministerial Council on Water (AMCOW), AMCOST and the African Climate Policy Centre (ACPC) to craft a new African agenda and position on climate change. This enables Africa to articulate its position at international for such as the United Nations Framework Convention on Climate Change (UNFCCC), the African Group of Negotiators and the Intergovernmental Panel on Climate Change (IPCC);

- Ensure the implementation of a structured GFCS at regional (i.e. continental) level, based on the input provided in Annex 6, on the understanding that the regional GFCS implementation will facilitate links between national and global GFCS level Ex; and
-
- Ensure that AMCOMET and the NMHSs actively participate in international negotiations such as the Conference of Parties (COP) to UNFCCC, UNCBD, UNCCD and the IPCC.

SP5: Strengthen Partnerships with Relevant Institutions and Funding Mechanisms

The success of the Strategy is highly dependent on the strength of the partnerships AMCOMET is able to forge, both with existing institutions able to support its mandate as well as funding mechanisms able to provide the necessary financial resources to meet its goals. To be effective, the Strategy must be clearly linked with the work of other government departments and agencies, technical partners, the private sector, and other relevant stakeholders, and work in concerted effort with other global and regional

frameworks. AMCOMET plays a vital role in harnessing and developing these relationships.

Below are the areas of action:

- Cultivate long-term partnerships with traditional financing mechanisms, such as development banks and aid agencies to ensure their involvement in the AMCOMET process paving the way for institutional and financial support;

- Remain abreast of the emergence of bilateral and multilateral funding mechanisms established to support developing and least developed countries in their development efforts including through improvement of meteorological infrastructure and services;
- Actively involve the private sector, especially within the agricultural, insurance, transport and tourism sectors, who represent a sustainable customer base for NMHSs and potential long term collaborators for the implementation of the Strategy;

- -Strengthen partnership with international scientific and technical partners (e.g. EUMETAST, ECMWF, IRI, etc.) in order to ensure that African NMHS and RCCs can access scientific and technical information delivered by these partners and contribute actively to their cooperative activities (research, training, etc); and
-
- Collaborate with existing Initiatives, such as ClimDev-Africa and the Monitoring of Environment and Security in Africa (MESA) as well as relevant African institutions, such as ACPC, ACMAD, RCCs, WMO Centre of Excellence on training, to ensure the convergence and complementarities of initiatives and programmes.

IMPLEMENTATION, RISKS AND ASSUMPTIONS

The thrust of AMCOMET will hinge on the need to acknowledge the strategic nature of National Meteorological and Hydrological Services, and the critical and inevitable role they play in national security, national stability and in the socio-economic development of any country. NMHSs are now more than ever, being called upon to urgently respond to the ever-increasing and varied needs of our societies, effects of climate variability and change as well as new opportunities arising from technological advances. AMCOMET should therefore commit to implementing the Strategy by not only according the visibility and recognition the value added of NMHSs within the country, but also by improving the sustainability, effectiveness, flexibility and efficiency of their structures and working mechanisms and practices. Once approved, the modalities of implementation for the Strategy need to be crafted in accordance with the priorities of AMCOMET as well the availability of financial resources. In addition to the above, there are associated risks (R) and assumptions (A) which should be taken note of and considered. Among these are the following:

- political disturbances in African countries (R)
- national resource allocations to national meteorological services are sufficient (A)
- political realignment with the development partners (R) as some donor aid comes with political strings as pre-requisites
- HIV/ Aids and epidemics like malaria, typhoid and cholera (R)
- High staff turnover, en-mass retirement and frequent staff changes (R)
- Appropriate skilled human resource is available (A), particularly in weather forecasting, data warehousing and data mining as well as quality control and climate modelling; and
- Environment for recruitment of women is conducive (A), more so in the context of adaptation and mitigation to climate change.

AMCOMET and partners will establish Task Forces as appropriate, in priority activities to (i) draft the **Implementation Plan** for the Integrated African Strategy on Meteorology (Weather and Climate Services) with detailed annual operational plans, and (ii) draft the **Resource Mobilisation** Strategy for the Implementation Plan.

AMCOMET Members should be encouraged to pursue dialogue with other countries, especially with those with more advanced capabilities, to better understand of how best to organize and support climate and weather services in their respective countries.

INSTITUTIONAL ARRANGEMENTS

Related institutions and structures are already in place to support the implementation of the Strategy. The development of the Strategy has involved the participation of the African Union Commission, Regional Economic Communities, national authorities and development partners through a consultative process. This participatory approach will continue throughout the implementation of the Strategy. Specific roles and responsibilities will be defined in the Implementation Plan for the implementation of the Strategy at the continental, regional and national levels by key stakeholders (AUC, RECs and Member States).

Climate for Development in Africa Program (ClimDev-Africa) is a joint initiative of the African Development Bank, the Commission of the African Union (AUC) and the United Nations Economic Commission for Africa (UNECA) that seeks ways of overcoming the lack of necessary climate information, analysis and options required by policy and decision-makers at all levels. The program has been mandated at meetings of African Heads of State and Government, as well as by African Ministers of Finance, Planning and

Environment. The budget for the program lasting up to 2020 is estimated to require about US$ 800 million.

Other African stakeholders, including the private sector and civil society organisations should also be consulted and involved. International stakeholders, as partners, should participate in the implementation of the Strategy and align their support with the Strategic Pillars and identified needs of key stakeholders.

RESOURCE MOBILISATION

To ensure a smooth implementation of the Integrated African Strategy on Meteorology (Weather and Climate Services), a resource mobilization strategy aligned with the institutional arrangements and coordination modalities established in the Strategy. The following items will be considered, among others:

- Challenges in resource mobilization, given the current global financial climate;
- Funding trends and sources;
- Resource mobilisation scenarios.

This is subject to the discussions and decisions by the Second Session of AMCOMET for further work after the adoption of the Strategy.

MONITORING, EVALUATION AND REPORTING

The implementation of the Strategy shall be reviewed in accordance with the planning cycle of AMCOMET. An appropriate Monitoring and Evaluation tool will be developed to ensure periodic reporting from focal points and stakeholders. It is expected that AMCOMET, the African Union Commission, Regional Economic Communities and National Governments will have key roles in the process.

To monitor the progress towards achieving the objectives of the Strategy, data and information will be collected from the following indicators:

- Enhanced the cooperation among African countries;
- Increased involvement of NMHSs in relevant government agenda;
- Enhanced capacity of NMHSs and regional climate centres in providing sector-specific weather and climate services;
- Increased number of ICAO certified NMHSs;
- Increased resources invested in the strengthening of NMHSs.

ANNEX 1: NAIROBI MINISTERIAL DECLARATION

1. **We**, the Ministers and Heads of Delegation participating in the Ministerial Segment of the First Conference of Ministers Responsible for Meteorology in Africa held in Nairobi, Kenya on 15 and16 April 2010;

2. **Noting** the increasing risks and threats to sustainable development associated with disasters of which 90% are due to or aggravated by meteorological or hydrological extreme events and that African countries are facing multi-faceted challenges of climate variability and change that require, among others, decision-making based on scientifically sound data and information by governments and communities in order to develop adaptation strategies and action plans as part of the ongoing development processes and policies at national, sub-regional and continental level;

3. **Recognizing** that weather and climate information, services and products are of key importance for supporting climate–sensitive social and economic development sectors, including in particular health; agriculture and food security; transport; disaster risk reduction; natural resource management and environmental protection; water resource management and development; energy generation and distribution; and tourism;

4. **Noting** the gaps in operational observation and telecommunication networks, including maritime networks and their negative impact on the reliability of weather and climate information and services, and in view of the need to collectively address this situation to enable the National Meteorological Services in Africa to fulfil their national, regional and international mandates:

5. **Considering** that weather and climate patterns recognize no boundaries and that no one nation can be entirely self-sufficient in the production of all its meteorological and climate services and the urgent need to work jointly and in synergy to contribute effectively and efficiently to the development of our countries, by exploiting the full potential of meteorology and related sciences;

6. **Taking into account** the African Union Summit Decision on climate change and development, adopted by the 8th General Assembly in 2007 whereupon the Assembly expressed strong concerns about the vulnerability of Africa's socio-economic sectors and productive systems to climate variability and change and further noting that African countries demonstrably require additional resources for adaptation towards meeting the Millennium Development Goals;

7. **Referring to** Resolution 26 of World Meteorological Organization (WMO) Congress XIII in 1999 on the Role and Operation of Meteorological Services which urges WMO Members to mandate the National Meteorological Services as the official voice in issuing weather warnings for public safety to help minimize risks to the health and safety of citizens as well as the primary national authority and official source of information and policy advice on the present and future state of the atmosphere and other aspects of national weather and climate, in support of policy development and the need to meet national, regional and international responsibilities in the effective implementation of the WMO programmes;

8. **Recognizing** the support provided to National Meteorological and Hydrological Services by the sub-regional and regional institutions, including the African Centre for Meteorological Applications for Development (ACMAD), the Centre for Training, Research and Applications of Agrometeorology and Operational Hydrology (AGRHYMET) the specialized institution of CILSS, the Intergovernmental Authority on Development (IGAD) Climate Prediction and Applications Centre (ICPAC), the Southern African Development Community (SADC) Drought Monitoring Centre (DMC) and the WMO Regional Training Centres in Africa.

9. **Recognizing** the need to ensure that all sub regions are adequately served by their subregional institutions on meteorology and climate services:

10. **Recognizing** the importance of programmes in Africa such as ClimDev Africa which is focused on climate observations, the African Monitoring of the Environment for Sustainable Development (AMESD) based on satellite observations and the African Early Warning and Climate Services (AEWACS); and particularly the support of the African Development Bank, UN Economic Commission for Africa, and the African Union;

11. **Recognizing** the socioeconomic benefits achieved in the use of meteorological information in various sectors in Africa such as transport, agriculture, health and water resources:

12. **Noting** with appreciation that the World Meteorological Organization (WMO), in collaboration with other UN System organizations, regional and subregional institutions and development partners, is assisting African countries to benefit from the scientific and technological progress made over the recent years, including access to satellite meteorological information to develop meteorological and climate products and services to support national and regional development planning, policy and programmes;

13. **Considering** the stringent and urgent requirements of the aviation sector for recommended and standard practices and the availability and provision of quality information to ensure safety of international air navigation;

14. **Recalling** the decision to establish a Global Framework for Climate Services (GFCS) made by the Heads of State and Government, Ministers and Heads of Delegation at the High-level segment of the World Climate Conference-3 held in Geneva, Switzerland, from 31 August to 4 September 2009, and;

15. **Having considered** the conclusions of the Expert Segment of the Ministerial Conference held in Nairobi from 12 to 14 April 2010, in particular its analysis of successful applications of weather, water and climate information, products and services to various sectors of social and economic development including for Disaster Risk Reduction and the recommendations on current and future programmes, projects and activities;

Commit ourselves to:

a) Strengthen and sustain National Meteorological Services by providing them with all necessary resources and adequate institutional frameworks to enable them to fully perform their roles as a fundamental component of the national development infrastructure of our countries and of the continent and a contributor to security and sustainable development, particularly poverty reduction efforts, climate change adaptation and disaster risk reduction;

b) Take all necessary steps to ensure that African National Meteorological Services meet the ICAO requirements regarding Quality Management Systems (QMS) by November 2012.

Agree to:

a) Establish the African Ministerial Conference on Meteorology (AMCOMET) as a high-level mechanism for the development of meteorology and its applications in Africa with a Bureau composed of Kenya (Chair), Mali (First Vice-Chair), Zimbabwe (Second Vice-Chair), Congo (Third Vice-Chair) and Morocco (Rapporteur) representing the five African sub-regions. This Bureau will represent AMCOMET during the intersessional period;

b) Designate during this Conference a Task Force of ten (10) members comprising the five Bureau members and Algeria (North Africa), Cameroon (Central Africa), Ghana (West Africa), Uganda (East Africa), and a representative of Southern Africa (to be designated)[9]. The Task Force, to be chaired by the AMCOMET chairperson, will define the institutional framework and internal arrangements of AMCOMET with WMO as the Secretariat with the support of AU. The Task Force should submit a proposal to the first session of AMCOMET which should meet regularly and at least every two years;

c) Take the necessary measures, within two years, to develop an African Strategy on Meteorology for enhancing cooperation between African countries to strengthen the capabilities of their National Meteorological Services and existing Regional and Sub-regional climate centres in Africa. so as to effectively meet government and societal needs and requirements for weather and climate information and services, taking into account the statement of the expert segment of this Ministerial Conference and the planning for the Global Framework for Climate Services (GFCS);

d) Establish, with the support of WMO and partners, a sub-regional structure for climate monitoring and adaptation to climate change for sustainable development in Central Africa;

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[9] Southern African ministers have assigned Zambia as a representative of southern Africa for the Task Force during the Meeting of the Committee of Ministers Responsible for Transport and Meteorology on the 28th of May 2010

e) Involve the technical and financial partners, the international community and the United Nations system and its agencies to support AMCOMET and the preparation and the implementation of the African Strategy on Meteorology;

f) Ensure that African National Meteorological Services and Regional and sub-regional centres have access to the Copenhagen Green Fund for Climate Change through the African Development Bank and other mechanisms;

g) Ensure that NMS benefit from cost recovery with respect to aeronautical and maritime meteorological services and other mechanisms;

h) Invite WMO to take note of this Declaration and bring it to the attention of the sixty second session of the Executive Council, fifteenth session of the WMO Regional Association for Africa and the Sixteenth WMO Congress and to take appropriate measures;

i) Invite the African Union Commission to take note of this Declaration, to bring it to the attention of the next African Union Summit and take appropriate measures.

ANNEX 2: MAJOR STAKEHOLDERS

Stakeholder(s)	Relationship and/ or contribution to the development of weather and Climate Services
At a Pan-African Level	
African Union (AU)	Political leadership and support by Heads of State for policy formulation
Other AU Specialised Technical Organs (such as AMCOW (Water), AMCEN (Environment), AMCOST (Science and Technology)	The specialised governmental bodies were created to address emerging issues crucial to the development of Africa. The areas of attention (the environment, water, science and technology and climate change) are all highly sensitive to weather and climate variability and climate change.
ACMAD	
United Nations Economic Commission of Africa (ECA)	Mobilisation of resources from various donors for social and economic development.
At Sub-continental level	
Regional Economic Communities (SADC, IGAD, ECOWAS, CEMAC, UMA)	Regional coordination of economic development of member states by way of protocols (including meteorology and hydrology) in various sectors. This includes allocation of financial resources.
River Basin Organisations (Congo, Zambezi, Niger, Nile, Limpopo), plus Inland lake Authorities (Lake Chad, Lake Victoria, etc.)	Trans-national management of water demand at river basins. They need weather forecasts for river control, apportionment and levying (water rights) and dam level monitoring (disaster preparedness).
WMO Regional Training Centres (RTCs)	These Centres have a mandate to contribute to capacity building of Members of the Region, complimenting training programmes at the national level.
WMO Regional Climate Centres (RCCs)	These institutions are being created to serve the sub-regional groupings with a mandate to handle regional datasets, monitor regional weather variability, develop regional scale climate products and information after downscaling them from the global producers
Regional Meteorological Development Institutions (ICPAC, AGRHYMET, SADC-CSC)	The Institutions were established to spearhead the development and applications of meteorology at the sub-regional level. The centres are conduits through which international development partners and donors support weather and climate projects and programmes, in addition to bilateral support. Some of them are expected to become RCCs in Africa
At National level	
National Governments	Political and financial support and inter-ministerial collaboration. This has an impact on the visibility of, and level of relevance of NMHSs at national level. NMHSs provide information essential to address issues affecting all citizens, particularly those that are vulnerable to climate and weather vagaries, plus climate change.
National Ministries (Environment, Finance, Health, Agriculture, Energy, Transport, Tourism, Water)	These represent meteorologically- related national interests and responsibilities to cushion all citizens from diseases, poverty alleviation, natural disasters, pollution, etc. Some of these Ministries are parent ministries of NMHSs. They also translate climate information into policy matters.
NMHSs	NMHSs are national designated authorities responsible for, among others, maintain and operate needed basic meteorological observational infrastructure in supporting services towards safety of life and property, national security and sustainable development.
National Universities and Technical Colleges	These are sources of skilled manpower. They also provide academic environment for meteorological and hydrological research.
NGOs	Work with local communities and addressing specific and varied interests. They work with/ are essential to NMHSs to help communities to mitigate against and/ or adapt to climate change and extreme weather variability.
Private Sector	The involvement of the private sector is important as they represent a sustainable customer base for NMHSs. Developing long-term partnerships with the private sector that place emphasis on achieving impact and scale is highly valued. Identify relevant potential partners, within the agricultural, insurance, transport and tourism sectors, to name a few, that would greatly benefit from improved weather and climate services, and develop a mutually beneficial approach to a long-term collaboration. This will create an enabling environment whereby the private sector can eventually play a major role in implementing the Strategy as well as providing them a platform where they can help shape climate-resilient policies beneficial not

	only for the businesses but also for the countries' long term economic growth as well as the well being of communities served.
Stakeholders operating at global level	
WMO, including its Technical Commissions (hydrology, climatology, Basic Systems, Atmospheric Sciences, Marine Aeronautical and Agricultural Meteorology	United Nations Specialised Organisation on Weather, Climate and Water. It is currently the Secretariat to AMCOMET and pivotal to the capacity (human and infrastructural) development of meteorology world wide. The Technical Commissions are responsible for implementing the programmes of WMO as agreed to by Members.
United Nations Organizations (such as UNEP, UNESCO, WHO, FAO, OCHA, WFP, WWF)	These are development partners at national, regional and international levels with specific mandates (social, environment, health, food security, disaster risk reduction and management, etc.).
Partners in global Earth observations such as the UN-led GCOS, the inter-agency GEOand the UNESCO/IOC-ledGOOS	These organisations have cross-cutting responsibilities and were formed through inter-agency joint initiatives with the purpose to providing integrated monitoring and observing services
ICAO, IATA	Represent air transport users and providers. They require meteorological forecasts and in-situ observations for operational purposes and flight planning. They represent an important source of revenue for NMHSs.
EUMETSAT, NOAA, ECMWF, NECP, etc.	Provides satellite-based meteorological information to NMHSs
Service providers at a Global Level	
Meteorological satellite operators in some countries (Korea, USA, Japan, China, India, Iran, etc)	The meteorological satellite provide coverage in different regions, but whose products are accessible by, relevant to, and being used in, Africa. The countries have made satellite derived products for free and have also offered scholarships and training courses programmes to Africa.
Joint WMO / IOC UNESCO Technical Commission for Oceanography and Marine Meteorology	JCOMM is an intergovernmental body of experts that provides the mechanism for international coordination, regulation and management of oceanographic and marine meteorological observing, data management and services systems.
Global climate research institutions	These operate at the global level using Numerical weather prediction models. Their meteorological products include weather forecasts (short- and medium- range) and climate predictions and future climate scenarios including those covering Africa.
Private Media with global outreach	They provide global weather forecasts. They are a threat to NMHSs. However, as of now, the forecast are of coarse resolution and hardly useful at local level.
Development Banks	
African Development Bank World Bank, sub-regional development banks e.g. Development Bank of Southern Africa (DBSA)	The Banks provide financial support through the African Union and its Regional Economic Communities for meteorological research and applications, particularly climate change related programmes. Banks place high priority on mainstreaming climate risk reduction into economic development.

ANNEX 3: MAJOR WEATHER AND CLIMATE RELATED HAZARDS IN AFRICA AND THEIR IMPACTS ON THE DEVELOPMENT OF THE CONTINENT

Meteorologically related natural disasters are increasingly retarding the pace of the socio-economic development of Africa, over two-thirds of which are Least Developed Countries (LDCs). Their magnitude, frequency and duration vary considerably across the vast continent. This segment briefly indicates some the major disasters and how they stifle Africa's endeavours to meet the Millennium Development Goals (MDGs) and uplift the wellbeing of its citizens.

Droughts

All types of droughts originate from a precipitation deficiency but other parameters come into play in the severity and resultant impacts of the phenomenon on development. In Africa, the frequency and severity of droughts have increased over the past 30 years, particularly in Eastern Africa. The East African drought of 2011 is proving to be one of the worst that Ethiopia has faced in 50 years. In Central Africa and the Sahel region, droughts have become more frequent since the late 1960s. In sub-Saharan Africa, increased exposure to drought is of particular concern as 10 million people are affected by the phenomenon.

Floods (including heavy rain, storm surges, coastal phenomena, flash floods)

Floods are episodic and are often triggered by severe storms, tropical cyclones, and tornadoes. Increases in precipitation intensity, in the frequency of rain days, in heavy rains and in rainfall extremes has been observed for southern Africa and the Guinean coast and are often accompanied by severe and devastating flooding, such as the events in southern Nigeria. In sub-Saharan Africa, 2 million were affected by flooding. Flooding is also a phenomenon of the coastal zone of many African countries. In Egypt, about 38% of the coastal population is at risk of flooding. In Djibouti and Gambia the population under such risks is 41%, and 38% respectively. The floods have the potential of rendering agricultural lands unproductive or making rural settlements inhabitable, which in turn affects the livelihoods of rural residents, forcing them to migrate to the urban areas.

Landslides

Landslides are displacements of earth, rock, and debris caused by heavy rains, floods, earthquakes and volcanoes. Most common types of mass movements, such as landslides, in Africa result from intense or prolonged rainfall, i.e. when the water pressure in the ground is high, or when there are sharp fluctuations in the groundwater level (Sekhar et al., 2009). In the last 25 years, many of the landslides that have occurred in the greater

Durban region of South Africa took the form of mudflows and were responsible for some of the worst damage which has occurred in the region. Based on an annual standard inflation rate of 10%, the current annual landslide associated expenses in southern Africa would be ~$163 million (Diop, 2012). Landslides caused by heavy rains are frequent in eastern Uganda where scores of residents were buried alive in a landslide that occurred on 1 March 2012, At least 23 people were killed in a similar disaster in 2011 after mounds of mud buried their homes. On 25 June 2012, more than 100 people were missing and about 30 confirmed killed in eastern Uganda after a landslide triggered by heavy rain buried villages in a coffee-growing area on the slopes of Mount Elgon.

Tropical cyclones

Tropical cyclones are some of the major weather bearing systems affecting Africa, particularly islands in the South West Indian Ocean and mainly coastal countries in eastern and southern Africa. They emanate from the equatorial regions of the Indian Ocean and, depending on their movement and tracks, can bring extreme weather either in the form of heavy rains, high winds or extremely dry and hot weather to these countries. They are highly destructive, causing infrastructure such as bridges and power lines to collapse and even loss of life. The costs associated in their wake are immense and often runs into billions of United States Dollars. Meteorological forecasts and warnings are essential in minimising their impacts.

Dust and sand storms

A dust or sand storm is a meteorological phenomenon common in arid and semi-arid regions and they arise when a gust front or other strong wind blows loose sand and dirt from a dry surface. When winds are strong and other near-surface atmospheric conditions, such as turbulence level, stability and soil moisture are favourable, large amounts of sand and dust can be lifted from bare, dry soils into the atmosphere. Every year 1.5 tons of sand and dust are emitted from deserts into the atmosphere. Suspended sand and dust generates semi-permanent patterns of local and regional scales that persist in the atmosphere for several days. Moreover dust can be transported downwind affecting regions hundreds to thousands of kilometers away. The distance of transport is mainly depending on the meteorological conditions in the free atmosphere.

Heat waves

Recently, a withering heat wave of unprecedented intensity and areal coverage smashed all-time high temperatures in Africa. Chad and Niger have all set new records for their hottest temperatures of all time. Also Sudan recorded its hottest temperature in its history when the mercury rose to 49.6°C (121.3°F) at Dongola. The previous record was 49.5°C (121.1°F) set in July 1987 in Aba Hamed. In October 2011, temperatures topped 43OC (110OF) amid a heat wave gripping much of southern Africa. Zimbabwe, Mozambique, Botswana, Zambia and Malawi have all seen widespread daytime temperatures above 38OC (100OF) during the same period. In the Zimbabwe capital, Harare, a high of 36OC

(97OF) was highest for October since 1925. About 5,000 feet above sea level, Harare normally has warm, not hot, daytime temperatures with typical October highs of about 28OC (82OF). In southern Zimbabwe, Chiredzi reached a fiery of 45OC (113OF).

Locust Invasions

Normally, the desert locust is a solitary insect that occurs in desert and scrub regions of northern Africa and the Sahel. During the solitary phase, locust populations are low and present no economic threat. When vegetation flushes occur in major desert locust breeding areas, rapid population build-ups and competition for food occasionally result in a transformation from solitary to gregarious behaviour on a regional scale. Following this transformation, locusts often form dense bands of flightless nymphs and swarms of winged adults that can devastate agricultural areas. A locust outbreak or upsurge is the vaguely defined transition from the innocuous solitary phase to the plague stage which can be localized or cross-regional. During plagues, locust swarms and bands are found on an interregional scale and originate from a number of breeding areas as part of a widespread but interrelated locust breeding and migrating dynamic that can continue for years. A single swarm of locusts can be small (hundreds of square meters) or huge, composed of billions of locusts, with up to 80 million per square kilometer over an area of more than 1,000 square kilometres. In one day, a swarm of locusts can fly 100 km in the general direction of prevailing winds. Bands of nymphs can march about 1.5 km per day. Plagues often involve hundreds of swarms, and the locusts' recession area can expand to envelop the sub-Sahel from Guinea to Tanzania.

Desert locusts can consume the approximate equivalent of their body mass each day (2g) in green vegetation. Nearly all crops, and non crop plants, are at risk, including millet, rice, maize, sorghum, sugarcane, barley, cotton, fruit trees, date palm, vegetables, rangeland grasses, acacia, pines, and banana. Locust inflicted damage, in addition to occurring very sporadically, is geographically patchy, owing to the nature of swarms. That is, where swarms do not land, losses do not occur. Where swarms do land and feed, losses can be 100% within hours at the local level. Such losses can occur to impoverished subsistence farmers in the Sahel, or to high value export growers in the Maghreb. Crop loss as a result of desert locust infestation is difficult to characterize, but it will be important for developing intervention strategies on a demonstrably cost-effective basis.

Diseases (Malaria, Cholera, Meningitis, etc)

Malaria: The distribution and seasonality of malaria are closely related to seasonal characteristics of the climate and may be found where and when the climatic conditions are favourable for transmission between the mosquito vector and its human host. The climatic conditions considered suitable for the development and transmission of the Plasmodium falciparum species through its life cycle are temperatures within the range 18°C to 32°C. At temperatures below 18°C, parasite development decreases significantly. Above 32°C the survival of the mosquito is compromised. Relative humidity greater than 60% is also considered as a requirement for the mosquito to survive long enough for the

parasite to develop sufficiently to be transmitted to its human host stage. Rainfall and surface water is required for the egg laying and larval stages of the mosquito life cycle and monthly rainfall above 80mm is considered as a requirement.

Cholera: Cholera is caused by vibrio cholera bacteria that live in water bodies. Temperature, salinity, rainfall and plankton have been shown to be important factors in the ecology of V. cholera. To date major regional cholera epidemics in Africa have been associated with climate variability events such as strong El Niños. Large scale epidemics occurred in Eastern Africa in 1983 and 1997 during strong El Niño events associate with significant temperature anomalies and rainfall. Of late cholera has become commonplace in southern Africa, with Zimbabwe being the latest in which over 4000 people died and over 200 000 people affected in 2011. Climate change will increase marine temperature and alter the ecology in ways that may favour the reproduction of vibrio. Some simulations from climate models suggest that the frequency of anomalous weather is increasing leading to an increase in the risk of cholera around large water bodies unless public health and hygiene are improved.

Meningitis: Meningococcal disease is an air-borne disease and about 50% of the global cases of the disease occur in the Sahelian belt in Africa. The risk of the disease is associated with high temperatures and low humidity although other non-climatic factors are involved.

Rift Valley Fever: Rift Valley Fever is a viral disease transmitted by mosquitoes mainly affecting livestock but also humans. The virus survives in the eggs during the dry period of Aedes mosquitoes and proceeds to the larval stage and finally into the adult female. When the female bites, the host gets infected. The virus is also transmitted by Culex, Mansonia and Anopheles species during the rainy or flooded season. The disease is strongly associated with flooding and the immunity of the host. In Eastern Africa where Rift Valley Fever epidemic have become frequent, flooding is driven by the interaction between the El Nino Southern Oscillation (ENSO) and the Indian Ocean Dipole Moment (IOD).

Climate Variability and Change

The observations of climate-related variables on national and global scales have made it possible to document and analyze the behaviour of earth's climate. The Intergovernmental Panel on Climate Change (IPCC) periodically reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change. The recent IPCC report, projects increased severity and frequency in droughts, floods, tropical cyclones in Africa. Information about these impacts of climate variability and change is needed by communities and resource managers to adapt and prepare for larger fluctuations as global climate change becomes more evident. The impacts of climate change are treated in the section 2.2 that follows below.

ANNEX 4: IMPACTS OF WEATHER AND CLIMATE ON VULNERABLE SECTORS

Introduction

There is no socio-economic sector which weather and climate do not have an impact. However, some sectors are much more sensitive to weather and climate variability and climate change. This Annex is aimed at illustrating the vulnerability of these sectors by indicating the linkages. The list is not exhaustive. The most vulnerable is the agricultural sector which is the mainstay and backbone of most African economies.

Agriculture (including livestock, rangelands and Fisheries) and Food Security

Weather and climate are critical for agriculture in risk assessment (for example, the spread of plant and animal pests and diseases and extreme events like frost) and agricultural production management systems (crop planning and irrigation scheduling, for example). Climate change affects rainfall, temperature and water availability for agriculture in vulnerable areas. For example, drought affected areas in sub-Saharan Africa could expand by 60–90 million hectares, with dry land zones suffering losses of US$26 billion by 2060 (HDR 2007-2008). By 2100, parts of the Sahara are likely to show agricultural losses of between 2 and 7% of GDP. Degradation of arable soils and lose of fertility due to high exposure to climatic stress and human pressure on forests and other vegetation cover under a changing climate will lead to a 50% drop in agricultural production in Africa by 2030. Climate models for Northern Kordofan in Sudan suggest that possible impacts on agriculture include a 70 per cent drop in yields of sorghum. Periods of droughts and floods will have an impact on food availability, food access, and on nutrient access. It is predicted that the impacts of climate change such as sea-level rise, droughts, heat waves, floods and rainfall variation could, by 2080, push another 600 million people into malnutrition and increase the number of people facing water scarcity by 1.8 billion. Inundation of floodplanes and river banks will lead to the death of large quantities of and thus a lot of food for fishes. This temporal availability of fish food will increase fish biomass and the availability of protein.

Coastal Resources

In some coastal areas of Africa, coral bleaching and mortality are on the increase. The increase in water temperature has detrimental effects on the physiology of marine organisms and promotes the establishment of thermophilic species. These effects are especially noticeable on the breeding habits of certain species. Low-lying cities located on lagoons, estuaries, deltas or large river mouths, such as Alexandria, Cotonou, Dar es Salaam, Lagos, Maputo, Mombasa and parts of Cape Town, are particularly vulnerable to extreme weather events caused by climate change. They are likely to experience storm surges, sea-level rises, increased flooding, (semi-) permanent inundation, coastal erosion,

landslides, and the increase of water-borne diseases, which may all have devastating effects on human settlements. African cities will also experience more severe and frequent flooding and these flooded areas and ditches, latrines and septic tanks are key reservoirs that perpetuate cholera, malaria, dengue and yellow fever in urban areas.

Forests, Wildlife and Biodiversity

Mountain ecosystems in Africa appear to be undergoing significant observed changes likely due to complex climate-land interactions and the climate change. The ice cap on Mt. Kilimanjaro could disappear by 2020. The mountains of Cameroon and the island-like Afromontane habitats that stretch from Ethiopia to South Africa at altitudes above about 2,000 meters are also threatened by increase in temperature. Around 5,000 African plant species and over 50% of bird and mammal species will be seriously affected or even lost by the end of this century. Typical large mammal migrations are sensitive to climate change, they involve regular movement between dry-season and wet-season grazing areas. Persistent drought due to increase in temperature and unreliable rainfall pattern in Tanzania, for example is expected to affect the lifestyles of most of the migratory wild species, in particular the wildebeest (in the Serengeti area of Tanzania and the Masai-Mara region of Kenya) and some bird species. Increasing temperatures, in combination with changes in rainfall and humidity, may have significant impacts on wildlife, domestic animals and human diseases.

Water Resources

Weather and climate forecasts and warnings are an essential ingredient for water resource management. The water sector is strongly influenced by, and sensitive to, changes in climate (including periods of prolonged climate variability). About 25% of the contemporary African population experiences high water stress while 69% of the population lives under conditions of relative water abundance. The impacts of climate change are expected to have severe consequences for the availability of water in Africa. A 3°C temperature increase could lead to 0.4 – 1.8 billion more people at the risk of water stress. Reduction in water quantity will lead to a reduction in water quality and associated impacts on health, biodiversity, etc.

Human Health

Most infectious diseases have seasonal cycles that include spatial and temporal changes in prevalence and the seasonality of the diseases is driven by changes in rainfall, temperature and humidity. For example most mosquito borne diseases cannot be transmitted below 14OC because the larval stages die and parasites cease to develop. On the other hand total thermal mortality of the adult mosquitoes occurs at 40OC (Githeko et al., 2000). In the case of malaria the mosquitoes can develop at temperatures above 16OC. However, below 18OC the malaria parasite development time exceed the lifespan of the female mosquitoes thus transmission is not possible at this temperature. Climate change and variability can drive the temperature above the threshold (18OC) and enable

transmission. This situation is the main cause of malaria epidemic in the Eastern African highlands (Githeko and Ndegwa, 2001). About 20% of the human populations living in East Africa are at a risk of malaria epidemics.

Across Africa, 45% of the urban population lacked access to improved sanitation in 2000. In Eastern Africa in 2006, open defecation was the only sanitation practice available to 33% of the population. This contributes to the contamination of water and land within cities as well as many of the waterborne diseases prevalent in slums. Under climate change this situation will be exacerbated.

Human Settlements and Security (including energy, transport, etc)

Approximately 80% of African households use biomass fuels (e.g. wood and vegetation) for cooking and water heating. Unsustainable harvesting of forests coupled with climate change and variability threatens biomass users with dwindling supplies. According to most of the African UNFCCC NAPAs, biomass as a major energy source for households in Africa is highly vulnerable to negative impacts of climate change. The resilience and regeneration capacity of forests resources are negatively affected by extreme climate conditions. On the other hand, the hydroelectric generation which represents the promising source of energy faces a lot of challenges apart from the fact that less than 4% of Africa's hydropower potential is currently utilized. It has been repeatedly stated in the NAPAs that hydro-electric power generation has been negatively affected by droughts and floods (Lesotho, 2007; Malawi, 2006; Zambia, 2007 – UNFCCC NAPAs). Increased climate variability and change can also impact on the functioning of key energy infrastructures (e.g. refineries, rigs, hydro-electric plants) within countries.

Interrelating issues between climate change and human security include water stress, land use and food security, natural disasters and environmental migration (Scheffran and Battaglini, 2011). The most direct link between climate change and threats to human security is probably the aspect of environmental security. Access to clean water resources and air pollution are considered to be the greatest environmental threats. The nature of impacts on economic security as one aspect of human security is manifold. The ultimate damages of climate change may significantly affect economic growth (Lecocq and Shalizi, 2007). The effects of global warming could lead to increased border tensions, and conflicts over food and water. Distributional conflicts will arise due to the degradation of natural resources as a result of over-exploitation and global warming. Populations will be forced to migrate internally or cross borders (Gleditsch et al., 2007). Environmental migration due to the effects of climate change is closely related to the concept of human security.

Tourism

Climate is a principal resource for tourism, as it codetermines the suitability of locations for a wide range of tourist activities; is a principal driver of global seasonality in tourism demand, and has an important influence on operating costs, such as heating-cooling, snowmaking, irrigation, food and water supply, and insurance costs. Thus, changes in the

length and quality of climate-dependent tourism seasons (e.g., sun-and-sea or winter sports holidays) will negatively impact the sector. Increases in the frequency or magnitude of certain weather and climate extremes (e.g. heat waves, droughts, floods, tropical cyclones) will affect the tourism industry through increased infrastructure damage, additional emergency preparedness requirements, and higher operating expenses. Changes in water availability, biodiversity loss, reduced landscape aesthetic, altered agricultural production (e.g., food and wine tourism), increased natural hazards, coastal erosion and inundation, damage to infrastructure and the increasing incidence of vector-borne diseases will all impact tourism to varying degrees. National or international policies to mitigate GHG emissions are likely to lead to an increase in transport costs and may foster environmental attitudes that lead tourists to change their travel patterns (e.g., shift transport mode or destination choices). Climate change is thought to pose a risk to future economic growth and to the political stability of some nations. Any such reduction of global GDP due to climate change would reduce the discretionary wealth available to consumers for tourism and have negative implications for anticipated future growth in tourism.

Disaster Risk Reduction

The causes for disasters, displacement, and migration, are manifold, however, climate change is one of the interlinking issues. Sudden-onset climate-related disasters, i.e. disasters such as floods and storms which climate change can influence both in terms of frequency and severity are responsible for most of displacements in Africa. The number of displaced people in Africa has increased from 697,066 in 2008 to 1.1 million in 2009 and 1.7 million in 2010. It is likely that many more will be displaced due to the other climate change-related drivers, including slow-onset and pervasive disasters, such as drought and sea level rise.

ANNEX 5: ROLE OF METEOROLOGICAL SERVICES AT THE NATIONAL, REGIONAL AND GLOBAL LEVELS

Introduction

The World Meteorological Organisation (WMO), its Regional Associations as well as National Meteorological Services collectively endeavour to ensure that, through their respective mandates and areas of jurisdiction, weather and climate services fully address the diverse needs of users and contribute to development. This Annex highlights their roles at various levels.

National, Regional and Global roles

Most National and Regional Meteorological Services in one way or the other, provide some information on drought situation in the country or region of jurisdiction. Drought watch and early warning systems exists but are least developed, operational and utilized at the optimum level. The FAO's Global Information and Early Warning System on Food and Agriculture (GIEWS) provides drought information, together with an interactive map of countries in crisis. In addition, the WMO provides useful global meteorological information, such as precipitation levels, cloudiness, and weather forecasts, which are visualized on a clickable map on the WMO website. It is difficult for many Services in Africa to access these websites. This is mainly due to inadequate communication capacity (internet, narrow broadband, etc.). Existing approaches for drought early warning must be improved. Due to the complex nature of droughts, a comprehensive and integrated approach that would consider numerous drought indicators is required for drought monitoring and early warning.

There is inadequate coverage of flood warning and monitoring systems in Africa and those available do not provide public access to information. The National Meteorological Services of Morocco and Nigeria have some flood warning systems. Technologies and tools that are useful in monitoring floods include orbital remote sensing equipment used to detect and map major floods. In particular, polar orbital and geostationary satellite data are used for flood observation. Satellite microwave sensors can monitor, at a global scale and on a daily basis, increases of floodplain water surface without cloud interference. These existing technologies for flood monitoring are not easily and widely available in most African countries due to financial, institutional and human capacity constraints. The technologies must also be improved to increase prediction capabilities and flood warning lead times. Global flood monitoring systems exist and these include the Dartmouth Flood Observatory and the WMO monitoring system, which provide public access to major flood information, satellite images and estimated discharge. National and Regional Meteorological Services that have the capability can access the products from these global services to improve their national warning systems.

National Meteorological Services and the Disaster Management Agencies have a lot of public awareness and sensitization to carry out on landslides and other sudden-onset disasters.

The WMO Regional Specialized Meteorological Centres (RSMC) monitor tropical cyclones globally and issue official warnings to the National Meteorological Services of countries at risk. These bodies have adopted standardized WMO-TCP operational plans and manuals which promote internationally accepted procedures in terms of units, terminology, data and information exchange, operational procedures, and telecommunication of cyclone information. Using the June-July meteorological information of the stratospheric quasi-biennial oscillation (QBO), West African rainfall, the El Nino-Southern Oscillation (ENSO) as well as sea level pressure anomalies (SLPA), and the upper-tropospheric zonal-wind anomalies (ZWA) in the Caribbean basin as predictors, it is now possible to issue seasonal forecasts of Atlantic basin tropical cyclone activity by August (see Gray et. Al:, 1993).

The WMO and the Meteorological Services of some member states are working towards improvement of the capabilities for more reliable sand and dust storm forecasts. This led to the establishment of the SDS-WAS programme in 2007 with the mission to achieve comprehensive, coordinated and sustained observations and modelling capabilities of sand and dust storms in order to improve the monitoring of sand and dust storms to increase the understanding of the dust processes and to enhance dust prediction capabilities. The *SDS-WAS programme* contains many research and/or operational institutes performing daily forecasts of sand and dust. Research and forecasting products from atmospheric dust models may substantially contribute to risk reduction in many areas of societal benefit. More than 15 organizations currently provide daily dust forecasts in different geographic regions. There is the need for real-time delivery of products.

Monitoring locust populations during recession periods to anticipate the onset of gregarious behaviour and to locate locust bands and swarms for control operations during outbreaks and plagues is a difficult task that has become increasingly technologically sophisticated. In most countries, the monitoring is done by the Pest Control Office under the Ministry of Agriculture. National and Regional Meteorological Services can contribute information generated from model-generated forecasts of locust population events and general patterns of swarm movement during outbreaks and plagues. These services use weather and vegetation index information gathered from satellite platforms, meso-scale and synoptic-scale weather patterns, soil mapping, and probabilities based upon historical knowledge about locust population dynamics throughout the recession and plague distributions.

ANNEX 6: IMPLEMENTATION OF GFCS IN AFRICA

Following the Addis Ababa declaration in support to the implementation of the GFCS in Africa, done on 30 September 2012 by the African Union Commission (AUC), the Regional Economic Communities (CEMAC, ECOWAS, IOC, IGAD, SADC) and the Secretariat of the African, Caribbean and Pacific (ACP Secretariat) Group of States, on the invitation of the Minister of Water and Energy of the Federal Democratic Republic of Ethiopia, the drafting team of the Addis Ababa declaration proposes the following contribution to the draft "African strategy on Meteorology (weather and climate services)".

This contribution indicates the possible roles of some key institutions in the various seven components of the GFCS.

Policy ownership of the GFCS African regional component

*The **African Union Commission (AUC)**, supported by the **WMO Regional Association I (RA-I, Africa)**, will make the necessary links with the global implementation mechanisms of the GFCS on the one hand and with the **Regional Economic Communities (RECs)** on the other hand, who will in turn establish the necessary links in their respective regions with the regional and national implementation mechanisms of the GFCS.*

Users of Climate information

*Regarding the users of the climate information that would be provided through the regional and national entities of GFCS, the main users of climate services will be designated by the national governments, and by regional institutions (including WMO Regional Climate Centres, the A**frican Union Commission and the Regional Economic Communities**) in line with national and regional priorities in terms of climate related risk management, adaptation and mitigation strategies. The users of climate services at national and regional scales are potentially numerous, and will be identified per sector (e.g. health, disaster risk reduction, agriculture and food security and water). The implementation plan shall take into account the need to structure these communities and to raise their awareness about the GFCS.*

Observations and Monitoring

*The African National Meteorological and Hydrological Services (**NMHSs**) play a crucial role in the GFCS Observations and Monitoring (O&M) component as they are responsible for collecting and archiving relevant climate information at national level (e.g. surface and upper-air). With respect to satellite observations, they presently rely on international efforts made by the various satellite operators contributing to the WMO Space Programme, in particular those of **EUMETSAT** whose Meteosat satellites have covered Africa for 30 years.*

Modelling, Research and Prediction

For the Research, Modelling and Prediction (RM&P) component of the GFCS, the existing regional centres in Africa ***(ACMAD, AGRHYMET, ICPAC, SADC-CSC)*** *play a significant role through participating in and conducting research and modelling efforts. The GFCS Implementation Plan should strengthen the cooperation between these centres (e.g. through establishment of an operational network which might be coordinated by ACMAD, based on its continental mandate) and increase cooperation and interaction with regional research communities such as those of WCRP CLIVAR. The Implementation Plan should also ask the regional centres to develop international partnerships in order to access the relevant international research data and products to feed regional and national climate research activities. The involvement of a large community of researchers (universities, research centres) is strongly encouraged, as advancing the knowledge with respect to climate variability and change in Africa is of upmost importance for planning and modelling.*

Climate Services Information System

In the GFCS, the Climate Services Information System (CSIS) is the principal mechanism through which information about the climate (past, present and future) will be routinely collated, stored and processed to generate high-quality, standardized products and services that inform decision-making in a wide range of climate-sensitive activities and enterprises. At regional scale, CSIS will comprise trained personnel, as well as physical infrastructure (institutions, computing capability, tools, operational practices) that includes WMO Regional Climate Centres (RCCs) and operational entities of GFCS partnering agencies such as the Regional Implementation Centres (RICs) that have been capacitated through projects like AMESD and MESA. RCC's users will be national CSIS entities including the NMHSs and other regional CSIS entities. In some cases, RCCs will provide services and products directly to other entities and agencies operating at a regional level (e.g. the RECs, ACPC or AUC). A vital role RCCs will play will be the establishment and conduct of regular Regional Climate Outlook Forums (RCOFs), which both build networks and consensus between information providers, and between providers and user communities.

User Interface Platform

The User Interface platform (UIP) component of the GFCS provides a structured means for interaction at all levels between the CSIS entities that operationally produce and provide climate information, products and services, the research communities, the observing communities, and the users (in particular decision makers in the context of the regional African implementation plan), who do not always have the necessary expertise to understand and interpret correctly the raw climate information produced by the CSIS. The UIP component plays a crucial role in identifying user needs, raising awareness, communicating, and ensuring that the requirements of the various user communities (notably decision makers and planners) are addressed within the other GFCS pillars. The

role of the user interface includes also developing interoperable databases including physical and the appropriate socio-economic information to support applied interdisciplinary research and development of tailored products. RCOFs and sector-specific COFs such as Malaria Outlook Forums (MALOFs) play a major role in facilitating the UIP on regional scale. On the national scale, UIP implementation will greatly benefit from the establishment and sustained operations of National Climate Outlook Forums (NCOFs).

*When users are regional decision making institutions (e.g. AUC), the **African Climate Policy Centre (ACPC)** within the UN-ECA can play an eminent and leading role in this component, by liaising closely with the regional CSIS entities on the one hand and with the regional policy institutions such as the Climate Change and Desertification Unit (CCDU) of the African Union Commission and the RECs on the other hand.*

Capacity development

*Capacity development efforts are needed in all GFCS components. The Capacity Development component of the GFCS Implementation Plan includes the key priority issues that need to be addressed in all pillars, which will assist potential **donors**. While the regional activities should be in close alignment with the global implementation plans for the GFCS Capacity Development component, a special focus in Africa needs to be extended to cover sensitization of policy makers and planners, which remains an urgent priority in the continent.*

ANNEX 7: REFERENCES

Inputs into the Strategy were sourced from a variety of sources, the following some of which are:

The World Meteorological Organisation
UN Istanbul Programme of Action for LDCs (2011-2020)
ISDR Extended Programme of Action for the Implementation of the Africa Regional Strategy for DRR (2006- 2015)
International Committee of the Red Cross
World Economic Forum Climate Change Initiatives
Rio + plus 20
Global Climate Observing System
UNEP
World Bank
World Resources Institute
FAO
UN-Water
ICAO
G8, G20 and BRICS strategies on climate change
AUC (Climate Change Strategy)
African Ministerial Council on Water (AMCOW)
African Ministerial Conference on Environment (AMCEN)
African Ministerial Conference on Science and Technology AMCOST ()
WMO RA I Strategic Plan
Regional Economic Groupings (IGAD, SADC, ECOWAS, ECCAS (Libreville), Union of Maghreb Arab - UMA) plus Indian Ocean Commission (IOC)
ClimDev Africa (ECA, AfDB and AUC) implemented by ACPC (Secretariat of ClimDev)
Maputo Convention
Multilateral Environmental Agreements
AMESD (Regional Implementation Centres) followed by MESA
AU-EU Africa Strategy
China-Africa Partnership

2012

Report of the 2nd session of the AU conference of ministers on meteorology (AMCOMET), Victoria Falls, Zimbabwe, 15-19 October 2012

African Union

African Union