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GBON National Contribution Plan of Ethiopia

Systematic Observations Financing Facility

Weather and climate data for resilience

GBON National Contribution Plan
Ethiopia

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Module 1. National Target toward GBON compliance

To comply with the GBON standard density requirement, results of Ethiopia's GBON Gap Analysis showed the need to improve 16 surface stations and two surface upper-air stations, as well as install 13 new surface stations and three new upper-air (radiosonde) stations (Table 1). Figure 1 shows the proposed sites for these stations.

Table1. GBON National Contribution Target

Type of station	Baseline (Results of the GBON National Gap Analysis)				GBON National Contribution Target	
	Target (# of stations)[1]	GBON-compliant stations (#)	Gap		To improve	New
			New	To improve		
Surface	29	0	13	16	16	13
Upper air	5	0	3	2	2	3
Marine	*When applicable					

Map of existing and proposed surface and upper-air stations

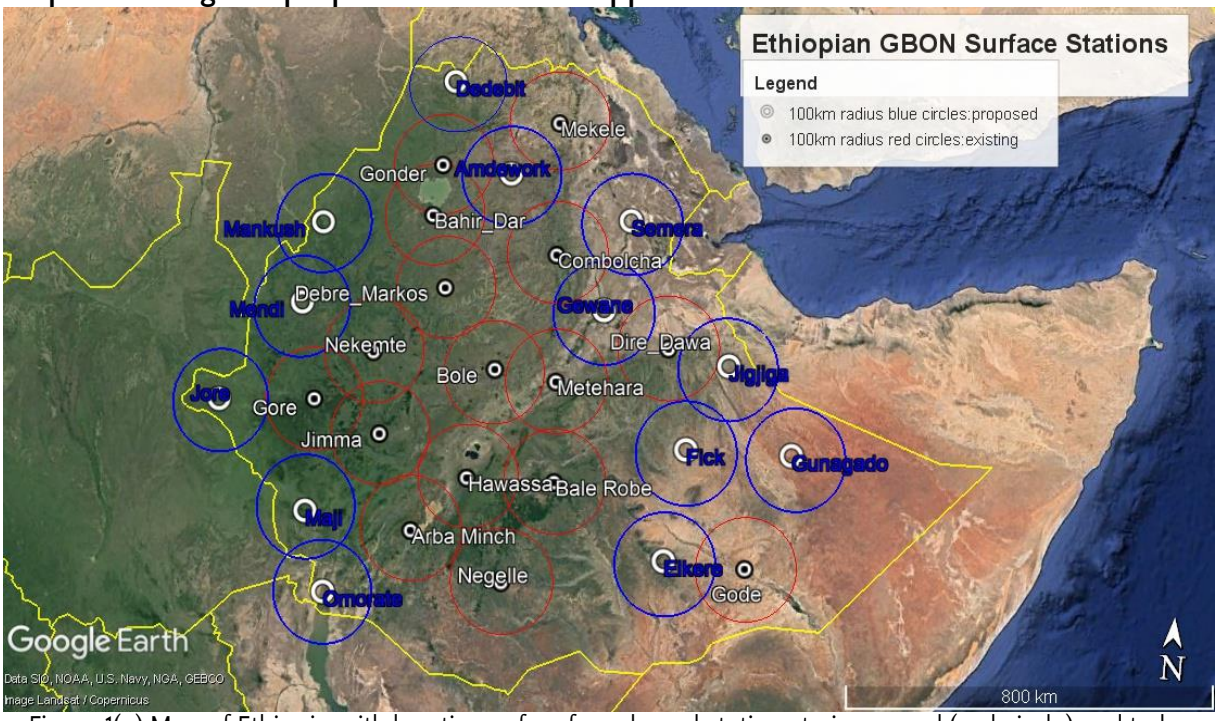


Figure 1(a) Map of Ethiopia with locations of surface-based stations to improved (red circle) and to be newly installed (blue circle)

[1] For SIDS, for the WMO GBON Global Gap Analysis in June 2023, the EEZ area has been added to the total surface area which is the basis for the target number of stations. The standard density requirements for SIDS have been calculated with 500 km for surface stations and 1000 km for upper-air stations.

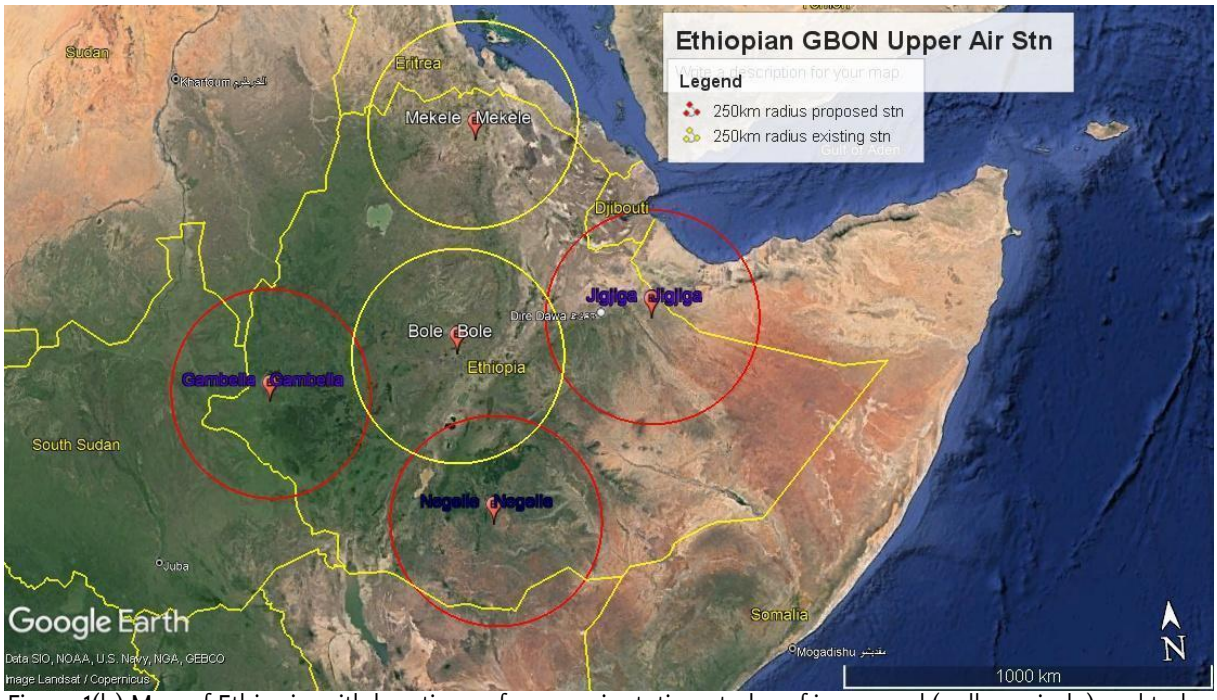


Figure 1(b) Map of Ethiopia with locations of upper air stations to be of improved (yellow circle) and to be newly installed (red circle)

Table 2: Ethiopia's National Contribution Target toward GBON compliance

Requirements	SOFF progressive threshold	National target toward GBON compliance and timeline	Vision for long-term target toward full GBON compliance
Horizontal resolution			
Surface-based	29 stations	60% of stations by 2025	100% of stations by 2026
Upper air	5 stations	60 of stations by 2025	100% of stations by 2026
Reporting cycle			
Surface-based	80% of monthly reports exchanged	60% of monthly reports exchanged by 2026	80% of monthly reports exchanged
Upper air	80% of monthly reports exchanged	60% of monthly reports exchanged by 2026	80% of monthly reports exchanged
EMI envisions 3 years as a target to achieve SOFF's minimum progress towards GBON compliance. Procurement process is expected to be the longest, however based on experience, all surface AWS can be installed in one-budget year upon acquisition. Upper air stations can be a challenge and may be installed by Vaisala, however one year is also deemed sufficient. Upon installation 60% data and after a year 80% data could be available for GBON. **Note:** The national contribution targets towards GBON are based on November 2023 investment plan approval.			

Module 2. GBON Business Model and Institutional Development

2.1. Assessment of national governmental and private organizations of relevance for the operation and maintenance of GBON

The Ethiopian government (Ethiopian Meteorological Institute (EMI)) fully owns and operates/maintains its observational network. Individual/commercial entities can install stations with permissions from EMI. They also have to report/share data to EMI's data archive. Their data should be for their own consumption and not for sharing. These entities are not allowed to give any sort of climate service based on the data from their stations, but the data can be used for their own research. Existing government stakeholders with engagement with EMI include: -

- Ministry of Water and Energy (MoWE)
- Ministry of Agriculture (MoA)
- Ministry of Irrigation and Lowlands (MILL)
- Ministry of Health (MoH)
- Ethiopian Public Health Institute
- Environmental Protection Authority (EPA)
- Ethiopian Disaster Risk Management Commission (EDRMC)
- Ethio-telecom
- Ethiopian Civil Aviation Authority (ECAA)
- Ministry of Education (MoE)
- Ethiopia Agricultural Institute (EAI)
- Agricultural Transformation Institute (ATI)
- Ethiopian Airlines (EAL)
- Ministry of Defense
- Ministry of Education/Universities
- Regional government entities like agriculture, water, health, environment, and disaster

It should however also be noted that these government and private entities with their own Meteorological stations such as the Ethiopian Institute of Agricultural Research, no longer collaborate with EMI to provide their observed data. A list of other organizations[2] that once operated meteorological stations in Ethiopia is provided.

EMI also has collaborations with the following private entities but not on provision meteorological observations and data services.

- UNDP
- Academia
    - Arba Minch University
    - Addis Ababa University
    - Adama Science and Technology University
    - Ethiopian Artificial Intelligence Institute
    - Space Science and geospatial Institute

(a) Existing partners and relationships.

- As part of Ethio-Finland project EMI has a 3-year extended maintenance agreement with Vaisala on the 3-Weather Radar under ongoing project.
- National Framework for Climate Services (NFCS) Partners (MoWE, MOH, MoA, MILL, EDRMC, EPA) engage continuously on climate service co-production.

[2] List of entities that once operated meteorological stations in Ethiopia.pdf

The EMI structure does not extend to the lowest administration level in the country. However, EMI has stations at places where it does not have physical offices. Government offices which are part of the NFCS do have a structure up to district (woreda level). So, to safeguard the stations EMI can work with them by entering into formal agreements (MoU) especially the MoA which can play a great role in this regard. The MoA has staff who are assigned to work at the lowest administration level. Recently EMI signed an MoU with Regional State Bureaus of NFCS Implementing partner institution, which would strengthen partnership to work closer to EMI Regional Meteorological Service Center.

(b) Potential new partners and recommendations of their roles.

- Telecommunication providers e.g. Ethio-Telecom and Safaricom- EMI to establish formal agreement (MoU/SLA) with telecommunication providers such that they can facilitate mechanisms to provide dependable communication for real time data transfer from stations to the HQ and to the WIS.
- Information Network Security Authority (INSA) - clearance services on communication devices - Formal collaboration with INSA can facilitate seamless and quick custom clearance on procured observation instruments.
- Academia - EMI has existing collaborations with academic and research institutions in Ethiopia. EMI has signed an MOU with Arba Minch University, Ethiopia Artificial Intelligence Institute, Addis Ababa University and Space Science and Geospatial Institute. These relationships must be strengthened with formal agreements and arrangements for collaboration on key areas of science and advancement of weather and climate services in Ethiopia. This can be with a focus on meteorological infrastructure and observations in Ethiopia as an essential element for successful application of weather and climate services. These collaborations can be instrumental in determining meteorological infrastructure and observations as a priority for future funding.
- Media - Media has a significant role in shaping the weather and climate policy. Meaningful partnership with media houses in Ethiopia will enable EMI to have input on how issues related to weather and climate services are framed and reported. Positive public feedback on services provided by EMI can be key for funding opportunities for EMI. Currently EMI has strong collaboration with mainstream media in communicating climate information to the public, in the form of regular weather reporting, press conferences, media briefing, interviews, etc. This has helped to build a good image of EMI in both the public and policy makers. This has to be strengthened to keep the momentum of government budget allocation to EMI.
- Electricity company in Ethiopia - The energy sector has different requirements for meteorological services in general within the last 5 years. to support decision-making in their operations and strategic planning for sustainable energy provision. Meteorological conditions affect production of energy and partnerships with these companies can be beneficial to both EMI and the electricity companies. While most of the energy production in Ethiopia is from hydropower, there are also solar, wind and geothermal sources of energy. The electricity company can thus set up observation networks managed by EMI for research and development on areas for efficiency of the wind generation and hydropower plants.
- Ethiopian Civil Aviation Authority (ECAA) - EMI received only 1 million ETB for the provision of aviation meteorology service to 4 international and 18 domestic airports in Ethiopia. This corresponds to about 0.3 % of EMI's 2023 budget which is significantly lower than the services provided. An evaluation team with representatives from EMI, Ethiopian CAA, and if possible, the Ethiopian Airlines Group should be set up to evaluate cost of EMI services to CAA, quality of the services received from EMI against the revenues EMI receives. In the end, funding allocated to EMI should be adjusted accordingly to match the full cost of the aviation services provided as stipulated Annex 3. The Ethiopian Airlines Group should also be encouraged to contribute to the cost recovery.
- Ethiopia's Infrastructure, Construction & Real Estate companies - Ethiopia has seen significant growth in the construction sector in the recent years. The industry can benefit from meteorological services both for planning of construction sites and for protection of construction workers against extreme weather events. Formal collaborations can be beneficial for EMI.
- Although there are no privately operated meteorological stations in Ethiopia, certain government departments with their own Meteorological stations collaborated with EMI to provide their observed data. Ethiopian Institute of Agricultural Research, for example, used to have around 30 manned sites. This practice is no longer practiced. Mechanism

should thus be put in place to revitalize these relationships and collaborations in order to facilitate continuous data sharing.

2.2. Assessment of potential GBON sub-regional collaboration

EMI has considered potential collaborations with neighboring countries with the aim of optimizing its observation network. Currently EMI is using the Kenya regional hubs for international data sharing. This collaboration has been essential but with the implementation of WIS2.0 EMI, as provided in the proclamation No. 201/1980 will exchange its meteorological data in accordance with international agreements to which Ethiopia is a party. EMI considered 2 OSCAR stations (Mandera and Moyale) in Kenya on the Ethiopian southern border in selecting the SOFF minimum number of station requirements for Ethiopia. In addition, sub-regional network design expansion with the SOFF initiative in Djibouti (SOFF 3rd batch). Somalia (SOFF 3rd batch), Sudan* (SOFF 3rd batch) and South Sudan (SOFF 1st batch/AU) will be very beneficial. Ethiopia is also part of regional climate organizations such as IGAD Climate Prediction and Application Center (ICPAC)[3] through which there are cross-border exchanges of data, warnings including capacity development with neighboring member countries in the region. EMI is also part of WMO's Regional Specialized Meteorological Centre (RSMC)[4]-Nairobi.

Collaborations with the WMO's Regional Instrument Center (RIC)[5] at Nairobi which was established to maintain relevant calibration standards and assist Members in calibrating their national meteorological and related environmental standards and monitoring instruments will be key for EMI.

With several countries in the region being beneficiaries of the SOFF project, sub-regional dialogues and co-ordinations should be established to facilitate best practices for procurement, network maintenance plans and human capacity development (resource optimization).

2.3. Assessment of a business model to operate and maintain the network

EMI operates on a ***government owned, government operated financial model*** **o**n the operations of its observation networks. Therefore 100 % **funding sources** come from the Ethiopian Government. Development partners including the African Development Bank and the GEF-UNDP have offered support to EMI mostly on initial investments e.g. providing AWS, spare parts, mobile calibration facilities.
The current annual expenditure for the operations of the observation networks at EMI is $ 1 059 844,76[6]

Recommendation of a different business model[7] to operate and maintain the GBON infrastructure, considering arrangements for SOFF financial support during the Compliance phase could be other than the existing model could be difficult at this stage. The EMI proclamation currently does not support privately owned station ownership and management "It's a mandate of EMI to share data internationally! The Ethiopian government (Ethiopian Meteorological Institute (EMI)) fully owns and operates/maintains its observational network". The National Metrology Institute of Ethiopia has an accredited calibration facility and helps in calibration of some of the meteorological instruments for EMI.

At present, EMI has limited to no relationships and partnership with the private sector for the design and operation of the basic observations infrastructure. Most private sector partnerships have a focus on climate service delivery.

While there is no provision for privately owned stations in Ethiopia, EMI can first work to establish sustainable relationships with the existing and potential private sector entities e.g. Telecommunication providers, media and academia etc. as recommended in 2.1 b. In general, these private entities can be sensitized on the importance of observations and service delivery improvement to the private sector because of better and sustainable observation infrastructure. Some of the private sector operators can as

[3] https://www.icpac.net/
[4] Regional Specialized Meteorological Centre (RSMC)
[5] https://community.wmo.int/en/activity-areas/imop/Regional_Instrument_Centres
[6] ጣቢያ በጀት_site budget.pdf
[7] See chapter 4 of the Operational Guidance Handbook on SOFF private sector archetypal business models

a result become new users of EMI weather products. In the end, EMI can receive support for the maintenance of its future observation systems. For EMI to maintain control over the setup, operation and data delivery as provided in EMI's proclamation, a new MoU with the private sector can be established for the sustainability of the observing system. i.e. Government-owned and privately operated networks.

EMI has developed a **financial plan**[8] with the support of peer advisors for operating the modernized infrastructure, including considerations on the total cost of ownership guided by a world bank report[9] on Charting a Course for Sustainable Hydrological and Meteorological Observation Networks in Developing Countries (Grimes et al. 2022). The estimates will be used in the investment funding request for Ethiopia.

2.4. Assessment of existing national strategies and projects related to observing networks

EMI has national strategies in place for establishing and improving its observing networks. Ethiopia's government revised meteorological station network master plan for 2021-2030 report[10] provides detailed information on EMI's plan to improve meteorological station distribution over Ethiopia. This is with the aim to provide representative, accurate and reliable climate information for various sectors and the public. In addition, the EMI's ten-year strategic development Plan[11] in place for the years 2020-2029 also provides development plans and targets relevant for the provision of meteorological data designed to represent the geography and ecology of the country. They include, but are not limited to:

1. Increase stations network coverage from the current 65% to 95% by establishing representative stations as per EMI's stations master plan; Main activities include,
    a. Establish conventional and modern stations as per EMI's stations master plan and manage them
    b. Put in place meteorological stations and meteorological data quality management system
    c. Collect and organize stations metadata
    d. Calibrate meteorological instruments
    e. Maintain or replace malfunctioning meteorological instruments

2. Increase quality controlled, representative and timely meteorological data provision services, which can be used for different socio-economic purposes, from 65% to 95%. Main activities include,
    a. Archive meteorological data collected from different kinds of stations
    b. Make efficient data provision via database system
    c. Administer and organizer EMI's database system
    d. Quality assure hard and soft copy meteorological data
    e. Process data and blend stations data with other proxy data
    f. Update EMI's map room
    g. Execute data rescue activities and make data reachable
    h. Introduce new services through research and studies
    i. Entertain data requests from the country and abroad and try to meet the country's international obligations

EMI is purely a meteorological institute and therefore does not run hydrology functions including installation of hydrology stations. However, EMI collaborates with the Ministry of Water and Energy (MoWE) and to which EMI is part of. Under the MoWE, there is a hydrology department where EMI collaborates with, in the National Framework for Climate Services Partners (NFCS) and engages continuously on specific climate service co-production and climate services delivery and in implementation of different projects. EMI and the department of hydrology have also worked together in the climate and information project under the direct guidance of UNDP. This project assisted EMI to install AWS stations and the hydrology department to install some hydrological stations.

In Ethiopia, there are currently very few planned investments and development projects of relevance for GBON. Most of the projects, as will be provided in Ethiopia's Country Hydromet Diagnostics report are

[8] Summary of cost for all cost (AWS, Upper Air and calibration).pdf

[9] Charting a Course for Sustainable Hydrological and Meteorological Observation Networks in Developing Countries

[10] Ethiopia's Station Master plan2021-2030_Final.pdf

[11] Ethiopian Meteorological Institute_10 yrs plan in Eng

relevant to climate services provision. However, below are some of current and planned investments and development projects of relevance for GBON.

- Ethio-Finland project: Improving Meteorological Observation and Forecasting Capabilities of EMI to minimize the impact of frequent Weather Hazards
    - Finland's strategic goals in Ethiopia are described in the Country Strategy and the Country Program. The latter focuses on development cooperation. In 2021–2024, Finland will focus on diversifying and deepening the relations between the two countries, supporting Ethiopia's political, social, and private sector reforms, and strengthening Ethiopian institutions. Finland's Country Strategy for Ethiopia[12]
    - As part of Ethio-Finland project EMI have a 3-year extended maintenance agreement with Vaisala on the 3-Weather Radar under the project.
    - Mechanism for project extension should be considered.
- SAREPTA project[13] from MET Norway; An Institutional Support and Capacity Building for Weather and Climate Services. For EMI the focus on capacity building is related to web site development, verification, IT infrastructure and data management, use of weather data, and observations.
    - There is a MoU between EMI and MET Norway for the period 2023-2027 with a possibility for an extension.

EMI should therefore consider other potential partnerships relevant to GBON as recommended in 2.1 b. Stakeholder engagement workshops that will maximize synergies between SOFF activities in EMI and other stakeholders including CSOs should be facilitated. This will be factored into the Investment Phase and included in the budget.

2.5. Review of the national legislation of relevance for GBON

Legislation with regards to the national responsibility for measuring and providing weather observations related to GBON in Ethiopia is provided in article 7 of the proclamation No. 201/1980[14] of the current Ethiopian Meteorological Institute and the former National Meteorological Services Agency establishment. Following article 7 of the proclamation, the institute has been given the following powers and duties necessary for the attainment of its purpose. Duties no. 1-5 directly relates to GBON implementation:

1. Establish and operate a national network of meteorological stations designed to represent various climatic regions of Ethiopia and to satisfy the needs of various national development plans and activities;
2. Collect meteorological data;
3. Exchange meteorological data in accordance with international agreements to which Ethiopia is a party;
4. Establish and operate communication systems in accordance with the law, for the collection and dissemination of meteorological data;
5. Publish and disseminate analyses and interpreted meteorological data and meteorological forecasts;
6. Give advance warnings on adverse weather conditions; disseminate advice and educational information through the mass media; and provide, upon request, meteorological services to any person;
7. Collect and centrally administer, notwithstanding the provisions of article 5 of the proclamation, any meteorological data collected by any person in the country;
8. Control air pollution and maintain the natural balance of the air in the country;
9. Permit any person to register and collect meteorological data when it deems necessary;
10. Ensure the implementation of international agreements regarding meteorology which are ratified by the government;
11. Undertake meteorological studies and research; implement fruitful results thereof;
12. Collect fees and charges for the services it renders after having them determined by the appropriate government office;
13. Represent the government in any meeting, conference or seminar concerning meteorology;
14. Enter into contract;
15. Sue and be sued in its own name; and
16. Own, possess, pledge, sell, exchange or transfer property in any other manner for the attainment of its purposes.

[12] https://um.fi/documents/35732/0/finlands-country-strategy-for-ethiopia-2021-2024.pdf
[13] https://bistand.met.no/en/Ethiopia
[14] Ethiopia Meteorological Institute proclamation 201 of 1980

Ethiopia's Climate-Resilient Green Economy (CRGE)' strategy includes the following adaptation options that are relevant for GBON implementation:

1. Shortlisted adaptation options in table 3 of the Ethiopia's CRGE Strategic document which includes: Ensuring the collection and communication of meteorological and agro-meteorological data to farmer and communities; Enhancing drought and flood warning systems, flood forecasting and drought monitoring system, proper use of climate information; risk profiling, risk screening; micro insurance and, weather index insurance.
2. Early Warning and Response has been taken as one of the major Agricultural Programs and Plans (Program to reduce disaster risk and impacts of disaster through establishment of a comprehensive disaster risk management 2.7 of the Climate Resilient Green Economy of the country has taken Climate Change and Environment as one of the cross-cutting Sectors
3. The updated Ethiopia's Determined Contribution submitted for UNFCCC, includes identified Early Warning System as part of catalyzing technology transfer (Section 7.2 of the document)
4. 8 adaptation options have been identified for implementation at all levels and across different development sectors, recognizing the considerable diversity in context and vulnerability across Ethiopia's regions and social groups. One of the adaptation options to be implemented is Improving early warning systems (Ethiopia's Climate Resilient Green Economy; National Adaptation Plan, 2019
5. Ethiopian Disaster Risk Management Council (EDRMC) released the MHEWS Roadmap[15] to close major gaps in the country's early warning system and upgrade it to a Multi-Hazard, Impact-Based Early Warning and Early Action System.

There is no specific legislation on procurement of observation networks (AWS and upper air stations) in Ethiopia, However the following general government procurement directive and custom regulations would apply: -

- All goods imported from abroad must pass through custom clearance. Tax and VAT payment is compulsory.
- To collect some goods like AWS and Upper Air System from custom offices, there is need for an approval statement from Ethiopian Telecom and Ethiopia Information Network Security Agency (INSA).
- Goods clearance should be done through government licensed transistors. EMI has one who contacts the custom transistor when goods arrive at the custom office.

Generally, the Ethiopian Custom Office has its own guide and individuals and organizations have to meet it to collect their goods. A copy of Ethiopian customs regulations can be provided on request.

There are no constraints to the implementation of GBON in Ethiopia. As provided in the proclamation No. 201/1980, EMI has the mandate to ratify exchange of meteorological data in accordance with international agreements to which Ethiopia is a party.

[15] A Roadmap for Multi-Hazard, Impact-Based Early Warning and Early Action System 2023-2030

Module 3. GBON Infrastructure Development

3.1. Design the surface and upper air observing network and observational practices

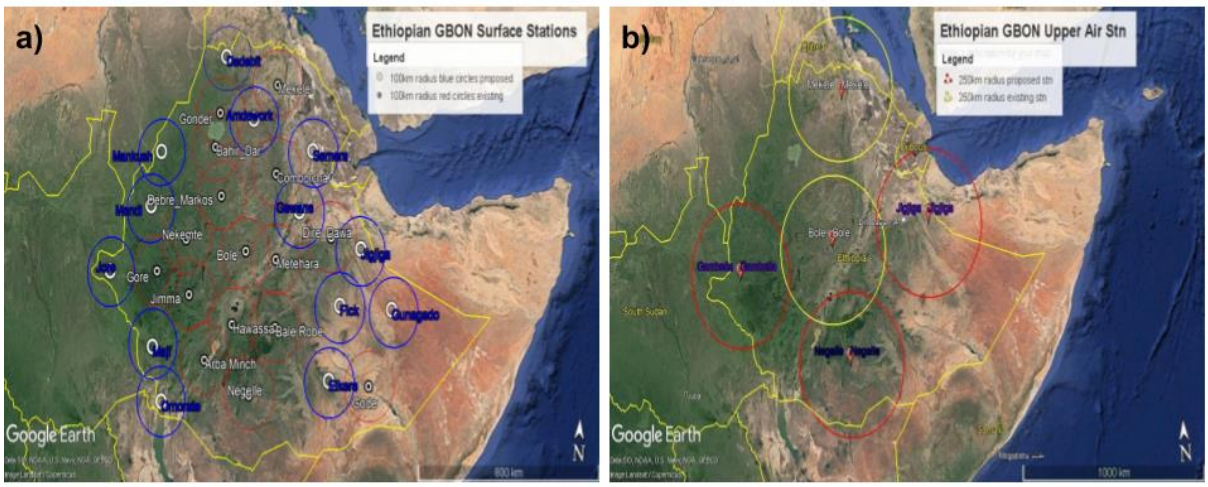


Figure 2: Map of observing network distribution in Ethiopia (a) Surface stations to improved (red circle) and to be newly installed (blue circle) and (b) upper air stations be improved (yellow circle) and to be newly installed (red circle)

The proposed design of the surface and upper air observing network and observational practices is based on the observation requirement for GBON compliance as identified in Ethiopia's GBON Gap Analysis. A list of observation instruments and systems per site[16] for the proposed GBON surface-based stations in Ethiopia is provided herein. General activities needed relevant for network design and planning in Ethiopia include:

- Calibration laboratory
- Mobile calibration unit for all sensors
- Maintenance workshop with all necessary equipment
- Upgrade of existing database system – CLIDATA
- Laptop for field purpose – configuration, maintenance, and installation
- Vehicles for field visit and station installation and management
- Desktop computers for monitoring and data processing
- Sensors
- Fencing
- Installation
- Capacity building
- ICT infrastructure (Server, WIS2box etc)
- Hydrogen/helium generator and housing

EMI in collaboration with the peer advisors have prepared a detailed summary of investments needed to install the proposed new GBON stations and the improvement of existing stations in the country. The summarized details are provided in section 2.3 and include cost for setting up calibration facilities, and for upgrading EMI database system relevant for data management and human capital development. The design, planning and budgeting of the network has considered all the costs required for each observation network. The IE will be supported by the peer advisors during the tendering process in the investment phase.

AWS stations with automatic data transmission systems will be established at the 29 GBON stations and 5 upper air stations including sending data automatically to the central server, GTS/WIS 2.0[17]. The stations should measure all GBON variables and meet the GBON requirements. Observational practices include but

[16] proposed GBON surface-based stations in Ethiopia.pdf
[17] https://docs.wis2box.wis.wmo.int/en/1.0b4/

are not limited to.

Automated Weather Stations:

- Have instruments well calibrated to report accurate data
- Real time transmission of observation (target hourly observations reporting);
- Automated data transmission for global data exchange via GTS/ WIS2Box;
- Continuous monitoring of station status and operations;
- Provide and monitor mobile network status for data communication;
- Provide and monitor LAN for servers communication and data integration;
- Fail-safe systems in place, such as power back-up to ensure systems uptime

Upper air Station;

- Real time transmission - target balloon launch 2 times a day;
- Automate data transmission for global data exchange;
- Continuous monitoring of station status and operations;
- Provide and monitor LAN for servers' communication and data integration;
- Fail-safe systems in place, such as power back-up to ensure systems uptime

The preliminary maintenance plan for existing and improved/new stations, including calibration practices will include,

- Cleaning of sensors per month
- Routine inspection, preventative and corrective maintenance one in three months
- Calibration of sensors once in a year (after EoL, and upon failure)
- Replacing sensors as per the company manual and types of sensors

The technical specification for new instruments and observing systems for the procurement process will follow the GBON Tender Specification for AWSs[18] guidelines, GBON Tender Specifications for Upper-air Stations (radiosonde)[19].Based on this, EMI in consultation with the peer advisors produced an EMI Technical Specification document for AWS, Upper Air Station, Standard Calibration including Environmental Sustainability Laboratory and ICT Infrastructure and Software's Technical Specification[20] that will be useful in the investment phase.

3.2. Design of the ICT infrastructure and services

The full data processing and transmission chain from an observing station to the national CDMS should be performed through a reliable ICT infrastructure. Skilled IT specialists for the increased data processing capabilities are thus critical to EMI and the sustainability of SOFF projects.

At present, data exchange at EMI is currently not compatible with the WIS2.0. EMI has not yet migrated to WIS 2.0 for data transmission, but still uses GTS through Nairobi RTH for international data transmission. This is also only done on their manually observed data. Urgent development is therefore necessary and should include modernization of outdated surface observation techniques and data loggers together with an automatization of data transfer from the station to the climate data storage and data services systems. A proper back-up, regular power supply and sustainable network services should be available.

A detailed description of the ICT infrastructure and services design including specifications of the data services (compatible with the requirements of WIS 2.0) have been summarized in pg.51-55 of the EMI's technical specification document (section 3.1). Technical specifications for the data collection system from the observing station to the collection point is also provided for in the document. All these components will be factored into the budgets for the investment phase. Measures to ensure resilience and continuity of the full data processing chain may include.

- Routine cleaning, preventive and corrective maintenance
- Communication with backup (GPRS and Satellite) from AWS to central station
- Power backup at upper stations

[18] GBON Tender Specifications for AWSs

[19] GBON Tender Specifications for Upper-air Stations (radiosonde).

[20] EMI Technical Specification for Automatic Weather Station, Upper Air Station, Standard Calibration Laboratory and ICT Infrastructure and Software's Technical Specification (September 2003)

- Capacity building across all value chains (train multiple staff and get commitment for a given period of time)
- Recruiting the right personnel with the right skills
- Sufficient stock of spare parts
- Build mobile calibration facilities and capacities
- Build partnerships

3.3. Design the data management system

The EMI database system, CLIDATA, has a feature that reads data stored in a specific folder in the server and exports the data into the database system. CLIDATA accepts comma separated values format. An application like SmartMet can do the work of transferring data from AWS base station to the specified folder. Once the data is in the database server the CLIDATA system can send the data to registered real time data seekers by email. This is an in-built data transfer service in CLIDATA:

The CLIDATA database management system makes use of a mix of dedicated and public network services, including public or private Internet with Transmission Control Protocol/Internet Protocol (TCP/IP), which may include encryption.
CLIDATA: -

- -Collects observations, generate products, create metadata and archive information;
- Assign user role;
- Maintain and expose a catalog of services and information;
- Authorize access to information by users;
- Deliver information to users (internal and external)
- Manage system performance

Presently, EMI has limited capability to perform structured procedures regarding data quality management to which SOFF projects can be of benefit. Organizational datasets management throughout the entire value chain including data ingestion, data quality control and assessment, storing, metadata management and data retrieval require great consideration to ensure the reliability and accuracy of observations. Short-term data processing, monitoring, storage and access through the services and protocols will depend on the capabilities and viability of the CLIDATA database system and in-house capacity.
CLIDATA system architecture and the EMI system for data quality control in place should be well understood by the relevant personnel. CLIDATA should be customized as the single endpoint for storing and retrieving observations and metadata. The database should in essence make it possible to implement quality control measures and new ways of filtering data ensuring that observational networks provide data that are suitable for climate purposes. The quality control system in place should be able to meet the needs of both the institute and external users of observational data. On data access, EMI should have in place policies that govern data access especially for international operations as required in SOFF. There needs to be a clear understanding and policies in place for the provision of EMI's data in accordance with open data principles. Guidelines on Surface Station Data Quality Control and Quality Assurance for Climate Applications (WMO-No. 1269)[21] provides recommendations when designing a monitoring system. The data quality and assurance system procured in the investment phase should be adapted to fit to the local meteorological environment and the local technical and needs. Procedures applied whether manual or automated in the entire data life cycle should be well determined with a long-term perspective.
With this regard EMI needs sufficient funding to have in-house climate data management specialists with geoscientific knowledge on observations data and data quality control and IT expertise for daily and scheduled maintenance of the database. The CDMS[22] specification provides additional information useful for the EMI data management team.

Presently data from manned synoptic stations are collected via radio or phone every three hours at the head office and manually keyed into the computer and loaded on MESSIR COMM software to be transmitted to GTS-RTH Nairobi. Once WIS is implemented and AWS installed at the 29 GBON surface and five upper air stations, the AWS's will directly send the data simultaneously to WIS and AWS base station at the head office.

Ethiopia does not get data from other national sources for operational activities. Dependence is solely on

[21] Guidelines on Surface Station Data Quality Control and Quality Assurance for Climate Applications (WMO-No. 1269)
[22] Climate Data Management System Specifications

using data collected on real time purpose every day for activities like forecast and user tailored products. Data from other WMO member countries come through the GTS.

Data delivery to the national CDMS

The CLIDATA system has been operational in EMI since 2004. The server has low capacity, and the system is old. The hard disk capacity of the server is very low (only half terabyte). The system needs an upgrade and new server. One main server and another backup server is needed for storing and effectively managing data and delivery to the national CDMS. The estimates for upgrading EMI's database is provided in the summary of cost for all cost (AWS, Upper Air and calibration) document (module 2.3)

EMI should set up within its data management system a data delivery component in such a way that delivery of its data services includes the following functions:

- Proper data discovery (both observational data and metadata)
- Data ingested should be stored in WMO format and in the right locations for long term preservation and delivery
- Data delivery and publication services should be based on open spatial standards (e.g., the Open Geospatial Consortium (OGC) , Web Map Service Interface Standard (WMS), the International Organization for Standardization (ISO) 19100 series or the Open-source Project for a Network Data Access Protocol (OPeNDAP)) - EMI data policy should take this into account

Discovery and descriptive metadata management

Stations and instruments metadata are collected partially. Up to now EMI has not implemented a well-structured metadata management system. This affects using the data confidentiality for research purposes. Metadata management is fully incorporated in the CLIDATA database system. What remains is appropriately collecting metadata information and computerizing them in compliance with GBON requirements. Two complementary types of metadata are required; Discovery metadata, used for relevant data discovery, access and retrieval. It describes who did what, where and when, how to access data and potential constraints on the data. Descriptive metadata, enables data values to be interpreted and discovered in context. This helps connect users to the data and provides important context about the data discovered.

The WIGOS Metadata standards (WMO, 2019)[23] can be used to identify conditions under which observations were made in addition to other aspects to determine whether observations are fit for purpose. The recent discovery metadata standard for the WIS2.0 platform by the "WMO Core Metadata Profile (WCMP) Version 2[24]" defines the content, structure, and encoding for the WMO Core Metadata Profile (WCMP). The standard is a profile and extension of the OGC API - Records standard[25].

Ideally, EMI should consider all WIGOS metadata standards categories as they are considered important for the documentation and interpretation of the observations made, and even for their use in future. Site metadata which includes station or platform identifiers, geographical location (lat, lon, and altitude) should be carefully revised. Photographs can be used to provide description of the observation site and its surrounding area. This can be done annually during scheduled station inspection to facilitate description of influences of cities, topography, land use and coverage on observations. In the end, EMI should have an observational metadata system that encompasses a complete history of all the GBON stations including their site/location, observation practices and instrumentation per site, calibration and inspection reports, site layout and condition, site exposure and details of all changes during a station lifetime within its database with a possibility of updating.

The CLIDATA database should be able to entail processes, software and governance arrangements that makes it possible for the discovery metadata to be captured, managed, and maintained. Ideally, EMI CLIDATA Oracle discoverer should be able to describe who did what, where and when, how to access data and potential constraints on the data (discovery metadata). Additional information on observational metadata can also be linked.

Monitoring of data, processing and services

The CLIDATA database system has the capability of managing data stored in it. The background relational database system on which CLIDATA is built on is oracle. The database system can produce inventory of missing and available data by year and month. Data processing is also incorporated in the system. From

[23] WIGOS metadata standard, (WMO-No. 1192)

[24] WMO Core Metadata Profile (WCMP) Version 2

[25] OGC API - RECORDS

observed daily and hourly data the system generates pentad, ten daily, monthly and yearly values provided the administrator defines a data processing scheme element by element in the metadata part of CLIDATA. Data stored in this database system is easily retrievable whether it is raw or processed data, Oracle discoverer module is used to extract data stored in different tables from the system. Ideally, the database should be able to monitor ingested and the derived changes in the observed (raw) data to detect and resolve potential systemic issues.

In general, EMI's data management system should be designed to be fit for purpose. Aspects related to the system redesign will be addressed in the investment phase and sufficient funding is required to enhance capabilities of the existing database system for longtime archiving and sustainable international observational data exchange. This should be allocated both for the system upgrade and especially for capacity development of personnel.

3.4. Environmental and sustainability considerations

Surface observing networks, infrastructure and operations have environmental impacts. To address these impact EMI will as much as possible in addition to the recommendations provided in EMI Technical Specification for Automatic Weather Station, Upper Air Station, Standard Calibration Laboratory and ICT Infrastructure and Software Technical Specification (September 2003) chapter on Environmental Sustainability).

- Consider the environmental accreditations of vendors and procure high quality equipment that are sustainable throughout their intended lifetime
- Procurement of open architecture solutions systems (i.e. data logger, sensors and CDMS) to improve interoperability
- Use of renewable energy (solar panels) as power supply for their observation networks
- Reduce the number of field visits and if possible, use of hybrid vehicles to reduce emissions and costs.
    - This can be facilitated by having scheduled preventive maintenance and calibration plans with reliable field equipment that reduces costly back and forth maintenance trips that could have otherwise been avoided.
        - Having scheduled preventive maintenance and calibration plans also lengthened the lifecycle of sensors.
    - Having contact personnel in remote stations with capabilities for simple maintenance check e.g. changing of batteries
    - Enhancing capacities for remote system diagnostics and alarms crucial to minimize maintenance trip. This is possible through improved telecommunication capabilities.
- EMI is already exploring possibilities for hydrogen gas production for upper air observations which is more environmentally friendly and sustainable. EMI can easily be a regional supplier.
- Increased and improved capacity of EMI staff (through training) to ensure dependency on local contractors for upper air sounding.
    - Continued focus on training and capacity building.

Module 4. GBON Human Capacity Development Module

4.1. Assessment of human capacity gaps

A summary of staff in different fields at EMI including their education levels and gender is provided in Table 3. Capacity gaps for technicians, experts, and management and recommendations on training activities and recruitment within the SOFF framework is provided in Table 4.

Table 3 Composition of staff at EMI with information on education and gender.

Ethiopian Meteorology Institute Staff numbers by profession and gender, updated in July 2023									
	Head Office			Regional Meteorological Services Centers			Overall total		
	Male	Female	Sum	Male	Female	Sum	Male	Female	Sum
Support staff	**97**	**100**	**197**	**174**	**104**	**278**	**271**	**204**	**475**
BA Degree	31	40	71	38	36	74	69	76	145
MA Degree	5	4	9	4	2	6	9	6	15
Diploma	19	23	42	22	35	57	41	58	99
12 grade and lower	42	33	75	110	31	141	152	64	216
Meteorological Science Researcher	**58**	**20**	**78**	**130**	**26**	**156**	**188**	**46**	**234**
BSc. Degree	37	19	56	119	25	144	156	44	200
MSc. Degree	20	1	21	11	1	12	31	2	33
PhD Degree	1	0	1	0	0	0	0	0	1
Meteorological Technicians	**22**	**8**	**30**	**129**	**80**	**209**	**151**	**88**	**239**
Diploma	19	6	25	71	32	103	90	38	18
Lower than 12 grade	3	2	5	58	48	106	61	50	111
Sum	**177**	**128**	**305**	**433**	**210**	**643**	**610**	**338**	**948**

Table 4: Capacity development activities for technical staff and senior management for GBON stations operations at EMI

Personnel	Task	Available at EMI	Education & Credentials	Analyzed Gaps
Network management planning specialists	Including those who work in service, incident, change and process improvement management, and life-cycle support	1	1st degree and 2nd degree in computer science	• Training on network configuration and management • CCNP certification • Manpower – need additional training personnel in network management
Field technicians (system operators or system observers)	Technical tasks of maintenance, repair, and upgrades to the meteorological system	11 including technicians in regional offices	meteorological instruments technicians trained at EMI without any formal training	• Basic electrical-electronics training on meteorological instrument and sensors • AWS training on installation, maintenance, configuration, and maintenance • Training on calibration of different meteorological instruments • Meteorological workshop management training

Personnel	Task	Available at EMI	Education & Credentials	Analyzed Gaps
				• Manpower – need additional trained meteorological instrument technicians
Operational support 24/7	From the IT service desk to log field site, communications, or server failures to ensure repairs are affected in a timely manner.	4	1st and 2nd degree in computer science	• Training on system backup and configuration • Manpower – need additional Its service desk personnel's
IT Specialists	Supporting data ingestion, QA/QC functions, storage and the flow of data and products to forecast models	5	1st degree and 2nd degree in Computer science	• Training on AWS and upper air maintenance, systems backup, and configuration • Training on system security and management • Training on application and use of WIS 2.0 and GTS • Manpower – need additional trained ICT specialist
Specialists /data scientist	analyze, interpret, and apply AWS information	Nil	1st degree and 2nd degree in Computer science and database administration	• Training on the use of database system (CLIDATA) • Training on application and use of WIS 2.0 and GTS • Training on metadata management • Training on managing AWS stations data • No database administrator
Engineers	AWS installation, configuration, maintenance, calibration, and overall management	10	Electrical and Electronics Engineers	• State of the art AWS training on installation, maintenance, configuration, calibration, and maintenance • Training on QMS on activities and services • Manpower – need additional trained Electrical-Electronics Engineers
Managers	Manage the data acquisition and station infrastructure activities. Administer and manage the whole ICT functions of the Institute. Coordinate the existing 11 Meteorological Services Centers Lead the whole activities related to stations management	14	1st and 2nd degree in Meteorological Science, Computer science, Civil Engineering	• Short term capacity building in managing stations and meteorological infrastructure. • Capacity building in ICT infrastructure management and configuration • Experience sharing with similar meteorological organization of well-established and developed nations

Personnel	Task	Available at EMI	Education & Credentials	Analyzed Gaps
	and data acquisition at the regional levels			
Senior management	Responsible for overseeing the overall data management regime at the institute, its design, implementation, and administration. throughout the organization. Responsible for the provision of strategic and operational leadership in SOFF planning and implementation. Inspect the data to day activities of data, ICT and station infrastructure offices and give direction to them in order meet the Institute's goals and objectives. Approve the annual plan of station administration, data management and ICT offices. Assign experts and managers to design, craft and implement development projects. Give direction to managers to incorporate the needs of the government in their areas of focus. Ensure in collaboration with relevant government organization and Ministry of Water and Energy the safe operation of conventional and AWS stations and the like	5	MSc in Meteorology or PhD in Meteorology and related fields	• Proper management training/ courses, including data administration and management functions. • Capacity building and training on modern database and information system and ICT technologies • Project management and implementation • Experience sharing with similar meteorological organization of well-established and developed nations. • Short course in leadership and managerial skills

4.4. Gender and Civil Society Organizations (CSOs) considerations

The government of Ethiopia has taken various measures to enhance women's empowerment to ensure gender equality. Most important, the government formulated the National Policy on Ethiopian women, with the objective of creating appropriate structures within government offices and institutions to establish equitable and gender-sensitive public policies. The 1995 Constitution assured equality between men and women and further guaranteed women affirmative actions to correct the historical legacy they experienced.

The Government of Ethiopia has also shown its commitment for women's empowerment and gender equality by integrating gender concerns in its development plans. Gender concerns have been included in all the strategies development plans. Above all, mainstreaming gender is stated as one of the shared mandates of all Ministries and Institutions which is believed to bring about accountability to gender related work.

The establishment of the Ministry of Women, Children and Youth (MoWCY) and Women's Affairs Bureaus in Regional State and Departments, in development sectors facilitates gender mainstreaming process. The personnel assigned in these structures are coordinating the effort of integrating gender in policies, strategies, projects, and other initiatives. There has been a progressive effort in mainstreaming gender. The MoWCY, currently renamed to Ministry of Women and Social Affairs (MoWSA) together with development partners is striving to bring attitudinal change and build capacity of the women's machinery at all levels to mainstream gender in policies, programs/projects, and activities. Many trainings have been organized and provided to decision makers, planners, women's affairs department heads, experts, and gender focal persons.

The proportion of the staff working in different fields at EMI has a relatively higher percentage of men (64%) than women (36%). The percentage of women increases slightly at the EMI's leadership team to 37%, but much lower in the scientific and technical positions. Ethiopian government policy encourages women participation and involvement, that is inclusive. EMI abides by the government policy.

For SOFF implementation in Ethiopia, EMI is expected to adopt the SOFF gender action plan that requires all the GBON National Contribution Plans to include gender considerations to promote gender equality and empowerment. In the Investment Phase, EMI and the implementing team are expected to have 50% participation of women in capacity building activities and 50% participation of women in consultations with CSOs. In addition to Ethiopia's government measures to enhance women empowerment, specific activities during SOFF investment activities in EMI as recommended by SOFF are provided in table 5.

Table 5: Gender considerations for SOFF activities in EMI

Activity	Indicator
Deliver capacity building activities on gender-sensitive topics in the context of SOFF operations	● Report on technical capacity building workshop at EMI on gender sensitive topics to mainstream the government strategies and development plans on gender concerns
Conduct a gender assessment analysis as part of the human capacity assessment (including areas as gender discrimination, harassment, gender balance etc.) and provide recommendations accordingly.	● Reports on the gender assessment analysis, highlighting findings and recommendation on affirmative action to bridge the gap where necessary
Organize stakeholder engagement workshops/consultations including, where possible, civil society organizations (CSOs) focused on women's empowerment	● Further stakeholders' engagement activities that involve CSOs focused on women' empowerment recommended in the National Contribution Plan o Through the SOFF project, EMI has already held a stakeholder workshop in collaboration with MET Norway. Details are provided below.

Promote gender equality by establishing minimum thresholds for female participation in SOFF-related activities	Ideally, women should represent at least ● 50 %[26] of all participants in SOFF-related and supported trainings ● 50 % of all participants in SOFF consultations, planning workshops, etc. ● 50 % of staff for operating and maintaining GBON stations ● 50 % of decision-making and project management positions where applicable EMI should set up an affirmative action plan to improve women representation from the current 36%.

Civil society organizations (CSOs) play many critical roles in promoting sustainable development. The different roles of CSOs in ensuring sustainable development are widely recognized in Ethiopia. EMI has been working with CSOs' in the formulation of the National Framework for Climate Services (NFSC). Christian Aid Ethiopia under the program Building Resilience and Adaptation to Climate Extremes and Disasters (BRACED) supported Ethiopia to do baseline study to inform development of NFCS and formulation of NFCS.

The Sustainable Development Goals (SDGs), which were adopted by the UN General Assembly in 2015, have given due recognition to the importance of enhancing global multi-stakeholders' partnerships, in general, and public-private and civil society partnerships, in particular, 'to support the achievement of the Sustainable Development Goals in all countries, in particular developing countries. Many states give similar recognition to CSOs in their national legal and policy instruments. This is also the case in Ethiopia and is recognized under the "Organizations of Civil Societies Proclamation No.1113/2019".

Though the scope and area of operation of CSO's very limited and does not cover the whole country, EMI is ready to work with CSOs in the implementation of GBON targets which should be governed by CSO's rules and regulations of the country. The CSOs may have a role to play in awareness creation of society about the use and functions of GBON surface and upper air stations.

In addition, EMI in collaboration with MET Norway held a SOFF stakeholders meeting in Adama, Ethiopia. The aim of the stakeholder workshop was to bring together relevant stakeholders and CSOs across the meteorological value chain in Ethiopia to facilitate dialogue and consultations that will maximize synergies between SOFF activities in EMI and other stakeholders. About 85 participants from different sectors in Ethiopia were present at the workshop and the report is provided.

EMI promised to promote more consultations and partnerships with CSOs. The SOFF stakeholders meeting in Adema report[27] is provided.

[26] In cases where it is not possible to meet this threshold a strong justification should be provided.

[27] Report of Consultative Meeting of Stakeholders on Systematic Observations Financing Facility

Module 5. Risk Management Framework

5.1 Assess the risks of the observing network and propose mitigation measures

Table 4: SOFF risk management framework at EMI

Operational risks	Analysis of risks	Actions for mitigating the risks	Monitor and evaluate risks following implementation of mitigation actions
Conflicts, safety, civil unrest, and political insecurity	Conflict and security problems in some parts of Ethiopia could hinder physical access to station sites. It can result in destruction of established stations and loss of data. **Risk level is high.**	Work on desk review based on prior studies, like EMI station master plan and EMI station resources. Cooperation with the private entities for the support of safeguarding if GBON stations against intrusions and possible destruction of stations and instruments.	Following up on the peace and security conditions in the country.
Inflated budget	In a country like Ethiopia in which the economic situations are not well established, prices of goods could rise and exchange rates as well. Planned budget may fail to accomplish set targets. **Risk level is high.**	Allocate contingency budget that considers the yearly inflation rate based on detailed analysis of past situations.	Follow up the use of contingency budget in case of inflation and good price rise.
City development (urban expansion) and appearance of possible station obstructions.	City administrators may plan to build public use high rise buildings near stations. This disturbs the data observation system and creates a microclimate different from when there were high rise buildings near the stations.	Create awareness to administrators. Relocating station sites. Regular update and archiving of metadata to know the effect of obstruction.	Get regular reports from meteorological observers and regional office administration.

	Risk level is high.		
Staff incompetence and turnover	Due to budget limitations and absence of training institutes in the field of meteorology; staff may lack the necessary skill to undertake specific tasks. Employees may move to other organizations in search of better salary. **Risk level is medium.**	Seek a training budget from other sources that could cover the expenses of training. Train more peoples Put in place incentive mechanisms for key staff under SOFF.	Get reports from the human resource management department.
Theft or vandalism of meteorological instruments from stations site	People may not know the purpose of establishing AWS statins and may be tempted to take them. Or if the stations are left unattended there may be an appropriate action of stealing meteorological instruments or other materials like solar panels and data loggers. This may lead to loss of data unless replacement done immediately. **Risk level is medium.**	The mitigation action following vandalism of instruments can be three-fold. 1. Create awareness to the society that details the reason why EMI establish stations and the use of the data 2. There may not be permanent staff at the station site that look after the station, in that case, work with other government institutes to attend the station on behalf of EMI. 3. Provision of local community weather and climate services.	Regular reports, meetings, and face to face engagement.,

Securing proper site for establishing new stations	Specifically in big cities where we do not have old stations, securing the required size of site may be a problem. Or getting a piece of land for establishing a station may take a long time. **Risk level is low.**	To mitigate such a risk, we need to work with heads of regional governments. A letter from the head of regional states could facilitate and make quicker securing land. Our ministry, MoWE, may help EMI to smooth out the land acquiring process.	Get reports from EMI regional offices. Get feedback from field level technicians
High turnover of new and advanced technologies	As advancement of technology an advantage that have positive consequences in achieving the desired goals but could not be handled without properly training on the use staff on the use of the new technology **Risk level is medium.**	Allocate budget. Continuous upgrading training of EMI staff on emerging technologies Undertake targeted capacity building activities. Recruitment of international consultants	Follow up on the usage of new technologies by trained experts

Module 6. Transition to SOFF investment phase

This module involves supporting the beneficiary country and the IE in preparing the Investment phase funding request based on the recommendations provided in the Plan.
Please provide any additional recommendation relevant for the translation of the National Contribution Plan into an Investment Phase Funding Request.

Summary of GBON National Contribution Plan

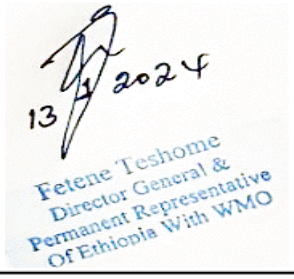
Components	Recommended activities
Module 2. GBON business model and institutional development	1.Revive past collaborations for continuous data sharing including establishing new formal agreements to maximize synergies between SOFF activities in EMI and the new partners
	2. Strengthen existing national and sub-regional collaboration
	3. Consider Government-owned and privately operated networks business model (PPP) by having formal agreements with private entities for station operations and maintenance.
	4. Explore mechanisms to ensure extension and consistency of existing few national projects related to observing networks. Explore the recommended potential partnerships relevant to GBON.
	5. There are no constraints to the implementation of GBON as EMI has the mandate to ratify exchange of meteorological data in accordance with international agreements to which Ethiopia is a party.
Module 3. GBON infrastructure development	1. The surface and upper air observing network in EMI is designed to meet GBON requirements. EMI will follow their national contribution targets towards GBON upon investment plan approval.
	2. Proper training to build capacity on modern database and information systems and ICT technologies to well interact with the proposed ICT Infrastructure and Software's system.
	3. Sufficient funding to have in-house climate data management specialists with geoscientific knowledge on climate data, data quality control and IT expertise for daily and scheduled maintenance of the proposed upgraded database system in EMI
	4.Explore the proposed recommendation on Environmental and sustainability considerations in their observing networks, infrastructure and operations plan to reduce their environmental impacts
Module 4. GBON human capacity development	1, 2, 3. The analyzed human capacity gaps in EMI should be filled. This is possible through sufficient funding both to increase manpower and capacity development through training and benchmarking programs as identified. Increasing the internal training budget including exploring other sources through regional and international collaborations to cover training expenses would be beneficial.
	4. Adopt the SOFF gender action plan by promoting women participation in EMI's SOFF activities including integrating gender concern in the institute's plan. A minimum threshold for women participation in the SOFF program should be established.

	Further engagements with CSOs will be fostered with formal agreements to maximize synergies especially those that are relevant for the operation and maintenance of GBON.
Module 5. Risk Management	Action plan for mitigating the identified operational risks will be best achieved through co-operations and collaborations.
Module 6. Transition to SOFF investment phase	

Annexes

1. List of entities that once operated meteorological stations in Ethiopia.pdf
2. Site budget.pdf
3. Summary of cost for all cost (AWS, Upper_Air and calibration).pdf
4. Ethiopia's Station Master plan2020-2030_Final.pdf
5. Ethiopian Meteorological Institute_10 yrs plan in Eng.pdf
6. Ethiopia Meteorological Institute proclamation 201 of 1980
7. Proposed GBON Surface Land Stations.pdf
8. Technical Specification for Automatic Weather Station, Upper Air Station, Standard Calibration Environmental Sustainability Laboratory and ICT Infrastructure and Software's Technical Specification.pdf
9. SOFF stakeholders meeting report.pdf

Report completion signatures

Peer Advisor signature Oslo, 12.01.2024 
Beneficiary Country signature 
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