FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

Ministry of Water, Irrigation and Energy

National Meteorological Agency

National Framework for Climate Services - Ethiopia

Strategic Plan: 2021-2030

May 2021

Addis Ababa, Ethiopia

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The NMA would also like to express its gratitude to a number of people and organizations which contributed their expertise and leadership during the development of the NFCS. These are:

- Partner organizations, namely, Ministry of Agriculture (MoA), Ministry of Water, Irrigation and Energy (MoWIE), Ministry of Health (MoH), and the National Disaster Risk Management Commission (NDRMC);
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Foreword

Minister

Deputy Prime Minister and Minister of Foreign Affairs

Mr. Demeke Mekonnen

High level delegates of the 3rd World Climate Conference (WCC-3) organized by World Meteorological Organization (WMO) in the year 2009 in Geneva, Switzerland foresaw adaptation to climate variability and change as an important challenge for sustainable societal development. The delegates also underscored the importance of a policy framework, technology, and actions, supported by relevant climate information and tools, to adapt the expected changes. Accordingly, conference participants by then declared to establish a Global Framework for Climate Services (GFCS) to strengthen the production, availability, delivery and application of science-based climate monitoring and prediction services.

WMO further called for its member states to develop a national framework for climate services (NFCS) and issued a step-by-step guideline for same. The GFCS consists of five pillars namely: (1) the User Interface Platform (UIP), (2) Climate Services Information System (CSIS), (3) Observations and monitoring, (4) Research, modeling and prediction, and (5) Capacity development. In line with WMO's call for developing NFCS, the National Meteorological Agency(NMA) of Ethiopia accepted the call and appointed a focal person in charge of coordinating development of NFCS and held series of consultations with WMO representatives. The aim was to get technical advice and financial support in this regard.

NFCS of Ethiopia is tool to strengthen the production, availability, delivery and application of science-based climate prediction and services in Ethiopia. The effective delivery of user-tailored climate services can only be realized through strong partnerships among NMA and user groups, including sectorial experts, government agencies, private sector and academia. This will help in the interpreting, tailoring, processing and applying of climate information and advisory services for decision-making, for sustainable development, and also for the improvement of climate information products, predictions and

outlooks. The processing of received climate, weather and water forecast information to jointly produce, among providers and users, a relevant climate service is defined as co-production.

This NFCS-E document is vital for strengthening early warning systems and its delivery mechanisms, disaster risk management and reduction at national and local levels. Although this document is produced primarily to advance the climate service of Ethiopia, many other governmental and non-governmental organizations, research institutes, academy's may take it as an input for their climate related deliverables.

Finally, I confident that NFCS-E will be helpful for the socioeconomic development of the Country. FDRE is committed to provide appropriate support for the full implementation of this Strategic plan.

Deputy Prime Minister of FDRE and

Minister of Foreign Affairs

Mr. Demeke Mekonnen

Foreword

H.E Dr. Eng. Seleshi Bekele
Minister, Water, Irrigation and Energy

The National Framework for Climate Services of Ethiopia (NFCS-E) and its strategy for the period 2021-2030 is the response of the declaration of the Third World Climate Conference (WCC-3), held in Geneva, Switzerland from 31 August to 4 September 2009. In that historical and remarkable event, Ethiopia, as one of the 190th WMO member countries, attained the conference through its late president, Girma Woldegiworgis.

By then, the delegates of the conference reached on consensus to establish a Global Framework for Climate Services (GFCS) with clear objectives to strengthen the production, availability, delivery and application of science-based climate monitoring and prediction services.
Weather observations and climate studies revealed that Ethiopia's climate is known to have high variability and the degree of occurrence of severe weather events has increased in recent decades and might also further increase in the future. The loss of life, damage to infrastructure and other impacts of adverse weather has become unprecedented challenges particularly to vulnerable communities.

In light of the above, an action plan has been set for the need to improve the understanding of climate variability and climate predictions, and the way in which climate data and information is analyzed and provided to serve the needs of society. However, addressing the immense variety of user needs for climate services in Ethiopia is far beyond the capacity of any single institution. Consequently, managing climate hazard or disaster risks in order to create climate resilience requires the development of integrated strategies, plans and programmes aimed at facilitating interactions between a variety of institutional and administrative mechanisms, projects, human and financial resources.

As per the call of WMO to member countries, Ethiopia has engaged to build climate resilient societies through institutionalizing the coordination of production, delivery and application of science-based climate monitoring and prediction services that are in line with the Global Framework for Climate Services (GFCS). The NFCS-E is the outcome of a wide range of stakeholders' consultations as well as the negotiations of climate sensitive sectors across the country.

As an instrument, the NFCS-E is set up a multi-stakeholder governance structure that supposed to pave a practical ground to implement an integrated, collaborative and cross-sector approach. In order to develop and implement NFCS in Ethiopia, a detail study had been conducted and examined the climate services that are currently being provided. The outcome of the baseline study has elucidated the existing climate service landmark and enable us to realize the existing gaps and strengths in our service that has been given in the country for the last nearly five decades. The results of the study were also able to identify the main actors in the national chain for climate services and assessed capacities of climate sensitive institutions in reference to the five pillars of Global Framework for Climate Services. In addition, the relevant policy issues were also assessed in order to understand the state of readiness of the country to implement NFCS. The findings of the study have taken as the starting points for the development and implementation of NFCS in Ethiopia.

The NFCS-E is built on elements which has been embedded within the vision of looking the livelihoods to be resilient through climate-informed decisions and assist the selected priority sectors to achieve their development and adaptation goals in the face of climate variability and change. We believe that such a well-functioning climate information can support various level decision-maker for using weather and climate information to understand, anticipate and manage climate-related risks. The NFCS-E is also aimed to strengthen climate services as a development and adaptation measures that can contribute for both the National Adaptation Plan (NAP) and the Sustainable Development Goals (SDGs).

Attempts have been made to rich the contents of the strategic documents through intensive technical reviews that gives strong emphases on improving climate service on the way of establishing better integration and collaborations among sectors in the country as opposed to

fragmented climate service and duplicated mandates. The strategic plan is also constructed on bases which ensure the continuity of previously initiated sectoral collaborations and introduces a number of innovations as called for during the consultations and negotiations. Having science-based climate service align with establishing effective coordination mechanism among climate service producing sectors can play crucial role to attain the long and short-term developmental plans of the country.

Although this document is produced primarily to advance the climate service of Ethiopia, many other governmental and non-governmental organizations, research institutes, academy's may take it as an input for their climate related deliverables.

Finally, on behalf of the ministry and the government of Ethiopia, I wish to express my earnest gratitude to all sectors and consortium members, consultants, technical sectoral experts, national and international research institutes, including academies and individuals who have made various level of contributions.

Minister

Ministry of Water, Irrigation and Energy

Dr. Eng. Seleshi Bekele

Preface

Mr. Fetene Teshome

Director General of
National Meteorological Agency and
Permanent Representative of Ethiopia
with WMO

The National Framework for Climate Services of Ethiopia (NFCS-E) is a tool designed to strengthen the production, availability, delivery, and application of science-based climate prediction and services in Ethiopia. The effective delivery of user-tailored climate services can only be realized through strong partnerships between the National Meteorological Agency (NMA) and user groups, including sectorial experts, government agencies, the private sectors, and academia. This will help interpret, tailor, process, and apply climate information and advisory services for decision-making, sustainable development, as well as the improvement of climate information products, predictions and outlooks. The processing of received climate and weather forecast information to jointly produce, among providers and users, a relevant climate service is defined as co-production.

In order to develop and implement NFCS in Ethiopia, consultants provided a Strategic Plan with the goals and objectives of the framework. Effective implementation of climate services through the existing platform for climate service provision in prioritized sectors was defined. These are Agriculture, Water, Health, Disaster Risk Management and Environment. The Strategic Plan document identified highly influencing weaknesses, strengths, opportunities, and threats surrounding climate service implementation.

Successful implementation of the NFCS will enhance provision of accurate, reliable, and timely weather and climate related products. This information will play a great role in sustainable development of the country. The NMA remains committed to lead the coordination and implementation of the NFCS.

Fetene Teshome

Director General of
National Meteorological Agency and
Permanent Representative of Ethiopia with WMO

Acronyms

AAU	Addis Ababa University
ACMAD	African Center of Meteorological Application for Development
AGP	Agricultural Growth Program
AI	Artificial Intelligence
AMMA	Amhara Mass Media Agency
AR5	IPCC Fifth Assessment Report
ATA	Agricultural Transformation Agency
AWOS	Automatic Weather Observing System
AWSs	Automatic Weather Stations
BDA	Basins Development Authority
BoA	Bureau of Agriculture
BoWIE	Bureau of Water, Irrigation and Energy
BRACED	Building Resilience and Adaptation to Climate Extremes and Disasters
CBD	Convention on Biological Diversity
CCA	Climate Change Adaptation
CCD	Convention to Combat Desertification
CFS	Climate Forecasting System
CHIRPS	Climate Hazard Group Infrared Precipitation with Station data
CR	Climate Resilience
CRGE	Climate Resilient Green Economy
CSs	Climate Services
CSIS	Climate Service Information System
CU	Coordination Unit
DAs	Development Agents
DRM	Disaster Risk Management
DRMFSS	Disaster Risk Management and Food Security Sector
DRMSPIF	Disaster Risk Management Strategic Program Investment Framework
DRMTWGs	Disaster Risk Management Technical Working Groups
DRR	Disaster Risk Reduction
ECMWF	European Center for Medium-range Weather Forecast
EFCCC	Environment Forest and Climate Change Commission
EIAR	Ethiopian Institute of Agricultural Research
ENACTS	Enhancing National Climate Services initiative
ENSO	El Niño Southern Oscillation
EW	Early Warning
GE	Green Economy
GFCS	Global Framework for Climate Services
GIS	Geographic Information System
GTP	Growth and Transformation Plan
HEWs	Health Extension Workers
HFA	Hyogo Framework for Action
H-NAP	Health National Adaptation Plan
HPC	High Performance Computing
ICAO	International Civil Aviation Organization
IGAD	Intergovernmental Authority on Development
ICPAC	IGAD Climate Prediction and Application Center
ICT	Information Communication Technology
IPCC	Intergovernmental Panel on Climate Change

IRI	International Research Institute for Climate and Society
MoA	Ministry of Agriculture
M&E	Monitoring and Evaluation
MoH	Ministry of Health
ML	Machine Learning
MoT	Ministry of Transport
MoTI	Ministry of Trade and Industry
MoU	Memorandum of Understanding
MoUDC	Ministry of Urban Development and Construction
MoWCY	Ministry of Women Children and Youth
MoWIE	Ministry of Water, Irrigation and Energy
NAPA	National Adaptation Program of Action
NFCS	National Framework for Climate Services
NMA	National Meteorological Agency
NOAA	National Oceanic and Atmospheric Administration
NRM	Natural Resources Management
NWP	Numerical Weather Prediction
PESTLE	Political, Economic, Socio-cultural, Technological, Legal, and Environmental analysis
SDGs	Sustainable Development Goals
SMHI	Swedish Meteorological and Hydrological Institute
SNNPR	Southern Nations, Nationalities, and People's Region
SOPs	Standard Operating Procedures
SWOT	Strengths, Weaknesses, Opportunities, and Threats
UCSB	University of California Santa Barbara
UIPs	User Interface Platforms
UN	United Nations
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
USGS	United States Geological Survey
WASH	Water Sanitation and Hygiene
WDRP	Woreda Disaster Risk Profiling
WHO	World Health Organization
WIE	Water, Irrigation and Energy
WMO	World Meteorological Organization

Definition of terms

Unless otherwise stated, definitions are adopted from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) or the World Meteorological Organization (WMO) Implementation Plan of the Global Framework for Climate Services (GFCS).

Adaptation: The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.

Adaptive capacity: The ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.

Anthropogenic: Resulting from or produced by human beings.

Climate: Climate in a narrow sense is usually defined as the average weather, or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization. The relevant quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system.

Climate anomaly: The departure of the value of a climatic element from its normal value.

Climate change: Climate change refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcing such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use.

Climate data: Historical and real-time climate observations along with direct model outputs covering historical and future periods.

Climate information: Climate data, climate products and/or climate knowledge.

Climate model: A numerical representation of the climate system based on the physical, chemical, and biological properties of its components, their interactions and feedback processes, which accounts for all or some of its known properties.

Climate prediction: A climate prediction or climate forecast is the result of an attempt to produce (starting from a particular state of the climate system) an estimate of the actual evolution of the climate in the future, for example, at seasonal, inter-annual, or decadal time scales. Because the future evolution of the climate system may be highly sensitive to initial conditions, such predictions are usually probabilistic in nature. Also see "climate projection" and "climate scenario."

Climate product: A derived synthesis of climate data. This is a product which combines climate data with climate knowledge to add value.

Climate projection: A climate projection is the simulated response of the climate system to a scenario of future emission or concentration of greenhouse gases and aerosols, generally derived using climate models. Climate projections are distinguished from climate predictions by their dependence on the emission/concentration/radiative-forcing scenario used, which is in turn based on assumptions concerning, for example, future socioeconomic and technological developments that may or may not be realized. Also see "climate scenario" and "climate prediction."

Climate change scenario: A plausible and often simplified representation of the future climate which is based on an internally consistent set of climatological relationships and assumptions of radiative forcing, typically constructed for explicit use as input to climate change impact models. A "climate change scenario" is the difference between a climate scenario and the current climate. Also see "climate projection" and "climate prediction."

Climate service: Providing climate information in a way that assists individuals and organizations in decision-making. A service requires appropriate engagement along with an effective access mechanism and must respond to user needs (WMO GFCS Implementation Plan). Climate service is climate information prepared and delivered to meet a user's needs (The Report of the High-Level Taskforce for the Global Framework for Climate Services).

Climate system: The climate system is the highly complex system consisting of five major components: the atmosphere, the hydrosphere, the cryosphere, the lithosphere, and the biosphere, and the interactions among them. The climate system evolves in time under the influence of its own internal

dynamics and because of external forcing such as volcanic eruptions, solar variations, and anthropogenic forcing such as the changing composition of the atmosphere and land use change.

Climate services institution: The NMA, as a climate services producer, under the National Framework for Climate Service (NFCS), and other governmental climate institutions, namely MoWIE, MOA, MOH, NDRMC, and EFCCC that are working in collaboration with NMA as climate service co-producers. Collectively, these institutions are said to be climate services institutions**.**

Climate variability: Climate variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all spatial and temporal scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability). Also see "climate change."

Disaster: Severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions. These may lead to widespread adverse human, material, economic, or environmental effects which require immediate emergency response to satisfy critical human needs and may require external support for recovery.

Downscale: Downscaling is a method that derives local- to regional-scale (10 to 100 km) information from larger-scale models or data analyses. Two main methods exist: dynamical downscaling and empirical/statistical downscaling. The dynamical method uses the output of regional climate models, global models with variable spatial resolution, or high-resolution global models. The empirical/statistical methods develop statistical relationships that link the large- scale atmospheric variables with local/ regional climate variables. In all cases, the quality of the driving model remains an important limitation on quality of the downscaled information.

Drought: A period of abnormally dry weather long enough to cause a serious hydrological imbalance. Drought is a relative term; therefore, any discussion in terms of precipitation deficit must refer to the particular precipitation-related activity that is under discussion

Extreme weather event: An extreme weather event is an event that is rare at a particular place and time of year. Definitions of rare vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile of a probability density function estimated from observations. By

definition, the characteristics of what is called extreme weather may vary from place to place in an absolute sense.

Feedback: An interaction in which a perturbation in one climate quantity causes a change in a second and the change in the second quantity ultimately leads to an additional change in the first. A negative feedback is one in which the initial perturbation is weakened by the changes it causes; a positive feedback is one in which the initial perturbation is enhanced. In the AR5, a somewhat narrower definition is often used in which the climate quantity that is perturbed is the global mean surface temperature, which in turn causes changes in the global radiation budget. In either case, the initial perturbation can either be externally forced or arise as part of internal variability.

Flood: Flooding is the unusual presence of water on land to a depth which affects normal activities.

Human settlement: A broad term meant to encompass housing or shelter; the surrounding community; neighborhoods, village or relevant social unit in which individuals live; the supporting physical infrastructure (e.g. water and sanitation services and communication links); and social and cultural services (such as health services, education, police protection, recreational services, parks, museums etc.).

Impacts of climate change: Effects on natural and human systems. In this report, the term impacts are used primarily to refer to the effects on natural and human systems of extreme weather and climate events and of climate change. Impacts generally refer to effects on lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure.

Infrastructure: The basic equipment, utilities, productive enterprises, installations and services essential for the development, operation and growth of an organization, city or nation.

Mitigation: A human intervention to reduce the sources or enhance the sinks of greenhouse gases.

Potential impacts: All impacts that may occur when there is a projected change in climate without considering adaptation.

Residual impacts: The impacts of climate change that would occur after adaptation.

Resilience: The capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation.

Risk: The potential of consequences where something of value is at stake and where the outcome is uncertain, recognizing the diversity of values. Risk is often represented as a probability of occurrence of hazardous events or trends multiplied by the impacts if these events or trends occur. Risk results from the interaction of vulnerability, exposure, and hazard. In this context, the term risk is used primarily to refer to the risks of climate change impacts.

Scenario: A plausible description of how the future may develop based on a coherent and internally consistent set of assumptions about key driving forces (e.g., rate of technological change, prices) and relationships. Note that scenarios are neither predictions nor forecasts, but are useful to provide a view of the implications of developments and actions. Also see Climate scenario.

Stakeholder: A person or an organization that has a legitimate interest in a project or entity or would be affected by a particular action or policy.

Weather forecast: A weather forecast is simply a scientific estimate of future weather condition. Weather condition is the state of the atmosphere at a given time expressed in terms of the most significant weather variables. The significant weather variables being forecast differ from place to place.

Executive Summary

Ethiopia's economy, as well as the health, security and prosperity of its people, are impacted by climate. Climate-related risks impede progress towards the nation's development goals, particularly in climate-sensitive sectors such as agriculture, health, disaster risk management, and management of land and water resources. Extreme events, such as drought or severe storms, can reverse development gains and erode livelihoods. The resulting uncertainty interferes with decision-making at all levels. Climate change is exacerbating sustainable development challenges by increasing the frequency and severity of extreme events.

In order to manage risks, decision-makers must understand what the risks are and be able to anticipate them. A well-functioning climate service has the potential to inform a range of both short- and long-term decisions, contributing to the resilience of governments, organizations, and individuals to current climate variability while also preparing for an uncertain future that may look very different from today.

The vision behind Ethiopia's National Framework for Climate Services (NFCS) Strategic Plan is "seeing Ethiopians whose livelihoods are resilient through climate-informed decisions." More specifically, it aims to help five priority sectors (health, agriculture, disaster risk management, water resources and environment) achieve their development and adaptation goals in the face of a variable and changing climate. This will be accomplished by supporting decision-makers to use weather and climate information to understand, anticipate and manage climate-related risks. The NFCS Strategic Plan also strengthens climate services as an adaptation measure, contributing to Ethiopia's National Adaptation Plan (NAP).

The NFCS Strategic Plan is guided by a theory of change (detailed in Annex A) which recognizes that Ethiopia's development across climate-sensitive sectors will be more resilient to climate impacts if targeted decision-makers from local to national levels understand, anticipate, and effectively manage climate-related risks (Figure 1).

These decision-makers will understand, anticipate, and manage climate-related risks if high-quality weather and climate services are tailored to their context-specific needs, as well as mainstreamed into the policies and operations of the relevant sector line ministries and the communities they serve. Improved, sector-specific weather and climate services will be implemented, delivered, and adopted if investment overcomes capacity constraints in four key areas: (a) human resources (the NMA and within the target sectors); (b) knowledge management (including research, monitoring and evaluation); (c) infrastructure for observations, data management and prediction; and (d) climate services governance (policy

framework, institutional arrangements and coordination processes). In line with the theory of change, activities and investments described in this strategic plan are organized around two goals:

1: *Institutional capacities are built to deliver high quality, decision relevant, timely, reliable and sustainable climate services.*

2: *Climate services that have been adapted to the diverse needs of users are then implemented, delivered, and adopted at all levels and at all times.*

These two strategic goals and the key actions needed to achieve them were formed by stakeholder consultative meetings and findings from the comprehensive baseline assessment. Insights from Strengths, Weaknesses, Opportunities, and Threats (SWOT) and Political, Economic, Sociocultural, Technological, Legal and Environmental (PESTLE) analyses have been integrated into the strategic plan and helped to inform the risk management strategy. The Strategic Plan follows an adaptive programming approach in line with changing circumstances and projected changes in the climate system. Key actions, results, and lessons will be managed by a robust monitoring, evaluation, and reporting framework that is based on the theory of change, logical framework, and baseline findings.

Through the lead role of the National Meteorological Agency (NMA), the Strategic Plan of the NFCS is designed to be implemented jointly by government stakeholders of climate sensitive sectors, bilateral and multilateral institutions, international and national think tanks, the private sector, and NGOs. High-level oversight of the Strategic Plan will be the responsibility of the NFCS Council drawn from relevant government organizations. NFCS coordination units at federal and sub-national levels will facilitate the day-to-day implementation, monitoring, evaluation, learning, and communication of the Strategic Plan. Sector-by-sector implementation of the Strategic Plan will be the responsibility of the sectoral taskforces and designated climate service experts. The Strategic Plan is designed to be implemented over a period of 10 years (from July 2021 to June 2030) with the first year being a preparatory phase, then eight years of implementation, followed by a consolidation and learning phase in the final year. The NFCS Strategic Plan will be implemented with a total budget of USD **125,023,350** (One Hundred Twenty-five Million Twenty-Three Thousand Three Hundred Fifty US Dollars).

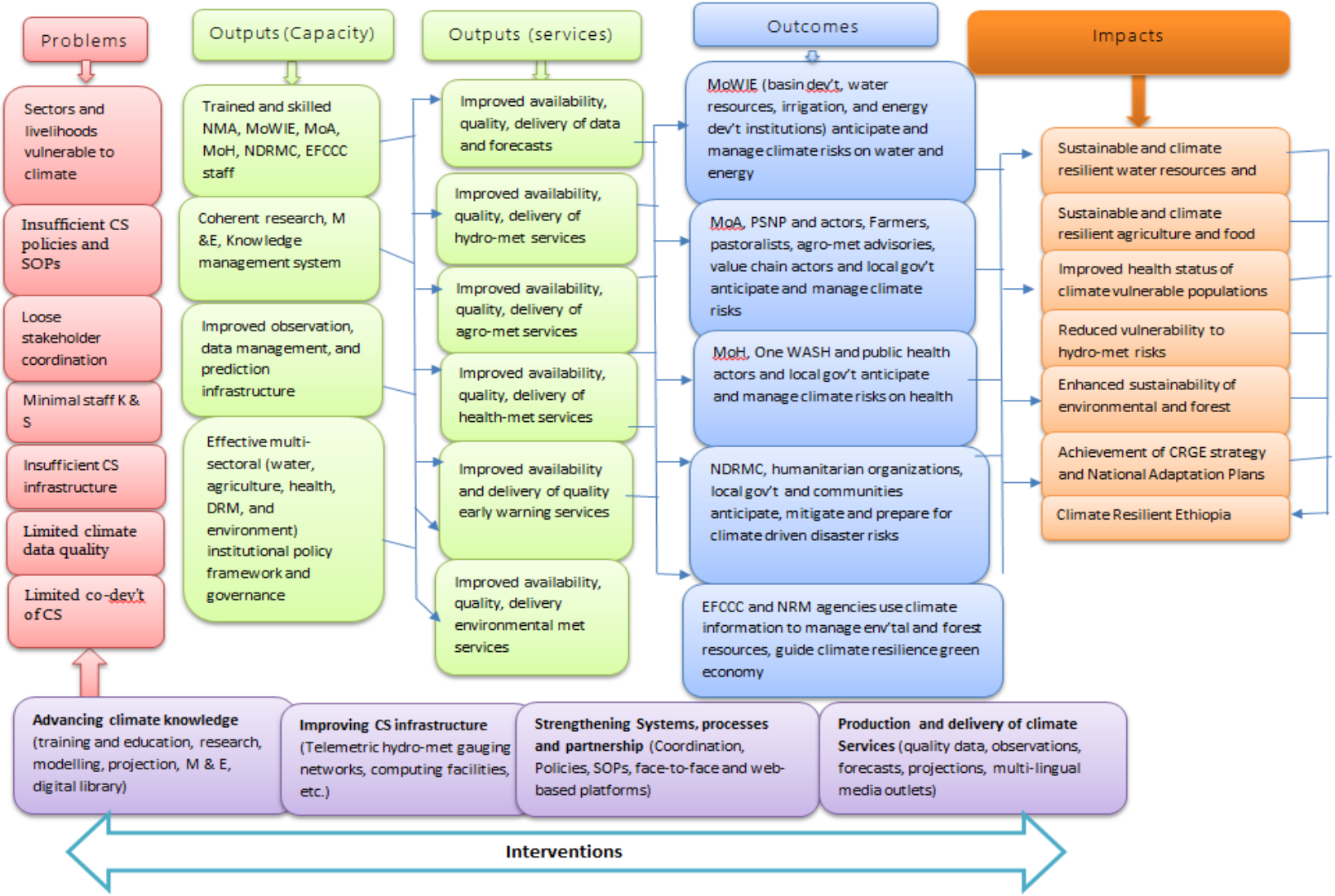

Figure 1: The theory of change for NFCS-Ethiopia

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1. Introduction and Background

1.1 Introduction

Ethiopia has diverse climatic features, including a highly stable wet season with erratic and frequently occurring prolonged dry seasons. The country has rich climatic resources, with distinct or interlinked seasonal cycles. Under normal conditions, rainfall totals often fall throughout the year, and the annual value ranges from 250 mm to 2500 mm. Length of rainy season varies from less than a month to more than nine months. These climatic resources support rain-fed agriculture, well-being of biodiversity, ecosystems and the natural environment, rangeland and water resources, and the generation of renewable energy (hydropower, solar and wind).

With existing natural variability and the shifting of mean states, however, Ethiopia has endured many climate-driven disasters of varying scales– all of which have common features of snatching lives and assets, adding to the pains of under-development and deprivation nationwide. Numerous studies have documented the climate of Ethiopia to have changed, exhibiting high degrees of variability across time and spatial scales. Such changes and variability in the climate system have been noted to be accompanied by increased frequency and intensity of climate driven hazards.[1]

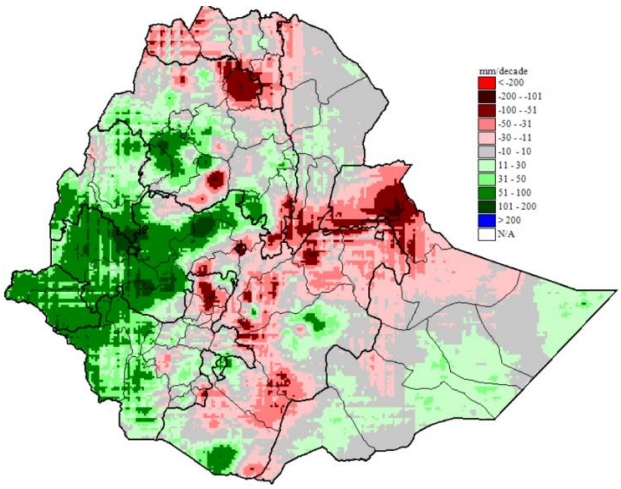


Figure 2: Change of annual rainfall totals over Ethiopia: 2011 to 2017 minus 1981 to 2010. (Source: 0.05x0.05 degree resolution Climate Hazard Group Infrared Precipitation with Station data rainfall analysis using GeoCLIM)

The most frequent and pronounced natural hazard of climatic origin in Ethiopia is drought. Recently, flooding has become an additional frequent phenomenon in many parts of the country. Between these two climate extremes, rainfall variability is now widely felt in almost all agro-ecological zones. This complicates the planning of various livelihood activities and, most importantly, the timing of agricultural practices.

1 Masih L. et al (2014): A review of droughts on the African continent: a geospatial and long-term perspective

The spatial and temporal natures of drought in Ethiopia have significantly varied from place to places. Historical records indicate that drought over Ethiopia is a recurrent climate phenomenon with a frequency of occurrence approaching one event per decade.[2] However, some specific temporal and spatial studies pointed out that there has been a significant increase in the frequency of drought in the country. For instance, the study conducted over the northern parts of Ethiopia, particularly in Tigray region, revealed that there has been an increase in the frequency of spring (Belg) season drought during the period between 1972-2011.[2] Often triggered by below normal precipitation, the nation has been stricken by nearly 15 intensive drought events recorded from 1900 – 2015, which claimed about 402,367 lives, and affected nearly 67 million people and registered an economic loss about 92,600 USD.[1] When we look into a single year drought event, the 1984 was the most devastating incident, which claimed one million people and affected about eight million people.[3] Despite the drought event has been increasing in the country, a drought event after 1984 have not snatched lives of any citizens in the country.[3] However, they have affected large number of people and caused series food insecurity in the country. For instance, in our recent memories, the drought in 2000, 2003 and 2015 alone could suffer 10.5, 13.0, and 10.2 million people respectively.[3] As the economy of Ethiopia largely depends on rain-fed agriculture, frequent drought events may result severe economic losses, affects GDP growth, crop failure and severe impacts on livestock.[4]

Similarly, flood events have also claimed greatest share of losses and damages across the country. Major floods which caused loss of life and damage on property occurred in different parts of the country in 1988, 1993, 1994, 1995, 1996 and 2006.[3] Among the major flood event in Ethiopia, the 2006 accounted large damage on social, environmental and economic costs. By then, the flood inundated in Dire Dawa and South Omo has caused intensive damage on lives and properties. For instance, the flood that occurred in Dire Dawa affected about 9,000 people; 256 died; over 6,000 people temporarily evacuated; and estimated economic loss of Birr 27 million. Similarly, the overwhelming flood in South Omo has also affected more than 8,000 people and about 364 people died. In addition, the report has also unveiled that 3,200 cattle and 760 traditional grain stores swept way and destroyed due to extraordinary overflow of Omo River.[3]

2 Gebrehiwote et al., (2011): Spatial and Temporal Assessment of Drought in the Northern Highlands of Ethiopia

3 NMA (2020, unpublished): Drought Hazard Map of Ethiopia

4 K.V. Suryabhagavan (2017): GIS-based climate variability and drought characterization in Ethiopia over three decades

Studies on projected climate change across Ethiopia[5] also indicated an increase in temperature above the global average. Potential effects of global warming levels of 1.5 °C and 2 °C above pre-industrial levels (1861–1890) on mean temperature and precipitation over the Greater Horn of Africa were studied using the large regional climate model ensemble from the Coordinated Regional Downscaling Experiments (CORDEX) show the Great Horn of Africa warming faster (0.8 °C over Northern Ethiopia) compared to the global mean (0.5 °C). While projected changes in precipitation are mostly uncertain across the Greater Horn of Africa, there is predicted to be a substantial decrease in rainfall over the central and northern parts of Ethiopia. Additionally, the length of dry spells is projected to increase while the length of wet spells is expected to decrease. The probable impacts of these changes on key sectors such as the agriculture, water, energy, and health sectors will likely call for formulation of actionable policies geared towards adaptation and mitigation of the impacts of 1.5 °C and 2 °C warming.

For a country like Ethiopia, whose economy and the livelihoods of millions of its citizens are dependent on the weather and climate, designing and implementing an overarching framework for climate services is of paramount importance. Accordingly, key stakeholders in the chain of climate services in Ethiopia, through the leadership of the National Meteorological Agency (NMA), have decided to launch a National Framework for Climate Services (NFCS). The NFCS is composed of three interrelated components. These are: a functional, cohesive, and coordinated NFCS, with a defined governance structure and rules of engagement to deliver on its mandate; a NFCS Strategic Plan that gives a shared vision of the stakeholders or participating institutions within the NFCS; and a comprehensive, actionable, time-bound and costed national action plan to implement the NFCS strategic plan.

The national Strategic Plan for improving climate services and the associated National Action Plan (NAP) with specific actions provide a strategic direction and appropriate actions for a NFCS which is built on five pillars (observations and monitoring; research, modeling and prediction; climate services information system; user interface platform; and capacity building). These are designed to realize the intended improvements in climate services to enable the public and sectors dependent on weather, climate, and water conditions to better manage the risks and opportunities of climate variability and change at all levels. This will be done through the development and incorporation of science-based climate information and prediction services into planning, policy, and practices of all climate-sensitive sectors.

3 NMA (2020, unpublished): Drought Hazard Map of Ethiopia

5 Sarah O. et al (2018): Projected climate over the Greater Horn of Africa under 1.5 °C and 2 °C global warming

The NMA of Ethiopia will play a central role in the generation of demand driven scientific climate information and other key stakeholders representing climate sensitive sectors (water, energy, agriculture, health, DRM and EFCCC) and will make use of scientific climate information to produce sector-specific products and advisory packages for different groups of users within the limits of mandate and capacity.

National and international research and academic institutions will play key roles in advancing the knowledge base in climate services through joint research, tailored educational and training programs, and knowledge sharing. Public and private media and information technology partners will contribute to effectiveness of climate services through creating user-friendly dissemination and feedback platforms.

Non-governmental organizations (NGOs) will support planning and implementation of climate service programs, capacity building, and documentation of lessons learned and best practices. End users of climate services such as pastoralists, mixed farming community members, and commercial farmers will play significant roles in prioritizing needs. They will help apply climate services for livelihood decisions, providing feedback and the context for research projects.

National government, bilateral, and multi-lateral organizations will provide an environment for designing, implementing, and sustaining climate services through appropriate policies, procedures, and budgets.

1.1.1 Basic Principles of NFCS

National Frameworks for Climate Services (NFCS) are multi-stakeholder user interface platforms enabling the development and delivery of climate services at the country level. This key Global Framework for Climate Services (GFCS) mechanism focuses on improving co-production, tailoring, delivery, and use of science-based climate predictions and services focused on the five GFCS priority areas: agriculture and food security, disaster risk reduction, energy, health and water. NFCSs support the Paris Agreement, which aims to strengthen the global response to the threat of climate change by helping Parties to the Agreement prepare, maintain, and communicate their Nationally Determined Contributions (NDCs). The development of the NFCS-E is a step in the right direction towards enhancing Ethiopia's commitments and capacity towards climate change adaptation, mitigation and resilience. The NFCS-E can deliver these through structured and coordinated provision of relevant climate data, information, products and applications to the users. Further, NFCSs complement National Adaptation Plans (NAPs) by providing climate services that help assess climate vulnerabilities, identify adaptation options, improve the understanding of climate and its impacts, and enhance the adaptation planning and

implementing capacity of climate-sensitive sectors. (https://gfcs.wmo.int/national-frameworks-for-climate-services)

1.1.2 Purposes of the NFCS Strategic Plan and Action Plan

The Strategic Plan and associated Action Plan for the NFCS are designed to serve the following purposes:

- Provide the groundwork for better coordination, interaction, and action of stakeholders in the national chain of climate services in Ethiopia;
- Provide an agreed-upon strategic framework for implementing user-driven climate services that includes a clear sets of strategic goals, objectives, strategies, results, and actions, including period of implementation, budget and responsibilities;
- Increase effectiveness of stakeholders in climate services delivery through improved institutional capacity (expertise, technology, systems and procedures, finance), coordination, timely implementation, proactive risk management, and learning exchange;
- Increase efficiency in climate services delivery resulting from co-production, synergy, and avoiding duplication/wastage of resources;
- Ensure sustainability of climate services as a result of better ownership, coordination, co-production, knowledge sharing, and meeting of users' needs; and
- Enhance transparency and accountability through the establishment of monitoring, evaluation and reporting frameworks.

1.1.3 Strategic Planning Methodology

The strategic plan and associated costed action plan design process involved a mix of approaches. Overall, the processes draw on recommendations from multiple stakeholder deliberations and baseline assessment findings. The WMO's integrated strategic planning handbook and other relevant secondary documentation have also been used to help guide the planning process.

The national consultative workshop that was held in April 2018 was concluded with agreement among stakeholders to set up a multi-stakeholder NFCS governance structure for climate services (comprising the steering committee and sectoral taskforces) and a decision to conduct a comprehensive baseline study that help inform development of NFCS. Partners of the strategic planning process led by National Meteorological Agency of Ethiopia (Christian Aid, farm Africa and Mercy Corps) deployed a team of consultants to: conduct baseline study, facilitate the strategic planning process, and integrate evidences,

insights, and recommendations into one strategic plan document. Baseline findings in themes related to the five pillars of GFCS have been used to inform different components of the strategic plan.

Sectoral taskforces of meteorology, water and energy, agriculture, health, and DRM held series of planning processes to identify and prioritize actions, responsibilities, and a budget for climate services. The works of sectoral taskforces were improved through rounds of stakeholder review workshops and eventually led into development of costed action plans (lists of stakeholders involved in the strategic planning process are given in Annex C.

Strengths, weaknesses, opportunities, and threats (SWOT) analysis was employed by the consulting team to assess the internal strengths and weaknesses and external opportunities and threats. In addition, Political, Economic, Social, Technological, Legal and Environmental (PESTLE) analyses have been done and findings from both SWOT and PESTLE analyses were further reviewed and updated through group discussions during and after the strategic planning workshop held from 13 to 14 March 2019.

The strategic goals and objectives including the key actions (strategies) outlined in the strategic plan are rooted on the problem background and are designed in a way they are Simple, Measurable, Achievable, Realistic, and Timely (SMART). Various strategic planning models encompassing the basic strategic planning model, the issue (goal) based model, the alignment model, the scenario-based model, the real-time planning model, and the theory of change model have been reviewed and considered. The theory of change model is selected for this strategic plan as it is found to fit better to the purpose, processes and expected results of the strategic plan. Yet, it integrates some relevant features of the alignment, the scenario-based, and the real-time planning models.

1.2 Background

1.2.1 Roles and Structures of Government Climate Services Institutions

1.2.1.1 National Meteorological Agency of Ethiopia

Following meteorological observations in Ethiopia by European missionaries in the late 19th century, a meteorological services unit (for the purpose of aeronautic services) was set up in 1951 under the then Civil Aviation Agency. While the importance and uptake of climate information grew during the early 20th century, the government of Ethiopia in the year 1980 (proclamation number 201/1980) established the National Meteorological Services Agency (NMSA), now called the National Meteorological Agency (NMA).

The NMA is accountable and reports to the Ministry of Water, Irrigation and Energy, the nationally designated body for meteorological data generation, research, modeling and prediction. It is responsible for ensuring quality meteorological data availability and access. Generally, three major categories of climate services are to be provided by the NMA. These are: historical climate data services, meteorological forecasts and advisory services, and meteorological research and study. The NMA leads climate services partnerships with co-producers, boundary organizations and users and convenes seasonal climate outlook forums and other related events. The NMA represents the country in national, regional, and global meteorological service deliberations.

Led by the Director General and Deputy Director General, the NMA is structured into seventeen Directorates, all of which have direct and indirect relevance with climate services. The roles of the seven directorates that are having relatively greater technical connection with climate services are summarized as follows:

a. **Meteorological Data and Climatological Directorate:** in charge of ensuring meteorological quality of data collected across the country, ensuring the accessibility of climate data to internal and external users and monitoring the climate of the country.
b. **Meteorological Forecast and Early Warning Directorate:** responsible for production of meteorological forecast and early warning services encompassing short, medium, and long-range weather and climate prediction, plus early warning information on meteorological extremes.
c. **Development Meteorological Services Directorate**: operates through the three working units (agro meteorology, hydrometeorology, and biometeorology), is responsible for assessing the impact of the past and future weather condition on agriculture, water and health sectors and developing and sharing relevant advisories.

d. **Meteorological Research and Studies Directorate:** responsible for undertaking various types of meteorological researches and studies including climate modelling, air quality and climate change projection, and meteorological forecast validation and verification.
e. **Aviation Meteorology Services Directorate:** responsible for generation and provision of weather services for air navigation.
f. **Meteorological Electronic Stations and ICT Directorate:** responsible for installation, calibration, and maintenance either individually or in partnership with suppliers and monitoring functionality of electronic stations.
g. **Meteorological Instruments and Building Directorate:** responsible for producing, importing and distribution, maintenance and calibration of meteorological equipment, and building of meteorological infrastructure such as office premises, fences, etc.

The NMA Training and Education Directorate coordinates all human resources capacity building, including meteorological technicians and graduate skill trainings. The NMA is also structured into one Branch Meteorological Service Centers Coordination Office and 11 sub-national branches of meteorological service centers, in line with the federal states that are responsible for managing meteorological observation networks in respective regions, down-scaling of weather and climate services into applicable sub-national geographic levels. They also represent the NMA in sub-national stakeholder climate services relevant deliberations. A schematic display of the NMA's organizational structure is given in Figure 2, and more information about the NMA can be found at: www.ethiomet.gov.et.

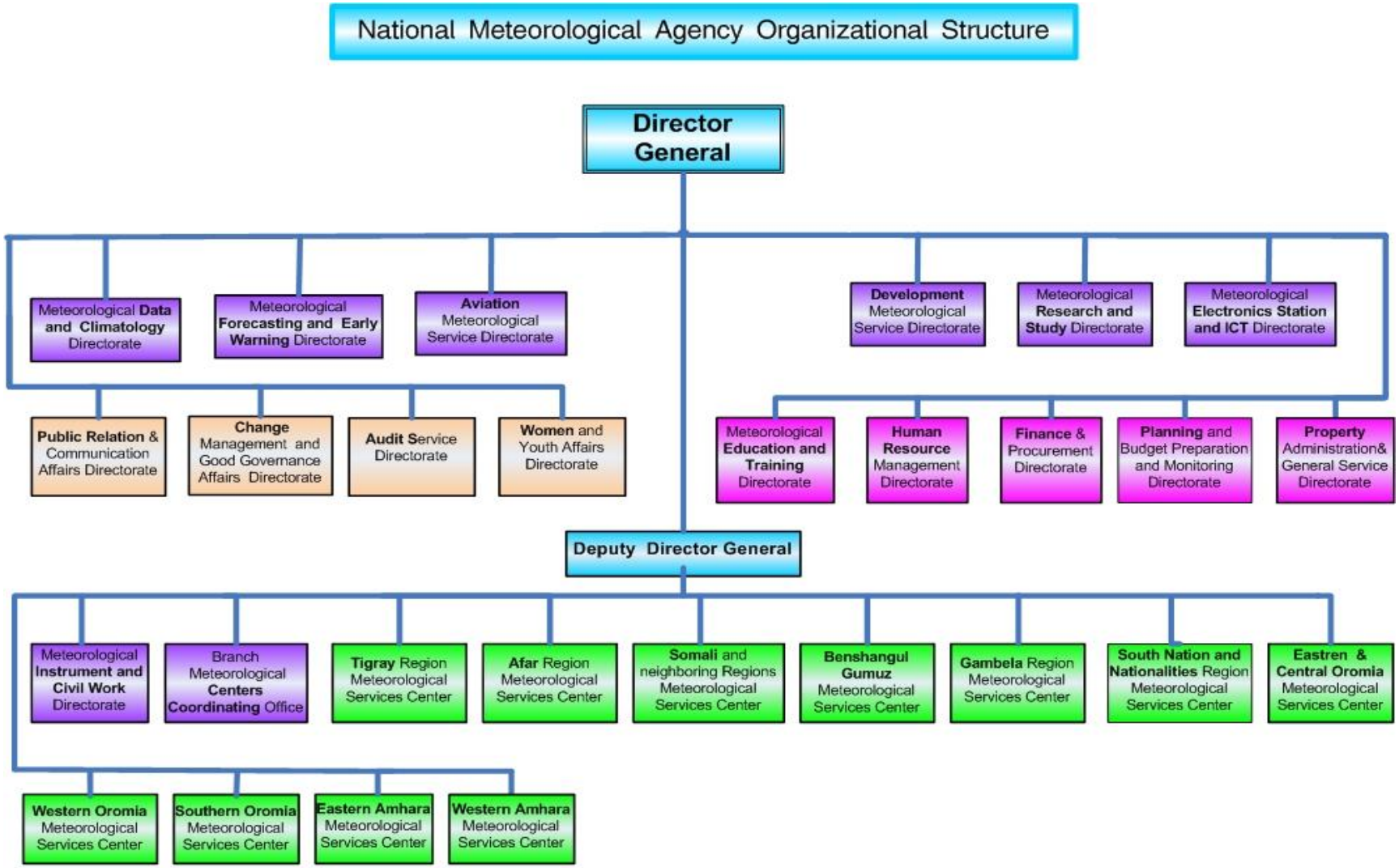
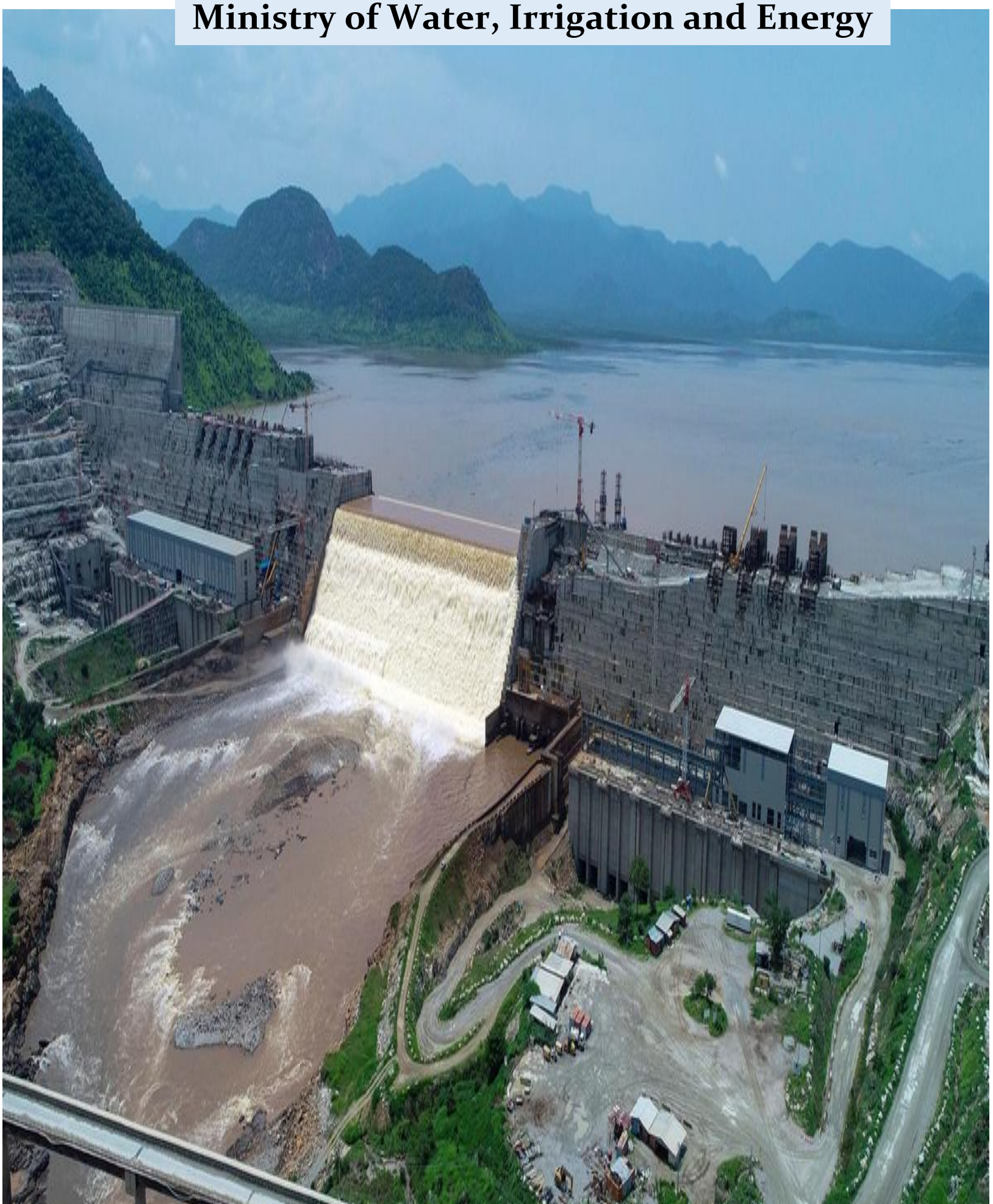


Figure 3: Organizational Structure of NMA (Source: NMA)

Ministry of Water, Irrigation and Energy



1.2.1.2 Ministry of Water, Irrigation and Energy

Ministry of Water, Irrigation and Energy (MoWIE) is a government organization mandated to manage water resources, water supply and sanitation, large and medium irrigation infrastructure, and energy resources in Ethiopia. It received its current name after passing through different organizational reforms, the most recent being "Ministry of Water, Irrigation and Energy." Headed by the Minister, State Ministers, and commissioners, MoWIE is structured into one authority, two commissions, and one sector. These are: Basin Development Authority, Water Resource Commission, and the Irrigation Commission and Energy Sector. The NMA is an autonomous Agency reporting MoWIE.

As shown in Figure 4, the MoWIE is further structured into functional departments (directorates, offices, units, etc.), some of which fall directly under authority, commission or sector, and others cut across them.

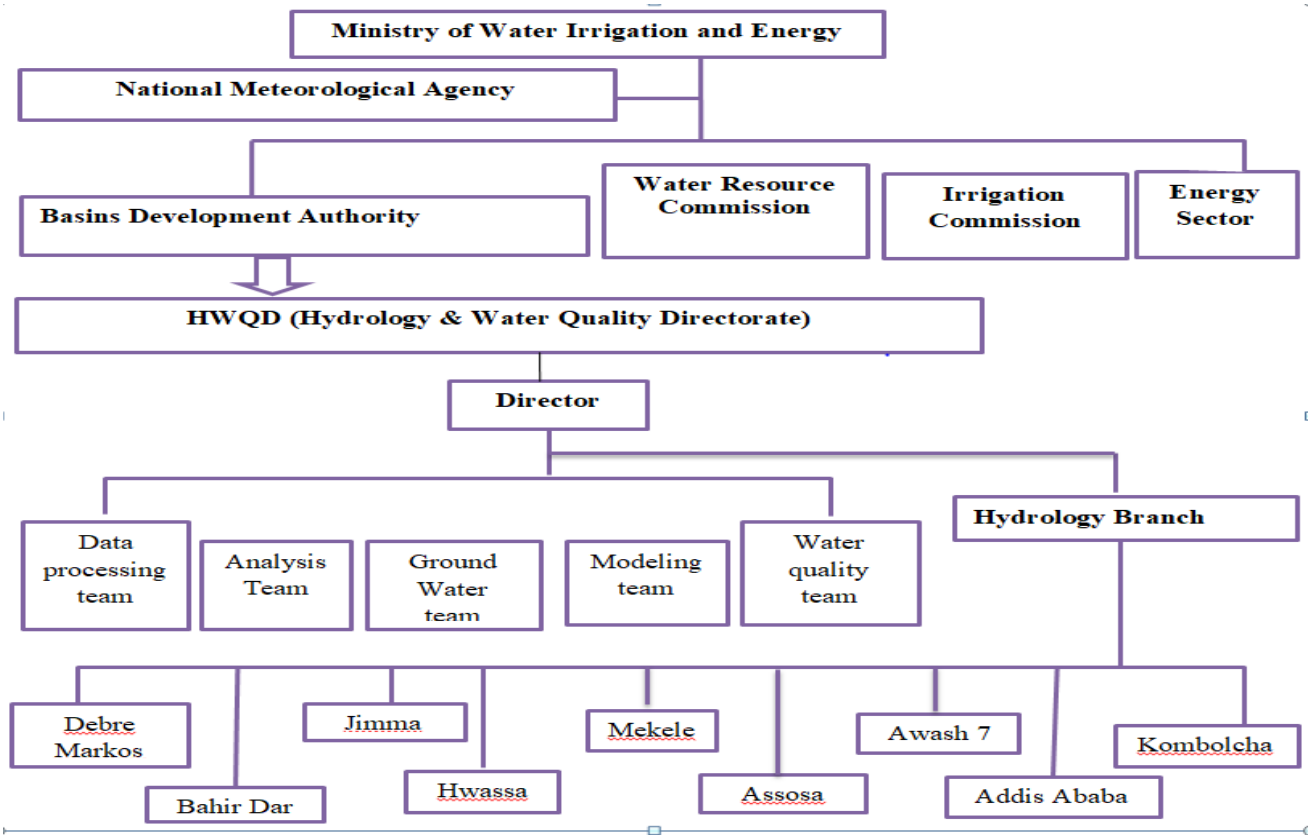


Figure 4: Organizational Structure of MoWIE (with a focus on Basin Development Authority)

Ensuring the proper execution of functions relating to meteorological services is one of the roles of MoWIE, and this ministry has very close technical and administrative ties with the NMA. All functional units listed above make use of climate information to inform program and project management decisions.

Ministry of Agriculture

1.2.1.3 Ministry of Agriculture

The recent institutional reform in Ethiopia enabled Ministry of Agriculture (MoA) to retain its oldest name. Headed by the Minister overall, the leadership of MoA is further split into four State Ministers in charge of leading four sub-sectors. The four sub-sectors include: Agricultural Development sub-sector, the Natural Resources Management sub-sector, the Livestock Development sub-sector, and the Agricultural Input and Marketing sub-sector.

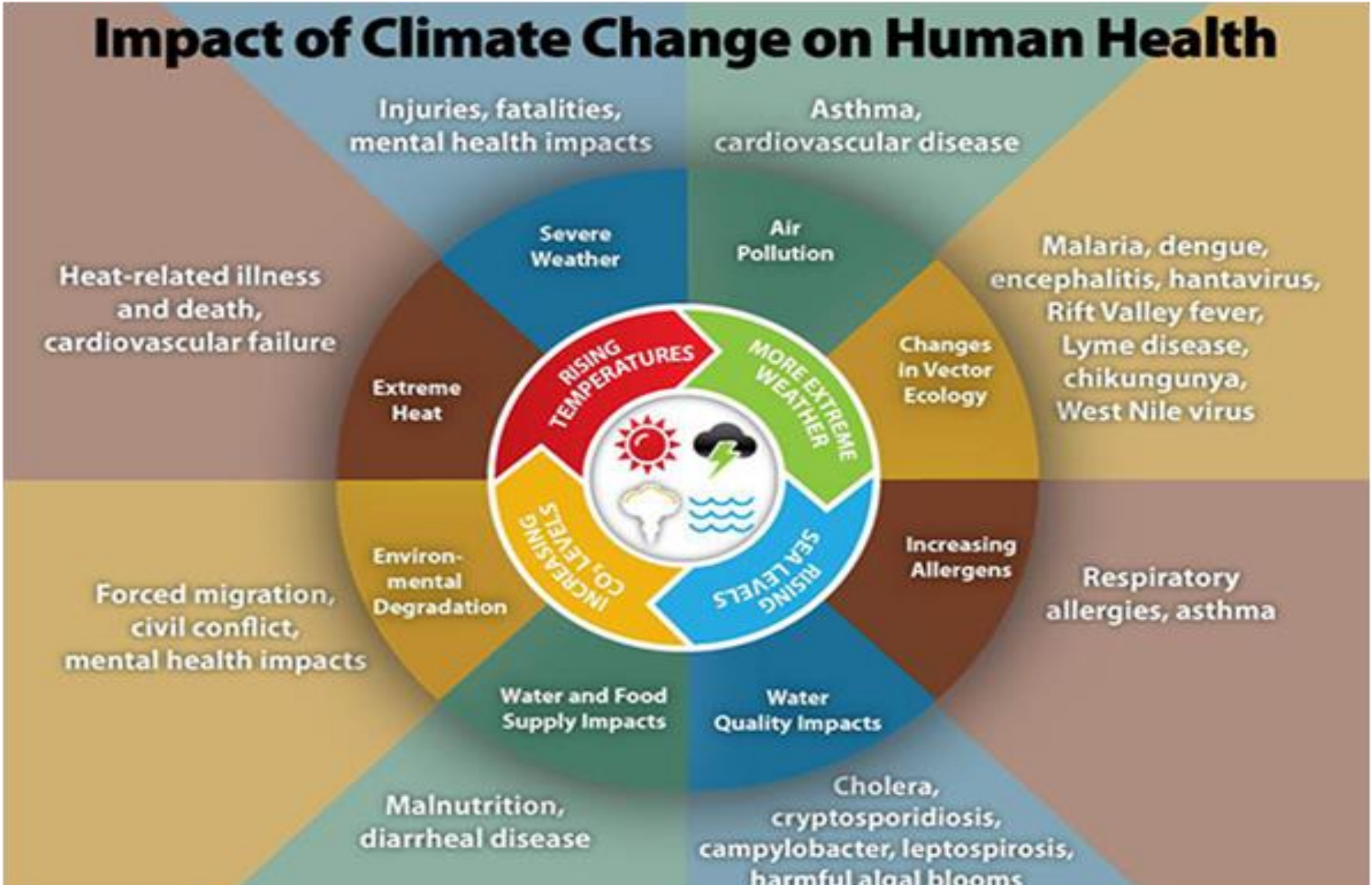
Under the Agricultural Development sub-sector are the Agricultural Extension Directorate General and the Plant Health Regulatory Directorate General. The Agricultural Extension Directorate General comprises five directorates, namely: Crops Development, Small Holder Horticulture Development, Agricultural Extension Communication, Agricultural Mechanization, and Agricultural Technical, Vocational and Educational Training Coordination Directorates. Three Directorates are set up under the Plant Health Regulatory Directorate General. These are: Crops Protection Directorate, the Plant Health and Product Quality Control Directorate, and Crops Variety Release, Protection and Seed Quality Control Directorate.

The Natural Resources Management Sector is structured into eight functional units that include: the Natural Resources Management Directorate, Rural land administration and Use Directorate, Soil Fertility Improvement Directorate, Soil Information and Mapping Directorate, small Scale Irrigation Development Directorate, Food Security Coordination Directorate, Rural Job Creation Directorate, and National Soil Testing Center.

The Livestock Development sector subsumes: Epidemiology Directorate, Animal Disease Prevention and Control Directorate, Livestock Identification, Traceability, and Welfare Directorate, Meat, Hide and Skin Development Directorate, Forage Resources Development Directorate, Apiculture and Sericulture Development Directorate, and the Women and Youth Affairs Directorate.

All the agricultural development, livestock development, and Natural Resource Management (NRM) sectors are highly sensitive to weather and make use of climate information as input for program management decisions. However, the practice of applying climate information is more dominant in the crops development function compared to soil and water conservation and livestock production.

Ministry of Health



1.2.1.4 Ministry of Health

Ministry of Health (MoH) is a federal government institution charged with a mission to promote the health and well-being of Ethiopians. Under the Hygiene and Environmental Health function, MoH has set up the Climate Change and Health unit responsible for implementing the National Health Adaptation Plan. Furthermore, MoH is coordinating a multi-stakeholder Climate Change and Health Technical Working Group. The aim of the working group is to provide guidance and input for developing enabling mechanisms as well as effective promotion and regulation of climate change and health related issues. This includes making sure the National Health Adaptation Plan is effectively implemented.

MoH and Ethiopian Public Health Institute (EPHI) have documented various findings regarding the relationship between climate change and Malaria and have extensively used climate information in this regard.

National Disaster Risk Management Commission

1.2.1.5 National Disaster Risk Management Commission

The National Disaster Risk Management Commission (NDRMC) evolved in 2013 with a mission of enhancing disaster risk management capacity for improved resilience towards natural and man-made disasters. It was formerly called the Disaster Risk Management and Food Security Sector (DRMFSS) established under the Ministry of Agriculture. Other organizational forms of NDRMC before DRMFSS include Disaster Prevention and Preparedness Commission (DPPC) and Relief and Rehabilitation Commission (RRC). The current NDRMC is set up under the Ministry of Peace and is led by the Commissioner and Deputy Commissioner. The schematic display of NDRMC's organizational structure is given in Figure 5.

There are four functional units structured under Disaster Risk Reduction Sectors that are technically relevant to climate services. These are:

- Disaster Risk Reduction and Rehabilitation Directorate;
- Early Warning and Emergency Response Directorate;
- Disaster Risk Management, Study, Research and Training Directorate; and
- Partner Cooperation and Resource Mobilization Directorate

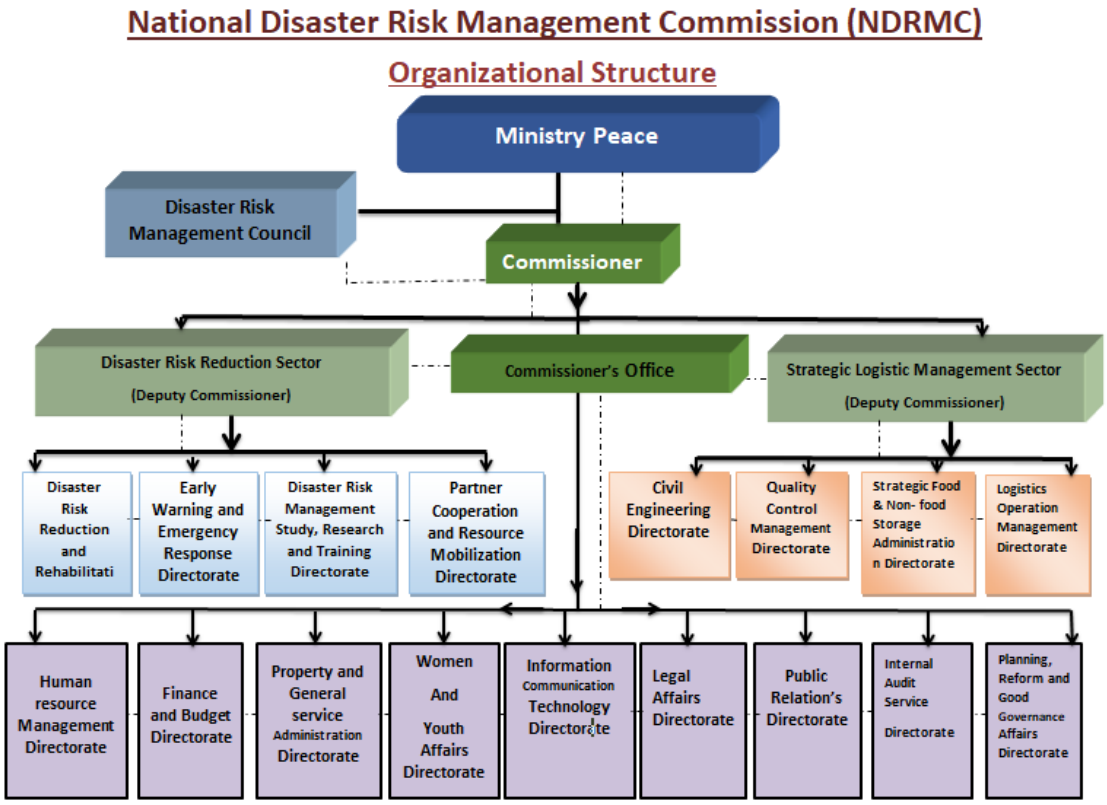


Figure 5: Organizational Structure for NDRMC (source: NDRMS change in governance)

Environment, Forest and Climate Change Commission

1.2.1.6 Environment, Forest and Climate Change Commission

Environment, Forest and Climate Change Commission (EFCCC), formerly called the Ministry of Environment, Forest and Climate Change, is a federal government organization established to execute issues related to Environment, Forest and Climate Change. Its vision is to see Ethiopia in a middle-income status with a Climate Resilient Green Economy (CRGE) by 2025.

EFCCC is headed by a commissioner and two vice commissioners designated to lead the environment sector and the forest sector. The Environment and Forest sectors together comprise eight Director Generals, each containing four. The Environment Sector includes: State of Environment and Assessment Director General, Compliance Monitoring and Control Director General, Environmental Impact Assessment, Evaluation, and Licensing Director General, and Climate Change Implementation Coordination Director General. The Forestry Sector comprises: Forest Strategic Support and Partnership Director General, Forest Protection and Conservation Director General, Forest Development Director General, and Forest Industry and Market Development Director General[6].

1.3 Organizational Structure of the National Framework for Climate Services

One of the most important features of the NFCS is ensuring functional coordination among climate service stakeholders for co-production, joint learning, and sustainable improvements in user-friendly and decision-relevant climate services. This can be achieved first by setting institutional mechanisms and management structures with defined roles and responsibilities.

Climate services are meant to serve different groups of users at different levels of social aggregation, and this should be considered while setting up institutional mechanisms. Accordingly, the institutional mechanisms of Ethiopia's NFCS are structured at four administrative levels—national, regional, zonal, and woreda.

1.3.1 Organizational Structure of NFCS at the National Level

The NFCS at federal government (national) level and head or vice head of Regional States and the Federal City Administrations will have the NFCS Council chaired by the Deputy Prime Minister of Ethiopia and co-chaired by the Minister of MoWIE. The NMA is the secretary of the NFCS council. The Council is made

[6]Since its re-organization as a commission by early 2019, EFCCC is undergoing internal re-structuring and functional units mentioned in this document would change in the future. There are also other cross-cutting functional units of the organization that are not listed in this document. More information about EFCCC can be found at: **http://www.efccc.gov.et**.

up of head of Regional States, Vice head of Regional States, Mayors and Deputy Mayors, Ministers, State Ministers, Director General, Deputy Director Generals and Commissioners, Deputy Commissioners represented from nine regional states, two federal city administrations and six federal governmental climate institutions (MoWIE, NMA, MoA, MoH, NDRMC, and EFCCC).

In order to effectively execute programmatic interventions and manage organizational routines, the NFCS will have a coordination unit housed at the NMA and managed by a professionally competent national coordinator. The national coordinator will be employed by the NMA and approved by the NFCS Council. He/she will participate in NFCS Council meetings as appropriate. The Coordination Unit (CU) will also have full-time employees and part-time consultants as required, and it will be financed by both government allocations and donor funding. Each of the six governmental climate institutions at the national level will officially designate high-level experts from climate-relevant functional units. These designated experts will form the NFCS Sectoral Taskforces chaired by the national coordinator. These sectoral taskforces will work to ensure that climate services in their respective sectors are regularly generated, linked, adapted, disseminated, applied, monitored, and evaluated. Pictorial representation of the organizational structure of NFCS at national level is given in Figure 6.

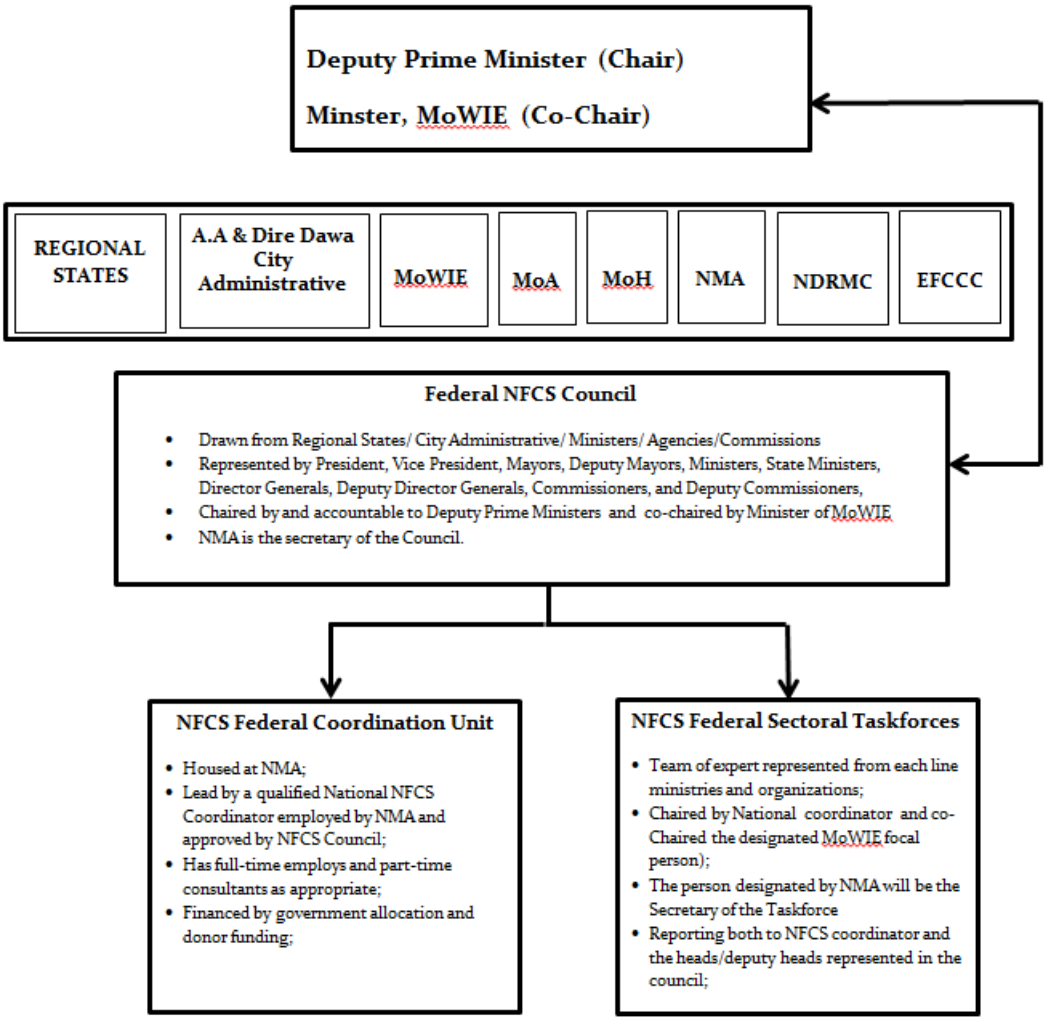


Figure 6: Structure of NFCS at national level

1.3.2 Organizational Structure of NFCS at Regional Government Level

As illustrated in figure 7, the structure of the NFCS at the regional government level follows more or less similar approaches s to the national one except it will be staffed with only one regional coordinator. Yet, part-time consultants can be hired when found necessary. The NFCS at regional government level has regional steering committee drawn from regional sector bureaus. The regional steering committee will be chaired by and accountable to the regional President and co-chaired by head of BoA. The head of RMSC is the secretary of the steering committee.

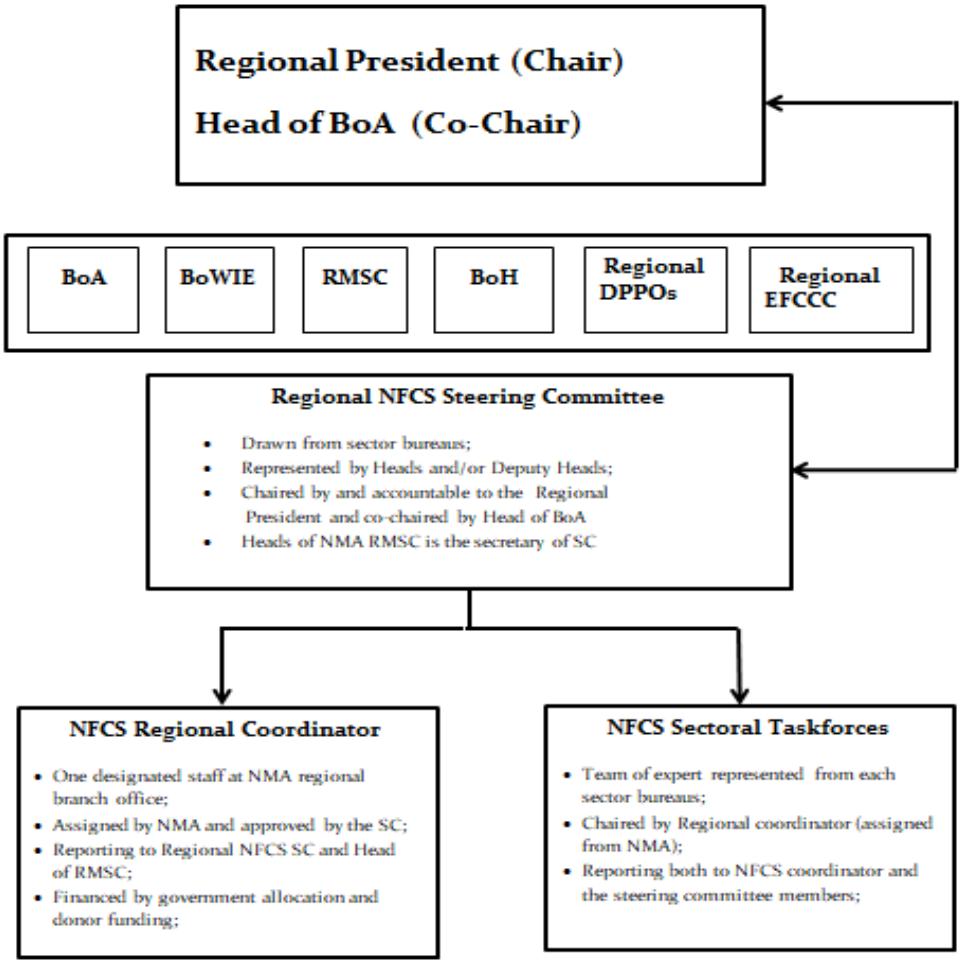


Figure 7: Structure of NFCS at regional level

1.3.3 Organizational Structure of NFCS at Zonal Level

As depicted in Figure 8, the NFCS at zone administrative levels has a zonal steering committee represented by heads and deputy heads drawn from zone sector offices. The zonal NFCS steering committee will be chaired by and accountable to the zone's administrator. Depending on the operational realities, the zonal NFCS will have one technical coordinator (meteorologist or Agro-meteorologist or hydro-meteorologist by profession) employed under the Zone office of Agriculture or Water and Energy. The technical coordinator will serve as the secretary of the steering committee. The zonal NFCS will also have a Technical Taskforce drawn from each of the five sector offices and chaired by the zonal NFCS technical coordinator. It shares similar roles to those technical taskforces at national and regional levels.

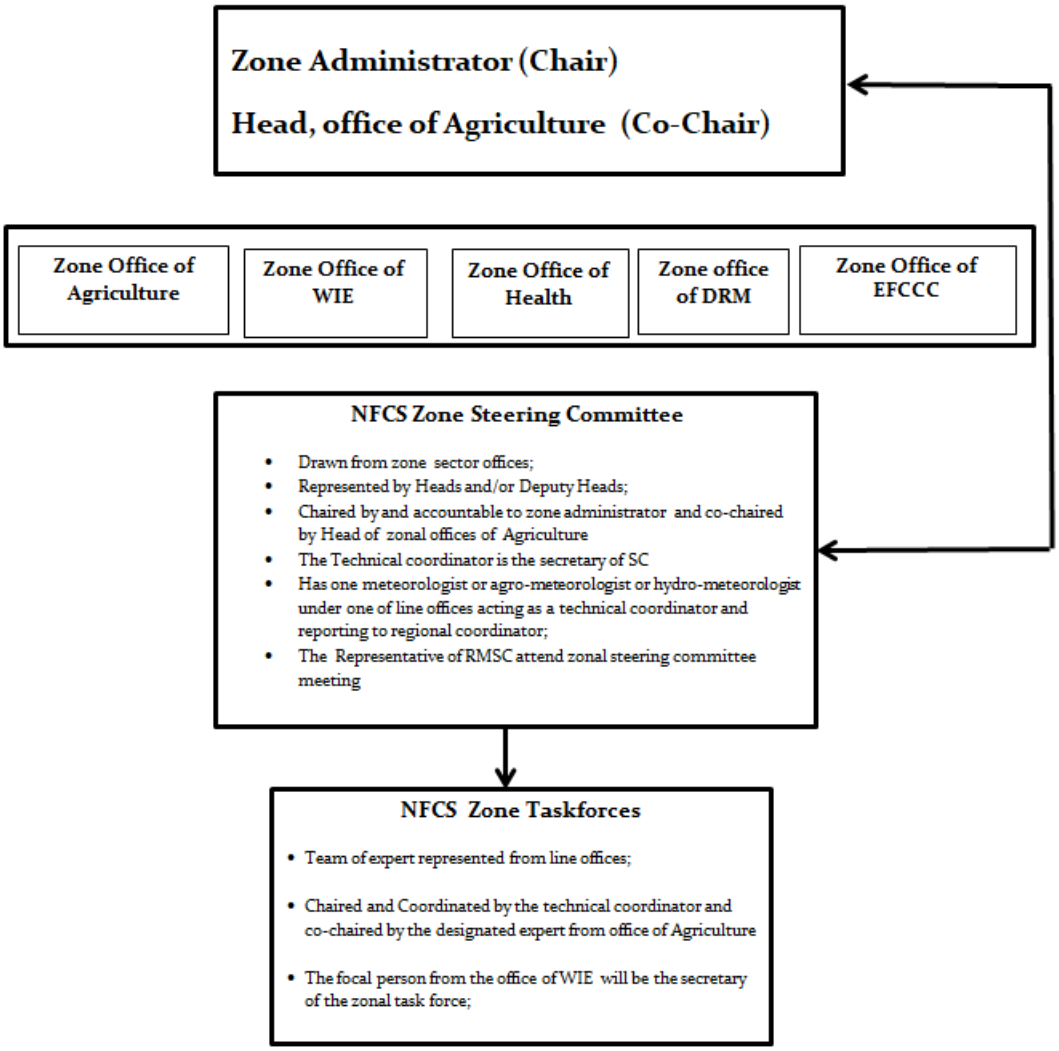


Figure 8: Structure of NFCS at Zone level

1.3.4 Organizational Structure of NFCS at Woreda Level

As depicted in Figure 9, at the Woreda level, the NFCS has a Woreda steering committee represented by heads and deputy heads drawn from Woreda sector offices. The Woreda NFCS steering committee will be chaired by and accountable to the Woreda administrator. Depending on the operational realities at the Woreda level, the Woreda NFCS will have one technical coordinator (meteorologist or Agro-meteorologist or hydro-meteorologist by profession) employed under the Woreda Office of Agriculture or the Office of Water and Energy. The technical coordinator will serve as the secretary of the steering committee. The Woreda NFCS will also have a Technical Taskforce drawn from each of the five sector offices and the RMSC and chaired by the Woreda NFCS technical coordinator. It shares similar roles to those technical taskforces at national and regional levels.

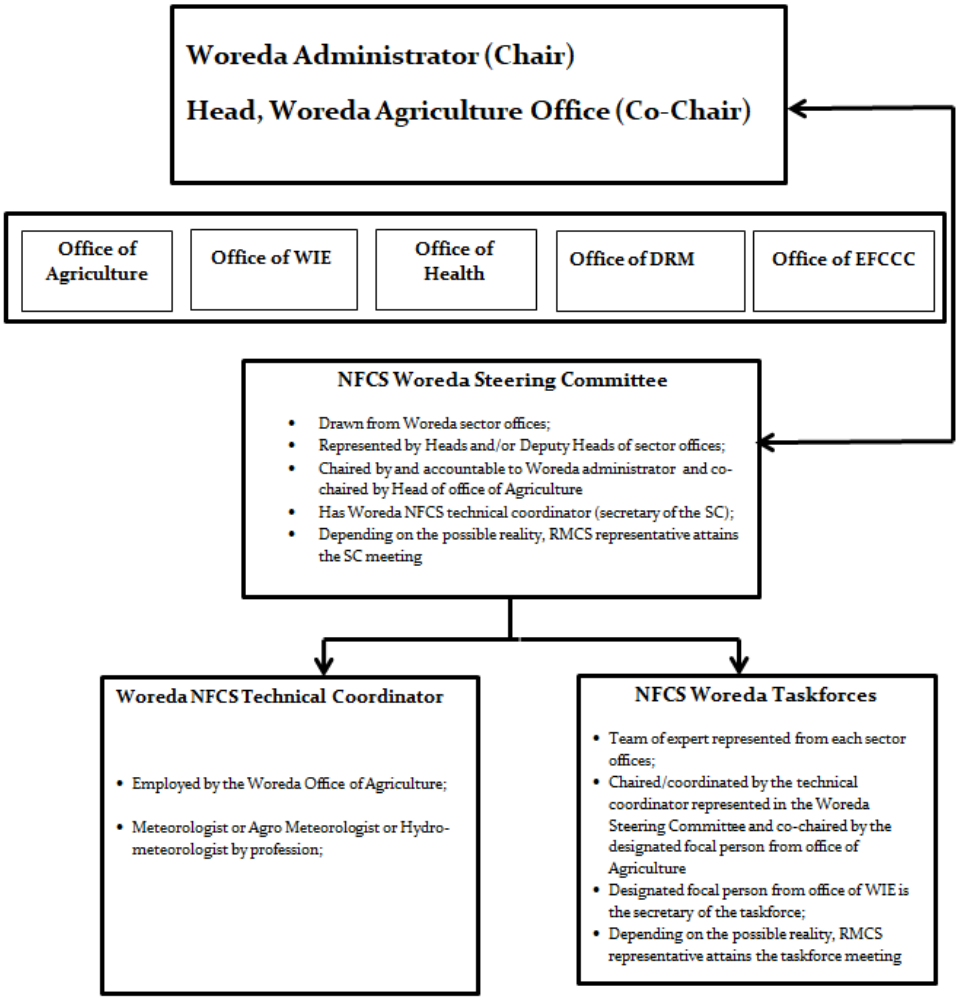


Figure 9: Structure of NFCS at Woreda level

1.4 Coordination among climate service stakeholders

The baseline assessment has identified eight categories of stakeholders in the chain of climate services. These are: in-country climate service providers, international climate data providers, co-producers, academic and research partners, funding partners, capacity strengthening and programming partners, purveyors, and end users of climate services. There should be effective coordination and communication among these stakeholders for timely, decision-relevant, and sustainable climate services.

The organizational structure of NFCS at the four administrative levels described above will provide grounds for coordination among climate service stakeholders. NFCS coordination units set up under each level will play central roles in facilitating such coordination as schematized in Figure 10 below.

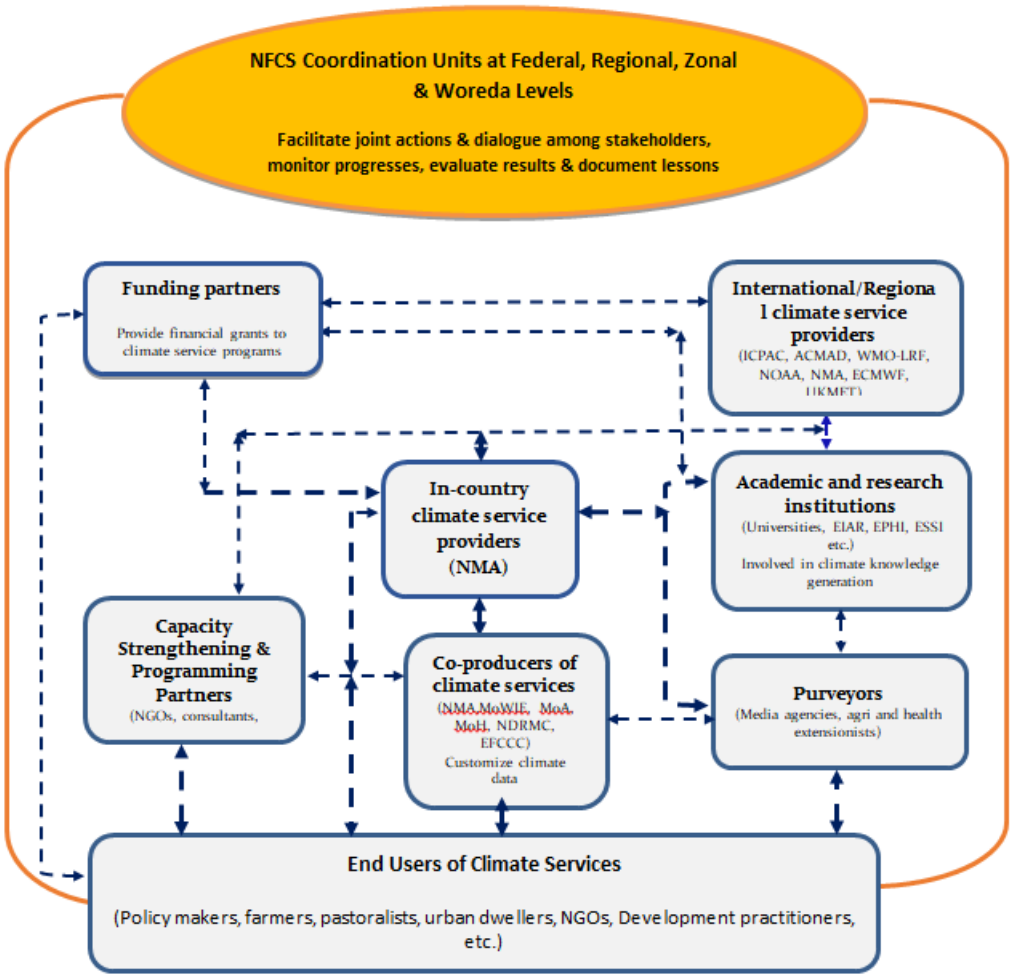


Figure 10: *Coordination of climate service stakeholders*

2. Environmental Scan

2.1. Strengths, Weaknesses, Opportunities and Threats Analysis

2.1.1. Strengths and Weaknesses (Internal)

Table 1: Strengths and weakness matrix

Priority Sectors	Strengths	Weaknesses
Meteorology	• Good progress on modernization of meteorological instruments; • Continuous effort on improving forecast skills; • Increased visibility (by ministries and the public); • Continuous efforts on capacity building (trainings); • Improving relations with external funders; • Growing computation resources (HPC); • Growing partnerships (national and international) and membership • Regular communication of weather information (website & media); • Presence of a web-based user interface platform (maproom).	• Limited weather and climate modelling capacity and research; • Lack of high-resolution climate products; • Shortage of experienced staff; • Lack of staff incentive mechanism; • Slow growth in instrumentation, calibration & maintenance and ICT capability; • Limitations on sustaining regularity of training opportunities and maintaining standards; • Limitation on building trust of climate service users; • Poor coordination among climate service actors.
Water and Energy	• Presence of established unit to deal with climate change and hydro-meteorology; • Cumulated experiences in water and energy development in Ethiopia; • Good institutional linkage with academic institutions; • Engagement in climate-water-energy relevant platforms.	• Limited staff expertise; • Low staff incentive mechanisms; • Slow growth in Hydro-met instrumentation, calibration & maintenance including ICT capability; • Limited practices in generating and disseminating Hydro-met services to users; • Limited practices in Hydro-met knowledge management; • Slow adaptation to institutional reforms; • Limitations in financial resources.
Agriculture	• Strong institutional presence from national to local levels; • Existing partnership with other climate institutions and research to improve Agro-met services (Agro-met platform).	• Lack of Agro-met specific staff in various fields of agriculture (crops, livestock and NRM); • Limited staff capacity at all levels; • Limited practices in Agro-met knowledge management;

Priority Sectors	Strengths	Weaknesses
		• Limitations in financial resources; • Limited capacity in Agro-met instrumentation, calibration & maintenance including ICT capability; • Slow adaptation to institutional reforms.
Health	• Strong institutional presence from national to local levels; • Launching the Health Adaptation Plan; • Appointment of climate and health expert; • Engagement in climate and health relevant platforms; • Presence of legal framework for disease surveillance; • Strong partnership with national and international stakeholders.	• Low track records in implementation and documenting results of the health adaptation plan; • Low staff capacity in Bio-met services; • Inadequate capacity in Bio-met knowledge management; • Low utilization of technology and innovations; • Lack of research on the link between climate and health
DRM	• Presence of clear policy and strategy on DRM; • Good experiences in applying climate information for early warning (for example, disseminating forecast-based early warning bulletins); • Launch of woreda disaster risk profiling approach; • Strong partnership with national and international DRM actors.	• Limited staff expertise; • Inadequate capacity in DRM knowledge management; • Limited ICT capability; • Low quality of Woreda Disaster Risk Profiling (WDRP) to inform risk management decisions (covering limited woredas, old, and dominantly qualitative information); • The organizational structure from national to woreda level is not well connected (for example, the woreda DRM function under Office of Agriculture).

2.1.2. Opportunities and Threats (External)

Table 2: Opportunities and threats matrix

Priority Sectors	Opportunities	Threats
Meteorology	• WMO's commitment to support NFCS; • Various international conventions supporting climates services such as UNFCC, HFA, CBD, CCD, and Sendai Framework; • International programs and commitments to finance climate services; • Climate change (to tap benefits that come along with climate change); • Advances in science and technology; • Growing and new demands for climate services; • Early warning for disaster risk reduction; • Organizational reform; • New partnerships; • Expansion of telecom networks and services.	• Uncertainties on external funding • Fast-changing technology; • Loss of focus on core activity; • Government bureaucracy (slow response to urgent admin requests); • Limited foreign currency.
Water and Energy	• Government attention to improve service delivery; • Increased need for water resources development that needs the service (National, regional and global demands for water resources management); • Climate change (to tap water and energy related benefits that come along with climate change). • Core government funding;	• Frequent organizational re-structuring; • Staff turnover to other institutions because of poor incentives; • Absence of institutions for tailored training areas.
Agriculture	• The majority of citizens dependent on climate sensitive agriculture and increasing demands for Agro-met services; • Growing national and international collaboration for Agro-met services; • Increasing numbers of graduates in Agro-meteorology; • Climate change (to tap agriculture related benefits that come along with climate change).	• Frequent organizational re-structuring; • Efficiency in Agro-met services would be compromised by actions in other sectors; • Uncertainties associated with climate and environmental change; • Fast changes in Agro-met technology and innovations globally; • Staff instability.

Priority Sectors	Opportunities	Threats
Health	• Increased global and national attention to climate driven health risks and their management;	• Growing health risks associated with environmental change; • Population growth and associated demand for more Bio-met services.
DRM	• Increased global and national collaboration in DRM.	• Increased frequency and severity of disaster risks associated with climate and environmental change; • Staff instability; • Potential overlap of roles with other institutions.

2.1.3. Political, Economic, Sociocultural, Technological, Legal and Environmental (PESTLE) Analysis

The PESTLE analysis identifies various forms of political, economic, socio-cultural, technological, legal, and environmental factors that are thought to have positive impacts on the implementation process and results of the Strategic Plan. The types of PESTLE factors and their links to and implications on climate services are presented in a matrix (Table 3).

Table 3: PESTLE matrix

PESTLE Category	Key features	Description, linkage to and implications for climate services
Political	*Recent political reforms*	Ethiopia is undergoing political reform accompanied by bold measures of solidarity, freedom, and a widening political space, including international cooperation. This political reform evolved after recent waves of nation-wide political protests. Despite restraining forces, reformists are steering the course of change to a desired direction while managing social and economic oscillations. This will help create an enabling environment for climate institutions to put a sustainable framework for climate services in place.
	Organizational restructuring	In line with political reforms, government institutions are highly likely to undergo restructuring. This would change the roles and accountability lines of some climate service functions and associated shifts in staff. Such movement would slow climate service delivery and risk loss of institutional memory.
	Government stability/ instability	The Government of Ethiopia is exercising its power and duties as stated in the constitution. This favor and facilitates the implementation and success of the strategic plan.

PESTLE Category	Key features	Description, linkage to and implications for climate services
	Corruption level	Ethiopia is one of the world states where corruption negatively impacts socioeconomic developments. The determination and commitment of the government to fight and curb corruption in the country will have a positive impact amount of budget allocated for the provision of weather and climate services.
	Government regulation and deregulation	Government regulation regarding citizens' access to data and information facilities will raise the need for the use of weather and climate services in different socio-economic developments sectors.
	Level of government subsidies	The government subsidizes the NMA and key stakeholders by allocating an annual budget which shows increments annually. This situation can be taken as an opportunity for the agency to execute weather and climate services as per its mandate.
	Bilateral relationships	The NMA's bilateral relationships with global and regional institutions and WMO and member states, ICPAC, ACMAD, and the IRI is a good opportunity for technology transfer and capacity development in favor of weather and climate service improvement.
	Size of government budgets	The government allocation of annual budget for the agency shows a growth rate. These favors executing the provision of weather and climate services nationally, as well as through international obligations regarding meteorology.
Economic	*Economic Philosophy (inclusive economic system)*	The objective of government economic program is to build an inclusive economic system that realizes the development of the people, in which government of Ethiopia plays the key role of making sure that wealth is distributed fairly and by intervening in strategic areas following the principles of market-led economy. The government will work to transition the economy from its current agriculture-dependent state to multi sectoral home grown economy reforms.
	Plan for a middle-income status by 2025	The government of Ethiopia envisions a middle-income country by 2025 through investing in key economic sectors and pursuing a climate proof green economic development pathway. To meet this national vision, the government of Ethiopia set out its objectives in the Growth and Transformation Plan (GTP-I and II). To this end, the first Growth and Transformation Plan (GTP-1) was implemented between 2010 and 2015. In addition to the government claiming of a double-digit economic growth during this period, world bank also confirmed that the country achieved average growth of 10.9 from 2004 to 2014. Beyond the above fact of growth figures, the issue of double-digit growth has remained a subject of debate and criticism within and outside the nation. The green economy component of the Climate Resilient Green Economy (CRGE) strategy, sharing a similar vision with GTP, was launched in 2011. GTP-2 was supplanted in the footprints of GTP-1 but with a slightly differing approach (nominally integrating CRGE as one of its pillars). Climate change and variability have impacts on effectiveness of both the GTP and CRGE, and these challenges necessitate greater application of

PESTLE Category	Key features	Description, linkage to and implications for climate services
		climate services. Yet, both GTP and CRGE have limitations (with varying degrees) in putting climate services at the center of their approaches and this needs to be addressed in upcoming development plans including the NFCS.
	Growth rate	Ethiopia is among the fastest growing non-oil economies. Weather and climate information plays a great role in shielding economic gains from the impacts of weather extremes and sustaining results.
	Exchange rate	The higher exchange rate requires additional budget to satisfy the agency and co-producers of climate services foreign exchange demand to import modern technology equipment and systems. In other words, higher exchange rates have a negative impact no implementing the Strategic Plan fully.
	Federal government budget deficits	Due to the federal deficit, the government has more difficulty raising funds to finance expenditures. It will have a stress on substantial allocation of budget, negatively impacting proper implementation.
	Gross domestic product trend	The Gross Domestic Product trend expanded to 7.7% in 2017 (which, for comparison, averaged 5.79 % from 1981 to 2017). Great attention is given to the provision of user-tailored weather and climate information for different socio-economic sectors during the Strategic Plan period.
	Economy highly dependent on agriculture (> 40% of GDP)	Ethiopia's economy is hugely dependent on agriculture, the sector known to be most sensitive to weather and climate. This implies sensitivity of the economy to fluctuations in the climate system which demands high quality climate services by taking into account the complex interaction between climate and agriculture in space and time.
	Fast-growing service sector in Ethiopia	Besides agriculture, other livelihoods, including those in the service sector, are governed by weather. For example, there is a growing interest among financial and insurance service providers to invest in climate sensitive sectors. The impacts of weather extremes, such as droughts and floods, on settlements, are drawing the attention of these institutions. Climate variables govern the type of transport facilities to use, timing of travel, and quality of transport infrastructure. Hotels would be concerned about ensuring a sustainable supply of weather-dependent raw materials, which includes agricultural products. All these imply the demand for diversified climate services for and working with different groups of users.
	Water-dependent national electric power and growing market for hydropower (10.9% of GDP)	The lion's share of national electric power is generated from hydro dams built on big rivers. Ethiopia invested in exporting hydropower to neighboring countries as well. The volume of water in reservoirs is highly sensitive to fluctuations in the climate system, especially changes in rainfall and temperature. Reliable information on climate variables that affect water volume is therefore of great importance for determining power outputs for both national and export consumption.

PESTLE Category	Key features	Description, linkage to and implications for climate services
	Very high unemployment	Unemployment has multiple social, environmental, and economic consequences. Advancing climate services for a diverse group of users implies a greater demand for human resources, and hence the NFCS can help combat unemployment by hiring professionals in fields relevant to climate services.
	Inflation	For various reasons, Ethiopia's economic growth is often characterized by high inflation rates. This would affect the purchasing power of local currency particularly in importing high quality technologies for advancing climate services. Possibilities of import substitution and/or external financing for technological inputs that aid climate services need to be explored.
	Better record on resource mobilization from global sources	Ethiopia exhibited growing bilateral and multi-lateral partnerships. This offers good opportunities to access financial resources for advancing climate services and addressing the challenges associated with inflation.
Socio-cultural	*Populous nation with fast population growth (2.6% per annum)*	Ethiopia is the second most populous country in Africa with about 100 million people. Total population is expected to reach 130 million in 2025, which will affect access to and quality of climate services. Effective and efficient climate service exchange platforms need to be thought of in advance, considering diversity of needs.
	More than 70% of the population is young (aged < 30 years)	The large youth population signals the need to consider the kind of economic sectors occupied by the young generation, their degree of sensitivity to climate, corresponding needs for climate services, and channels for communication. The higher tendency for youths to accept technology would favor the culture of using climate services to inform livelihood decisions.
	High rate of urbanization	Urbanization is associated with expansion of service infrastructures such as roads, buildings, telecommunication, power networks, etc.— all having implications on the diversity of climate services required to meet various purposes.
	More than 80% of the population lives in rural areas	Rural Ethiopia is characterized by a high level of illiteracy, poor social and economic infrastructure, rain-fed agriculture, male-dominated culture, and strong social ties. This all affects not only the types of climate services to be delivered to inform rural livelihoods but also technological options and communication media that work better for social groups inhabiting rural areas.
	Diverse cultures and languages	Language matters for understanding and application of climate services. More than 80 languages are believed to exist in Ethiopia. These languages are spoken by different ethnic segments inhabiting diverse agro-ecological areas. Furthermore, to realize the plan for creating multinational unity, government will work to have additional Federal and Regional Government working languages. Climate service stakeholders are therefore required to think of both communication routes and types of climate services serving different livelihoods.

PESTLE Category	Key features	Description, linkage to and implications for climate services
	Religious values and beliefs	The majority of Ethiopia's population is religious with its own norms, values, and beliefs. Some religious beliefs would put restrictions on applying climate services. For example, timeliness of actions would clash with religious holidays. Weather forecasts would be regarded as beyond human acts. Reliance on and application of weather forecasts may be considered as attempts to intervene in God's matters. All of these have implications on how to deal with climate services in harmony with religious norms, values, and beliefs.
	Growing demand for high-quality climate services	Growing sensitivity of livelihoods to weather and climate variability coupled with recent improvements in the reliability of scientific weather forecasts have contributed to increasing demands for high-quality climate services. Climate service stakeholders are therefore required to proactively address such growing demands, and this has implications on institutional and human capacity, technological readiness, etc.
	Education level	According to UNESCO, Ethiopia has an adult literacy rate of 39% for males and 49.13% for females, showing a big gap between the sexes. In comparison with other countries, the literacy rate in Ethiopia is low. This negatively impacts the implementation and use of climate service and the success of the Strategic Plan.
	Gender imbalances	The socio-economic status of men and women in Ethiopia is generally unbalanced, putting women in a disadvantaged position. The impacts of climate change and the need for climate services are also different between men and women. It is therefore worthwhile to consider different possible impacts and the differing needs of men and women for climate services.
	Rapidly changing users' needs	Lessons from the past, technological advancements, and climate change and variability are causing human livelihoods to change consistently, along with the need for climate services. Understanding social, economic, technological, and environmental dynamics are therefore worthwhile for delivery of effective climate services.
Technological	*Access and affordability of technologies (importantly, modern stations)*	One of the means for ensuring availability of good quality climate data on time is through modern weather monitoring infrastructure such as Automatic Weather Stations (AWSs), upper air observation and Weather Radar. These devices are relatively expensive but there exists a good level of national experience in management of such stations. Establishing such an automatic climate infrastructure can play significant role to overcome the challenges related to Pandemic disease outbreak, likes COVID 19. It has become clear that in relation to the current incidence of Corona Virus, the availability of manual observations has significantly decreased globally. Building on such experience would able to deliver improved climate services even at a time of disease outbreak in the future.

PESTLE Category	Key features	Description, linkage to and implications for climate services
	Rapidly changing ICT landscape	Efficient and affordable technologies are required for climate services. In light of rapid technological dynamics, however, care should be taken while choosing the type and generation of ICT equipment we use for climate services. Possible useful life of the technologies, simplicity for upgrading and/or replacement, and their environmental and economic impacts should be considered before application.
	Emergence of new tech platforms	Emergence of new technological platforms, such as Machine learning (ML) and Artificial Intelligence (AI), would have implications on the future of climate services which should be considered along with rapid changes in technology.
	Expanding telecom services	Availability of telecom networks over many parts of the country and trends of expansion signals a good opportunity for advancing the fast delivery of climate services. Proactive actions in linking climate services with technological and telecom services are therefore worthwhile.
	Expanding access to and use of smart phones	Use of smart phones is increasing among the young generation (representing the greater portion of Ethiopia's population). Increasing smart phone use offers greater opportunities to deliver good quality climate services. Proactive actions may include development of user-friendly applications that can be easily installed on smart phones, user guides, and client-oriented services, etc.
	Limited access to climate research and knowledge products	Research regarding climate knowledge is widespread but uncoordinated. Getting access to research findings is constrained by poor information communication systems. Technological platforms leading to improved monitoring, predictions, and understanding of the changes in weather, climate, water and related environmental conditions at all spatial and temporal scales are therefore of important.
	Managing big climate data	Climate services are multi-thematic and multi-sectoral in character. They involve gathering, storing and exchanging 'big climate data'. This necessitates application of computational facilities that meet data management requirements at all levels.
	Crowdsourcing	Open discussions between groups of people having expertise in a specific field is gaining momentum. This can be employed in climate services and requires application of ICT and use of social media channels.
Legal	*Federal and regional level legal framework*	The political and administrative system of Ethiopia is structured at federal, regional, zonal and woreda (district) levels. Each administrative hierarchy has its own legal frameworks and rights of decision making. Delivery of climate services should therefore conform to different administrative tiers.
	Ratification of several international conventions	Ethiopia is a member and signatory of several international conventions that include, but are not limited to: the WMO, the UNFCCC, the Hyogo Framework; the Sendai Framework; the convention on Biodiversity; and the Convention on Combating

PESTLE Category	Key features	Description, linkage to and implications for climate services
		Desertification. All these support advancement of climate services through increased international cooperation and access to finance and technology.
	The Climate Resilient Green Economy (CRGE) strategy	The CRGE is a nationally recognized strategy for climate change adaptation (CCA) and mitigation efforts. Both adaptation and mitigation interventions in the country and elsewhere require robust climate services to inform intervention planning, implementation, monitoring & evaluation. Accordingly, the NFCS needs to be well aligned with and contributing to the goals, objective, and investment plans of the CRGE strategy.
	Presence of legally established institutions on environment (NMA & EFCCC) with clear mandate	The National Meteorological Agency is a nationally mandated institution which provides meteorological information and has presence at federal and sub-national levels. Strong and nationally mandated institutions in all prioritized climate sensitive sectors (Water & Energy, Agriculture, Health, and DRM) are also present. Presence of mandated institutions will help expedite the availability, access, quality, and application of climate services provided that these institutions are working in a collaborative and well-coordinated approach.
	Data protection laws	The country does not have a legally binding comprehensive data protection law. As a result, the country relies on the existing laws that are found in different pieces of legislation. The existing laws are found inadequate to address the challenges related to data protection. Knowing the inadequacy of the existing laws, the country has drafted a comprehensive data protection law, but waits for parliamentary deliberation and approval. Weather and climate data are resources that need protection from unlawful use.
	Health and safety laws	Ethiopia has had a regulation on Occupational Safety and Health (OSH) since the 1940's. The Ministry of Labor and Social Affairs (MOLSA) is the state organ that regulates workers' safety and health in workplaces, both private and state owned. This is a good opportunity to secure the health and safety of employees which require uninterrupted provision of weather and climate services.
	Data sharing and management policy by NMA	The NMA has put in place meteorological data management policy which can be further elaborated on and improved. Other climate service relevant institutions in climate sensitive sectors are also expected to develop and/or adapt data management policy to advance climate services.
Environmental	*Severe deforestation and land degradation*	Numerous studies say the country is experiencing severe deforestation and land degradation. These problems are associated with low land productivity, imbalances in mass and energy exchanges among elements of the climate system in general, and imbalances in local hydrological systems in particular. It is therefore important to consider how climate services would inform decisions that help mitigate risks associated with deforestation and land degradation.

PESTLE Category	Key features	Description, linkage to and implications for climate services
	Climate change, variability and extremes	The planet in general, and Ethiopia in particular, are experiencing changes in the mean state of climate variables and associated manifestations of extreme events (drought, frost, heat waves, floods, hail, etc.). Provision of climate services such as forecasts and predictions are complicated by these variations in space and time. Scientific rigor, high level of knowledge in the field of climate science, and technology are therefore of great importance to ensure reliability of climate services within the frontiers of climate change, variability, and extremes.
	Pests (human and animal)	Distribution of disease-causing organisms in space and time are largely governed by climatic variables such as temperature, precipitation, humidity, and wind speed and direction. Climate change, variability, and extremes are adding another layer in making disease epidemiology more complex over the norm. Our approaches in climate services should therefore be good enough to address health risks associated with climate.
	Air and water pollution	Air pollution is one of the major environmental problems in Ethiopia. By expanding the existing network of Air Pollution monitoring stations, we can collect, process, analyze and generate information to provide to users and policy makers. This issue will be addressed during implementation of the strategic plan.
	Support for renewable energy	Ethiopia is a country very well endowed with renewable energy resources, especially wind and solar power. Collected data on wind and sunshine duration at the agency's archive should be processed and made available to users in the strategic plan period.

2.1.4. National Stakeholder Consultation and Baseline Analysis

Since 2018, climate service stakeholders have conducted rounds of deliberations to pave the way for improved climate services in Ethiopia. The first NFCS consultation workshop held in April 2018 was concluded with a decision to have a structured mechanism that brings all climate relevant organizations together for a common end. This was followed by establishment of a National Steering Committee and Sectoral Taskforces from key stakeholder institutions. Successive workshops and meetings of both the Steering Committee and the Sectoral Taskforces resulted in review of baseline study methodologies, comprehensive baseline assessments; and reviewing of baseline reports–all of which are integrated into the final baseline report. They have also been engaged in reviewing draft versions of the Strategic Plan and development of sectoral costed action plans that together form part of the Strategic Plan. A summary of baseline findings (based on the five pillars of the GFCS) are presented in the sub-sections below, while costed action plans are provided in section 6.

2.1.5. Observation and Monitoring of Climate Data

The NMA has set up a strong climate data observation and monitoring system and has extensive experience in climate data observation and monitoring. Both manual and automatic observation networks are employed for this purpose, but automatic weather station networks are given more attention. The NMA employs the CLIDATA database system, which is a powerful system meeting required standards for storage, processing, and retrieval of climate data.

The proportion of AWSs relative to manual systems are limited (19%), including disproportionate geographical distributions of existing AWSs. Missing data values, typo errors, instrument theft, data flow gaps, data outliers, lack of meta data, low level of expertise of observers, low payment to retain better qualified staff, internet connectivity problems, etc. have been identified as main challenges in climate data observation systems. In addition, the CLIDATA server and High-Performance Computing (HPCs) are only available at the head office but not in sub-national meteorological service centers.

More than 90% of rainfall and temperature data collected before 2018 has been digitized, but other meteorological variables are incomplete or not at all being digitized. Absence of officially published Standard Operating Procedures (SOPs) and capacity limitations (expertise, technology, and budget), especially in sub-national branch offices, are the main challenges.

Access to historic time series data (station or gridded) is crucial for some planned and future climate service applications within the target sectors. However, despite institutional demand for open-access climate information, the NMA's current data policy is not supportive of open access to climate data. Data are provided based on NMA data bases upon request. The NMA's maprooms deliver only climate information products derived from the gridded time series temperature and rainfall data, but not the data itself. Furthermore, analyses of climatic extreme events, trends, climate change and derived products do exist but need to be improved further.

Based on the aforementioned, it is suggested that:

- Expediting approval, financing and implementation of a weather station master plan;
- Advancing AWSs networks as per weather station standards and in a way that acceptably represent diverse agro-climatic and ecological regimes in the country;
- Setting standard operating procedures for quality data management and ensuring their implementation;

- Implementing mechanisms for addressing missing data values and ensuring continuity of all station data;
- Developing an open-two-way data exchange policy and data sharing mechanisms among climate service institutions;
- Increasing the capacity of regional meteorological service centers in quality data management (expertise, technology, and finance);
- Addressing payment related challenges for observers and other relevant staff.

2.1.6. Climate Services Information System

Different categories of stakeholders in the national chain of climate services have been identified. The NMA is at the core of the Climate Service Information System (CSIS) and provides various climate services that encompass: historical climate data services; climate monitoring; meteorological forecasts and early warning of extreme events; and advisory services including hydro-met, Agro-met, Bio-met, and aviation meteorological advisories. Co-producers such as MoWIE, MOA, MoH, and NDRMC transform meteorological forecasts into sector-specific forecasts, but their prediction of losses and damages as well as their co-producing of advisory packages have not proved strong.

Almost all climate services provided by the NMA and other co-producers have been found to be important by different user categories, including traditional weather forecasters, which is a good signal. Timeliness of climate services, spatial resolution, availability, accessibility, reliability, and uptake, for various reasons, are however very limited. The level of understanding on the same type of climate services differs among climate service actors at different levels. For example, probabilistic weather forecasts are not equally understood and applied by meteorologists, experts in other sectors, and farmers or pastoralists.

Rural mixed farming households and pastoralists represent most users of climate services and are the ones affected most by climate driven disasters. However, these social groups have little or no access to climate services communicated through high-tech channels such as web platforms, television, and smart phones. Many are also illiterate, making it difficult to understand written climate service messages. They therefore rely heavily on agricultural development agents (DAs), health extension workers (HEWs), disaster risk reduction (DRR) and early warning committees, and on woreda based experts for guidance. These local agents have limited expertise in disseminating climate services, have limited or no access to the internet, and have other overlapping commitments. Moreover, women have been found to have disproportionately low access to climate services.

It is therefore recommended to:

- Strengthen co-production of sector-specific climate services and linkage among stakeholders in the climate services chain;
- Diversify climate service products with regard to gender needs, type of product, space, time, format, etc. and corresponding routes of communication, as appropriate;
- Have a well-planned capacity building intervention for DAs and HEWs to improve dissemination of climate services to local communities with a gender lens;
- Create awareness and continuously train actors (particularly at the local levels) on the nature and application of weather forecasts and climate predictions.

2.1.8. User Interface Platforms

The baseline assessment has identified various forms of user interface platforms. They are generally grouped into face-to-face and web-based platforms and feature as national and sub-national platforms, multi-sectoral and sectoral platforms, and institutionalized and ad-hoc platforms.

The face-to-face platforms include: Seasonal Climate Outlook Forums, National Disaster Prevention and Preparedness Council, DRM Technical Working Groups, Agro-meteorology platforms, Flood Taskforce, Climate & Health Taskforce, the Ethiopian Meteorological Society (EtMS), and Woreda & Kebele DRR & Early Warning Committee. The web-based platforms subsume: the NMA's website and its maproom, the WDRP, and FEWSNET. Only the NMA and NDRMC have web-based platforms (other than organizational websites) dedicated for climate services.

Most platforms lack well-defined and binding coordination arrangements. They also experience high turnover of representatives and their availability declines as we move from national to local levels. All User Interface Platforms (UIPs) didn't involve academic institutions or the private sector in their deliberations and development. Most platforms depend on external assistance for funding and coordination. The Seasonal Climate Outlook Forums are usually top-down in approach and do not involve sectoral agencies in delivering sector-specific forecasts and assessments of the degree to which they have translated forecasts into practical action. Some platforms, such as the Flood Taskforce, are found to be reactive and often initiated during and after flood induced disasters.

Web-based platforms run by national agencies provide a good starting point, but they lack strength in terms of the diversity of information available, consistency of access (web pages not available), and low level of user feedback mechanisms. The NMA maproom is one of the most advanced national web-based platforms, but it has various limitations in terms of access (internet), limited climate variables (so far only rainfall and temperature), limited to graphical information, dependence on external expertise to fix

complex technical problems, and low levels of user engagement. Information made available by the WDRP is partially complete, outdated, mostly qualitative, and has a limited ability to inform risk reduction decisions.

Suggestions include:

- Improving NMA's interactive and dynamic, web-based climate service platforms for use by all priority climate service sectors;
- Institutionalizing existing face-to-face platforms (establishing binding coordination mechanisms such as MoU and defining clear approaches that apply to all administration tiers);
- Engaging academic institutions and the private sector in UIPs at all levels;
- Harmonizing and running manageable size of face-to-face platforms;
- Strengthening woreda disaster risk management system (decentralized risk profiling);
- Staffing priority sectors at all levels (and more importantly at woreda levels) with Agro-meteorologists, hydro-meteorologists, bio-meteorologists;
- Training staff in priority sectors;
- Creating access to climate services & knowledge products; and
- Increasing the capacity of meteorological observers and engaging them in woreda and zonal DRR and Early Warning platform meetings.

2.1.7. Research, Modelling, and Prediction

Recent and current collaborative efforts in climate research, modelling, and prediction are encouraging. A prime example of these efforts is the adoption of the Enhancing National Climate Services (ENACTS) initiative, which involved the blending of satellite data with ground station data to enable the NMA to institutionalize, produce, and distribute gridded historical climate data for rainfall and temperature. The NMA has also launched many climate research and modelling projects since 2016, and this is another laudable move. However, almost all of them are run without partnering with other climate service stakeholders. Moreover, there are limitations on producing a well-defined and accepted document on observed and projected climate change over Ethiopia. But there has been a promising attempt of producing some publications, for example, to address the issue of climate change and forecast verification. In this regard the 2007 publication of National Adaptation Program of Action (NAPA) and the recently published research on the verification and validation of NWP can be mentioned among the major efforts made.

Most research and modelling projects run by other priority sectors are also isolated. Exceptions do exist, including the collaborative Agro-met research entitled *Increasing Agricultural Production and Resilience through Agro-weather Information Services.* The Ethiopian Institute of Agricultural Research (EIAR) is currently conducting various exemplary Agro-met research and modelling projects that have the potential to be replicated.

The research and modelling research projects run by the MoWIE are very limited and very recent and therefore no model-based outputs have been produced on the link between climate and hydrological systems. NDRMC does not run research and modelling projects relevant to climate and disaster risks. Likewise, well planned climate research and modelling projects run by the MoH could not be identified. Instead, the Ethiopian Public Health Institute have been found to collaborate with other international actors (importantly with the IRI) to conduct research and review the link between malaria epidemics and climate change.

Only one academic institution, Addis Ababa University (AAU), conducts model-based climate research. Co-generation of research themes and implementation of joint research initiatives between academic institutions are very limited. Most interviews in academic institutions (also in other priority sectors) reported very limited knowledge and skills including lack of infrastructure in conducting advanced model-based climate research.

Current MSc and PhD educational programs relevant to climate services are found to be limited in light of the demands for manifold climate services, encompassing: scientific weather forecasting, climate prediction, climate projection, modelling and down scaling, and linking forecast, prediction and projections with livelihood decisions in different socio-economic and ecological settings. BSc level educational programs in meteorology and hydrology are only conducted in Arba Minch University.

Recommendations include:

- Promoting a culture of participatory climate research and development that apply to all climate sensitive sectors;
- Strengthening the knowledge and skills of staff in priority sectors in climate research and modelling;
- Advancing MSc and PhD level education programmes in such a way that they inform the current knowledge and skill gaps in climate services;
- Matching the demand for BSc level graduates with existing uptake by academic institutions;
- Developing and issuing research findings on observed and projected climate change over Ethiopia;

- Establishing a digital library for documenting and availing climate service relevant knowledge products;
- Commissioning participatory climate research based on prioritized research themes;
- Addressing research infrastructure, particularly computational facilities with high storage and processing speed.

2.1.9. Institutional Capacities

It is understood that nationally mandated and well-organized institutions and systems exist in Ethiopia for development and implementation of NFCS. The NMA is at the core of these institutions, already having a clear organizational structure and function. Other core institutions for climate service include priority sectors such as the MoWIE, MoA, MoH, and NDRMC. Despite some limitations and challenges, all these institutions have enabling policies, strategies, and plans for implementing the NFCS. Yet, the emphasis given to climate services in the overarching second Growth and Transformation Plan (GTP-2) is limited.

Despite the enabling policy and institutional environment for NFCS, large capacity gaps have been noted in staff knowledge and skills, availability of knowledge products, climate service infrastructure, and finance. It is therefore recommended to:

- Ensure the future national strategic plan/GTP explicitly addresses the roles of climate services for effectiveness of climate sensitive sectors in national development;
- Conduct comprehensive staff capacity needs assessment in all climate service priority sectors at all administrative levels;
- Set an implementation and monitoring plan for comprehensive staff capacity building;
- Link generation of climate knowledge products to research with staff capacity building;
- Ensure availability and accessibility of knowledge products, especially through electronic media;
- Address infrastructure and financial constraints through direct government budget allocation and external funding. This includes setting clear accountability mechanisms for effective resource utilization.

2.1.10. Conclusions from the Environmental Scan

The presence of strong climate institutions in all priority sectors, the presence of face-to-face and web-based user interface platforms, the growing international and national partnerships among climate stakeholders, and growing experience in climate services, are found to be major positives for execution of

NFCS. Yet, various limitations have been noted. These encompass: limited availability and low technical capacity of staff, minimal incentive mechanisms, poor research and knowledge management capability, loose stakeholder coordination, and gaps in addressing users' needs are identified as key weaknesses.

Global conventions and initiatives supporting climate services, enabling national policies and strategies, advancements in technology and communication platforms, tapping potentials resulting from climate change, and growing interest and needs in climate services are identified as main opportunities to be exploited. On the other hand, various factors that may challenge to climate services have been noted. These include: climate change and variability, environmental change, fast changes in technology, frequent organizational reforms, unpredictability of funding, negative balance of trade, and staff instability.

Several political, economic, socio-cultural, technological and legal factors (in addition to those outlined in the SWOT analysis) either to help advance climate services or restrain its effectiveness. The enabling factors should be exploited as opportunities, while the restraining factors should be considered for mitigation or adaptation.

Various economic factors are linked to and affect the type and quality of climate services. These include: Development of state economic philosophy, the vision for middle-income country by 2025, a huge dependence of the economy on agriculture, a fast-growing service sector, water-dependent national electric power generation and growing market for hydropower, unemployment, inflation, and positive trends in external financing. Various social factors that subsume: huge population and fast population growth rates, greater proportion of the youth, high rate of urbanization, high proportion of the population inhabit in rural areas, diverse cultures and languages, religious values and beliefs, and growing demands for climate services and rapidly changing users' needs have been identified. All these factors affect the type, quality, timing, and communication media for climate services.

Access and affordability of Automatic Weather Stations, rapidly changing ICT landscape and emergence of new technological platforms for information exchange, expansion of telecom services, increasing trends in use of smart phones, limited access to climate research and knowledge products, manipulation of big climate data, and crowdsourcing and among the technological factors that help advance or inhibit climate services.

The legal factors having a bearing on climate services in Ethiopia include: presence of national and local legal frameworks, presence of legally mandated institutions for climate services, ratification of several

interventional climate relevant agreements, presence of an overarching climate resilient green economy (CRGE) strategy, and data management policy by the NMA.

Finally, several environmental factors are noted to affect climate services positively or otherwise. These encompass: climate change, variability, and extremes, deforestation and land degradation, and human and animal pests.

Findings from the comprehensive baseline assessment (based on the five pillars of the GFCS) and recommendations from stakeholder consultation workshops suggest various actions to improve climate services. These include, among others: improving the climate observation and monitoring system through better technology and data quality management, establishing and/or strengthening functional face-to-face and web-based user interface platforms, strengthening stakeholder coordination at all levels, developing climate services that meet the diverse needs of users, advancing climate research, prediction, and knowledge management, and building the human and institutional capacity of climate institutions.

3. Vision, Mission, and Values of the National Framework for Climate Services

3.1. Vision

The vision of the NFCS is "Seeing Ethiopians whose livelihoods are resilient through climate-informed decisions."

3.2 Mission

The mission of NFCS is building the capacity of climate institutions; ensuring co-development of climate services for different groups of users; providing user driven, high-resolution and accurate climate services; and continuously learning and improving climate services in Ethiopia.

3.3. Values

The NFCS will be guided by four core values. These include:

a. **Co-design and co-production:** This consists of joint planning, implementation, learning, and improvement for a common end. This principle will help increase efficiency by avoiding duplication of resources.
b. **Users first:** The NFCS Strategic Plan will put users at the center of its processes, and it will make sure the services produced and delivered are based on users' needs.
c. **Excellence:** This principle involves professionalism and dynamic change based on documentation and sharing of knowledge.
d. **Sustainability**: This principle refers to lasting impacts that transcend the implementation period as a result of actions of the Strategic Plan

4. Strategic Framework

4.1. Strategic Goals, Objectives and Strategies

4.1.1 Strategic goals

Grounded on the key recommendations from stakeholder consultation processes and baseline findings, Ethiopia's NFCS has the following two strategic goals (long-term outcomes):

Strategic Goal 1: *Institutional capacities will be built to deliver high quality, decision-relevant, timely, reliable and sustainable climate services.*

Strategic Goal 2: *Climate services, adapted to the diverse needs of users, will be implemented, delivered, and adopted at all levels and times.*

The first strategic goal is meant to establish the enabling environment for effective and sustainable climate services. The second strategic goal, enabled by the first, is the provision and use of relevant, timely, and reliable climate services

Increased anticipatory management of climate risks by climate service stakeholders in the water, energy, agriculture, health, DRM, and environment and forestry sectors will contribute to six climate-resilient development impacts:

1. Sustainable and climate resilient water resources and power supply;
2. Sustainable and climate resilient agriculture and food security;
3. Improved health status of climate-vulnerable populations;
4. Reduced vulnerability to Hydro-met risks;
5. Enhanced sustainability of environmental and forest resources; and
6. Successfully executed CRGE strategy and NAP.

The combined impact will advance overarching national climate-resilient green economic development goals through climate-informed decision making. The underlying assumption is that development programs informed by relevant, timely, and reliable climate services will be able to take proactive measures to mitigate the risks associated with extremes of weather and climate, as well as maximize opportunities from favorable weather climate conditions. As a result, development gains will not be compromised or reversed.

The effectiveness of climate services on national development will extend to global efforts in responding to the impacts of observed and future climate change and to sustainable development goals (particularly in battling hunger, eradiating poverty, and sustaining environmental resources).

4.1.2. Objectives

Ethiopia's NFCS, under the strategic goals and intermediate outcomes, is set to meet 10 objectives. The first 4 strategic objectives are relevant for improved capacity of climate institutions (Strategic goal 1), while the remaining six are relevant to climate service delivery (Strategic goal 2).

Objective 1.1: Knowledge and skills of staff in climate services institutions at all levels enhanced

This strategic objective is focusing on building the scientific and technical capacity of staff in generation, dissemination, monitoring, evaluating, and continuously updating climate services for different groups of users and in different socio-economic and agro-ecological contexts. It is believed to be the engine for meeting other strategic objectives and eventually realizing all strategic goals.

Objective 1.2: Coherent research, M & E, and knowledge management system

This strategic objective is about institutionalizing effective knowledge management in climate services. It will involve: generating knowledge though research and learning, applying knowledge to build the capacity of staff in one hand and improved climate services delivery on the other, and establishing effective monitoring, evaluation, and feedback mechanisms. This objective is also meant to address the climate research, prediction, and projection component of the five pillars of the GFCS.

Objective 1.3: Improved observation, data management, and prediction infrastructure

Contextually appropriate technology contributes to the availability and quality of climate services. This objective will therefore involve strengthening meteorological, hydro-meteorological, Agro-meteorological, bio-meteorological, and DRM systems with observation networks and computing facilities, including calibration and maintenance.

Objective 1.4: Effective multi-sectoral (water, agriculture, health, DRM, and environment) institutional policy framework and governance

This strategic objective focuses on: establishing climate services coordination mechanisms, improving existing policies and developing new and important ones, strengthening and harmonizing user interface platforms, establishing standard operating procedures (SOPs), refining staffing profiles and structures,

and nurturing strong partnerships at local, national, and international levels– all in favor of effective climate services.

Objective 2.1: Improved availability, quality, and delivery of climate data and forecasts

This strategic objective focuses on ensuring availability of good quality meteorological observations, forecasts, and advisories to different groups of users. It conforms to the observation and monitoring component of the five pillars of the GFCS and has some features of the climate services information system. It will involve: diversification of climate data products, generation of good quality forecasts and advisories, data quality control, and digitization of climate data.

Objective 2.2: Improved availability, quality, and delivery of Hydro-met services

This objective is intended to meet the diverse demands for Hydro-met services through improved Hydro-met observations, forecasts, and advisories.

Objective 2.3: Improved availability, quality, and delivery of Agro-met services

This objective is intended to meet the demands for Agro-met services through improved Agro-met observations, forecasts, and advisories in themes that include, but not limited to: crop production and protection, livestock production and health management, natural resources management, and agricultural inputs and marketing management. Agro-met services are expected to give due emphasis to the contexts and differential needs of men and women farmers and pastoralists.

Objective 2.4: Improved availability, quality, and delivery of Bio-met services

This objective is intended to meet the demands for Bio-met services through improved Bio-met observations, forecasts, and advisories.

Objective 2.5: Improved availability, quality, and delivery of early warning services

This objective is intended to improve early warning for improved national and local DRM effectiveness. Climate extremes affect men and women differently, and the DRM component of climate services is expected to take this into account.

Objective 2.6: Improved availability, quality, and delivery of environmental met services:

This objective is intended to contribute to effectiveness of national to local environmental protection through generation of environment relevant climate observations, forecasts, and projections.

4.1.3. Strategies

Meeting strategic goals of Ethiopia's NFCS will be possible through the implementation various strategies relevant to different objectives as provided within Table 4.

Table 4: Strategies under strategic objectives of Ethiopia's NFCS

Strategies for Goal 1: Institutional capacities are built to deliver high quality, decision relevant, timely, reliable and sustainable climate services				
Objectives	**Strategies**	**Outputs**	**Time frame**	**Responsibilities**
Objective 1.1: **Knowledge and skills of staffs in climate services institutions at all levels enhanced**	Joint training and educational needs assessment of staff in key core governmental climate services institutions.	Training and educational needs of staff and students identified and prioritized	Late 2021 to middle of 2022	NMA, MoWIE, MoA, MoH, NDRMC (and their sub-national branches), national research and academic institutes, international think tanks, media/IT partners & civil society
	Co-development of climate services training and reference materials	Tailored training and reference materials in climate services jointly developed	Late 2021 to middle of 2022	Ditto
	Delivery of tailored thematic trainings in priority sectors of climate services	Staffs of climate service sectors at all levels and students in higher learning institutions received relevant training and applied in practical settings	Middle of 2022 to middle of 2023	NMA, MoWIE, MoA, MoH, NDRMC (and their sub-national branches), national research and academic institutes, international think tanks, media/IT partners
	Strengthening university level educational programs in climate services giving emphases on Gender equity/Gender inclusive approach	Tailored educational programs for advancing climate services launched	Early 2022 to middle of 2030	Climate service institutions, universities, international think tanks
	Awareness creation and raising of climate services for stake holders and General public at all level	Climate aware society that utilize climate information in day today life	2021-2030	NMA, MoWIE, MoA, MoH, NDRMC (and their sub-national branches), national research and academic institutes, international think tanks, media and civil society

Strategies for Goal 1: Institutional capacities are built to deliver high quality, decision relevant, timely, reliable and sustainable climate services				
Objectives	**Strategies**	**Outputs**	**Time frame**	**Responsibilities**
Objective 1.2: Coherent research, M&E, Knowledge management system	Participatory identification and design of research priorities in climate sensitive sectors NMA, MoWIE, MoA, EFCCC, MoH, NDRMC	Priority research needs for different groups of users co-identified and co-designed	Late 2021 to early 2022	NMA, MoWIE, MoA, EFCCC, MoH, NDRMC, national research and academic institutes, international think tanks, media partners, municipalities, commercial farmers, mixed farmers, pastoralists
	Launch joint research, modelling and projection projects in priority research themes	Priority research projects in climate service priority sectors and themes co-implemented	Late 2021 to end of 2026	Ditto
	Setting up digital climate services knowledge management library	CS knowledge products made available online	2022 to 2030	CS institutions
	Establish effective monitoring and evaluation system	Climate services effectively monitored, evaluated and lessons shared.	2021 to 2030	CS institutions
Objective 1.3: Improved observation, data management, and prediction infrastructure	Expanding Modern Weather Observing Station networks	Increased coverage of automated meteorological observation in the country	2021 to 2030	NMA
	Expanding automated automatic hydrological stations	Increased coverage of automatic hydrological stations in the country	2021 to 2023	MoWIE
	Setting up and running high performance computational facilities in key climate service institutions	Increased national availability of and access to high computing facilities	2021 to 2023	NMA, MoWIE, MoA, EFCCC, MoH, NDRMC (and their sub-national branches), Research institutes, Universities

Strategies for Goal 1: Institutional capacities are built to deliver high quality, decision relevant, timely, reliable and sustainable climate services				
Objectives	**Strategies**	**Outputs**	**Time frame**	**Responsibilities**
	Install high quality software packages for improved climate services in key climate institutions	High quality software packages meeting international software license protocols available in key climate institutions	2021 to 2026	NMA, MoWIE, MoA, EFCCC, MoH, NDRMC (and their sub-national branches), research institutes, universities
	Setup of Meteorological Instruments Calibration Facilities at Head Quarter and Regional Meteorological Service Centers	Meteorological Instruments Calibration Facilities available at Head Quarter and Regional Meteorological Service Centers	2022 to 2026	NMA and RMSC
Objective 1.4: Effective multi-sectoral (water, agriculture, health, DRM, and environment) institutional policy framework and governance	Revitalizing face-to-face UIPs at all levels	Face-to-face UIPs are harmonized and guided by clear operational guidelines	2021 to 2022	NMA, MoWIE, MoA, EFCCC, MoH, NDRMC (and their sub-national branches), national research and academic institutes, international think tanks, media partners, municipalities, bilateral and multilateral organizations, NGOs
	Launching new and strengthening existing web-based UIPs in all priority climate service institutions	Interactive and user-friendly web-based UIPs established in all priority sectors	2021 to 2022	NMA, MoWIE, MoA, EFCCC, MoH, NDRMC (and their sub-national branches)
	Strengthen existing and develop new policies and SOPs	Improved policies and procedures for effective climate services	2021 to 2022	NMA, MoWIE, MoA, EFCCC, MoH, NDRMC (and their sub-national branches)
	Nurture strong partnership with local, national and international stakeholders for expert knowledge transfer, technology, and finance	Improved partnership among climate stakeholders at all levels	2021 to 2026	NMA, MoWIE, MoA, EFCCC, MoH, NDRMC (and their sub-national branches)

Strategies for Goal 2: Climate services, adapted to the diverse needs of users, are implemented, delivered and adopted at all levels and at all times				
Objectives	**Strategies**	**Outputs**	**Time frame**	**Responsibilities**
Objective 2.1: Improved availability, quality, and delivery of climate data and forecasts	Co-development and delivery of diverse Climate service (observation, forecast, prediction, and projection including impacts and advisories)	Need-based meteorological services made available	2021 to 2030	NMA and its Regional Meteorological Services Centers (RMSCs) and Stakeholders
	Strengthening climate data quality management system (observer monitoring, cleaning, addressing missing data values, digitization, etc.)	Quality and timely meteorological data and data products made available for further application	2021 to 2030	NMA and its RMSC and stakeholder
	Improve quality of aviation weather forecasting Ethiopia	Aviation weather services delivered as per ICAO standards	2021 to 2030	NMA and its RMSC and stakeholder
	Implementing-Impact Based Forecasting (IBF), for weather and climate extremes such as drought, flood, heat wave, frost, landslide and forest fire etc.	Impact based information produced and communicated to users	2022 to2030	NMA and its RMSC and stakeholder Climate Service Institutions
Objective 2.2: Improved availability and quality and delivery of Hydro-met services	Co-development and delivery of diverse water and energy services (Hydro-met observation, forecast, prediction, and projection including impacts and advisories)	Need-based water and energy services made readily available	2021 to 2030	NMA, MoWIE and its stakeholders
	Strengthening hydro-meteorological, water and energy data quality management system (SOPs, monitoring, etc.)	Quality and timely Hydro-met data and data products made available for further application	2021 to 2030	NMA, MoWIE and their stakeholders
Objective 2.3: Improved availability, quality and delivery of Agro-met services	Co-development and delivery of diverse Agro-met services (Agro-met observation, forecast, prediction, and projection including impacts and advisories)	Need-based Agro-met services made available	2021 to 2030	NMA, MoA and their stakeholders

Strategies for Goal 2: Climate services, adapted to the diverse needs of users, are implemented, delivered and adopted at all levels and at all times				
Objectives	**Strategies**	**Outputs**	**Time frame**	**Responsibilities**
	Strengthening Agro-met data quality management system (SOPs, monitoring, etc.)	Quality and timely Agro-met data and products made available for further application	2021 to 2030	NMA, MoA and their stakeholders
Objective 2.4: Improved availability, quality and delivery of Bio-met services	Co-development and delivery of diverse Bio-met services (Bio-met observation, forecast, prediction, and projection including impacts and advisories)	Need-based Bio-met services made available	2021 to 2030	NMA, MoH and their stakeholders
	Strengthening Bio-met data quality management system (SOPs, monitoring, etc.)	Quality and timely Bio-met data and products made available for further application	2021 to 2030	NMA, MoH and their stakeholders
	Document and share case definition for nationally prioritized Climate Sensitive Diseases (CSDs) and other health events	Case definition for nationally prioritized Climate Sensitive Diseases (CSDs) and other health events Documented	2021 to 2023	NMA, MoH and their stakeholders
Objective 2.5: Improved availability, quality, and delivery of early warning services	Co-development and delivery of diverse DRM services (DRM observation, forecast, prediction, and projection including impacts and advisories)	Need-based DRM services made available	2021 to 2030	NMA, NDRMC and their stakeholders
	Strengthening DRM data quality management system (SOPs, monitoring, etc.)	Quality and timely DRM data and products made available for further application	2021 to 2030	NMA, NDRMC and their stakeholders

Strategies for Goal 2: Climate services, adapted to the diverse needs of users, are implemented, delivered and adopted at all levels and at all times				
Objectives	**Strategies**	**Outputs**	**Time frame**	**Responsibilities**
Objective 2.6: Improved availability, quality, and delivery of environmental met services	Co-development and delivery of diverse environmental safeguarding services (environmental observation, forecast, prediction, and projection including impacts and advisories)	Need-based environmental safeguarding services made available	2021 to 2030	NMA, EFCCC and their stakeholders
	Strengthening environmental data /to be defined /quality management system (SOPs, monitoring, etc.)	Quality and timely environmental data and products made available for further application	2021 to 2030	NMA, EFCCC and their stakeholders

5. Risk Assessment

5.1 Risk Assessment Approach

Risk assessment is a process or application of a methodology for evaluating risk, as defined by probability and frequency of occurrence of a hazard event, exposure of people and property to the hazard, and consequences of that exposure. Different methodologies exist for assessing the risk of natural hazard events, ranging from qualitative to quantitative. The practice of risk management permits decision-makers to anticipate losses and to evaluate potential impacts to facilitate effective planning and management. It requires recognition of risks, evaluation of the frequency of those events and the related magnitude of consequences or potential losses, and determination of appropriate measures for prevention or reduction of these risks from a cost/benefit point of view (Long and John, 1993).

In this particular document, the risk matrix method (a qualitative risk assessment approach) has been employed. This approach is less quantitative and detailed and does not estimate damage or losses. In the risk matrix approach, both the magnitude and frequency of occurrence of a hazard are given a qualitative measure that permits the prioritization of risk among multiple hazards. The condition of the risk can be labeled as high-risk, moderate-risk or low-risk based on the level and frequency of occurrence. The risk matrix approach may follow the following steps of activities;

- Define and describe hazards, measure of magnitude and severity, causative factors, and interrelations with other hazards;
- Rank, or order, the identified hazards as a function of the relative degree of risk;
- Determine whether risks that have been identified and estimated in the previous steps can be tolerated;
- Select cost-effective actions to reduce or mitigate unacceptable risks, including technological and management controls;
- Implement mitigation measures to control risk to acceptable levels
- Periodically monitor and review risks.

5.2 Risk Identification and Analysis

The PESTLE analysis and the "weaknesses" and "threats" components of the SWOT analysis helped to identify various types of risks that affect delivery and effectiveness of the NFCS Strategic Plan and its costed action plan. A three-level rating (high, medium, and low) has been used to weigh the probability of occurrence and impact levels of those risks. A risk analysis matrix containing all categories of risks and their features, likelihoods, and impact levels are given in Table 5. As risks are dynamic in space and time, the risk analysis matrix would be modified as required during the period of strategic plan implementation.

Table 5: Risk analysis matrix

No	Types of risks	Description of risks	Likelihood	Impact level
1	Inflation	The country is experiencing inflationary challenges. This would affect the purchasing power of local currency, particularly in importing high quality technologies supporting climate services.	High	Medium
2	Fast-changing technology	Technologies produced and/or imported could be outdated and replaced within a short period of. This could compromise the quality of climate services and become costly to adapt to technological changes.	High	Medium
3	Unreliable external funding	The amount of external assistance for climate services would not meet the demand at the ground. This could be partly linked to changes in the global political landscape and partnership priorities of known donor governments such as the UK (aid for trade).	Medium	High
4	Cuts in communication networks	Communication networks such as internet, mobile phones, etc. may be cut due to power shortages, especially in remote/rural areas. This would obstruct exchange of climate service-related information.	High	High

No	Types of risks	Description of risks	Likelihood	Impact level
5	Education level	According to UNESCO, the adult literacy rate is 39%, with 49.13% for males and 28.92 % for females, which shows a big gender gap. In comparison with other countries, the literacy rate in Ethiopia is low. This would create problems in getting access to technology-supported climate service platforms and/or understanding written messages.	High	High
6	Religious values and beliefs	Some religious values and beliefs in Ethiopia would put restrictions on applying climate services. For example, timeliness of actions would clash with religious holidays. Weather forecasts would be regarded as beyond human acts. Reliance on and application of weather forecasts may be considered as attempts to intervene in God's matters.	High	Medium
7	Organizational re-structuring	In line with political reforms, government institutions are highly likely to undergo re-structuring. This would bring changes in the roles and accountability lines of some climate service functions and associated shifts in staff positions. Such movement would slow climate service delivery and compromise institutional memory.	High	Low
8	Staff instability	More experienced staff are often leave their positions in search of better paid jobs. As in the effects of organizational re-structuring, this may compromise speed, continuity, and quality of climate services.	Medium	Medium
9	Climate change and variability	The impacts of climate change and variability are manifold. They have pronounced impacts on economic sectors such as agriculture and water	High	High

No	Types of risks	Description of risks	Likelihood	Impact level
		including services. The depth and breadth of climate service required for users in different sectors would therefore be beyond existing institutional capacities. Climate change and variability are likely to complicate predictability of climate phenomena and hence risk the reliability and application of forecast services.		
10	Deforestation and land degradation	These challenges result in low land productivity, imbalances in mass and energy exchanges among elements of the climate system in general and especially imbalances in localized hydrological system. These challenges require high level climate services that may transcend existing capacities and create complexities in modelling the relationship between climates other agricultural and hydrologic variables. However, the current national tree planting campaign can play a role in reducing the impact of deforestation.	Medium	High
11	Limited staff expertise	The diversity and professional rigor needed for effective climate service would be compromised due to limited staff expertise.	High	High
12	Inadequate organizational policies and SOPs	Gaps in organizational policies and SOPs such as human resources management, climate data management, joint engagement and coordination, performance measurement, etc. would risk the type, pace, and quality of climate services.	High	High

No	Types of risks	Description of risks	Likelihood	Impact level
13	Changing government policies	The course of some high-level government policies, such as GTP and CRGE, may change in a way that is less suitable for implementing NFCS.	Medium	Low
14	Low acceptance and application of climate services	There is always a risk of error in meteorological forecasts. As a result, many end users, particularly in rural communities, may not accept and apply them.	High	Medium
15	Unmet expectations in climate institutions	With new interventions are multiple organizational and individual expectations for greater roles, more resources, and benefit packages. These may exceed the scope and resources of the strategic plan and would bring in poor collaboration, conflict over responsibilities and resources, refusal to accept weaknesses, and reduced effectiveness.	Medium	Low
16	Low level of executing activities and budget spending	All climate institutions do not have equal capacity and experiences in delivering climate services. This would compromise the speed at which program activities are implemented and associated under-spending	Medium	Medium

5.3 Risk Management Strategies

There are four commonly known strategies for risk management.[7] These are: avoidance, transfer, mitigation, and acceptance. Choosing the right strategy depends on the combined effects of risk probabilities and their impact levels. For example, risks with medium probability and medium impact

[7] WMO Integrated Strategic Planning Handbook, 2016

entail risk monitoring while those with low probability and medium impact (or vice versa) would be accepted. Management strategies for risks indicated in the risk analysis matrix are provided in Table 6. These would be modified in line with changes in the risk analysis matrix above during the period of the Strategic Plan.

Table 6: Risk management strategies

No	Types of risks	Likelihood	Impact level	Risk management strategies
1	Inflation	High	Medium	**Risk mitigation**: budgeting activities based on relatively stable foreign currency (such as USD); enhance partnership with donors and ensure donor compliance; exchange rate monitoring; dynamic budget forecasting; and import substitution.
2	Fast changing technology	High	Medium	**Risk mitigation:** watching technological dynamics; select technologies that are believed to be adaptive and used for longer periods and; adaptive staff knowledge building.
3	Unreliable external funding	Medium	High	**Risk mitigation:** Lobbying for greater government budget allocations; improve donor relations and compliance; and integrate climate services with other development programs.
4	Cuts in communication networks	High	High	**Risk mitigation:** Use of solar power sources.
5	Illiteracy	High	High	**Risk mitigation**: use of local languages, voice messaging, and printed materials; and advocate for nation-wide functional adult literacy.
6	Religious values and beliefs	High	Medium	**Risk mitigation**: Engage religious leaders in climate services; unfolding awareness creation and

No	Types of risks	Likelihood	Impact level	Risk management strategies
				demonstrate how religious values are not against application of climate services.
7	Organizational re-structuring	High	Low	**Risk mitigation**: close monitoring of institutional dynamics and understand where exactly climate service functions will be; putting in place climate knowledge management systems that are relatively immune to re-organization; and sharing information among stakeholders on time.
8	Staff instability	High	Medium	**Risk mitigation**: lobbying for better staff payments; developing clear human resource policies and financial incentive mechanisms; and promote non-financial rewarding approaches such as clear assignment of roles, and recognition for achievements.
9	Climate change and variability	High	High	**Risk Transfer and Mitigation:** promote risk insurance in climate sensitive sectors such as crop and livestock insurance schemes; promote livelihood diversification and market linkages; increase expert competence in weather forecasting within the contexts of climate change and variability; awareness creating on probabilities of forecasts.
10	Deforestation and land degradation	High	High	**Risk Avoidance, Transfer, and Mitigation:** promote land rehabilitation and afforestation/ reforestation programs; promote risk insurance in climate sensitive sectors such as crop and livestock insurance schemes; promote livelihood diversification and market linkages; increase expert

No	Types of risks	Likelihood	Impact level	Risk management strategies
				competence in climate systems modelling within the contexts of environmental change.
11	Limited staff expertise	High	High	**Risk Mitigation:** Adaptive Need/gap based knowledge and skill development; and promote quality and excellence in higher education.
12	Inadequate organizational policies and SOPs	High	High	**Risk Avoidance and Mitigation:** Develop good enough policies and SOPs and improve existing ones; and monitor implementation of policies and SOPs.
13	Changing government policies	Medium	Low	**Accepting risk** but with close monitoring of the possible impacts of change
14	Low acceptance and application of climate services	High	Medium	**Risk Mitigation:** Improve reliability of weather prediction through better staff competence, methodological applications, and timeliness; continuous forecast validation and verification; and unfolding awareness creation among stakeholders and end users.
15	Unmet expectations in climate institutions	Medium	Low	**Accepting risk** but with close monitoring of the possible impacts of these unmet expectations for initiating possible mitigation strategies.
16	Low level of execution of activities and budget spending	Medium	Medium	**Risk Mitigation:** Setting effective work plan supported by detailed work breakdown structure and budget; periodic monitoring of activity and budget spent; budget forecasting; and work plan

No	Types of risks	Likelihood	Impact level	Risk management strategies
				and budget revisions depending on anticipated and residual risks.

5.4 Risk Monitoring

Risk monitoring will be integral to risk assessment. It is intended to track implementation, effectiveness, and relevance of proposed risk management strategies. It also helps to verify whether observed risks are consistent with their likelihoods and impact levels anticipated in advance (during risk analysis). Monitoring results will help to refine risk mitigation strategies and/or propose new one as types and risk behavior's change. The risk monitoring matrix (shown in Table 7) will be employed for this purpose and is subject to modification in line with changes in risk analysis matrix and management strategies in due course.

Table 7: Risk monitoring matrix

No	Types of risks	Monitoring indicators	Likelihood		Impact level		Monitoring Frequency	Responsible body
			Before intervention	*After intervention*	*Before intervention*	*After intervention*		
1	Inflation	% inflation minimized	High		Medium		Monthly	NFCS Coordination unit
2	Fast changing technology	Numbers of new technological changes assessed and associated adaptation recommendations made	High		Medium		Bi-annual	NFCS Coordination unit
3	Unreliable external funding	% change in amount of external funding	Medium		High		Quarterly	NFCS Steering Committee and Coordination unit
4	Cuts in communication networks	% increase in solar based power sources	High		High		Weekly	NFCS implementing entities
5	Illiteracy	Numbers of local languages used for exchanging voice-based climate services; type and number of pictorial illustrations to convey climate services (messages); and coverage of functional adult literacy programs	High		High		Annual	NFCS implementing entities
6	Religious values and beliefs	Proportion of end-users using science-based weather forecasts	High		Medium		Monthly	NFCS implementing entities
7	Organizational re-structuring	Types and number of immune knowledge management platforms established; numbers of stakeholder meetings conducted to manage effects of re-structuring and actions taken.	High		Low		Annual	NFCS Steering Committee and Coordination unit
8	Staff instability	Types of staff stability measures developed and implemented; % change in staff resignation	High		Medium		Quarterly	NFCS Steering Committee and Coordination unit

No	Types of risks	Monitoring indicators	Likelihood		Impact level		Monitoring Frequency	Responsible body
			Before intervention	*After intervention*	*Before intervention*	*After intervention*		
9	Climate change and variability	% increase in climate insurance users; coverage and sufficiency of weather insurance services; numbers of staffs trained in high level weather forecasting; degree of accuracy of weather forecasts; numbers of farmers diversifying livelihoods	High		High		Monthly	NFCS implementing entities
10	Deforestation and land degradation	% increase in forest land and area of land reclaimed with other biological and physical measures; Numbers of staff trained in high level modelling of climate and other environmental systems; degree of match between models and realities in hydrologic and land surface parameters.	High		High		Annual	NFCS implementing entities
11	Limited staff expertise	Numbers of knowledge and skills gaps/needs assessments conducted; numbers of staff development interventions conducted (trainings and higher learning); degree of staff satisfaction on knowledge and skills gained	High		High		Quarterly	NFCS Coordination unit
12	Inadequate organizational policies and SOPs	Types and numbers of policies and SOPs developed and implemented	High		High		Bia-annual	NFCS Coordination unit
13	Changing government policies	Types of policies changed and assessing their impacts on the strategic plan.	Medium		Low		Bi-annual	NFCS Steering Committee and Coordination unit
14	Low acceptance and application of	% change in users of climate services; and numbers of awareness creation events conducted	High		Medium		Monthly	NFCS implementing entities

No	Types of risks	Monitoring indicators	Likelihood		Impact level		Monitoring Frequency	Responsible body
			Before intervention	*After intervention*	*Before intervention*	*After intervention*		
	climate services							
15	Unmet expectations in climate institutions	Types and level of impacts due to unmet expectations	Medium		Low		Annual	NFCS Coordination unit
16	Low level of execution of activities and budget spending	Operational performance of activities compared to planned targets; amount and proportion of budget spent.	Medium		Medium		Quarterly	NFCS Coordination unit

6. National Action Plan

The NFCS action plan will be implemented over 10 years. NFCS stakeholders believe this time will be sufficient to realize the goals and objectives of the Strategic Plan and align with the new overarching national development plan of Ethiopia. The first year of the Strategic Plan period is dedicated to preparatory works intended to create the enabling environment for thoughtful actions. The time period spanning from year 2 to year 8 will see actual implementation of planned activities according to scope, time, and budget. The final year of the plan period is dedicated to consolidating lessons, evaluating results, reviewing achievements, lessons, and challenges with stakeholders, and designing a new strategic plan for climate services that builds on lessons from the past.

7. Budget

The Strategic Plan of the NFCS principally follows activity-based budgeting for objectives and strategic goals, plus administrative costs for executing the plan. The total budget to implement the national action plan of the NFCS is estimated at USD **125,023,350** (One Hundred Twenty-five Million Twenty-Three Thousand Three Hundred Fifty US Dollars). The summary of total as well as the two five years budget by major objectives is provided in Table 8 while the total budget detail by component and by five years period (2021-2025 and 2026-2030) of costed action plan is provided in parallel column in Annex B.

Table 8: Budget by component for implementing national action plans

S/No	Component	1st 5 years (July 2021-June 2025)	Proportion (%)	2nd 5 years (July 2026-June 2030)	Proportion (%)	Total Budget (USD)	Proportion (%)
A1.1	Objective 1.1	8,090,000	10	950,000	2	9,040,000	7
A1.2	Objective 1.2	3,300,000	4	460,000	1	3,760,000	3
A1.3	Objective 1.3	32,780,000	39	18,750,000	45	51,530,000	41
A1.4	Objective 1.4	6,180,000	7	750,000	2	6,930,000	6
Total (Goal 1)		**50,350,000**	**61**	**20,910,000**	**50**	**71,260,000**	**57**
A2.1	Objective 2.1	5,060,000	6	2,930,000	7	7,990,000	6
A2.2	Objective 2.2	1,443,000	2	1,314,000	3	2,757,000	2
A2.3	Objective 2.3	1,860,000	2	1,680,000	4	3,540,000	3
A2.4	Objective 2.4	684,000	1	72,000	0	756,000	1
A2.5	Objective 2.5	1,110,000	1	720,000	2	1,830,000	1
A2.6	Objective 2.6	1,890,000	2	1,080,000	3	2,970,000	2
Total (Goal 2)		**12,047,000**	**14**	**7,796,000**	**19**	**19,843,000**	**16**
AC	**Administrative Costs**	**20,816,350**	**25**	**13,104,000**	**31**	**33,920,350**	**27**
Grand Total		**83,213,350**		**41,810,000**		**125,023,350**	

8. Implementation of the Action Plan

The NFCS Coordination Units (CUs) at all administrative tiers, comprised of coordinators and key thematic experts, will be central to implementing the NFCS action plan by all stakeholders of climate services. Every climate service stakeholder institution appoints designated expert/s (making up the technical taskforce) to ensure implementation of respective action plans according to scope, time, and budget. Both the CUs and technical experts in stakeholder organizations will be accountable to the NFCS Council and the Steering Committee.

An adaptive programming approach will be pursued while implementing the action plan whereby actions of the Strategic Plan are modified in response to changing environments and on the findings and lessons from monitoring, evaluation, and risk management. Differing needs between male and female climate service users will be given due consideration.

9. Monitoring, Evaluation, and Reporting

Overall, the monitoring, evaluation, and reporting skeleton of the NFCS will be guided by the theory of change, the logical framework of the strategic plan, and the baseline. During the readiness phase (Year 1), the NFCS CU at federal level, in consultation with technical experts and regional CUs, will set out logical framework, a monitoring and evaluation (M&E) plan, and detailed budget and work breakdown chart to manage effective monitoring, evaluation and reporting. The M&E specialist placed at the federal NFCS CU will take the lead role in this process.

9.1 Monitoring

Action monitoring will be conducted on a monthly basis at woreda and zonal levels, as well as a quarterly basis at regional and federal levels. The monitoring process will be guided by the logical framework and the detailed work and budget breakdown chart. Each of the six lead climates service stakeholders at all level will develop respective detailed work and budget breakdown charts that are consistent with the overall action plan. They will serve as monitoring checklists against which activity and budget progresses are tacked. Experts assigned at each climate service organization will be responsible for monitoring activity progress under the guidance of the M & E specialist at federal NFCS CU.

In addition to monthly and quarterly activity monitoring, annual work and budget revisions will be done by the lead role of the federal NFCS coordination unit.

9.2 Evaluation

A mid-term evaluation of the Strategic Plan will be conducted at the middle of the implementation period (Year 5). The mid-term evaluation is intended to verify whether the theory of change and the logical framework of the Strategic Plan are valid and to adapt courses of action.

End-of-Strategic-Plan evaluation will be conducted during the closure phase (Year 9). The purpose of the end-of-Strategic-Plan evaluation is to assess whether the plan has achieved its goals in an efficient and effective way. It is also aimed at garnering lessons that help inform future programming of climate services.

Both the mid-term and end-of-strategic plan evaluations will be by a team of external consultants. The M&E specialist of the NFCS CU will coordinate the entire process and with support from main climate service stakeholders.

9.3 Reporting

The federal NFCS CU, in consultation with technical experts and regional CUs, will develop a monthly, quarterly, and annual activity progress and budget spending reporting templates. Reporting from woreda to zonal and to regional NFCS CUs will be conducted on monthly basis. A quarterly reporting approach will be followed from Regional Taskforces to the regional NFCS CU and to the regional Steering Committee. The regional CU will report to the federal NFCS CU on quarterly basis and the federal NFCS CU will report to the NFCS Council and to donors on bi-annual basis.

10. Communicating the Strategic Plan

The NMA's Director General, Deputy Director General, and the NFCS focal person at the NMA will be in charge of the Strategic Plan document, ensuring it is shared among different stakeholders via various

channels. Initially, it will be circulated among NFCS Council and sectoral taskforces via electronic and hard copies, followed by stakeholder workshops for endorsement. Then, the endorsed Strategic Plan document, along with the coordination guidelines, will be submitted to the council of Ministers, Regional Presidents and Federal City Mayors for approval as an official plan. It will then be circulated in both soft and hard copies to main national and international stakeholders that encompass government organizations, bilateral and multilateral organizations (WMO, UNDP, DFID, USAID, SIDA, the World Bank, ICPAC, SHMI, IRI, GIZ, etc.), and NGOs.

During the preparatory phase, national and sub-national stakeholder workshops will be facilitated by the NMA to familiarize the NFCS to wide range of stakeholders including the private sector, academia and research. Once the NFCS CUs are set up at federal and regional levels, they will continue to share the Strategic Plan to relevant stakeholders. During the implementation period, the NFCS coordination unit will develop a communications strategy.

11. Annexes

Annex A: NFCS Theory of Change

The problem context

Major economic sectors such as water, agriculture, and health and livelihoods in Ethiopia are increasingly becoming sensitive to the variability of weather and climate. Low levels of institutional capacities in providing decision-relevant climate services is one of the main factors that have contributed to low resilience of sectors and livelihoods to the impacts of weather and climate extremes. Strong policies and standard operating procedures to advance climate services are often lacking, and coordination among climate service stakeholders is loose and not binding. Staff knowledge and skills in climate analysis, weather forecasting, climate prediction, modelling, projection, and research are minimal. Technologies and financial resources that help increase institutional capacities are insufficient. Climate data quality, timeliness and reliability of climate services, and uptake by end users is limited. In-depth assessment of users' needs and co-development of climate services have not been parts of institutional cultures and practices.

The aspired change

Stakeholders of climate services envision to seeing Ethiopians whose livelihoods are resilient through climate-informed decisions. For their vision to come true, they have set seven interdependent strategic goals (impact level changes). These are:

1) Sustainable and climate resilient water resources and power supply;

2) Sustainable and climate resilient agriculture and food security;

3) Improved health status of climate vulnerable populations;

4) Reduced vulnerability to Hydro-met risks;

5) Enhanced sustainability of environmental and forest resources;

6) Achievement of CRGE strategy and National Adaptation Plans; and

7) Climate resilient Ethiopia.

These strategic goals are materialized through five outcomes that relate to increased climate risk anticipatory and management capacity of climate service institutions in water and energy, agriculture, health, DRM, and environment and forestry sectors.

In order to ensure increased anticipatory and management capacity, stakeholders of climate services in Ethiopia have set 10 objectives (outputs). The first four objectives relate to building capacity, while the other six objectives relate to improved climate services. These objectives include:

1) Trained and skilled NMA, MoWIE, MoA, MoH, NDRMC, EFCCC staff;
2) Coherent research, M&E, and knowledge management system;
3) Improved observation, data management, and prediction infrastructure;
4) Effective multi-sectoral (water, agriculture, health, DRM, and environment) institutional policy framework and governance;
5) Improved availability, quality, and delivery of climate data and forecasts;
6) Improved availability, quality, and delivery of Hydro-met services;
7) Improved availability, quality, and delivery of Agro-met services;
8) Improved availability, quality, and delivery of Bio-met services;
9) Improved availability and delivery of quality early warning services; and
10) Improved availability, quality, delivery of environmental meteorological services.

How change happens

The process of change under Ethiopia's NFCS involves five major steps in an interconnected, complementary and non-linear fashion. The first step is consensus**,** the second step is management, the third step is building capacities, the fourth step is delivering climate services, and the fifth step is impact and sustainability.

Step 1: Consensus

If consensus among climate institutions is reached on the problems in climate services, **then** they will be able to design, implement, and manage relevant measures.

Step 2: Management

If the NMA, in collaboration with stakeholders, is able to establish NFCS Coordination Units at federal, regional, zonal, and woreda levels, **then** the coordination units will serve as hubs for nurturing partnerships, monitoring and evaluation, knowledge management, quality assurance, accountability, and designing new interventions that build on lessons from preceding interventions.

Step 3: Building capacities

If needs-based trainings and educational programs in climate services are designed and offered to staff in climate institutions, **then** their level of knowledge and skills in climate analysis, forecasting, prediction, projection, and modelling will be increased to the required level. This will also contribute to increased institutional capacities and eventually to production and management of decision-relevant climate services.

If climate institutions identify and implement joint research projects to produce knowledge, ***and if*** they set up digital knowledge management library for sharing, ***and if*** an effective monitoring and evaluation system is put in place, ***then*** knowledge in climate services will be effectively managed. This will also contribute to increased institutional capacities and eventually to production and management of decision relevant climate services.

If climate institutions are equipped with modern and contextually applicable technologies for climate services such as automatic observation networks, high capacity computational facilities, and software packages, ***then*** they will be able to generate better quality climate data and produce analytical products. The same will contribute to increased institutional capacities and eventually to production and management of decision relevant climate services.

If climate institutions are able to revitalize existing and/or establish new and strong face-to-face and web-based partnership platforms, ***and if*** they strengthen existing and set up new policies and SOPs, ***and if*** they nurture strong partnerships with local, national and international stakeholders, ***then*** they will have established well-functioning coordination mechanisms and have policies and procedures that help improve climate services. This will also contribute to increased institutional capacities and eventually to the production and management of decision relevant climate services.

Step 4: Delivering services

If the NMA, in collaboration with its allies, is able to co-produce and deliver climate and weather observations, forecast, prediction, and projection including impacts and advisories, ***and if*** it is able to improve its data quality management system, ***and if*** it is able to improve aviation weather forecast according to ICAO standards, ***and if*** it pilots and applies impact-based weather forecasting, ***then*** quality, availability, and delivery of meteorological services will be improved.

If the NMA and MoWIE, in collaboration with their stakeholder, are able to co-produce and deliver Hydro-met observations, forecast, prediction, and projection including impacts and advisories, ***and if*** it is able to improve its data quality management system, ***then*** quality, availability, and delivery of Hydro-met services will be improved.

If the NMA and MoA, in collaboration with their stakeholder, are able to co-produce and deliver Agro-met observations, forecast, prediction, and projection including impacts and advisories, ***and if*** it is able to improve its data quality management system, ***then*** availability and quality of Agro-met services will be improved.

If the NMA and MoH, in collaboration with its stakeholder, is able to co-produce and deliver Bio-met observations, forecast, prediction, and projection including impacts and advisories, ***and if*** it is able to improve its data quality management system, ***then*** quality, availability and delivery of Bio-met services will be improved.

If the NMA and the NDRMC, in collaboration with its stakeholder, is able to co-produce and deliver DRM observations, forecast, prediction, and projection including impacts and advisories, ***and if*** it is able to improve its data quality management system, ***then*** quality, availability and delivery of climate relevant DRM services will be improved.

If the NMA and EFCCC, in collaboration with its stakeholder, is able to co-produce and deliver environmental observations, forecast, prediction, and projection including impacts and advisories, ***and if*** it is able to improve its data quality management system, ***then*** quality, availability and delivery of climate relevant environmental protection services will be improved.

If *the* NMA, in collaboration with its stakeholder s, is able to launch multi-lingual radio and TV channels for climate services, ***then*** effective and user-friendly climate service dissemination routs will be set up and climate services will reach diverse groups of users.

Step 5: User outcome stage

If the quality, availability and delivery of Hydro-met services are improved, ***and if*** MoWIE and its stakeholder community are supported by training and an enabling institutional and policy environment, ***then*** MoWIE and other water resource management decision-makers (e.g., river basin authorities, reservoir and hydroelectric generation managers) will use Hydro-met services to anticipate and manage climate-driven supply fluctuations.

If the quality, availability and delivery of Agro-met services are improved, ***and if*** MoA, agricultural extension, and other agricultural stakeholders are supported by training and an enabling institutional and policy environment, ***then*** MoA, farmers, agricultural advisors, value chain actors, local government, PSNP, and other agriculture sector decision-makers, will use Agro-met services to understand, anticipate and manage climate-related risks.

If the quality, availability and delivery of Bio-met services are improved, ***and if*** MoH and its stakeholder community are supported by training and an enabling institutional and policy environment, ***then*** MoH, One WASH, health NGOs, public health workers and other health sector stakeholders will use Bio-met services to understand, prepare for and mitigate climate-sensitive diseases and other climate-driven human health threats.

If the quality, availability and delivery of early warning services are improved, ***and if*** NDRMC and its stakeholder community are supported by training and an enabling institutional and policy environment, ***then*** NDRMC, humanitarian organizations, local government, other disaster risk reduction stakeholders, and local communities will use early warning services anticipate, and implement early, well-targeted disaster prevention and mitigation actions.

If the quality, availability and delivery of environmental met services are improved, ***and if*** EFCCC and its stakeholder community are supported by training and an enabling institutional and policy environment, ***then*** EFCCC and managers of environmental and forest resources will use environmental met services to manage these resources, and EFCCC will use climate information to guide climate change adaptation under Ethiopia's NAP and Climate Resilient Green Economy strategy.

Step 6: Impact and sustainability stage

If the MoWIE and other water resource management decision-makers (e.g., river basin authorities, reservoir and hydroelectric generation managers) use Hydro-met services to anticipate and manage

climate-driven supply fluctuations, ***then*** use of Ethiopia's water and hydroelectric resources will be more reliable, sustainable, and resilient to climate variations.

If the MoA, farmers, agricultural advisors, value chain actors, local government, PSNP and other agriculture sector decision-makers use Agro-met services to understand, anticipate and manage climate-related risks, ***then*** food security and economic growth of Ethiopia's farmers and agriculture economy will improve.

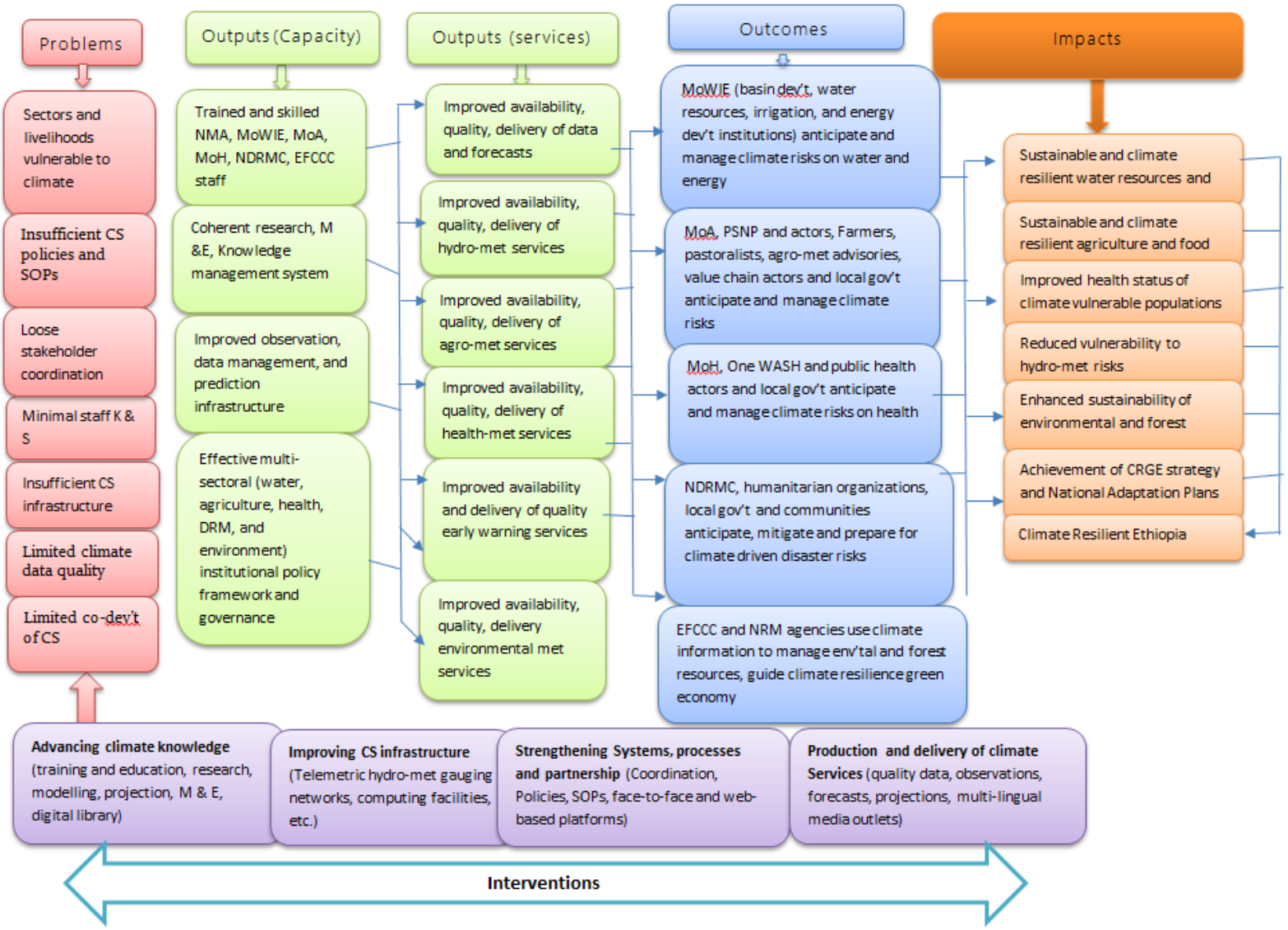
If the MoH, One WASH, health NGOs, public health workers and other health sector stakeholders use Bio-met services to understand, prepare for and mitigate climate-sensitive diseases and other climate-driven human health threats, ***then*** the effectiveness of Ethiopia's public health system and the health status of its vulnerable populations will improve.

If the NDRMC, humanitarian organizations, local government, other disaster risk reduction stakeholders, and local communities use early warning services anticipate, and implement early, well-targeted disaster prevention and mitigation actions, ***then*** immediate and long-term impacts from hydro-meteorological disasters will be reduced.

If the EFCCC and managers of environmental and forest resources use environmental met services to manage these resources, ***then*** sustainability of Ethiopia's environmental and forest resources will improve.

If the EFCCC uses climate information to guide climate change adaptation under Ethiopia's NAP and Climate Resilient Green Economy (CRGE) strategy, ***then*** Ethiopia's long-term adaptation goals will be achieved.

If climate services contribute to improvements in water and hydroelectric resource use, agricultural sector growth and livelihoods, the health of vulnerable populations, disaster risk reduction, environmental and forest sustainability and CRGE implementation, ***then*** Ethiopia's livelihoods and economy will become climate-resilient.


Problems
Outputs (Capacity)
Outputs (services)
Outcomes
Impacts
Sectors and livelihoods vulnerable to climate
Insufficient CS policies and SOPs
Loose stakeholder coordination
Minimal staff K & S
Insufficient CS infrastructure
Limited climate data quality
Limited co-dev't of CS
Trained and skilled NMA, MoWIE, MoA, MoH, NDRMC, EFCCC staff
Coherent research, M &E, Knowledge management system
Improved observation, data management, and prediction infrastructure
Effective multi-sectoral (water, agriculture, health, DRM, and environment) institutional policy framework and governance
Improved availability, quality, delivery of data and forecasts
Improved availability, quality, delivery of hydro-met services
Improved availability, quality, delivery of agro-met services
Improved availability, quality, delivery of health-met services
Improved availability and delivery of quality early warning services
Improved availability, quality, delivery environmental met services
MoWIE (basin dev't, water resources, irrigation, and energy dev't institutions) anticipate and manage climate risks on water and energy
MoA, PSNP and actors, Farmers, pastoralists, agro-met advisories, value chain actors and local gov't anticipate and manage climate risks
MoH, One WASH and public health actors and local gov't anticipate and manage climate risks on health
NDRMC, humanitarian organizations, local gov't and communities anticipate, mitigate and prepare for climate driven disaster risks
EFCCC and NRM agencies use climate information to manage env'tal and forest resources, guide climate resilience green economy
Sustainable and climate resilient water resources and
Sustainable and climate resilient agriculture and food
Improved health status of climate vulnerable populations
Reduced vulnerability to hydro-met risks
Enhanced sustainability of environmental and forest
Achievement of CRGE strategy and National Adaptation Plans
Climate Resilient Ethiopia
Advancing climate knowledge (training and education, research, modelling, projection, M & E, digital library)
Improving CS infrastructure (Telemetric hydro-met gauging networks, computing facilities, etc.)
Strengthening Systems, processes and partnership (Coordination, Policies, SOPs, face-to-face and web-based platforms)
Production and delivery of climate Services (quality data, observations, forecasts, projections, multi-lingual media outlets)
Interventions

Annex B: Costed Action Plan

The costed action plan is provided in the following Table

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
A1.1	**Activities under objective 1.1: Knowledge and skills of staffs in climate services institutions at all levels enhanced**												
A1.1.1	**Joint training and educational needs assessment of staff in key climate service institutions**												
A1.1.1.1	*Joint training and educational needs assessment of staff in meteorological services institutions*	*NMA*	*Bilateral and multilateral development partners*	# of assessments	*2*	*2*	"-"	One for training and one for higher education	**20,000**	**40,000**	**0**	**40,000**	Costs for out-of-pocket expenses, travel, accommodation, consultant and publication
A1.1.1.2	*Joint training and educational needs assessment of staff in water and energy services institutions*	*MoWIE*	*NMA, National academic and research institutions, SMHI, media partners, consultants*	# of assessments	*2*	*2*	"-"	One for training and one for higher education	**20,000**	**40,000**	**0**	**40,000**	Costs for out-of-pocket expenses, travel, accommodation
A1.1.1.3	*Joint training and educational needs assessment of staff in Agro-met services institutions*	*MoA*	*ATA, EIAR, NMA, National academic institutions, CGIAR institutions, FAO, media partners, consultants*	# of assessments	*2*	*2*	"-"	One for training and one for higher education	**20,000**	**40,000**	**0**	**40,000**	Costs for out-of-pocket expenses, travel, accommodation
A1.1.1.4	*Joint training and educational needs assessment of staff in Bio-met services*	*MoH*	*WHO, NMA, EPHI, National academic and research institutions, IRI, media partners, consultants*	# of assessments	*2*	*2*	"-"	One for training and one for higher education	**20,000**	**40,000**	**0**	**40,000**	Costs for out-of-pocket expenses, travel, accommodation
A1.1.1.5	*Joint training and educational needs assessment of staff in DRM services*	*NDRMC*	*NMA, MoWIE, EFCCC, MoA, MoH, National academic and research institutions, UNDP, UNOCHA, consultants*	# of assessments	*2*	*2*	"-"	One for training and one for higher education	**20,000**	**40,000**	**0**	**40,000**	Costs for out-of-pocket expenses, travel, accommodation
A1.1.1.6	*Joint training and educational needs assessment of staff in environmental safeguarding services*	*EFCCC*	*NMA, MoWIE, MoA, MoH, National academic and research institutions, UNDP, media*	# of assessments	*2*	*2*	"-"	One for training and one for higher education	**20,000**	**40,000**	**0**	**40,000**	Costs for out-of-pocket expenses, travel, accommodation

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
			partners, consultants										
Subtotal (A1.1.1)										**240,000**	**0**	**240000**	
A1.1.2	**Co-development of climate services training and reference materials**												
A1.1.2.1	*Co-development of nationally appropriate meteorological services training and reference materials*	*NMA*	*Bilateral and multilateral development partners, research and academic institutions*	# of training and reference materials	*24*	*24*	"-"	Themes of training to be prioritized and the numbers of training materials would change	**10,000**	**240,000**	**0**	**240,000**	Costs for professional fee and on-demand travel and accommodation, review meeting and printing
A1.1.2.2	*Co-development of nationally appropriate water and energy services training and reference materials*	*MoWIE*	*NMA, National academic and research institutions, SMHI, media partners, consultants*	# of training and reference materials	*15*	*15*	"-"	Themes of training to be prioritized and the numbers of training materials would change	**8,000**	**120,000**	**0**	**120,000**	Costs for professional fee and on-demand travel and accommodation
A1.1.2.3	*Co-development of nationally appropriate Agro-met services training and reference materials*	*MoA*	*ATA, EIAR, NMA, National academic institutions, CGIAR institutions, FAO, media partners, consultants*	# of training and reference materials	*15*	*15*	"-"	Themes of training to be prioritized and the numbers of training materials would change	**8,000**	**120,000**	**0**	**120,000**	Costs for professional fee and on-demand travel and accommodation
A1.1.2.4	*Co-development of nationally appropriate Bio-met services training and reference materials*	*MoH*	*WHO, NMA, EPHI, National academic and research institutions, IRI, media partners, consultants*	# of training and reference materials	*9*	*9*	"-"	Themes of training to be prioritized and the numbers of training materials would change	**8,000**	**72,000**	**0**	**72,000**	Costs for professional fee and on-demand travel and accommodation
A1.1.2.5	*Co-development of nationally appropriate DRM services training and reference materials*	*NDRMC*	*NMA, MoWIE, EFCCC, MoA, MoH, National academic and research institutions, UNDP, UNOCHA, consultants*	# of training and reference materials	*12*	*12*	"-"	Themes of training to be prioritized and the numbers of training materials would change	**8,000**	**96,000**	**0**	**96,000**	Costs for professional fee and on-demand travel and accommodation
A1.1.2.6	*Co-development of nationally appropriate environmental protection services*	*EFCCC*	*NMA, MoWIE, MoA, MoH, National academic and research institutions, UNDP, media*	# of training and reference materials	*12*	*12*	"-"	Themes of training to be prioritized and the numbers of training materials would change	**8,000**	**96,000**	**0**	**96,000**	Costs for professional fee and on-demand travel and accommodation

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
	training and reference materials		*partners, consultants*										
Subtotal (A1.1.2)										**744,000**	**0**	**744,000**	
A1.1.3	**Delivery of tailored thematic trainings in priority sectors of climate services**												
A1.1.3.1	*Delivery of tailored ToT training in meteorological services (observation, data analysis, forecasting, research, modelling, projection, etc)*	*NMA*	*Bilateral and multilateral development partners, research and academic institutions*	# of trainees	*360*	*360*	"-"	Four rounds of training sessions per year and two training themes per session for three consecutive years of the planning period. Maximum of 30 trainees per session	**400**	**144,000**	**0**	**144,000**	Costs for trainers' fee, travel, accommodation, venue, and associated expenses
A1.1.3.2	*Delivery of tailored training in water and energy services*	*MoWIE*	*NMA, National academic and research institutions, SMHI, media partners, consultants*	# of trainees	*1033*	*1033*	"-"	60 trainees at national level, 99 at regional level, and 74 at zonal level and 800 at woreda level	**400**	**413,200**	**0**	**413,200**	Costs for trainers' fee, travel, accommodation, venue, and associated expenses. Costs will be lower at woreda level.
A1.1.3.3	*Delivery of tailored training in Agro-met services*	*MoA*	*ATA, EIAR, NMA, National academic institutions, CGIAR institutions, FAO, media partners, consultants*	# of trainees	*2663*	*2663*	"-"	90 trainees at national level, 99 at regional level, 74 at zonal level, and 2400 at woreda level	**400**	**1,065,200**	**0**	**1,065,200**	Costs for trainers' fee, travel, accommodation, venue, and associated expenses. Costs will be lower at woreda level.
A1.1.3.4	*Delivery of tailored training in Bio-met services*	*MoH*	*WHO, NMA, EPHI, National academic and research institutions, IRI, media partners, consultants*	# of trainees	*1066*	*1066*	"-"	90 trainees at national level, at regional level, 94 at zonal level and 800 at woreda level	**400**	**426,400**	**0**	**426,400**	Costs for trainers' fee, travel, accommodation, venue, and associated expenses. Costs will be lower at woreda level.
A1.1.3.5	*Delivery of tailored training in DRM services*	*NDRMC*	*NMA, MoWIE, EFCCC, MoA, MoH, National academic and research institutions, UNDP, UNOCHA, consultants*	# of trainees	*934*	*934*	"-"	60 trainees at national level, 66 at regional level, 74 at zonal level, and 800 at woreda level	**400**	**373,600**	**0**	**373,600**	Costs for trainers' fee, travel, accommodation, venue, and associated expenses. Costs will be lower at woreda level.

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
A1.1.3.6	*Delivery of tailored training in environmental safeguarding services*	*EFCCC*	*NMA, MoWIE, MoA, MoH, National academic and research institutions, UNDP, media partners, consultants*	# of trainees	*934*	*934*	"-"	60 trainees at national level, 66 at regional level, 74 at zonal level, and 800 at woreda level	**400**	**373,600**	**0**	**373,600**	Costs for trainers' fee, travel, accommodation, venue, and associated expenses. Costs will be lower at woreda level.
Subtotal (A1.1.3)										**2,796,000**	**0**	**2,796,000**	
A1.1.4	**Strengthening university level educational programs in climate services**												
A1.1.4.1	*Support national universities to launch new and improve existing MSc and PhD educational programs in meteorological services (observation, forecasting, research, modelling, and projection)*	*NMA*	*WMO, National academic and research institutions, IRI, UK Met Office, SMHI,*	# of MSc and PhD students	*190*	*95*	*95*	Educate 15o MSc and 40 PhD students by working in partnership with AAU, Arbaminch and Mekelle universities	**10,000**	**950,000**	**950,000**	**1,900,000**	Cost includes student allowances, advisor fees, computers, and associated expenses
A1.1.4.2	*Support national universities to launch new and improve exiating MSc and PhD educational programs in water and energy services*	*MoWIE*	*NMA, National academic and research institutions, SMHI*	# of MSc and PhD students	*150*	*150*	"-"	Work in partnership with AAU, Arbaminch and Mekelle universities to educate 74 MSc at zonal level, 55 MSc at regional level, 11 PhD at regional level and 10 PhD at federal level	**5,000**	**750,000**	**0**	**750,000**	Cost includes student allowances, advisor fees, computers, and associated expenses
A1.1.4.3	*Support national universities to launch new and improve existing MSc and PhD educational programs in Agro-met services*	*MoA*	*ATA, EIAR, NMA, National academic institutions, CGIAR institutions, FAO, media partners*	# of MSc and PhD students	*186*	*186*	"-"	Work in partnership with Haramaya, Bahir Dar, Jimma, Hawassa and Mekelle universities to educate 74 MSc at zonal level, 55 MSc at regional level, 33 PhD at regional level, 15 MSc at feral level and 9 PhD at federal level	**5,000**	**930,000**	**0**	**930,000**	Cost includes student allowances, advisor fees, computers, and associated expenses

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
A1.1.4.4	*Support national universities to launch new and improve existing MSc and PhD educational programs in Bio-met services*	*MoH*	*WHO, NMA, EPHI, National academic and research institutions, IRI*	# of MSc and PhD students	*112*	*112*	"-"	Work in partnership with AAU, Gondar and Jimma universities to educate 74 MSc students at zonal level, 22 MSc at regional level, 22 PhD at regional level, 12 MSc at federal level, and 4 PhD at federal level	**5,000**	**560,000**	**0**	**560,000**	Cost includes student allowances, advisor fees, computers, and associated expenses
A1.1.4.5	*Support national universities to launch new and improve existing MSc and PhD educational programs in DRM services*	*NDRMC*	*NMA, MoWIE, EFCCC, MoA, MoH, National academic and research institutions, UNDP, UNOCHA*	# of MSc and PhD students	*112*	*112*	"-"	Work in partnership with Bahir Dar University to educate 74 MSc students at zonal level, 22 MSc at regional level, 12 MSc at federal level and 4 PhD at federal level	**5,000**	**560,000**	**0**	**560,000**	Cost includes student allowances, advisor fees, computers, and associated expenses
A1.1.4.6	*Support national universities to launch new and improve existing MSc and PhD educational programs in environmental safeguarding services*	*EFCCC*	*NMA, MoWIE, MoA, MoH, National academic and research institutions, UNDP*	# of MSc and PhD students	*112*	*112*	"-"	Work in partnership AAU, Jimma and Mekelle universities to educate 74 MSc students at zonal level, 22 MSc at regional level, 12 MSc at federal level, and 4 PhD at federal level	**5,000**	**560,000**	**0**	**560,000**	Cost includes student allowances, advisor fees, computers, and associated expenses
Subtotal (A1.1.4)										**4,310,000**	**950,000**	**5,260,000**	
Subtotal (A1.1)										**8,090,000**	**950,000**	**9,040,000**	
A1.2	**Activities under objective 1.2: Coherent research, M & E, and knowledge management system**												
A1.2.1	**Participatory identification and design of research priorities in climate sensitive sectors**												
A1.2.1.1	*Participatory identification and design of meteorological research priorities*	*NMA*	*National and international academic and research institutions (such as IRI, ICTP, WMO, etc)*	# of research themes	50	50	"-"	The numbers of research themes would change during the readiness phase	**20,000**	**1,000,000**	**0**	**1,000,000**	Costs for venue, out-of-pocket expenses, expert fees and associated expenses
A1.2.1.2	*Conduct climate service forums*	*NMA*	*National, International institutions and development partners*	# forums	5	2	3		**70,000**	**140,000**	**210,000**	**350,000**	Costs include: expert fee, out-of-pocket expenses, travel, accommodation, venue and associated expenses

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
A1.2.1.3	*Participatory identification and design of water and energy research priorities*	*MoWIE*	*NMA, National academic and research institutions, SMHI, media partners, NGOs, consultants*	# of research themes	30	30	"-"	Ditto	**4,500**	**135,000**	**0**	**135,000**	Costs for venue, out-of-pocket expenses, consultant/expert fees and associated expenses
A1.2.1.4	*Participatory identification and design of Agro-met research priorities*	*MoA*	*ATA, EIAR, NMA, National academic institutions, CGIAR institutions, FAO, media partners, consultants*	# of research themes	30	30	"-"	Ditto	**4,500**	**135,000**	**0**	**135,000**	Costs for venue, out-of-pocket expenses, consultant/expert fees and associated expenses
A1.2.1.5	*Participatory identification and design of Bio-met research priorities*	*MoH*	*WHO, NMA, EPHI, National academic and research institutions, IRI, media partners, consultants*	# of research themes	15	15	"-"	Ditto	**4,500**	**67,500**	**0**	**67,500**	Costs for venue, out-of-pocket expenses, consultant/expert fees and associated expenses
A1.2.1.6	*Participatory identification and design of DRM research priorities*	*NDRMC*	*NMA, MoWIE, EFCCC, MoA, MoH, National academic and research institutions, UNDP, UNOCHA, NGOs, consultants*	# of reasearch themes	15	15	"-"	Ditto	**2,000**	**30,000**	**0**	**30,000**	Costs for venue, out-of-pocket expenses, consultant/expert fees and associated expenses
A1.2.1.7	*Participatory identification and design of environmental safeguarding research priorities*	*EFCCC*	*NMA, MoWIE, MoA, MoH, National academic and research institutions, UNDP, media partners, NGOs, consultants*	# of reasearch themes	15	15	"-"	Ditto	**4,500**	**67,500**	**0**	**67,500**	Costs for venue, out-of-pocket expenses, consultant/expert fees and associated expenses
Subtotal (A1.2.1)										**1,575,000**	**210,000**	**1,785,000**	
A1.2.2	**Launch joint research, modelling and projection projects in priority research themes**												
A1.2.2.1	*Launch joint meteorological research, modelling and projection projects*	*NMA*	*WMO, National academic and research institutions, IRI, UK Met Office, SMHI, media partners, consultants*	# of reasearch themes	50	30	20		**10,000**	**300,000**	**200,000**	**500,000**	Costs include: expert/consultant fee, out-of-pocket expenses, travel, accommodation and associated expenses

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
A1.2.2.2	*Launch joint water and energy research, modelling and projection projects*	*MoWIE*	*NMA, National academic and research institutions, SMHI, media partners, NGOs, consultants*	# of research themes	35	30	5		10,000	300,000	50,000	350,000	Costs include: expert/consultant fee, out-of-pocket expenses, travel, accommodation and associated expenses
A1.2.2.3	*Launch joint Agro-met research, modelling and projection projects*	*MoA*	*ATA, EIAR, NMA, National academic institutions, CGIAR institutions, FAO, media partners, NGOs*	# of research themes	30	30	"-"		10,000	300,000	0	300,000	Costs include: expert/consultant fee, out-of-pocket expenses, travel, accommodation and associated expenses
A1.2.2.4	*Launch joint Bio-met research, modelling and projection projects*	*MoH*	*WHO, NMA, EPHI, National academic and research institutions, IRI, media partners, NGOs, consultants*	# of research themes	15	15	"-"		10,000	150,000	0	150,000	Costs include: expert/consultant fee, out-of-pocket expenses, travel, accommodation and associated expenses
A1.2.2.5	*Launch joint DRM research, modelling and projection projects*	*NDRMC*	*NMA, MoWIE, EFCCC, MoA, MoH, National academic and research institutions, UNDP, UNOCHA, NGOs, consultants*	# of research themes	15	15	"-"		10,000	150,000	0	150,000	Costs include: expert/consultant fee, out-of-pocket expenses, travel, accommodation and associated expenses
A1.2.2.6	*Launch joint environmental safeguarding research, modelling and projection projects*	*EFCCC*	*NMA, MoWIE, MoA, MoH, National academic and research institutions, UNDP, media partners, NGOs, consultants*	# of research themes	15	15	"-"		10,000	150,000	0	150,000	Costs include: expert/consultant fee, out-of-pocket expenses, travel, accommodation and associated expenses
Subtotal (A1.2.2)										1,350,000	250,000	1,600,000	
A1.2.3	**Launch digital climate services knowledge management library**												
A1.2.3.1	*Establish NMA's Digital Knowledge Management Facility (Library)*	*NMA*	*National, International institutions and development partners*	# of facility	1	1	"-"		150,000	150,000	0	150,000	Procurement of servers, installation, display, electronic books and publication, softwares,

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
A1.2.3.2	*set up electronic water and energy knowledge management library*	*MoWIE*	*NMA, National academic and research institutions, SMHI*	# of digital libraries	1	1	"-"		**15,000**	**15,000**	**0**	**15,000**	Costs for expert/consultant at set up stage and will be managed by organizational IT experts after then
A1.2.3.3	*set up electronic Agro-meteorological knowledge management library*	*MoA*	*ATA, EIAR, NMA, National academic institutions, CGIAR institutions, FAO, media partners, private IT firms*	# of digital libraries	1	1	"-"		**15,000**	**15,000**	**0**	**15,000**	Costs for expert/consultant at set up stage and will be managed by organizational IT experts after then
A1.2.3.4	*set up electronic Bio-met knowledge management library*	*MoH*	*WHO, NMA, EPHI, National academic and research institutions, IRI, private IT firms*	# of digital libraries	1	1	"-"		**15,000**	**15,000**	**0**	**15,000**	Costs for expert/consultant at set up stage and will be managed by organizational IT experts after then
A1.2.3.5	*set up electronic DRM knowledge management library*	*NDRMC*	*NMA, MoWIE, EFCCC, MoA, MoH, National academic and research institutions, UNDP, UNOCHA, private IT firms*	# of digital libraries	1	1	"-"		**15,000**	**15,000**	**0**	**15,000**	Costs for expert/consultant at set up stage and will be managed by organizational IT experts after then
A1.2.3.6	*set up electronic environmental safeguarding knowledge management library*	*EFCCC*	*NMA, MoWIE, MoA, MoH, National academic and research institutions, UNDP, private IT firms*	# of digital libraries	1	1	"-"		**15,000**	**15,000**	**0**	**15,000**	Costs for expert/consultant at set up stage and will be managed by organizational IT experts after then
Subtotal (A1.2.3)										**225,000**	**0**	**225,000**	
A1.2.4	**Establish effective monitoring and evaluation system**												

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
A1.2.4.1	*Establish effective monitoring and evaluation system for climate services*	*NMA*	*MoWIE, MoA, MoH, NDRMC, EFCCCand other bilateral and multilateral organizations*	M & E system	*1*	*1*	"-"	This involves all actions relevant to M & E including setting up an M & E plan, baseline assessments, operational performance monitoring plan, mid-term evaluation plan, final evaluation plan, sharing of lessons among stakeholders, integrating research and learning outputs into elements of the strategic plan, etc.	**150,000**	**150,000**	**0**	**150,000**	
Subtotal (A1.2.4)										**150,000**	**0**	**150,000**	
Subtotal (A1.2)										**3,300,000**	**460,000**	**3,760,000**	
A1.3	**Activities under Objective 1.3: Improved observation, data management, and prediction infrastructure**												
A1.3.1	*Expanding automatic weather stations (AWSs)*	*NMA*	*Bilateral and multilateral organizations, NGOs, Private met equipment suppliers*	# of AWSs	1000	500	500	1000 additional AWSs are assumed to have good geographical representation for ethiopia and we have 270 at baseline.Two Mobile calibration unit for each RMSC	**21,000**	**10,500,000**	**10,500,000**	**21,000,000**	Costs for procurement, installation, calibration, maintenance, and associated management costs
A1.3.2	*Mobile calibration unit*	*NMA*	*Bilatera and multilateral organizations, NGOs etc*	#Vehicles	22	19	3	Two Mobile calibration unit for each RMSC	**50,000**	**950,000**	**150,000**	**1,100,000**	Costs for procurement, installation, distribution, maintenance, and associated management costs
A1.3.3	*Improve and expand Radar networks*	*NMA*	*Bilateral and multilateral organizations, NGOs, international radar suppliers*	# of Radar networks	6	3	3	One Radar network is already installed and another six are expected.	**2,500,000**	**7,500,000**	**7,500,000**	**15,000,000**	Costs for procurement, calibration, installation, maintenance, and associated management costs
A1.3.4	*Improve and expand air quality monitoring networks*	*NMA*	*EFCCC, MoH, Bilateral and multilateral organizations, NGOs, academic and research institutions, Private met equipment suppliers*	# of air quality observation stations	50	20	30	3 are already installed and 10 mobile stations will be added by this SP	**20,000**	**400,000**	**600,000**	**1,000,000**	Costs for procurement, calibration, installation, maintenance, and associated management costs
A1.3.5	*Expanding hydrological gauging networks*	*MoWIE*	*Bilateral and multilateral organizations, NGOs, Private Hydro-met equipment suppliers*	# of ground water gauging stations	400	400	"-"	One ground water guaging station in 50% of total woredas	**15,000**	**6,000,000**	**0**	**6,000,000**	Costs for construction of simple observation wells, monitoring, and

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
													associated expenses
A1.3.6	Establish centralized hub of high-performance computing facilities for climate research, modelling, and projection	NMA	WMO, National academic and research institutions, IRI, UK Met Office, SMHI, MoWIE, EFCCC, MoA, NDRMC, MoH, Private high-tech computer suppliers	# of central computing facility	1	1	"-"	A high computing facility with 100 tera bytes storage, 40 cores and 2 login nodes will be centrally managed but, in a way, to serve all climate system researchers and modellers nationwide.	1,500,000	1,500,000	0	1,500,000	Costs for procurement, calibration, installation, maintenance, and associated management costs
A1.3.7	National Data Center	NMA			1	1	"-"		800,000	800,000	0	800,000	
A1.3.8	Run high quality softaware packages for improved meteorological services	NMA	WMO, National academic and research institutions, IRI, UK Met Office, SMHI, NGOs, consultants	# of software packages	4	4	"-"	One for modelling and projection, one for Numerical weather prediction and one for statistical computing and one for mapping	15,000	60,000	0	60,000	Costs for procurement, calibration, installation, maintenance, and associated management costs
A1.3.9	*Run high quality softaware packages for improved water and energy services*	*MoWIE*	*NMA, National academic and research institutions, SMHI, NGOs, consultants*	# of software packages	4	4	"-"	One for hydrologic modelling & projection; one for energy modelling; one for statistical analysis; and one for mapping	15,000	60,000	0	60,000	Costs for procurement, calibration, installation, maintenance, and associated management costs
A1.3.10	*Procure and manage Agro-met monitoring drone*	*MoA*	*ATA, EIAR, NMA, National academic institutions, CGIAR institutions, FAO, media partners, NGOs, international manufacturers*	# of drones	4	4	"-"		75,000	300,000	0	300,000	Costs for procurement, maintenance, and associated management costs
A1.3.11	*Run high quality softaware packages for improved Agro-met services*	*MoA*	*ATA, EIAR, NMA, National academic institutions, CGIAR institutions, FAO, media partners, NGOs, international manufacturers*	# of software packages	5	5	"-"	One for annual crops and pasture modelling, one for perennial crops modelling; one for watershed management modelling, one for livestock yield modelling and one for livestock disease	15,000	75,000	0	75,000	Costs for procurement, calibration, installation, maintenance, and associated management costs

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
A1.3.12	*Run high quality software packages for improved health services*	*MoH*	*WHO, NMA, EPHI, National academic and research institutions, IRI, NGOs, consultants*	# of software packages	3	3	"-"	One for climate sensitive disease modelling and projection; one for statistical analysis; and one for mapping	**15,000**	**45,000**	**0**	**45,000**	Costs for procurement, calibration, installation and maintenance
A1.3.13	*Run high quality software packages for improved DRM services*	*NDRMC*	*NMA, MoWIE, EFCCC, MoA, MoH, National academic and research institutions, UNDP, UNOCHA, consultants*	# of software packages	3	3	"-"	One for climate sensitive disease modelling and projection; one for statistical analysis; and one for mapping	**15,000**	**45,000**	**0**	**45,000**	Costs for procurement, calibration, installation and maintenance
A1.3.14	*Procure and manage fire extinguishing aircraft (helicopter)*	*NDRMC*	*Ministry of Defense, NMA, EFCCC, international manufacturers*	# of helicopters	1	1	"-"	These helicopters would have co-benefits such as in crop protection	**2,500,000**	**2,500,000**	**0**	**2,500,000**	Costs for procurement, maintenance, and management
A1.3.15	*Expand woreda-net infrastructure*	*NDRMC*	*NMA, MoWIE, EFCCC, MoA, MoH, National academic and research institutions, UNDP, UNOCHA, private IT service providers*	# of woreda net infrastructure	400	400	"-"	Covering 50% of woredas during the SP period	**5,000**	**2,000,000**	**0**	**2,000,000**	Costs for procurement, calibration, installation and maintenance
A1.3.16	*Run high quality software packages for improved environmental safeguarding services*	*EFCCC*	*NMA, MoWIE, MoA, MoH, National academic and research institutions, UNDP, NGOs, consultants*	# of software packages	3	3	"-"	One for climate change modelling and projection; one one for statistical analysis; and one for forest analysis and mapping	**15,000**	**45,000**	**0**	**45,000**	Costs for procurement, calibration, installation and maintenance
Subtotal (A1.3)										**32,780,000**	**18,750,000**	**51,530,000**	
A1.4	**Activities under Objective 1.4: Effective multi-sectoral (water, agriculture, health, DRM, and environment) institutional policy framework and governance**												
A1.4.1	**Revitalizing face-to-face UIPs at all levels**												
A1.4.1.1	*Strengthen climate outlook forums at national and sub-national levels*	*NMA*	*MoWIE, MoA, MoH, NDRMC, EFCCC and other sectoral government and non-government institution.*	# of forums	886	886	"-"	One at federal level, 11 at regional level, 74 at zonal level and 800 at woreda level	**5,000**	**4,430,000**	**0**	**4,430,000**	Costs to cover travel, accommodation, out-of-pocket, and associated expenses. Costs get lower at zonal and woreda levels.

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
A1.4.1.2	*Strengthen Hydro-met forums at national and regional levels*	*MoWIE*	*NMA, MoA, MoH, NDRMC, EFCCC, UNDP, National academic and research institutions, NGOs*	# of forums	12	12	"-"	One at federal level and 11 at regional level. Forums at zonal and woreda levels are addressed under A1.4.1.1 by NMA	**10,000**	**120,000**	**0**	**120,000**	Costs to cover travel, accommodation, out-of-pocket, and associated expenses.
A1.4.1.3	*Strengthen Agro-met forums at national and sub-national levels*	*MoA*	*ATA, EIAR, NMA, National academic institutions, CGIAR institutions, FAO, media partners, NGOs*	# of forums	12	12	"-"	Ditto	**10,000**	**120,000**	**0**	**120,000**	Costs to cover travel, accommodation, out-of-pocket, and associated expenses.
A1.4.1.4	*Strengthen Bio-met forums at national and sub-national levels*	*MoH*	*WHO, NMA, EPHI, National academic and research institutions, IRI, NGOs*	# of forums	12	12	"-"	Ditto	**10,000**	**120,000**	**0**	**120,000**	Costs to cover travel, accommodation, out-of-pocket, and associated expenses.
A1.4.1.5	*Strengthen DRM forums at national and sub-national levels*	*NDRMC*	*NMA, MoWIE, EFCCC, MoA, MoH, National academic and research institutions, UNDP, UNOCHA, NGOs*	# of forums	12	12	"-"	Ditto	**5,000**	**60,000**	**0**	**60,000**	Costs to cover travel, accommodation, out-of-pocket, and associated expenses.
A1.4.1.6	*Strengthen EFCCC forums at national and sub-national levels*	*EFCCC*	*NMA, MoWIE, NDRMC, MoA, MoH, National academic and research institutions, UNDP, UNOCHA, NGOs*	# of forums	12	12	"-"	Ditto	**10,000**	**120,000**	**0**	**120,000**	Costs to cover travel, accommodation, out-of-pocket, and associated expenses.
Subtotal (A1.4.1)										**4,970,000**	**0**	**4,970,000**	
A1.4.2	**Launching new and strengthening existing web-based UIPs in all priority climate service institutions**												
A1.4.2.1	*Improve the quality of NMA's existing web-based user interface platform*	*NMA*	*WMO, National academic and research institutions, IRI, UK Met Office, SMHI, NGOs, private IT firms*	# of websites	1	1	"-"	Capacity building of staffs to maintain and run NMA maproom and website	**45,000**	**45,000**	**0**	**45,000**	Costs for consultants, IT infrastructure and associated expenses
A1.4.2.2	*Set up web-based water and energy user interface platform*	*MoWIE*	*NMA, National academic and research institutions, SMHI, NGOs,*	# of websites	1	1	"-"		**45,000**	**45,000**	**0**	**45,000**	Ditto

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
			private IT firms										
A1.4.2.3	*Set up web-based Agro-met user interface platform*	*MoA*	*ATA, EIAR, NMA, National academic institutions, CGIAR institutions, FAO, media partners, NGOs, private IT firms*	# of websites	1	1	"-"		**45,000**	**45,000**	**0**	**45,000**	Ditto
A1.4.2.4	*Set up web-based Bio-met user interface platform*	*MoH*	*WHO, NMA, EPHI, National academic and research institutions, IRI, NGOs, private IT firms*	# of websites	1	1	"-"		**45,000**	**45,000**	**0**	**45,000**	Ditto
A1.4.2.5	*Improve the quality of existing web-based DRM user interface platform (WDRP)*	*NDRMC*	*NMA, MoWIE, EFCCC, MoA, MoH, National academic and research institutions, UNDP, UNOCHA, NGOs, private IT firms*	# of websites	1	1	"-"		**45,000**	**45,000**	**0**	**45,000**	Ditto
A1.4.2.6	*Set up web-based environmental safeguarding user interface platform*	*EFCCC*	*NMA, MoWIE, MoA, MoH, National academic and research institutions, UNDP, NGOs, private IT firms*	# of websites	1	1	"-"		**45,000**	**45,000**	**0**	**45,000**	Ditto
Subtotal (A1.4.2)										**270,000**	**0**	**270,000**	
A1.4.3	**Strengthen existing and develop new policies and SOPs**												
A1.4.3.1	*Improve existing and develop new meteorological services policies and SOPs in line with acceptable international and national standards*	*NMA*	*WMO, National academic and research institutions, IRI, UK Met Office, SMHI, NGOs*	# SOPs	7	7	"-"	Data access and utilization policySOPs for Data quality management; SOPs for partnerships; SOPs for extreme events monitoring; SOPs for PWS media guide; HR policy; climate research strategy	**10,000**	**70,000**	**0**	**70,000**	Costs for expert/consultant fees, travel, accommodation, out-of-pocket and associated expenses

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
A1.4.3.2	*Improve existing and develop new water and energy services policies and SOPs in line with acceptable international, regional, and national standards*	*MoWIE*	*NMA, National academic and research institutions, SMHI, NGOs*	# of policies	5	5	"-"	Hydro-met data access and utilization policy; SOPs for Data quality management; SOPs for partnerships; HR policy; Hydro-met strategy	**10,000**	**50,000**	**0**	**50,000**	Costs for expert/consultant fees, travel, accommodation, out-of-pocket and associated expenses
A1.4.3.3	*Improve existing and develop new Agro-met services policies and SOPs in line with acceptable international, regional, and national standards*	*MoA*	*ATA, EIAR, NMA, National academic institutions, CGIAR institutions, FAO, media partners, NGOs*	# of policies	5	5	"-"	Agro-met data access and utilization policy; SOPs for Data quality management; SOPs for partnerships; HR policy; Agro-met strategy	**10,000**	**50,000**	**0**	**50,000**	Costs for expert/consultant fees, travel, accommodation, out-of-pocket and associated expenses
A1.4.3.4	*Improve existing and develop new Bio-met services policies and SOPs in line with acceptable international, regional, and national standards*	*MoH*	*WHO, NMA, EPHI, National academic and research institutions, IRI, NGOs*	# of policies	6	6	"-"	Bio-met data access and utilization policy; SOPs for Data quality management; SOPs for partnerships; HR policy; Bio-met strategy	**10,000**	**60,000**	**0**	**60,000**	Costs for expert/consultant fees, travel, accommodation, out-of-pocket and associated expenses
A1.4.3.5	*Improve existing and develop new DRM services policies and SOPs in line with acceptable international, regional, and national standards*	*NDRMC*	*NMA, MoWIE, EFCCC, MoA, MoH, National academic and research institutions, UNDP, UNOCHA, NGOs*	# of policies	5	5	"-"	DRM data access and utilization policy; SOPs for Data quality management; DRM mainstreaming guide; SOPs for partnerships; HR policy;	**10,000**	**50,000**	**0**	**50,000**	Costs for expert/consultant fees, travel, accommodation, out-of-pocket and associated expenses
A1.4.3.6	*Improve existing and develop new environmental safeguarding services policies and SOPs in line with acceptable international, regional, and*	*EFCCC*	*NMA, MoWIE, MoA, MoH, National academic and research institutions, UNDP, NGOs*	# of policies	5	5	"-"	Environmental data access and utilization policy; SOPs for Data quality management; environmental mainstreaming guide; SOPs for partnerships; HR policy	**10,000**	**50,000**	**0**	**50,000**	Costs for expert/consultant fees, travel, accommodation, out-of-pocket and associated expenses

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
	national standards												
Subtotal (A1.4.3)										**330,000**	**0**	**330,000**	
A1.4.4	**Refine staffing structure in climate service institutions**												
A1.4.4.1	*Refine staffing structure in meteorological services institutions*	*NMA*		Staff structure	2	1	1	This process is limited to the purpose for climate services	**50,000**	**50,000**	**50,000**	**100,000**	Costs for meeting venue, expert/ consultsnt fee, travel and other out-of-pocket expenses for staff interview
A1.4.4.2	*Refine staffing structure in water and energy services institutions*	*MoWIE*		Staff structure	1	1	"-"	Ditto	**12,000**	**12,000**	**0**	**12,000**	Ditto
A1.4.4.3	*Refine staffing structure in Agro-met services institutions*	*MoA*		Staff structure	1	1	"-"	Ditto	**12,000**	**12,000**	**0**	**12,000**	Ditto
A1.4.4.4	*Refine staffing structure in Bio-met services institutions*	*MoH*		Staff structure	1	1	"-"	Ditto	**12,000**	**12,000**	**0**	**12,000**	Ditto
A1.4.4.5	*Refine staffing structure in DRM services institutions*	*NDRMC*		Staff structure	1	1	"-"	Ditto	**12,000**	**12,000**	**0**	**12,000**	Ditto
A1.4.4.6	*Refine staffing structure in Environmental services institutions*	*EFCCC*		Staff structure	1	1	"-"	Ditto	**12,000**	**12,000**	**0**	**12,000**	Ditto
Subtotal (A1.4.4)										**110,000**	**50,000**	**160,000**	
A1.4.5	**Nurture strong partnership with local, national and international stakeholders for enhanced knowledge transfer, technology, and finance**												
A1.4.5.1	*Nurture partnership for meteorological knowledge transfer, technology and finance (High level government*	*NMA*	*WMO, National academic and research institutions, IRI, UK Met Office, SMHI, NGOs, Private CS related*	# of partnership events	10	5	5	1 partnership events per year	**20,000**	**100,000**	**100,000**	**200,000**	Costs for travel, venue, accommodation, out-of-pocket expenses, etc

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
	and donor visits, international and national experiences sharing events)		*tech#logy suppliers*										
A1.4.5.2	*Nurture partnership for water and energy knowledge transfer, technology and finance (High level government and donor visits, international and national experiences sharing events)*	*MoWIE*	*NMA, National academic and research institutions, SMHI, NGOs, Private CS related technology suppliers*		10	5	5	1 partnership events per year	**20,000**	**100,000**	**100,000**	**200,000**	Costs for travel, venue, accommodation, out-of-pocket expenses, etc
A1.4.5.3	*Nurture partnership for Agro-met knowledge transfer, technology and finance (High level government and donor visits, international and national experiences sharing events)*	*MoA*	*ATA, EIAR, NMA, National academic institutions, CGIAR institutions, FAO, media partners, NGOs, Private CS related technology suppliers*		10		10	1 partnership events per year	**20,000**	**0**	**200,000**	**200,000**	Costs for travel, venue, accommodation, out-of-pocket expenses, etc
A1.4.5.4	*Nurture partnership for Bio-met knowledge transfer, technology and finance (High level government and donor visits, international and national experiences sharing events)*	*MoH*	*WHO, NMA, EPHI, National academic and research institutions, IRI, NGOs*		10	5	5	1 partnership events per year	**20,000**	**100,000**	**100,000**	**200,000**	Costs for travel, venue, accommodation, out-of-pocket expenses, etc
A1.4.5.5	*Nurture partnership for DRM knowledge transfer, technology and finance (High level government and donor*	*NDRMC*	*NMA, MoWIE, EFCCC, MoA, MoH, National academic and research institutions, UNDP, UNOCHA,*		10	5	5	1 partnership events per year	**20,000**	**100,000**	**100,000**	**200,000**	Costs for travel, venue, accommodation, out-of-pocket expenses, etc

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
	visits, international and national experiences sharing events)		*NGOs, Private CS related tech#logy suppliers*										
A1.4.5.6	*Nurture partnership for environmental safeguarding knowledge transfer, technology and finance (High level government and donor visits, international and national experiences sharing events)*	*EFCCC*	*NMA, MoWIE, MoA, MoH, National academic and research institutions, UNDP, NGOs*		10	5	5	1 partnership events per year	**20,000**	**100,000**	**100,000**	**200,000**	Costs for travel, venue, accommodation, out-of-pocket expenses, etc
Subtotal (A1.4.5)										**500,000**	**700,000**	**1,200,000**	
Subtotal (A1.4)										**6,060,000**	**750,000**	**6,810,000**	
A2.1	**Activities under objective 2.1: Improved availability, quality, and delivery of climate data and forecasts**												
A2.1.1	*Co-development and delivery of meteorological observation, forecast, and projection including impacts and advisories*	*NMA*	*MoWIE, MoA, MoH, NDRMC, EFCCC, National academic and research institutions, IRI, UK Met Office, SMHI, NGOs*	*Various*	*10*	*5*	*5*	It is hardly possible to measure all observation, forecast and projection services in a single metric and same will be unpacked during detailed work planning process	**150,000**	**750,000**	**750,000**	**1,500,000**	Costs cover expenses related to assessment of users' needs for climate services, expert knowledge exchange, coproduction expenses, etc.
A2.1.2	*Strengthening meteorological data quality management system (observer monitoring, cleaning, addressing missing data values, digitization, etc)*	*NMA*	*National academic and research institutions, IRI, UK Met Office, SMHI, NGOs*	*# of data quality SOPs*	*1*	*1*	"-"		**60,000**	**60,000**	**0**	**60,000**	Costs covering expert/consultant fee and costs associated with review meetings plus publication
A2.1.3	*Improve quality of aviation weather forecasting for Ethiopia*	*NMA*	*Ethiopian Civil Aviation, Ethiopian Airlines, ICAO, and IATA*	*Various*	*10*	*5*	*5*		**120,000**	**600,000**	**600,000**	**1,200,000**	Costs covering expert/consultant fee, tecnology, and associated costs

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
A2.1.4	*Piloting impact-based forecasting (IBF)*	*NMA*	*MoWIE, MoA, MoH, NDRMC, EFCCC, National academic and research institutions, IRI, UK Met Office, SMHI, NGOs*	*No of Seasons for impact-based forecasts*	*6*	*6*	"-"	piloting to be done in weather extremes variables (precipitation and temperature)	**45,000**	**270,000**	**0**	**270,000**	Costs covering expert/consultant fee and costs associated with review meetings plus publication
A2.1.5	*Assess climate service relevant communication channels*	*NMA*	*EBC, sub-national media agencies, MoWIE, MoA, MoH, NDRMC, EFCCC, National academic and research institutions, UK Met Office, NGOs*	*No of media channels*	*4*	*4*	"-"	Focus will be given to radio, TV, mobile apps, and printed materials	**15,000**	**60,000**	**0**	**60,000**	Costs for expert/consultant fee, travel, data collection, analysis, review and documentation
A2.1.6	*Launch regular climate service radio programs (for all climate sensitive sectors)*	*NMA*	*EBC, sub-national media agencies, MoWIE, MoA, MoH, NDRMC, EFCCC, National academic and research institutions, NGO's*	*# of radio channels*	*25*	*15*	*10*	There are diverse ethnic groups but 25 languages spoken by the majority of Ethiopians will be slected. The numbers of languages are subject to change depending on needs and impact.	**150,000**	**2,250,000**	**1,500,000**	**3,750,000**	Costs covering media infrastructure, message production (expert/consultant fee), and associated expenses
A2.1.7	*Launch climate and weather TV channel*	*NMA*	*EBC, sub-national media agencies, MoWIE, MoA, MoH, NDRMC, EFCCC, National academic and research institutions, NGOs*	*# of TV channels*	*5*	*5*	"-"	5 languages spoken by the majority of Ethiopians will be slected climate/weather TV	**150,000**	**750,000**	**0**	**750,000**	Costs covering media infrastructure, message production (expert/consultant fee), and associated expenses
A2.1.8	*Establish mobile apps for disseminating climate services*	*NMA*	*EBC, sub-national media agencies, MoWIE, MoA, MoH, NDRMC, EFCCC, National academic and research institutions, NGOs, Private IT service providers*	*No of climate sensitive sectors for which moble apps are developed*	*5*	*4*	*1*	Priority will be given for Agriculture, water, DRM and health sectors	**80,000**	**320,000**	**80,000**	**400,000**	Costs covering expert/consultant fee, infrastructure, testing, and application management
Subtotal (A2.1)										**5,060,000**	**2,930,000**	**7,990,000**	

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
A2.2	**Activities under objective 2.2: Improved availability, quality, and delivery of Hydro-met services**												
A2.2.1	*Co-development and delivery of Hydro-met observation, forecasts, and projection services including impacts and advisories*	*Mo WIE*	*NMA, National academic and research institutions, SMHI, NGOs*	*Various*	*11*	*5*	*6*	It is hardly possible to measure all observation, forecast and projection services in a single metric and same will be unpacked during detailed work planning process	**150,000**	**750,000**	**900,000**	**1,650,000**	Costs cover expenses related to assessment of users' needs for climate services, expert knowledge exchange, etc.
A2.2.2	*Co-development and delivery of advisories on wind and solar energy resources (current status, potentials, access, utilization, benefits, challenges, etc)*	*Mo WIE*	*NMA, GIZ, National academic and research institutions, NGOs*	*Various*	*11*	*5*	*6*	Ditto	**45,000**	**225,000**	**270,000**	**495,000**	Costs cover expenses related to assessment of users' needs for climate services, expert knowledge exchange, etc.
A2.2.3	*Strengthening water and energy data quality management system (SOPs)*	*Mo WIE*	*NMA, EFCCC, MoH, National academic and research institutions, SMHI, NGOs*	*# of data quality SOPs*	*1*	*1*	"-"		**60,000**	**60,000**	**0**	**60,000**	Costs covering expert/consultant fee and costs associated with review meetings plus publication
A2.2.4	*Develop water balance and allocation for targeted watersheds including Irrigation schedule*	*Mo WIE*	*NMA, EFCCC, MoH, National academic and research institutions, SMHI, NGOs*	*No of river basins*	*12*	*12*	"-"		**24,000**	**288,000**	**0**	**288,000**	Costs covering expert/consultant fee and costs associated with review meetings plus publication
A2.2.5	*Climate smart monitoring services for major water reservoirs*	*Mo WIE*	*NMA, EFCCC, MoH, National academic and research institutions, SMHI, NGOs*	*Various*	*11*	*5*	*6*		**12,000**	**60,000**	**72,000**	**132,000**	Costs covering expert/consultant fee and costs associated with review meetings plus publication
A2.2.6	*Water quality monitoring services*	*Mo WIE*	*NMA, EFCCC, MoH, National academic and research institutions, SMHI, NGOs*	*Various*	*11*	*5*	*6*		**12,000**	**60,000**	**72,000**	**132,000**	Costs covering equipment, expert/consultant fee, and costs associated with review meetings

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
													plus publication
Subtotal (A2.2)										**1,443,000**	**1,314,000**	**2,757,000**	
A2.3	**Activities under objective 2.3: Improved availability, quality, and delivery of Agro-met services**												
A2.3.1	*Co-development and delivery of crop-met services (planting time, phenology, harvesting, pest, and yield observations, forecast, prediction, and projections including impacts and advisories for major crops)*	*MoA*	*ATA, EIAR, NMA, National academic institutions, CGIAR institutions, FAO, media partners, NGOs*	*Various*	*11*	*5*	*6*	It is hardly possible to measure all crop-met services in a single metric and same will be unpacked during detailed work planning process	**150,000**	**750,000**	**900,000**	**1,650,000**	Costs cover expenses related to assessment of users' needs for climate services, expert knowledge exchange, etc.
A2.3.2	*Co-development and delivery of livestock-met services (pasture, livestock pest, and yield observations, forecasts, prediction, and projections including impacts and advisories for major livestock species and breeds)*	*MoA*	*ATA, EIAR, NMA, National academic institutions, CGIAR institutions, FAO, media partners, NGOs*		*11*	*5*	*6*	Ditto	**90,000**	**450,000**	**540,000**	**990,000**	Costs cover expenses related to assessment of users' needs for climate services, expert knowledge exchange, etc.
A2.3.3	*Co-development and delivery of climate smart NRM observation, forecast, projection, impact and advisory services (importantly on soil erosion, water*	*MoA*	*ATA, EIAR, NMA, National academic institutions, CGIAR institutions, FAO, GIZ, media partners, NGOs*		*7*	*5*	*2*	Ditto	**120,000**	**600,000**	**240,000**	**840,000**	Costs cover expenses related to assessment of users' needs for climate services, expert knowledge exchange, etc.

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
	harvesting, and other land reclamation activities)												
A2.3.4	*Strengthening Agro-met data quality management system (SOPs)*	*MoA*	*ATA, EIAR, NMA, National academic institutions, CGIAR institutions, FAO, media partners, NGOs*	*No of Agro-met data quality SOPs*	*1*	*1*	"-"		**60,000**	**60,000**	**0**	**60,000**	Costs covering expert/consultant fee and costs associated with review meetings plus publication
Subtotal (A2.3)										**1,860,000**	**1,680,000**	**3,540,000**	
A2.4	**Activities under objective 2.4: Improved availability, quality, and delivery of Bio-met services**												
A2.4.1	*Document and share case definition for nationally prioritized Climate Sensitive Diseases (CSDs) and other health events*	*MoH*	*WHO, NMA, EPHI, National academic and research institutions, IRI, NGOs*	*# of climate sensitive diseases*	*6*	*6*	"-"	There are numerous climate sensitive diseases but focus will be given for the main ones.	**24,000**	**144,000**	**0**	**144,000**	Costs covering expert/consultant fee and costs associated with review meetings plus publication
A2.4.2	*Develop alert thresholds for nationally prioritized CSDs, malnutrition, SRH, mental health and air Quality*	*MoH*	*WHO, NMA, EPHI, National academic and research institutions, IRI, NGOs*	*# of alert thresholds*	*5*	*5*	"-"	One alert threshold for CSDs, malnutrition, SRH, mental health and air quality	**24,000**	**120,000**	**0**	**120,000**	Costs covering expert/consultant fee and costs associated with review meetings plus publication
A2.4.3	*Co-development and delivery of Bio-met observation, forecast, prediction, projection, impacts and advisories*	*MoH*	*WHO, NMA, EPHI, National academic and research institutions, IRI, NGOs*	*Various*	*11*	*5*	*6*	It is hardly possible to measure all healthmet services in a single metric but will be unpacked during readiness phase	**12,000**	**60,000**	**72,000**	**132,000**	Costs cover expenses related to assessment of users' needs for climate services, expert knowledge exchange, etc.
A2.4.4	*Strengthening Bio-met data quality management system (SOPs)*	*MoH*	*WHO, NMA, EPHI, National academic and research institutions, IRI, NGOs*	*# of data quality SOPs*	*1*	*1*	"-"		**60,000**	**60,000**	**0**	**60,000**	

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
A2.7.6	*Integrating climate information with District Health Information System 2 (DHIS 2)*	*MoH*	*WHO, NMA, EPHI, National academic and research institutions, IRI, NGOs*	Various	*1*	1	"-"	Designed to work for all 800 woredas	**300,000**	**300,000**	**0**	**300,000**	Costs for expert/consultant fee, travel, testing, and system management
Subtotal (A2.4)										**684,000**	**72,000**	**756,000**	
A2.5	**Activities under objective 2.5: Improved availability, quality, and delivery of early warning services**												
A2.5.1	*Co-development and delivery of climate driven disaster risk (hazard and vulnerability) observations, forecasts, and projections*	*NDRMC*	*NMA, MoWIE, EFCCC, MoA, MoH, National academic and research institutions, UNDP, UNOCHA, NGOs*	*Various*	*11*	*5*	*6*	There are numerous climate driven hazards but focus will be given to five main ones (drought, flood, land slide, frost, and fire).	**120,000**	**600,000**	**720,000**	**1,320,000**	Costs cover expenses related to assessment of users' needs for climate services, expert knowledge exchange, etc.
A2.5.2	*Strengthening DRM data quality management system (SOPs)*	*NDRMC*	*NMA, MoWIE, EFCCC, MoA, MoH, National academic and research institutions, UNDP, UNOCHA, NGOs*	*# of data quality SOPs*	*1*	*1*	"-"		**60,000**	**60,000**	**0**	**60,000**	Costs covering expert/consultant fee and costs associated with review meetings plus publication
A2.5.3	*Establish woreda based early warning system linked to the WDRP*	*NDRMC*	*NMA, MoWIE, EFCCC, MoA, MoH, National academic and research institutions, UNDP, UNOCHA, NGOs*	*Early warning system*	*1*	1	"-"	Designed to work for all 800 woredas	**450,000**	**450,000**	**0**	**450,000**	Costs for expert/consultant fee, travel, testing, and system management
Subtotal (A2.5)										**1,110,000**	**720,000**	**1,830,000**	
A2.6	**Activities under objective 2.6: Improved availability, quality, and delivery of environmental met services:**												
A2.6.1	*Co-develop and deliver past and current account (map) of forest resources*	*EFCCC*	*NMA, MoWIE, MoA, MoH, National academic and research institutions, UNDP, NGOs*	*# of forest maps*	*3*	*3*	"-"	One for current forest map of the entire country and two historical forest cover maps with at least 10 years interval	**45,000**	**135,000**	**0**	**135,000**	Costs covering expert/consultant fee and costs associated with travel, review plus publication
A2.6.2	*Co-develop advisories to enhance the status of national forest and other key environmental resources*	*EFCCC*	*NMA, MoWIE, MoA, MoH, National academic and research institutions, UNDP, NGOs*	*Various*	*11*	*5*	*6*	It is hardly possible to measure all forest advisory services in a single metric but will be unpacked during readiness phase	**90,000**	**450,000**	**540,000**	**990,000**	Costs cover expenses related to assessment of users' needs for climate services, expert

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
													knowledge exchange, etc.
A2.6.3	*Co-develop and deliver a historical account of observed climate change and associated impacts on various sectors in different parts of Ethiopia*	*EFCCC*	*NMA, MoWIE, MoA, MoH, National academic and research institutions, UNDP, NGOs*	*No of historical account of observed CC on key sectors*	*6*	*6*	"-"	Although many sectors are affected by climate change, focus will be given to six priority sectors (Water, forest, crops, livestock, health, and energy)	**45,000**	**270,000**	**0**	**270,000**	Costs covering expert/consultant fee and costs associated with travel, review plus publication
A2.6.4	*Co-develop and deliver climate advisories to adapt to and mitigate impacts of observed and projected climate change*	*EFCCC*	*NMA, MoWIE, MoA, MoH, National academic and research institutions, UNDP, NGOs*	*Various*	*11*	*5*	*6*	It is hardly possible to measure all ccM and CCA advisory services in a single metric but will be unpacked during readiness phase	**90,000**	**450,000**	**540,000**	**990,000**	Costs cover expenses related to assessment of users' needs for climate services, expert knowledge exchange, etc.
A2.6.5	*Co-develop and deliver greenhouse gas emission monitoring services from climate sensitive sectors*	*EFCCC*	*MoWIE, MoA, MoT, MoTI, MoUDC, National academic and research institutions, bilateral and multilaterals, NGOs*	*# of major GHGs emitting sectors*	*7*	*7*	"-"	Major GHG emitting sectors include: Forestry; Crops; Livestock; Energy; Transport; Industry; and Construction.	**75,000**	**525,000**	**0**	**525,000**	Costs for data collection, analysis, review and communication
A2.6.6	*Strengthening environmental data quality management system (SOPs)*	*EFCCC*	*NMA, MoWIE, MoA, MoH, National academic and research institutions, UNDP, NGOs*	*# of data quality SOPs*	*1*	*1*	"-"		**60,000**	**60,000**	**0**	**60,000**	Costs covering expert/consultant fee and costs associated with travel, review plus publication
Subtotal (A2.6)										**1,890,000**	**1,080,000**	**2,970,000**	
Total (Goal 1)										**50,230,000**	**20,910,000**	**71,140,000**	
Total (Goal 2)										**12,047,000**	**7,796,000**	**19,843,000**	
AC	**Administrative costs**												
AC 1	**Readiness Phase Activities**												

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
AC 1.1	*Stakeholder consultations at national and sub-national levels for kicking off the NFCS strategic plan*	*NMA*	*MoWIE, MOA, MoH, NDRMC, EFCCC, regional administration and regional bureaus, zonal administration and sector departments, woreda administration and sector offices*	*# of meetings*	*87*	*87*	"-"	Two rounds of meetings at federal level and one round in each region (11) and one round at zonal and woreda level combined (74)	5,000	435,000	0	435,000	Lump sum costs for venue, accommodation, transport, out-of-pocket expenses, stationery, etc. These costs vary depending on numbers of participants at different administrative levels
AC 1.2	*Establishment of the NFCS Coordination Units (CUs) at national and sub-national levels*	*NMA*	*MoWIE, MOA, MoH, NDRMC, EFCCC, regional administration and regional bureaus, zonal administration and sector departments, woreda administration and sector offices*	*# of CUs*	*885*	*885*	"-"	One at federal level, one in each region (11), and one in each zone (74) and one in each woreda (800)	300	265,500	0	265,500	lump sum costs for travel, out-of-pocket expenses, communication, and on-demand mini meetings with stakeholders at all levels.
AC 1.3	*Developing MoUs and signing partnership agreements among NFCS strategic plan implementing partners*	*NMA*	*MoWIE, MOA, MoH, NDRMC, EFCCC, regional administration and regional bureaus, zonal administration and sector departments, woreda administration and sector offices*	*# of MoUs signed*	*885*	*885*	"-"	One at federal level, one in each region (11), and one in each zone (74) and one in each woreda (800)	10	8,850	0	8,850	These activites are assumed to be facilitated at office level and along with other budgeted activities such as activities.
AC 1.4	*Recruitment of relevant staff*	*All*	*NMA, MoA, and MoH*	*# of staff*	*43*	*43*	"-"	6 at national CU, 11 ar regional CU, 4 at federal level institutions, and 2 in each region (22)	1,000	43,000	0	43,000	These include costs for advertisment, screening, interview and selection.
AC 1.5	*Procurement of vehicles*	*All*		*# of vehicles*	*13*	*13*	"-"	Two for national CU and 11 for regional CUs	50,000	650,000	0	650,000	Costs are assumed to be duty free and all vehicles are four-wheel drive
AC 1.6	*Procurement of motor bikes*	*All*		*# of bikes*	*2400*	*2400*	"-"	Three in each woreda	2,000	4,800,000	0	4,800,000	Costs are assumed to be duty free

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
AC 1.7	*Procurement of office equipment*	*All*		*Lump sum*	*1*	*1*	"-"	Computers, printers, scanners, cameras, tables, chairs, file cabinets, etc)	**500,000**	**500,000**	**0**	**500,000**	
AC 1.8	*Detailed work planning and budgeting*	*All*		*# of key partners*	*6*	*6*	"-"	NMA, MoWIE, MoA, MoH, NDRMC, EFCCC	**2,000**	**12,000**	**0**	**12,000**	Costs for out-of-pocket expenses, travel, accommodation
Subtotal (AC1)										**6,714,350**		**6,714,350**	
AC 2	**Salaries ****												
AC 2.1	*NFCS coordinator (federal)*	*NMA*		*# of months*	132	60	72		**5,000**	**300,000**	**360,000**	**660,000**	Monthly salaries and benefit packages for 7 years at a rate of USD 4000 per month
AC 2.2	*NFCS regional coordinators (11)*	*NMA*		*# of months*	1452	660	792		**4,000**	**2,640,000**	**3,168,000**	**5,808,000**	Monthly salaries and benefit packages for 11 regional coordinators for **10** years
AC 2.3	*NFCS Climate knowledge Management Lead (federal)*	*NMA*		*# of months*	132	60	72		**4,000**	**240,000**	**288,000**	**528,000**	Monthly salaries and benefit packages for 10 years
AC 2.4	*NFCS IT and computations specialist (federal)*	*NMA*		*# of months*	132	60	72		**4,000**	**240,000**	**288,000**	**528,000**	Monthly salaries and benefit packages for 10 years
AC 2.5	*NFCS M & E specialist (federal)*	*NMA*		*# of months*	132	60	72		**4,000**	**240,000**	**288,000**	**528,000**	Monthly salaries and benefit packages for 10 years
AC 2.6	*NFCS Finance head (federal)*	*NMA*		*# of months*	132	60	72		**4,000**	**240,000**	**288,000**	**528,000**	Monthly salaries and benefit packages for 10 years
AC 2.7	*NFCS accountant (federal)*	*NMA*		*# of months*	132	60	72		**3,000**	**180,000**	**216,000**	**396,000**	Monthly salaries and benefit packages for 10 years
AC 2.8	*Agro-met experts*	*MoA*		*# of months*	1848	840	1008	*3 experts at federal level and 11 at regional level*	**3,000**	**2,520,000**	**3,024,000**	**5,544,000**	Monthly salaries and benefit packages for 14 experts for 10 years
AC 2.9	*Bio-met experts*	*MoH*		*# of staff*	1584	720	864	*1 expert at federal level and 11 at regional level*	**3,000**	**2,160,000**	**2,592,000**	**4,752,000**	Monthly salaries and benefit packages for 12 experts for 10 years

S/No	Activities	Owner	Partners	UoM	Targets total	Targets to be reached over years of the planning period		Target description	Budget (USD)				Budget assumptions
						2021-2025	2026-2030		Unit cost	Cost July 2021-June 2025	Cost July 2026-June 2030	Total cost July 2021-June 2030	
AC 2.9	*Hydro-met experts*	*MoWIE*		*# of staff*	1584	720	864	*1 expert at federal level and 11 at regional level*	3,000	2,160,000	2,592,000	4,752,000	Monthly salaries and benefit packages for 12 experts for 10 years
Subtotal (AC2) ****										10,920,000	13,104,000	24,024,000	
AC 3	**Other admin costs**												
AC 3.1	*Fuel*	*All*		*# of sectors*	6	6	"-"		100,000	600,000	0	600,000	Lump sum costs (will be unpacked during detailed budgeting)
AC 3.2	*Maintenance*	*All*		*# of sectors*	6	6	"-"		50,000	300,000	0	300,000	Ditto
AC 3.3	*Communications*	*All*		*# of sectors*	6	6	"-"		30,000	180,000	0	180,000	Ditto
AC 3.4	*Miscellaneous*	*All*		*# of sectors*	6	6	"-"		150,000	900,000	0	900,000	Ditto
Subtotal (AC3)										1,980,000	0	1,980,000	
Total (AC)										20,816,350	13,104,000	33,920,350	
Grand Total										83,213,350	41,810,000	125,023,350	

Annex C: Stakeholders Involved in Developing the Strategic Plan of the NFCS

Annex C1: Members of the NFCS Steering Committee

No.	Name	Organization	Position	Email	Telephone
1	H.E. Dr. Kaba Urgessa	MoA	State Minister	urgessak2001@yahoo.co.in	011-646 0746
2	H.E. Dr. Abrha Adugna	MoWIE	State Minister	abrhaadu@gmail.com	0944-344948
3	Dr. Eyasu Abrha	MoA	Adviser to the Minister	eyasuabraha@gmail.com	0944-741726
4	Mr. Fetene Teshome	NMA	Director General	fetenekoket@yahoo.com	0911-208025
5	Mr. Getachew Gizaw	BDA	Deputy Director General	gech970@gmail.com	0912-000535
6	Mr. Kinfe Hailemariam	NMA	Deputy Director General	kinfe_hm@yahoo.com	0911-208024
7	Mr. Nigusu Lemma	EFCCC	Director Climate Change and Bio-Diversity	negusu2002@gmail.com	011–170 4216
8	Mrs. Almaz Demessie	NDRMC	Director for Early Warning and Emergency Response Directorate	demessiead@gmail.com	0946-653944
9	Mr. Jobier Ayalew	MoT	Director for Environment and Climate Change	jobirayalew@gmail.com	0941-285307
10	Mrs. Ekram Redwan	MoH	Director, Hygiene & Environmental Health	ekram.redwan@moh.gov.et	011-553 5938
11	Mrs. Semunesh Golla	MoWIE	Director for Hydrology and Water Quality Directorate	semunesh_golla@yahoo.com	0911- 123708

Annex C2: Members of the NFCS Sectoral Taskforce

#	Name	Organization	Position	Email	Telephone
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4	Mr. Getu Mamo	MoA	Soil and Water Conservation Senior Expert	getumamo11@gmail.com	0912-902033
5	Mr. Alemayeh Gemechu	MoA	Agricultural Extension Communication Senior Expert	almayehug@gmail.com	0913-007304
6	Mr. Tamerat Tsegaye	NDRMC	Agronomy and DRM Senior Expert	tamrattm@gmail.com	0911-487096
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10	Mr. Mohammed Ali	MoWIE	Water Resource Engineer	mohammedalis123@gmail.com	0911-822169
11	Mr. Tauahir Esa	MoWIE	Addis Ababa Hydrology Branch office Head	tuahirissa@gmail.com	0913-291734
12	Mr. Micheal Mulugeta	MoWIE	Senior Environmentalist	mikemulu2017@gmail.com	0911467848

Annex C3: Members of NMA Technical Working Group

No.	Name	Position	Email	Telephone
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2	Mr. Fitsum Bekele	A/Director for Meteorological Research and Studies Directorate	amake2008@gmail.com	0912-113572
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7	Asaminew Teshome (PhD)	Chief Meteorologist	asmin2met@gmail.com	0913-582017
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Annex C4: Members of CMESA-E Project Management Unit

#	Name	Organization	Position	Email	Telephone
1	Solomon Woldetsadik	Christian Aid Ethiopia	Senior Programme Officer – Climate Change/CMESA-E Project Consortium Coordinator	swoldetsadik@christian-aid.org	0911-631481
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3	Tarekegn Abera	National Meteorological Agency	CMESA-E Project focal person	tatarish59@gmail.com	0913-838770
4	Asefa Hailu	Mercy Corps	Deputy Chief of Party, Market Approach for Resilience Project	ahailu@mercycorps.org	0912-091551
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