



International Water
Management Institute

Improving Institutional Arrangements for Strengthening Water and Climate Data and Analytic Tools in Ethiopia

Synthesis Report

Juan Carlos Sanchez Ramirez, Abdulkarim H. Seid, Mekuria Tafesse,
Muluken E. Adamseged and Musa M. Abseno



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Cover photo: A farmer operating a hand pump to draw water from his ponds in the Felana watershed, northeast Wollo, Ethiopia (photo: Dr. Sirak Tekleab)

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Acronyms and Abbreviations

BoA	Bureau of Agriculture (of Regional States)
BoH	Bureau of Health (of Regional States)
BoWIE	Bureau of Water, Irrigation and Energy (of Regional States)
DPPO	Disaster Prevention and Preparedness Office (of Regional States)
EFCCC	Environment Forest and Climate Change Commission
EMI	Ethiopian Meteorology Institute (formerly, National Meteorological Agency, NMA)
EPA	Environmental Protection Authority
FAO	Food and Agriculture Organization of the United Nations
IMISSET	Irrigation Management Information System of Ethiopia
MILLS	Ministry of Irrigation and Lowlands
MoA	Ministry of Agriculture (formerly, Ministry of Agriculture and Rural Development, MoARD)
MoWE	Ministry of Water and Energy (formerly, Ministry of Water, Irrigation and Energy, MoWIE)
NFCS	National Framework for Climate Services
NFCS-E	National Framework for Climate Services of Ethiopia
NMA	National Meteorological Agency
RMSC	Regional Meteorological Services Center
SC	Steering Committee
SSP	small-scale producer
WMO	World Meteorological Organization

Summary

Sound water management decisions are required to address the effects of climate change on water and, through this, enhance resilience to its impacts. Timely, context-specific and reliable climate and water data and information are prerequisites for sound water management decisions that aim to enhance the climate resilience of small-scale agricultural producers. Climate change impacts water by exacerbating scarcity, increasing the frequency and intensity of extremes – droughts and floods – and increasing the interannual variability of rainfall, on which the livelihoods of most rural households in Ethiopia depend. While the climate and water monitoring networks and database systems constitute the basic data infrastructure, institutional practices are equally important, if not more important, to ensure water and climate data are collected, processed and used to support water management decisions at multiple institutional levels.

A review of current institutional practices in the collection, organization, dissemination and use in decision-making of climate and water data was conducted as part of the project, through which several gaps were identified that need to be addressed to improve the climate resilience of small-scale agricultural producers. They include fragmentation of data, lack of adequate human and institutional capacity, frequent restructuring or reform of institutions, the absence of a well-coordinated knowledge management system and the absence of clear boundaries or linkage mechanisms between federal-level institutions and those operating within the basin or sub-basin levels.

Three options are proposed in this report that are aimed at strengthening institutional mechanisms for improved collection, organization, sharing and dissemination of climate and water data and decision support tools. Option 1 focuses on substantially strengthening existing data collection, organization and dissemination infrastructure, coupled with fit-for-purpose coordination arrangements among the key government agencies through task forces and working groups. Option 2 focuses on substantially strengthening the multi-level organization structure and scope of the institutional arrangement for the National Framework for Climate Services of Ethiopia (NFCS-E). The scope of climate services needs to be expanded to include water information services, which are underserved in the current structure. The central proposal under Option 3 is to have a dedicated multi-ministerial institution on climate and water data and analytics.

The options can be considered as stand-alone alternatives. They can also be understood to be stages in a phased transformation of the institutional settings for climate and water data and decision support services. Option 1, being the least disruptive, can be considered the first or starting point. A successful implementation of Option 1 would mean robust climate and water data monitoring networks combined with a strong information and communications technology (ICT) basis. This sets the stage for full-scale implementation of the NFCS-E structure with an expanded scope of water information services. The NFCS-E is coordinated by the Ethiopian Meteorology Institute (EMI). In Option 3, a fully dedicated climate and water data and analytics center is proposed.

The options can be further developed together with key stakeholders. It is imperative that a well-thought-out institutional landscape be agreed upon by key government agencies before adopting any of the options.

Introduction

Background

Sound water management decisions are required to address the effects of climate change on water and, through this, enhance resilience to its impacts. Timely, context-specific and reliable climate and water data and information are prerequisites for sound water management decisions that aim to enhance the climate resilience of small-scale agricultural producers (Grossi and Dinku 2022). Climate change impacts water by exacerbating scarcity, increasing the frequency and intensity of extremes – droughts and floods – and increasing the interannual variability of rainfall, on which the livelihoods of most rural households in Ethiopia depend. While the climate and water data collection monitoring networks and database systems constitute the basic data infrastructure, institutional practices are equally important, if not more important, to ensure water and climate data are collected, processed and used to support water management decisions at multiple institutional levels. Traditionally, government agencies invested in climate and water data collection networks and database systems with few inter-sector linkages and synergies. However, as water management decisions become increasingly more complex due to, among others, climate change, the need for stronger collaboration between government agencies is becoming mission-critical.

In Ethiopia, hydrological and meteorological data are collected, processed, organized and disseminated by the Ministry of Water and Energy (MoWE) and its specialized agency, the Ethiopian Meteorology Institute (EMI). The Ministry of Agriculture (MoA) and the Ministry of Irrigation and Lowlands (MILLS) are key users of the data collected by MoWE. Data on impacts of climate extremes are managed by the Disaster Risk Mitigation Commission.

A review of current institutional practices in the collection, organization, dissemination and use in decision-making of climate and water data was conducted as part of the project, identifying several gaps that need to be addressed in order to improve the climate resilience of small-scale agricultural producers. This synthesis report summarizes the review's key findings of the current institutional structure, mandates and practices for addressing climate and water data and information needs for various sectors in Ethiopia. It aims at synthesizing the key gaps in current practices and proposing options for improving climate and water data and tools toward enhancing climate resilience in water resources planning and management in Ethiopia. By addressing these gaps, the study seeks to enhance the national capacity to manage water resources effectively, thus contributing to the broader goals of climate resilience and sustainable development.

This report is one of two outputs of the project *Prioritization of Climate-smart Water Management Practices* (hereinafter referred to as 'the project'), financed by the Bill & Melinda Gates Foundation.

This synthesis report also seeks to provide guidance on how to address the critical need for comprehensive, accessible and actionable data and information systems that support the climate and water resources management requirements of small-scale producers within the broader domain of climate-smart water resources management. This report builds on the findings of the project on the current availability and use of climate and water data and tools in water resources planning and management. These findings are presented in another synthesis report, which will hereinafter be referred to as the 'Data and Decision Support Tools report' (Taye et al. 2024).

The objective of this synthesis report is to contribute towards improving institutional coordination in the provision of climate and water data and decision support tools for strengthening resilience in the space of agricultural water management (with a focus on small-scale producers) and broader water resources planning and management in Ethiopia. By contributing towards the enhancement of data and analytics capabilities in the country, the study aims at improving government decision-making to ultimately improve the climate resilience of small-scale producers (SSPs); see Figure 1.

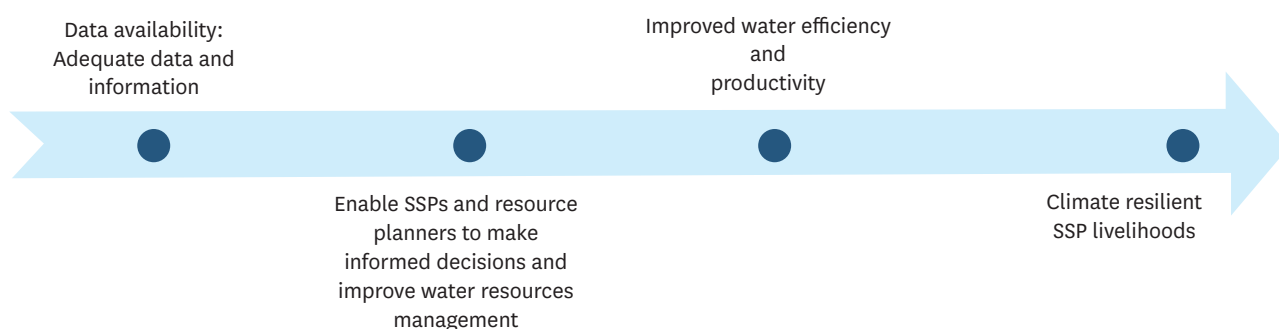


Figure 1. Data availability continuum for improved water and agricultural practices.

Notes: SSP - small-scale producers

Methodology

The report has been prepared based on a review and analysis of secondary data, i.e., proclamations, laws, strategies, regulations and policies of relevant sector ministries – mainly the Ministry of Water and Energy, the Ministry of Agriculture, the Ministry of Irrigation and Lowlands and the Disaster Risk Management Commission. In addition, consultations were conducted with key stakeholders at the federal, regional and local levels, which made possible an assessment of current practices pertaining to the provision and use of climate and water data. A simplified illustration of the methodology is given in Figure 2.

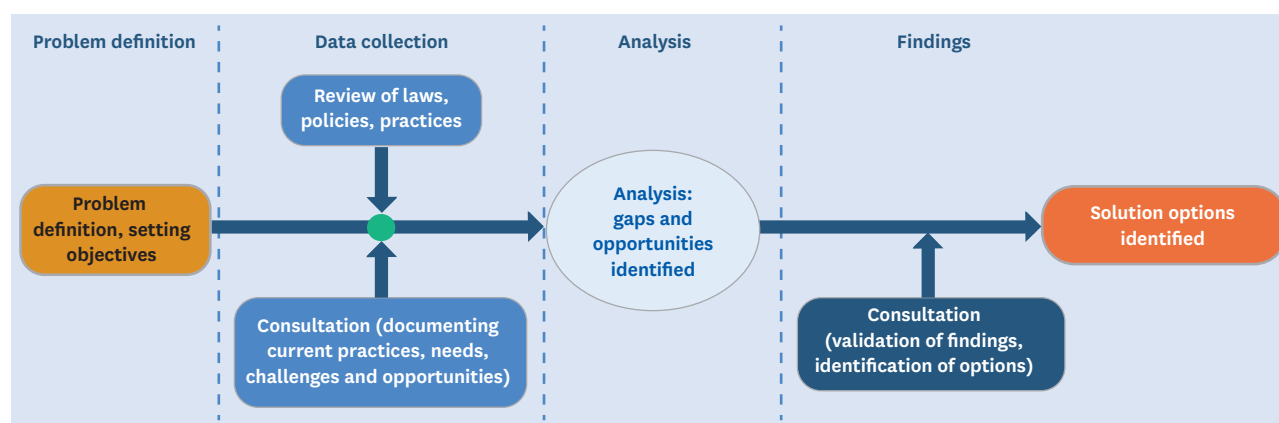


Figure 2. Schematic of study methodology.

The institutional assessment consisted of three specific sub-assessments, including (a) Review and assessment of the legislative framework which was undertaken during the inception phase; (b) Review and assessment of national coordination mechanisms; and (c) Review and assessment of water governance, policy and institutional arrangements. Table 1 summarizes the features of these institutional assessments.

Key government documents reviewed in preparing this report include the latest proclamation defining the powers and duties of government institutions (FDRE 2022), the Ethiopian Water Resources Management Policy (MoWR 1999), Ethiopia's Agricultural Sector Policy and Investment Framework for 2010–2020 (MoARD 2010) and the National Policy and Strategy on Disaster Risk Management (DRMC 2013). The report benefited from a series of consultations and meetings held by the International Water Management Institute (IWMI) Ethiopia Team with key government stakeholders.¹

¹ The list of key individuals consulted is given in Annex 1.

The findings of the abovementioned consultations supplement those from the institutional assessments conducted as part of the project. The institutional assessments are described in Table 1.

Table 1. Specific institutional assessments that serve as the basis of the report.

Report Title	Authors	Short Description
Inception Report	IWMI team	This report is based on the policy and legislative framework assessments conducted as part of the inception phase of the project.
Coordination arrangements for climate-smart water management (national level)	Eng. Mekuria Tafesse Dr. Musa M. Abseno	This report explores existing coordination arrangements for climate-smart water management in Ethiopia at the national level.
Report on a review of the policy, institutions and governance mechanisms for water resources planning and management with relevance to climate change adaptation	Muluken L. Alemu (Ph.D)	This paper reviews the institutional structure and governance capacity related to multi-scale water resources planning and management in the Awash River Basin of Ethiopia through secondary and primary data. It recommends multi-scale agricultural water management (AWM) planning tools based on intervention evidence and stakeholder needs. The review of policy and legislation considers the involvement of multi-level formal and informal institutions during the design and implementation stages of policies and their relation to climate change adaptation, gender and social inclusion.

Further, the report has based its institutional recommendations on the findings of the Data and Decision Support Tools report (Taye et al. 2024).

The report has also benefited from the discussions and recommendations from the ‘Vision for Strategic Planning: Climate and Water Solution Concept Development’ workshop convened by The Bill & Melinda Gates Foundation on July 19–20 2023, in Addis Ababa.

Existing Situation

Overview of Climate and Water Data and Decision Support Tools

The climate and water data and decision support tools within the scope of this report are those that are needed for water resources planning and management at scales ranging from national to watershed levels and for agricultural water management across the rainfed-irrigation continuum. The focus of this report is mainly on institutional aspects, while details on the types of climate and water data collected and the decision support tools used are described in the Data and Decision Support Tools report (Taye et al. 2024).

Hydrometeorological data: The Ministry of Water and Energy (MoWE) operates an estimated 490 streamflow gauging stations in Ethiopia. The Ethiopian Meteorology Institute (EMI) operates more than 1000 meteorological stations. These are best estimates based on the available information. The actual number of operational stations varies from time to time. Reports indicate that more than 60 river flow and lake level stations were installed in the Awash River Basin alone. However, most of these stations are no longer functional.²

² Based on a review of available datasets collected as part of the project.

Accessibility and availability of observers were the main criteria used when the stations were initially established. As a result, more than 70% of the rainfall and streamflow gauging stations have been located at the head catchments of river basins, i.e., along or close to road networks, which are denser in the highlands. This has resulted in inadequate gauging of large catchments.

Overall, the lack of consistent and good-quality long-term data is a major constraint and challenge, especially for variables other than rainfall and temperature. Assessments conducted as part of the project indicate that, even for rainfall and temperature, the current network of meteorological stations in the basin is insufficient in terms of spatial coverage and the network of stations does not meet the guidelines of the World Meteorological Organization (WMO). Such an inadequate distribution of stations is mainly related to the inaccessibility of most areas of the country.

For many stations, hydrometeorological records are short in length and the periods covered vary greatly across the sub-basins. This has rendered comprehensive assessment of the hydrology and modeling of the country's important basins difficult, if not impossible.

Telemetry: Telemetry refers to the automatic collection and wireless transmission of data to a remote location, such as a data center. While there are a few stations (information on exact number not available) equipped for automated relay of streamflow data, most hydrometeorological monitoring stations are manual stations from which transmission of data to the central location, i.e., MoWE or EMI or any of their location offices, takes place. There are plans by MoWE to upgrade the current manual river flow monitoring system.

Databases: MoWE has been using the HYDATA database system for the processing and storage of its streamflow gauge data. HYDATA was developed by the UK Centre for Ecology & Hydrology. MoWE is phasing out the use of HYDATA and is currently developing an integrated database system as a replacement. There is also a groundwater database, an online version of which is available on the website of Acacia Water.³ Further, MoWE has developed a water resources audit to expand its database. The Water Resources Audit (WA) is an inventory of water infrastructure and water use. The audit was prepared on the basis of field data collected in 134 *weredas*⁴ in the Abay (Blue Nile) Basin, 117 *weredas* in the Awash Basin and 108 *weredas* in the Rift Valley Basin (WLRC 2023).

Access to data: Access to hydrometeorological data requires a formal request to either the Hydrology and Basin Information Unit of MoWE for river flow and water level data or the Ethiopian Meteorology Institute for meteorological data. It is policy that one must pay for meteorological data, though some users, such as students, are exempt from paying.

Requests for meteorological data can be made online via the EMI website⁵ by filling out the data request form. Using the station list provided on the website, one can select the stations for which data is to be requested (Figure 3). The data policy of EMI is accessible through the same website. The data policy also offers the option to submit data requests by email while specifying who can get data free of charge.

Figure 3. Screenshot of the EMI data request form.

Climate information services (also referred to as climate services): The World Meteorological Organization (WMO) defines climate services as the provision and use of climate data, information and knowledge to assist in decision-making. Climate services can include a range of services such as providing information on rainfall conditions, soil moisture and

³ <https://mowe.acaciadata.com>

⁴ *Wereda* is the third-level administrative division of Ethiopia.

⁵ www.ethiomet.gov.et/stations/regional_information/7

temperature patterns (Vaughan and Dessai 2014; Sutanto et al. 2022). Small-scale producers often face challenges such as limited access to education, credit and agricultural services compared to large-scale commercial farmers (Sekaranom et al. 2021). Climate services can help address these challenges by providing small-scale producers with the necessary information and tools to adapt their farming practices to changing climate conditions (Mango et al. 2018).

In the context of small-scale producers (SSPs), climate services refer to making available customized products and information that assist SSPs in adapting to and mitigating the impacts of climate change on their agricultural practices (Rubio-Martin et al. 2021). For example, climate services can provide SSPs with information on suitable crops and planting dates based on climate projections, helping them optimize their yields and reduce risks (Sutanto et al. 2022). Participatory workshops and engagement with SSPs can play a positive role in the provision of effective climate services (Roncoli et al. 2008). By involving SSPs in the co-creation of climate services, their specific needs and knowledge can be incorporated into the design and delivery of these services (Roncoli et al. 2008). This participatory approach can enhance the relevance and usability of climate services for SSPs. Climate services for SSPs are part of a broader concept of climate services that involves the generation, provision and contextualization of climate information and knowledge derived from climate research for decision-making at all levels of society (Vaughan and Dessai 2014). These services aim to bridge the gap between climate science and decision-making by providing actionable information that can support adaptation and mitigation efforts (Vaughan and Dessai 2014). Further, climate information services complement other measures that are meant to enhance climate resilience, such as small-scale irrigation (Mango et al. 2018).

These services are mostly provided by government agencies for users at different levels, though other actors, including the private sector, can play an important role in the provision of climate services (Tsfaye et al. 2019). WMO has developed the Global Framework for Climate Services (GFCS), the aim of which is to support, strengthen and coordinate the development, delivery and use of climate services to assist decision-making by addressing climate risks at national, regional and global levels.

Following the guidelines of the GFCS, Ethiopia has developed and adopted its national framework – the Ethiopian National Framework for Climate Services (NFCS-E). The framework involves multiple government agencies. The coordination guideline document for the NFCS-E was co-signed by the Ministry of Water, Irrigation and Energy (now the Ministry of Water and Energy), the National Meteorological Agency (now the Ethiopian Meteorology Institute, EMI), the Ministry of Agriculture, the Ministry of Health, the Environment, Forestry and Climate Change Commission (now, partially, the Environmental Protection Authority) and the Ethiopian Disaster Risk Management Commission. The Ethiopian Meteorology Institute (EMI) serves as the secretariat which coordinates the generation and dissemination of climate data and information and provides climate services. The types of services currently provided are described in the Data and Decision Support Tools report (Taye et al. 2024).

Decision support tools: Very few tools that can be broadly described as ‘decision support tools’ have been developed by government ministries for climate and water information services. The key tools described in the Data and Decision Support Tools report are: the Irrigation Management Information System of Ethiopia (IMISSET) developed by the Ministry of Agriculture with the support of the Food and Agriculture Organization of the United Nations (FAO), which is currently being enhanced with the support of IWMI; tools used for water allocation planning in the Awash Basin (focusing on water allocation from the Koka Reservoir); various tools used by EMI to generate weather forecasts (many of them off-the-shelf modeling tools available in the public domain); and tools used to convert the weather forecasts into sector-specific indicators.

Institutional Mandates

Introduction

This section provides a description of institutional mandates for the collection, organization, processing and dissemination of climate and water data. Institutional mandates have evolved in the last two to three decades with the evolution of the organizational structure of relevant government agencies.

Assessment scope: The first step used in the assessment of institutional mandates with respect to climate and water data and information is to define the context that underpins the need for and use of climate and water data and information. Climate and water data are needed for nearly all development interventions – be it the design of airports, irrigation development or road network design. On the other hand, the types and temporal and spatial resolution of data needed depend on the specific purposes. Therefore, climate and water data related mandates of institutions are extracted from the broad duties of the various government institutions relevant to climate resilient water resources management. The main purposes or thematic areas of focus that are in-line with this project are described in Table 2. Further, mandates on the collection of raw climate and water data as well as other information (e.g., flood forecasts) are considered relevant in the context of the ongoing discussion and, hence, included in the assessment. There are cases where the execution of certain mandates requires strong water and climate data and tools. Such mandates are also included in the review, and the inter-sector coordination needed to execute such mandates is discussed.

Table 2. Broad categories of purposes for data and decision support tools assessment.

Key purpose	Mandated government agencies
Agricultural water management in rainfed systems	Ministry of Agriculture
Agricultural water management in irrigated systems	Ministry of Irrigation and Lowlands
Agricultural water management for livestock	Ministry of Irrigation and Lowlands
Preparedness against climate extremes – floods, droughts and heatwaves	Ministry of Water and Energy National Disaster Risk Management Commission Ethiopian Meteorology Institute as part of its role in leading and coordinating the activities of the National Framework for Climate Services
River basin management, including water allocation across users, and reservoir operation	Ministry of Water and Energy
Environmental flow management	Ministry of Water and Energy (see mandate 32c)

Ministry of Water and Energy (MoWE)

The Ministry of Water and Energy (MoWE) together with its specialized agency, the Ethiopian Meteorology Institute (EMI), is the main government institution mandated to collect, organize and disseminate climate and water data. Table 3 shows the powers and duties of MoWE extracted from Proclamation 1263/2021, Article 32. Those aspects of the mandates that directly link to water and climate data and information, including decision support tools, are highlighted in bold italics. Review notes are added under each mandate to highlight important areas of intervention. Further to the powers and duties vested in MoWE by the proclamation, the draft Ethiopian Water Resources Management Policy provides a detailed description of the strategies that will be followed to execute the mandates. Section 2.2.4 of the policy deals with water information systems and the policy provisions (Box 1).

Table 3. Climate and water data related powers and duties of the Ministry of Water and Energy (MoWE).

Article	Mandate as in Proclamation 1263/2021	Remarks
32(b)	“undertake policy studies, surveys and researches needed to create a conducive environment for the implementation of an integrated water resource management within basins; and implement the same upon approval.”	<i>In the context of climate resilience for small-scale producers (SSPs), this mandate empowers MoWE to assess the efficacy of water management practices at multiple scales – from national to basin and watershed scales – in addressing the water security of SSPs and propose/recommend measures for improving water security and enhancing climate resilience. Given the capacity to implement this mandate, the potential contribution of MoWE to strengthen the climate resilience of SSPs is substantial.</i>
32(c)	“ensure that projects, activities and interventions related to water in the basins are, in line with the integrated water resources management process; develop and use basin models in order to guide and support strategic planning of water resources and water administration functions; identify measures through study, that should be taken against pollution and damage to basins; implement the same in collaboration with relevant organs; conserve, protect and manage water bodies and related ecosystem.”	<i>Basin models and decision support tools come in various formats and have a spectrum of uses in IWRM. They can range from simple basin water balance models to those employing complex optimization routines to support prioritization of water allocation among users to maximize selected objectives. In the past, MoWE had used different types of water resource models in the development of basin master plans. There is also some attempt to use modeling tools to support decisions on the allocation of water from the Koka dam in the Awash River Basin. A field survey conducted by the International Water Management Institute (IWMI) team as part of the project shows that the use of even simple water balance models is nonexistent in most of the catchments studied. There are significant shortcomings in this area. Without the capacity to simulate river basin functioning under different climatic, socio-economic and land use scenarios, it is nearly impossible to ensure that water resources management is climate resilient.</i>
32 (d)	“perform flood protection forecasting and early warning ; carry out necessary works to protect and save human and animal lives and properties within a basin from danger due to natural disaster in relation to flood and drought;”	<i>The capacity to provide timely, geographically specific and context-sensitive flood forecasts is one of the pillars of climate-smart water management at multiple scales. MoWE is the co-chair of the National Framework for Climate Services of Ethiopia (NFCS-E) whose first objective is to build resilience to climate-related hazards through better provision of climate information and services. MoWE generates flood forecasts and issues early warnings in the Awash Basin. However, there is still a need to refine the forecasting and early warning systems to make them more geographically referenced and improve coordination with other institutions, such as the Disaster Risk Management Commission.</i>
32(e)	“ identify the volumetric and quality terms of the country’s ground and surface water resources by undertaking basin studies and facilitate utilization of the same; cause improvement and expansion of water resource development and management; devise awareness creation programs on potable water use; implement the same;”	<i>The last major water resources assessments conducted by MoWE were during the preparation of basin master plans in the late 1990s. There is a need to update most of the water resources assessments to ensure water management decisions are made based on the most up-to-date information regarding the state of Ethiopia’s water resources. What is also critically needed is the monitoring of actual water use in agriculture, which consumes most of the water in any river basin. With the expansion of small-scale/ smallholder irrigation, which is key for improving the climate resilience of SSPs, monitoring of water availability, actual water use and water deficiencies at smaller spatial scales is very important. In this context, the roles of government institutions at the regional state, zonal and wereda levels are critical. At the national level, regular publication of knowledge products, such as ‘State of the Basin reports’, can serve as important inputs in decision-making at the strategic level as well.</i>

Continued...

Table 3. Climate and water data related powers and duties of the Ministry of Water and Energy (MoWE). (Continued)

Article	Mandate as in Proclamation 1263/2021	Remarks
32(p)	“provide support to promote expansion of meteorological services; enhance risk forecasting capacity ; enhance capacity to utilize data obtained from the sector;”	<i>These two clauses essentially sum up MoWE mandates on the collection, organization and dissemination of water and climate data and the facilitation of their use. More specific mandates on meteorological data are assigned to the Ethiopian Meteorology Institute (EMI) (described below).</i>
32(s)	“establish a system to facilitate the collection, organization and utilization of data of water and energy resource; cause the expansion of water and energy development;”	

Notes: IWRM - Integrated Water Resources Management

Box 1. Selected provisions from the Ethiopian Water Resources Management Policy (1999)

Water Resources Management Information Systems, Monitoring, Assessment and Auditing

A. Management of Water Resources Information

1. Manage and administer water resources information on the basis of project and sector information, management information system, technical information and public information systems.

B. Development of Information Management System

1. Develop a coherent, efficient and streamlined process of information management in the water sector consisting of:
 - defining and incorporating: data collection, processing, analysis and dissemination,
 - determine the requirements of: human, technology, data and financial resources,
 - identifying the users' typography, information requirements,
 - defining information requirements of users,
 - identifying sources of information.
2. Recognize the link between properly managed water resources and the availability of viable information systems and to develop a practical, coherent, well designed and smoothly functioning Ethiopian Water Resources Information Systems (EWRIS), by establishing the Ethiopian Water Resources Information Center (EWRIC).

Ethiopian Meteorology Institute (EMI)

The Ethiopian Meteorology Institute is one of the specialized government institutions reporting directly to MoWE. It is primarily responsible for the collection, organization and dissemination of meteorological and climate change information and for issuing weather forecasts for use by multiple sectors. It is also the coordination unit of the National Framework for Climate Services. Its mandates, as provided by Proclamation 1263/2021, are listed below:

1. Provide meteorological and climate related services;
2. lead national climate services; conduct study and research on meteorological and climate change;
3. Execute the international obligations signed by Ethiopia with respect to meteorological and climate change; implement supports;
4. Lead and coordinate Ethiopian climate change adaptation and mitigation activities;
5. collect, analyses and forecast meteorological, air pollution and climate change information;

6. provide educational information, early warning and advisory services with respect to weather condition, climate and climate change
7. examine requests for collection of meteorological information and issue permit for same.

From the above description of powers and duties under Proclamation 1263/2021 and the relevant policy provisions (though still draft), MoWE together with EMI, has the mandate for the collection, organization and dissemination of climate and water data. Clause 32(d) of the Proclamation 1263/2021 also covers flood and drought forecasting and early warning systems.

Overall, the mandates of MoWE with respect to climate and water data, including forecasting and early warning, are comprehensive, covering surface water and groundwater resources, water quantity and quality aspects, water availability, water use monitoring, historical trends, as well as forecasts of droughts and floods.

Ministry of Agriculture (MoA)

The Ministry of Agriculture of Ethiopia also plays a role in collecting and using climate data for agricultural planning and policy formulation. The ministry may have its own data collection systems and work in collaboration with EMI.

MoA is responsible for formulating policies, strategies, programs and legal frameworks to ensure the sustainability of agriculture and forest development and its competitiveness. Among its mandates, those relating to water include establishing a system for the strengthening of water harvesting, diversion of water, developing groundwater resources, establishing a support and incentive system to upgrade the water utilization skills of farmers and pastoralists and ensuring its effectiveness. In addition, MoA is responsible for the implementation of programs and projects for the utilization of river basin resources, conservation of river basins and wetlands, and coordination, and it holds the implementing powers previously granted to the Ministry of Environment, Forest and Climate Change. Coordination with MILLS, MoWE and the Environmental Protection Authority (EPA) is part of the responsibility of MoA.

MoA has three main sectors, namely the crop, livestock and natural resources sectors, each led by a state minister. There is coordination between different ministries, and the MoA Climate Change Desk is responsible for coordinating climate change resilience-related activities. According to the Climate Change Desk, MoA has been delegated by the EPA to undertake climate change resilience activities as major emissions come from agriculture. There is a general belief (internally) that MoA plays a leading role in climate change activities as the bulk of emissions is agriculture related. MoA therefore conducts training and awareness raising on land degradation, and improved soil and water management. MoA also coordinates with the Ministry of Finance on Climate Resilient Green Economy (CRGE)-related financing and with UNESCO on IWRM and climate resilient water management.

In the context of climate services for small-scale producers, even though MoA might not be at the forefront of data collection and production of value added information, per its mandate, MoA is a critical stakeholder for providing inputs to the agency or mechanism that will deliver those services. The following two mandates of MoA are selected in this assessment because they require strong water and climate data and information for their effective execution.

20(n) “establish a system for the **strengthening of water harvesting, diversion of water, development of ground water resource**, utilization of water pumps activities by integrating water used for farming with rain, surface and ground water; establish a support and incentive system to **upgrade the water utilization skills of farmers and pastoralists**; ensure its effectiveness;”

20(q) “build capacity which enables **to predict the impact of natural and man-made disasters on agricultural development**; establish, in collaboration of the concerned organs, a system for mitigation of vulnerability and resilience capacity of the same, ensuring emergency relief support and food security; implement the same; coordinate rural productive safety net program;”

- **Remarks:** The effective execution of these two mandates requires water and climate data that are collected by MoWE and EMI. EMI-generated short range and seasonal weather forecasts are used to predict impacts on agriculture, which are then published as Agromet Bulletins. A technical committee that also includes experts from MoA works closely with EMI experts to translate the forecasts into potential impacts on agriculture. This activity falls within the scope of the NFCS-E. This is a very good example of institutional coordination. However, there is a lot to be done in terms of making the Agromet Bulletins more geographically focused, for which more spatially disaggregated forecasts are needed. Further, dissemination of the information to lower government levels (e.g., zonal and wereda levels) requires substantial strengthening and capacity building for effective communication and use of the information.

Ministry of Irrigation and Lowlands (MILLS)

MILLS is a newly established ministry through Proclamation No. 1263/2021 under the new government structure of Ethiopia. The ministry was established to bridge the gap that existed between water and energy infrastructure and desired agricultural productivity. Due to the importance of and needed focus on sustainable development in irrigation and lowlands to achieve food sovereignty, food security and improvement of livelihoods, irrigation as well as lowland development and governance initiatives have been elevated to a ministerial institution.

With respect to climate and water data and information, the following are the powers and duties vested in MILLS under Proclamation No. 1263/2021:

33(c) “encourage irrigation projects to be supported by innovative technologies that will enhance productivity and to **adopt mechanisms for effective use of water;**”

- **Remarks:** This mandate is included in this review because data on actual water use in irrigated agriculture is key for enhancing the effective use of water (in irrigation). It requires monitoring water withdrawals to irrigation fields, losses in irrigation systems and continuous monitoring of water use efficiency. This requires closer collaboration between MoWE and the Ministry of Agriculture.

33(j) “administer dams and water infrastructure financed by federal budget;”

- **Remarks:** This mandate, though not directly linked to water and climate data/information generation and use, needs timely data on river inflows into dams (current and forecasted), water abstractions for irrigation, water demands and water needs for other uses, such as energy generation, flood protection and ecological requirements. This, in turn, requires close coordination among MoWE, the Disaster Risk Management Commission and the Ethiopian Electric Power (EEP).⁶ Coordination with government institutions at the regional state level is equally important.

33(q) “establish irrigation development information and database management systems;”

- **Remarks:** This mandate appears to focus on information and databases on the development side of irrigation rather than the management side. Given that low water use efficiency and water productivity are key challenges to the nascent irrigation development in Ethiopia, it is important to include data on actual use, water productivity and water use efficiency in the database. MoA has developed the Irrigation Management Information System of Ethiopia (IMISSET), which could be used as a common database and tool for monitoring irrigation development and performance.

⁶ EEP is the state-owned electricity producer in Ethiopia.

Disaster Risk Management Commission

The Ethiopian Disaster Risk Management Commission is the main federal agency for disaster prevention and response coordination.

One of the duties and responsibilities of the commission⁷ is *in cooperation with domestic and foreign information sources, to monitor, forecast, and warn against disasters that could affect the agricultural sector and livelihoods of the population.*

This is further elaborated in the National Policy and Strategy on Disaster Risk Management (DRMC 2013). The policy and strategies that relate to forecasting and early warning, for which climate and water data are critical, are selected and given below:

Policy 3.2: response shall only be provided on the basis of early warning and assessments conducted during the disaster period.

Strategies:

1. Based on the disaster risk profile, area specific multi-hazard and multisectoral early warning system shall be established and strengthened.
2. A mechanism that enables sectoral early warning systems to complement each other and exchange information in a uniform and regular manner shall be established.

Institutional Gaps

There are major constraining factors that hinder adequate provisioning of climate and water data and information services in the priority area of agriculture for small-scale producers. They include fragmentation of data, lack of adequate human and institutional capacity, frequent restructuring or reform of institutions, the absence of a well-coordinated knowledge management system and the absence of clear boundaries or linkage mechanisms between federal-level institutions and those operating within the basin or sub-basin levels.

The National Framework for Climate Services of Ethiopia (NFCS-E) provides a well-laid-out governance structure for climate services. However, in practice, much remains to be done to implement this structure across sectors and at the regional, zonal and *wereda* levels. While the agencies responsible for collecting and maintaining climate and hydrological data continue to improve their service provision, there are several governance challenges related to data ownership, management and sharing. The main constraining factors include:

Fragmentation of data management functions: Data collection and management are often fragmented across different government departments and institutions. Efforts are being made to develop an integrated database by MoWE bringing together water quantity and quality data for surface water and groundwater resources. There is also a need for linking (e.g., making databases interoperable) this integrated database with other databases within the MoA and MILs (e.g., with IMISET of MoA and the irrigation database under development by MILs). Failure to address fragmentation in data management will entail duplication of efforts and, hence, wastage of scarce resources.

Data access and sharing: Limited streamlined data sharing between agencies can hinder research, policy development and disaster management efforts. Climate and water data needs are context-specific. The needs change based on the

⁷ <https://edrmc.gov.et/about-us/edrmc>

purpose, geographic location and urgency of the undertaking for which the data are needed. Therefore, deploying the right institutional mechanism supported by modern information and communication technology (e.g., cloud-based systems) would be critically important for efficient data sharing among agencies.

With the increasing importance of data in decision-making and the move towards more cloud-based systems, ensuring the security and privacy of sensitive climate and hydrological data is crucial. This includes safeguarding against data breaches and unauthorized access.

Capacity gaps: There are substantial capacity gaps among government agencies to collect, manage and analyze climate and water data effectively. Further, human and institutional capacity is limited in monitoring actual water use, employing, among others, satellite remote sensing. Most data collection efforts focus on hydrological and meteorological data. With the high priority attached by the government to enhancing the resilience of smallholder agriculture (rainfed as well as irrigated), the need to monitor actual water use in agriculture is substantial. However, there is very weak capacity to meet this need, even for the highly utilized Awash Basin.

The capacity gaps are not the same across the key government agencies relevant to this study. For instance, the Ministry of Irrigation and Lowlands (established in 2021) has some of the highest capacity development needs compared to other ministries, which have been in existence for much longer.

Funding and sustainability: Based on the observations made as part of the project, there appear to be severe budgetary constraints for modernizing the hydrological data collection networks. Adequate funding for data collection and management is essential for sustaining these efforts over the long term. Budgetary constraints are also one of the key reasons for poor maintenance of the existing monitoring network, including regular updating of rating curves for hydrological stations.

Weak inter-sector coordination: Lack of effective cross-sectoral coordination is hindering the efficient dissemination of decision-ready information and collaborative actions. There is a need for and room for improved cross-sectoral coordination to put in place efficient sharing of climate and water data, dissemination of decision-ready information, and, ultimately, to enhance joint action in the space of climate resilient water resources management.

Frequent re-structuring of ministries or agencies: The restructuring of public agencies is resulting in overlapping mandates. This dynamic introduces complexities in coordination, diminishes clarity in roles and responsibilities and may hinder the development of a streamlined and efficient cross-sectoral coordination mechanism for climate and water data management. Often, the newly formed institute or ministry has low capacity to deliver its mandate for data or tool development.

The experts examined several interlinked areas or domains, identifying and delineating a series of institutional bottlenecks that hinder the realization of a robust climate and water information system and institutions that enable climate resilience of SSP livelihoods. Based on their findings, the experts have suggested potential solutions to address the identified bottlenecks. It is worth emphasizing here that a clear understanding of and consensus on the challenges is critical because the identified challenges provide the starting point and guide the development of potential institutional options for the establishment of a national center for water and climate data and information. Whatever particular institutional options are adopted, there will always be a need to strengthen cross-sector working groups or task forces in order to ensure the timely collection, organization and dissemination of climate and water data as informed by sectoral needs.

Proposed Options

Introduction

This section presents options for strengthening institutional mechanisms for improved collection, organization, sharing and dissemination of climate and water data, and development and adoption of decision support tools. While the gaps identified in the previous section are many, the focus of this report shall be on the gaps within existing institutional setups and coordination mechanisms.

First, from a water, climate and water governance perspective, data provide insights into the state of water resources, their availability and the potential risks they face. Without reliable data, policymakers, water resource managers, and other end users would be operating in the dark, making it challenging to design and implement policies, regulations and strategies that ensure the equitable and sustainable use of water. Climate and water governance rely on accurate data to set priorities, allocate resources and monitor the impact of interventions, ultimately facilitating the alignment of water management practices with societal and environmental needs.

Second, climate and water governance are essential for the proper collection, management and dissemination of water-related data. Transparent and accountable governance structures and institutions ensure that data are collected and shared systematically, are accurate and accessible, and adhere to established standards and protocols. Effective governance frameworks also facilitate data sharing and cooperation between various stakeholders, including government agencies, research institutions and local communities. When governance mechanisms are weak or lack transparency, data may be underreported, mismanaged or unevenly distributed, which can lead to conflicts over water resources and hinder sustainable water management. Therefore, a robust governance system is fundamental to maintaining the integrity of water-related data and ensuring data availability for key stakeholders, such as small-scale farmers, water utilities and disaster management agencies.

Third, climate resilient water resources management and agricultural water management require robust coordination among sectoral institutions and stakeholders. Coordination is needed in the formulation as well as the implementation of sectoral policies, strategies and regulations.

Considerations for the Framing of Improved Institutional Mechanisms

As described in the section *Institutional Mandates*, various sectoral ministries and government agencies are key stakeholders in the collection, organization, processing, dissemination and use of climate and water data and the development and adoption of decision support tools. Proclamations, policies, strategies and working practices have already been developed and used thus far. Therefore, the existing institutional situation is the point of departure for developing options to strengthen the institutional mechanisms. The following are key considerations that informed the development of the proposed options:

1. **Leverage existing institutional setups:** To the extent feasible, build on existing arrangements and, where available, use or adopt existing good practices. *Don't reinvent the wheel.*
2. **Ownership and legitimacy:** Ensure and, overall, aim to achieve legitimacy and credibility in the process of coordination. The institutional mechanism must be accepted by those implementing it (from decision-makers to technical experts generating data).
3. **Multi-layer collaboration:** Promote institutional collaboration at multiple levels, i.e., at technical, policy and decision-making levels.

4. **Tailored responsibilities:** The collection of primary data (e.g., meteorological data, land use/cover, river discharge) is most efficiently conducted by those government agencies mandated for these duties.
5. **Collaboration:** Encourage the co-development and co-management of databases and decision support tools by sector ministries and agencies to ensure transparency and interoperability of databases and build trust.
6. **Cost-effectiveness:** Ensure institutional mechanisms are cost-effective and clearly demonstrate value for money for their sustainability.
7. **Task orientation:** Build institutional collaboration around solving key climate change related problems in the water and agriculture sector.
8. **Adaptability:** Understand that any solution is imperfect. Therefore, any option selected should be adjusted to fit the specific situation that might evolve over the period during which the option is implemented.
9. **Technological solutions:** All of the proposed options are predicated on the understanding that they will be supported by strong technological solutions to make climate and water data collection, organization and dissemination more efficient, transparent and sustainable.
10. **Policy alignment:** Ensure alignment with current policies, strategies, institutional setups and working practices and incorporate them into the proposed options for seamless integration into the current institutional setting.
11. **Enhanced stakeholder engagement:** All of the proposed options would benefit from strengthening engagement with a broader range of stakeholders, including research centers, NGOs and academia, to ensure a more inclusive approach to climate services.

Options for Improving Institutional Mechanisms

The concept of ‘institutions’ covers laws, regulations, policies, organizational structures, and, equally important, adopted norms and practices. In the context of climate and water data and information, the proposed options focus on organizational setups and operating procedures that need to be put in place to make the desired improvement. Based on the analysis conducted as part of the project, the authors do not foresee or propose, at least as an immediate step, major changes to water laws or policies.

The options, therefore, focus on improving institutional practices for collecting, organizing and disseminating climate and water data in the space of agricultural water management. Climate and water data within the scope of this report cover data on meteorology/weather, availability and quality of surface water and groundwater resources, and water use data in agriculture. Therefore, the options focus on three sector ministries, namely, the Ministry of Water and Energy, the Ministry of Agriculture and the Ministry of Irrigation and Lowlands.

The options are presented in order of increasing degree of disruptiveness to the existing institutional settings and practices. While the primary focus of the discussion is on data, it also implicitly includes in its scope decision support tools that are used to generate information (read analytics). These tools facilitate decision-making in the space of water resources management at multiple scales for minimizing vulnerability to climate change and enhancing resilience of agricultural water management practices.

Thus, we have formulated three distinct options, each carefully developed in consideration of the current institutional setting, to strengthen the mechanism for the collection, organization, processing, dissemination and use of climate and water data and the development and adoption of decision support tools. Figure 4 provides a diagrammatic presentation of the options, which are described further below.

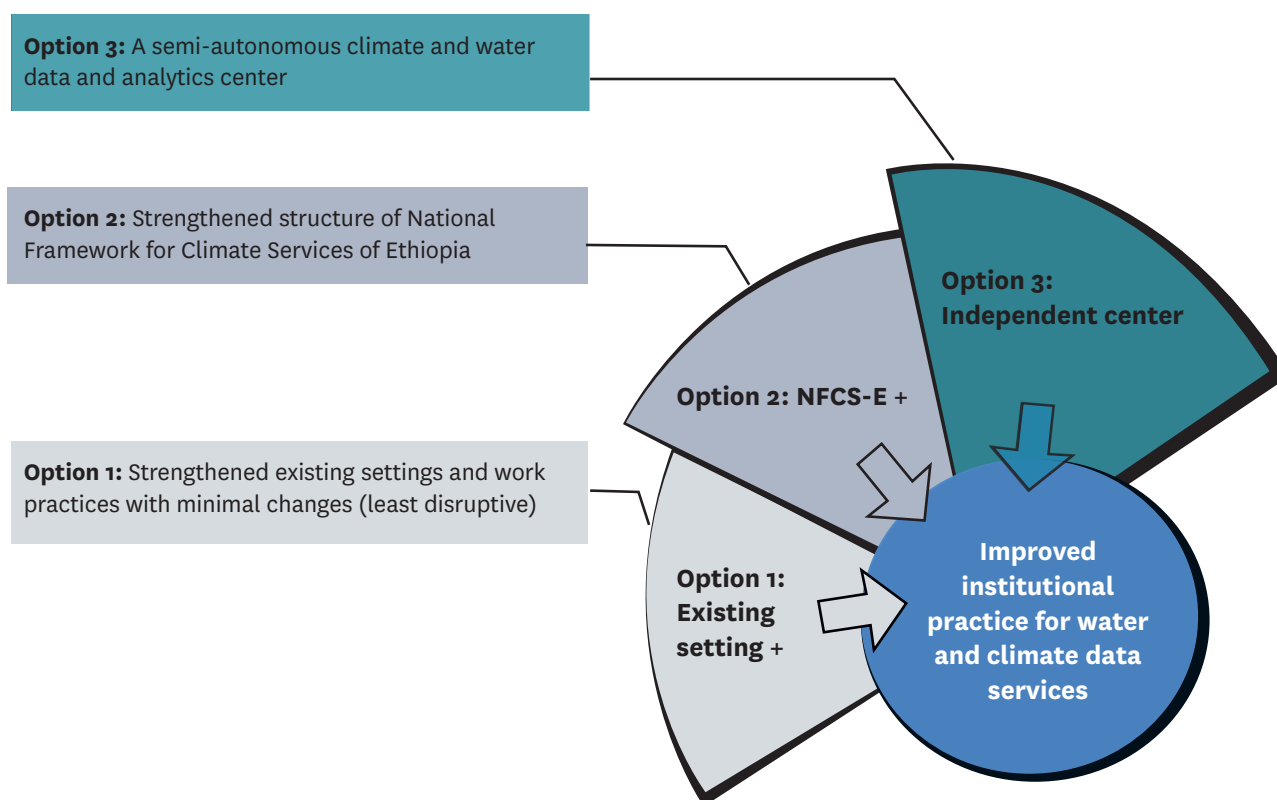


Figure 4. Overview of the three proposed options for improving institutional practices to strengthen water and climate data services and decision support tools.

Option 1 focuses on substantially strengthening existing data collection, organization and dissemination infrastructure, coupled with ad hoc coordination arrangements among the three ministries through task forces and working groups. Option 2 focuses on substantially strengthening the multi-level organizational structure and the scope of the institutional arrangements for the NFCS-E. The scope of climate services needs to be expanded to include water information services, which are underserved in the current structure. The central proposal under Option 3 is to have a dedicated multi-ministerial institution on climate and water data and analytics.

The options can be considered standalone alternatives. They can also be understood as stages in a phased implementation of the proposed transformation of the institutional settings for climate and water data and decision support services. Option 1, being the least disruptive, can be considered the first or starting point. A successful implementation of Option 1 would mean strong climate and water data monitoring networks combined with a strong ICT backbone. This sets the stage for full-scale implementation of the NFCS-E structure with an expanded scope of water information services. The NFCS-E is coordinated by EMI. In Option 3, a fully dedicated climate and water data and analytics center is proposed.

Option 1: Strengthened existing institutional setup

This option is the least disruptive of all three, with its focus being on strengthening the existing institutional setting and working practices rather than creating a new structure.

All three key ministries, i.e., MoA, MoWE and MILLS, are engaged in the collection, organization and dissemination of data needed for improving climate resilient water resources management. While MoWE, together with EMI, is primarily mandated to collect hydrometeorological data, MoA deals with water use data in agriculture, and MILLS has an initiative to develop an irrigation database for Ethiopia. Data on actual water use in agriculture are the least collected and, hence, not available for irrigated systems or rainfed areas. Due to weak implementation capacity and a lack of finances, river discharge gauging stations are in poor condition. Due to the absence of water use data, it is virtually impossible to

estimate the performance of irrigation systems in terms of water use efficiency and water productivity. Such data are also directly needed for monitoring food production in the irrigation subsector. Further, the databases that exist in these three ministries are not interconnected. The institutional coordination mechanism for data and tools among the three ministries is weak. In simple terms, substantial effort will have to be expended to first strengthen the basic infrastructure for the collection, organization and utilization of climate and water data. In addition, there is a need to create a mechanism for the three ministries to seamlessly integrate their databases (e.g., interoperable databases) and develop a data sharing platform.

Therefore, this option comprises four elements described as follows:

- **Improved basic data collection, organization and dissemination infrastructure:** The improvements encompass rehabilitating and strengthening field data collection networks, substantially building the capacity for leveraging Earth observation (satellite remote sensing) and building an ICT infrastructure backbone that will be cloud-based with interoperable databases.
- **Build capacity of and incentivize personnel involved in data collection, processing and dissemination:** There are indications that a lack of capacity and incentives is adversely affecting climate and water data services. Therefore, even for the least disruptive option to be successful, there is a strong need and justification for building the capacity of personnel. Incentive mechanisms need to be designed and implemented at multiple administrative layers to ensure well-motivated staff – from observers to data analysts – manage the business of climate and water data in the three ministries.
- **Implement issue-based working groups:** One of the key gaps in the existing practice is a lack of coordination. While a well-connected ICT infrastructure backbone (first point mentioned above) can make databases interoperable and make data sharing smooth, this cannot be fully utilized without a well-functioning coordination mechanism. It is proposed to strengthen issue-based working groups and task forces, such as the Agricultural Water Management Task Force, to streamline data sharing, promote joint action and ensure decisions are made with the best available data.
- **Establish an integrated data sharing platform based on integrated technology:** Develop and implement a comprehensive data sharing protocol, supported by agreements, rules and regulations, to facilitate collaboration among the ministries, institutes and other public agencies. This protocol should define the terms, standards and mechanisms for sharing climate and water data among the ministries and beyond. Establish clear rules for data accessibility, confidentiality and usage, ensuring compliance with existing policies and regulations. Regular consultations can be made and joint working groups can be instituted to review and enhance the collaborative framework, fostering effective data sharing and joint decision-making without necessitating a centralized platform.

Option 2: Enhanced National Framework for Climate Services of Ethiopia (NFCS-E)

A second option would be to build upon the implementation structure of the current National Framework for Climate Services of Ethiopia (NFCS-E), launched in 2018.

The NFCS-E strategic plan has the ambition to ‘deliver reliable climate services customized to different groups of users and build the capacity of climate institutions, thereby contributing to the effectiveness of the Climate Resilient Green Economy (CRGE) strategy and other overarching development plans of the nation’ (NMA 2021). This entails the delivery of climate services in key climate sectors encompassing water and energy, agriculture, health, disaster risk management and environmental protection.

As per the NFCS-E strategic plan, it is evident that the delivery of effective and sustained climate services in key climate-sensitive sectors requires coordinated actions among climate institutions engaged in various sectors and possessing a wealth of experience and expertise. Therefore, joint implementation of the NFCS-E requires a coordination guideline that provides clear direction on institutional arrangements, sets of principles and procedures, responsibilities and accountability mechanisms that enable climate institutions to work towards a common end. To that end, the NFCS-E has already developed steering structures at the national, regional and zonal levels. For illustrative purposes, the national structure is depicted in Figure 5.

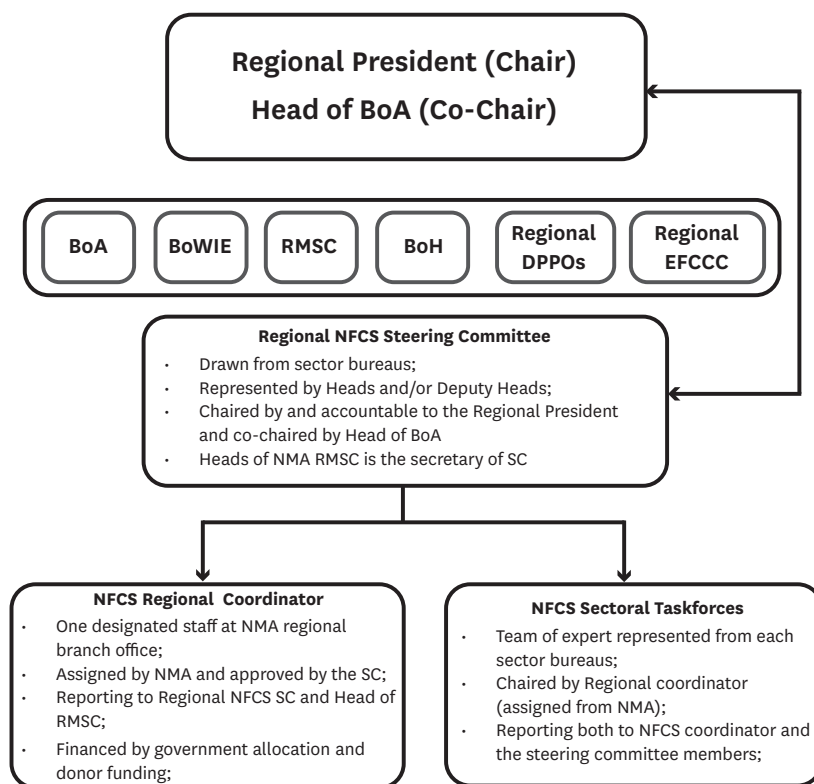


Figure 5. Organizational structure of the National Framework for Climate Services of Ethiopia.

Source: NMA 2021.

Notes: BoA - Bureau of Agriculture; BoWIE - Bureau of Water, Irrigation and Energy; RMSC - Regional Meteorological Services Center; BoH - Bureau of Health; DPPO - Disaster Prevention and Preparedness Office; EFCCC - Environment Forest and Climate Change Commission; NFCS - National Framework for Climate Services; NMA - National Meteorological Agency; SC - Steering Committee

Major suggested improvement areas for the existing structure are:

- Expanding and strengthening the scope for water information services
- Strengthening the implementation capacities at subnational levels (regional state, zonal and *wereda* levels). This will be a major undertaking requiring substantial resources.
- Improving basic data collection, organization and dissemination infrastructure as in Option 1
- Strengthening the task forces that are already part of the organizational structure of the NFCS-E. In addition, finding ways for the existing task forces in the ministries to be part of the NFCS-E

Option 3: Independent Climate and Water Data and Analytics Center

Option 3 involves the establishment of an independent Climate and Water Data and Analytics Center, dedicated to the comprehensive management, analysis and dissemination of climate and water data. It builds on and takes some of the elements of Options 1 and 2. The major distinguishing element of Option 3 is that it proposes a *multi-ministerial joint institutional setup*, referred to herein as the Climate and Water Data and Analytics Center. The primary duty of this center is to transform the way climate and water information services are developed and mainstreamed into key government decision-making for climate resilience.

As in Options 1 and 2, the mandates for the collection, organization and dissemination of climate and water data remain as per the current setup. However, instead of somewhat ad hoc coordination working groups or task forces as in Option 1 or EMI as the coordinating unit of the NFCS-E structure, Option 3 proposes an autonomous multi-ministerial center. The center will manage the ICT infrastructure backbone, which will have a distributed architecture in which individual databases residing at MoWE, MoA and MILLS are interconnected.

The institutional home for this center is open to negotiated agreement. Possible candidates are MoWE, the Ministry of Planning and Development or the Prime Minister's Office.

The advantages of such a center are many. Among others, the center makes possible:

- seamless integration of databases and systems across different government agencies, avoiding duplication of efforts,
- unified knowledge services provided across sectors,
- much more efficient data sharing and integration into decision-making, and
- a much more cost-effective solution as it minimizes duplication of efforts.

The center could also:

- **serve as an innovation hub:** by bringing together experts from various ministries and agencies, the center could serve as an innovation hub, fostering the development and implementation of new technologies and methods in climate and water data analysis and beyond. Given emerging Artificial Intelligence and technology development, the center could support the government in adapting and staying updated on emerging technologies, changing requirements and evolving best practices in climate and water management;
- **enhance public engagement:** due to its focused outreach programs, the center could actively engage with the public, raising awareness about climate issues and encouraging community involvement in sustainable water resources management; and
- **promote international collaboration:** the center could serve as a focal point for international collaboration which would allow for the exchange of knowledge and data.

Conclusion

Three institutional options have been proposed to transform climate and water decision support services in the space of climate resilient water resources management at multiple scales. The options are proposed to serve as inputs for subsequent consultations with key stakeholders.

Option 1 is the least disruptive of current setups, with most of the proposed efforts focusing on improving the data collection, organization and dissemination infrastructure. This makes Option 1 relatively easy to adopt and implement. However, due to the ad hoc nature of the coordination mechanism it involves, coordination among the relevant government agencies may not be as effective as in Options 2 and 3.

Option 2 builds on key elements of Option 1 to widen the scope and strengthen the existing NFCS-E. It builds on the strong foundation of the NFCS-E. In this regard, if implemented timely and comprehensively, it can result in significant improvements in water and climate information services at an affordable cost and in a reasonably short time. However, integration of water information services into the current NFCS-E may not be as simple as it sounds because the NFCS-E structure is a copy of the global structure for climate services by WMO and its member states. Further, implementation of the structure at sub-national levels can entail a considerable cost.

Option 3 requires fundamental changes to existing institutional settings, requires significant effort to get buy-in from key stakeholders and requires substantial resources to implement. This option can result in a transformation of the current practice in the provision of water and climate data and information services. It could overhaul the entire coordination mechanism and open the door for water and climate data and information services that are streamlined with water management decisions in the country. Implementation of this option, however, requires consensus among the key government agencies, which requires substantial negotiations.

These options are expected to be further discussed and refined with key stakeholders. Once the preferred option has been agreed upon by key government agencies, details of the preferred option need to be developed that shall form the basis for the improved institutional landscape for enhanced climate and water data and information services.

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Annex 1

List of organizations/programs and officials consulted

Name	Organization
H.E. Ato Asfaw Dingamo, State Minister WASH Sector	Ministry of Water and Energy (Water Management, WASH and Energy Sectors)
H.E. Dr. Abraha Adugna, State Minister, WRM Sector	
Ato Abiy Girma, OWNPN	
Ato Gossaye Mengiste, Senior Advisor	
Ato Teketel Tadesse	
Ato Shiferaw Demissie	
Ato Kaleab Getahun, Ex Staff	
Ato Zewdu Teferra	
Ms Semunesh Gola	
Belayneh Yirdaw	
Ato Wubishet Abas	Ministry of Planning
Ato Elias Awol	Ministry of Agriculture (RED-FS Coordination and AWM TF)
Ato Dejene Abesha	
Ato Addis Negash	
Ato Solomon Cherie	Ministry of Irrigation and Lowlands
Ato Mohammed Andoshe	Ethiopian Environmental Protection Authority
Dr. Gete Zeleke	Land & Water Research Center (Kunzila Integrated Landscape Management and WASH Project)
Dr. Tena Alamirew	
Ato Seyoum	International Fund for Agricultural Development (IFAD)
Dr. Abdulkarim Seid	International Water Management Institute (IWMI)
Dr. Amare Haile Sellasie	
Ato Dagmawi Melaku	
Ato Fekadu	Farm Africa
Ato Habtamu Y.	Water Aid Ethiopia
Ms. Tsigereda Abraham	
Ato Abate Getachew	Ethiopian Meteorology Institute
Dr. Muluken Alemu	Consultant
Dr. Hizkyas Dufera	Senior Advisor to the Minister of Irrigation and Lowlands, Ethiopia
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