



DRAFT Version 5.0

**INTEGRATED AFRICAN STRATEGY ON
WEATHER AND CLIMATE SERVICES**

**African Ministerial Conference on
Meteorology (AMCOMET)**

FOREWORD

Winds of change are blowing rapidly across the African continent. Countries in the region have never been more vulnerable than at present to the impacts of weather and climate, forcing them to continually adjust national development programmes, often at huge costs. Most countries or subregions are increasingly prone to floods, droughts and food shortages. Water for economic activity, drinking and livestock is becoming increasingly scarce. Duststorms are increasing in frequency, with associated 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. Rift valley fever, which was eradicated over fifty years ago, is now reoccurring. These changes are happening against the backdrop of increasing population.

Agriculture is the mainstay of Africa's economy, and over 60% of African citizens directly depend on it for their daily living. African farmers, who rely on rainfall, are now confused about what crops to plant and when, as climate change and variability affect traditional agricultural and crop-weather calendars. The climate is changing, and the past is no longer a reliable indicator of the future. Populations are moving in search of better pastures. Wildlife is searching for new migratory routes in Eastern and Southern Africa, encroaching into already populated areas and resulting in inevitable conflicts.

The situation in Africa highlights the need for the African Ministerial Conference on Meteorology (AMCOMET) to recognize the magnitude of the problems and challenges, and to reaffirm the vital role that political leaders entrusted with the responsibility for National Meteorological and Hydrological Services (NMHSs) in countries can play in addressing these issues. It is becoming increasingly clear that weather and climate services have a strategic role in countries and regions. It is necessary to change policymakers' perception of NMHSs by empowering and capacitating NMHSs to tackle societal and developmental concerns. This Integrated African Strategy on Weather and Climate Services is aimed at laying the foundation for what needs to be done to allow African communities to further benefit from the investments that governments make in meteorology.

In enabling NMHSs to provide weather and climate services, it is clear that there are gaps to be filled. For example, weather observation stations in most African countries are not of the required density to inform research, policy solutions and decisions at the detail that policymakers require. Weather forecasts and climate predictions can be improved to meet the increasing demand from almost every socioeconomic sector. While the Global Framework for Climate Services provides an opportunity to help address implementation of the Strategy, decisive leadership is necessary to guide African NMHSs to make a meaningful contribution in meeting the needs of users.

These challenges and opportunities can be met through collaboration, using existing subregional mechanisms (such as Regional Economic Communities) to work in partnership. AMCOMET presents a great opportunity to work together as a collective to address challenges, agree on strategies and develop funding mechanisms. The creation of a funding mechanism such as an AMCOMET facility will demonstrate commitment to the AMCOMET process and will also provide a beacon for technical and development partners to join in and support efforts.

I wish to thank WMO, the African Union Commission, the other AMCOMET Bureau Members, the African Union and WMO Members for their support and input leading to the drafting of this Strategy. I would like to dedicate this Strategy to the late founding Chairperson 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, wherever he is, he is resting in eternal peace and smiling at us as we forge ahead with the development of NMHSs.

I would also like to express my profound gratitude to colleagues for demonstrating their willingness to ensure that AMCOMET succeeds. I particularly thank the AMCOMET Secretariat for the work carried out with consistency and courage, bringing essential elements into the process of recognition of the AMCOMET platform and its activities.

I look forward to receiving suggestions on the way forward. To quote a famous African proverb, "alone we can go fast, but together we can go far".

Hon. Minister Dr Gilberto Correia Carvalho Silva

Ministry of Agriculture and Environment, Cabo Verde

Chair of AMCOMET

PREFACE

Countries in Africa are witnessing increased weather and climate variability. Natural disasters related to weather and climate have become more frequent and more extreme in intensity. The continent is regularly experiencing floods and drought, lightning and strong winds, sandstorms or duststorms, scarcity of freshwater, changes in weather patterns and disruption to agricultural production. Annual economic losses from disasters in Africa are estimated by the United Nations Office for Disaster Risk Reduction at between US\$ 250 billion and US\$ 300 billion, extrapolating from a study of nationally reported disaster losses.¹

The African Ministerial Conference on Meteorology (AMCOMET) was established as a high-level mechanism for the development of meteorology and its applications in Africa. Ministers responsible for meteorology unanimously committed to strengthening and sustaining National Meteorological and Hydrological Services (NMHSs) by providing them with the necessary resources and adequate institutional frameworks to enable them to fully perform their roles as strategic actors of national development. As a key joint initiative of the African Union and WMO, AMCOMET leads the planning and response efforts, through the Integrated African Strategy on Weather and Climate Services, to ensure that NMHSs in Africa can better address climate variability and change. This is already contributing to security and sustainable development, particularly in poverty reduction efforts, climate change adaptation, gender gap reduction and disaster risk reduction, as these are addressed in the Sustainable Development Goals. Weather and climate patterns and behaviour do not recognize political boundaries.

Enhanced cooperation among African countries is therefore required to effectively meet government and societal needs through hydromet information and services. Through its strategic pillars, the Strategy underscores: the necessity of increased political support and recognition of NMHSs; the urgent need for enhanced weather and climate service delivery; the requirement for improved access to meteorological services for the aviation sector; the increased support for the provision of weather and climate services for climate change adaptation and mitigation; and the strengthening of partnerships with relevant institutions, with emphasis on the private sector and funding mechanisms.

Successful implementation of the Strategy enhances the delivery of key sustainable development programmes in Africa. Resources are required through government funding, with complementary support from development partners, particularly banks and aid agencies. WMO is committed to supporting the AMCOMET process and its initiatives.

Petteri Taalas

Secretary-General

WMO

¹ United Nations Office for Disaster Risk Reduction, 2015: *The Human Cost of Weather Related Disasters 1995-2015*, https://www.preventionweb.net/files/46796_cop21weatherdisastersreport2015.pdf.

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INTRODUCTION

In April 2010, the Nairobi Ministerial Declaration¹ from the First Conference of Ministers Responsible for Meteorology in Africa agreed to establish 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 socioeconomic development of every country, and therefore deserve strong support at the highest possible level of government. Ministers further recognized that sound governance of the science of meteorology and its related applications must be streamlined in national development agendas to promote cooperation, security, socioeconomic development and poverty reduction at a pan-African level. By establishing AMCOMET, the ministers committed themselves to carry out the following:

- Strengthen and sustain National Meteorological and Hydrological Services (NMHSs) by providing the resources and appropriate institutional frameworks to enable them to execute their functions, particularly in observations, forecasting and applications.
- Recognize the role of meteorological and climate services as a fundamental component of national development infrastructure, and ensure that meteorological information is a permanent parameter and feature in national plans, programmes and policies in the key sectors of a country's economy.
- Regard NMHSs as strategic national assets that contribute to national security (especially with regard to 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 (DRR)).
- Ensure that all subregions of the African continent are active and adequately resourced.

Furthermore, they agreed to develop an "African Strategy on Meteorology". This has been carried out in partnership with WMO and the African Union Commission (AUC), which were engaged in the preparation of the Strategy through consultation with Regional Economic Communities (RECs), Members, Regional Climate Centres (RCCs) and other relevant stakeholders at the global, pan-African, subcontinental and national levels.

The Strategy has been developed to enhance cooperation among African countries and to ensure that NMHSs are modernized and have the capacity to fulfil their responsibilities, including in the implementation of the Global Framework for Climate Services (GFCS) in Africa.

Building on the lessons learned from the implementation of the previous Strategy, Integrated African Strategy on Meteorology (Weather and Climate Services),² a strengths, weaknesses, opportunities and threats (SWOT) analysis and a stakeholder analysis, the new Integrated African Strategy on Weather and Climate Services presented here focuses on the following five interrelated Strategic Pillars (SPs):

- SP1: increase political support and recognition of NMHSs and related WMO RCCs
- SP2: enhance capacities for the production and delivery of tailored weather and climate services for sustainable development
- SP3: improve quality of meteorological information and knowledge sharing in aviation

¹ https://www.wmo.int/amcomet/sites/default/files/field/doc/events/declaration_amconf_en_06122010.pdf.

² https://www.wmo.int/amcomet/sites/default/files/field/doc/pages/amcomet-integrated-african-strategy-meteorology-13677_en_0.pdf.

and marine sectors

- SP4: ensure and support the provision of weather and climate services for climate change adaptation and mitigation
- SP5: strengthen partnerships with relevant institutions and funding mechanisms

Priority areas of action of SPs are identified with a view to promoting the production and incorporation of science-based hydrological and meteorological (“hydromet”) information and services into African national development policies, plans and programmes. These actions can be undertaken at national, regional and continental levels. They are supported by institutional partnerships that bring together AMCOMET and development partners to support meteorological (weather, water and climate) services.

It is envisaged that this updated version of the Strategy will be approved at the AMCOMET high-level session to be held in Cairo in February 2019.

After describing the African context and background, this report summarizes the conclusions of the SWOT and stakeholder analyses. It then gives the purpose, objective and intended outcomes of the updated Strategy. The five SPs and their areas of action are discussed in detail. Finally, the Strategy implementation, risks, assumptions, institutional arrangements, resource mobilization, monitoring, evaluation and reporting are outlined.

CONTEXT

Hydromet hazards are responsible for 90% of total disaster losses worldwide.³ Their effects are projected to become even more severe due to population growth, rapid urbanization and climate change. Hydromet services are therefore essential to provide real-time weather, water, early warning and climate information products to end users, based on weather, water and climate data.

In Africa, countries have made significant development achievements in the last few decades, and annual gross domestic product growth has averaged 4.5%. However, the increasing weather, water and climate risks threaten these gains. The continent has experienced more than 2 000 natural disasters since 1970, with just under half taking place in the last decade. During this time, natural disasters have affected over 460 million people and resulted in more than 880 000 casualties.

Less than 20% of sub-Saharan African countries provide reliable weather, water and climate services to their people and economies. Governments often juggle competing priorities for investment, and NMHSs are rarely prioritized. Inadequate funding inhibits NMHSs from providing the services needed for climate-resilient development and adaptation planning.

There is an increasing need for the delivery of sector-specific weather, climate and water services to ensure food security, improved water resource management, DRR and better health. To enable provision of these services at the national level, efforts need to be done to modernize NMHSs, from the observation network perspective (for example, by building infrastructure such as radar, and automated weather stations) through to strengthening institutions and service delivery. Subregional efforts include standardizing procedures to promote transboundary collaboration. Africa-wide efforts ensure hydromet services across the continent will be linked to regional and global centres, thus improving data access and availability, and promoting partnerships within the meteorological community.

³ <https://www.worldbank.org/en/results/2017/12/01/hydromet>.

Moreover, the science and technology related to weather forecasting and climate services are rapidly advancing globally (for example, new generations of weather satellites, cloud computing, big data and high-performance computing). Some countries in Africa might not be able to cope with these rapidly changing technologies due to lack of capacity and access to the necessary knowledge and tools. Many NMHSs have a stagnant pool of human and financial resources and obsolete technologies that limit their capabilities to produce the best services needed by policymakers and other decision-makers.

Accurate and timely weather forecasts and climate analyses and predictions will improve human safety, prosperity and livelihood, and preserve precious natural resources for the benefit of communities, especially the most vulnerable. This is 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 in agriculture, health, water resource management and DRR. Its key objectives are to promote security, socioeconomic development and poverty reduction on a pan-African level through sound governance of the science of meteorology and its related applications.

At the pan-African and multi-stakeholder levels, institutions exist that can support the objectives of AMCOMET. The building blocks of AUC are RECs, which facilitate subregional development and implementation of AUC-supported programmes and mechanisms. As AMCOMET brings political support, it is critical to establish cooperation with RECs, and ensure that they are part of the AMCOMET process to harmonize development of meteorology through regional approaches and minimize duplication of efforts among NMHSs. It is also necessary to imbed the Strategy within REC operations to promote interregional cooperation for socioeconomic development within the context of climate and weather.

The investment and financial flows needed to support the delivery of weather and climate services to address the challenges of climate variability and change in Africa are substantial. In addition to national governments' investments in NMHSs and the critical role that national institutions play in ensuring investments are sustainable, it is acknowledged that the African Development Bank (AfDB), as the premier financial institution, plays a key role (through the Climate for Development in Africa (ClimDev-Africa) programme, for example) in providing the complementary financial support for the implementation of the Strategy. However, the Strategy demands large investments for modernization of African NMHSs, and requires multiple development partners to cooperate and coordinate efforts for the efficient and effective implementation of the Strategy. AMCOMET is the natural platform for coordination among such development partners.

This Strategy recognizes that sustainability of future projects will rely upon integrated support for equipment, maintenance, operation, service development and training elements. With recent technological developments, cooperation with global centres through WMO will facilitate low-cost processing and storage of relevant large datasets, thus reducing the equipment and maintenance costs required in developing countries. Service development budgets are becoming essential given the emerging sectors requiring weather and climate services.

STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS ANALYSIS OF WEATHER AND CLIMATE SERVICES DELIVERY

A SWOT analysis of weather and climate services delivery by African NMHSs was conducted from June to September 2018. It was based on the previous one in 2010, and

was the result of collective work conducted by a WMO consultant with a multi-stakeholder approach.

The conclusions of the SWOT analysis are as follows:

- There is a continued lack of visibility and national funding for modernization processes, although NMHSs are recognized as national strategic partners in weather, climate and water services, especially for DRR and security of population and goods.
- NMHSs provide key weather, climate and water information for the necessary socioeconomical development at the national level in many sectors. However, this is not always easy to demonstrate and communicate, and existing observation networks need to be upgraded and modernized.
- Access to global weather and climate data (for example, satellite data, climate data and global numerical weather prediction (NWP) model data), which are key for national weather and climate services, is not secured.
- There is a clear need to enhance NMHS human capacities (technical and managerial). Some training has been delivered through regional and international cooperation, including by existing WMO Regional Training Centres.
- AMCOMET makes a strong commitment and contribution in African United Nations programmes (for example, through the Sustainable Development Goals (SDGs)).
- The Regional Framework for Climate Services and the National Framework for Climate Services (NFCS) of GFCS in most of Africa are not yet functional.
- WMO Integrated Global Observing Systems (WIGOS)/WMO Information Systems (WIS), including nomination of focal points of these programmes, are in place.
- Raising awareness of gender aspects in terms of service provision and organizational performance at national, regional and continental levels is a key opportunity to modernize, create inclusive institutions, and provide better tailored products and services.
- New technologies create opportunities for African NMHS development (for example, through information technology systems, satellite technology and mobile applications); establishing broadband Internet connectivity will help the modernization process.
- Increased collaboration in some countries with national media (especially on disasters and hazards faced by communities) has helped to raise public awareness.
- There is a lack of strategic planning competencies and processes, including human resource planning, marketing and communication, monitoring and evaluation, total quality management (TQM), strategic indicators follow-up and so forth.
- There is a lack of alignment among NMHS strategic plans (if they exist), governmental national development plans, and funding donor programmes and projects.
- Thirty-three least developed countries have urgent needs for support and development in many areas (such as technical, human and financial) due to obsolete infrastructure and extremely low capacity to produce and deliver services.
- A clear opportunity for NMHSs in Africa is the increasing need for collaboration with the private sector.
- There is a need to strengthen coordination and improve knowledge at the national level, among NMHSs through WMO Centres, other national institutions, academia and the private sector.
- The use of Quality Management Systems (QMSs) could enhance NMHS core and specific competencies.

STAKEHOLDER ANALYSIS

The stakeholder analysis identified the key partners essential in the implementation of Strategy activities at the global, pan-African, subcontinental and national levels.

Partners have important roles at the level of formulation of appropriate policies relevant to the goals and aspirations of African Union and WMO 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; subregional economic communities; research, training and policy-related institutions; non-governmental organizations; academia; media and communications organizations; parliamentarians; and United Nations agencies operating in the Africa region.

Development partners are also important given that resource mobilization for implementing the Strategy is a key requirement in the implementation plan.

The key issues for supporting implementation of Strategy activities generally revolve around the following:

- Cooperating with national and international stakeholders to enable adequate delivery of weather, climate and water-related information and services in the region.
- Developing human and institutional resources in NMHSs.
- Developing strategic and action plans articulating vision, priorities, long-term goals, objectives, activities and funding requirements, as well as contributions of the activities to be implemented for national socioeconomic development.
- Committing NMHSs to collaborate closely to address common challenges, particularly in the area of water-related DRR.
- Engaging relevant stakeholders, especially policymakers, in investing in the multifarious infrastructure necessary to provide accurate and timely weather and climate services that meet the needs of end users.
- Addressing the issues surrounding risk management, early warning, climate change and climate variability, with emphasis on investing in the necessary resources to adequately disseminate weather and climate services for informed decision-making.

There are important and critical players that must work together for weather and climate services in Africa to be effective.

PURPOSE AND OBJECTIVE

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

The objective of the Strategy is to enhance cooperation among African countries and to strengthen capabilities of governments to provide weather, climate and hydrological services, in which NMHSs play a critical role. At the same time, the Strategy is a blueprint for linkages of African NMHS actions with the Africa Agenda 2063,⁴ the Paris Agreement on climate change,⁵ the Sendai Framework for Disaster Risk Reduction⁶ and

⁴ <https://au.int/en/agenda2063>.

⁵ <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>.

⁶ <https://www.unisdr.org/we/coordinate/sendai-framework>.

the United Nations SDGs.⁷

The Strategy further aims to serve as a framework for integrated and coordinated mechanisms. These will provide strategic direction to Members and other stakeholders in streamlining policies that address challenges and opportunities associated with the development of adequate weather and climate services at national, regional and continental levels.

Guiding principles

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, and address societal and sectoral needs and challenges at all African levels, including the community level
- Concentrate on benefiting Africa while contributing to global efforts in the advancement of the science of meteorology

INTENDED OUTCOMES

The intended outcomes of the Strategy are as follows:

- Increased recognition of NMHS roles at the political level. It is vital for Africa's governments and policymakers to take on board the contribution of NMHSs to socioeconomic planning and development, integrate them in national development programmes and accord the necessary financial support.
- Accelerated implementation of the WMO Gender Action Plan⁸ and the African Union Gender Policy⁹ at all African levels through the active role of Regional Associations.
- Improved climate risk management for the protection of life and property. Increased and timely availability of hydromet information (including 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, coastal trading, fishing, recreational boating and aviation leads to reduced associated risks.
- Enhanced quality of life. Communities and institutions are better informed and educated on the societal values of hydromet information, which leads to sustained socioeconomic growth, including reduced health problems, improved food security, reduced disaster and climate risk, and better quality of life. Their ability to act accordingly is also important.
- Enhanced cooperation among African countries to strengthen NMHSs in developing coordinated research and operational capabilities, in addressing transboundary weather and climate impacts and in contributing to national, regional and global networks and initiatives in the context of DRR and climate change.

⁷ <https://sustainabledevelopment.un.org/?menu=1300>.

⁸ https://ane4bf-datap1.s3-eu-west-1.amazonaws.com/wmocms/s3fs-public/GAP_Draft.pdf?VDGolo0GoiMq9aT5FAHzO2uHJdKJTqmZ.

⁹ http://www.un.org/en/africa/osaa/pdf/au/gender_policy_2009.pdf.

STRATEGIC PILLARS

The Strategy is a collective endeavour designed to contribute to and address hydromet-related challenges faced by African countries. It therefore needs to identify and harness existing opportunities. It focuses on five SPs that highlight feasible and actionable policies with measurable outcomes and positive impacts on national development and economy.

SP1: Increase political support and recognition of NMHSs and related WMO Regional Climate Centres

In many African countries, the ministers responsible for meteorology have key roles in liaising with their NMHSs. This is one of the main reasons why visibility and funding of NMHSs need to be tactically organized. With climate change and high-impact events, NMHSs are increasingly requested to serve different development sectors in different government departments (for example, agriculture or energy) or in the private sector and civil society. Structural reform to provide a conducive legal environment that ensures autonomization of NMHSs is emerging as a basic requirement to better serve emerging needs and ensure operational sustainability.

This pillar aims to increase recognition of the role of NMHSs within the political decision-making arena through the integration of meteorological service contributions to various economic sectors and in national development policies, strategies and programmes. It further aims to increase sustainability of services with the active participation of relevant intergovernmental officials and other stakeholders including the emerging private sector in establishing adequate weather and climate services, at the national and regional levels, aligned with policies that address development challenges and opportunities.

The areas of action are to:

- Formulate policies and provide the necessary legislation to ensure that NMHSs acquire more autonomy in the longer term, so they 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 and business plans, service charters aligned with their governments' development agenda and priorities.
- Ensure that RCCs develop strategic and business plans aligned with AUC and REC agenda and priorities.
- Facilitate regular meetings with policymakers to inform them of NMHS/RCC activities and plans as well as to demonstrate the value of weather and climate services and their relevance to socioeconomic development. Establish national frameworks that facilitate coordination of activities with the involvement of all stakeholders, and eventually organize direct interactions/awareness training with and for them (including parliamentarians, ministries of finance and planning, and so forth).
- Ensure regular uptake and utilization of RCC products and services by NMHSs, as well as collection of feedback using Regional Climate Outlook Forums and National Climate Outlook Forums, to help refine RCC products and services.
- Facilitate close cooperation from RECs and other relevant African institutions to support production and delivery of weather and climate services.
- Accelerate implementation of the African Union Gender Policy and the WMO Gender Action Plan at national, regional and continental levels through the active role of Regional Associations.

SP2: Enhance the capacities for production and delivery of tailored weather and climate services for sustainable development

Acknowledging the complexity of the landscape of service delivery, and also the critical role of NMHSs as the main providers of the expanding portfolio of hydromet services in Africa, this pillar aims to improve the effectiveness and efficiency of the production and delivery of services enabling appropriate responses to the changing needs of government, society and sectoral users through suitable structures and working mechanisms. Co-design, co-development and co-production, at African and international levels, are to be embedded in this SP, as key elements to enhance capacities in producing and delivering the tailored services.

One of the fundamental elements to achieving this is to fill the weather and climate data observation gaps as well as to facilitate data and product 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, minimizing the spread of climate-sensitive diseases, improving water resources management and improving disaster risk management.

African countries are highly vulnerable to natural disasters and weather extremes such as floods, droughts, tropical cyclones and forest fires. Weather stations are so far apart that their data cannot be extrapolated to the local level due to the varying terrain and altitude. In addition, there has to be continuous monitoring and appropriate forecasting of these extreme events. Africa is utilizing NWP and satellite-derived products provided from outside the continent, with limited involvement in the design of these products. In addition to being a consumer of these products, the continent should develop its own expertise to generate Africa-tailored satellite-based products and NWP model outputs.

Implementation of this SP should be aligned with WMO programmes such as the Space Programme,¹⁰ the Global Data-Processing and Forecasting Systems (GDPS),¹¹ the Climate Services Information Service (CSIS),¹² GFCS,¹³ the World Climate Services Programme,¹⁴ the Commission for Climatology,¹⁵ the World Weather Research Programme (WWRP)¹⁶ and the World Climate Research Programme (WCRP).¹⁷ The African Space Policy¹⁸ and Strategy¹⁹ and the Abidjan Declaration²⁰ should also be taken into account.

The areas of action are to:

- Develop a network that is fit for purpose, with a design that cascades down from the needs of users, and invest in the relevant weather and climate monitoring infrastructure (observation networks) such as automatic weather stations, meteorological radars, and rain and water gauges, which all connect to WIS.

¹⁰ http://www.wmo.int/pages/prog/sat/index_en.php.

¹¹ <http://www.wmo.int/pages/prog/www/DPS/gdps.html>.

¹² <https://www.wmo.int/gfcs/CSIS>.

¹³ <http://www.wmo.int/gfcs/>.

¹⁴ <http://www.wmo.int/pages/prog/wcp/wcsp.html>.

¹⁵ http://www.wmo.int/pages/prog/wcp/ccl/index_en.php.

¹⁶ <https://public.wmo.int/en/programmes/world-weather-research-programme>.

¹⁷ <https://public.wmo.int/en/programmes/world-climate-research-programme>.

¹⁸ https://au.int/sites/default/files/newsevents/workingdocuments/33178-wd-african_space_policy_-_st20444_e_original.pdf.

¹⁹ https://au.int/sites/default/files/newsevents/workingdocuments/33178-wd-african_space_strategy_-_st20445_e_original.pdf.

²⁰ https://www.wmo.int/amcomet/sites/default/files/field/doc/events/abidjan_declaration_-_signed_by_all.pdf.

- Develop the relevant business models for generating and accessing data and for enhancing observations. Collectively engage manufacturers of meteorological equipment, accessories and consumables towards the lowering of costs, rendering the equipment more affordable in an effort to improve station density and sustainability, and provide the training necessary for installing and maintaining networks.
- Enhance telecommunications systems within and among the countries, including through the regional Data Collection and Production Centres of WIS.
- Enable the human capacity development necessary for climate research, modelling and prediction, and for generation of tailored climate information and services.
- Enable the human capacity development necessary for weather, for example, in observations, instrument maintenance, forecasts, advisories, watches and warnings.
- Develop specific programmes and workshops to implement operationally the African Union Gender Policy²¹ and the WMO Gender Action Plan²² at the continental, regional and national levels.
- Improve service delivery mechanisms, particularly early warning systems, climate watch advisories and awareness systems.
- Implement CSIS and the Climate User Interface Platform²³ at all African levels.
- Ensure that the necessary funding is provided to sustain and develop NMHSs and RCCs through appropriate national and regional mechanisms, including their possible transition into semi-autonomous or autonomous entities, where and when appropriate.
- Ensure that all subregions of Africa are equitably considered, including the establishment of RCCs and Regional Specialized Meteorological Centres (RSMCs) across the continent such as a subregional climate institution for sustainable development in Central Africa.
- 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.
- Develop an action statement on user engagement, co-production, intermediaries to provide contact with the community and so forth, and thus encourage the uptake of hydromet services by co-developing products with users.
- Create and sustain national and regional forums that facilitate and encourage continuous interaction among meteorological experts, national meteorological advisers, sectoral stakeholders and government policymakers at the appropriate governmental levels.
- Ensure sustainable access and use of existing and future geostationary (and polar-orbiting weather satellites), in particular the Meteosat Third Generation, which will be located above the Gulf of Guinea and provide weather observations over the full African continent every 10 minutes.
- Increase African capacities to develop African-tailored products based on satellite data, through an African Meteorological Satellite Application Facility (AMSAF) as proposed by the Abidjan Declaration, and engage with international partners to combine or assimilate in situ observations, model outputs and satellite-derived products to better address African requirements.

²¹ http://www.un.org/en/africa/osaa/pdf/au/gender_policy_2009.pdf.

²² https://ane4bf-datap1.s3-eu-west-1.amazonaws.com/wmocms/s3fs-public/GAP_Draft.pdf?VDGolo0GoiMq9aT5FAHzO2uHJdKJTqmZ.

²³ <https://www.wmo.int/gfcs/UIP>.

- Ensure that the African meteorological weather requirements on satellite-derived products are channelled through the regional WIGOS and the WMO Space Programme, in addition to the Regional African Satellite Communication Organization existing telecommunications satellite.

SP3: Improve quality of meteorological information and knowledge sharing in aviation and marine sectors

Aviation

The International Civil Aviation Organization (ICAO) requires that meteorological authorities should supply operators, flight crew members, air traffic service units, search and rescue service units, airport management and other related aviation stakeholders with meteorological information that meets the needs of international air navigation.²⁴ AMCOMET is urgently required to facilitate the availing of national funds to ensure that the countries meet ICAO deadlines²⁵ in terms of compliance and aviation requirements.

The areas of action for aviation are to:

- Develop and implement a QMS for meteorological services for international air navigation conforming to the requirements of ICAO, including certification to the ISO 9000 series of quality management standards.
- Facilitate QMS training to staff from various NMHSs and use them as consultants to put in place QMSs in other NMHSs in Africa.
- Ensure that the competency of aeronautical meteorological personnel (observers and forecasters) meets international standards established by WMO.
- Ensure regular calibration of equipment in line with WMO standards.
- Make optimal use of existing products supplied by regional and global centres (for example, world area forecast centres and volcanic ash advisory centres) to ensure national/subregional service provision.
- Access, use and develop satellite-based meteorological products for aviation (for example, lightning detection, tropopause folding turbulences, fog detection and volcanic ash).

Marine

Meteorological forecasts and warnings that are critical for safety of life and property at sea, integrated coastal management and societal impacts should be provided by NMHSs. The standard and recommended practices for marine meteorological services in coastal waters, ports and lakes are described in the WMO *Manual on Marine Meteorological Services*.²⁶ The user requirements for marine services and guidance for improved service delivery are described in the WMO *Guide to Marine Meteorological Services*.²⁷

For national shipping, the United Nations Convention on Safety of Life at Sea outlines the communication infrastructure that contracting governments should provide as part of the Global Maritime Distress and Safety System (GMDSS). NMHSs should make arrangements to provide marine forecasts and warnings to mariners at sea in their

²⁴ https://www.wmo.int/amcomet/sites/default/files/field/doc/events/annex_4_safe_skies.pdf.

²⁵ NMHSs to be certified to International Organization for Standardization (ISO) standard ISO 9001, equipment with calibration certificates and readings to be regularly verified, skills of personnel to be regularly updated and controlled, and so forth.

²⁶ https://library.wmo.int/pmb_ged/wmo_558_en-v2.pdf.

²⁷ https://library.wmo.int/doc_num.php?explnum_id=5445.

national waters on the available GMDSS infrastructure. For international shipping, there is a coordinated forecast and warning service, and broadcasts to ships through the International Maritime Organization/WMO Worldwide Met-Ocean Information and Warning Service.

The WMO–Intergovernmental Oceanographic Commission Joint Technical Commission on Oceanography and Marine Meteorology (JCOMM) provides the technical expertise to support NMHS marine service delivery.

The areas of action for marine are to:

- Ensure that NMHSs fully utilize the available marine-related model guidance products available from GDPFS RSMCs.
- Establish verification mechanisms to monitor performance and communicate with stakeholders.
- Improve communication among Members and JCOMM expert teams, through nomination of a National Marine Services Focal Point for each Member.
- Implement the standard and recommended practices for forecast and warning services covering coastal waters, ports and lakes, as described in the *Manual on Marine Meteorological Services*.
- Improve mechanisms and regional coordination to train and assess marine forecasters against the WMO Marine Forecaster Competency Framework.
- Develop relevant education content on marine hazards, and on how to fully utilize the forecast and warning services available from NMHSs for daily planning and decision-making.
- Foster and develop relationships with relevant government agencies and marine safety organizations to improve connection with decision-makers and emergency response operations.
- Facilitate access and use of globally available operational oceanography data from oceanography satellite operators (for example, Jason or Sentinel-3) and global ocean analysis and forecast centres (for example, the Copernicus Marine service) as well as the production of African-tailored marine forecast products based on these global data.
- Facilitate the deployment of buoys, where necessary, particularly in the Indian Ocean, and other critical areas (Atlantic and inland waterways such as Lake Victoria).
- Facilitate the sustained provision of global and regional coverage of observational data, products and services to address the continued and expanding requirements of the maritime user community for met-ocean information and services, including development of tsunami capabilities and monitoring of tropical cyclones.

SP4: Support the provision of weather and climate services for climate change adaptation and mitigation

Africa is a highly vulnerable region to the impacts of climate change. Most of the continent's disasters are related to meteorology or hydrology. These disasters pose a serious threat to the continent's ability to attain SDGs.²⁸ While impacts vary across the continent, it is generally agreed that the climate is becoming more extreme. Therefore, the overall future of the African continent is bleak unless adequate preparations are made, and sufficient mitigation and risk reduction measures are put in place against the anticipated droughts and sea-level rises.

²⁸ <http://www.un.org/en/africa/osaa/pdf/events/20160420/linkagesagenda2063sdg.pdf>;
www.un.org/en/africa/osaa/pdf/au/agenda2063-framework.pdf.

It is therefore crucial that AMCOMET, in collaboration with relevant African institutions, be actively involved in the African communities' position on climate change in international negotiations, including the African Ministerial Conference on Environment, the African Ministers Conference on Water and the Conference of African Heads of States and Government on Climate Change (CAHOSCC).

The areas of action are to:

- Ensure, at the national level, that at least 5% of budgets allocated to NMHSs and associated research institutions is for research and development.
- Encourage NMHSs to work together with CR4D (Regional Climate Research Partnership)²⁹ in the design, resourcing and production of user-driven climate information and services.
- Formulate legislation designating NMHSs as the leading authorities on climate change science-based projections. This will ensure country climate-sensitive sectors do not use climate change scenarios from different sources with different projects and so create confusion.
- Design the relevant national adaptation plans³⁰ and natural disaster vulnerability mapping, in alignment with the national DRR management plan.
- Involve mainstream economic, trade and finance ministries and the development community, and a broader range of stakeholders in other priority sectors. Thus, AMCOMET should galvanize greater engagement among climate communities and development communities.
- Liaise with relevant continental institutions and platforms³¹ to develop a new African agenda and position on climate change. This will enable Africa to articulate its position at the international level such as under the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Group of 77 and China, the African Group of Negotiators and the Intergovernmental Panel on Climate Change (IPCC).
- Ensure the implementation of a structured GFCS at the African level, in line with the recommendation of the African Union Specialized Technical Committee on Agriculture, Rural Development, Water and Environment as adopted by the African Union Executive Council in January 2018.³²
- Ensure that AMCOMET and NMHSs actively participate in international negotiations such as those of UNFCCC, the United Nations Convention on Biological Diversity, the United Nations Convention to Combat Desertification and IPCC.

SP5: Strengthen partnerships with relevant institutions and funding mechanisms

The success of the Strategy is highly dependent on the strength of the partnerships. These are with existing institutions that support and collaborate for their own mandates and those of AMCOMET, and also with funding mechanisms able to provide the necessary financial resources to meet the goals. The Strategy must be clearly linked with the work of government departments and agencies, technical partners, the private sector and other relevant stakeholders, and work in collaboration with global and regional

²⁹ https://www.uneca.org/sites/default/files/uploaded-documents/CCDA5/cr4d_brochure.pdf;
https://www.uneca.org/sites/default/files/images/annex_a2.2.2_-_first_meeting_of_institutional_collaboration_platform_report_en.pdf.

³⁰ www.africaadaptationinitiative.org/.

³¹ Such as CAHOSCC, African Group of Negotiators and African Union organs.

³² https://au.int/sites/default/files/decisions/33909-ex_cl_decisions_986-1007_e.pdf.

frameworks, including the Africa Hydromet Program.³³ AMCOMET plays a vital role in harnessing and developing these relationships, especially with consolidated private and public academia partnerships, to optimize production and delivery of climate services, and with its partners in the co-design, co-development and co-production of knowledge.

The areas of action are to:

- Stimulate national and regional research activities on DRR and climate change, and also in other important areas such as health, agriculture, energy and water, in collaboration with WMO, partners and sponsored research programmes such as Global Atmosphere Watch, WWRP and WCRP. WMO is focusing on integrative science to respond to the international disaster risk and climate agenda towards a society resilient to extremes, climate variability and change. Collaborative research demonstrates how diverse research communities can tackle issues of common interest and deliver tangible and measurable outcomes in a short time frame.
- Build scientific, technical and managerial capacities of NMHSs and RCCs for quality services through collaboration with WMO global or advanced regional centres.
- Cultivate long-term partnerships with traditional financing mechanisms, such as development banks and aid agencies, to ensure their involvement in the AMCOMET process, thus paving the way for institutional and financial support.
- Identify funding streams established to support African countries in their development efforts including through improvement of meteorological infrastructure and services, and work to ensure efforts are focused on Africa's priorities and are adequately coordinated.
- Liaise with the United Nations Economic Commission for Africa (UNECA) and the private sector for development and implementation of innovative business models that ensure growth and sustainability of NMHSs/RCCs.
- Actively involve the private sector which represents a sustainable customer base and co-developers for NMHSs and potential long-term collaborators for implementation of the Strategy.
- Strengthen collaboration with international scientific and technical partners to ensure that African NMHSs and RCCs can access, exchange and contribute scientific and technical information with these partners.
- Collaborate with existing initiatives³⁴ and relevant African institutions,³⁵ on training to ensure the convergence and complementarity of initiatives and programmes.
- Work with academic institutions, including WMO Regional Training Centres to supply trained and competent people, and to update and develop training curricula in line with contemporary needs and requirements.

IMPLEMENTATION, RISKS AND ASSUMPTIONS

The key issues in implementation of the Strategy are recognition and acknowledgement by all stakeholders, including national governments, of the strategic nature of NMHSs, and the critical and inevitable role they play in national security, national stability and socioeconomic development of every country.

³³ http://www.worldbank.org/en/programs/africa_hydromet_program.

³⁴ Such as ClimDev-Africa, the Intra African, Caribbean, and Pacific Group of States Climate Services and related applications programmes, Southern African Science Service Center for Climate Change and Adaptive Land Management, West African Science Service Center on Climate Change and Adapted Land Use, and the Global Monitoring for Environment and Security and Africa programme.

³⁵ Such as the African Climate Policy Centre, the African Centre of Meteorological Applications for Development, and WMO RCCs and Regional Training Centres.

These NMHSs are increasingly being called upon to urgently respond to the ever-increasing and varied needs of societies, the effects of climate variability and change, and the new opportunities arising from technological advances.

Therefore, Members and continental institutions, with the support of development partners, should commit to implementing the Strategy by improving the visibility and recognizing the value added of NMHSs within countries and also by improving the sustainability, effectiveness, flexibility and efficiency of their structures and working mechanisms and practices.

A risk management process is generally implemented as part of a TQM initiative. The AMCOMET Secretariat and the AMCOMET Bureau shall be responsible for adopting the best approach and business model to minimize the risks of Strategy implementation, building on the *WMO Risk Management Framework*³⁶ and Guidelines.

Modalities of implementation for the Strategy need to be crafted in accordance with the priorities of AMCOMET as well as the availability of financial resources. There are associated risks (R) and assumptions (A) that should be taken note of and considered, including the following:

- Political disturbances in African countries (R)
- Sufficient national resource allocations to NMHSs (R)
- Political realignment with development partners (R) because some donor aid comes with political prerequisites
- HIV/AIDS and epidemics like malaria, typhoid and cholera (R)
- High staff turnover, retirement and frequent staff changes (R)
- Availability of appropriate skilled human resources (R), particularly in weather forecasting, data warehousing and data mining, as well as quality control and climate modelling
- Conducive environment for recruitment of women (A), in the context of adaptation and mitigation to climate change

INSTITUTIONAL ARRANGEMENTS

Institutions and structures are already in place to support implementation of the Strategy. Development of the Strategy has involved participation of AUC, RECs, national authorities and development partners through a consultative process. This participatory approach will continue throughout the implementation process. Specific roles and responsibilities will be defined in the implementation plan for the Strategy at the continental, regional and national levels by key stakeholders.

The Strategy complements the ClimDev-Africa programme, which is a joint initiative of AfDB, AUC and UNECA, that seeks ways of overcoming the lack of necessary climate information, analysis and options required by policymakers and decision-makers at all levels.

In addition to NMHSs, other African stakeholders, including the private sector and civil society organizations, should also be consulted and involved. International stakeholders, as partners, should participate in the implementation of the Strategy and align their support with SPs and identified needs of key stakeholders. As these partners are key to the co-design, co-development and co-delivery of services with NMHSs, it is recommended that NMHSs increase efforts in collaborating with them at a national level.

³⁶ https://library.wmo.int/pmb_ged/wmo_1111_en.pdf.

Task forces

To work on prevention plans and anticipate better risks, AMCOMET and partners need to establish task forces in priority activities to:

- Design a complete logical framework linking SPs, strategic objectives, relevant strategic indicators and programmatic initiatives.
- Review and follow, together with management and the Secretariat, at least once a year the Implementation and Resource Mobilization Plan of the Integrated African Strategy on Meteorology (Weather and Climate Services)³⁷ with its detailed annual operational plans.
- Review and follow the resource mobilization strategy³⁸ for the implementation plan together with AMCOMET budget and programmatic activities.
- Explore the feasibility of developing and establishing AMSAF, leading to the generation of Africa-tailored satellite products answering to African socioeconomic requirements, based on the four main components of the WMO Space Programme and in line with the African Space Policy and Strategy.³⁹
- Maintain and develop ongoing efforts of meteorology and climate research and services (for example, CR4D) with academia.

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

RESOURCE MOBILIZATION

To ensure smooth implementation of the Strategy, resource mobilization efforts are needed in alignment with the institutional arrangements and coordination modalities established in the Strategy. Resource mobilization for the Strategy will focus on:

- Further mobilizing resources from African countries and institutions
- Aligning the Strategy's needs and requirements on available and potential financing sources
- Collaborating and coordinating with various resource partners, including multilateral funding mechanisms, bilateral development agencies and multilateral development banks
- Working closely with partners that already include the Strategy in their priority areas of focus, as well as other strategic development partners such as AfDB, the World Bank, the European Union, and the African, Caribbean, and Pacific Group of States Secretariat
- Identifying funding trends and sources, as well as resource mobilization scenarios, in considering the challenges posed by the current global financial and economic crisis

MONITORING, EVALUATION AND REPORTING

The implementation of the Strategy shall be reviewed under the planning cycle of

³⁷

https://www.wmo.int/amcomet/sites/default/files/field/doc/events/doc.4.0_approved_implementation_and_rm_plan_en.pdf.

³⁸ https://www.wmo.int/amcomet/sites/default/files/field/doc/events/annex_6_rmdp_0.pdf.

³⁹ https://www.wmo.int/amcomet/sites/default/files/field/doc/events/1_report_tf_space_programme_0.pdf.

AMCOMET. Monitoring and evaluation will be conducted in accordance with the WMO Monitoring and Evaluation System.⁴⁰ An appropriate monitoring and evaluation tool needs to be developed to ensure periodic reporting from focal points and stakeholders. It is expected that AMCOMET, AUC, RECs and national governments will have key roles in this process.

To monitor the progress towards achieving the objectives of the Strategy, data and information will be collected to measure the progress against the expected outcomes of the Strategy, recalling:

- Increased recognition of NMHS roles at the political level
- Accelerated implementation of the WMO Gender Action Plan
- Improved climate risk management for the protection of life and property
- Increased safety on land, on water and in the air
- Enhanced quality of life
- Enhanced cooperation among African countries

Strategic indicators need to be implemented to measure the progress and should include regional, subregional and national indicators such as:

- Degree of regional cooperation in Africa
- Degree of involvement of NMHSs in relevant government agendas
- Percentage of enhanced capacity (technical, human and financial) of NMHSs in providing tailored meteorology, hydromet and climate services
- Percentage of enhanced capacity (technical, human and financial) of RCCs in providing sector-specific weather and climate services
- Number of designated meteorological authorities for aviation services providing meteorological services for international air navigation
- Performance in delivering services to major users (through measures providing a global index on user satisfaction of hydromet services delivered)
- Percentage of NMHSs that comply with the requirements of ICAO and WMO, including QMSs and aeronautical meteorological personnel competency
- Percentage of NMHSs that are certified to ISO 9001:2015
- Percentage of increased resources invested in the strengthening of NMHSs (national versus international)
- Percentage of NMHSs that implement a gender action plan, aligned with AUC and/or WMO recommendations

Possible aligned key performance indicators could be as follows:

- Number of regional initiatives where activities are aligned with AMCOMET objectives and vision
- Number of subregional initiatives where activities are aligned with AMCOMET objectives and vision
- Percentage of increased budget for AMCOMET-related activities
- Number of projects co-designed with stakeholders from the private and public sectors

⁴⁰ https://www.wmo.int/pages/about/documents/1088-WMO-monitoring-and-evaluation-Guide_en.pdf.

- Number of research projects and programmes co-designed and co-developed with academia
- Number of international publications on a yearly basis with the AMCOMET stamp
- Number of stakeholders and development partners events where AMCOMET contributed
- Number of user and development partner events organized by AMCOMET
- Calculated return on investment for each organized and/or co-organized event
- Rate of satisfaction of stakeholders on a yearly basis (an index could be generated around the AMCOMET brand)
- Compliance with ISO 9001:2015 for AMCOMET (leading by example)
- Advancement in knowledge management (sharing data, information and knowledge through social media)
- Percentage of women participating in decision-making bodies, governance structures and user forums in the AMCOMET environment (activities to measure this specific gender-related indicator could include awareness programmes for women and girls in science, technology, engineering and mathematics, in partnership with non-governmental organizations, academia and so forth); a series of gender-sensitive indicators should be generated
- Number of NMHSs with strategic plans complying with the proposed WMO framework for strategic planning process
- Number of NFCSs complying with GFCS, and adopted by national governments
- Percentage of capacity-development programmes specifically dedicated to the enhancement of climate, water and meteorological services at the Africa level