National Framework for Climate Services (NFCS) Kenya

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KENYA METEOROLOGICAL DEPARTMENT

ICPAC

Foreword

The Inter-Governmental Panel on Climate Change (IPCC) projects that global temperatures will rise by 2.5^0 C. by the year 2050. This would exacerbate the negative impacts of climate variability and change and stifle sustainable development for nations of the world. In response to this threat, the World Meteorological Organization (WMO) through the Global Framework for Climate Services (GFCS) and other relevant organizations are implementing various programs and projects by supporting the improvement of national climate services. Specifically, the GFCS is supporting the establishment of National Frameworks for Climate Services (NFCS) to facilitate improvement in provision of country climate services. The NFCS will provide the institutional mechanism to coordinate, facilitate and strengthen collaboration among national institutions to improve the co-production, tailoring, delivery and use of science-based climate information and services, particularly in the climate sensitive sectors including agriculture, livestock and food security, Disaster Risk Management (DRM), health, among others.

The meteorological and related services currently provided by Kenya Meteorological Department in collaboration with relevant institutions, are limited in scope and face governance and strategic challenges due to lack of a national institutional coordination arrangement. Significant gaps in availability of climate data and poor public attitude and awareness of climate services also exist. To better prepare for reduction of the increasing climate related risks and disasters, the Government recognizes the need for the current services to be improved by, among others, enhancing observations and monitoring, and strengthening platforms for interaction and engagement, understanding, co-design and co-production of climate information services, promoting research, modelling & prediction, enhancing communication flow, and capacity building at all levels (national &county), improve the development, production and delivery and application of climate information and services to and by the end users through the envisaged Kenya NFCS.

The implementation of the Kenya NFCS will not only support the implementation of national development plans and strategies, but will also make them more resilient in the face of climate variability and change. Aptly, it addresses the gaps in the provision of climate services in the Vision 2030, national climate related policies and programs, including County Integrated Development Plans (CIDPs), KMD capacities and needs, sector and institutional climate services initiatives and needs, and purposes to continually integrate specific, state, sector and community perspectives. Critical climate information and services production, communication, delivery, as well as collaboration themes are adequately addressed. The systematically laid out strategic framework and costed action plan set the stage for its successful implementation.

As provision of climate services is an expensive intervention that requires substantial resources, collaboration and coordination among all stakeholders are key to its successful implementation. In this regard, the GoK and the Ministry of Environment, Climate Change & Forestry will extent appropriate support to entities charged with supporting, promoting and managing climate services in order to realize successful implementation of this framework.

I take this opportunity to appeal to climate actors, colleagues at all levels of Government, development partners, donors, experts, the private sector and climate information users to come on board and make appropriate contribution towards its implementation.

Hon. Soipan Tuya, CBS

Cabinet Secretary
Ministry of Environment, Climate Change & Forestry

Preface

This framework is necessitated by the increasingly devastating and recurrent negative episodes of weather and climate events experienced in Kenya. Floods, drought and disease incidences have continued to negatively affect and impact livelihoods and development. Further, capacities of institutions in the climate service value chain are limited and have yet to be coordinated and their capacities harnessed to effectively address this situation. The Country's demand for climate services is increasing and becoming more sophisticated and requires improved technologies and approaches in addressing. The envisaged Kenya NFCS mechanism is expected to help enhance and improve the provision of the country's climate services.

With a main mission to improve national climate services, this framework is the tool that will guide Kenya in engaging and coordinating actors and stakeholders along the country's climate services value chain in developing and enhancing existing and planned management and operational systems and processes of the Kenya NFCS pillars. These include observations networks & monitoring systems, user interface platforms, research, modelling and prediction, climate services information systems, and capacity building.

The framework reviews the existing climate services capacities and identifies the gaps and needs for relevant sectors, institutions and user groups. It sets out goals, objectives and strategies, and actions, the NFCS must embrace in order to improve national climate services. The framework shall coordinate institutions and enable them to work together to co-design, co-produce, communicate, deliver and use climate services for decision-making in climate-sensitive socioeconomic sectors. This will go a long way to support other actions in enhancing resilience of our communities and reducing vulnerability to climate change impacts. In addition, it will guide in understanding and adjusting to changing circumstances in its operating environment, as well as provide for robust networking and building partnerships, as well as monitoring and evaluation to measure performance. The framework costed action plan is key to the realization of resource mobilization to support implementation of strategies and plans to achieve desired outcomes.

I am convinced that with collaboration among all relevant entities, this framework will be successfully implemented and national climate services improved.

Eng. Festus N`geno, CBS

Principal Secretary
State Department of Environment & Climate Change

Acknowledgements

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We express our sincere appreciation to Hon. Soipan Tuya – Cabinet Secretary, Ministry of Environment, Climate Change and Forestry; Eng. Festus N`geno, PS Environment & Climate Change; Dr. Chris Kiptoo, PS the National Treasury; Mr. Mark Madjodina WMO Regional Representative; and Dr. Guleid Artan, Director of ICPAC, who gave impetus and provided support, direction and substance to the development of this framework .

We express our gratitude to the 11th European Development Fund which availed funding. We also thank the IGAD Climate Prediction & Applications Center for facilitating the NFCS development process, and the Kenya Meteorological Department staff for providing focal point supports and valuable information and other critical input into the process. We thankfully acknowledge the technical officers from the climate sensitive sectors including Agriculture & Food Security, Environment & Forestry, Health, Water, Energy, Disaster Risk Management institution, National Disaster Management Unit, The Kenya Redcross, The National Treasury, Kenya Agricultural & Livestock Research Organization , Kenya Civil Aviation Authority and Transport among others, for their valuable active participation, insights and contribution during workshops and during interviews towards the development and finalization of the document.

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Dr. David Gikungu
Director KMD

Acronyms

ACP	African, Caribbean and Pacific Countries
ASDSP	Agricultural Sector Development Support Program
CIS	Climate Information Services
ClimSA	Intra-ACP Climate Services and Related Applications
CoGs	Council of Governors
CSIS	Climate Services Information System
DRM	Disaster Risk Management
EAC	East African Community
FAO	Food and Agriculture Organization
FEWSNET	Famine Early Warning Systems Network
GFCS	Global Framework for Climate services
GPC	Global Production Center
ICPAC	IGAD Climate Prediction and Applications Center
IGAD	Inter-Governmental Authority on Development
I-MCCS	Inter-Ministerial Committee on Climate Services
IMTR	Institute for Meteorological Training and Research
IOC	International Oceanographic Commission
IPCC	Inter-Governmental Panel on Climate Change
KALRO	Kenya Agricultural & Livestock Research Organization
KMD	Kenya Meteorological Department
M&E	Monitoring and Evaluation
NDMA	National Drought Management Authority;
NFCS	National Framework for Climate services
NGO	Non-Governmental Organization
NMHS	National Meteorological and Hydrological Service
NSP	National Strategic Plan
PESTLE	Political, Economic, Social, Technological, Legal, Environmental
PMF	Performance Measurement Framework
SWGs	Sector Working Groups
SWOT	Strengths, Weaknesses, Opportunities, Threats
UIP	User Interface Platform
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
WIGOS	WMO Integrated Global Observing System
WIS	WMO Information System
WMO	World Meteorological Organization

Additional Acronyms

ASAL	Arid and Semi-Arid Lands
BETA	Bottom Up Economic Transformation Agenda
CCD	Climate Change Directorate

CCOF	County Climate Outlook Forums
CCU	Climate Change Units
CSA	Climate Smart Agriculture
DHIS2	District Health Information Software 2
EWS	Early Warning System
GDC	Geothermal Development Company
IDF	Intensity Duration Frequency
IPC	Integrated Food Security Phase Classification
KCAA	Kenya Civil Aviation Authority
KEFRI	Kenya Forest Research Institute
KENGEN	Kenya Electricity Generating Company
KENHA	Kenya National Highways Authority
KQ	Kenya Airways
KERRA	Kenya Rural Roads Authority
KETRACO	Kenya Electricity Transmission Company
KEWI	Kenya Water Institute
KFS	Kenya Forest Service
KMA	Kenya Maritime Authority
KMFRI	Kenya Marine and Fisheries Research Institute
KNSL	Kenya National Shipping Line
KPA	Kenya Ports Authority
KPLC	Kenya Power and Lighting Company
KRB	Kenya Roads Board
KRC	Kenya Railways Corporation
KURA	Kenya Urban Roads Board
KWS	Kenya Wildlife Services
LULC	Land Use and Land Cover
MDA	Ministries, Department and Agencies
MOALD	Ministry of Agriculture Livestock Development
MODIS	Moderate Resolution Imaging Spectroradiometer
MoH	Ministry of Health
MOU	Memorandum of Understanding
MSWG	Multi Sectoral Working Group
MTP	Medium Term Plan
NCCAP	National Climate Change Action Plan
NDMU	National Disaster Management Unit
NDOC	National Disaster Operation Centre
NEMA	National Environment Management Authority
NTSA	National Transport and Safety Authority
PSP	Participatory Scenario Planning
RCC	Regional Climate Centre
RCOFS	Regional Climate Outlook Forums
SCADA	Supervisory Control and Data Acquisition System
SGR	Standard Gauge Railways
SOP	Standard Operating Procedures
SWGs	Sector Working Group
WRA	Water Resource Authority

Key Words

***Boundary organization*:** An institution or entity that works with users in given sector(s) at various levels and, at the same time, have certain in-house expertise in understanding and interpreting climate information and products.

Climate: A synthesis of weather in a given area, characterized by long-term statistics (mean values, variance, probabilities of extreme values etc.) of the meteorological elements.

Climate change: The change in the state of the climate that can be identified 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 forces, or to 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, and accounting for all or some of its known properties.

Climate information: Historical data, and analyses and assessments based on these data, forecasts, predictions, outlooks, advisories, warnings, model outputs, model data, climate projections and scenarios, climate monitoring products, etc., and can be in the form of text, maps, charts, trend analyses, graphs, tables, GIS overlays, photographs, satellite imagery, etc.

Climate Risk Management (CRM): An approach to decision-making in climate-sensitive activities that seeks to reduce the vulnerability associated with climate risk and aims to both maximize the positive and minimize the negative outcomes for these sectors.

Climate service. A continuum of provision, delivery and consumption of climate information and products. Climate services should have the properties of being available, dependable, usable, credible, responsive, flexible and sustainable.

Framework. The structure on which improved climate information and services will be built and is used in this strategy to represent the National Framework for Climate Services.

Global Producing Centre (GPC). A WMO-designated operational center producing long-range forecasts of global large-scale fields of a standard set of climate variables with a regular predefined frequency. GPCs provide access to their forecasts for all WMO Members.

Operational Unit (OU): A mechanism that will operationalize the Kenya NFCS Secretariat.

Regional Climate Centre (RCC): A WMO-designated regional institution with capacity to develop high-quality regional-scale climate products based on global products incorporating regional information.

Regional Climate Outlook Forums (RCOFs): Platforms in which climate experts develop consensus-based regional climate predictions and meet with users of climate information, usually at significant seasonal changes in climate. RCOFs produce and disseminate a regional, consensus-based assessment of the state of the regional climate (that is, a climate prediction) for the upcoming season.

Services: Actions, such as delivery of climate information, guidance, or a product to a client or user.

User (decision-maker): A client with responsibilities for decisions and policies in climate-sensitive settings, who receives and uses climate services including information and products. Users can include individual end users, a sector/sub-sector of the global socio-economic community, the media, academic institutions, the modelling and prediction communities, the private sector, NGOs, United Nations Agencies, government agencies or Ministries, state governments, etc.

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

Institutional framework: A set of formal organizational structures, rules and informal norms for service provision which forms the precondition for the successful implementation of other national climate services intervention tools.

Executive Summary

Development of the Kenya National Framework for Climate Services (NFCS) was facilitated by ICPAC with funds from the 11th European Development Fund through the Intra-ACP Climate Services and Related Applications (ClimSA), project in collaboration with the Kenya Government, through the Financing Locally Led Climate Action Programme (FLLOCA). The main objective of establishing a National Framework for Climate Services is to enhance coordination, facilitation and collaboration among institutions to ensure development and incorporation of science-based climate information and prediction into planning, policy and practices for all climate-sensitive socioeconomic sectors.

The framework formulation process entailed a systematic process based on WMO/GFCS guidance document called *"Step-by-step Guidelines for Establishing a National Framework for Climate Services*" and involved consultations and planning, stakeholder mapping, baseline assessment environmental scan, strategy development, and pre-validation/validation workshops.

Country climate services situation

Climate knowledge and information are produced by public sector, institutional and independent initiatives and programs and delivered to a wide range of users in the country. The services are limited in scope and face governance and strategic challenges due to lack of a national policy and a formal national institutional coordination arrangement. There exist, among others: lack of coordination mechanisms; inadequate technical infrastructure, a proliferation of independent entities providing unregulated climate services; limited climate information flow and; inadequate funding. The increasing climate variability and change have led to increased threat to the environment. Hence Kenya should address the growing demand for user, sector, and early warning climate services to build resilience and reduce vulnerability to climate change by communities.

The political, economic, social and technological environments are well developed and geared to support improvement of country climate services.

Purpose

The main purpose of NFCS is to establish an institutional mechanism to coordinate, facilitate and strengthen collaboration among national institutions to improve the co-production, tailoring, delivery and use of science-based climate predictions and services

The National Framework for Climate Services

The Kenya NFCS, depicted in Figure 4, is the national level structure designed to improve national climate services by coordinating and facilitating collaboration, interactions and capacity development among national institutions and stakeholders at all levels of the value chain. It shall comprise the steering and oversight (Inter-Ministerial Committee on Climate Service), and the operational (Secretariat/Sector working groups) levels.

The vision of the Kenya NFCS is "To provide an Effective National Mechanism that Enables Coordination and Provision of Integrated National Climate Services for Planning, Decision Making and Sustainable Development"

The main goals.

The main goals are to:

1. Create effective coordination mechanism for climate services;
2. Improve access or provision of climate services and Early Warnings for all;
3. Enhance observation and monitoring network;
4. Enhance capacity for climate services users, providers, and researchers to interact at all levels;
5. Enhance capacity for research modeling and prediction;
6. Enhance capacity to generate and use climate information and products; and
7. Promote partnerships and collaborations in the implementation of NFCS

The key objectives are to: operationalize the NFCS governance structure; enhance country observations networks and monitoring systems; develop mechanisms for institutional coordination, stakeholder interactions; strengthen communication; support research, modelling and prediction and; mobilize resources. Key strategies include; establishment of requisite systems and processes, baselines and designs; awareness creation, development of NFCS pillars, mobilization of resources, institutional coordination; capacity building and monitoring and evaluation.

Key expected outputs include; Kenya NFCS coordination strengthened; public awareness, institutional visibility, standardized and enhanced national observations networks and monitoring systems; strengthened national communications networks, an integrated national CSIS, developed UIPs, increased climate services knowledge, products and applications and performance.

Timeframe and implementation

The NFCS first phase of implementation will be in step with the national 2023-2027 MTP cycle. The overall responsibility for implementation of the framework lies with the Kenya NFCS Inter-Ministerial Committee on Climate Service, in consultation and collaboration with KMD and other appropriate entities depicted in Figure 4.

NFCS-Costed action plan (CAP)

The CAP details cost items and activities among them operationalization of governance structure, capacity building, awareness creation and brand building, procurement, installation and maintenance of systems and networks, institutional coordination, development of pillars, communication and M&E. The indicative total cost of implementing the plan is **USD 68,211,000.00**

Overall benefits from implementation of Framework

The key overall benefit is increased availability of improved products and services to users. Others are; increased scope and improved institutional coordination leading to increased knowledge within sectors and institutions, efficiency and cost effectiveness in providing the services, better informed

planning and decision making within climate sensitive sectors and other institutions, reduced risks associated with climate change and variability and improved livelihoods.

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1 Introduction and Background

1.1 Introduction

Kenya's climate is a tale of diversity, shaped by its varied topography, ranging from the coastal lowlands to highland plateaus and mountains. This geographic diversity gives rise to a wide range of climatic zones, including the hot and humid coastal regions, arid and semi-arid (ASAL) areas characterized by low rainfall and high temperatures, cool to temperate highlands with distinct wet and dry seasons, and variable climates in the Rift Valley. However, Kenya is not immune to the global challenge of climate change. The nation is witnessing rising temperatures, shifting rainfall patterns, and an increased frequency of extreme weather events, such as droughts, floods, and storms. These changes have significant implications for various sectors within the country.

The impacts of climate change in Kenya cannot be ignored. Agriculture, a cornerstone of the economy, is particularly vulnerable, with climate variability leading to reduced crop yields, food insecurity, and economic instability, especially in ASAL regions. Water resources are also under threat as changing rainfall patterns affect the availability of freshwater resources. Rising temperatures contribute to the spread of vector-borne diseases like malaria, impacting public health. Additionally, frequent floods and landslides damage infrastructure, disrupt transportation networks, and affect energy production.

In response to these challenges, Kenya has taken steps to enhance its resilience to climate change. The National Climate Change Action Plan (NCCAP) is a crucial policy initiative that outlines the country's efforts to adapt to and mitigate the effects of climate change. These efforts encompass climate-smart agriculture practices, afforestation, reforestation initiatives, and the promotion of renewable energy sources, such as geothermal and wind power. Furthermore, Kenya has invested in disaster risk reduction and early warning systems to mitigate the impact of extreme weather events.

Despite these efforts, several challenges persist. Kenya faces data and information gaps, with limited access to timely and accurate climate data, especially in rural areas. Climate modeling and forecasting capabilities require further development, and institutional capacity for climate information dissemination needs strengthening. To address these issues comprehensively, Kenya should consider the establishment of a National Framework for Climate Services (NFCS). Such a framework would coordinate the collection, analysis, and dissemination of climate data, assigning clear roles and responsibilities to government agencies, research institutions, and other stakeholders. Moreover, capacity building and infrastructure development for climate information systems should be prioritized.

Stakeholder engagement is vital, and Kenya has been collaborating with international organizations and research institutions on climate research and data collection. At the local level, partnerships with communities and non-governmental organizations (NGOs) play a

crucial role in climate adaptation and resilience-building efforts. Furthermore, promoting climate literacy among the general population is essential to enhance understanding of climate-related risks and opportunities.

Financial resources are paramount to effectively implement climate resilience strategies. Kenya must secure service infrastructure and capacity building. In this evolving landscape, Kenya's National Framework for Climate Services is in line with the Global Framework for Climate Services (GFCS). The NFCS should be adaptive and responsive to emerging climate trends and vulnerabilities, ensuring a sustainable and resilient future for the nation.

1.2 The Global Framework for Climate services (GFCS)

A declaration establishing the Global Framework for Climate Services (GFCS) by the United Nations World Meteorological Organization (UN-WMO) was adopted on the 3rd of September 2009 at the 3rd World Climate Conference (WCC-3) by high-level policy-makers from more than 150 countries, including Heads of States and Governments. GFCS is designed to mainstream climate science into decision-making at all levels and help ensure that every country and every climate-sensitive sector of society is well equipped to access and apply the relevant climate information.

The GFCS defines climate services as “Climate information prepared and delivered to meet users’ needs” (WMO, 2011). It is built through user–provider partnerships that include all stakeholders, and is based upon five pillars: *user interface platform (UIP*); a structured means for users, climate researchers and climate information providers to interact at all levels; *climate services information system* (CSIS), the mechanism through which climate information is managed and processed to generate products and services; *observations and monitoring*; *research, modelling and prediction* and; *capacity building*. GFCS goals can only be achieved by establishing National Frameworks for Climate Services in member countries.

1.3 National Framework for Climate Services

A national framework for climate services (NFCS) is an institutional mechanism to coordinate, facilitate and strengthen collaboration among national institutions to improve the co-production, tailoring, delivery and use of science-based climate predictions and services particularly in the climate sensitive sectors (Agriculture, Livestock and Food Security, Disaster Risk Management, Health Services, Water, and Energy among others).

The National Meteorological services play the key role in gathering observations that form the foundation of climate services and are central to the climate services information system. The Meteorological services are also key to the implementation of systems and processes for generation of climate products as well as facilitation of broad interaction among users through key actors and play a significant role in the UIP component. To develop user-oriented climate services, the data gathered by the other institutions involved, including research, and linkages among them as well as the processes employed, are vital.

1.3.1 Purpose of NFCS

The main purpose of NFCS is to establish an institutional mechanism to coordinate, facilitate and strengthen collaboration among national institutions to improve the co-production, tailoring, delivery and use of science-based climate predictions and services.

1.3.1.1 Goals of the NFCS

The Kenya`s national framework for climate services has the following 7 strategic goals. These are to:

1. Create effective coordination mechanism for climate services;
2. Improve access or provision of climate services and Early Warnings for all;
3. Enhance observation and monitoring network;
4. Enhance capacity for climate services users, providers, and researchers to interact at all levels;
5. Enhance capacity for research modeling and prediction;
6. Enhance capacity to generate and use climate information and products; and
7. Promote partnerships and collaborations in the implementation of NFCS.

1.3.1.2 Justification/Rationale

Kenya being one of the countries severely impacted by Climate Change and increased frequency and magnitude of extreme climate events should be at the forefront of ensuring protection of its citizens by early warning systems and information. The quality and quantity of climate information generated by Kenya Meteorological Department (KMD) has improved with advancement in technology. However, one of the major problems faced in discharging some of the functions of KMD has been lack of smart and specific climate services in which "Climate information is prepared and delivered to meet specific users' needs". The Meteorological Department produces forecasts and early warning advisories for various socio-economic sectors without sufficiently blending climate knowledge with sector-specific knowledge. More often the national meteorological service generates and provides climate information to user sectors with little input from the sectors, therefore, most sector users cannot integrate the climate information into their sector plans and decision-making processes.

In addition, currently there are undefined and unstructured overall national institutional coordination mechanism, to facilitate the co-production of *science-based climate predictions and services.* This gap is a key drawback to the effective management of national climate services.

Moreover, there is limited stakeholder interaction and co-production mechanisms both at the national and county levels. User interface platforms (UIPs) to enable users, climate researchers and climate information providers to interact at all levels are yet to be defined,

structured and established. Existing interactions are ad hoc. A climate service should provide "climate information in a way that assists decision-making by individuals and organizations" (WMO, 2014). The service component involves appropriate engagement, an effective access mechanism and responsiveness to user needs. Such services typically generate and provide contextualized information on past, present and future climate and its impacts on natural and human systems, and apply that information for decision-making at all levels of society.

To improve the uptake of science within societal decision-making, it has been proposed that there is a greater need for "long-term dialogues and interactions" between "producers" and "users" of scientific knowledge (Mitchell et al. 2006, p. 324). The basic premise of increasing interaction between producers and users has been around for several decades in the area of climate information (see, e.g., NOAA 1998); WMO 1997). However, how processes of user engagement are conceptualized and implemented has important implications for whether or not they will contribute toward the production of knowledge that is "useable" for decision-making and action.

Establishing a National Framework for Climate Services and operationalization of sustainable User-Interface Platform is key to promoting people-centered systems at the National and County levels. This will increase the number of recipients of climate information services who use the information in their risk management and decisions, in line with the Strategic Objective 01 in the National Climate Change Action Plan (NCCAP 2023-2027) which aims to reduce risks to communities and infrastructure resulting from climate-related disasters and enhance institutional preparedness and response.

The NFCS is clearly linked to the UN early warning for all initiative, since it is only through the multi-sector coordination that the multi-hazard early warning system and information can be developed/produced. The NFCS will also operationalize a digital and standardized early warning system platform for climate-related information exchange across all counties and enable access to multi-hazard early warning alerts and advisories.

1.3.1.3 Methodology used in formulation of the Framework

The World Meteorological Organization (WMO) provides a step-by-step guideline for establishing a national framework for climate services. The following five steps were undertaken in formulating the NFCS-Kenya, these are:

The first step was undertaking the baseline assessment of national climate services capacities. The step delivered an adequate baseline on the institutional capacities, country readiness, stakeholder mapping, the currently provided services and respective needs as well as existing gaps, in providing national climate services. The WMO 'Questionnaire for Baseline Assessment of Country Capacities to Deliver and Use Climate services' tool was restructured into separate national and sub-national sections and deployed online to respondents

identified by the team through a stakeholder mapping process using the KOBO Toolkit platform.

The second step was conducting a national consultative workshop. The workshop was conducted over two days where a hybrid approach entailing virtual and in-person participation was simultaneously employed. The workshop brought together key actors and facilitated consensus building on vital issues, identification of appropriate mechanisms to improve and sustain the flow, co-production and delivery of user-salient climate information for different users. Participants were drawn from government departments, universities and research institutions, key decision-makers, partners and key climate-sensitive socio-economic sectors.

The 1st and 2nd steps were underpinned by a stakeholder mapping and analysis exercise. The exercise helped to identify and define stakeholders along the climate services value chain in terms of categories and their potential role in the NFCS, and the NFCS expectations from and potential contributions to their mandates. The mapping and analysis contributed to identifying and defining the country's climate services landscape, needs and NFCS strategic issues. The country climate services stakeholder mapping/analysis is presented in Annex I.

The outputs realized included: identification of existing capacities for providing climate services; a shared and clearer understanding of the needs for climate services by user sectors and, capacity development needs for implementation of the NFCS; improved knowledge and identified recommendations on climate services communications mechanisms; and strategic guidance on the institutional arrangements, partnerships and processes required to operationalize the NFCS at the national level. The outputs from the consultative workshop are consolidated in Chapter 3.

The third step was the drafting of NFCS implementation plan and costed action plan through stakeholder`s workshop. The workshop focused on a technical interrogation of the draft national implementation plan and costed action plan. It facilitated incorporation of stakeholder inputs into the draft plan, and ensured comprehensiveness and validation of the priority activities presented in the costed action plan.

The fourth step was conducting NFCS technical validation workshop of the strategic actions. This was to ensure inclusion of perspectives into the framework, comprehensiveness and verification of the priority activities presented in the action plan to realize the implementation of the NFCS, as outlined in the framework.

Finally, the Cabinet endorsed the Framework and the NFCS launched to set the stage for official roll out and implementation of the NFCS-Kenya.

1.4 Country Background on Climate Services

1.4.1 Overview of institutions providing climate services

Meteorological observations in Kenya started in 1896 at the then Mombasa Old Observatory, Port Reitz. However, organized meteorological services were established in 1929 as part of the British East African Meteorological Service (BEAMS). In 1947/48, it was renamed the East African Meteorological Department (EAMD), which was placed under the East African Common Services in 1965. In 1977, post East African Community (EAC), the Kenya Meteorological Department (KMD) was established as a department in the Ministry of Power and Communications. It has since been domiciled in various ministries and is currently a department in the Ministry of Environment, Climate Change and Forestry.

KMD is the mandated central institution for providing weather and climate information services. This mandate is anchored on Executive Orders on the structure and organization of the Government of Kenya and the World Meteorological Organization Convention. The Convention also recognizes the National Meteorological Service to be the single and authoritative voice and source on matters of severe weather and extreme climate events among WMO's member states.

There are other institutions which provide climate information services (CIS), early warning (EW) services and platforms through arrangements that NFCS can leverage and collaborate with. These institutions are as listed in *Table 1*.

Traditional and community based EWS, for example the Nganyi Group and the Pokot Community EWS bring into play broad forecasting knowledge bases in their own localities. There is also the Information Technology and Indigenous Knowledge with Intelligence (ITIKI), an app based innovative drought early warning system anchored on a novel framework that integrates indigenous and scientific drought forecasting approaches, and the National Flood Early Warning System (N-FEWS) which provide flood forecasting and management, through collaboration of Ministry of Water and Irrigation (MoWI), KMD, the Water Resources Authority (WRA) and the United States Geological Survey (USGS).

Table 1 Institutions providing climate related information in Kenya

Organization: Functions/Climate Related Services	**Existing collaboration arrangements NFCS can leverage**
1) ICPAC: Foster IGAD regional and national capacity for climate information, prediction products and services, early warning, and related applications.	NCOF forums; training; data analysis, modelling & predictions

Organization: Functions/Climate Related Services	Existing collaboration arrangements NFCS can leverage
2) KALRO: Promote, streamline, co-ordinate and regulate research in crops, livestock etc.	Data collection, co-production; research
3) Ministry of Agriculture, Livestock: Strengthen structures and capacities for consultation, cooperation and coordination in the agricultural sector	Capacity building for UIPs in the agricultural sector
4) Regional Center for Mapping of Resources for Development (RCMRD): Established 1975 under UNECA/OAU. Provide remote sensing & spatial data supply	Monitoring and sharing remote sensed data with NDMA, KMD.
5) NDMA: Provide DEWS services; building resilience; mainstreaming climate information in plans	Co-production/dissemination of forecasts, advisories and warning information; planning (PSPs)
6) Institutes of Climate Change and Adaptation (ICCAs) -UON/Maseno/SEKU Universities: Training & research in water meteorology, water systems	Platform for technical capacity and model development
7) Food & Agriculture Organization (FAO): Increasing the resilience of food and livelihood systems, observations and monitoring	Weather and climate data generation and sharing, dissemination and usage
8) FEWSNET: Provide evidence-based early warning and analysis on food insecurity services	Platform for provision of early warnings, alerts, advisories and development of management information systems
9) Kenya Red Cross Society (KRCS): Humanitarian & relief services	Communication and outreach to communities; last mile advisories & warnings
10) ADA Consortium: supported formulation of County climate change funds	Capacity building for civil society to provide CIS through the CCF
11) Water Resources Authority (WRA)	Monitoring water levels, data sharing, communication platforms
12) Agricultural Insurance Consortium (AIC): Caution smallholder farmers against climate change related risk	Provision of climate information services
13) Cereal Growers Association (CAG): Bring together commercial cereal farmers to promote collective action for the sustained improvement	User interface platform, user data & information needs, issuance of warnings& alerts

Organization: Functions/Climate Related Services	Existing collaboration arrangements NFCS can leverage
14) Kenya Livestock Producers Association (KLPA): Training, extension services and market access.	Training & capacity development on climate issues; user data & information needs
15) Green Without Borders: Climate smart Agriculture, Environmental conservation	User needs, CIS
16) Eastern Africa Grain Council–EAGC: Climate information dissemination and training & capacity building	Communication & dissemination of information & forecasts; training & capacity building for intermediaries& users
17) Kenya Correspondents Association: Training / capacity building for journalists on environment and climate change, and content creation/news gathering and dissemination	Dissemination & communication of weather & climate products & services, communications networks, public education platforms, training
18) Media – Mainstream electronic and print: Informing, educating	
19) Kenya Community Media Network (KCOMNET): A platform for networking between community media, with other media stakeholders, and the general public	
20) ACTED: WASH, food security and livelihoods	Early warning data & information
21) Egerton University (EU): Research, extension services /community outreach	Training & research, modeling, communication, extension service mechanisms, last mile communication platforms and communications networks
22) Kenya Marine and Fisheries Research Institute (KMFRI) Research in aquaculture inland and marine Fisheries and oceanography	Data observations over ocean waters & inland water bodies. Warnings of ocean circulations
23) Kenya Civil Aviation Authority	Dissemination of information concerning the presence of moderate/severe turbulence enroute as reported by aircraft in flight and presence of windshear at airports of interest.
24) Devolved Departments at the county level	Providing sector advisories at the county level

2 Situational Analysis

Both the (SWOT) and (PESTLE) factors in both the internal and external operating environments will influence decisions during implementation of the NFCS, and impact its outputs and outcomes. They are factored in the framework and risk analysis but must be constantly reviewed as change with time. Table 2 provides the SWOT analysis of climate services in Kenya.

2.1 Strengths, Weaknesses, Opportunities & Threats (SWOT) Analysis

Table 2 SWOT Analysis Matrix –Institutional Provision of Climate services

Internal	External
Strengths a) A well established and decentralized national meteorological service with well trained and experienced staff. b) Established and operational national climate services related policies and structures c) Climate sensitive sectors prioritized as important drivers of national socio-economic development d) Presence of an active wide range of multi-sector and independent climate information providers e) Existence of a regional training and research center for climate services f) established Climate Change Units (CCUs) at national ministries and 47 counties. **Weaknesses** a) Poor visibility and understanding of climate services within the public sector, multi-level users and the general public	**Opportunities** a) Growing demand for user, sector, meteorological and early warning climate services b) Potential to coordinate, leverage and exploit existing/future in country sector/ institutional and external capacities and resources c) Room for increasing data availability and sharing through enhancement and networking of observations networks and integration of monitoring systems d) Exploitation of existing/ emerging communications infrastructure for improved information flow e) Opportunities for partnerships, linkages, integration and synergy of systems and processes among sector/institutions/private sector, as well as external capacities f) Enhanced integration of climate change adaptation and disaster risk reduction for more efficient utilization of resources.

b) Significant gaps in technical capacity across the board c) Limited national and cross-sector institutional coordination and collaboration mechanisms d) Unstructured, weak and inadequate observations networks and monitoring systems, technical facilities, user interface platforms, communication /dissemination structures and mechanisms, among others e) Gaps in national and institutional legal, policy and regulatory frameworks f) Bureaucratic impediments and inefficiency in management of climate services g) inadequate resources to maintain and sustain observations networks and monitoring systems, user interface platforms, communication /dissemination structures and mechanisms, among others h) Limited incentives and platforms for research and development i) Inadequate national and cross-sector financing and capacity building initiatives j) Undefined national user map/data bases k) Limited mechanisms for data sharing and exchange	g) Availability of opportunities to collaborate with international partners in research and capacity building initiatives h) Enhanced data sharing and exchange i) Existing alternative models for financing of national /sector/institutional climate services initiatives **Threats** a) Weak financing of climate services b) Poor perception and recognition of the value of, and support for, meteorological/climate services by the public and policy makers c) Lack of regulatory and coordination framework to guide other institutions in the generation and delivery of climate services d) Slow uptake by users to rapidly changing technologies across climate services operations e) Emerging unregulated climate service providers

2.2 Political, Economic, Sociocultural, technological, legal and environmental (PESTLE) analysis

Table 3 provides the PESTLE analysis of climate services in the country.

Table 3 PESTLE Analysis

	Narrative
Political	Kenya recognizes, actively subscribes to and is implementing programs to the following global, international, regional and national climate services related decisions and development paths as embedded in its development agenda: WMO Conventions; Intergovernmental Panel on Climate Change (IPCC); UN Framework Convention on Climate Change (UNFCCC); United Nations International Strategy for Disaster Reduction (UNISDR); UN Convention to Combat Desertification; Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM). Relevant regional initiatives include East African Community (EAC) Sectoral Council on Transport, African Ministerial Conference on Meteorology (AMCOMET), Communications and Meteorology, African Union (AU) Agenda 2063 and the IGAD Regional Climate Centre: IGAD Climate Prediction and Applications Centre (ICPAC), also designated as the World Meteorological Organization (WMO) Regional Climate Centre for Africa National policy initiatives and instruments that derive from these frameworks include; the Vision 2030 National Plan, National Spatial Plan 2045, Kenya Constitution 2010 which encompasses relevant Acts; Water Act 2016, Kenya Airports Authority 1991, Kenya Civil Aviation Authority, Forestry Conservation and Management Act, Kenya Maritime Authority, National Drought Management, and others), the National Climate Change Act (CCA) and National Climate Change Action Plan (NCCAP 2023-2027), among others. Others are: Nationally Determined Contribution (NDC) 2020 to the UNFCCC; Kenya Climate Smart Agriculture Strategy, 2016-2030; the Fourth Medium Term Plan, 2023-2027 (MTP IV), that provides a cross-cutting section on climate change and mainstreaming climate change into relevant sectors, Third County Integrated Development Plans (CIDPs III) and; decentralization of meteorological services

	Narrative
Economic	Under the economic pillar of the Vision 2030, six sectors namely tourism, agriculture, manufacturing, trade (wholesale and retail), business process outsourcing; and financial services are identified to deliver the 10 percent annual economic growth rate. Climate related challenges identified under this pillar are disaster risk, erratic and extreme weather events which negatively impact the sensitive sectors. Overall, there is an upsurge in national demand for climate services due to the increasing extreme climate events, and technological advances for accessing, understanding and usage of climate data and information, and a moderately performing economy that has seen levels of disposable income of the expanded market base rise. As a result, there exists an unregulated and uncontrolled environment in the provision of climate services with a proliferation of local and international institutional and individual providers some of which are unreliable and unauthenticated. Currently KMD is not positioned to earn any revenue from aviation, shipping and other climate sensitive public and private sectors. There are no legal frameworks nor structured mechanisms to facilitate this. The potential is thus high for revenue generation, resource mobilization and addressing related monetary and fiscal issues if the ongoing KMD processes of developing pertinent legal and policy frameworks and hence response to emerging pertinent economic challenges are successful.
Socio-cultural	Kenya is a socially and culturally diverse country and the increasing extreme climate events continue to negatively impact the different socio-cultural fabrics of the country. There is increasing rural-urban migration leading to higher populations and disease outbreaks, displacement of communities and migration of pastoralists as well as conflicts over natural resources. Indigenous communities' livelihoods and entrenched cultural practices have been disrupted, shifting from traditional to modern ways increasing the demand for climate services to enhance response and resilience building. At the national level, the events including prolonged droughts, frost in some of the productive agricultural areas, hailstorms, extreme flooding, receding/increasing lake levels, drying/swelling of rivers and other wetlands, invasions of pests and diseases among others coupled with limited official funding have contributed to depressed performance of the national economy.

	Narrative
	The general perception of and attitude towards forecasts remains lower than optimal partly due to limited awareness raising programs, traditional beliefs, limited accessibility to and low understanding of weather and climate information, as well as poor visibility of KMD as the single authoritative voice on climate matters. In some instances, conflicting interpretation of weather and climate information has caused confusion mainly as a result of ineffective communication. Collectively, the community and traditional knowledge and systems held within the country, if properly harnessed, has the potential to positively impact national climate services.
Technological	Kenya is at the forefront of technological innovations and is often referred to as the 'Silicon Savannah'. The ICT sector's growth has outperformed every other sector. Internet access has continued to spur economic growth and led to the government's launch of the Digital Economy Blueprint with all the 47 counties now have ICT Roadmaps. This opportunity is available for appropriation by institutions to innovatively integrate data and information from other sources to develop an end-to-end multi-hazard early warning systems that leverages Internet of things (IOT) including social media platforms. There is a reasonable level of collaboration in research between KMD and research institutions like KALRO, University of Nairobi. The emerging regional, national and sub-national climate services landscape has potential for concerted collaborative efforts to build initiatives to embrace new and emerging technologies like the Big Data, Machine learning and artificial intelligence (ML and AI) and Internet of Things (IoTs) by all institutions. For example, KMD has embraced and is implementing the WMO WIGOS/WIS programs and regional responsibilities upon which it can build capacity for gathering, storing and exchanging "big data", collecting and sharing crowdsourced data, and working with information through social media channels. KMD has installed the Integrated Meteorological Information System (IMIS) for data capture, processing, assimilation and modeling (a Central Information Processing System (CIPS), under the WMO-WIGOS/WIS framework)

	Narrative
	and, with legislative support, is well advantaged to accelerate its technological capabilities.
Environmental	Kenya's economy depends heavily on environmental goods and services. There is a wide range of progressive environmental policies, but implementation remains a challenge. Kenya's largest sector, agriculture, relies heavily on the health of the environment. Over the past 50 years, weather patterns have changed due to climate change and widespread warming has been observed. The environmental management efforts are frustrated by constraints on the national capacity to execute, monitor, and enforce existing environmental regulations. Land degradation due to poor land use practices and deforestation have exacerbated the effects of climate change. (Reforestation efforts have however increased the current forest cover to 8.8%). Challenges in water sector include scarcity, very low replenishment rates, and quality and related community conflicts. There are active Government policy initiatives to rehabilitate all Kenya's water catchment zones and catchment towers. The rich and diverse marine and coastal ecosystems are under threat from development of the blue economy while waste management remains a significant ecological challenge. The evident decline in wildlife and biodiversity is spurred by complex and interrelated drivers key among them climate change. The country is also experiencing heat waves, floods, drought, rise in sea and river levels, increasing disease incidences etc. Substantial investments in enhancing building resilience, mainstreaming climate information in environmental programs and strengthening information linkages between the providers of climate

	Narrative
	information and local communities will be necessary in alleviating the foregoing challenges**.**
Legal	Currently there are no legal mechanism to coordinate provision of climate services. Most user interface platforms operate in an ad hoc manner. There are no harmonized data sharing protocols between providers and users of climate services.

2.3 Conclusions from the SWOT and PESTEL analysis

The CIS space has several strengths in the provision of climate services, including an observation network, innovative data platforms, a comprehensive climate database, prioritization of Climate sensitive sectors as vital drivers of national Social Economic development, presence of an active wide range of multi sector CIS providers and well-trained staff across the sectors. These strengths place KMD in a unique position to lead the country in the implementation of NFCS-Kenya. However, there are notable weaknesses to address; such as gaps in staffing across sectors, inadequate coordination mechanisms, and bureaucratic inefficiencies. While there are significant opportunities, like collaboration with regional and international climate centers and a growing demand for climate services there are also noted threats. These threats range from poor public understanding and recognition of climate services to the challenges posed by rapidly changing technologies and emerging competition.

Politically, Kenya is active in international and regional climate service provision agreements and has several national policies derived from these commitments. However, funding for CIS and meteorological programs faces bureaucratic bottlenecks and no regulation in the CIS arena. Economically, the increasing demand for climate services, spurred by extreme climate events and technological advances, offers avenues for revenue generation, but there are challenges in positioning key sectors to tap into this potential. Socio-culturally, extreme climate events have strained the diverse Kenyan society, and the perception of CIS remains suboptimal. Technologically, Kenya's rapid ICT growth offers climate sensitive socio-economic sectors, a chance to integrate innovative solutions, but there is a need to embrace newer technologies like Big Data and IoT more extensively. Environmentally, Kenya's heavy reliance on environmental goods and services is challenged by changing weather patterns, land degradation, and other climate-induced threats. Legally, while Kenya adheres to international standards in provision of climate services, there's a pressing need for a domestic legislative framework to solidify its mandate and enhance its service delivery.

3 Baseline Assessment of climate services

The national consultative workshop and baseline assessment activities described in 1.3.1.3 yielded outputs presented in this chapter.

3.1 Current status of the delivery of climate services at the national level

3.1.1 National mandate for provision of climate services

KMD, a department under the Ministry of Environment, Climate change and Forestry is mandated to provide timely early warning weather and climate information for safety of life, protection of property and conservation of the natural environment. This mandate is anchored on Executive Orders on the structure and organization of the Government of Kenya and the World Meteorological Organization Convention. This positioning limits the institution to mainly meteorological services, and also limits its sphere of governance, operations and coordination of country climate services.

3.1.2 Limitations to the delivery of climate services at national level

a**) Lack of national policy, regulatory and institutional frameworks**

Delivery of climate services is limited by a lack of national policy, regulatory and institutional frameworks, and consequently, strategy. This has resulted to weak control and coordination of operations and programs, fast growing proliferation of unregulated institutional and individual providers that could be providing sub-standard products and services and causing confusion among stakeholders and users.

b**) Limited institutional visibility and public awareness and support**

The level of public awareness and understanding of the role and importance of climate services is relatively low among the Kenyan populace. This has led to perceived negative attitude towards, and limited support to provision of climate services.

c**) Inadequate observations networks, and monitoring and early warning systems**

Observations and communications networks and monitoring systems operated by partners, sectors, independent institutions and traditional providers have not been harmonized into a national grid, limiting the quantity and quality of data available for development of climate services products.

Despite data generation, digitization, homogenization, rescue, integration, access among other related capacities being in place, they are inadequate. The level of functions including analysis of extreme events, climatic trends and climate change scenarios within the current monitoring system are limited by gaps in the data and information. The staff technical competencies and equipment, and support and empowerment for production, tailoring and communication are also inadequate. In addition, lack of a national coordination mechanism

between KMD and relevant monitoring institutions like in water, agriculture, disaster management, energy, health sectors etc, limits the outputs, including early warning services.

d) **Limited stakeholder interaction and co-production mechanisms**

User interface platforms (UIPs) to enable users, climate researchers and climate information providers to interact at all levels are yet to be defined, structured and established. Existing interactions are ad hoc. Though KMD and some partners are implementing a CIS initiative with some success, the services provided are, to a significant extent, not user driven. Involvement of users in identifying the needs for climate services, co-development of products, identification of capacity development requirements, and influencing the direction of observational investments and research efforts is limited in scope and depth. This limits the user component in provision of, and hence impact on, national climate services.

The initiatives currently being undertaken for co-design and co-production of climate services products include: NCOFs; ASDSP which facilitates downscaling of weather information; engagement between KMD/partners and intermediaries (sector experts) for tailoring of CI to specific sector needs and; Participatory Scenario Planning (PSPs) for co-design/production, including integration of indigenous CI into climate products and services. There may be other initiatives used by independent CIS providers around the country. This situation limits the effectiveness of co-production of climate services as they operate without national guidelines and coordination, are ad hoc and limited in scope, and lack a performance framework.

e) **Limited dissemination and communication of climate products and services**

A range of climate products and services are currently received by national level users. However, the methods of accessing the products and services, their relevance, usage and appropriateness are yet to be clearly defined. Feedback mechanisms remain unstructured and minimal.

Data and information dissemination and communication to users is not based on a comprehensive and or integrated national strategy. Channels used are not well defined and developed. The channels target traditional audiences, are generalized and have limited feedback mechanisms and hence, render their effectiveness difficult to measure.

f) **Undefined and unstructured overall national institutional coordination mechanism**

Facilitation and coordination of institutional mandates and operations including creating and operationalizing linkages, integration and synergies among institutions contributing to the development, generation and provision of climate services, is hampered by lack of a structured national coordination, collaboration and partnership mechanism. This gap is a key drawback to the effective management of national climate services.

g) **Unstructured and weak research, modeling and prediction arrangements**

Collaboration on research, modeling and prediction between KMD and climate services related institutions exists at a broad based and ad hoc level. ICPAC is a key institution for climate prediction in the region and collaborates with KMD. The potential in this area of climate services is limited. These efforts are however, limited by the lack of a mechanism to pool the respective contributions into a national climate services knowledge management resource center.

h) **Inadequate financing mechanisms for climate services**

Resources at the disposal of agencies providing climate services are inadequate. The budgetary allocations for meteorological services from the national government are inadequate and disbursed through normal bureaucratic channels, while donor financing is mainly for infrastructure development and is inadequate as well. Gaps exist particularly in infrastructure capacity development which is donor dependent. Provision of national climate services are limited by lack of an all-inclusive, cohesive and flexible funding model.

i) **Mainstreaming of climate information into national policies and plans**

There exist a process and competencies at both levels, as well as tools and methodologies at the national level, for mainstreaming climate services in sectoral policies, strategies and plans. These are however, yet to be sufficiently entrenched within public and private sector institutions and organizations. The net effect is the limitation this places on the uptake of climate services for efficient decision making for development at all levels.

3.2 Needs for national climate services.

The national climate services needs are informed by a combination of factors: the climate challenges experienced by the country, the current situation in providing the services, feedback from the framework development process and lessons learnt from other jurisdictions applying the WMO/GFCS recommendations on managing country climate services. The needs that emerged from the baseline assessment and consultative workshop are outlined in the sub-sections below.

3.2.1 Improved quantity, quality and availability of climate data and information to strengthen DRM, enhance resilience building and adaptation to climate change effects and impacts

Kenya's economy is highly dependent on climate sensitive sectors which include agriculture and food security, environment, water, health, energy and infrastructure. Lately, the country has been experiencing increasing extreme climate events and impacts including: prolonged droughts; extreme flooding; seasonal variations in rain-fed agricultural areas; hailstorms; receding/ increasing lake levels; drying/swelling of rivers and other wetlands; invasions of pests and diseases; migration and displacement of communities; conflicts over natural

resources among others. These events lead to loss of lives and property, instability in livelihoods, substantial economic losses and adverse impacts on food security. Thus there is need to reduce vulnerability and enhance resilience to climate change by use of climate information and services.

3.2.2 Strengthened national positioning and public ownership of climate services

Public and political ownership and support of climate services are key to their effective provision and uptake. The NFCS development process revealed low political support and positioning of climate services within the public sector hierarchies, and low awareness and understanding among relevant publics. Thus, there is need to strengthen and enhance political and public awareness, understanding and support of climate services.

3.2.3 Legal, regulatory & policy frameworks

Under the current dispensation, development and provision of country climate services is limited by a lack of regulatory frameworks. This has led to lost opportunities for enhancing the services, increasing risk of compromised operational as well as product standards, and misuse of weather and climate data and information by a proliferation of unregulated providers.

3.2.4 National network of weather and climate data generation, and monitoring system

The generation, processing and management of weather and climate data and information form the backbone of climate services. The quantity, quality, credibility, completeness and timely availability of these data and information, as well as the professional processing and management, are critical for the success of climate services. The country requires to identify, network and regulate the in-country data generation networks and integrate the monitoring systems.

3.2.5 A national framework to facilitate coordination of climate services institutions and enable co-development, co-delivery and use of climate services

In order for Kenya's society and ecosystems to maintain its function to withstand the challenges of climate variability and change, it is important to strengthen collaboration among institutions. This will ensure co-production of climate products and services, and co-delivery and incorporation of science-based climate information and prediction into priority socioeconomic sectors (Agriculture, Livestock and Food Security, Environment, Disaster Risk Management, Health Services, Water, Energy, Infrastructure) and related and ultimately national planning and decision making.

To achieve the foregoing, the country requires a national mechanism to coordinate, facilitate and strengthen collaboration among national institutions and stakeholders at all levels of the climate services value chain. The coordination will be underpinned and guided by the climate services value chain which defines the institutional relationships and roles that link climate

knowledge to adaptation action on the ground through interactions and collaboration among stakeholders who work together towards the common goal of availing climate products and services to different levels of users. The coordination will also be implemented in the context of the GFCS functional components namely: observations and monitoring, UIPs, CSIS, research, modelling & prediction and capacity development. The national framework will be a national mechanism to enable the appropriate coordination and collaboration required to ensure that the NFCS pillars are effectively addressed**.**

Figure 1 depicts different levels of the value chain actors/stakeholders who are interlinked in mandates that complement each other's interests and work. These are: providers (external and internal) generate, process and disseminate data; sector climate experts/co-producers develop/produce and apply sector specific data and information; boundary organizations or intermediaries develop, communicate data and information between, and advice providers/co-producers and users; enablers/partners support climate services initiatives at different level and in different ways; national level users co-produce apply and provide feedback and; end users co-produce, apply and provide feedback.

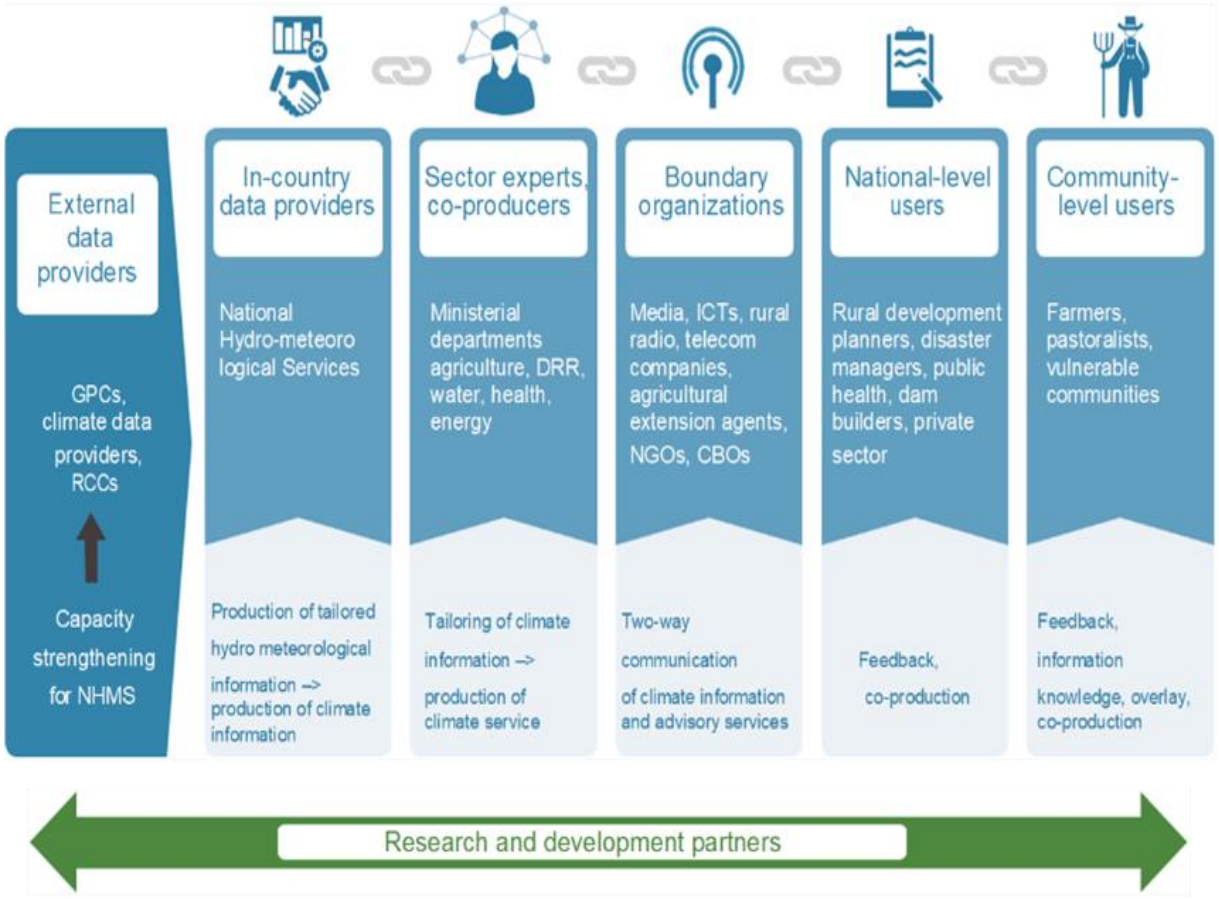

Figure 1 The Climate Services Value Chain (Climate knowledge to action)

Source: WMO Step by Step Guide for Establishing a National Framework for Climate Services

3.3 Specific needs for climate services in the different climate-sensitive sectors

3.3.1 Agriculture, livestock, fisheries & food security sector

The Ministry of Agriculture and Livestock Development under the sectoral Climate Change Unit (CCU) mainstreams matters of climate Change that prioritize climate smart agriculture (CSA) in sectoral policies and plans. The Ministry developed The Kenya Climate Smart Agriculture Strategy (KCSAS) and its implementation Framework, the Kenya Climate Smart Agriculture Implementation Framework (KCSAIF). The Climate Smart Agriculture (CSA) is composed of three key pillars;

- Increased productivity as the key mandate,
- Capacity building for climate change resilience building,
- Reduction of emissions and removal of Greenhouse gasses (GHGs).

The agriculture sector decision areas are the crops, livestock and fisheries farmers, value chain players, extension service providers and policy and decision makers. Decisions relate to, among others, managing exposure and vulnerability to weather hazards; agronomical practices & advisories; post-harvest management and compiling climate risk narratives.

Climate information needs include extreme weather warnings and alerts, daily, weekly, monthly and seasonal weather forecasts; climate change projections, climatological statistics and summaries downscaled to the county and ward level, weather observatories at the community (Ward level) where agriculture activities are undertaken, climate monitoring and validation at the level of agroclimatic zone of the counties, Satellite derived data and information for interpolation , climatic zone maps of counties and customized agro-weather advisories up to community (wards level).

The strategic needs and mechanism required for implementation of NFCS in this sector include; technical backstopping of agricultural research (climate studies), technical support to up to county level, defined structure and mechanisms for sector co-designing and co-production, Capability for comparisons between advice given on climate information and the production yield to produce a convincing picture of user needs, simplified scientific information (terminologies) for respective targeted audiences through appropriate media, In addition the outlined mechanisms are required as follows; follow ups on drought mitigation measures and clear technological methods of combating climate change, local extension workers (users/scouts) to monitor successes, trends and failures of interventions. There is also urgent need to strengthen the relationship with KMD and sectoral co-producers and a user feedback mechanisms and tools for research.

However, the sector faces some gaps and challenges that hinder the provision of climate services, which include; limited data with poor spatial coverage, limited personnel to analyze and utilize CIS, low capacity in data collection and product development at County, sub-county, ward, village level, inadequate computing and Meteorological infrastructure to observe, run models and dissemination, as well as limited budget for maintenance of the meteorological equipment for sustainability.

The sector proposed solutions to the above challenges include; joint planning through a common platform of co-producers and co-designers, complementary funding of activities and human resource in data procurement and processing, and agree on coverage area allocation to the stakeholders to avoid unnecessary overlaps in space and task

3.3.2 Disaster risk management (DRM) sector

Some of the agencies involved in DRR activities include; NDOC, NDMU, NDMA and Kenya Red Cross. The agencies in the sector have various mandates on both disaster risk management and emergency response. They execute their mandate by among other things monitoring all disaster incidents, mobilizing national resources to combat disasters, coordinating disaster management activities, sensitizing and informing the public on disaster related issues, promoting research into all disaster risk management aspects and trends and overseeing regular drills and exercises in all public establishments. The NDMA specifically exercises overall coordination over all matters relating to drought risk management and runs a Drought Early Warning System.

The sectoral decision areas in the sector are disaster prevention operations, rehabilitation and recovery, sectoral preparedness and planning and response activities. Sector decisions relate to environmental conditions, quantitative assessment which combines information on vulnerabilities and socio-economic data, decisions on early warning, medium- and long-term sectoral planning and weather indexed insurance and risk financing. This requires downscaled extreme weather warnings and alerts; monthly & seasonal weather forecasts; climate change projections and climatological statistics and summaries. The forecasts should include details on temperature, wind speed and direction, dry spells (consecutive dry days), clouds (fog) for transportation, long-term trends, frost forecast, lightning strikes, desert locusts forecast, forecasting of pests, (fall armyworm), flood forecast. In order to facilitate disaster preparedness, the sector requires; an impact-based forecast with thresholds for each hazard to determine trigger points, multi-hazard hotspot zoning, and early action.

In order to implement NFCS the sector requires a; multi-sector, multi-agency platform for regular reviews on CIS issues and an inclusive continuous assessment of vulnerabilities and risk by actors and stakeholders. Furthermore, mechanism for data and information processing, analysis, modelling and prediction and Early warning to be established.

These identified sectoral gaps and needs can be addressed through; having a systematic and structured engagement to promote dialogue, establish a harmonized and common understanding of terminologies and concepts (e.g., use of info-graphics), creation of a digital platform to collect, analyze and disseminate information, creating a mechanism to obtain feed-back for iterative co-production, and integration of cross border information in the co-production process and simplification.

3.3.3 Water sector

The institutions operating within the water sector include: The Ministry of water, Water Works Development Agencies, Kenya Water Institute (KEWI), Regional Centre for Ground Water and Research, Water Resources Authority (WRA), National water Harvesting and Storage Authority, National Irrigation Authority, Water service providers, WRUAS, Kenya Water Towers, Kenya Forest Service, Water Services Regulatory Board, Water Services Trust fund. Water resources management and services provision are the key decision areas for climate services in the sector. These decisions relate to floods management, water allocation and provision for various purposes such as; rain water harvesting and storage (reservoir capacity, quantity of surface runoff), Sanitation facilities & hygiene promotion, Water Quality Management. Other climate affected activities include: artificial groundwater recharge, control of water pollution, de-silting of pans & dams; safety of water storage structures and conservation and protection of water catchment areas, riparian areas and wetland, Capacity building for water service providers, Water resources users associations and water management committees, Water related conflicts management (mitigation, alternate water resource provision), Design for hydro-met stations (distribution networks for river gauges and rainfall station), drought impacts mitigation (Early warning, mitigating of drought impacts), Management of drainage systems and Management of Indian ocean water intrusion.

The sector CIS needs include: location specific extreme weather warnings and alerts, flood/drought hot spots, national weather forecasts and extreme Warnings for estimation of change in water reservoir volumes, river flow and flood forecasts, inflow forecasts, water balance for various basins, monthly high and low river flows and, information into hydrological models, Intensity Duration Frequency Curves, air quality forecasts, flood Inundation Mapping; evapotranspiration (relative humidity, sunshine, wind speed), weather Hazards (landslides, heavy rainfall, strong winds, mudslides), dry spells forecast, drought forecasts estimation of water related disease prevalence and incidence and drought conditions updates. Climate change projections are required for trends and projections in weather patterns, intensity and frequency of droughts and floods shift in rainfall seasons and its impacts on water resources and their impacts on water resources.

For the successful implementation of the NFCS in this sector, there is need to establish a CIS platform to capacity build; water service providers, users' associations and management committees on climate services, and livestock water points development.

The identified sector challenges in the sector include: non standardized data collection instrument, inhomogeneous Rainfall runoff and flood forecast models, poor maintenance and operation of equipment, poor data distribution network and lack of coordination within the sector.

3.3.4 Health sector

The Ministry of Health (MoH) is the government body whose key mandate is to build a progressive, responsive, and sustainable healthcare system for accelerated attainment of the highest standard of health to all Kenyans as enshrined in the Constitution of Kenya 2010. In 2013, Kenya transitioned into a devolved system of governance comprising two levels: the national government and 47 county governments. Under the new system, the health service delivery function was assigned to county governments while the national government is responsible for health policy and regulatory functions, technical assistance to counties, and management of national referral health facilities.

Many diseases are influenced by weather conditions or display strong seasonality, suggestive of a possible climatic attribution. The climate information needs for the sector are climate trends, weather patterns, extreme weather events, air quality, radiation, strong winds, other weather and climate conditions can result in diseases and their distribution, flooding, pollution, physical injuries all which lead to negative effects and impacts on plant, animal and human lives and livelihoods. Decision areas include environmental impact assessments, wetland and biodiversity inventory and awareness campaign; climate change adaptation and mitigation; climate research and extension services; disease epidemic and incidence management; health and safety workers to name a few. National extreme weather warnings and alerts and daily through to seasonal forecasts, national climate change projections and national climatological statistics and summaries. These translate to sectoral statistics on; disease epidemics, river bank water levels, water bodies and vegetation, water temperatures, mapping of climate hazard prone areas, specific amounts of air pollutants released periodically.

The sectoral strategic needs and mechanisms necessary to implement NFCS include; establishing a data sharing protocol with KMD, needs assessment on climate services, demographic data that includes Age, gender, socio-economic status, and other demographic factors that can affect health outcomes and vulnerability and disease surveillance and response data.

The aforementioned challenges would be addressed through the capacity-building on operations and maintenance of the weather instruments. In addition, capacity would be required on interpretation of weather and CIS product which will enhance the health sector's ability to utilize weather, and climate services effectively.

3.3.5 Energy sector

The Ministry of Energy and Petroleum, State Department for Energy is the government institution charged with all energy matters for the country. Kenya's energy mix is over 90% from renewable energy sources. Renewable energy sources include: geothermal, hydropower, solar, wind and biofuels. KENGEN is the institution under the State department for Energy responsible for most of the power generation requirements. The hydropower dams, solar and wind power plants are under its custody. Power transmission and distribution is charged to Kenya electricity Transmission Corporation (KETRACO) and Kenya Power and Lighting Company (KPLC). Geothermal Development Company (GDC) is responsible for the-exploration and development of Geothermal resources in Kenya. GDC is involved with infrastructure development and upfront risk taking on behalf of the Government of Kenya. GDC sells steam to IPP's (independent power producers) and KENGEN for power production through their power plants.

The sector needs climate data and information to manage the impact of climate on the energy supply and demand, to estimate wind and solar energy potential as well as water availability in order to ensure that future energy needs are met. In addition, the energy sector releases emissions such as CO_2, which accounts for the largest global anthropogenic greenhouse gas (GHG) emissions. Furthermore, energy operations such as renewable sources, namely; wind, solar and hydropower, electrical distribution and transmission systems, are adversely affected by climatic variability and change, including extreme weather and climate events. Thus, climate services are needed to; improve their resilience to weather extremes, climate variability and change, support in the increased development and use of renewable energy sources in the country, develop strategies risks under current and future climatic conditions associated with climatic variability and change.

Some of the Climate products required by this sector include; national weather and Climate outlook forecasts**,** Solar radiation, Rainfall, Wind speed and direction information, Severe weather updates to mitigate impact for the surrounding community, Pollution monitoring, Daily Radiation data and upper air wind data.

3.3.6 Transport sector

The Roads and transport Sectors Agencies are Kenya National Highways Authority (KeNHA), Kenya Urban Roads Authority (KURA), Kenya Rural Roads Authority (KERRA), Kenya Wildlife Service (KWS), County Governments, Kenya Roads Board (KRB), and National Transport and Safety Authority (NTSA) which oversee road transport; Kenya Railways Corporation (KRC), Tata Magadi railways, and Standard Gauge Railway (SGR) for railway transportation; Kenya

Civil Aviation Authority (KCAA), Kenya Airports Authority (KAA), and Kenya Airways (KQ) for the aviation sector; Kenya Maritime Authority (KMA), Kenya Ports Authority (KPA). The policies in this sector that will support the implementation of NFCS are the National Disaster Management Policy, the Integrated National Transport Policy (INTP), and the National Environmental Policy.

The Roads sectoral requirements for climate services include; Rainfall, temperature wind and IDF data for design and adaptation of road and infrastructure, Daily weather data helps in planning of activities in roads and infrastructure, Flood hazard maps for design and flood prediction. The catchment area information, various forecast and diurnal temperature ranges are very important with the design and material decision which are critical for daily planning.

In aviation Meteorological information needed include: historical wind regime for an area, (30years), temperature data and pressure data-these determine the length of the runway.Hourly meteorological information is required for operations at the airport, e.g. routineobservations: METAR Reports (wind, visibility, temperature, Altimetric pressure, precipitation, cloud cover); warnings- significant weather (if wind or cloud is significant, a warning is issued), Volcanic ash, windshear, Visibility (low level clouds); Rainfall (extreme rainfall) aerodrome warnings; operational Meteorological information (OPMET).

The Marine sector requirements include; shipping forecasts, marine forecasts, onsets & cessation of monsoons and Platform for stakeholder data and information exchange and applications.

The training or capacity-building need that will enhance transport sector's ability to utilize weather, and climate services effectively are the interpretation of weather and climate information by professional in the road sector. This may be achieved through the introduction of basic meteorological course in training institutes in the sector. Catchment information should be included in the course. Quality assurance should be done for ensuring the correct information is incorporated in designs. For aviation sector WMO standards refresher course, systems installation and benchmarking are some of the capacity needs identified by stakeholders.

3.3.7 Environment and Forestry

This sector undertakes the broad constitutional and social mandate of safeguarding a sustainable and resilient environment, healthy ecosystems and sustained biodiversity. This is in line with the various multilateral and bilateral regulatory & Policy frameworks including the Kenya Vision 2030, the MECC&F Strategic Plan 2023-2027 and the Kenya Kwanza Government's Bottom-up Economic Transformation Agenda (BETA). Climate services can provide the necessary tools required by environmental experts to model climate change impacts on biodiversity species distributions, abundance and possible loss. NFCS will support

the Paris Agreement by helping the country prepare, maintain, and communicate our Nationally Determined Contributions (NDCs) and complement National Adaptation Plans (NAPs) by providing climate information services that help assess climate vulnerabilities, identify adaptation options, improve understanding of climate and its impacts, and enhance the adaptation planning and implementing capacity of climate-sensitive sectors.

The current climate service needs for environmental and Forestry Sector include: Forest fire forecasts, Wind falls forecasts, Weather forecasts, Forest Danger rating (Visual Chart), daily rainfall data, soil depth measurements (moisture conditions), cloud conditions data for aid in use of Satellite imagery for land use and land use change (LULC) classification, tidal, sand floods, and flooding data. Furthermore, KFS have Forest stations with meteorological instruments for monitoring of weather conditions and their service is informed by weather forecast product. KFS forest fire monitoring and forecasting. KFS also employs innovative Drones technology for mapping, monitoring and natural resource accounting.

For environmental management, NEMA requires information on **e**nvironmental disasters including; landslides, lightning strikes, severe floods, droughts, forest fires, massive soil erosion. NEMA also requires; sunshine hours, cloudiness, temperature, rainfall distribution and intensity from KMD.

NEMA also requires additional CIS information for environmental & social impact assessment: urban development, housing, transport & infrastructure; Energy (sunshine hours, rainfall, and cloudiness), waste management: Air pollution; climate change vulnerability assessment. In order to discharge the mentioned roles NEMA requires from the following CIS products; Urban development: spatial plans, Transportation, Dams, Aerial spray pollution, Mining, Electrical infrastructure, waste disposal and leachate (for location of waste management sites) and Environmental vulnerability/impact assessment.

Challenges faced in the sector include; inadequate awareness creation on climate data sources and availability, specific area delineation on weather & climate forecasts, untimely (temporal) data availability on data request, routine Air quality forecasts, data sharing platform, lack of awareness of available data, lack of detail (location) in weather and climate forecast (e.g., monthly forecasts), lack of awareness on data sources e.g., county forecasts, no feedback reports on the use of climate services, and lack of information on Costing of data

The Solutions to identified challenges include; provision of data sharing platform, Awareness creation of freely available CIS data sources, feedback mechanism on use of CIS products.

3.4 Recommendations for improved co-designing and co-production

The current mechanisms for co-production are the NCOFs, the PSPs workshops, at the county and community levels and between KMD and stakeholders' individual institutions. The production of climate services is constrained by limited data and information sharing at all levels; limited stakeholder participation in analysis & modeling, inadequate technical skills, limited dissemination of information and stakeholder participation in downscaling processes, and lacks effective feedback mechanism.

Recommendation 3.4: *An effectively co-designed and co-produced climate service must be inclusive, collaborative and flexible in order to support specific user needs decision making contexts. It is imperative that these user needs are identified in order to define the desired climate products and services. The NFCS, once operationalized, must undertake a broadly inclusive national co-exploration exercise to establish user needs and corresponding issues of concern. This must be followed by stakeholder engagement and dialogue to agree on national co-production guidelines, and development of a national mechanism that will facilitate improvement of co-production processes that best meet respective user needs.*

3.5 Recommendations for improvement of Climate Services

This section highlights recommendations for improvement of climate services to facilitate the flow of climate information from global and regional scales through to national and local scales.

For effective delivery of climate information, appropriate institutional mechanisms to generate, exchange and disseminate information at global, regional and national levels on an operational basis are essential. The CSIS and observations (under WMO Integrated Global Observation System (WIGOS), an integrated, coordinated and comprehensive observing system and enables integration and interoperability) and monitoring components of climate services are supported by the WMO Information System (WIS), depicted in *Figure 2*, which is designed to provide users with relevant climate information. The system is also designed to facilitate subscription receipt of information from different sources, including individuals, through the Data Collection Prediction Centre (DCPC) or (RTH collection center). This requires an efficient communications system.

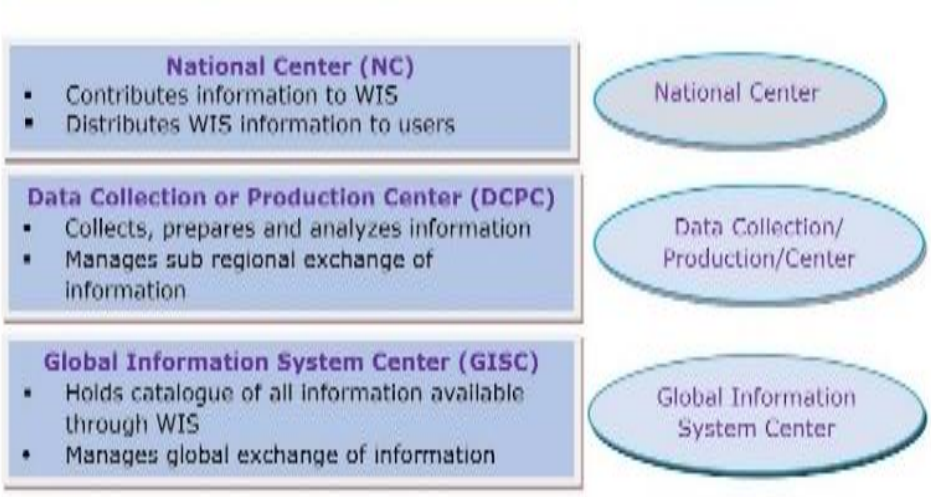

Figure 2 WMO Information System Structure Source: WMO

The process of generation of climate information is cyclical, beginning with identification of user requirements, followed by development and delivery of the information and products based on observations, monitoring, research, modelling and predictions, use/uptake of these, feedback by the user, and product improvement. Flow of information and generation of products within the system essentially includes feedback from users at various levels, for continual improvement of services. Climate services consist of products that are based on historical climate records, contemporary climate information, monthly, seasonal, inter-annual and decadal predictions and long-term projections.

Kenya, through KMD, subscribes to and has partially implemented the WIGOS/WIS programs. The system for production of models, however, malfunctioned, and the WIS required to be upgraded to version 2 and implemented in order to be compatible and serve as an effective information flow interface at all levels. Climate information flow in the country are facilitated mainly through partnerships with WMO systems, development partners, regional structures (ICPAC), and interactive and iterative dialogues between the climate information providers and a representative set of users. These arrangements have continued to advance the country's climate information flow but are often ad hoc and lack clear mandates and coordination.

Recommendation 3.5 (i) *To ensure comprehensive inclusivity and effective collaboration among the entities involved in climate information flow at all levels, the Kenya NFCS, through the CSIS, should be the core institutional framework to promote collaboration, and manage and coordinate national climate information flow.*

Recommendation 3.5 (ii) *To ease and foster collaboration, the Kenya NFCS should consider mandating and incentivizing entities to share information within the context of set national standards.*

Recommendation 3.5 (iii) *Build respective professional capacities in climate information flow for entities.*

Recommendation 3.5 (iv) *The communications system currently operated at KMD should be evaluated with a view to syncing with current global networks, making it more accommodative of the anticipated enhanced flow of information.*

Recommendation 3.5 (v) *Rehabilitate and strengthen the KMD model production system, and upgrade the WIS to a desired version in order to make the climate services central institution compatible with the DC* ***and*** *PC depicted in Figure H, in keeping with global operational standards.*

3.6 Road Map for Development and Application of Climate Services

This section highlights the Road Map for development and application of climate services in support of the different climate-sensitive sectors at all levels (national and county).

Currently, climate sensitive sectors in the country work separately with KMD/other climate institutional and independent information services providers, development partners and user groups in the development sector services. This approach denies the sectors the opportunity to build linkages, and synergize and integrate systems and processes whereby they would be more efficient and cost effective. This situation is exacerbated by the limited scope of involvement of the value chain actors and users, and data and information flow and availability. To support this cause, the NFCS Kenya will:

a) Constitute a multi-sectoral working group
b) Develop guidance, and use it to leverage the Inter-Sector Working Group (I-SWG) to identify areas of linkages, synergy and integration within each and among the sectors for production and application of climate services at the national level
c) Consultatively develop standards, mandates and protocols and a mechanism to operationalize respectively sector/inter-sector climate services production and application
d) Encourage and support sector climate services development and application professionally through training and secondment of staff to climate service institutions and materially through facilitation of alignment to, and use of the NFCS Kenya respective pillar resources and capacities, as well as regional and global structures.

4 THE NFCS –Kenya Model

4.1 NFCS-Kenya Vision, Mission and Core Values

4.1.1 NFCS-Kenya Vision

To provide an Effective National Mechanism that Enables Coordination and Provision of Integrated National Climate Services for Planning, Decision Making and Sustainable Development.

4.1.2 NFCS-Kenya Mission

Build climate services capacities to: enhance climate services networks and systems; coordinate relevant institutions, sectors and other actors; facilitate sustainable development and implementation of NFCS pillars; co-design, co-produce, communicate, deliver and use climate services for decision-making in climate-sensitive sectors. Reduce risks and impacts associated with climate variability and change and enhance sustainable development.

4.1.3 NFCS-Kenya Core Values:

The NFCS-Kenya believes in, and will uphold the values described below.

Focus on user needs. We believe that development and delivery of products and services must always be informed by a thorough understanding of the needs of users.

Quality services. We adhere to globally recognized standards and procedures during generation, development and delivery of products and services to ensure that we offer the highest quality possible to our clients and the public.

Teamwork. Inclusivity of and collaboration with relevant actors and stakeholders along the entire national climate services value chain is the hallmark of our operations.

Simplicity. Understanding of climate products and services by target audiences is key to their uptake, use and ownership. We continually ensure the subject matter of climate services, their development and the outputs there from are comprehensible at all levels.

Credibility. Beyond the science we use, we are committed to incorporating the knowledge, experience and opinion of indigenous providers and users in the development of products and services.

Timeliness. As climate services are highly perishable, time will be a critical factor in their delivery.

Social responsibility. In facilitating the provision of climate services, we at all times remain cognizant that the services provided are a public good when saving lives.

Transparency & Accountability. We always endeavor to ensure transparency and accountability in delivering on our mandate.

Respect for climate associated risks. Recognition and respect for effects and impacts of climate change on the very survival of humanity gives more impetus and strengthens our commitment to proactive management of climate services.

Equity and Inclusivity- ensuring all communities including marginalized and vulnerable groups have equal access to and can benefit from climate services.

4.2 Functions of the NFCS

The main functions of the NFCS is to serve as:

- **A platform for institutional coordination, collaboration and co-production** among relevant technical departments across line ministries at national and county levels.
- **A legal framework** for collaboration at national and county levels to generate and share user-oriented climate services for use by the relevant social and economic sectors.
- **An opportunity to bridge the gap** between available climate services and user needs at National and county levels, continuously identifying user needs for climate services, communicating available climate products and services to users in the relevant sectors, and obtaining feedback from users on climate products and services.
- **A vehicle for scientific coordination** to synthesize the state of the climate at the national level, and distil climate knowledge outputs for policymaker actions founded on scientific evidence.
- **An operational bridge** between climate research, Kenya Meteorological Department and other relevant national institutions, to increase collaboration to improve services by working together on climate knowledge, and by sharing data and expertise.
- **A functional chain for linking climate knowledge with action** on the ground so as to maximize the application of climate information and products by identifying bottlenecks in improved delivery of climate services.
- **An opportunity** for enhancing the contribution of climate science to the development of national adaptation plans, DRR, Sustainable Development Goals and national development policies by enhancing the integration of climate information and products into decision making as well as into national policies.

4.3 The Pillars of the National Framework for Climate Services

The main role of the NFCS is to coordinate, facilitate and strengthen collaboration among institutions to ensure co-production and incorporation of science-based climate information

into planning for climate-sensitive socioeconomic sectors. It is built through user–provider partnerships that include all Stakeholders, and is based upon the following five components, or pillars (see *Figure 3*):

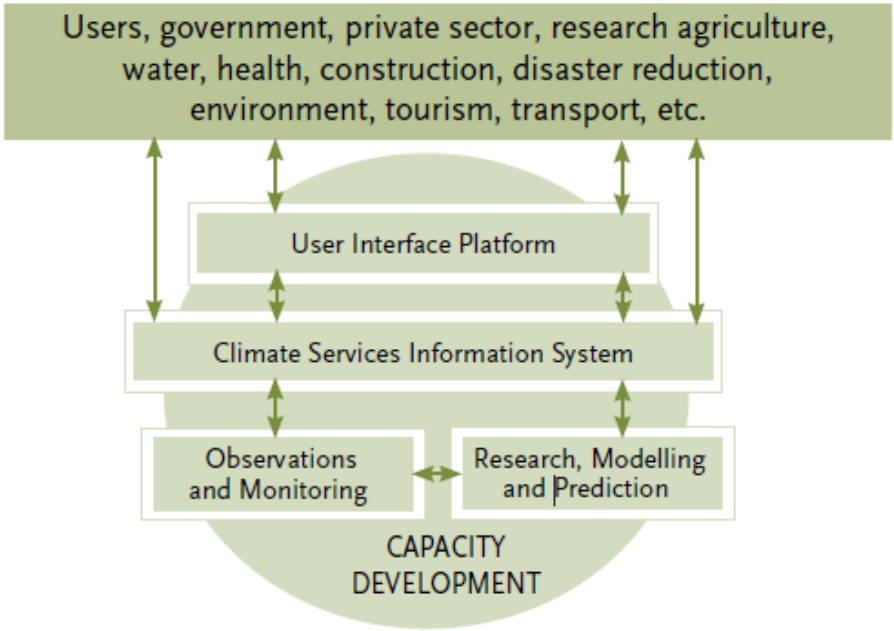

Figure 3: Functional components (pillars) of NFCS

- **User interface platform (UIP)**: A structured means for users, climate researchers and climate information providers to interact at all levels
- **Climate services information system:** The mechanism through which information about climate (past, present and future) is routinely collected, stored and processed to generate products and services that inform often complex decision-making across a wide range of climate-sensitive activities and enterprises
- **Observations and monitoring:** To ensure that climate observations and other data necessary to meet the needs of end users are collected, managed and disseminated and are supported by relevant metadata
- **Research, modelling and prediction:** To foster research towards continually improving the scientific quality of climate information, providing an evidence base for the impacts of climate change and variability and for the cost-effectiveness of using climate information
- **Capacity development:** To address the particular capacity development requirements identified in the other pillars and, more broadly, the basic requirements for enabling any NFCS-related activities to occur.

The critical component of NFCS is the UIP.

- User interface platform (UIP): *is a structured means for users, climate researchers and climate information providers to interact at all levels*
- The involvement of users in helping to establish the needs, co-develop appropriate products, identify capacity development requirements and influence the direction of observational investments and research efforts is crucial in achieving NFCS goals.
- The UIP therefore influences the development of all the other pillars of NFCS.
- Establishment of a User interface platform (UIP) such as the National Outlook Forum (NCOF) and County Climate Outlook Forum (CCOF), or commonly referred to as Participatory Scenario Planning (PSP)) would contribute to enhancing long-term dialogue, enhance dissemination of products, providing a regular platform for communication with users and for obtaining their feedback on the usefulness of products and the level of understanding; Improve understanding of the users' needs in terms of the way information is presented and communicated (formats, standards, visual interpretation, etc); and enhancing dissemination of relevant climate products, reducing risks that result from climate-related disasters.
- User interface platforms can also be established at sector levels (e.g agriculture sector, water sector, etc). Sector User Interface Platforms allow for the customization and tailoring of climate information according to the needs of different users. This ensures that climate services are relevant and useful to end users, as they can access information specific to their level of operation (region), sector, or decision-making context. Tailoring the information helps in addressing the diversity of users and their varying levels of understanding and technical expertise. They can also serve as a feedback mechanism, enabling users to provide valuable insights on the usefulness, relevance, and effectiveness of climate services. This feedback loop can inform improvements and refinements in services offered, leading to iterative learning and continuous improvement.

4.4 Governance structure of the NFCS Kenya

The NFCS shall be operationalized through a credible governance structure comprising of all key institutions in the climate-sensitive socio-economic sectors, proficient human resources, and adequate financial resources that will support full execution of its functions. One key component of the governance structure is the NFCS-Secretariat. The Secretariat shall be hosted by the ministry responsible for meteorological services, which will serve as the institution that provides the coordination of climate services nationally into a central platform and bring about collaborative climate-related research, monitoring, modelling and prediction capability at a national and county levels. The NFCS-Secretariat will require supporting

infrastructure such as servers, high performance computers, climate databases, data networks, modelling software and software development capabilities. Figure 4 depicts a simplified governance structure of the NFCS.

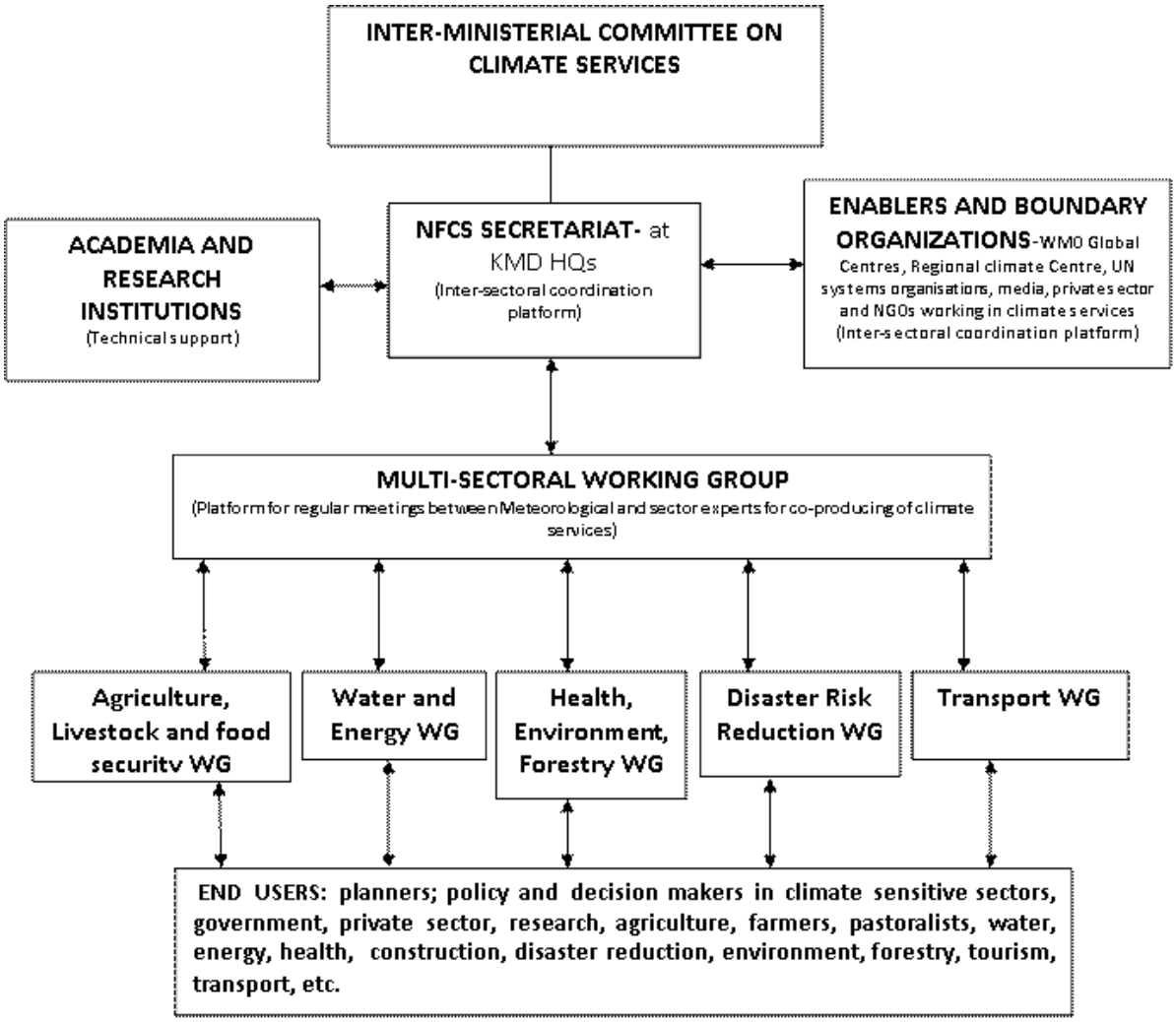

Figure 4 NFCS administrative structure at National Level

4.4.1 Roles and responsibilities of the NFCS administrative structure:

I. The **Inter-Ministerial Committee on Climate Services (I-MCC)** will provide direction and oversight operations of the NFCS. The I-MCC will comprise of Principal Secretaries of Ministries responsible for the National Treasury (TNT), Interior, Meteorology, Agriculture and Livestock, Energy, Water, Environment, Health, Disaster Risk Reduction and Transport. The role and responsibilities and functions of the Interministerial Committee include among others;

   a) Mobilizing resources for operationalization of the Kenya NFCS
   b) Providing Overall policy and strategic direction for the NFCS
   c) Oversight and supervisory of the secretariat

d) Enforcing national standards for climate services
e) Provide strategic advice to the secretariat for the implementation of activities

II. **The NFCS Secretariat** will operationalize and implement the Kenya NFCS policies, strategies and plans. It will work in close liaison and consultation with the multi-sectoral working group and all national value chain actors. The Secretariat will comprise of at least 10 officers, five nominated by the Kenya Meteorological Department, and five nominated from the key climate-sensitive sectors of agriculture and Livestock, Water/energy, Health, Disaster risk reduction and Transport. The Secretariat will perform the following functions:

a) Provision of secretarial services to the I-MCC;
b) Coordinate the operations of national climate services UIPs, National Climate Outlook forums (NCOFs) and forecasts;
c) Coordinate data sharing and modelling activities of the Sector Working groups;
d) Establishment, operation and control of a national central database for climate services and, coordination of management of country climate data, information, products and applications;
e) Communicate, deliver and disseminate climate services/early warning products for decision-making in climate-sensitive socioeconomic sectors;
f) Coordinate capacity building for sector working groups to enhance co-production and co-designing of sector specific products, advisories and early warning products;
g) Identifying and addressing capacity needs for climate services and capacity development for inter sector data integration and modelling;
h) Determining, documenting, operationalizing, controlling and continuously reviewing a national network of observatories;
i) Ensuring that climate information products/early warning products are effectively communicated, interpreted and understood by users;
j) Obtaining and responding to ~~user~~ Sector working group feedback, improvement of climate products, joint- interpretation, access and their application;
k) Undertaking a national climate services providers and users' needs assessments;
l) Ensuring that users are capacitated in understanding climate adaptation and disaster readiness, and ensuring of provision of user needs driven climate services.

III. **The Multi-Sectoral Working Group (MSWG)** will comprise of ***focal points*** from key climate sensitive sectors of Agriculture/Livestock, Energy, Water, Environment, Meteorology, Transport, Health, Disaster Risk Reduction institutions, Academia, and the National Treasury/Planning. The functions of the MSWG include:

a) Coordinate and oversee the co-designing and co-production of climate products and services/early warning advisories by sector working groups (SWGs);

b) Advising the I-MCCS on current climate issues, early warning and early action;
c) Providing a platform for inter-sector integration of information and advisories;
d) Support delivery and dissemination of climate services/early warning advisories for decision-making in climate-sensitive socioeconomic sectors.

IV. The **Sector Working Groups (SWG**s) will comprise of technical teams from key climate sensitive sectors of Agriculture/Food Security, Energy/Water, Health/Environment, Transport and Disaster Risk reduction. Each sector working group will be backed up by officers from Meteorology (to provide climate information) and academia/research institutions. The main roles and functions of the SWGs are:

a) Co-designing, co-production, and tailoring of science based climate predictions and services/early warning advisories for decision-making in climate-sensitive socioeconomic sectors;
b) Integration of climate and sector –specific data to produce sector specific products.
c) Data analysis and modelling
d) Standardize and tailor climate information and products, including monthly and seasonal forecasts/early warning advisories
e) Development of national and sectoral management/mitigation plans and advisories in response to weekly, monthly or seasonal forecasts
f) Blending of sector specific knowledge and climate knowledge
g) refinement of the product based on client feedback
h) user engagement, iterative dialogue addressing client needs

V. **Enablers/Boundary Organizations**-The operations of the NFCS will be supported by UN/regional organizations which support climate services initiatives; institutions which add value to climate products & services such as WMO and IGAD Climate Prediction and Application Centre (ICPAC). In addition, the NFCS will be supported by boundary organizations which intermediate and facilitate communication between providers and users in delivery of climate services.

VI. **Academia and Research**: -among the functions of the NFCS ***is to provide an operational bridge*** between climate research, National Meteorological services and other relevant national institutions, to increase collaboration to improve services by working together on climate knowledge, and by sharing data and expertise. The Universities and Research institutions will be key in improving collaborative climate research, towards climate research outputs that are more salient and end-user driven. The Universities/Research institutions will act as "**co-producers**", or partners to National Meteorological Services in the tailoring and curating of science-based forecasts.

The NFCS structure will be cascaded to the counties and sub-counties and figure 5 depicts the governance structure at the county level.

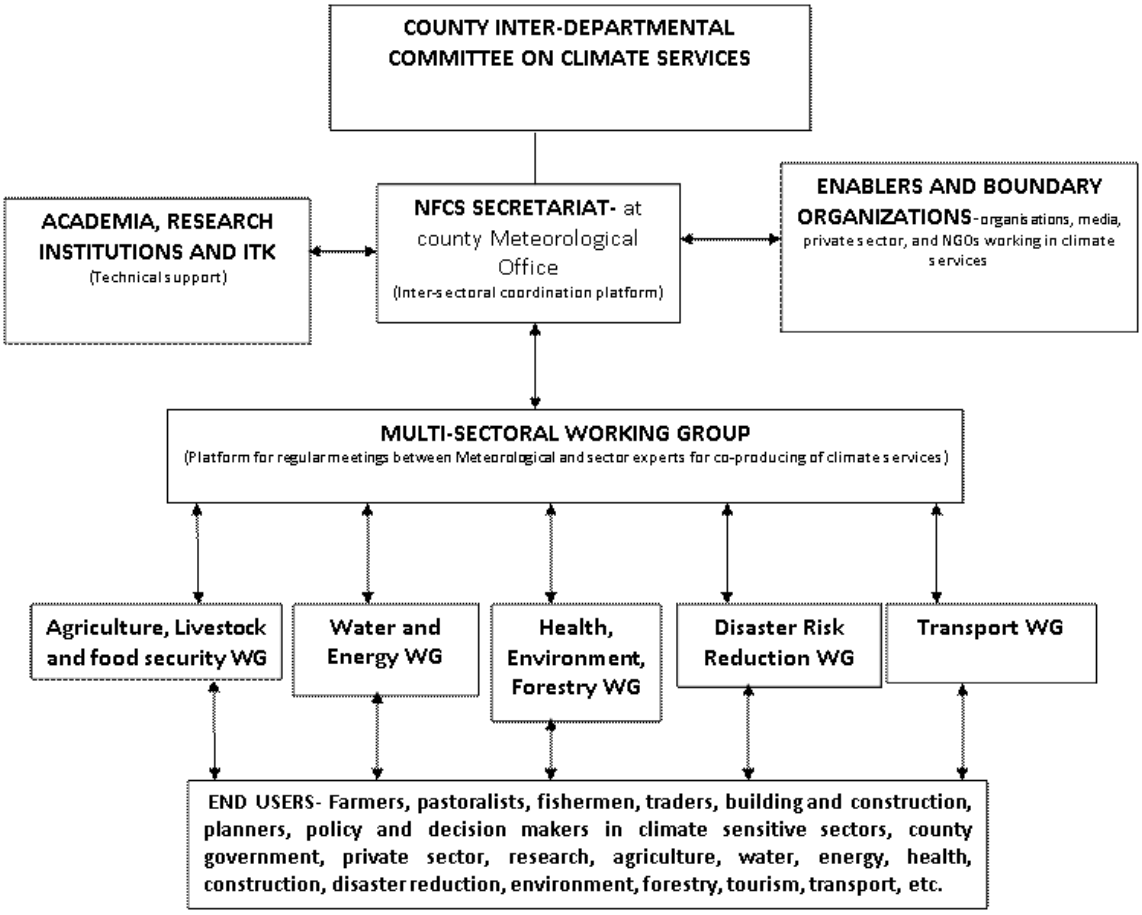

Figure 5 County Framework for Climate Services: administrative structure at County Level

4.5 NFCS Kenya linkages with the National Development Plans and strategic goals

The framework implementation will address key result areas of the Vision 2030 and the Bottom-up Economic Transformation Agenda (BETA), the UN early warning for all initiative, besides supporting government priorities in the development agenda, in the following ways:

a) Early warning products for early action and response at the grassroot level in all socio-economic sectors.
b) Climate information in support to development of modern agriculture risk management instruments that ensure farming is profitable and is predictable such as crop and livestock insurance schemes.
c) Increase agriculture and livestock production, utilizing onset and cessation dates of the season provided by seasonal forecasts.
d) Early warning and mitigation for water borne diseases and epidemics such as cholera, typhoid, and diarrhoea as well as vector borne diseases such as malaria.

e) Early warning advisories for optimization and management of hydroelectric & wind power production.
f) Support sustainable infrastructure development including storm water drainage.
g) Mitigation against great losses attributed to hydro-meteorological hazards such as floods, flash floods and landslides among others.
h) Water resources assessment and management in support of food production, floods and drought early warning.
i) Land management such as terracing to minimize erosion.
j) Safeguard lives by warning of rapidly increasing extreme climate events (floods/droughts) and heat incidences.

The establishment of the NFCS is clearly linked to the UN Early Warning for All Initiative, since it is only through the multi-sector coordination that the multi-hazard early warning system and information can be developed/produced. The NFCS will operationalize a digital and standardized early warning system platform for climate-related information exchange across all counties and enable access to multi-hazard early warning alerts and advisories.

4.6 NFCS linkages to UN Early Warning for All Initiative

At the World Leaders Summit on 7th November 2022, during the UN climate change negotiations, Conference of Parties (COP27) held in Sharm el-Sheikh, Egypt, the UN announced the World Meteorological Organization (WMO) ***Executive Action Plan for the Early Warnings for All (EW4All).*** The plan drawn up by the WMO and partners, calls for initial new targeted investments between 2023 and 2027 of US$ 3.1 billion – a sum which would be dwarfed by the benefits. This is a small fraction (about 6 percent) of the requested US$ 50 billion in adaptation financing. It would cover disaster risk knowledge, observations and forecasting, preparedness and response, and communication of early warnings.

The UN called for equal investment in adaptation and resilience and for every person on Earth to be protected by early warning systems within five years, (2023-2027) with the priority to support the most vulnerable.

Early warning systems are widely regarded as the “low-hanging fruit” for climate change adaptation because they are a relatively cheap and effective way of protecting people and assets from hazards, including storms, floods, heatwaves and tsunamis to name a few. “Early warnings save lives and provide vast economic benefits. Just 24 hours’ notice of an impending hazardous event can cut the ensuing damage by 30 per cent,” said WMO Secretary-General Prof. Petteri Taalas, during the launch of the Early Warning for All action plan.

At the regional level, Ministers, heads of NMHSs and key regional partners have been issuing high-level declarations: - for example the **African Heads of State and Government** gathered for the inaugural Africa Climate Summit (ACS) in Nairobi Kenya from 4th-6th September 2023, which culminated in Commitment No. 42.

ACS Commitment no. 42

"Strengthen early warning systems and climate information services, as well as taking early action to protect lives, livelihoods and assets and inform long-term decision-making related to climate change risks; emphasizing on the importance of embracing indigenous knowledge and citizen science on both adaptation strategies and early warning systems'

Figure 6 depicts the conceptual framework concerning Early Warning.

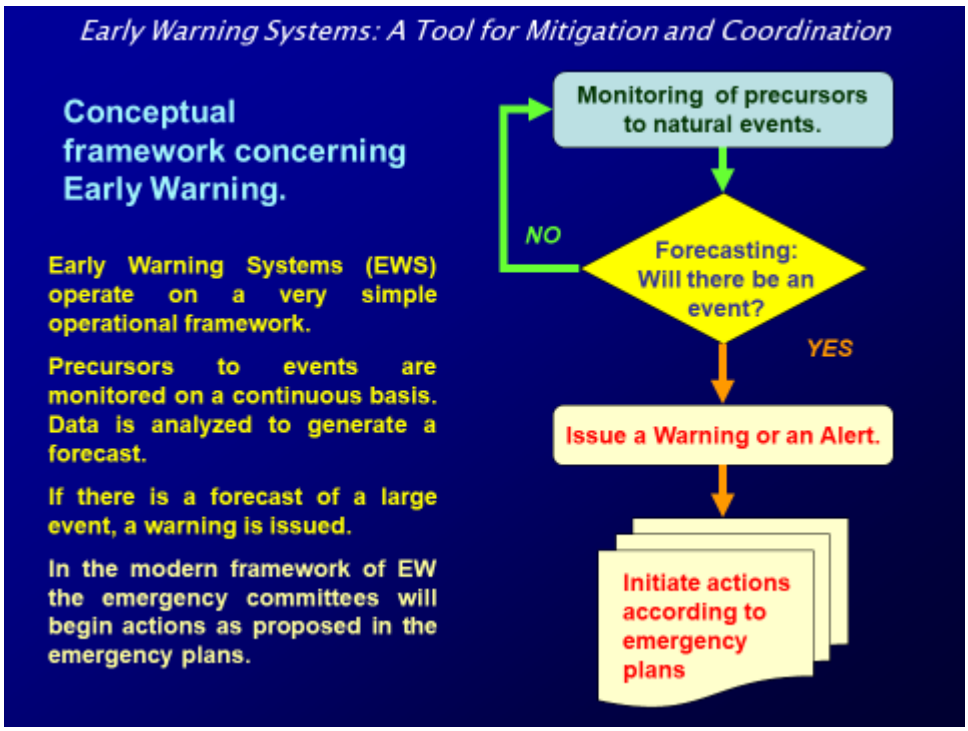

Figure 6 Conceptual Framework on Early Warning

The Sector Working Groups (SWGs) of the NFCS, comprising of technical teams from key climate sensitive sectors of Agriculture/Food Security, Energy/Water, and Health/Environment and Disaster Risk Reduction, will generate tailor-made early warning advisories relevant for each sector both at national and county levels. The frequency of the products generated may depend on the expected conditions, daily, weekly, monthly or seasonally.

The products generated will be fed into a digital Multi-Hazard Early Warning System. The digital platform will be Interactive Online multi-hazard early warning system, accessible to all climate service providers and users. The platform will be characterized by robust web and mobile based functionalities to enhance users' access to climate services across the country. The alert issued will provide expected actions and response up to the Ward administrative level at a click of a button in a web or mobile Apps. It is also expected that bulk SMS through mobile service

providers will be exploited to reach all Kenyans. Linkages with the sub-national level will be created appropriately as need arises.

Figure 7 demonstrates the flow of information for a multi-hazard early warning system

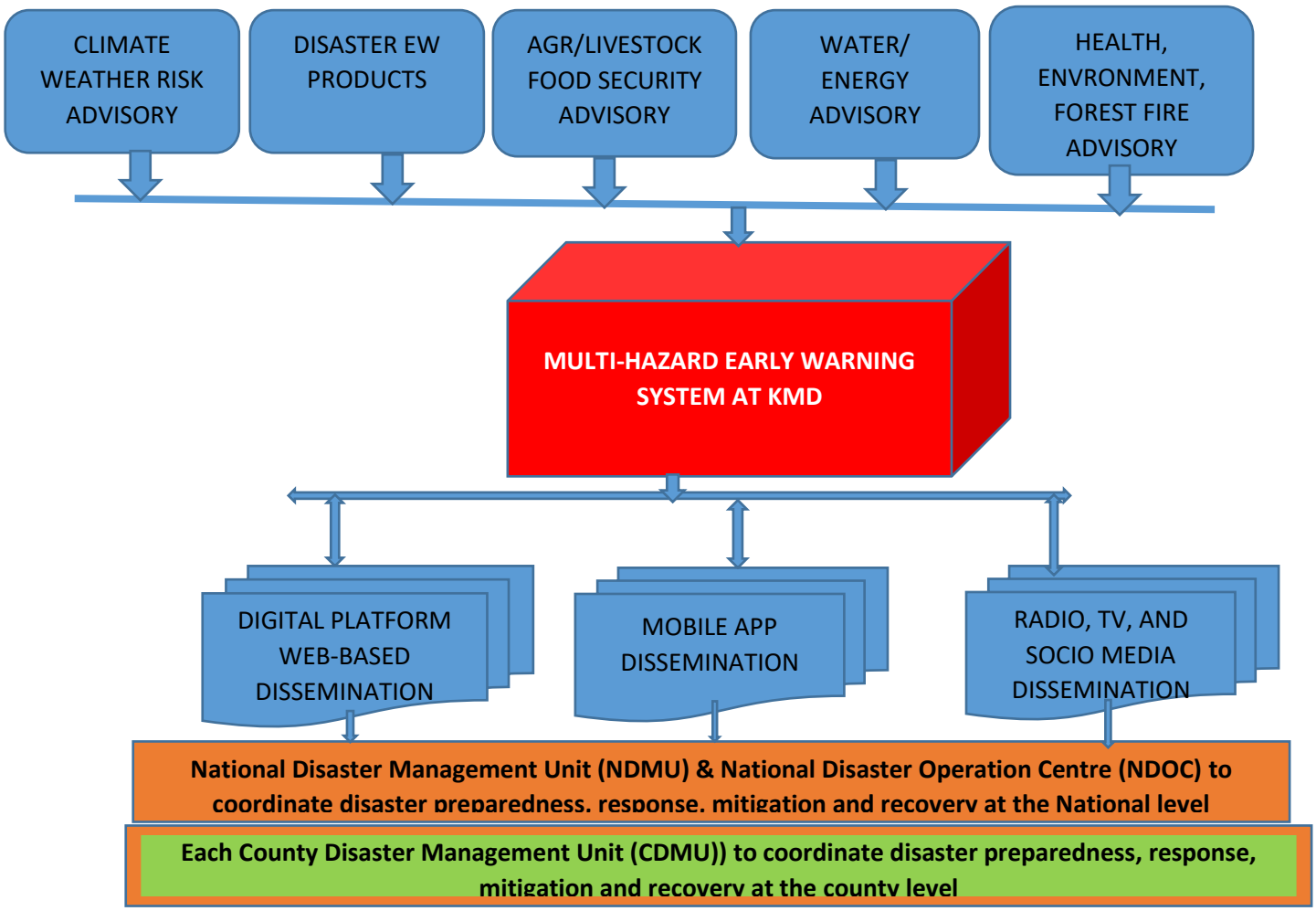

Figure 7 Flow of information for Multi-Hazard Early Warning System at national and county levels

As an example, agro-weather advisory tool to be developed – can be automated system to generate and disseminate location specific agro-weather advisories (both climate and crop/agriculture information). The tool is useful for farmers to access and interpret information for better decision making. The tool should be able to provide pre-season advisories issued before the season start and in- season weather advisories based on crop calendars and issued to farmers on a weekly basis. The messages to the farmers can be send via SMS, mobile App, partnering organizations and also through agriculture -extension officers to deliver information to the farmers.

4.7 Expected results of establishing the NFCS Kenya

The following are the expected results of establishing the NFCS Kenya

a) Improved coordination, facilitation and collaboration among national institutions to co-produce, co-design and deliver science-based climate predictions and services.

b) One stop –shop production/dissemination of weekly monthly/seasonal forecast and early warning advisories for each sector. Co-production of client-tailored climate services to enhance the integration of climate information and products into decision making as well as into national policies for climate resilience development.

c) Established User interface platforms (UIPs) such as the National Outlook Forum (NCOF) and County Climate Outlook Forums (CCOFs), strengthened sector UIPs: - enhancing long-term dialogue and dissemination of products. The forums to provide regular platforms for communication with users and for obtaining their feedback on the usefulness of products and the level of understanding; enhancing dissemination of relevant climate products, thus reducing risks that result from climate-related disasters.

d) Enhanced provision and access of early warning information for all- reducing the vulnerability of society to climate related hazards; through a digital and standardized early warning system platform for climate-related information exchange across all counties, providing multi-hazard early warning information. Improved access to climate information shall include the frequencies and mediums of dissemination that is best suitable for different users and vulnerable communities.

e) Improved observations and monitoring networks that will ensure precursors to climate events are monitored on a continuous basis.

f) Enhanced capacity to generate and use climate information and products/advisories.

g) Strengthened climate-informed decision-making processes at national and county levels, hence advancing the key national development goals.

h) Improved research, modelling and prediction capabilities-fostering improved scientific quality of climate information, providing an evidence base for the impacts of climate change and variability.

4.8 Roles and Responsibilities of Key Climate Related Sectors

Climate services offer science-based information, weather forecasts and climate projections that can empower decision makers to manage the risks and opportunities of climate variability and change. By combining this information, sectoral products can be derived such as food security and water availability and health outlooks. For example, forecasts and predictions of dry spells, which might lead to crop failure, can enable agriculture and other policy makers to better prepare for expected famine and related drought related disasters. Climate services therefore underpin climate action and adaptation.

However, there is still a gap between climate services knowledge production and use; blending climate knowledge with sector-specific knowledge is still not developed across the country. Hence an established NFCS will be in a position to build capacity to produce sector specific products to facilitate informed decision-making regarding the climate sensitive sectors in order to create a higher degree of climate resilience. The following sectors/institutions will play key roles in the NFCS.

4.8.1 Agriculture, livestock, fisheries & food security sector

Kenya faces major food security challenges due to the over dependence on rain-fed agriculture for food production. Agriculture and food security are closely linked to weather and climate conditions and are negatively affected by extreme events such as droughts and floods which in turn, lead to crop failure and food insecurity. Climate services make it possible to incorporate climate information into practices and policies for supporting agriculture and food security and to make society more climate resilient.

The key institutions in the sector include The Ministry of Agriculture and Livestock Development (MoALD) and KALRO among others. The Ministry of Agriculture and Livestock Development through the Climate Change Units (CCU) mainstreams matters climate Change that prioritizes climate smart agriculture (CSA) in sectoral policies and plans.

The roles and responsibilities of agriculture sector institutions in the NFCS include

- Co-production of agro-weather advisory
  - which crop varieties to plant and when to plant;
  - the best time to spray during crop growth periods;
  - when plant or livestock disease outbreaks are likely to occur; and
  - the quantity of water that will be needed for irrigation and livestock in drought-prone periods and regions
- Co-production of seasonal food insecurity advisory derived from climate forecast
- Agricultural Stress Index System (ASIS) for drought risk management;
- Desert Locust Information Systems (DLIS);
- Integrated Food Security Phase Classification (IPC).
- Collaborate on purchase and installation of weather monitoring equipments
- Monitoring and surveillance of pests and diseases especially during drought event

- Research and development of crops suited to varying climatic conditions

The Sector will also provide data on:

- Production per unit area (Yield)
- Mortality in Livestock
- Livestock productivity (yields of milk, eggs, etc)
- Potential Crops failure
- Migratory Pest populations buildup (desert locusts, fall armyworms)
- Prevalence data for diseases and pests outbreaks surveillance (Fungal, Bacterial, Viral)
- Soil data type, moisture retention capacities, PH at ward level

4.8.2 Disaster risk management (DRM) sector

The Government of Kenya has recognised the growing threat of climate-related risk to the achievement of its development goals; and, in response, has improved its capacity to prevent, manage and recover from disasters. Yet the challenge of effective response has become more urgent as the frequency of climate related disasters increases. Studies show that about 90% of disasters occurring around the world are caused by weather and climate related hazards such as floods, droughts, cyclones, storm surges, strong winds, extreme temperatures, landslides and wildfires. Actions to improve disaster preparedness include modernisation of meteorological systems, and a well-maintained early warning system. These systems should be backed by a reliable and effective social safety net programme. Disaster preparedness managers need to have advance warning of weather and climate extremes to plan for response/mitigation measures and help communities to proactively plan their resource allocation for core services. Development and dissemination of climate services will contribute to availability and accessibility of multi-hazards early warning.

The Key institutions in DRR include: The National Drought Management Authority, National Disaster Operation Centre, National Disaster Management Unit and the Kenya Redcross.

The DRR institutions require climate data and forecasts to support the decision – making in the entire sector especially in Mapping risk areas, determining vulnerability of the communities and infrastructure, pre-positioning of resources and activities, e.g. exam paper distribution and accessing exam centers, market accessibility, Sensitization and enforcement required, like dumping of waste

The roles and responsibilities of DRR institutions in the NFCS include

- Co-production and generation of drought early warning products: VCI maps, Desert Locusts, frost maps, County Phase classification (normal, alerts, emergency)- (by NDMA)
- Generation of data on vulnerability of communities, understand hazard specific areas (risk maps for different hazards, pre-position on activities. hazard map, contingency plan, Develop Multi Hazard Early Warning System, demographic data, disaster impacts data, land change land use data, livelihood zoning (by NDOC/NDMU)
- Flood hotspots, Riverine Flash floods, landslides/mudslides early warnings
- Co-design products, with weekly forecast interpreted with weather mtaani and give advice to those prone to floods and, flood plans (Developing Risk Awareness through Joint Action (DARAJA))
- Setting up structures and systems for National and subnational forums at various time scales
- Operationalizing national and subnational dialogue forums
- Partner with research institutions to promote research on climate change, variability and DRM
- Support Impact-based forecasting by providing impacts data
- Sensitization of users on use of climate information and supporting co-development of impact-based forecast

4.8.3 Water sector

The key institutions include the ministry of water; Water works development Agencies, Kenya Water Institute (KEWI), Regional Centre for Ground Water and Research, Water Resources Authority (WRA), National water Harvesting and Storage Authority, National Irrigation Authority,' Water service providers, WRUAs, Kenya Water Towers, Kenya Forest Service, Water Services Regulatory Board, Water Services Trust fund.

Water resource management is important for addressing drought, for generation of hydropower, drinking water and water for irrigation. Water resource management is linked to Kenya's expected economic and social transformation, and is directly linked to food security, health and Gross Domestic Product (GDP) growth. Climate variability and change has adverse impacts on the quality and quantity of water across the country. Downscaling of climate information and forecasts to water related services are important in planning effective utilization of water resources to achieve sustainable development.

Management of surface water supplies (hydrology) require Climate data which is essential for calculations regarding the frequency and duration of heavy rainfall, the probable maximum precipitation, low flow and flood forecasting and water resources assessment.

The design of water infrastructure such as dams, irrigation systems, flood protection systems, etc. need to be integrated with information on future trends of rainfall and related extremes. At the operational level, water resources managers use climate information to optimize water supply, flood management the generation of hydroelectricity.

The roles and responsibilities of water institutions in the NFCS include

- Co-production of flood early warning, Intensity Duration Curves, Hazard maps (Flood, Flood inundation, mudslides, and landslides), Stream Flow forecast, and Optimal Dam levels management, Safe water yields, Flood Early warning information
- Co-production of flood control management plans (control, drainage, mitigating effects of floods, flood early warning)
- Dam Management/Safety of water storage structures (spillways, fencing, silt control and De-silting of pans & dams)
- Sanitation facilities & hygiene promotion
- Catchment Management (Conservation & protection of water catchment areas, riparian areas & wetland)
- Early Warning Systems for Rain Water Harvesting and Storage (reservoir capacity, quantity of surface runoff)
- Capacity building for water service providers, Water resources users associations and water management committees
- Design and develop of optimum observations network for hydro-met stations (distribution networks for river gauges & rainfall station)
- Groundwater Recharge (managed aquifer recharge and natural aquifer recharge)
- Drought impacts mitigation (Early warning, mitigating of drought impacts**)**
- Development of water information management system
- Create a producer and user communication platform
- In collaboration with other stakeholders develop an early warning system for all basins
- Establishment of a central data base management system

The sector will also contribute to data availability on - Water level data (Ground and Surface), Water velocity, and Reservoir water levels, Water abstraction data, Water quality data. Rainfall intensity duration curves. Catchment characteristics and inundation maps and Long range- data for planning, design, and development of new civil structures

4.8.4 Health sector

The burden of climate-sensitive disease is high in Kenya and future climate change and variability is expected to exacerbate the occurrence and intensity of future disease outbreaks and may increase the spread of diseases in some areas. Climate change is expected to put human health at risk by exacerbating the magnitude and occurrence of heat stress, asthma

vector-borne diseases (such as malaria, dengue, schistosomiasis and tick-borne diseases), and food-borne diseases (such as diarrheal diseases), increase exposure to Rift Valley Fever, malnutrition and water-borne diseases. The protection of public health from an increasingly variable and changing weather and climate is a priority for the health sector. Timely delivery of weather and climate information is crucial for planning intervention measures in the health sector.

Climate services can provide the information needed to anticipate the incidence of diseases influenced by climate. This would enable the public health services to provide warnings and undertake contingency planning in order to reduce the risk and impact of diseases. Appropriate climate services and products can increase the understanding of how environmental and climate factors influence the timing and location of increased health risks. For example, public health authorities can use climate outlooks to estimate and respond to the possible health consequences of climate extremes such as droughts, heat waves and floods

The roles and responsibilities of health institutions in the NFCS include

- Co-production of health advisories including:
  - Water Vector borne (highland malaria) and Water borne diseases (cholera associated with extreme heavy rainfall and floods).
  - Malnutrition associated with rainfall deficit and droughts.
  - Physiological discomfort due to extreme high temperature or heat waves
  - Upper respiratory diseases including asthma due extreme low temperature
  - Injuries such as bruises and fractures due to strong winds-extreme winds (wind gusts) can cause, damage of health infrastructure, flying debris, felling trees and traffic accidents
  - Environmental pollution - wind carries air contaminants away from their source, causing them to disperse
- Development of early warning system for climate related diseases (Malaria, Cholera, Rift Valley Fever),
- Information on disease hotspot areas
- Temperature related health advisories
- Air quality index
- Data on mortality and morbidity rates
- Disease trends
- Data on disease outbreaks
- Data on disease surveillance
- Data on disease prevention and control

- Epidemiological data (incidence and prevalence of diseases within a population, including information on the number of cases, location, and demographic characteristics of affected individuals.
- Data from clinical laboratories to confirm presence of specific pathogens and track their spread
- Data on vaccination coverage and vaccine distribution to track immunization rates and identify areas at risk of vaccine/ immunization-preventable disease outbreaks.
- Develop early warning system for climate related disease in high-risk areas

4.8.5 Energy sector

The Key institutions in this sector include, Ministry of Energy and Petroleum (that is charged with all energy matters for the country). KENGEN (responsible for power generation), Kenya electricity Transmission Corporation (KETRACO) and Kenya Power and Lighting Company (KPLC) -(in charge of Power transmission and distribution, Geothermal Development Company GDC—(Exploration and development of Geothermal resources in Kenya).

Kenya's energy mix is over 90% from renewable energy sources. Renewable energy sources include: geothermal, hydropower, solar, wind and biofuels. This sector has been most impacted by droughts and unreliable rainfall. Whenever there is a drought for example electricity production distribution and transmission systems, are adversely affected resulting to power rationing, power cuts and high electricity bills due to thermal/diesel generation.

The sector needs climate data and information to manage the impact of climate on the energy supply and demand, to estimate wind and solar energy potential as well as water availability in order to ensure that future energy needs are met. Such data include solar radiation, Rainfall, Wind, speed and direction information, -severe weather updates to mitigate impact for the surrounding community-pollution monitoring-Daily Radiation data and wind weather and climate information-radiation data, data, upper air wind data Severe weather information updates. Climate information is used in energy planning, to manage hydropower dam flows and also, to provide early warning for downstream settlements incase above normal rainfall is expected in the river catchments that will impact the dam volumes.

Thus, climate services are needed to: improve their resilience to weather extremes, climate variability and change; support in the increased development and use of renewable energy sources in the country; develop strategies risks under current and future climatic conditions associated with climatic variability and change. Some of the products needed include, seasonal outlook; monthly, weekly, 5day and daily forecasts.

The roles and responsibilities of energy institutions in the NFCS include

- Application of Weather and Climate Information to Optimize Power Production

- Co-production of hydropower generation scenarios for the major hydropower plants.
- Co-production of consumer information on early warning
- Provision information regarding energy planning, modelling and forecasting.
- Early warning as a mitigation on the distance the wind blows by shutting the affected well.
- Energy planning function
- Provide data for early warning for downstream settlements near hydropower dams
- Decision making for relocation and settlement for affected communities of pollution
- Collaboration on citing solar and wind farms
- collaboration in citing of meteorological stations within solar and wind farms
- area climatological information
- Provision of data on:
    - area AWS meteorological data
    - climatological Data
    - noise data
    - chemical data detector
- In collaboration with stakeholders GDC to Enhance observation networks, monitoring and modelling a systems
- Enhance pollution monitoring especially around geothermal wells
- Development of supervisory, control and data acquisition System (SCADA)
- Blending of weather and pollution model and enhance coverage resolution

4.8.6 Transport sector

Major Transport and infrastructural projects for economic growth of the country and the lives and wellbeing of citizens have to be implemented using reliable climate information and skillful climate predictions and projections to ensure that safe and sustainable settlement infrastructures are made available for communities. Rainfall, temperature wind and Intensity duration frequency (IDF) data is required for design and adaptation of road and infrastructure. Daily weather data helps in planning of activities in roads and infrastructure. Flood hazard maps are needed for design and flood prediction. Diurnal temperature ranges help with design and material decision. Bridges and tunnels, culverts and Storm water drainage systems, bicycle lanes and pedestrian footpaths, require climate data for climate-proving the infrastructure.

In aviation Meteorological information for example historical wind regime for an area, (30years), temperature data and pressure data-these determine the length of the runway. Hourly meteorological information is required for operations at the airport, e.g routine observations: METAR Reports (wind, visibility, temperature, pressure); warnings- significant weather (if wind or cloud is significant, a warning is issued), Volcanic ash, Visibility (low level clouds); Rainfall (extreme rainfall) aerodrome warnings; operational Meteorological information (OPMET).

Key institutions in this sector include; - Roads – KENHA, KURA, KERRA, KWS, County Governments, KRB NTSA; Railways – KRC, Tata Magadi, SGR; Aviation – KCAA, KAA, KQ; Maritime – KMA, KPA, KFS, KNSL; Pipelines – KPC; National Construction Authority

The roles and responsibilities of Transport institutions in the NFCS include

- Integrating climate data to climate-proof infrastructure design e.g. bridges, culverts and drainage systems
- *Updating of IDF curves, Weather summaries and catchment data for design and project planning purposes*
- *Incorporation of road safety measures into daily weather forecast advisory*
- *Enhance in the country winds hear observation and monitoring systems*
- *Enhance in country observations networks, and monitoring systems for* domestic airports:
- Sharing road network data to help advice the public on flood prone areas,
- Collaboration in installation of observation network
- Installation of hazard signs e.g. cross winds warning, using daily weather
- Major climate proved structural designs using climate data

4.8.7 Environment and Forestry Sector

The key institutions in the Environment and forestry sector include the Ministry of Environment, Climate Change and Forestry, the Kenya Forestry Service (KFS) , KEFRI, NEMA and Kenya Wildlife Service (KWS), Water Towers, NetFund and the Climate Change Directorate (CCD)

Climate data is required for example in the forestry sector to forecast forest fires, wind falls, and forest danger rating (Visual Chart). Moisture conditions- informs tree planting and survival rates of forests. Other useful environmental data include: cloud cover data for validating satellite imagery (e.g Landsat, MODIS, Sentinel) for land use and land use change classification e.g., vegetation, forest covers, forest fires, tidal data, sand floods, quarrying, flooded area maps; farm forestry services, Environmental disasters e.g., landslides, lightning, floods, droughts, (extremes), massive erosion (e.g. , gullies), Air-Quality forecasting; Environmental & social impact assessment: urban development (rainfall, winds, temperatures), housing, transport & infrastructure, sunshine-hours, rainfall, cloudiness), waste management (wind): air pollution; climate change vulnerability assessment; waste disposal and leachate (for location of waste management sites).

The roles and responsibilities of Environment and Forestry institutions in the NFCS include:

- Monitor environmental degradation
- Forest fire monitoring and alerts

- Collaborate in operationalization of the governance structure
- Ecological zoning & suitable tree species site matching using climate data
- Collaborate in key areas of capacity building
- Vulnerability assessment (rainfall, temp, drought occurrence)
- Environmental damage and cost of restoration/reconstruction
- Ambient air quality**,** water quality (for consumption),
- GHG emission from waste, stack emissions,

4.8.8 Kenya Meteorological Department

KMD will become the lead institution in implementing the NFCS and will also assume the role of coordination of the activities of the NFCS. KMD will provide technical assistance to the Secretariat and also provide expert advisory to the inter-ministerial committee on matters concerning climate services.

Other key roles for KMD will include:

- Provision of weather and climate information and services
- Downscaling of climate and weather services for tailored products
- Capacity building of providers and users on matters on climate services and coproduction
- Ensuring standards in weather and climate observation and monitoring
- Custodian of climate data
- Host digital multi-hazard early warning platform
- Generation of Climate change scenarios for national/county to inform national/county climate risk planning.

5 The NFCS Kenya Strategic Framework

This chapter outlines the strategic goals, objectives and strategies/activities the Kenya NFCS will address in fulfilling its vision, mission and mandate. These are based on existing policies, regulations and strategies supporting provisioning of climate services in Kenya as well as proposed needs of key sectors whose productivity and growth is heavily impacted on by climate extremes and variability. In achieving the above, NFCS strategic goals and objectives were informed by analyzing the outputs from the National Consultative forums involving different actors currently involved in the climate services ecosystem in the country. Potential actors' needs scanned from emerging global and national interventions were also considered.

The goals, objectives and strategies in this chapter are based on the NFCS pillars and how they meet the needs of each of the key socio-economic sectors. The strategies outlined below will help the Kenya NFCS get established with a credible governance structure comprising of all key institutions in the climate-sensitive socio-economic sector. It will build operational capacities to facilitate enhancement of national observations and monitoring, institutional coordination, stakeholder and user interactions, communication, research, modeling and

prediction, partnerships and collaboration and; mobilize resources in order to achieve overall improvement in national climate services and better management.

5.1 Goals

The strategic goals that Kenya NFCS has determined to focus on are:

Goal #1: Create effective coordination mechanism for climate services

Goal # 2: Improve access or provision of climate services and early warning to all

Goal #3: Enhance Observation and monitoring network

Goal #4: Enhance capacity for climate services users, providers and researchers to interact at all levels

Goal #5: Enhance capacity for Research modeling and prediction

Goal #6: Enhance capacity to generate and use climate information and products

Goal #7: Promote partnerships and collaborations in implementation of NFCS

5.2 Objectives and Strategies

In line with the goals outlined in 5.1, the NFCS-Kenya Secretariat aims to achieve the following respective strategic objectives:

Goal 1: Create effective coordination mechanism for climate services

Objective 1.1: Actualize NFCS governance and operational structures.

Strategy 1.1.1 Constitute Inter-Ministerial Committee on Climate Services

Strategy 1.1.2 Constitute the NFCS –Secretariat

Strategy 1.1.3 Constitute the NFCS Multi-Sectoral Working group

Strategy 1.1.4 Constitute the NFCS- Sector working groups

Strategy 1.1.5 Build support from decision makers and public for climate services

Strategy 1.1.6 Develop institutional management systems and processes to guide implementation of operations and service provision

Objective 1.2 Enhance national public awareness and support for climate services, and institutional visibility, image, and support.

Strategy 1.2.1 Establishment of a national climate services public & international communications unit

Strategy 1.2.2 Public awareness raising, sensitization and education on climate services

Goal 2: Improve access or provision of climate services and early warning to all

Objective 2.1 Develop a digital and standardized early warning system platform for climate-related information exchange across all counties

Strategy 2.1.1 Develop a multi-hazard digital platform (Web-Based Apps) for accessing early warning/advisories-from National, County, Sub-County to ward levels

Strategy 2.1.2 Develop an interactive mobile App for accessing early warning advisories from National, County, Sub-County, to ward Levels

Strategy 2.1.3 Develop and implement a strategy to ensure accessibility and understanding of early warnings and climate services by various user groups, including vulnerable and marginalized populations.

Strategy 2.1.4 Enhance communication systems (traditional media, social media, community forums, etc.) and feedback mechanisms for climate services and early warnings.

Goal 3: Enhance capacity for climate services users, providers, and researchers to interact at all levels

Objective 3.1 Establish climate services User Interface Platforms (UIPs).

Strategy 3.1.1 Regularly convene the National Climate Outlook Forums (NCOFs) and National sector UIPs.

Strategy 3.1.2 Establish and sustain county climate outlooks forums (CCOFs) and County sector UIPs, to ensure that climate information is localized, relevant and actionable at the community level.

Strategy 3.1.2 Identify and engage key stakeholders to foster collaboration and information sharing

Strategy 3.1.3 regularly convene the County Climate Outlook Forums

Strategy 3.1.4 Develop web-based interactive platforms

Strategy 3.1.5 Develop climate interactive mobile apps / socio-media etc

Objective 3.2 Build priority technical, infrastructure, and human capacities of the key institutions in climate services.

Strategy; 3.2.1 Undertake Training needs assessment in key priority sectors for climate services

Strategy 3.2.2 Conduct training for technical personnel in key climate service sector

Strategy 3.2.3 Procure hardware and software for delivering of climate services

Goal 4: Enhance capacity for Research Modeling and prediction

Objective 4.1 Strengthen and enhance research, technology, and innovation in climate services.

Strategy 4.1.1 Undertake research initiatives promoting sector-based modeling and predictions

Strategy 4.1.2 Collaborate with research institutions to leverage on their expertise and resources to produce cutting edge research in climate related modeling and predictions

Strategy 4.1.3 Assess existing national climate research, modeling and prediction initiatives and identify feasible opportunities for collaborations

Goal 5: Enhance capacity to generate and use climate information and products

Objective 5.1: Enhance capacity of the national meteorological service to generate climate information and products

Strategy 5.1.1 Train climate services providers to generate climate information products

Objective 5.2 Develop capacity of sectors to generate sector specific products for climate services

Strategy 5.2.1 Train climate services sectoral personnel on co-designing, co-production and value addition of sector specific products.

Objectives 5.3 Increase the national reach, understanding, use, and uptake of climate products and services

Strategy 5.3.1 Train all users and communities on digital access and use of climate information

Strategy 5.3.2 Develop and implement a national climate services communication strategy

Goal 6: Enhance Observation and monitoring network

Objective 6.1 Enhance observation and early warning networks across the country.

Strategy 6 .1.1 Technical evaluation of existing KMD/other national networks and systems

Strategy 6.1.2 Design national observation and data networks, and monitoring systems

Strategy 6.1.3 Implement plan for networking, strengthening, and enhancing national observation and communications networks, monitoring and backup systems

Strategy 6.1.4 Procure and install required number of observation/monitoring systems

Strategy 6.1.5 Establish and operationalize an inspectorate unit to enforce the standards

Objective 6.2 Strengthen collaboration with stakeholders to enhance implementation of global and national operational standards for observation and monitoring networks.

Strategy 6.2.1 Develop Agreements with various stakeholders/partners

Strategy 6.2.2 Develop, document, and sensitize stakeholders of national standards, regulations, and protocols for developing and operation of observation and communications networks, and monitoring systems

Goal 7: Promote partnerships and collaborations in the implementation of NFCS

Objectives 7.1 Develop and implement a partnership and collaboration strategy that outlines the mechanisms for engaging with various stakeholders (e.g., government entities, NGOs, private sector, communities, etc.) in the NFCS implementation.

Strategy 7.1.1 Establish a platform or forum for regular dialogue and coordination among different stakeholders involved in NFCS implementation

Strategy 7.1.2 Develop and implement a resource mobilization strategy

Strategy 7 .1.3 Develop agreements, MOUs, and data sharing protocols with key climate partners in the climate value chain

Strategy 7.1.4 Explore Public-Private Engagements with partners.

5.3 Strategies and Outputs

Table 4 provides expected outputs for each of the strategies

Table 4 NFCS Kenya Strategies and Outputs

Objectives	Strategies	Outputs
Goal 1: Create effective coordination mechanism for climate services		
Objective 1.1: Actualize NFCS governance and operational structures.	**Strategy 1.1.1** Constitute Inter-Ministerial Committee on Climate Services **Strategy 1.1.2** Constitute the NFCS –Secretariat **Strategy 1.1.3** Constitute the NFCS Multi-Sectoral Working group **Strategy 1.1.4** Constitute the NFCS-Sector working groups **Strategy 1.1.5** Build support from decision makers and public for climate services **Strategy 1.1.6** Develop institutional management systems and processes to guide implementation of operations and service provision	**Output 1.1.1**: Established and operational NFCS governance entities (Inter-Ministerial Committee, Secretariat, Working groups, etc.) **Output 1.1.2**: Official documentation and guidelines for the operation of NFCS structures. **Output 1.1.3:** A series of meetings and workshops with NFCS entities to initiate coordinated activities. **Output 1.1.4**: A detailed management and operational manual for NFCS institutions. **Output 1.1.5**: Implemented institutional management systems, tracked and recorded in an operational database.
Objective 1.2: Enhance national public awareness and support for climate services, and institutional visibility, image, and support.	**Strategy 1.2.1** Establishment of a national climate services public & international communications unit **Strategy 1.2.2** Public awareness raising, sensitization and education on climate services	**Output 1.2.1**: A nationwide public awareness campaign regarding the significance of climate services. **Output 1.2.2**: Press releases, media appearances, and public engagements that enhance NFCS visibility and image.
Goal 2: Improve access or provision of climate services and early warning to all		

Objectives	Strategies	Outputs
Objective 2.1 Develop a digital and standardized early warning system platform for climate-related information exchange across all counties	**Strategy 2.1.1** Develop a multi-hazard digital platform (Web-based Apps) for accessing early warning/advisories-from National, County, Sub-County to ward levels **Strategy 2.1.2**-Develop an interactive mobile App for accessing early warning advisories from National, County, Sub-County, to ward Levels **Strategy 2.1.3** Develop and implement a strategy to ensure accessibility and understanding of early warnings and climate services by various user groups, including vulnerable and marginalized populations. **Strategy 2.1.4** Enhance communication systems (traditional media, social media, community forums, etc.) and feedback mechanisms for climate services and early warnings.	**Output 2.1.1**: A fully functional multi-hazard digital platform with user interaction data and feedback. **Output 2.1.2:** A functional mobile App with user download and interaction statistics. **Output 2.1.3:** A documented strategy and implementation report detailing the accessibility and understanding enhancements for various user groups. **Output 2.1.4**: Documented communication systems and strategies, with analytics of reach and impact from various media and forums.
Goal 3: Enhance capacity for climate services users, providers, and researchers to interact at all levels		
Objective 3.1 Establish climate services User Interface Platforms (UIPs).	**Strategy 3.1.1** regularly convene the National Climate Outlook Forums (NCOFs) and National sector UIPs **Strategy 3.1.2** Establish and sustain county climate outlooks forums (CCOFs) and county sector UIPs to ensure that climate information is localized, relevant and actionable at the community level. **Strategy 3.1.3** Identify and engage key stakeholders to foster collaboration and information sharing	**Output 3.1.1**: Organized and documented National and County Climate Outlook Forums/ sector UIPs. **Output 3.1.2**: Established localized climate forums/sector UIPs and workshops at the county level. **Output 3.1.3**: Launched web-based platforms and mobile apps, ensuring accessibility and user-friendly interaction with climate services.

Objectives	Strategies	Outputs
	Strategy 3.2.4 regularly convene the County Climate Outlook Forums **Strategy 3.1.5** Develop web-based interactive platforms **Strategy 3.1.6** Develop climate interactive mobile apps / socio-media etc	
Objective 3.2 Build priority technical, infrastructure, and human capacities of the key institutions in climate services.	**Strategy; 3.2.1** Undertake Training needs assessment in key priority sectors for climate services **Strategy 3.2.2** Conduct training for technical personnel in key climate service sector **Strategy 3.2.3** Procure hardware and software for delivering of climate services	**Output 3.2.1:** A comprehensive report on the training needs and capacity gaps within key priority sectors. **Output 3.2.2:** Trained technical personnel across various sectors in climate service provision and management. **Output 3.2.3**: Enhanced technical capacity with procured hardware and software ensuring efficient delivery of climate services.
Goal 4: Enhance capacity for Research modeling and prediction		
Objective 4.1 Strengthen and enhance research, technology, and innovation in climate services.	**Strategy 4.1.1** Undertake research initiatives promoting sector-based modeling and predictions **Strategy 4.1.2** Collaborate with research institutions to leverage on their expertise and resources to produce cutting edge research in climate related modeling and predictions **Strategy 4.1.3** Assess existing national climate research, modeling and prediction initiatives and identify feasible opportunities for collaborations	**Output 4.1.1**: Sector-based climate modeling and prediction reports resulting from initiated research initiatives. **Output 4.1.2:** Established collaborative frameworks with research institutions and publication of joint research findings. **Output 4.1.3**: A compiled report of assessed existing national climate research initiatives and identified collaboration opportunities.
Goal 5: Enhance capacity to generate and use climate information and products		

Objectives	Strategies	Outputs
Objective 5.1: Enhance capacity of the national meteorological service to generate climate information and products	**Strategy 5.1.1** Train climate services providers to generate climate information products	**Output 5.1.1:** Capacity to provide better climate services and products that suites co-designing and co-production.
Objective 5.2 Develop capacity of sectors to generate sector specific products for climate services	**Strategy 5.2.1** Train climate services sectoral personnel on co-designing, co-production and value addition of sector specific products.	**Output 5.2.1:** Increased knowledge on co-designing and co-production and better value addition ability of sector specific products.
Objectives 5.3 Increase the national reach, understanding, use, and uptake of climate products and services	**Strategy 5.3.1** Train all users and communities on digital access and use of climate information **Strategy 5.3.2** Develop and implement a national climate services communication strategy	**Output 5.3.1:** Support and uptake of climate products and services **Output 5.3.2:** Increased public awareness and support for climate services
Goal 6: Enhance Observation and monitoring network		
Objective 6.1 Enhance observation and early warning networks across the country.	**Strategy 6.1.1** Technical evaluation of existing KMD/other national networks and systems **Strategy 6.1.**2 Design national observation and data networks, and monitoring systems **Strategy 6.1.3** Implement plan for networking, strengthening, and enhancing national observation and communications networks, monitoring and backup systems **Strategy 6.1.4** Procure and install required number of observation/monitoring systems **Strategy 6.1.5** Establish and operationalize an inspectorate unit to enforce the standards	**Output 6.1.1**: A comprehensive report detailing the current status and gaps in existing observation networks. **Output 6.1.2:** Design blueprints and implementation plans for national observation and data networks. **Output 6.1.3**: Installation and networking of enhanced observation and communication systems across identified locations.

Objectives	Strategies	Outputs
Objective 6.2 Strengthen collaboration with stakeholders to enhance implementation of global and national operational standards for observation and monitoring networks.	**Strategy 6.2.1** Develop Agreements with various stakeholders/partners **Strategy 6.2.2** Develop, document, and sensitize stakeholders of national standards, regulations, and protocols for developing and operation of observation and communications networks, and monitoring systems	**Output 6.2.1**: Signed MOUs/agreements with various stakeholders and partners. **Output 6.2.2**: Publication and dissemination of national standards, regulations, and protocols regarding observation networks.
Goal 7: Promote partnerships and collaborations in the implementation of NFCS		
Objectives 7.1 Develop and implement a partnership and collaboration strategy that outlines the mechanisms for engaging with various stakeholders (e.g., government entities, NGOs, private sector, communities, etc.) in the NFCS implementation.	**Strategy 7.1.1** Establish a platform or forum for regular dialogue and coordination among different stakeholders involved in NFCS implementation **Strategy 7.1.2** Develop and implement a resource mobilization strategy **Strategy 7 .1.3** Develop agreements, MOUs, and data sharing protocols with key climate partners in the climate value chain **Strategy 7.1.4** Explore Public-Private Engagements with partners.	**Output 7.3.1:** PPPs, MOUs, etc in place between partners and stakeholders **Output 7.3.2** Co-funding models for resource mobilisation

6 Risk Analysis for National Framework for Climate Services (NFCS)

The risk management plan's strategic intent is to cover all the pillars of the NFCS Implementation from risk management, risk identification, risk assessment, planning and prevention.

For the purpose of this NFCS, the risk management plan is approached as a plan that utilizes internal controls as a measure to mitigate and control risk. The risk management plan is a team effort where all key users, service providers, stakeholders and other representative and administrative personnel are included to ensure effective control and mitigation of risks.

The NFCS secretariat will be responsible for implementing the Risk Management Plan. The NFCS should as a part of risk management implement a comprehensive system of controls to ensure that risks are reduced and that the objectives of the NFCS are achieved.

Risk management procedures can be utilized to identify opportunities for the NFCS and should not only be viewed from a negative perspective. Effective risk management can easily be transformed into a competitive benefit for all the pillars of the NFCS. Risk management is a continuous process of identification, evaluation and control of risks.

In establishing the Kenya National Framework for Climate Services (NFCS), several risks were identified. The table (table 5) below, prioritized identified risks with their corresponding risk levels;

Table 5: Risks and with their corresponding risk levels in establishing NFCS in Kenya

Risk Description	**Risk Impact**	**Risk Level (Low/Medium/High)**	**Mitigation Measures**
1. Policy and Institutional arrangements			
Policy Alignment	Lack of alignment with existing policies and strategies	Low	Align the Framework with sector policies
2. Financial			
Budgetary Constraints	Insufficient funds for establishing and maintaining the NFCS	High	Facilitate regular meetings with policy makers to inform on the framework and demonstrate relevance to socio economic development Generate own income by selling meteorological products to consumers who need the products to enable them run their businesses and generate income of

Risk Description	Risk Impact	Risk Level (Low/Medium/High)	Mitigation Measures
			their own from such activities. Examples: Aviation service providers such as the Air Navigation Service Provider (KCAA), Kenya Airports Authority (KAA), Kenya Airways (KQ) and maritime transport players such as Kenya Ferry services (KFS), Kenya Ports Authority (KPA) etc.
Sustainability	Lack of long-term financial sustainability	Medium	Operationalize budgetary funding
Non-committal financial support from external partners for the financing of the NFCS	Poor planning	Low	Develop prior partnerships for investment in the full implementation of the framework
High dependency on external source of funding	Disruptions of the implementation plan	Low	Work with the budgetary allocations and reduce dependency on external funding.
Inadequate capacities for resource mobilization	Low uptake of donor funding	Medium	Employ and Capacity build of the relevant technical staff.
Inadequate capacities for resource uptake	Funding agencies lse confidence in the NFCS	Low	Employ and Capacity build of the relevant technical staff.
3. Technical and technological capabilities			

Risk Description	Risk Impact	Risk Level (Low/Medium/High)	Mitigation Measures
Poorly distributed station network Inability to secure suitable sites/land for the observation network	Inadequate climate data due to spatial distribution of stations.	Medium	Enhance station network Sensitize, create awareness among land owners on need to support climate observation and monitoring
Non-conformity to industry standard	Non-standard observation instruments leading to poor quality data	Medium	Continuous enforcement of industry standards
Poor maintenance and vandalism of the observation systems	High replacement costs Inability to produce climate information products	High	Operationalize continuous maintenance of instruments Sensitize, create awareness among communities on need to support climate observation and monitoring systems
Capacity Building	Limited technical and human capacity Weak research, modelling and prediction skills.	Medium	Develop clear training and development plans including internal means of training e.g knowledge transfers, mentorship programs etc
4. Stakeholder Engagement			
Inexhaustive mapping of stakeholders in the	Poor coordination of stakeholders within the NFCS	Medium	Continuous mapping of all producers, co producers,

Risk Description	Risk Impact	Risk Level (Low/Medium/High)	Mitigation Measures
climate services value chain			intermediaries and users
Communication	Challenges in communicating climate information to all stakeholders including rural vulnerable households Low understanding of user needs	Medium	Clear definition of roles and commitment from sector groups and stakeholders Enhance capacities for production and delivery of tailored climate services and products
5. Data Quality and Reliability			
Data Quality Control	Data inaccuracy and reliability concerns	Medium	Set up clear data management protocols Continuous capacity building on data management
Data Validation	Lack of data validation and verification procedures	Medium	Set up clear data management protocols Continuous capacity building on data management
Data Protection	Data security, privacy, and ethical concerns	Medium	Set up clear data management protocols Continuous capacity building on data management
6. Climate Information Service Delivery			
Timeliness	Delays in submission of information by the various stakeholders	Medium	Ensure clear roles and responsibilities of stakeholders

Risk Description	Risk Impact	Risk Level (Low/Medium/High)	Mitigation Measures
Accessibility	Limited access to climate information due to inoperability of systems	Medium	Investment in technology commonality
7. Legal and Regulatory			
Legal Coordination	Challenges in coordinating with sector partners due to changes in organizations legal status	Medium	Harmonization of engagement that is not responsive to the legal status of various stakeholders
Affiliations to various governing bodies	Inability to commit fully to the NFCS process due to affiliation to other governing organizations	Medium	Clearly map organizations statuses prior to commitments
8. Evaluation and Monitoring			
Effectiveness	Ineffective capacities in undertaking monitoring and evaluation activities of the NFCS	Medium	Develop and commit to a clear monitoring and evaluation plan for the NFCS
Adaptation	Delays in adapting and adjusting to the NFCS	Medium	Commit and sign agreements with stakeholders within the framework Undertake Continuous capacity building

7 Developing the NFCS Implementation and Costed Action Plan

7.1 Basis for developing the Costed Action Plan (CAP)

Chapter 5.0 identified the goals that the NFCS aims to realize. These goals are systematically underpinned by associated objectives. To be achieved, the objectives require strategies which

then translate into outputs when implemented. The strategies are implemented by performing actions that result in the outputs. These actions are activities that form the cost items that build into the CAP. The activities to be undertaken to implement the Kenya NFCS will revolve around: establishing the NFCS and actualizing the Secretariat within it; public awareness and support for climate services; interactions and engagement among producers, users and stakeholders; capacity building for sectors, institutions and climate services (NFCS) pillars; institutional collaboration and coordination; availability and uptake of climate products and services to users; mainstreaming and; reduction of climate related risks.

Key activities are summarized below while implementation of the activities is presented in **Annex III**: Kenya NFCS– Implementation Plan. The activity cost estimates were used as a guide in preparing the results-based budget presented in Table 6.

i) Communicating the Kenya NFCS

This activity focuses on the first year and entails promotional & launch events, strategy meetings, promotional items, and press briefings among others as depicted in the work plan for communicating the NFCS- in Table 10.

ii) Establishing the Kenya NFCS and actualizing the governance structure.

The establishment of the NFCS and the actualization of the governance structure, is a collaborative effort led by Government of Kenya (GoK) and development partners. The process involves several key steps.

First, it entails the preparation of a comprehensive concept, outlining the objectives, scope, and strategies of the NFCS. This concept will be carefully developed, taking into account the specific needs and priorities of Kenya's National Framework for Climate Services (NFCS).

Once the concept for the entire NFCS is finalized, it will be submitted to the Cabinet for approval. Cabinet approval is a crucial step in ensuring the official establishment of the NFCS, including it's the governance structure, signifying the commitment of the government to advancing climate services in Kenya.

Upon approval, the Kenya NFCS- Secretariat will play a pivotal role in developing the necessary strategies, plans, systems, and activities required for the effective functioning of the NFCS.

iii) Raising awareness and educating the public on climate services, and enhancing the visibility and image of relevant institutions

This will entail development and implementation of a corporate communication plan and operationalize a fully equipped public communications and international affairs unit within the Kenya NFCS Secretariat.

*v**) Enhancing and maintenance of observation and communication networks, and monitoring systems***

This will entail undertaking an overall national technical evaluation of existing networks and systems and developing and implementing a master plan to harmonize them into a national network. It will also entail mobilizing resources to respectively rehabilitate and install existing and new networks and systems, as well as maintain all on a sustainable basis.

vi) Standardizing, harmonizing and regulating national climate services

A multi-sectoral and multi-stakeholder team will be set-up to set national standards for developing and operating networks and standards, and to consider and document protocols, and mechanisms for enforcing them

vii) Coordinating and promoting collaboration among climate services institutions operating in the country.

The initial step will be to explore the national institutional landscape and develop a baseline on capacities, followed by consultations with the actors, the development and implementation of institutional coordination strategy.

viii) Financing implementation of the NFCS

The financing of implementation of the NFCS will require deliberate forward planning to secure resources for funding specific activities. The key financing sources will be the GoK, partners and collaborators. The activities entailed in actualizing the financing model as described below.

a) Securing public (GoK) funding

GoK financing will entail preparation and submission through normal public service funding procedures, of results-based budgets developed by the Kenya NFCS Secretariat as informed by the CAP. The budget will contain the broad items depicted in the indicative results-based budget presented in Table 6.

b) Mobilizing resources from partners and collaborators

Given the critical role Kenya NFCS will be playing in national planning and development, and that the functions it will be performing are inextricably tied to regional and global climate services frameworks, networks, systems and programs, a sound, stable and predictable funding base is instructive. A resource mobilization strategy (RMS) to guide activities towards establishing such a base is important.

Resources mobilized through the RMS will bridge gaps in officially budgeted and disbursed resources. Methods for actualizing resource mobilization include: sensitization and awareness raising on the funding needs; presentations, discussions and analyses in conferences and workshops; project proposals; intelligence and analysis of donor and partner programs and activities; building resource mobilization frameworks and; monitoring, evaluation and reporting on resource mobilization. The approach will encompass all potential external and internal contributors from diverse spheres of life.

ix*) Facilitating development and sustainable operation of national climate services pillars*

In addition to the outputs from the technical evaluation of all observations and communications networks and monitoring systems, further work will be carried out to determine the status requirements and opportunities for strengthening and or establishment of national UIPs, an integrated CSIS and research, modeling & prediction systems. This work will also further refine and quantify capacity development needs identified through the NFCS processes. The outputs will inform the final actions to be taken, in consultation with relevant collaborators and stakeholders, in supporting development and operationalization of the pillars.

x) Effectively communicating climate services

This activity will be guided by development and implementation of a Kenya NFCS national climate services communication strategy.

xi) Supporting the national effort in mainstreaming of climate information into national planning and decision making

The key activity will be creating linkages and synergies with entities and processes currently driving the mainstreaming effort, e.g through the MTP process, the NCCAP development process etc.

xii) Monitoring and evaluating national climate services activities

This will entail implementing the M&E framework described in Chapter 9.0.

7.2 Results based budget

To have a clear and implementable resource mobilization vision, these agenda are translated into a budget as depicted in Table 6 below. Cost estimates provided by key sectors in the climate service value chain, which are the basis of the indicative results-based budget are contained in **Annex III**.

Table 6 Indicative Results Based Budget for Implementation of NFCS Kenya

#	*Objective*	*Outputs*	*Results*	*$US 000's*
1	Actualize NFCS governance and operational structures	Legal, policy & institutional frameworks; governance and operational structures, systems and functions	Effective and efficient governance management of climate	***290***

#	Objective	Outputs	Results	$US 000's
2	Enhance capacity of the national meteorological service to generate sector specific climate information and products	Improved knowledge and skills of technical staff Improved modelling capacity for CIS	Improved sector specific climate services	***4,900***
3	Develop a digital and standardized early warning system platform for climate-related information exchange across all counties	Digital early warning system	Improve access to early warning	***8,300***
4	Build priority technical, infrastructure and Human capacity in key institution in climate services	Improved climate services infrastructures Improved knowledge and skills of technical staff at all levels	Improved climate services for all sectors	***5,100***
5	Enhance national public awareness and support for climate services and institutional visibility, image and support	Positive institutional communications capacity visibility & image	Strengthened anchor institution and national climate services brand	***1,000***
6	Enhance the national network of observations networks & monitoring systems	Enhanced national observation network	Adequate data availability for CIS	***13,930***
7	Strengthen and enhance research, technology and innovation in climate services	Improved climate services production tools	Improved climate information services products	***10,700***
8	Develop capacity of sectors to generate sector specific products for climate services	Improved understanding and application of sector specific CIS	Enhance application and use of CIS in	***3,000***

#	Objective	Outputs	Results	$US 000's
			sectoral decision making	
9	Establish climate services user interface platform	Network of national UIPs; an integrated national CSIS;	Improved; user interactions, information flow, and; reduced climate risk;	***17,380***
10	Increase the national reach, understanding, use and uptake of CIS	Better understanding, user feedback	Enhanced reach, availability, use and uptake of services	***400***
11	Strengthen collaboration with stakeholders to enhance implementation global and national operational standard for observation and monitoring	Developed standards of operations	Standardized operations	***3,000***
	Total			***68,000***

Assumptions& Notes

- *GoK will inject and or engage WMO/Partners/Collaborators to avail requisite resources for initial activities*
- *establishing and operationalizing Kenya NFCS through institutionalization*
- *Kenya NFCS budget will be approved and allocation from GoK made*
- *Project partners & stakeholders may donate some assets and equipment in kind*
- *Cost estimates which are the basis of the indicative results-based budget are contained in Appendix III*

Table 7 Kenya NFCS & CAP Resource Mobilization Strategy (RMS)

#	Objectives	Strategies	Activities	Timeline					
				Yr. 1		Yr. 2			
				Q3	Q4	Q1	Q2	Q3	Q4
1	Establish RM unit								

2	Raise awareness, obtain buy in	Provide strategic focus to resource	i) Build RM concept & action plan	
3	Increase predictability of achieving goals	Define envelop ranges	i) Engage potential funding sources on basket ranges	
4	Increase pooled / un-earmarked funding	Define outcome and impact focus areas	i) Workshop to present impact and outcome focus areas to donors and stakeholders	
5	Broaden funding base	Identify & engage emerging donors	i) Coordinate and expand partnerships ii) Monitor donor trends	
6	Achieve results based approach	Step up RM from project to impact approaches	i) Recognize and promote donors ii) Develop new frameworks for multiple donor funding iii) Monitor, evaluate and report	

8 Implementing the Kenya NFCS

Implementation of the NFCS will be based on the Government financial year commencing July 2024 in line with the 2023-2027 MTP cycle.

8.1 Roles and responsibilities of entities in implementation of NFCS Kenya

The various entities that will be involved directly and indirectly in the implementation and delivery of the NFCS are outlined in Table 8.

Table 8: Roles & Responsibilities of Implementing Entities.

#	Entity	Role & Responsibility
1	Cabinet	-Approve the establishment of Kenya NFCS -Approve financing of the NFCS implementation
2	Inter-Ministerial Committee on Climate Services	-Oversight governance, operationalization and implementation of Kenya NFCS policies and programs- -Coordination of legal, policy, institutional and governance -Resource mobilization
3	KMD	Lead institution in establishment of Kenya NFCS Coordination of NFCS activities Lead institution in provision of climate information and services Climate monitoring, research, modelling and prediction
4	Kenya NFCS Secretariat	- Act as secretariat to NFCS I-MCCS - Facilitate overall visibility of and support for, and improvement of national climate services - Institutionalize the Operational Unit (OU) - Operationalize Kenya NFCS/Implementation plan
5	Key State Departments – OP / AG and Treasury	- Provide executive and legal direction - Facilitate financing of Kenya NFCS initiatives
6	Climate services partners	- Support establishment of Kenya NFCS - Provide technical backstopping to the Secretariat

#	Entity	Role & Responsibility
		- Play appropriate roles in implementation of the NFCS
7	Inter-Sectoral Working Group	- A forum for sensitive sectors/national technical consultations on climate services - Provision of sector specific needs, information and services - Liaison between the sectors and the Secretariat -Value addition to climate information and services
8	County Governments	- Support coordination of local CIS activities - Provide county level UIPs and data and information - Promote local sensitization and awareness on climate services
9	Research & professional institutions	- Technical cooperation and collaboration - Promote climate knowledge, products and applications
10	Enablers – UN system (WMO, UNDP, FAO, etc)	- Financial and technical support - Capacity building
11	Boundary organizations – (NGOs, media, private sector etc)	- Serve as intermediaries in flow of climate information and services between produces and users - Contribute to enhancing availability and use of climate services - Support capacity building
12	Stakeholder networks	- Coordination of relevant sector climate activities
13	Regional and national programs/projects	- Technical cooperation and capacity building - Coordination of initiatives - Provide resource inputs
14	Users	- Provide feedback and basis for engagement and improvement - Promote climate action on the ground - Prudent uptake and use of climate information and services
15	Thematic experts / facilitators / consultants	- Technical backstopping to Kenya NFCS Secretariat

8.2 Implementation matrix

The Kenya NFCS implementation matrix is presented in Annex III.

9 Monitoring Evaluation and Reporting

9.1 Approach

Monitoring and evaluation (M&E) framework is a necessary tool for effective implementation of the programs, projects and activities listed in the CAP. It will support the establishment of accountability of the OU regarding implementation of the Framework, under the oversight of I-MCCS.

The users of the M&E system include organization staff, partners, collaborators, clients, and other stakeholders. A three-pronged approach will be used to carry out M&E:

- Data collection by organization staff
- Participation by climate sensitive sectors and partners
- Surveys and special studies

Two types of indicators will be tracked. Performance indicators will be used to monitor ongoing progress of technical and management activities, outputs and outcomes and make necessary corrections. Impact indicators will periodically measure results against plans.

9.2 Monitoring

The monitoring process will play a critical role in planning and management decisions. To actualize this task, the Kenya NFCS Secretariat will undertake the activities described below, in line with the identified performance indicators. In collecting data, the Kenya NFCS Secretariat will remain cognizant of the need to balance the exercise with related ongoing work at the national level.

i. One of the key outcomes at the initial stages is to establish the legal, policy and institutional frameworks, and organizational systems and processes. These, when put in place, will form the basis of building a monitoring system.

ii. The Framework will identify staff with monitoring skills and charge them with the responsibility of working with any other relevant parties, including external monitoring experts, to monitor performance of activities.

iii. Members of the team will be assigned specific data elements that make up corresponding indicators with instructions to ensure that their particular sets of indicators are properly defined and to oversee that the performance data are collected according to the specified

frequency and methodology. The Kenya NFCS Secretariat will ensure that all aspects (infrastructure development, capacity building, operations, user interfacing, information flow, knowledge management, service provision, partnerships, collaboration and resource mobilization) of implementation of the plan are covered. Data collection will be both quantitative and qualitative. It will be collected using tools designed in formats that suit the data sets.

iv. The M&E team leader will be responsible for assembling input from the various groups, synthesizing the indicators from various data elements, and providing overall quality control using predesigned data base programs for various activities. As the framework has no baseline, a zero-start status will be assumed.

v. Monitoring will require buy in and involvement of all stakeholders since it will be important to familiarize with the process.

vi. Program and project funding entities and other collaborators may be involved in monitoring.

9.3 Evaluation

Evaluation will focus on relevance, efficiency, effectiveness, impact and sustainability of implementing the framework. It will draw lessons which can be used for future programming and learning. The Kenya NFCS will evaluate both the operational and service provision aspects of the framework. There will be three main evaluations of the performance in implementation of the framework:

- Pre-term (inception)
- Mid-term
- End–term

Undertaking each evaluation will require planning that will entail:

i. Identifying the aspect(s) or milestone to be evaluated
ii. Setting evaluation objectives as related to cost effectiveness, efficiency, relevance, and impact
iii. Deciding on the evaluation type
iv. Identifying the composition of evaluators and holding meetings to plan the evaluation exercise. These will be drawn from internal and external (stakeholders/partners) resources with specific expertise in in-depth evaluation
v. Developing the data collection tools
vi. Undertaking the evaluation exercise

vii. Writing and disseminating evaluation reports
viii. Holding evaluation report validation workshops
ix. Taking action on conclusions and recommendations contained in the report

The Monitoring, Evaluation and Reporting will follow procedures set by the Government and GFCS monitoring and evaluation tool. Secretariat will be the overall coordinator for sector specific activities while relevant sectors will be responsible for their areas.

Monitoring mechanism for implementing activities of the framework will be conducted quarterly and evaluation carried out biannually.

9.4 Performance Measurement Framework (PMF)

The PMF will ensure timely and consistent monitoring, evaluation and reporting on program activity, performance and inputs and will be used for informed decision-making by management. Establishing an effective performance measurement system will require engagement of all stakeholders to agree on what is to be achieved and how important performance management decisions will be made.

The performance indicators will provide the means for monitoring progress of activities, provide feedback to the Secretariat on performance and help identify areas where implementation strategies may need to be adjusted. The indicators will be selected based on the overall strategic approach and will closely reflect the work plan, capturing the main activities and tasks of the framework. The key performance indicators will be based on key result areas as listed in the costed action plan of the framework. Table 8 is a demonstration of the template be used for performance measurement. The template will be filled according to the result areas being measured at any one time.

Table 8 Kenya NFCS Monitoring and Evaluation Mechanisms

Objectives	**Indicator**	**Means of verification (source)**	**Frequency of verification**	**Responsible agencies**
1.1: Actualize NFCS governance and operational structures.	Governance structure in place	-reports, circulars and cabinet memoranda	Once	MECC&F, Treasury, AG
1.2 Enhance national public awareness and support for climate services, and institutional visibility, image, and support.	Outreach programs developed. No. of people reached.	Outreach Reports Training report	Biannually	NFCS-Inter-Ministerial Committee, NFCS-Secretariat,KMD MDAs,

Objectives	Indicator	Means of verification (source)	Frequency of verification	Responsible agencies
Objective 2.1 Develop a digital and standardized early warning system platform for climate-related information exchange across all counties	Number of digital platforms (web based, mobile apps) installed	A fully functional digital platform Completion certificates Acceptance reports	Once	KMD and all climate sensitive sectors
3.1 Establish climate services User Interface Platforms (UIPs).	Number of interactive systems	Participatory reports Responses to feedback	Continuous	KMD, MDAs, & Private Partners
3.2: Build priority technical, infrastructure, and human capacities of the key institutions in climate services	Number of technical staff trained Number of new infrastructure installed	Training reports Acceptance reports Completion reports	Annually	KMD, Private institutions
4.1 Strengthen and enhance research, technology, and innovation in climate services.	Number of new CIS developed	Research Reports	annually	KMD and other stakeholders
5.1 Enhance capacity of the national meteorological service to generate climate information and products	Number of technical personnel trained Number of tailor-made products	Training reports. Product reports	continuous	KMD and other institutions
5.2 Develop capacity of sectors to generate sector specific products for climate services	No of training Courses Approved No of technical staff Trained.	Training Materials Developed and approved Certificates, attendance sheets	Quarterly	IMTR, RCMRD
5.3 Increase the national reach, understanding, use, and uptake of climate products and services	Outreach programs developed. No. of people reached.	Outreach Programs developed. No. of personnel trained	Biannually	KMD, MDAs,

Objectives	Indicator	Means of verification (source)	Frequency of verification	Responsible agencies
6.1:Enhance observation and early warning networks across the country.	Number of stations installed Number of stations rehabilitated	Acceptance reports Distribution maps of stations Certificate of completion Field surveys	annually	KMD and other stakeholders
6.2 Strengthen collaboration with stakeholders to enhance implementation of global and national operational standards for observation and monitoring networks.	Number of stakeholders Number of MOUs signed	Stakeholder reports MOUs signed and agreements Funds Disbursed Co-produced products	annually	KMD and other stakeholders
Objectives 7.1 Develop and implement a partnership and collaboration strategy that outlines the mechanisms for engaging with various stakeholders (e.g., government entities, NGOs, private sector, communities, etc.) in the NFCS implementation	CSIS rolled out, No of partnerships developed with Research institutions, international organizations and NGOs. Operational procedures developed. Resources Mobilized	Signed LOAs, MOUs Resources availed.	Quarterly	KMD, Research institutions, NGOs Multilateral donors, MDAs and

9.5 Reporting

The secretariat will use the PMF to provide annual and quarterly progress monitoring reports as well as three evaluation reports for internal management use. These reports will be submitted to the secretariat Kenya NFCS.

The reports will contain in-depth analysis of implementation progress against the indicated goals, objectives and targets achieved, discussions of progress and hurdles, and presentation of success stories if appropriate. In addition to providing quantitative data, departments will also provide written narratives covering major achievements during the reporting period and/or major obstacles that hamper project implementation. The team leaders will provide the quantitative spreadsheets and narrative text to the relevant users for compiling the Kenya NFCS reports.

In addition to the formal semi-annual and annual M&E reports, the Secretariat will generate Periodic internal M&E updates between reporting periods. The secretariat will review these updates with departments regularly. Should the interim results indicate the need to refocus implementation activities or update project strategies, the secretariat will work with staff, and where need be stakeholders and partners, to effectuate those changes.

Annual evaluation reports will be prepared and submitted to the Kenya NFCSI-MCCS and copied to the M-SWG, KMD, and relevant partners & value chain actors.

10 Communicating the Kenya NFCS

It is imperative for Kenya NFCS to gain visibility and buy-in, educate stakeholders on its existence and purpose, and their respective roles in its implementation, and to earn program support. It will, therefore, communicate the plan both at the inception and at various stages of implementation depending on the needs and changing circumstances.

The secretariat will be charged with the responsibility of sharing the NFCS document among different stakeholders via various channels. Initially, it can be circulated among NFCS stakeholders as soft and hard copies followed by stakeholder workshops for endorsement. Then, the endorsed implementation plan document, along with the coordination guidelines, will be submitted to the Inter-ministerial committee for approval as an official plan. It will then be circulated in both soft and hard copies to main national and international stakeholders.

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12 Annexes

ANNEX A: Kenya Climate Service Stakeholder Mapping/Analysis

Stakeholders	Stakeholder Interests	NFCS Expectations / Relationships	Potential Contribution
Providers			
External providers: (GPCs; RCCs)	i. Data & information sharing ii. Co-development	i. Data & information sharing	Capacity development for KMD/co-producers
Country anchor provider: KMD	i. Conducive/enabling political environment ii. Adequate institutional, human & technical capacities for data generation and development & delivery of country CSs iii. Strong UIPs/interaction environment	i. Country anchor for provision of CSs ii. Shared CSs infrastructure iii. Co-production & co-delivery of CSs iv. Adequate, credible data & information	i. Host UIP structures ii. Technical expertise iii. CSISs iv. Shared technical infrastructure
Partners/Co-producers: ICPAC, FEWSNET, RCCMRD, NDMA, FAO, ITK	i. Structured partnerships & collaboration in data sharing, analysis, modelling and product development	i. Enhanced data sharing ii. Co-design, co-production & co-delivery of forecasts, advisories, warnings	i. Co-production ii. Communication / feedback iii. Capacity development
Co-producers			
Sector technical experts /co-producers: Agriculture, Food Security, Fisheries Livestock, DRM, Health, Water, Energy, Environment, Transport	i. Availability of adequate, quality & timely data and information ii. Technical & human capacity development iii. Sensitization on CSs issues iv. Consultative platforms v. CSs information centers	i. Improved co-production / tailoring & co-delivery ii. Promote country CSs iii. Efficient, ethical and timely services to stakeholders iii. Feedback on usage	i. Tailoring, co-delivery ii. User needs & engagement iii. Sector data & information iv. Program support v. Interaction & UIP structures
County Governments	i. Support and collaboration ii. Enhanced synergy and linkages in CSs systems and processes iii. Support for CI mainstreaming	i. Enhanced collaboration in delivery of CSs ii. Linkages & synergies in in project/program implementation	i. Local knowledge and expertise ii. Communication / feedback ii. UIP/interactions
Specialized agencies: KCAA, NDMA, KMA, security organs etc.	i. Tailored, accurate and timely data and information ii. Co-production	i. Value for money to providers ii. Value addition	i. Resources ii. Joint programs
Regional Bodies: EAC; AU	i. Structured partnership and collaboration engagements ii. Effective dissemination communications networks	i. Documentation, establishment of and effective participation in regional CSs policy frameworks and structures	i. Interaction platforms ii. Program financing / Material contributions iii. Data & information
Regional NMHSs	i. Data & information exchange ii. Effective telecommunications networks.	i. Cooperation ii. Shared programs	i. Data & information ii. Program support
Enablers			

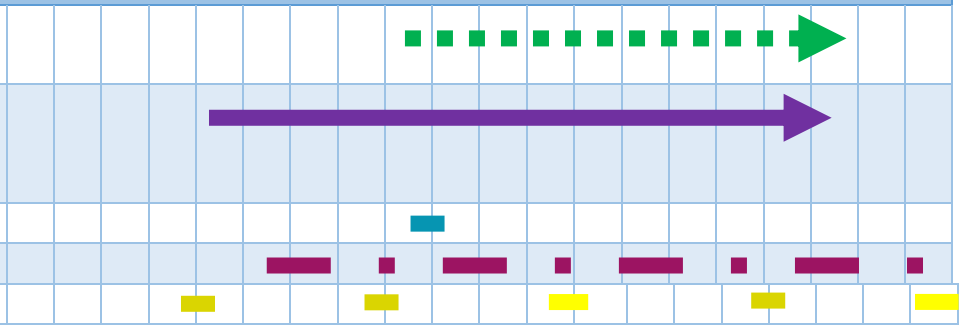
Stakeholders	Stakeholder Interests	NFCS Expectations / Relationships	Potential Contribution
UN Agencies: WMO; FAO, UNDP,	i. Adherence to recognized global and international operational standards and guidelines on CSs ii. Enhanced cooperation and collaboration	i. Support for country GFCS CSs components capacity development including establishment of UIPs and CSIS	i. Program/project financing (infrastructure) ii. Data & information iii. Training
International Agencies: OXFAM; World Vision, IFRC, etc.	i. Meteorological and related sciences data and information ii. Joint programs on climate change interventions	i. Partnership and collaboration ii. Resource mobilization	i. technical backstopping ii. Facilities
Research & Academic Institutions: UON, SEKU, KALRO, KEFRI,	i Enabling environment (platforms) for research in meteorological & related sciences ii Share data and information iii. Documentation & application of outcomes	i. Link knowledge to action ii. Partnership and collaboration in research and development	i. Knowledge ii. Product development / innovations iii Manpower development
Development Partner Institutions: DFID-WISER, ADA Consortium, USAID, JICA,	i. Development of joint CSs program/project ii. Enabling environment for collaboration and support on development and delivery of CSs	i. Resource mobilization	i. Financing programs/projects ii. Technology transfer iii. Technical training / backstopping
Boundary organizations			
Communicators: CIS providers, media agencies & networks, local radio networks, telecoms companies, journalist networks & associations	i. Partnership in dissemination & communication ii. Enhance capacity building on interpretation of weather and climate products iii. Technical backstopping and support	i. Partnership in implementation of national programs and projects ii. Provide UIPs ii. Timely, credible and effective communication iii. Fair and responsible coverage on CSs	i Public education ii. Publicity and visibility iii. Ideas / information iv. Feedback v. Interaction fora
State/County Extension Services	i. Relevant, location specific and credible user driven products & services from providers ii. Adequate logistical support & collaboration iii. Adequate public/user awareness iv. User feedback mechanisms/UIPs	i. ii.	i. Feedback
National NGOs : Red Cross,	i.		
CBOs			
User Groups			
General Public	i. Participatory engagement ii. Improved awareness and education on CSs iii. Efficient, reliable and accountable services	i. Responsive citizenry iii. Enhanced effective utilization	i. Buy-in & support ii. Communication iii. Feedback

Stakeholders	Stakeholder Interests	NFCS Expectations / Relationships	Potential Contribution
Local NGOs / CBOs	i. Program partnership ii. Good governance	i. Guidance on governance	i. Program funding ii. Technical backstopping iii. UIPs
Private sector: Banking institutions, corporates, cooperatives,	i. Sensitization on CSs issues ii. Provide enabling environment and incentives for business iii. Relevant, reliable and timely products & services	i. Play their rightful role in development of meteorological services ii. Compliance with laws, regulations and best business practices	i. Financing/Material support ii. Ideas /expertise on sector needs iii) Co-delivery mechanisms / interaction platforms
National/sub level Departments:finance, planning,	i. Sector specific data and information		i.
Users: national; communities; end users; farmers, fisher folk, pastoralists, special interest groups	i. Timely, relevant and location specific products and services ii. Adequate interface platforms iii. Effective communication channels		i. Traditional CS Knowledge / systems & processes ii. Co-production

ANNEX B: Kenya NFCS Implementation Matrix

Annex II: Implementation Plan - Kenya NFCS 2023–2027

#	Activities	Timeline				
		Year 1	Year 2	Year 3	Year 4	Year 5
1	Launch the NFCS					
2	Communicating the NFCS, raising awareness to gain buy-in and support					
3	Operationalization of the NFCS Governance Structure					
4	Budgeting, effectuation of Government funding processes and securing funding					
5	**Operationalize the NFCS:**					
6	Building Secretariat operational capacities					
7	Undertaking technical evaluation of KMD/Key Sectors networks & systems					
8	Consulting with stakeholders on national networks & systems capacity needs					
9	Setting national standards for generation and provision of climate services					
10	Supporting strengthening of institutional roles and responsibilities					
11	Plan and hold a partnership/collaboration/resource mobilization conference					
12	Supporting enhancement of observation and communications networks, and monitoring systems					
13	Consulting with institutions, documenting agreed protocols and building and implementing structures					
14	Supporting development and operation of climate services (NFCS) pillars					

#	Activities	Timeline
15	Supporting enhancement of communication and outreach of climate services to users	
16	Support mainstreaming of climate information into planning, decision making and climate risk management	
17	Undertake user/climate services uptake survey	
18	Undertaking monitoring	
19	Undertake annual, mid and end-term evaluations	

ANNEX C: Sector Specific Costed Action Plan (CAP)

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
AGRICULTURE, LIVESTOCK, FISHERIES & FOOD SECURITY SECTOR						
Goal 3: Enhance Observation and monitoring network						
3.1 Enhance country observations and communications networks, and monitoring systems	3.1.1 Formulate and implement data sharing frameworks among institutions promoting climate services and products 3.1.2 Capacity build climate data stakeholders Building capacities of the agricultural actors such as farmers, agriculture sector extension staff (public and private), relevant Ministries Departments, agencies and Climate Smart Agriculture stakeholders' platforms in the Counties	3.1.1.1 Climate data sharing frameworks developed 3.1.1.2 Multisectoral Master Service trainers (MSTs) to cascade trainings to lower levels (County & Ward) Climate data Management manuals developed	2years	1000	Climate data management manual developed for counties.	KMD, Relevant Ministries Department and Agencies
	3.1.3 Procure and install new simpler monitoring equipment County Agricultural offices and for	3.1.3.1 County & ward observations and communications networks, and	1 year	10	Assorted basic weather stations equipment	KMD/ County Gvts

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
	selected schools at ward level. E.g., rain gauge	monitoring systems enhanced			procured forward level use	MoALD Academic institutions (ward based)
Goal 4: Enhance capacity for climate services users, providers, and researchers to interact at all levels						
4.1 Develop and establish and strengthen national climate services UIPs	4.1.1 Evaluation of existing UIPs 4.1.2 Development, design and implementation of a national UIP network 4.1.3 Monitoring performance and continuous improvement	4.1.1.1 Increased stakeholder interaction and engagement platforms 4.1.2.1 Enhanced co-production /delivery of climate services	1 year	25	Evaluated, developed, designed and implemented UIP reports and documentation	KMD, MoALD, Ministries and relevant stakeholders
4.2 Develop *and operationalize an integrated national CSIS*	4.2.1 Assessment of national CSIS 4.2.2 Undertake national rescue of data on obsolete media 4.2.3 Plan, design, develop, test and deploy an integrated	4.2.1.1 A complete, digitized national data inventory 4.2.1.2 A national integrated CSIS 4.2.1.3 Improved management of	1 year	25	developed, designed, digitized and integrated CSIS reports and documentation	KMD, Ministries and relevant stakeholders

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
	national CSIS national repository	national climate data and information				
4.3 Enhance national reach, understanding, use and uptake of climate products and services	4.3.1 Development & implementation of a national climate services communication and outreach strategy	4.3.1.1 Increased availability to and use of climate services by users 4.3.1.2Enhanced and effective communication of national climate services	(2024-2027)	25	Reports and documents of implemented national climate services communication and outreach strategy	KMD, Stakeholders CCUs
4.4 Enhance mainstreaming of climate information /services in decision making processes	4.4.1 Improve current mainstreaming methodologies/tools and determine NFCS role and develop NFCS specific mainstreaming methodologies & tools 4.4.2. Collaborate with mainstreaming actors/institutions and synergize and integrate NFCS	4.4.1.1 Methodologies for mainstreaming climate services developed 4.4.1.2. NFCS mainstreaming role integrated into current national initiative	1st and 2nd year	10	Collaborations and other stakeholders MOUs and Integrated tools in place	KMD, CCU,MoALD

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
	methodologies /tools into current national effort					
Goal 5: Enhance capacity for Research modeling and prediction						
5.1 Support Research and innovation in climate services	5.1.1 Build institutional capacities to undertake research on climate services for improved food productivity and building resilience to climate change. 5.1.2Improve coordination of research innovation and knowledge generation. 5.1.3 Enhance development and dissemination of climate smart production innovations and technologies.	5.1.1.1 Co-designed, co-produced and dissemination of climate services.	1year	100	Climate research undertaken, documented and implemented	KMD, Relevant ministries KALRO/ARS/KMFRI
5.2 *Strengthen and enhance research, modeling and prediction*	5.2.1 Evaluation of existing national initiatives 5.2.2 Consultations with institutions on relevant protocols, modalities	5.2.1.1 Increased and improved national climate products and services portfolio and knowledge	1 year	25	Evaluated and established early warning climate management	KMD, MoALD, and relevant stakeholders

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
.	5.2.3 Establishment/operationalization of coordination mechanism	5.2.1.2 Enhanced early warning and climate risk management.			reports and documentation	
Goal 6: Enhance capacity to generate and use climate information and products.						
6.1 Harmonization and alignment of sectoral policies and frameworks to effect climate data handling	6.1.1. Conduct an inventory of existing MSPs from National toward level that handle agricultural climate data. 6.1.2. Conduct the review to identify and prioritize key data types required for sector climate decision. 6.1.3. Identify gaps in the policies & frameworks that are insufficient in climate data collection.	6.1.1.1. MSPs platforms from National to Ward levels. 6.1.1.2. Inventory of Key climate data for sector use 6.1.1.3. Profile most useful policies & frameworks for climate data	1 year	125	Data tool developed. Inventorized data base for climate data. Customized climate data framework for counties.	KMD, Ministry of Agriculture, Treasury and agricultural stakeholders
6.2 Develop institutional management system, Enhance national	6.2.1 Establishment of a national climate services public & international communications unit	6.2.1.1 Support and uptake of climate products and services	2 years	100	Established NCF Communication Unit	KMD, MoALD

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
public awareness and support for climate services, institutional visibility, image	6.2.2 Public awareness raising, sensitization and education on climate services	6.2.1.2 Increased public awareness and support for climate services			Number, reports and extent of sensitization and awareness conducted	
	6.2.2 Mainstreaming of sectoral institutions and structures at both levels of government.	6.2.2.1 Sectoral institutions structures strengthened at all levels and representation at the secretariat	1Year	100	-Institutional secretariats at CCUs	KMD, MoALD
Goal 7: Promote partnerships and collaborations in the implementation of NFCS						
7.1 Develop stakeholder consensus on mechanisms for collaboration and coordination	7.1.1Establishment of a technical baseline on institutions 7.1.2 Consultations with institutions and stakeholders on modalities and mechanism for collaboration and coordination	7.1.1.1 Technical baseline on national climate institutions 7.1.1.2 Documented modalities for institutional coordination and collaboration	1 year	10	Established technical institutions reports and collaboration status	KMD and Other stakeholders

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
7.2 Strengthen partnerships, resource mobilization and capacity development	7.2.1 Establish and strengthen Climate Smart Agriculture - Multi - stakeholder Platform (CSA-MSP) for climate services delivery	7.2.1.1 Resources mobilized 7.2.1.2 Sector and climate services pillar technical and human capacities built 7.2.1.3 Coordinated delivery of climate services.	2years	25	Established CSA-MSP for climate service delivery	CSA - MSP/ CCU - MoALFC
DISASTER RISK MANAGEMENT						
Goal 4: Enhance capacity for climate services users, providers, and researchers to interact at all levels						
4.1 Enhanced availability and quality of climate services for DRM through improved co-production.	4.1.1 Collaborative development and delivery of a comprehensive range of Disaster Risk Management (DRM) services, encompassing DRM observation, forecasting, prediction, projection, and inclusive assessments of impacts, as well as the issuance of advisories.	4.1.1.1Tailored DRM services designed to address specific climate-related challenges MOUs and Policies to enable data sharing. 4.1.1.2 Quality and timely DRM data and products made available for further application	3 years	100	Number of MOUs developed and polices reviewed	NDMA/NDMU/NDOC/ Kenya Redcross

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
	4.1.2 Enhancing the Data Quality Management System for Disaster Risk Management, including Standard Operating Procedures (SOPs) and monitoring protocols 4.1.3 Establishing a data sharing framework	4.1.1.3 Data sharing, analysis and dissemination platform				
4.2 Enhance the coordination of Disaster Risk Reduction (DRR)	4.2.1 Establishing a systematic and structured approach to foster meaningful dialogue.	4.2.1.1 Structures set-up for National and subnational forums at various time scales National and subnational forums hosted	1 year	35	Number of structures set up Number of forums hosted	NDMA/NDMU/NDOC/ Kenya Red cross/County Governments
4.3 Enhance capacity of users to understand and utilize weather and climate information	4.3.1 Identify existing structures and programs for sensitization of communities 4.3.2 Establish a feedback mechanism	4.3.1.1 Increased utilization of weather and climate information 4.3.1.2 Increased feedback on relevance	Continuous	3	Percentage increase of persons using climate	NDMA/NDMU/NDOC/ Kenya Red cross/County

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
	4.3.3 Sensitization of communities on use of climate information	and usability of the information			information and feed back	
	4.3.4Collaboratively developing and delivering a wide range of Disaster Risk Management (DRM) services, encompassing DRM observation, forecasting, prediction, projection, and including assessments of their impacts and issuance of advisories.	4.3.4.1collaborations	continuous	2.5	reports and assessments, advisories	NDMA/NDMU/NDOC/ Kenya Red cross/County
WATER SECTOR						
Goal 3: Enhance Observation and monitoring network						
3.1 Enhance in country observations networks, and monitoring systems	3.1.1 Procure and install 300 new hydromet stations to the network	6.1.1.1National observations and communications networks, and monitoring systems enhanced	5 years	3000	No of Automatic Weather and Hydro met instruments installed	KMD/Ministries in charge of Water

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
	3.1.2 Operations, Maintenance and Rehabilitation of Stations	6.1.2.1Stations maintained and rehabilitated	5years	250	No of Stations rehabilitated	KMD/Ministries in charge of Water
Goal 5: Enhance capacity for Research modeling and prediction						
5.1 Strengthen Capacity Building, Policies, and Coordination.	5.1.1 Capacity Building	5.1.1.1Trained Personnel	5years	100	No. of People trained	KMD/Ministries in charge of Water
	5.1.2 Harmonization of overlapping laws and Policies and Coordination	5.1.2.1Policies harmonized	5years	50	No of laws & policies harmonized	Ministries in charge of Water, Environment
5.2 To enhance research, modelling and prediction	5.2.1 Standardization and Calibration	5.2.1.1 Data quality enhanced	5years	100	Centre for Instrumentation and Calibration	KMD/Ministries in charge of Water
	5.2.2Development/ Procurement of rainfall – runoff models	5.2.2.1 Rainfall run–off Models developed/procured	5years	100	No. of models developed	KMD/Ministries in charge of Water
5.3 Enhance Sustainable Water Catchment Management	5.3.1 Catchment conservation, Protection & restoration	5.3.1.1 Catchments conserved	5years	2000	No of catchments rehabilitated	Kenya water towers, KFS, Local Community

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
5.4 Enhance Flood control Water provision, &Storage	5.4.1 Construction of flood control infrastructure (dams, dykes)	5.4.1.1 Flood infrastructure constructed	5years	6000	No. of Check dams & dykes constructed	Ministries in charge of Water and public works
5.5 Improved availability and quality of hydro-met services	5.5.1 Collaborative development and provision of a wide range of water and energy services, encompassing hydro-meteorological observations, forecasting, predictions, projections, and inclusive assessments of impacts and advisory services. 5.5.2 Enhancing the quality management system for water and energy data, which includes standard operating procedures (SOPs), monitoring procedures, and related measures.	5.5.1.1 Need-based water and energy services made readily available 5.5.1.2 Quality and timely hydro-met data and data products made available for further application	5years	25		KMD/Ministries in charge of Water

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
HEALTH SECTOR						
Goal 4: Enhance capacity for climate services users, providers, and researchers to interact at all levels						
4.1 Develop early warning system for climate related disease in high-risk areas	4.1.1 Identify and map climate-related disease hotspot areas. 4.1.2 Collect and analyze relevant data. 4.1.3 Provide capacity-building training to healthcare workers on monitoring and reporting. 4.1.4 Engage with stakeholders in the process. 4.1.5 Procure necessary infrastructure, including computers, printers, internet access, and automatic weather stations.	4.1.1.1 Early warning system for all climate related diseases developed in high-risk areas	Year 1	300	MOH, Meteorological services, NEMA, KEMRI, National treasury, CoG, relevant County governments	
4.2 Monitor air quality in major cities	4.2.1 Acquisition of mobile air quality monitoring vehicles.	4.1.1.1 Timely interventions on air pollution in major cities	Year 1 and 2	710	MOH, NEMA, Meteorological services	

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
	4.2.2 Conduct capacity-building programs focusing on operations and maintenance.				National treasury, CoG, County governments	
Goal 5: Enhance capacity for Research modeling and prediction						
5.1 Enhance national public awareness and support for climate services, institutional visibility, image	5.1.1 Raise awareness among community health extension workers. 5.1.2 Conduct sensitization sessions for County health management teams on climate change and health. 5.1.3 Strengthen the Ministry of Health's DHIS2 reporting system to enhance reporting on climate-sensitive diseases and conditions. 5.1.4 Review reporting tools to capture climate and health indicators.	5.1.1.1 Increased the knowledge base for health workers on Climate Change & Health. 5.1.1.2 Promoted increased uptake of climate products and services among health professionals. 5.1.1.3Updated the DHIS2 reporting system with revised indicators to better capture climate-related health data.	2 years	30	CCU-MOH, CCU-47 Counties CCU-MOH, MOH-HMIS, KMD, CCD-MOEF, CoG	

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
5.2 Develop institutional management systems and processes	5.2.1 Development of climate change and health strategy and 5.2.2 Develop climate change & health policy	5.2.1.1 strategy developed and disseminated 5.2.2.1 Policy developed and disseminated	3years 5 years	5 6	CCU-MOH, KMD-NCFS, CCD-MOEF	
5.3 Develop priority technical and human capacities through research, modeling, and relevant training initiatives.	5.3.1 Conduct training programs and workshops to enhance technical skills in climate-related fields. 5.3.2 Develop and implement capacity-building programs for health professionals in climate services. 5.3.3 Facilitate knowledge transfer on the climate change and health nexus, synthesizing research evidence to inform the development of policy briefs. 5.3.4 Engage in data collection and analysis, with a	5.3.1.1 Established proficient technical teams at both the National and County levels. 5.3.2.1 Strengthened human and technical capacities. 5.3.2.2 Finalized staff recruitment. 5.3.2.3 Acquired essential office furniture and equipment. 5.3.2.4 Established a comprehensive data repository for climate and health variables.	5 years	28	CCU-MOH, KMD-NCFS, CCD-MOEF	

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
	focus on gathering climate and health data.	5.3.2.5 Shared research findings regarding insights into climate-health relationships and the identification of vulnerable groups. 5.3.2.6 Formulated policy briefs for dissemination.				
Goal 7: Promote partnerships and collaborations in the implementation of NFCS						
7.1 Improved availability and quality of co-produced climate related health services	7.1.1 Collaborative development and provision of a comprehensive array of health-meteorology services, including health-meteorology observations, forecasts, predictions, projections, and impact assessments, along with advisory issuance. 7.1.2 Enhancing the quality management system for health-meteorology data	7.1.1.1 Provision of health-meteorology services based on identified needs. 7.1.1.2 Ensure the availability of high-quality and timely health-meteorology data and products to support various applications.	5 years	5	KMD/NMHSs/Met Services, CoG, Counties, MoH, KEMRI etc	

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
	(including standard operating procedures and monitoring). 7.1.2 Develop and disseminate clear and documented case definitions for nationally prioritized Climate Sensitive Diseases (CSDs) and other noteworthy health events.					
7.2 Improve the integration of climate information and services into decision-making processes within the health sector.	7.2.1 Develop and distribute a Health National Adaptation (HNAP) strategy. 7.2.2 Collaborate with mainstreaming actors and institutions to harmonize and integrate health sector methodologies and tools into the ongoing national efforts.	7.2.1.1 Publish a dissemination report. 7.2.1.2 early define the status of integrating climate services into decision-making processes within the health sector. 7.2.1.3 Develop methodologies and tools for mainstreaming climate services. 7.1.1.4 Integrate the role of mainstreaming	2 years	21	MOH, Counties, CoG, KMD	

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
		into existing national health sector initiatives.				
ENERGY SECTOR						
Goal 1: Create effective coordination mechanism for climate services						
1.1 Actualize and implement NFCS governance and operational structures	1.1.1Establish a NFCS Secretariat office	1.1.1.1 Normative entity/Established NFCS institutional & policy frameworks 1.1.1.2 Domicile ministry & offices 1.1.1.3Approved organizational structure 1.1.1.4Support NFCS Secretariat office at KMD	1year	30	Full functioning of NFCS secretariat office at KMD -Reports and documentation	KMD/Min of Energy
Goal 3: Enhance Observation and monitoring network						
3.1Enhance observation networks, monitoring systems and additional	3.1.1 Procure and install new AWS stations to the network due to diverse area coverage	3.1.1.1 Data sharing for areas covered by GDC and energy stakeholders,	Year 1	70	7 AWS Automatic Weather stations and 1 model	KMD/Ministry in-charge of energy/GDC

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
observation network, modelling and monitoring systems	3.1.2 Procure and install modelling software and licenses	3.1.1.2Server linkage communications networks, and monitoring systems enhanced				
	3.1.2 Procure mobile pollution monitoring laboratory	3.1.2.1. Early warning services to communities around the wells due emission of Gasses 3.1.2.2 Regular pollution monitoring	2years	100	1 mobile pollution monitoring laboratory	KMD/Ministry in-charge of energy/GDC
3.2 Enhance in country observations and communications networks, and monitoring systems	3.2.1 Technical assessment of all existing networks and systems 3.2.2 Capture and document national sectoral metadata 3.2.3 Establish a platform for linking sectoral and KMD observation stations	3.2.1.1 Technical report on in country status of networks & systems 3.2.2.1 Documented national sectoral metadata 3.2.3.1 A platform for linkage	1 year	60	No.of technical reports	KMD/MoE

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
	3.3.1Procure and install (SCADA-Supervisory control and data acquisition) system for controlling, monitoring and analyzing industrial devices and processes.	3.3.1.1 Real time data platform and interface for all IPPs in power planning. 3.3.1.2 hydro-power, wind -power, solar-power deemed power solution and linkage	2 years	100	-number of actors linked	KMD,KPLC, SOLAR FARMS,WIND FARMS, Kengen.
Goal 5: Enhance capacity for Research modeling and prediction						
5.1 Strengthen and enhance research, modelling and prediction	5.1.1. Co-development and delivery of hydromet observations, forecast, and projection services including impacts and advisories 5.1.2 Co-development and delivery of advisories on wind and solar energy resources (current status, potentials, access, utilization, benefits, challenges etc)	5.1.1.1.No. Of co-production workshops and dissemination platforms 5.1.1.2 No. Of co-production workshops and dissemination platforms 5.1.1.3 No. of data quality standards operating procedures (SOPs)	2 years	100	No. Of workshops -No. Of SOPs develop -No. of water reservoirs monitored -No. Of staff trained -No. Of research themes	KMD/MoE

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
	5.1.3 Strengthening water and energy data quality management systems Climate smart monitoring services for major water reservoirs 5.1.4 Capacity building of staff on climate service modelling and prediction 5.1.5 Participatory identification and design of energy research priorities Launch joint research, modelling and projection programs	5.1.1.4 No. of reservoirs monitored 5.1.1.5 No. Of staff trained 5.1.1.6 No. Of research themes 5.1.1.7 No. Of research themes			No. Of research themes	
Goal 6: Enhance capacity to generate and use climate information and products.						
6.1 Enhance national reach, understanding, use and uptake of climate products and services	6.1.1 Development & implementation of a sectoral climate services communication and outreach strategy	6.1.1.1 Strategy document 6.1.2.1 Database	1 year	5	- No. of documents developed	KMD/MoE

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
	6.1.2 Set up electronic energy knowledge management library					
Goal 7: Promote partnerships and collaborations in the implementation of NFCS						
7.1 Strengthen partnerships, resource mobilization and capacity development	7.1.1Inclusion of sectoral climate services resource mobilization in the energy sector resource mobilization strategy	7.1.1.1 A document for resource mobilization	1 year	10	Number of documents	KMD/MoE
Goal 2: Improve access or provision of climate services and early warning to all						
2.1. Enhance Updating of digital IDF curves, climate and Weather information summaries, catchment data for design, project planning purposes for early warning	2.1.1. KMD to update the relevant required datasets for users, 2.1.2 Re-introduce generation of data summaries, digitization of required datasets which Includes cost of acquisition of weather data in ToRs during design stage.	2.1.1.1Updated and digitized IDF curves, Summaries and catchment data 2.1.1.2 installed digital platform for monitoring	1 year	100	1.Climate change resilient road infrastructure 2.Real time relay of IDF curves	KMD, Road Authorities and Transport stakeholders

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
	2.1.3. procure and install digital platform monitoring systems					
2.2. Enhance Provision of daily weather forecast data and climate data for projects activity scheduling/planning	1.2.1Development of the Application software, populate with real time weather forecast data	1.2.1.1 Application software that provides daily weather forecast	1 year	25	Efficient and effective Construction project process	KMD/Road authorities/ Contractors
2.3 incorporation of road safety measures into daily weather forecast advisory and thematic area climate information	2.3.1 Provision of road network data by KRB, customize weather data as per provided road network 2.3.2 Disseminate the weather data to road users	2.3.1.1 Weather forecast alerts 2.3.1.2. Road safety signage	1 years	50	Reduced road accidents	KRB/ NTSA/ KMD/ Road Authorities
Goal 3: Enhance Observation and monitoring network						
3.1. Enhance in the country wind shear observation and monitoring systems	3.1.1 Conduct a wind shear study at major Kenyan International airports	3.1.1.1 wind shear study report. 3.1.1.2 wind shear observation and monitoring sensors at	1 year	150	Completed wind shear study report and installed sensors	KMD/KCAA

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
	3.1.2 Procure and install wind shear observation and monitoring systems	airports where wind shear is considered a safety risk				
3.2. Enhance in country observations networks, and monitoring systems	3.2. Procure and install automatic weather stations at the 15 identified domestic airports:	3.2.1.1 Current weather for air navigation at domestic airports/airstrips	1year	350	15 Automatic weather stations installed	KMD/KCAA
3.3.Enhance capacity building among originators and users of climate services	*3.3.1 Develop and implement a training plan for new systems established and co-used by KCAA/KMD*	3.3.1.1 Training conducted before use of new equipment	1 year	60	Training conducted	KMD/KCAA
3.4 Enhance collaboration between KMD and KCAA	*3.4.1 Develop a framework for collaboration between KMD & KCAA.* *3.4.2.Review letters of agreement between KCAA & KMD*	3.4.1.1 A collaboration framework between KCAA and KMD and implement Revised letters of agreement	1year	60	Participation of KMD/KCAA stations	KCAA/KMD

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
ENVIRONMENT SECTOR						
Goal 4: Enhance capacity for climate services users, providers, and researchers to interact at all levels						
4.1 Enhancing the accessibility of climate services to support environment and climate sector	4.1.1 Establish a framework for engagement (e.g., MoUs, agreements, collaborations)	4.1.1.1MoUs, agreements/ 4.1.1.2 Mutually agreed framework of engagement	Year-1	5	Number of existing MoUs/agreements	NEMA/KFS/KMD/ KWS/ KEFRI/KWS/DRSRS
	4.1.2 Awareness creation	4.1.2.1Sensitised stakeholders/institutions	Year-1; should be a continuous process	5	No. Workshops/forums No. of stakeholders sensitised	NEMA/KFS/KMD/ KWS/ KEFRI/KWS/DRSRS
	4.1.3 Introduction of emerging (new) services e.g., air quality forecast, water quality) and others	4.1.3.1 Co-produced Value-added product 4.1.3.2 Framework for production of new (identified) service Infrastructure, instrumentation,	2-years	100	Number of new products	NEMA/KFS/KMD/ KWS/ KEFRI/KWS/DRSRS

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
		dissemination, modelling, capacity building				
	4.1.4 Address feedback problems on climate information	4.1.4.1 MRE process	Year-1	5	Web-based MRE tool	NEMA/KFS/KMD/ KWS/ KEFRI/KWS/DRSRS
	4.1.5 Collaborative development and delivery of a wide range of environmental protection services, encompassing environmental monitoring, forecasting, prediction, and projection, including impact assessments and advisories 4.1.6 Enhancing the Environmental Data Quality Management System, including the development of Standard Operating Procedures (SOPs) and monitoring procedures	4.1.5.1 Tailored environmental safeguarding services made available 4.1.6.1Timely and high-quality environmental data and products for subsequent application	5 years	100	established information links, Reports	NEMA/KFS/KMD/ KWS/ KEFRI/KWS/DRSRS

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
NATIONAL METEOROLOGICAL SERVICE (KMD)						
Goal1: Create effective coordination mechanism for climate services						
1.1.Actualize NFCS governance and operational structures	1.1.1Establish a NFCS Secretariat	1.1.1.1Normative NFCS policy frameworks ii)Approved organizational structure iii) NFCS Secretariat office at KMD	1year	27	Reports, and documentation in place	KMD/NFCS Secretariat
1.2 Develop institutional management systems and processes	1.2.1Design management systems and processes	1.2.1.1 NFCS management systems and processes	1year	10	Management systems are in place	KMD
1.3 *Build priority technical and human capacities*	1.3.1 Preparation and submission of institutional budget 1.3.2 Requisition of funding 1.3.3 Assignment and secondment of human resource	1. 3.1.1 Funding for human & technical capacities	1 year	10	-Submitted budget -number of persons on secondment	KMD

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
Goal 4: Enhance capacity for climate services users, providers, and researchers to interact at all levels						
4.1. Enhance national public awareness and support for climate services, institutional visibility, image	4.1.1Establishment of a effective communication unit for climate services ii) Establishment of Public awareness , sensitization and education on climate services	4.1.1.1 Support and uptake of climate products and services ii) Increased public awareness and support for climate services	2024-2027	25	-reports on established communication unit ii)number of sensitized on climate services	KMD
4.2. Develop, establish and strengthen national climate services UIPs	4.2.1 Evaluation of existing UIPs 4.2.2 Development, design and implementation of a national UIP network 4.2.3 Monitoring performance and continuous improvement 4.2.4Support and facilitate UIPs at National, Regional , County levels and Modernize KMD Website	4.2.1.1 Increased stakeholder interaction and engagement platforms 4.2.2.1 Enhanced co-production /delivery of climate services 4.3.3.1 Modernized KMD Website	2024-2027	100	Developed national UIP network and reports ii)modernized KMD Website	KMD

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
Goal 3: Enhance Observation and monitoring network.						
3.1. Enhance in country observations and communications networks, and monitoring systems	3.1.1 Technical assessment of all existing networks and systems 3.1.2 Capture and document national metadata 3.1.3Development and implementation of masterplan for national networks & systems 3.1.4Establishment of observation stations 3.1.5Human Capacity building in monitoring systems	3.1.1.1 Technical report on in country status of networks & systems 3.1.1.2 Document national meta data 3.1.1.3Masterplan on enhancing KMD/other in country networks & systems developed and implemented 3.1.1.4KMD/other national observations and communications networks, and monitoring systems enhanced 3.1.1.5 Human capacity build	2024-2027	50	Number of networks stations established	All Stakeholders
3.2. Strengthen collaboration with stakeholders to	3.2.1. Identification of institutions in national	3.2.1.1 Documented national standards and procedures for climate	2024-2027	25	-number of observational institutions	KMD

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
enhance standards for observation and monitoring networks	observation and data dissemination network 3.2.2. sensitize on existing standards 3.2.3. Capacity building in other institutions 3.2.4. Institutionalize Voluntary Observation services	services networks, systems and operations 3.2.2.1 Actors sensitized on existing standards 3.2.3.1 Human capacity capable of making reliable observations in other institutions. 3.2.4.1 Framework for Volunteer Observers			collaborated and networks identified. -report on voluntary observation	
3.3 Establish and operationalize an inspectorate unit to enforce the standards thus Strengthen inspection unit at KMD and County Offices	3.3.1. Equipping KMD's calibration center 3.3.2. Procurement of transport vehicles for all county offices and National Inspection Unit	3..3.1.1 Functional calibration center 3.3.2.2 Availability of transport for field inspection	2024-2025	100	-number of calibrated equipment -number of vehicles for inspection bought	KMD
3.4 *Strengthen partnerships, resource mobilization*	3.4.1. Implementation of the partnership, collaborations	3.4.1.1 Resources mobilized	2024	25	Designed and implemented	KMD and All Partners

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
and capacity development	and resource mobilization strategy 3.4..2 Design and implement a monitoring and evaluation (M&E) framework	3.4.2.1 Sector and climate services pillar technical and human capacities built 3.4.3.1Improved performance			monitoring framework	
3.5. Build institutional and stakeholder consensus on modalities and mechanisms for collaboration and coordination	3.5.1 Establishment of a technical baseline on institutions 3.5.2 Consultations with institutions and stakeholders on modalities and mechanism for collaboration and coordination	3.5.1.1 Technical baseline on national climate institutions 3.5.1.2 Documented modalities for institutional coordination and collaboration	1ear	50	Established technical baseline institution reports and documentation.	KMD
Goal 2: **Improve access or provision of climate services and early warning to all**						
2.1 *Develop and operationalize an integrated national CSIS*	2.1.1 Assessment of national CSIS 2.1.2 Undertake national rescue of data on obsolete media	i) A complete, digitized national data inventory ii). A national integrated CSIS	2024-2026	50	-developed CSIS -Modernized and equipped National	KMD

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
	2.1.3 Plan, design, develop, test and deploy an integrated national CSIS& national repository 2.1.4 Strengthen Public Weather Service unit 2.1.5 Acquire High Performance Computing Systems .2.1.6 Enhance weather surveillance systems 2.1.17Establishment of CIS Communication Strategy Plan	i. Improved management of national climate data and information ii) Ease user access to CISs iii) High performance computer systems iv) Skilled forecasters v) Catalogue of triggers for various extreme weather impacts in place vi) Modernize and equipped National Meteorological Centre vii) Weather Radars installed across the country viii) CIS Communication Strategy in place			Meteorological Center (NMC)	

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
2.2 Develop a digital and standardized early warning system platform for climate-related information exchange across all counties	2.2.1 Develop a multi-hazard digital platform (Web-based Apps) for accessing early warning/advisories-from National, County, Sub-County to ward levels 2.2.2-Develop an interactive mobile App for accessing early warning advisories from National, County, Sub-County, to ward Levels 2.2.3 Develop and implement a strategy to ensure accessibility and understanding of early	i) A fully functional multi-hazard digital platform with user interaction data and feedback in place ii) afunctional mobile App with user download and interaction statistics in place **:**A documented strategy and implementation report detailing the accessibility and understanding	2024-206	3000	Established multi-hazard EWS	KMD, MDAs, County Gvernment

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
	warnings and climate services by various user groups, including vulnerable and marginalized populations. 2.2,4 Enhance communication systems (traditional media, social media, community forums, etc.) and feedback mechanisms for climate services and early	enhancements for various user groups. Documented communication systems and strategies, with analytics of reach and impact from various media and forums.				
Goal 5: Enhance capacity for Research modeling and prediction						
5.1 Strengthen and enhance research, modelling and prediction	5.1.1 Evaluation of existing national initiatives 5.1.2Consultations with institutions on relevant protocols, modalities 5.1.3 Establishment/operationaliza	5.1.1.1Increased and improved national climate products and services portfolio and knowledge 5.1.1.2 Enhanced early warning and climate risk management	2024-2026	100	-Developed modelling network -number of county climate information centers established	KMD,,County Government and other stakeholders.

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
	tion of coordination mechanism 5.1.4develop innovative modelling network between KMD and other Research institutions 5.1.5 Offer mentorship to early carrier meteorologists 5.1.6 Promote postgraduate education in specialized operational areas 5.1.7 Strengthen IMTR research unit 5.1.8 Modernize and equip National Meteorological Library at IMTR. 5.1.9 Establish County Climate Information Centers	5.1.1.3 Skilled operational researchers in specialized areas 5.1.1.4 Modernized National Meteorological Library 5.1.1.5 County Climate Information Centre in place			-strong research unit at IMTR	
Goal 6: Enhance capacity to generate and use climate information and products						
6.1 Enhance national reach,	6.1.1Development & implementation of a national	6.1.1.1 Increased availability to and use of	year 1	10	reports and documentation	KMD

OBJECTIVES	*Activities/strategies*	*Outputs*	*Time frame*	*Cost in million Ksh*	*KPI* *Indicators*	*Responsibility*
understanding, use and uptake of climate products and services	climate services communication and outreach strategy	climate services by users 6.1.1.2. Enhanced and effective communication of national climate services				
6.2 Enhance mainstreaming of climate information /services in decision making processes	6.2.1. Review current mainstreaming methodologies/tools and determine NFCS role and develop NFCS specific mainstreaming methodologies & tools 6.2.2. Consult with mainstreaming actors/institutions and synergize and integrate NFCS methodologies /tools into current national effort	6.2.1.1 Defined status of mainstreaming of climate services into decision making 6.2.1.2Methodologies for mainstreaming climate services developed 6.2.2.1 NFCS mainstreaming role integrated into current national initiative	year 1	10	reports and documentation	KMD and mainstream actors/institutions

ANNEX D: List of Organization Participants in NFCS Consultative workshops

List of organizations/participants in the National Consultative Workshop 21-22 April 2021

ON-LINE (VIRTUAL PARTICIPANTS)			
NAME	**ORGANIZATION**	**SECTOR**	**EMAIL**
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Workshop on the assessment of sectoral needs and development of costed action plan for the national framework for climate services NFCS

Figure 8 Participants of the NFCS Stakeholder engagement held in Naivasha between 21st and 22nd September 2023

Table 9 Participants of the NFCS Stakeholder engagement held in Naivasha between 21st and 22nd September 2023

	Names	**Designation**	**Sector**
1.	Jane Njeri Reuben	Senior Agri. Officer	AGRICULTURE
2.	Julius Komunga	Principal Agri. Officer	AGRICULTURE
3.	Philip M. Muraguri	Senior Supt. Hydrologist	WATER
4.	Nancy A. Odero	Hydrologist I	WATER
5.	Domnic K. Wambua	Chief Hydrologist	WATER
6.	Evans A. Ogochi	ATM & SAR Inspector	TRANSPORT
7.	Winstone Gicheru	Chief Met Inspector	TRANSPORT
8.	Michael Muchiri	Engineer I	TRANSPORT
9.	Maithya Mutyauvyu	Senior principal GIS	ENVIRONMENT AND FORESTRY
10.	Cromwel B. Lukorito	IPCC Vice Chair	ACADEMIA
11.	Beatrice Nyairo	Environment Scientist	ENERGY
12.	Zachary KK Atheru	Prog. Coordinator-ICPAC	ENVIRONMENT AND FORESTRY
13.	Jemimah Maina	Climate Unit Manager	DISASTER RISK REDUCTION
14.	Eunice W. Maina	GIS & RS Officer	ENVIRONMENT AND FORESTRY
15.	John Njoroge Mbitu	Ast. Gov. Chemist	TRANSPORT

16.	Catherine N. Kitela	Senior Supt. Engineer	TRANSPORT
17.	Nelson Mutada	DDDI	DISASTER RISK REDUCTION
18.	David Nanyende	DDVS	DISASTER RISK REDUCTION
19.	Rose Mokaya	PPHO	HEALTH
20.	Jusper Omwenga	Researcher	DISASTER RISK REDUCTION
21.	James Mutinda	DTSO	DISASTER RISK REDUCTION
22.	Francis Opiyo	Senior Scientist	ENERGY
23.	Fridah Mkatha	Senior Scientist	ENERGY
24.	Julius Muindi	PWRO	HEALTH
25.	Chris Kiptum Ngetich	PM	KMD-Forecasting
26.	Samuel M. Kamau	PMT	KMD-ICT
27.	Emmanuel Ashitiva	DIO	DISASTER RISK REDUCTION
28.	James K Mwangi	Community Co-ordinator	DISASTER RISK REDUCTION
29.	Lilian F. Mungau	ICTO	HEALTH
30.	Stellah B. Nyamweya	PMT	KMD-Liaison
31.	Dr. David Gikungu	Director KMD	KMD
32.	Kennedy K. Thiong'o	DDTSS	KMD-Technical Services
33.	Benard Chanzu	DDFS	KMD-Forecasting services
34.	David Adegu	ADCMS	KMD-Climate services
35.	Peter Sila Masika	AD-CCR	KMD-International Relations
36.	Dr. Geoffrey Ogutu	KMD FLLoCA	KMD-Climate Scientist
37.	Chito Njeria	KMD FLLoCA	KMD-Strategic Planning
38.	Mary N. Kamau	ADPWS	KMD- Public Wx Service
39.	John Gaturu Mungai	AD	KMD-Liaison and Relationships
40.	Beverly Mukoma	AD	KMD-Project coordination
41.	Ezekiel M. Njoroge	ADFS	KMD-Forecasting
42.	Hannah W. Kimani	AD	KMD-Forecasting
43.	Lukas W. Okach	AD	KMD-Training and Research
44.	Elisha M. Chanzu	AD	KMD-Training and Research
45.	Paul Murage	AD-IMTR	KMD-Training and Research
46.	Absae Ndege	AD-NET	KMD-Observation and Networks
47.	Japheth O. Migiro	AD-AGRO	KMD-Agrometeorological
48.	Njuguna N. Hiram	AD	KMD-Marine meteorology
49.	Zacharia N. Mwai	AD	KMD-Hydro Meteorology
50.	Pamela K. Mulwa	AD-BIOMET	KMD-Bio Meteorology
51.	Roger W. Ndichu	AD	KMD-Public Outreach
52.	Christine Nyagengo	PMT-MCA	KMD-Liaison and Relationship
53.	Joyce Kimutai	PM-Climate	KMD-Climate Scientist
54.	Bahati Musilu	PMT-CCR	KMD-Corporate Communication
55.	Isaac M. Kangila	PMT-HOF	KMD-Finance
56.	Bundi S. Kimaita	PM-DM	KMD-Hydro Meteorology
57.	Bonface L. Kariuki	PA	KMD-Support services
58.	Antony Settim	Driver	KMD-Support services