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GBON National Contribution Plan of (*Timor-Leste*)

Systematic Observations Financing Facility

Weather and climate data for resilience

GBON National Contribution Plan
Timor-Leste

SOFF Beneficiary country focal point and institution	Mr Terencio Fernandes Moniz National Directorate of Meteorology and Geophysics, Ministry of Transports and Communications – Timor Leste (DNMG)
SOFF Peer advisor focal point and institution	Edith Rodriguez- Finnish Meteorological Institute (FMI) Nelly Florida - Indonesia Agency for Meteorology Climatology and Geophysics (BMKG)

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Abbreviations

AWOS	Automated Weather Observing System
AWS	Automatic Weather Station
BMKG	Meteorological, Climatological, and Geophysical Agency
BoM	Bureau of Meteorology of Australia
CAP	Common Alerting Protocol
CHD	Country Hydromet Diagnostics
DGTC	Directorate-General for Transport and Communications
DGAS	National Directorate for Water and Sanitation
DNMG	National Directorate of Meteorology and Geophysics
FMI	Finnish Meteorological Institute
GBON	Global Basic Observing Network
MoU	Memorandum of Understanding
NGO	Non-Governmental Organization
QA/QC	Quality Assurance/Quality Control
RIMES	Regional Integrated Multi-Hazard Early Warning System
SOFF	Systematic Observations Financing Facility
UNEP	United Nations Environment Programme
WIGOS	WMO Integrated Global Observing System
WIS	WMO Information System
WMO	World Meteorological Organization

Module 1. National Target toward GBON compliance

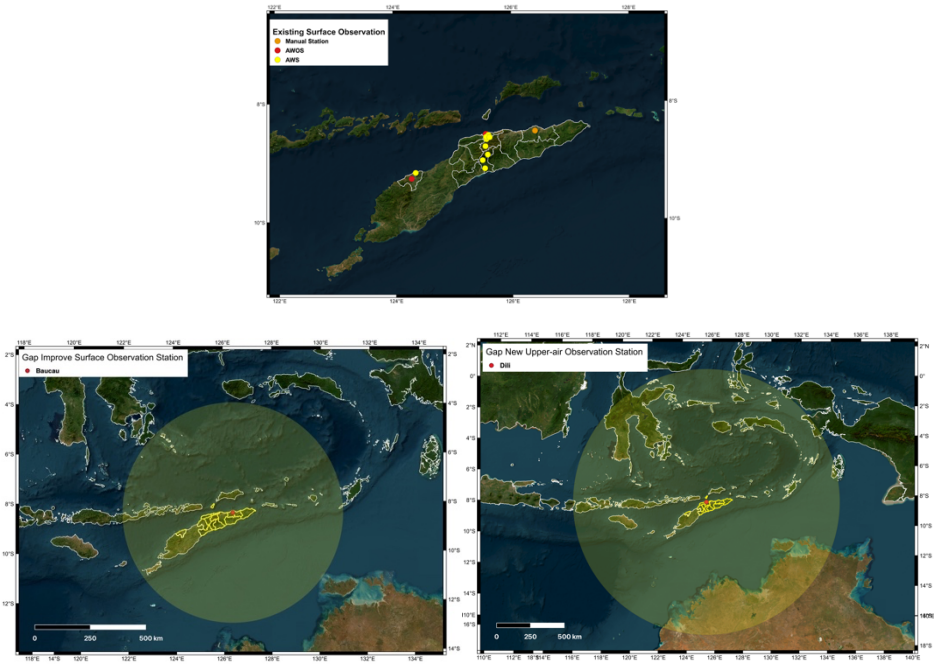
(Summarize the national target toward GBON compliance in the Table below and provide the technical details as needed)

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	1	1		1	1	
Upper-air	1	1	1			1
Marine	***when applicable**					

(Add here a map of existing and proposed surface and upper-air stations with 200km/500 (diameter) km circles (500km/1000 km for SIDS) to indicate the coverage of the stations and provide the explanation as needed [1])

Picture 1. Map of existing and proposed surface and upper-air stations



[1] For SIDS, for the WMO GBON Global Gap Analysis in January 2022, 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.

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

Timor-Leste has contributions from donors and public organizations for the meteorological observations to cover their needs, although currently, there is no maintenance for the AWS network in the country. Before planning the new observations, the National Directorate of Meteorology and Geophysics (DNMG) must be consulted to ensure that deployed sensors and methods would produce observations with sufficient quality. To secure the sustainability of the country network, anyone making meteorological observations is responsible for sharing observations with the DNMG and should support the network maintenance. DNMG supports the aviation network, but the service provisions in the country are handled by the Bureau of Meteorology (BoM) of Australia, so DNMG shared with BoM.

The Ministry of Agriculture shared the data with DNMG, but there is a need to recover or maintain the instruments under the ministry. Overall, it is recommended to Promote internal cooperation between the different institutions and proper data-sharing policies to facilitate the work of the different institutions and the network operations. The private sector needs to be more involved in the activities; it is necessary to discuss their needs and potential collaboration with DNMG. Although there is not large investment from the private sector in the country, the World Bank Group has been given financial support to the Timorese government to support private investment in tourism, agrobusiness, renewable energy. DNMG gets support from a few NGOs like the Food and Agriculture Organization (FAO) and Mercy-Corps. It is also recommended to fund the National Climate Outlook Forum after the termination of the SOFF project.

Based on discussions, it became clear that there is no real possibility of outsourcing the maintenance of AWS's (preventive and/or malfunction) or upper air sounding station within Timor-Leste. **The DMNG needs to contract and properly train two new staff members to take care of station maintenance to ensure that DNMG covers the GBON requirements.** Additionally, it is recommended that the Meteorology, Climatology, and Geophysical Agency (BMKG) of Indonesia take care of the calibration of the different sensors to ensure good quality observation and compliance with GBON. **The partnership in calibration plays a key role in supporting the aims of DNMG relative to GBON.**

For the Data management and data storage in DNMG, UNEP has an ongoing project is setting up the National Forecasting Centre at DNMG with Climate Data Information System (CDIS) and Decision Support System (DSS) servers for five key sectors (like Agriculture, Health, DRR, Water and Energy). **Even though the project includes a new expert to take care of the system, there is a need to secure the maintenance of the network by including a new expert to be responsible of the data transmission to the GBON**.

For the data processing (e.g., QC/QA) and analysis, there is a need for training the DNMG experts about the use and interpretation of the data to reach and maintain GBON compliance. **The organization is encouraged to explore partnerships to support data processing (e.g., QC/QA) and analysis.**

The public authorities that cooperate with DNMG are:

- Air Navigation Director of Air Navigation (AACTL-IP) - forecast information
- Air Navigation Director of Air Traffic Control (ANATL-IP) - forecast information
- Nacional Authority for Civil Protection (APC-IP) - forecast information
- Ministry of Agriculture and Fisheries National - Data sharing
- Ministry of Environment- National Designated Authority (NDA) - Data sharing
- Ministry of Environment- National Directorate for Climate Changue - Data sharing
- National Directorate for Water and Sanitation - Data sharing
- National Authority for Tourism/Ministry of Tourism - forecast information

Overall, the data sharing is limited and tight to a MoU agreement. There is a need to develop a data policy and to define responsibilities for the different institutions to avoid overlaping work and better use the resources.

2.2. Assessment of potential GBON sub-regional collaboration

The main topics for collaboration with the neighbouring countries were identified: 1) subregional distribution of GBON-compliant observation stations. Considering the regional needs and the current stations distribution the regional sharing data is an important input for all the countries. 2) radio sounding, and 3) calibration support from BMKG Indonesia. The existence of GBON-compliant stations in Indonesia and Australia supports the country's activities, DNMG gets support from BMKG and BoM (Bureau of Meteorology of Australia), for tropical storms forecast, but there is a need to develop capacities in the other countries in Southwest Pacific to have sufficient spatial coverage for observations in the region.

GBON will be about to facilitate the investment of the first radio-sounding system into Timor-Leste. This means that sharing experience and expertise (including benchmarking operation and maintenance practices) with like BMKG and BoM will be very important and recommended when implementing the Plan. BMKG has an operational calibration laboratory, which will serve the DNMG needs.

BMKG supports DNMG through the UNEP project, giving training in the WMO Information System (WIS) and GTS (Global Telecommunication System), which is fundamental collaboration and equal to GBON requirements.

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

DNMG Timor-Leste is a technical directorate in the Ministry of Transport and Communications of Timor-Leste, as part of the Directorate General of Transport and Communications. Currently, the institute makes an annual financial planning at the end of the year. In the yearly planning,

the DNMG must include the needed increase of budget related to new instruments maintenance or other activities. There is a need for a long-term strategic and operational plan for the DNMG and other institutions involved in hydrometeorology and climate. **To secure the GBON radio-sounding and AWS operation, the DNMG leaders must receive financial and strategic planning training.**

DNMG must coordinate with the most relevant governmental stakeholders that have activities in line with the GBON plans to avoid duplication. The DNMG cooperate with the activities related to meteorological observations, especially with the Civil Aviation Authority of Timor-Leste (AACTL), Administration of Airports and Air Navigation of Timor-Leste (ANATL).

In future, **DNMG plans to coordinate the operation and lifecycle investments of GBON radio sounding observations with AACTL and ANATL.** The organizations will be the key beneficiaries of sounding observations. This is essential for the operation's sustainability and is strongly supported by WMO (guide no. 1258[2]).

DNMG will have financial support from the Timor-Leste government to carry out GBON-compliant operations consisting of Government budget funding after the SOFF secretariat end the support. DNMG's total budget for 2023 was 400,000 USD, from which 180,000 USD are used to pay Bureau of Meteorology of Australia (BoM) the provided services for aviation, to the total cost for DNMH staff salaries is 150,000 USD. The remaining budget (70,000 USD) is what DNMG has for operation and the maintenance of the station and supplies. Additionally, the institute has an international development collaboration project and financial support from UNEP under the project "Enhancing Early Warning Systems to Build Greater Resilience to Hydrometeorological Hazards in Timor-Leste" (2021-2025)[3], which will finance, among other things, the strengthened observations, monitoring, analysis and forecasting of climate and its impacts. The project includes the implementation of the Climate Database Management Systems (CDMS). The CDIS will be a single integrated platform for easier access, quality control, and generation of derived products. It is expected that the radio-sounding and AWS data coming from the GBON investment will be included on the platform. The project has a robust capacity-building component that will also help to support the GBON activities. But SOFF must support the CDMS to the WIS 2.0 to secure the data transmission

To secure the station maintenance (including financial support for maintenance missions), DNMG must systematically include budget and project funding allocations for maintenance, replacing sensors at stations and procuring calibration services. **DNMG must develop a lifecycle plan for AWS and the radio-sounding station**. The lifecycle plan will support sufficient financing for timely maintenance.

To secure sustainability and liability on the DMNG operations, there is a need to involve the private sector in the network development by expanding the DNMG services for specific

[2] WMO guide no. 1258
[3] https://www.greenclimate.fund/sites/default/files/document/funding-proposal-fp171.pdf

products for the private sector needs. Currently Timor-Leste do not have a large investment from the private sector, the World Bank Group has been given financial support to the Timorese government to support private investment in tourism, agrobusiness, renewable energy, and it is expected that in the near future the investments start to be fruitful, and it is where DNMG must have the capacity to cooperate in those fields. **The implementation of data policy and services provision must be put in place in the short them in the country**.

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

The DNMG has no strategic plan for developing and improving the observation network. Nonetheless, the UNEP mentioned above project will enhance DNMG observational network development and strengthen the network maintenance capacity. **The SOFF programme is foreseen as an appropriate platform to continue increasing human capacity on the network maintenance in DNMG**. In the coming years, DNMG will also get new stations donated by Mercy Corps; what is needed is the establishment of the AWS network and the development of the SOPs required for the maintenance of the network and to contract new employees to take care of the work.

Currently, DNMG and the Ministry of Agriculture hold two different AWS networks, but none of them have been maintained in the past years. The lack of financial support and qualified personnel to care for the networks is the main reason for the poor conditions of the stations. There is a need for the stations renovation and to secure internal cooperation between the different institutions and proper data-sharing policies to facilitate the proper maintenance and operation of the stations. **To systematically operate and maintain all observation stations, a lifecycle plan and a tight connection to annual and long-term budgeting must be developed where the SOFF programme is foreseen as the right platform**. The lifecycle plan also supports better coordination between budget funding allocation, projects and working towards strategic goals. DNMG does not have a short-term strategic plan for develop. Part of the training requested through the SOFF program is in strategic planning for the DNMG directives to support them in the financial and strategic planning development.

2.5. Review of the national legislation of relevance for GBON

The activities and regulations of DNMG are included under the General Directorate of Transportation and Communication:

The Directorate-General for Transport and Communications, hereinafter called the DGTC, is responsible for ensuring the integrated general direction and coordination of all services **Ministry of Transport and Communications** with assignments in the areas of land and sea transport, the meteorological services and geophysics, postal services, and networks of Ministry of Transport and Communications and Government.

http://www.mtc.gov.tl/mtc/index.php/explore/organs

Within the **General Directorate of Transport and Communications** tasks, the DNMG responsibilities are defying in the following items:

b) Improve the legal and regulatory framework for land and sea transport, meteorological services, postal services and networks of communication, including the promotion and definition of technical standards and regulations in these areas.

j) Develop, in collaboration with other relevant governmental agencies, national and international information systems and meteorological monitoring, climatology and seismology, as well as ensuring the provision of public services in this area.

It is recommended to define a specific mandate for the different institutions responsible for the hydrometeorological networks in the country to facilitate the development of data policies and network responsibilities in the country, facilitating cooperation within the different institutions.

UNEP will carry out the tender and procurement process by following its processes. The customs and taxes can go up to 10%, but a tax exception is possible under the government agreements. A requisition letter from the Ministry of Transportation and communication to the Ministry of Finance is needed to start the process.

Due to the extension of the country, it is recommended to delegate all the responsibilities on the meteorological networks at DNMG and to centre the needed resources and expertise at the institute to secure the operation of the different networks. As mentioned above a data policy must be implemented to secure that all the institutions receive the needed information for their operations.

Module 3. GBON Infrastructure Development

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

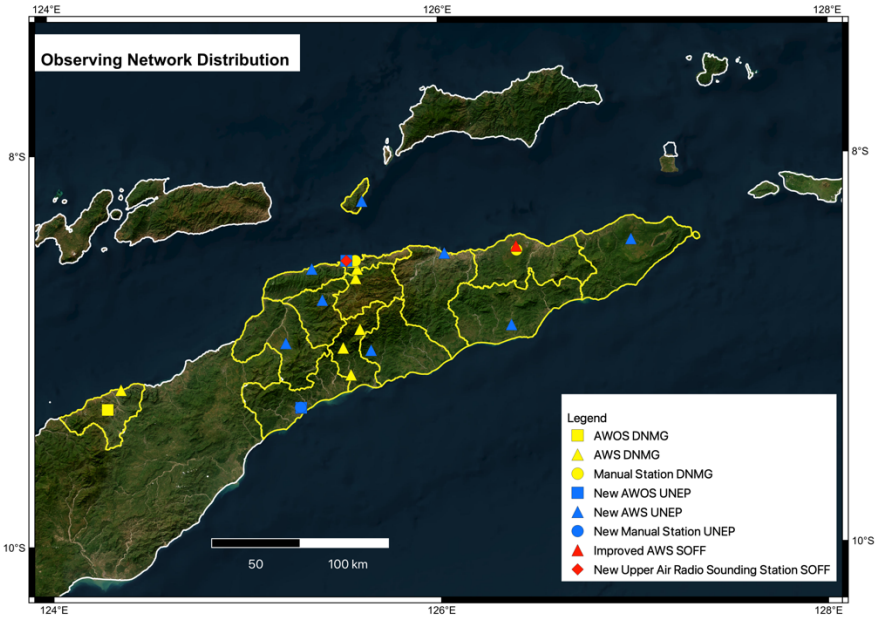
The Gap Analysis preceding the work of National Contribution Plan reviews the existing Automatic Weather Station (AWS) network (Figure. 1). The current AWS observation network includes aged components and consists of sensors and loggers from two different manufacturers.

The DNMG has preliminarily chosen Baucau as the location for upgrading AWS station and invest on new radio-sounding station for Dili. The locations of the stations included in the table 1.

table 1. Stations to be included in the SOFF program

Name	Latitude	Longiute
Bacau (AWS) (to recover)	-8.48	126.40
Dili (radio-sounding)	-8.55	125.52

FIgure 1. Map of observing network distribution and new or rehabilitated GBON stations in Timor-Leste.



Based on the Gap Analysis, the SOFF project executive team of Timor-Leste is recommending the following initial investments to become GBON compliant.

- **Renew one AWS with**
  - Temperature sensor
  - Humidity sensor
  - Atmospheric pressure sensor
  - Rain sensor

- Wind speed and direction sensor
- Data logger including solar panel.
- One spare sensor for temperature, humidity, atmospheric pressure, and wind delivered one year after the initial delivery of AWS for making periodical maintenance.
- Improvement of the access to the station involves civil work to recover the route.
- Ensuring security of the site
- Improvement of the station facilities including the electric connection to the network and telecommunications .

- **One fully automatic upper-air radiosounding station including**
    - Hydrogen generator and required shelter (ATEX requirements apply)
    - Consumable parts (balloons, sondes etc.) for the first year of operation
    - Required civil infrastructure
    - Include annual maintenance during warranty period

To supplement SOFF investment, **spare parts for 1 year maintenance of 9 AWS and 2 AWOS installed under the GCF-funded project**

- 15 spare sensors for temperature, humidity, atmospheric pressure, wind speed and direction, radiation, soil moisture and soil temperature
- 3 spare Ceilometers and Visibility Meters

The operation of AWS and radio sounding station require a robust process including preventive and corrective maintenance together with Standard Operation Procedures (SOP) that needs to be implemented for both instruments.

The Radiosounding will be a new observation system for Timor-Leste requiring training for operation and maintenance. Operating an upper-air radio sounding station during the investment phase requires annual investments on consumable parts and budget for annual maintenance, and thus, investment phase funding request must include budget for them. The beneficiary is recommended to outsource annual maintenance of radio sounding station to manufacturer.

For the calibration of the AWS is recommended to outsource the calibration to BMKG. DNMG will be responsible of the maintenance of the stations. The UNEP project already include some training for the maintenance of the stations but there is a need to implement standards operation procedures for the maintenance of the stations that must be supported by SOFF. For the radio sounding the maintenance will be responsibility of DNMG too, for that technical staff is needed as well as training for the technical staff. In addition to the already mentioned there is a need to support the operation cost of the stations that includes:

- 2 technical staff to take care of the of the work, and the needed training for the experts.
- A vehicle for the technical staff operations
- Power generator to cover the power failure in both stations.

The IE will be supported to carry out tender process by following WMO guidance (WMO no. 8[4], Report no. 136[5]) and GBON instructions for tendering AWS[6] and upper-air radiosounding station [7].

Disclaimer:

It is recommended to include the 9 AWS and 2 AWOS installed under the GCF-funded project "Enhancing Early Warning Systems to build greater resilience to hydro-meteorological hazards in Timor-Leste" for maintenance under the last year of the Investment phase and the subsequent years of the Compliance phase, as per the sustainability strategy of the GCF project. SOFF funding will be critical to ensure sustainability of these stations which are required for more accurate weather and climate forecasting in Timor-Leste due to its extreme mountainous topography. The map of these stations is provided in the Figure included in the Annexe 1. ***The sustainability strategy of the GCF project was previously discussed and agreed to by the WMO representatives during the project development stage.***

It is proposed to include the 9 AWS and 2 AWOS as an additional activity for the Investment phase. The SOFF Secretariat is expected to review and approve the needed funding for this activity within the evaluation of the investment document.

3.2. Design of the ICT infrastructure and services

In addition to automatic and/or manual meteorological observations on site and transfer, a modern, functional Data Management System (DMS) is a key element in the value chain of observation from measurement station to end user interface. The ICT infrastructure should be able to support a principle of automatic data delivery from station to international and stakeholder distribution through a database including an automatic Quality Control (QC) of observation.

Technical specifications for database: Data management system should use open-source technologies and open protocols (e.g., Open CDMS[8]) to ensure sustainable and redundant operation, maintenance, and development throughout their lifecycles and beyond. Based on communication with WMO, OpenCDMS will be fully available starting from 2025. As default, OpenCDMS will allow seamless processing of real-time and non-real time data to WIS2.0.

DMS can be built cloud-based or on premises-based depending on national legislation and regulation, staff capacity as well as a decision of the organization. DMS must meet the following criteria/specifications:

- Ability to ingest and store multiple different types of weather observation data formats. Including, but not limited to, the following:

[4] WMO no. 8
[5] Report no. 136
[6] GBON Tender especificaitons for AWSs
[7] GBON Tender Specifications for Upper-air Stations
[8] OpenCDMS

- Surface weather observations
- Upper-air radiosounding observations
- Aviation weather observations

Weather radar data have such a big volume and requires much more from storage capacity than a single point/profile data and is thus beyond the considerations of this document. Data ingestion to the data warehouse (database) should be made with a modular approach so that new data feeds may be added with minimal effort and modification to the already existing components and database structures.

For smooth data acquisition, database system must provide relevant APIs for data ingestion. Supported protocols for data transfer must include at least MSQT and SFTP, as defined in GBON specifications. An ability to receive and decode messages from 3rd party data collection systems must be provided. Additionally, a www-based tool for manual observation entry from stations must be provided.

A data quality control (QC) module should be an independent and/or modular part of the system. The QC module must be made so that it is capable of producing quality control regardless of the underlying database system. Additionally, the quality control module must be able to perform real-time quality control and should enable non-real-time manual quality control.

The database system should support queries of timeseries with adequate performance. System must be able to serve as real-time and long-term (climatological) data storage.

Modules to calculate added value parameters and use of data from the archive should be made possible. These may include aggregate parameters like daily means, minimums, and maximums.

The data management system must be made capable of offering data to a standard API for a retrieval of the database contents. The API could include the following but not limited to

- WFS
- EDR
- WMS
- Export to SYNOP & BUFR message format and delivery to GTS-network
- WIS 2.0[9] (requirement for GBON compliance)

System must be able to store relevant metadata regarding stations, station networks and observations. Automatic updates to the WMO/OSCAR -system are preferred.

The delivery of GBON hourly observations should be reported by following WMO guidance (no. 306[10]) and GBON practices[11].

[9] WIS2box
[10] WMO no 306
[11] GBON link

As part of the UNEP project DNMG will get the following infrastructure. It is expected that the data of the radio sounding station and the AWS can be included on the same data base at least for the first year's operations. SOFF supports must be included for the items that are not going to be covered by UNEP including the needed IT experts for the network operations and the needed update of the systems after the UNEP project ends. The IT experts must have the needed training to secure the network operation and to fulfil the GBON requirements. As well as the power generator and the adaptation of the room where the system is going to be implemented including the Fire Suppression System and the internet connection and the router.

IT hardware for data transfer to WIS2.0. Corresponding open access software and capacity building are requested from WMO.

- Minimum system specifications[12] for WIS2.0 IT hardware given by WMO will be acknowledged when procuring IT hardware.
- IT hardware and software for a database will come through the parallel UNEP project.
- WMO support[13] in implementing WIS2.0 for data sharing including the associated capacity building of IT staff are requested.

Budget considerations; Resilience and the continuity of the full data processing chain: Budget must consider the infrastructure needed to run a DMS and store the data. Also, a solution for a backup of essential data needs to be accounted for when making investments. A valid support contract with a hardware vendor is advisable during the lifetime of the hardware. The lifespan of such hardware may be estimated to be between 5-8 years before the need of renewal of the systems.

Resilience will be supported by two main resource factors: skilled staff and IT hardware including sufficient lifecycle plan and budget. DNMG must have the capacity for taking care of the complete data pipeline. Thus, development of ICT infrastructure for a value chain of automatic observation network is recommended to begin with building required human capacity and resources. Enough staff to ensure resilience should be tasked and trained in skills and knowledge relevant to IT in meteorological observation. The organization is recommended to gain knowledge and skills in meteorological data, data processing principles and tools, data formats (e.g., NetCDFv4 and BUFR), system architecting, software developing, database, API, network management, WIS2.0 as well as web developing. Please find further considerations on human capacity resilience in section 4.

- **UNEP project acquitions:**

Requirements/ Detailed Items		Minimum Specifications and suggested brand
Hardware		
1	Server	· 6 units of DELL R6525 o 2 x 64C/128T AMD 3rd GEN EPYC Processor o 256GB RAM

[12] WIS2.0 system specifications
[13] WIS2.0 in a box training

Requirements/ Detailed Items		Minimum Specifications and suggested brand
		o 2 TIB SSD Storage o Dual Port SFP/SFP+/QSFP Pluggable 10G/25G NIC/Smart NIC
2	Central UPS	· 2 units of Easy UPS 3S 30 kVA 400 V 3:3 UPS for external batteries · 2 units of Easy UPS 3S Empty Modular Battery Cabinet · 48 Units of 7.2 Ah battery modules
3	Workstations	· 8 Units of Dell Precision T3460 SFF o CPU: 12th Generation Intel® Core™ i7-12700, 25 MB Cache, 12 Core, 2.1 GHz to 4.9 GHz, 65W o RAM: 32GB (2x16GB) DDR5 4800MHz, SO-DIMM, Non-ECC o HDD: M.2 1TB PCIe NVMe Class 35 Solid State Drive + 3.5 inch 2TB 7200rpm Hard Disk Drive o VGA: NVIDIA Quadro T1000, 4 GB GDDR6, 4 mDP to DP adapters o NIC: LAN 10/100/1000 o Optical: 8x DVD+/-RW 9.5mm Optical Disk Drive CHASSIS: Tower o OS: Windows 11 Pro, English
4	Videowalls	· IP Cameras
5	Storage Server	· 3 units of DELL R450 o Intel Xeon 8C/16T Processor o 32GB RAM o 1 TIB SSD/HDD Storage o Dual Port SFP/SFP+/QSFP Pluggable 10G/25G NIC/Smart NIC · 2 units of DELL R450 o Intel Xeon 8C/16T Processor o 32GB RAM o 1 TIB SSD/HDD Storage o Dual Port SFP/SFP+/QSFP Pluggable 10G/25G NIC/Smart NIC · 4 units of DELL R740xd o Intel Xeon 24C/48T Processor o 2 x 1TB SSD in RAID-1 o 22 x 2.4TB HDD (NO RAID!) o - Dual Port SFP/SFP+/QSFP Pluggable 10G/25G NIC/Smart NIC
6	Protocol Data Unit (PDU)	• 8 units of APC Rack PDU 9000 Switched, ZeroU, 11.5kW, 200-240V
7	Rack	• 42U height, 19 inch width Dell netshelter
Software		
1	OS	• Ubuntu Server, Windows11, PROXMOX
2	MS Office	• 8 units of Microsoft 2021 (5 year subscription)
3	Firewall	• FortiGate-80F Hardware plus 5 Year FortiCare Premium and FortiGuard Enterprise Protection
4	Security Information and Event management (SEIM)	• ManageEngine Log360 - Basic Plan (5-year subscription)

- **SOFF request:**

Requirements/ Detailed Items		Minimum Specifications and suggested brand
Computer room adaptation		
1	Air Conditioning	· Three (3) units of MITSUBISHI MSY-GT15VF 14330
2	Electricity	· 220v 1100Wx5 500Wx8 2200Wx2
3	Internet	· 1000 Mbps Fiber
4	Router	· 1 unit of Mikrotik CCR2116-12G-4S+: 12Giga Port 10Gx4 Port SFP Router
5	Electrical cables, electrical equipment/switches etc. and other electrical and other accessories required for electrical wiring of server room	· 3 units of Electrical Wiring Cable – Copper wires · 3 units of Load Center 12 Slots SQUARE D Model Q03-100EZ12G/ SN · 3 units of Circuit breaker 3P 100A · 3 units of Surge Protection Device · 2 units of Miniature Circuit Breaker 3P 63A 6KA · 4 units of Miniature Circuit Breaker (Branch Breaker 50A) · 5 units of Miniature Circuit Breaker (Branch Breaker 20A) · 2 units of Miniature Circuit Breaker (Branch Breaker 16A) · 1 unit of IEC 01 (THW) 25 sqmm · 1 unit of IEC 01 (THW) 16 sqmm · 1 unit of VCT-G Power Cable 2x10 sqmm · 1 unit of EMT Conduit, Flexible Conduit
6	Generator set (for power backup/redundancy)	· *Power requirement assessment of all equipment in the data center/server room need to be conducted*
7	Storage Server WIS 2.0 node	(Similar description than in the UNEP acquistions)
Hardware protection		
8	Fire Suppression System	· FM 200 o Cylinder & valve o Cylinder Strap o 24V DC Electric Solenoid- only EA-45 listed w/UL- Not ASCO o Nozzle (pre-engineered), sidewall or central o 2- Battery1- Photoelectric Detector, 24 VDC w/ Base o Ionic Detector, 24 VDC w/ Base Combination Horn/Strobe, 24 VDC o Strobe Ceiling Mount o Modular Frame o Pre-engineered Piping/Fittings o Chemical formula: CF3;CHFCF3 o Molecular weight: 170.03 o Boiling point @ 1 atm: -16.4°C (2.6°F) o Critical Density: 621 kg/m^3 (38.76 lb/ft^3)^3 o Critical temperature: 101.7°C (215.1°F) o Critical Density: 621 kg/m^3 (38.76 lb/ft^3)
Human Resources		
9	IT staff	1 personnel with working experience on Windows, Linux, network, hardware, driver
10	System admin	1 personnel with working experience on Windows, Linux, MySQL, python/php

Requirements/ Detailed Items		Minimum Specifications and suggested brand
11	Programmer	1 personnel with working experience on front-end (html/js/Angular/jquery/React etc.) and back end (Linux, python/php/js/html, database) programming

3.3. Environmental and sustainability considerations

The key suggest factor for sustainable investment, and day-to-day operation of GBON stations relay on highly competent and motivated management and staff in the organization. Further system specific considerations include at least:

Upper-air sounding station: The GBON compliant sounding system (despite of being fully or semi-automatic) is recommended to be located at a site where permanent staff works on a daily basis. This will decrease unnecessary travelling and burdening financial implications when the sounding station requires an attention of staff. Such regular attention will include e.g., filling the system with sondes. The tender process should emphasize quality criteria related to composability in material selection where applicable.

The investment in sounding system is made for 20-30 years, and thus, care must be taken to ensure that annual maintenance is ensured throughout its lifecycle. This has high financial cost implication for the operation, especially in the case of fully automatic sounding systems.

Generation of hydrogen, needed by balloon, locally at the station will make the operation more environmentally sustainable and independent from importing gas by the 3rd party.

AWS: The GBON compliant weather station is recommended to replace an existing AWS with civil infrastructure (e.g., electricity, wind mast etc.) that is reusable. With scheduled preventive maintenance and calibration, the lifecycle of sensors will be lengthened as long as appropriate.

Scheduled preventive maintenance and calibration routines require, as a rule of thumb, about 1.3 times more sensors than there are stations, during the time life of the equipment, the sensor calibration will be made every 2 years. As an example, for 100 stations with temperature sensor, the organization is recommended to own 130 temperature sensors, when 30 of them are in storage or under calibration procedure. In the case of GBON compliance in Timor-Leste, only one surface weather station will be invested in, and thus, each sensor must accompany a spare sensor in initial investment to ensure a sustainable operation of station. Frequency for preventive maintenance may rarefied based on the scientific experience and statistics gained through calibration.

Use of solar panels support environmental sustainability through an availability of renewable energy.

Module 4. GBON Human Capacity Development Module

The key indicators for SOFF implementation phase

- Enhanced competence-building process in DNMG (**supported by peer adviser**)
- Benchmarked and developed an observation process of upper-air sounding (**supported by peer adviser**)
- Benchmarked good practices on archiving, transfer, and QC/QA, and subsequent SOPs, as well as a roadmap for QC/QA methods, developed (**supported by peer adviser**)
- Training given on upper-air system (basic level) and surface weather station (advanced/supplementing) operation and maintenance are needed since it will be new measurement techniques for the organisation. (**Vendor, supported by peer adviser**)
- Basic programming skills enhanced throughout the value chain of observation (**outsourced by IE**)
- Benchmarked mature project and portfolio management and coordination culture (**supported by peer adviser**)
- Organised high and end-user-level engagement events to support SOFF implantation and operation in Timor-Leste (**supporter by peer adviser**)
- Organised gender workshop together with relevant stakeholders (**supported by peer adviser**)

General

A successful and sustainable human capacity building of an organisation depends on three main components:

1) the individual him/herself
2) the organisation
3) The availability of training opportunities

Learning is a self-driven process. This means that every staff member is responsible for his/her own learning results when participating in training events or doing self-studying through online courses and other material. Motivation, attitude, in-advance preparedness, understanding of the benefit of learning new skills, and undistracted and concentrated participation in training events are key to gaining sufficient and sustainable learning results. Acting as a trainer by him/herself further strengthens the staff member's capacity.

Longevity and stability of contracts will help to ensure motivation of staff as well as ensure that there is no high turnover rate of staff (one of the problems with DNMG currently is short contracts with staff).

The organisational culture and support from management ensure the competence of staff members and their possibilities for sustainable learning results and, further, facilitate the operation and development of the organisation through enhanced human capacity. The organisation must determine the necessary competence of staff in each task, as well as it must

ensure that the staff is competent in appropriate education, training, and exercise. The organisation should also have and develop an internal competence development process to support the main service provision process of the quality management system. Special emphasis is recommended for guiding new staff members into their duties with the appropriate evaluation methods of required skills. Additionally, the management must ensure that staff members can participate in training events without the requirement to carry out daily duties or any other distractions.

The availability of training opportunities depends on the internal competence development process, annual development planning of individuals, and access to training outside the organisation (e.g., through national and international partnership and development collaboration). The organisation must ensure equal access to training events regardless of gender, age, or position.

The following capacity development needs and proposed activities will target both technical staff who operate and maintain the observing network and senior management who implements the Plan.

4.1. Assessment of human capacity gaps

DNMG has in total 42 persons working at the institute. From where 28 are male (66,7%) and 14 are female (33,3%). In the lead role of the institute, there are 5 men and 2 women. DNMG employees are distributed as follows:

- 7 Meteorologists: 1 person with MSc (Atmospheric Science), and 1 person with a degree in meteorology, who is due to retire soon.
- 5 Weather Forecasters: degrees in Physics, Science, Accounting, and Information.
- 4 climate staff: Telecommunications and Information degrees.
- 3 in IT Section with a degree in Information Technology (2 of them paid by UNEP GCF FP-171 project)
- 8 meteorological observers
- 3 Technical staff for instruments calibration and maintenance (Paid by UNEP GCF FP-171 project)
- The remaining staff are in administration and finance.

All staff members have the needed background training and education. The gap in capacity is in specific job/task-related areas: the installation and maintenance of observation networks. Similarly, a capacity gap exists in data transfer, handling, and quality assurance and quality control of the data. There is a new staff starting, and DNMG was contracted through the UNEP GCF Project FP-171 project on a temporary contract, so specific training is needed as well to secure the continuity of the experts.
DNMG does not have a gender policy, but based on the discussion, the institute has equal job opportunities for females and males. One must, however, remember that getting children often requires strengthened attention from the mother at home. In Timor-Leste, the support for

caring for the children comes from the relatives. This fact can lessen the job opportunities for females.

4.2. Design capacity development activities for technical staff

DNMG needs to have competence building to handle the Quality Management System. The UNEP GCF Project FP-171 project will be implemented the system in the coming year, and there needs to be more experts to manage it. **The recruitment of new experts and training is recommended to be enhanced in the framework of SOFF (easy fix). The DNMG is strongly recommended to develop and enhance competence building process by following guidance by WMO (no. 1205)**. Additionally, the current competence-building process lacks a systematic internal training programme, and unfortunately, almost all training depends on external funding, projects, and trainers. The agenda for the internal training programme will be determined through developing competence criteria. Material for training programmes can be developed, e.g., based on material shared in international capacity-building projects. WMO (no 1114) guides internal trainers.
Recommendations on training activities within the SOFF framework to support work towards gaining minimum competence relative to WMO guiding no. 1083 . The training needs were identified during the Gap Analysis.

- **Quality management system (QMS)**: Effective and continuously developing QMS is a basis for the systematic operation and maintenance of observation network(s). The organisation has a strong understanding and knowledge of QMS, as well as well-trained staff for internal auditing. Effective development of the observation process, including lifecycle planning, however, requires support through benchmarking mature sub-processes for upper air sounding and surface weather stations in other organisations. The DNMG is recommended to develop surface station and upper air sounding SOPs.
- **Data archiving:** The programming skills of staff members must be strengthened to support strong and effective data archiving. Additionally, DNMG is recommended to benchmark other organisations with mature data archiving systems and tools to learn best practices.
- **Data transfer:** Programmers need training on the automatization of data transfer from stations to the database and, subsequently, to WMO WIS2.0, which will replace the GTS system. Training to manage and update information in OSCAR surface service is needed.
- **Data quality control and assurance:** Basic programming skills and scientific understanding must be upgraded sufficiently to apply QC/QA methods and algorithms. The relevant staff members need capacity building to manage the scientific background behind different QC/QA methods. Benchmarking QC/QA methods in other organisations would substantially benefit the DNMG.
- **Instrument and station maintenance at the site:** Sufficient technical training for maintaining different sensor types is needed, and the technical staff would benefit from good quality SOPs and competence requirement criteria. Both the SOPs and owning required competence support self-confidence at any work. Training on upper-air system operation and maintenance is needed since it will be a new measurement technique for the organisation.
- **Calibration and maintenance at the workshop:** The responsibility for calibrating meteorological observation sensors will be outsourced to BMKG. Due to the number of stations that will be supported and DNMG capacities, it is recommended to use the well-established calibration facilities that BMKG has the calibration cost for the 5 years will be

29.364 UD. After 5 years the capacities must be revised to define the need of building a calibration laboratory at DNMG.

- **Network monitoring and ICT system operations:** There is a need for new staff members responsible for ICT (e.g., programming skills and technical understanding) to ensure the 24/7 automatic operation of the data pipeline from station to international distribution.

The new staff members needed to ensure GBON compliance operation of investments to be covered by the SOFF programme support is:

IT staff	1 personnel with working experience on Windows, Linux, network, hardware, driver
System admin	1 personnel with working experience on Windows, Linux, MySQL, python/php
Programmer	1 personnel with working experience on front-end (html/js/Angular/jquery/React etc.) and back end (Linux, python/php/js/html, database) programming
IT experts with degree in Information Technology	The 2 experts currently paid by the UNEP GCF FP-171 project needs to be paid by the SOFF project after the project ends.
Technical staff	2 experts to maintain the AWS network and the new radio sounding station.

The needed trainig needed to ensure the GBON compliance operation of investment to be covered by SOFF is:

Capacity building in AWS maintenance
Capacity building in radio sounding operation and maintenance
Capacity building in all the IT
Financial management (master level)
Strategy Planning and Management (master level)

4.3. Design capacity development activities for senior management

Based on discussions, the DNMG would benefit from having at least 2 staff members of the managerial level trained in financial management coordination and strategic planning, it must include the DNMG director general and at least one of the lead roles of the different units, and at least one of the must be women to keep the equality; it will help the institute to develop a portfolio and strategic Plan in line with the ministry and government strategy. The organisation is recommended to consider training through at least the following:

- International development collaboration
- Benchmarking organisations with mature project and portfolio management and coordination culture
- By certifying key staff members with an internationally recognised certificate.

- Workshops in the international arena

4.4. Gender and CSOs considerations

Climate change and extreme weather events are not gender neutral, but they affect women, girls, men, and boys differently[14]. This is due to socioeconomic circumstances, cultural beliefs or traditions that can all contribute to inequality, resulting in women being put in situations of disadvantage when disasters strike. Therefore, it is important that in the pre-disaster context, those who likely will be the most affected by crisis, are also included in the preparedness process[15]. This includes having equal access on political, social, and economic levels as well as being able to participate in decision making. Not only is it fair, that population is equally engaged in climate change adaptation and resilience building, but there is also substantial evidence that shows that women are often the most resilient members of society and the powerful agents of change in the event of a disaster. They also have historic coping mechanisms that can be of use when designing and tailoring local grass-root level early warning systems or other climate change adaptation services and activities. To include women in designing hydrometeorological and climate services directly leads to saving lives and livelihoods, as the needs of different groups have been better identified.

The rational for organisations to pursue gender equality in governance, strategy, programmes, and decision making, is highlighted in WMO's recently updated Gender Action Plan[16]. It emphasizes that organizations that respect and value gender equality and diversity attract and retain talented staff and improve overall organizational performance, have more satisfied employees, are more innovative and have better governance. Teams that have gender diversity have better decision-making processes and attract more external partnerships, as well as have better access to local communities. Encouraging women to take up leadership positions has also shown to lead to important achievements in the field of climate change adaptation and disaster preparedness.

In Timor-Leste gender balance is considered in the country's Strategic Development Plan 2011-2030 within the process of developing policies that focus on social inclusion in our education system. Programs such as school grants and the school feeding program are being implemented to ensure children are not excluded from education based on their economic status. The education system also needs to improve gender equity, which is a particular problem at the tertiary level.

Timorese laws' development includes customary laws recognised within Timor-Leste's legal system, laws on children's rights and laws on mediation and arbitration, among others. In preparing a comprehensive set of laws for our nation, it will be necessary to ensure that:

- Laws adopted take adequate account of the Timorese context
- Gender issues are considered
- Simple and readily understandable language is used
- All laws are translated and published in Tetun and Portuguese

[14] UNDP, 2017, Gender adaptation and disaster risk reduction

[15] Disaster Recovery Guidance Series, 2018, Gender Equality and Women's Empowerment in Disaster Recovery

[16] WMO Gender Action Plan

- Tetun legal terminology is adopted
- A body of national legal advisors, capable of performing legal drafting functions and able to gradually replace their international colleagues, is developed.

The principles of non-discrimination, sensitivity to gender issues and the protection of vulnerable groups and human rights will be guaranteed in the justice sector in the long term.

Employment targets: In particular, the growth in the services sector is expected to create considerable employment opportunities for women. As economies develop, the services sector tends to expand. Timor-Leste will be a gender-fair society where human dignity and women's rights are valued, protected and promoted by our laws and culture. Although there are efforts to work on the gender gap, widespread stunting among children reflects a persistent difference and the low access to health and nutrition-related information and services for women and girls, particularly on reproductive health and nutrition, as well as counselling for gender-based violence is still a persistent issue.

The DNMG does not have a gender policy or measures for gender non-discrimination. According to the discussions with division managers responsible for hiring employees, new staff members are hired based on their competence, not based on gender. The institute has a gender balance of 66,7% male and 33,3%. Nonetheless, as part of the UNEP GCF Project FP-171, a Gender Assessment and Action Plan has been proposed that insolvents the DNMG, to increase gender parity at the institute. The document is included in annexe 2

Gender balance and non-discrimination

Considerations on gender balance and women empowerment are inspired by the WMO Gender Action Plan. The beneficiary is recommended to take the following immediate steps.

- The management of beneficiaries to gain basic training on gender balance and measures on non-discrimination during the SOFF implementation.
- Conduction of gender analysis with the support of human resources.
- A preparation of gender policy together with measures for non-discrimination for the organisation.

Recommendations:
In addition to the previously recommended Gender Policy, **a gender assessment should be conducted as part of the human capacity assessment.** This could be included as part of a Gender Workshop. It is also recommended that the following gender quota as recommended by WMO is implemented at MMS:

- Women should represent at least 50 % of all participants in SOFF-related and supported trainings
- Women should represent at least 50 % of all participants in SOFF consultations, planning workshops, etc.
- Women should represent at least 50 % of staff for operating and maintaining GBON stations
- Women should represent at least 50 % of decision-making and project management positions where applicable

The following actions from the WMO Gender Action Plan[17], have been selected as recommendations to include in the Gender Policy and to be discussed during the gender workshops:

- Increase the participation of women by: (i) identifying and nominating female experts from DMNG or other national institutions to participate in the work of WMO governance bodies and their working structures and (ii) seeking equality in the composition of delegations to sessions (1.1.1(c) in WMO Gender Action Plan).
- Strive for gender balance, including in management and working structures (1.1.2(c) in WMO Gender Action Plan).
- Encourage and support female networks of experts (1.1.3(c) in WMO Gender Action Plan).
- Designate DMNG gender equality focal points (1.3.4(c) in WMO Gender Action Plan).
- Develop monitoring mechanisms at the national level by (i) adapting the WMO gender monitoring indicators or (ii) using an existing national framework (2.4.1 in WMO Gender Action Plan).
- Include gender equality (including the WMO Policy, GAP, link to online trainings and gender webpage, information on key activities) in the induction of new PRs and DMNG staff (3.1.4(c) in WMO Gender Action Plan)
- Develop the capacity of NMHS staff on unconscious bias, inclusive leadership, gender mainstreaming, and gender responsive service delivery through trainings and workshops (3.1.5(c) in WMO Gender Action Plan)
- Offer internships to young professionals, especially female, and secondments of staff from meteorological services on a rotational basis. (3.4.2(c) in WMO Gender Action Plan)
- Engage with international organizations field offices, such as UN Women, UNDP, etc. (5.1.4 (c) in WMO Gender Action Plan)
- Conduct research and provide the Secretariat with case studies, stories and examples of gender mainstreaming, including in service provision, for the development of a compendium of good practices (5.3.3(c) in WMO Gender Action Plan).
- Develop and disseminate communication materials (i) highlighting the role of women in meteorology, hydrology and climatology, (ii) promoting female role models, and (iii) advocating for gender responsive weather, hydrological and climate services (5.1.3(c) in WMO Gender Action Plan).

- (i) Customize weather and climate services to the particular needs and roles of women and men and (ii) Provide education and training to target female users in accessing and using weather and climate information and products (7.3.1(c) in WMO Gender Action Plan).

During SOFF investment phase strong recommendation is to promote 50% of women participating in the capacity building activities and 50% of women participating in consultations with civil society organizations. It must be noted that 50% women participation is not feasible in training events for IT staff or management. Specific gender balance related activities during the SOFF investment phase will include the following:

Activity	Indicator

Conduct two gender workshops to assess gaps in gender balance and gender opportunities (including gender discrimination, harassment) and provide recommendations accordingly.	Outline of the gender assessment with recommendations for actions in DNMG
Organize stakeholder engagement workshops/consultations including, where possible, civil society organizations (CSOs) promoting gender equality by establishing minimum threshold for female participation	Stakeholders' engagement activities that involve CSOs with 50% female and male participants invited
Promote gender equality by establishing minimum thresholds for female participation in SOFF-related training events	Women should represent at least 20 % of all participants in SOFF-related and supported training events.

Active participation of CSOs

To include CSO engagement during and after the SOFF implementation phase will bring mutual benefit and grounds for sustainable operation. The following actions are recommended to ensure that CSO's are regularly consulted during the entire length of the programme cycle:

- Conduct stakeholder engagement workshops on the implementation of the SOFF project deliverables (observational data exchange to support weather/climate and water services and products), bringing together key stakeholders and CSOs, to involve and collaborate with the DNMG and the SOFF project team from the early onset, as well as ensure the stakeholders are consulted on operations and maintenance.
- Organise awareness-raising activities for the community by engaging the Red Crescent, i.a. to prevent vandalism.
- Organise high level dialogues on benefits, co-production, and ownership of the new national GBON infrastructure.
- Organize stakeholder engagement workshops/consultations including, where possible, local civil society organizations (CSOs) focused on women's empowerment
- Ensure that 50% of the DNMG staff and stakeholders participating in consultations with civil society organizations are women.

Module 5. Risk Management Framework

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

General

Currently, DNMG does not have any risk matrixes for AWS and ICT operation or maintenance. As recommended by WMO no. 1100[20], DNMG must work on getting an ISO9001:2015 certified Quality Management System and risk matrixes for AWS and ICT operation and maintenance. The matrix must include risks related to 3rd party operators and their role in the value chain of observation. Risk management should be developed to include all the instruments of observation that the organisation and country have.

Recommendations for risk management during SOFF investment implementation and operation period

As stated in the SOFF Operations Manual[17], the risk mitigation procedures of the IE will be relied upon for SOFF implementation during the Investment phase. The Operational phase is supported by the risk mitigation procedures of the beneficiary.

The following summarises critical risks for the investment and operation phase to be carefully considered and handled by IE, beneficiary, and peer adviser.

Potential key risks for investment and operation during SOFF implementation	Mitigation measures and responsibilities	Monitoring and evaluation
Investment phase		
There needs to be more technical specifications of items and other quality criteria in the tender process. Price should be one criterion for choosing a vendor.	Seamless collaboration between IE (responsible for the tender process), peer adviser (responsible for technical sensor specification), beneficiary (responsible for supporting in setting up quality requirements and technical specifications to best support the needs in the country)	IE (on request with support from a beneficiary and peer adviser) will monitor and evaluate the quality of documents before opening the tender process.
Failure in tax exemption when importing goods	Before shipment, IE will ensure that the shipper and freight agent know the tax exemption process in the Timor-Leste border before shipment. The beneficiary is responsible for providing all required documentation, information,	IE will follow up on the shipment process until it has been tax-exempted in the Timorese customs.

[17] SOFF operations manual

	and support for the tax exemption declaration process.	
Operation phase		
Decrease in funding support for operations	Sufficient lifecycle planning and subsequent annual budget planning combining different funding sources (SOFF, budget, UNDP support, cost-recovery)	IE and the management of DNMG are responsible for monitoring and taking required corrective actions.
Increase of the service cost operation of the stations.	The Depreciation cost must be included in the investment planning of SOFF	The management of the beneficiary organisation, together with DNMG, is responsible for monitoring and evaluation.
Decrease of the government support within the changes of governments	DNMG is responsible for keeping visibility of the activities to the government to secure their support	DNMG is responsible for monitoring and evaluation
Insufficient staff competence. Difficulties to take on the needed new personnel responsible for the maintenance and the IT systems.	DNMG is responsible for hiring new personnel; fair and stable working conditions must be offered to avoid brain drain. The DMNG should develop an internal training programme including the criteria of competence requirements for technical staff. In future, a duplication of skilled staff members for critical tasks must be planned.	The management of the beneficiary organisation, together with DNMG, is responsible for monitoring and evaluation.
Delays in the acquisition process of the ICT infrastructure and the management observation system through the UNEP GCF Early Warning Project.	As the responsible institution for the project, the UNEP will keep updates on the project procurement progress and take the needed actions to secure the minimum delay in the process.	The management of beneficiary organisation
The management of observation and data processes is insufficient.	Frequent follow on how strategic goals and annual targets have been achieved.	The beneficiary management is responsible for reviewing and monitoring that work has been conducted as

		intended, according to QMS.
Extreme Natural hazards are affecting the stations' operations.	DNMG will be responsible for keeping the stations operational—installation of the lightning rod. During the tropical cyclones, all the systems will be down.	DNMG is responsible for monitoring and evaluation

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

Provide summary of GBON National Contribution Plan by filling this table

Components	Recommended activities
Module 2. GBON business model and institutional development	The business model of DNMG relies on the public sector and donors. The organization must develop a middle long-term strategic and financial plan that involves the private sector and consider their needs to guarantee to cover the full chain of GBON compliance.
	The Financial support for DNMG comes from the Timorese government, and the UNEP GCF FP-171 project that covers technical support. The DNMG subcontract the aviation services to MoB.
	The existing AWS in Timor-Leste has not been maintained or calibrated in the past ten years. There is a need to allocate human resources and financial support for the station operations.
	Overall,there is a need to allocate a systematically justified budget and project funding allocations for maintenance, replacing sensors at stations and procuring calibration services, the DNMG must develop a lifecycle plan for AWS and radiosounding stations. The lifecycle plan will support sufficient financing for timely maintenance.
Module 3. GBON infrastructure development	Despite the investment in the ongoing UNEP project on ICT infrastructure and management system, to guarantee the GBON compliant observation infrastructure and subsequent data pipeline, it is recommended to build and develop by following WMO guidance, good practices, operation process and SOP in the beneficiary organization, as well as by benchmarking equivalent operations in other organizations. There is also a need to increase the number of staff at the institute to ensure the operations.
	As mentioned in the disclaimer in section 3, the inclusion of the weather stations under the GCF-funded project to be maintenaned under the last year of the Investment phase and the subsequent years. SOFF funding will be critical to ensure sustainability of these stations which are required for more accurate weather and climate forecasting in Timor-Leste. It is proposed to include the 9 AWS and 2 AWOS as an additional activity for the Investment phase. The SOFF Secretariat is expected to review and approve the needed funding for this activity within the evaluation of the investment document.
Module 4. GBON human capacity development	The gap in capacity of DNMG staff is in specific job/task related areas includes the installation, maintenance, and calibration of observation networks. In a similar way, a capacity gap exists in data transfer, handling, and quality control. The number of experts responsible for this activities is limitated and do not have the needed tools and knowloge to do the their work. The temporality on the contract agrements make difficult to aboid the experts braindrain.
	The main gap in human capacity development includes immature competence building process in DNMG. The enhancement of the competence building process is recommended as an urgent and very

<table>
<tr><td></td><td>first task which is supported with specialized training described in the Annex for the module.</td></tr>
<tr><td></td><td>Training in strategic planning and financial magment is also a gap at DNMG. Support for the DNMG leaders to have training is advaice, it can come from a comprenhensive plan benchmarked from a sister organization or/and certificate training international recognized.</td></tr>
<tr><td></td><td>SOFF support request Personnel:
<table><tr><td>IT staff</td><td>1 personnel with working experience on Windows, Linux, network, hardware, driver</td></tr><tr><td>System admin</td><td>1 personnel with working experience on Windows, Linux, MySQL, python/php</td></tr><tr><td>Programmer</td><td>1 personnel with working experience on front-end (html/js/Angular/jquery/React etc.) and back end (Linux, python/php/js/html, database) programming</td></tr><tr><td>IT experts with degree in Information Technology</td><td>The 2 experts currently paid by the UNEP GCF FP-171 project needs to be paid by the SOFF project after the project ends.</td></tr><tr><td>Thecnical staff</td><td>2 experts to maintain the AWS network and the new radio sounding station.</td></tr></table>
Soff request Training:
<table><tr><td>Capacity building in AWS manteinance</td></tr><tr><td>Capacity building in radio sounding operarion and manteinance</td></tr><tr><td>Capacity building in all the IT</td></tr><tr><td>Financial management</td></tr><tr><td>Strategy Planning and Managment</td></tr></table></td></tr>
<tr><td>Module 5.
Risk Management</td><td>Currently, DNMG does not have any risk matrixes for AWS and ICT operation or maintenance. As recommended by WMO no. 1100[20], DNMG must work on getting an ISO9001:2015 certified Quality Management System and risk matrixes for AWS and ICT operation and maintenance. The main key risks and their mitigation measures relevant to SOFF implementation and operation phases are given.</td></tr>
<tr><td>Module 6.
Transition to SOFF investment phase</td><td>The transition to SOFF investment phase is recommended to carry out by following the Gap Analysis (approved by SOFF secretariat) and National Contribution plan (present document).

The peer adviser, IE and beneficiary will together fill in funding request for SOFF implementation phase. This supports the best coordination in the transition phase.</td></tr>
</table>

Annexes 1

Figure 1. Map of the stations to be installed under the GCF-funded project

Report completion signatures

Peer Advisor signature 
Beneficiary Country signature 
WMO Technical Authority signature