Malawi

SOFF Investment Phase Funding Request

Version 5.0

21 May 2024

Systematic Observations Financing Facility

Weather and climate data for resilience

SOFF Investment Phase Funding Request

The SOFF Investment Funding Request template includes the following sections:

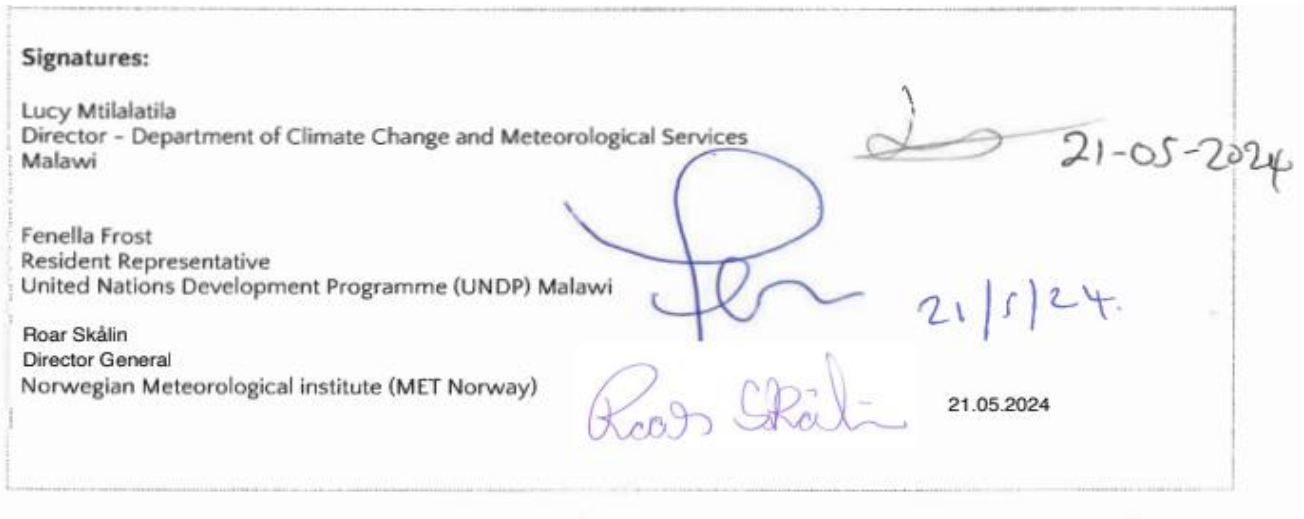
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The **GBON Gap Analysis**, the **GBON National Contribution Plan** and **Country Hydromet Diagnostic** are included in **Annex 1, 2, 3**. **The Terms of References of the advisory services provided by the SOFF peer advisor are provided in Annex 4.**

1. Basic Information

SOFF Beneficiary Country and Focal Point	Malawi Dr. Lucy M. Mtilatila, Director- Department of Climate Change and Meteorological Services, PR to WMO email: lmtilatila@metmalawi.gov.mw phone +265882266579			
Country classification	☒ LDC	☐ SIDS	☐ FCS	☒ ODA-recipient
SOFF Implementing Entity and Focal Point	United Nations Development Programme - Malawi Challa Getachew, Deputy Resident Representative email: challa.getachew@undp.org phone +265999960113			
SOFF Peer Advisor and Focal Point	Norwegian Meteorological institute (MET Norway) Teferi Demissie, email: teferidd@met.no, phone 004745069493			
Total Budget (USD)	Total budget for this Funding Request: **US$ 3,841,163 (plus PA fees)** First tranche: **$ 2,336,880 (70 %)** Second tranche: **$ 1,001,520 (30 %)** *(tranches exclude peer advisors fee)*			
Delivery timeframe	01-09-2024 to 01-02-2029			
Date of Steering Committee Approval	Planned for 19th June 2024			

SOFF Steering Committee Co-Chairs Signature (signature confirms Steering Committee approval of the funding request)



2. SOFF Programming Criteria

Alignment with the SOFF Programming Criteria *This section should be based on the SOFF Readiness Phase outputs, i.e. the National GBON Gap Analysis and GBON National Contribution Plan, and the Country Hydromet Diagnostic where available.*

Close the most significant data gaps

The WMO Global GBON Gap analysis conducted in September 2023, to the Department of Climate Change and Meteorological Services (DCCMS) in Malawi established the need for 4 GBON Surface land stations and 1 upper air to close the GBON Compliant observation gaps in Malawi. (see Annex 1)

Type of station	Baseline (Results of the GBON National Gap Analysis)				GBON National Contribution Target	
	Target (# of stations)	GBON-compliant stations (#)	Gap		To improve	New
			New	To improve		
Surface	3	10[1]	0	4	4	0
Upper-air	1	0	1	0	0	1

The GBON surface and upper-air observing network design is based on the WIGOS network design principles and envisages to provide the best horizontal well distributed network across Malawi that is GBON compliant. Due to Malawi's elongated geographical shape, four stations instead of three suggested as baseline targets are required to achieve the 200 km GBON standard horizontal resolution requirement. In addition, the stations will represent Malawi's main regions, the Northern Region (Mzuzu), the Central Region (Lilongwe), and the Southern Region (Blantyre). The new fourth station Bilira EPA has been selected to represent the South Eastern part of Lake Malawi and it is an easy fix (cf. Annex 1, Fig 2).

DCCMS has not operated upper air stations for a long time and this is a significant gap. Furthermore, there is a need for human capacity building in areas such as; project management, ICT expertise, data management and systems integration, calibration, data analysis and post-processing. Institutional capacity is also required to improve the ICT infrastructure, capacity to undertake effective servicing and maintenance of monitoring systems, and management of data through a reliable climate database management system and backup. It will also ensure that all relevant technical national focal points on WIGOS and WIS which have been nominated have the capacity to perform their roles.

1 The number of GBON compliant stations in Malawi as of April 2023. Malawi is currently not GBON compliant https://gbon-compliance.wmo.int/country/map/MWI/standard/GBON/2024/Q1

Target easy fixes	DCCMS has a network of existing automatic weather stations that need easy fixes to be GBON compliant in the long term. These fixes include change of batteries, strengthening the security fence, replacement of selected sensors and re-design of the ICT infrastructure for full data processing among others. With basic improvements, Malawi has potential to improve several stations identified in Malawi's GBON Gap analysis in addition to the 4 that will become GBON compliant through SOFF support. Malawi has also benefited through WMO's WIS2Box pilot project and is already sending hourly observations as of April 2023 albeit with some challenges that included cloud hosting potential of DCCMS (this was the first-time effort) as well as limited technical collaboration with the WMO and the network supplier, Campbell-scientific Africa to enable DCCMS technical team take full control of WIS2Box's operation and maintenance. These challenges are still unsolved and need to be resolved as a part of the investment phase. The peer advisors will assess the best approach to support DCCMS to achieve a seamless exchange of observations in accordance with the WIS 2.0 strategy. The design of the WIS 2.O box solution will be aligned to MET Norway's capabilities to support DCCMS throughout the investment and compliance phase. The WIS 2.0 services may be deployed using cloud infrastructure/technologies that offer capability to increase cross-border real-time, operationally supported data exchange via web-based services. Additionally, DCCMS has endeavoured to improve the capacity of its engineering and ICT staff, though the expertise that exists is mainly limited to available systems in use at DCCMS. Further capacity can be addressed through the SOFF implementation.
Create leverage	UNDP has been collaborating with DCCMS for Improved Climate and Weather Forecasting and Early Warning Systems. The SOFF intervention will therefore complement previous and on-going activities hence contributing to improved climate data and climate informed decision making by different stakeholders at different levels. For instance, through the Green Climate Fund funded MCLIMES project, 33 land surface AWS were installed across Malawi (see remarks on table 3, Annex 1). These investments did, however, not factor in the total cost of ownership and were lacking funding for continuous maintenance of the stations for sustained future operations. Through additional SOFF funding DCCMS commits to fix and maintain operations of four stations to be GBON compliant in the future. However, intent is to use the SOFF funding as a leverage to make more stations GBON compliant, building on the capacity building invested in infrastructure and human resources. This includes future strengthening of the WIS2Box solution which WMO introduced in Malawi through a pilot project in 2023. SOFF's investment will also ensure the reintroduction of upper observation after over 20 years, as well as making Malawi through DCCMS to be fully integrated into global data sharing at the recommended higher temporal resolution. Malawi through DCCMS is also a beneficiary of the coordination with Norwegian Meteorological Institute (Met Norway) under the SAREPTA project. The project provides institutional support and capacity building in the production and delivery of weather and climate services. Through SAREPTA, Malawi is developing a weather mobile App and upgrading its website. It is therefore expected that SOFF implementation for Malawi will benefit from the existing partnerships among Malawi's DCCMS, UNDP Malawi and Met Norway. Additional relevant hydromet projects are provided in element 1.5 of Malawi's CHD report[2]. DCCMS is also pursuing partnerships with private partners that have the potential to assist in

2 Malawi's CHD report

	providing answers to most of the information communication and technological challenges that have been faced. Examples include Telecom Networks Malawi (TNM).
Maximize delivery capacity	The Implementing Entity, UNDP Malawi, has worked with Malawi's DCCMS in several development projects, and has in the process developed a sound working relationship. DCCMS has been continuously involved in UNDP-Malawi coordinated programs and projects since 2010 and UNDP-Malawi has contributed significantly to the growth of climate services as well as having a good understanding of DCCMS strengths and challenges. Key UNDP coordinated programs that DCCMS participated in included the GEF funded early warning systems project, the GCF M-CLIMES project, Africa Adaptation (AAP) and Climate Change (CCP) programs. DCCMS has a SAREPTA project that it is implementing with Met-Norway, the Peer Advisor. This project is a continuation of the working relationship that started around 2020 during which Met Norway worked with DCCMS in building capacity to improve the production and access of weather and climate services as digital public goods. The good understanding that Met Norway has of DCCMS guarantees high likelihood of successful SOFF implementation. DCCMS is also participating in multi-sectoral resilience building programs under the World Bank. Through these programs, DCCMS has the potential to seek support to help in maintaining the observation network and ensuring GBON compliance. There will be no duplication of activities, as DCCMS seeks to expand their station network beyond the four that will be supported under SOFF. DCCMS has a presence in the targeted areas where the SOFF initiative will be implemented in Malawi. DCCMS has representation at district and institutional levels owing to its vast experience in climate data collection production of weather and climate information for Malawi. The SOFF initiative will fill the gaps in terms of hydro-meteorological infrastructure ensuring that non-transmitting AWSs are maintained, and this is expected to lead to DCCMS enhancing its capacity to provide climate information, and in the process gaining the trust of district stakeholders who are crucial in the safe-guarding of weather monitoring stations. UNDP has a dedicated Project Coordination Unit for Climate Information and Early Warning Systems under Disaster Risk Management Department in Malawi which will support

	implementation of the SOFF initiative. In addition, UNDP Malawi has a well experienced Procurement Unit team to support procurements of the high value hydromet equipment. DCCMS has significantly benefited from the UNDP procurement process and has proven to be reliable when it comes to high cost and technologically advanced procurements. UNDP is an implementing partner under the Early Warnings for All Initiative (EW4All) and a member of a technical working group under 2 (Observations & Forecasting). Launched by the UN Secretary-General in November 2022 at the COP27, the EW4All Initiative calls for the whole world to be covered by early warning systems by the end of 2027.
Sub-regional gains	There exist various organisations that would support Malawi's implementation of the SOFF initiative. There are on-going efforts in the Southern Africa Development Community (SADC) to enhance the early warning and coordination among countries' NHMS. An example is the African Union Initiative, CLIMSA[3] which SADC is coordinating in the southern Africa region. Under CLIMSA effort is being made to improve the national and regional early warning systems in the pursuit of Early Warning for ALL. Initiatives under CLIMSA have assisted Malawi with high performance computing capacity and are expected to assist with data management as well. The CLIMSA primary interest is on climate products/information management for ease of access for decision making, making it possible to integrate climate services into disaster risk reduction strategies. This differs from the main data management in SOFF which focuses on the short-term data flow from stations to the global NWC in real time. Malawi is affiliated with Regional WIGOS Centre (RWC) Southern Africa. RWC can support improving stations metadata, At the same time, the human capacity of DCCMS in terms of collaboration with RWC will be strengthened through SOFF support. Through SADC again there has been an initiative to assist the region with databases and data management capacity. This is an effort to address the highly varying data management capacities among member countries. Malawi is hoped to also address some of its data management gaps through the initiatives. Neighbouring countries to Malawi include Mozambique, Zambia and Tanzania. All of which are beneficiaries to the SOFF support; Mozambique (SOFF 1st batch), Tanzania (SOFF 1st batch) and Zambia (SOFF 2nd batch). Considerations for resource optimization during procurement of stations and maintenance plans in the investment phase should be explored as all the neighbouring countries are recipients of the SOFF support. Sub-regional dialogues and co-ordinations should be established to facilitate best practices for procurement, network maintenance plans and human capacity development. With regards to regional collaborations, DCCMS participates in two Regional Climate Outlook Forums (RCOFs)s; Southern African Region COF (SARCOF) annually and South-west Indian Ocean COF (SWIOCOF) on invitation. These are mainly active during the approach of rainfall season: SARCOF is for the Southern African Development Community (SADC) countries; SWIOCOF is for Indian Ocean (IO) islands (Comoros, Madagascar, Mauritius, Reunion, Seychelles) and IO west coast countries (Mozambique and Tanzania). Regionally, NHMS in the SADC are linked through the SADC Climate Services Centre (located in Botswana). Its coordination capability is not very strong and has so far dealt with weather/

3 CLIMSA programme

	seasonal forecasting issues and network expansion and management. Malawi was among the countries to pilot WIS2Box operationalization in Africa, Malawi benefitted from the regional initiative to train SADC member countries in WIS2Box operations. For the future, Malawi has the potential to be among the countries that could aid others in WIS2Box operations. Technicians from DCCMS will be trained to provide assistance to other neighbouring SOFF beneficiary countries.

3. Readiness and Country context (1 page)

SOFF Beneficiary Country Capacity Assessment *This section should summarise existing Beneficiary Country capacity to execute the GBON National Contribution Plan.*

The Department of Climate Change and Meteorological Services (DCCMS) is a governmental department in Malawi under the Ministry of Natural Resources and Climate Change (MoNRCC). With regards to GBON implementation, DCCMS has the sole responsibility for meteorological services provision, including management of monitoring stations and data. It is therefore DCCMS that has the mandate to fulfil WMO obligations in Malawi, including leading the implementation of SOFF.

The current activities at DCCMS are considered as a fully public business model (Government owned, government operated). DCCMS partners with some ministries and government institutions in hosting of DCCMS owned weather monitoring stations. The management of these stations and data is the sole mandate of DCCMS. DCCMS has existing meteorological engineering and ICT capacity to roll out the SOFF program. Effort is also being made to include the private sector to collaborate in the operation and maintenance of automated weather stations; examples include national parks and Malawi's Energy Generation Company (EGENCO). For sustainable GBON compliance, DCCMS needs to plan for proper collaboration with the public and private partners. In the case of installations and maintenance of stations, DCCMS technical staff has had capacity built for the existing weather monitoring systems. The main challenge to this has been available funds to acquire necessary materials and enable travel to the stations.

The GBON compliance will also depend on the ICT capabilities at DCCMS to support data transmission from remote AWS. DCCMS has stations that have been transmitting through WIS2Box in a cloud server system. DCCMS intends to continue using this approach although the institute reserves the right to modify the services (e.g. cloud service providers) to fit their systems and expertise. DCCMS has servers that collect data, processing for data management and data transmission. The room hosting the servers is powered by a solar-mains hybrid power backup system which minimises operations disruptions in case of blackouts. The servers are all on a local network, and data transfer for archiving or processing is done locally. Global data transfer to GTS and NWP centres is currently done through WIS2Box for AWSs and GTS for manual stations, using a Netsys Message Handling System. Messages to GTS are in alpha-numeric code format. While the existing human capacity in ICT has been able to manage the ICT infrastructure, much of the management has depended on the knowledge of specific systems through operations instructions and factory training. Overall ICT capacity needs improvement; this is in terms of reliable expertise in managing the network, ensuring health and discipline in the installations and organisation of systems.

DCCMS has not operated upper air stations for over 15 years. This means that much of the expertise that used to be there for upper air operations has been lost through retirements. DCCMS will need to take capacity building in the upper air O&M seriously. This is one area that DCCMS could benefit from regional co-operations and

collaborations.

For ICT and management in general, there is a need to build the capacity beyond the ability to maintain the routine problems. There is a need to enable critical thinking that will help in developing sustainability measures as well as enabling embracing technological changes that are taking place.

Investment Phase Alignment with the GBON National Contribution Plan

Please attach the National GBON Gap Analysis and GBON National Contribution Plan as Annex 1.

The investment phase proposal includes all activities and recommendations from the National Contribution Plan which was concluded in the readiness phase. Additional activities have been included to enhance the capacity of DCCMS for easy operation and maintenance of the infrastructure for easy integration with existing interventions. Other activities have also focused on improved stakeholder engagement for enhanced capacity and maximum impact.

Please explicitly indicate and justify any differences in the proposed Investment Phase targets and the requirements of the GBON National Contribution Plan approved at the finalization of the Readiness Phase.

The investment phase proposal includes all activities and recommendations from the National Contribution Plan.

4. Investment Phase Outputs and Budget

The GBON National Contribution Plan provides detailed information on the Investment Phase Outputs (please see Annex 1).

Output 1. GBON institutional and human capacity developed	Main activities	Budget (USD)
1.1 **National consultations** including with CSOs, and other relevant stakeholders conducted	• Conduct inception **workshops** at the national and sub-national level • Stakeholder engagement (media/Private, CSO, Communities, etc) workshops on implementation	30,000
1.2 **NMHS institutional capacity** required to operate the GBON network developed	• Develop and enhance a Quality Management Systems • Develop SOPs and learn from best practices on the O&M of meteorological equipment and **IT infrastructure** for effective SOFF implementation • Promote gender equality through gender assessment leading to an action plan, and workshops to advocate for gender equality in the SOFF activities at institutional level.	50,000
	• Cover the direct project costs in terms of oversight, country Project Coordination (Unit) for IE and Department of Climate and Meteorological Services for 4 years	330,000
1.3 **NMHS human capacity** required to operate the GBON network developed	• Experience sharing and capacity building on GBON/SOFF key components for DCCMS Management • Capacity building on calibration of meteorological equipment including setting up a station maintenance plan and standard calibration routines • Training of DCCMS officers in ICT and other modes of communications (in-person) • In-person training in operational and maintenance (O & M), data management including AWS data integration, climate database management systems, satellite and NWP data analyses and interpretation, data post-processing, archiving, etc • Participation in the regional trainings (in-person and virtual) also linked to SOFF investments in neighbouring countries • Promote gender equality through gender assessment leading to an action plan, and workshops to advocate for gender equality in the SOFF activities. • Capacity development on WIGOS metadata and data quality monitoring system • Attachment of experts and/or recruitment of personnel to supplement the capacity at DCCMS required to operate the GBON network developed (in collaboration with IE and peer advisors) • Develop observation process and practices for upper-air sounding (in collaboration with the peer-advisors) • Continued training on upper-air system (basic level) and surface weather station (advanced/supplementing)	300,000

Output 2. GBON infrastructure in place	Main activities	Budget (USD)
2.1 New land-based stations and related equipment, ICT systems, data management systems and standard operating practices in place	None	N/A
2.2 Improved land-based stations and related equipment, ICT systems, data management systems and standard operating practices in place	● Improve four land-based stations. Kasungu, Ngabu, Mlowe and Bilira EPA, the fourth easy fix station ○ Kasungu and Ngabu meteorological stations require rehabilitation to include several sensors and all related ICT costs for upgrading the stations data transmission needs compatible with WIS 2.O server. (Based on the list of observation instruments and systems per site per the proposed GBON Surface Land station in Malawi's NCP (Annex 2 pg 12), these two stations had reached their EoL and were deemed too old for improvement. It could be beneficial to have new installation as this can be cheaper than procurement of individual sensors and missing parts) ○ Mlowe also requires replacement of several sensors and spare parts ○ Bilira EPA meteorological stations is an easy fix ● Related cost estimates for upgrading four surface stations include: ○ Cost to rehabilitate and replace data loggers for three stations to meet the data transmission needs compatible with WIS 2.0 ○ Malawi WIS 2.0 Box as as a Service - Cloud Option @ $76,421 ○ Procure and replace required spare parts (sensors, power accessories) for improvement; as well as rehabilitation of existing broken equipment and measuring devices. $ 200,000 (see the first bullet) ○ Procure desktop computers for monitoring and data processing and for field use in servicing and maintenance ● Enhance sites' suitability (fencing, security enhancement, base strengthening, community awareness for ownership and safety) (4 @ $1,500) ● Travel cost for personnel and labour for station improvement ● Procurement of calibration instrument for and setting up a calibration unit/laboratory $ 300, 000 ○ As provided in module 3.1 of Malawi's NCP report, calibration systems for all sensors of the AWS at DCCMS; including climate chamber, pressure generator, barometric pressure chamber, a field calibrator, wind tunnel and a rainfall calibrator are lacking. DCCMS thus lacks the ability for laboratory calibration of its AWS sensors that has been considered in these estimates. The cost estimates include procurement of calibration equipment for air pressure, temperature, relative humidity and precipitation, in addition to a mobile calibration test equipment. The calibration equipment for wind and speed sensors (wind	600,000

	tunnel) is not included in these estimates. This will ensure DCCMS acquires partial assured traceability according to WMO No. 8, Volume I with a possibility to reach assured traceability level during the SOFF investment phase. ● Procure one field vehicle for easy preventative maintenance of stations on a regular basis. @ $60,000 ● Upgrading of DCCMS climate database system and a backup- including new hardware and software for seamless data transition in accordance with GBON requirement. ● Participate in relevant factory and on-site trainings ● Ensure internet connection for transfer the data from AWS to the central server	
2.3 **New upper-air** stations and related equipment, ICT systems, data management systems and standard operating practices in place	● Procurement and installation of one automatic upper air station including hydrogen generator and power system, other utilities, delivery, clearance and site acceptance ● Procurement of upper air station accessories (balloons, gas, radiosondes) including annual labour and operational cost (2 launches per day for one year) ● Conduct factory training for procured Upper air (DSA, travel and fees) ● Investment on platform for automated launching system including gas storage/generation facilities and hydrogen generator and associated civil works ● Setup internet/VPN for upper air communication and communication infrastructure to Integrate Upper air data into the upgraded CDMS) ● Acquire 2 desktop PCs and UPSs for Upper air and AWS operations' monitoring ● Technical Assistance including development and test of SOPs for O&M (included in the PA fees) ● Conduct awareness at installation sites for routine maintenance and cleaning of Upper air station Malawi has not operated upper air stations for about 20 years, Hence, there is no institutional capacity at DCCMS for installing, operating, and maintaining such stations, Not only is there a need to procure a full new system from the ground up, but also to set up SOPs and train staff members from different levels of DCCMS. The associated cost for a new automatic upper air station in Malawi are based on the estimates for Rwanda which have already been accepted by the SOFF steering group.	1,190,000
Outcome: Sustained compliance with GBON	**Main activities**	**Budget (USD)**
3.1 **GBON land-based stations' commissioning period completed**, country-specific standard cost for operations and maintenance established, and data sharing verified by WMO Technical Authority	● Provide for mobile data communication of the AWS for continuous data transmission ● Undertake regular (quarterly) stations' calibration, servicing and maintenance ● Acquire rugged field laptops and stations' spare parts, batteries for replacement ● Acquire maintenance tools and stations' cleaning tools ● Labour cost for experts recruited to supplement the capacity at DCCMS for GBON compliance	180,000

3.2 **GBON upper air stations' commissioning period completed**, country-specific standard cost for operations and maintenance established, and data sharing verified by WMO Technical Authority	● Operation and Maintenance of the Upper air station including procurement of consumables; sounding accessories, spare parts; balloons, gas cylinders, radiosondes, weighing stones, and related materials and operations. ○ Procurement of upper air station accessories (balloons, gas, radiosondes) including annual labour and operational cost (2 launches per day for two year) (costing guided by the estimates from other peer-advisors) ▪ Annual maintenance cost without labour per site $ 80,000 ▪ Benchmark cost for upper air station consumable per site per year $ 140000 ● Monitoring and regular checks of the systems, along with responses due to automated alerts or non-reporting. ● Administrative Costs	440,000
Total for all Outputs		**3,120,000**
Implementing Entity Fee [1] (GMS) 7%		**218,400**
SOFF peer advisory services[4]		**502, 763**
Total funding request		**3,841,163**

4 Based on the experience during the Readiness phase, the cost for travel to Malawi is higher than for many other beneficiary countries, and includes costly airline tickets and long travel times (up to 60 hours per return trip).

Budget breakdown by UNDG category (Excluding SOFF peer advisory services)[2]		USD
Staff and personnel costs		**400,000**
Supplies, Commodities and Materials		**1,620,000**
Equipment, Vehicles, Furniture and Depreciation		**139,400**
Contractual Services Expenses		**488,600**
Travel		**210,000**
Transfers and Grants		
General Operating Costs		**262,000**

5. Investment Phase Implementation Arrangements

Execution model and implementation arrangements	UNDP as Implementing Entity will manage and execute the implementation of the Investment Phase in Collaboration with the beneficiary country, Malawi, following the processes described in the SOFF Operational Manual and in line with the SOFF Terms of Reference, and the UNMPTF legal agreements and UNDAF. A regular coordination mechanism between DCCMS and UNDP will be set up for technical coordination. Additionally, an annual planning exercise will be conducted to closely plan all activities for the upcoming year, analyse any bottlenecks or delays in implementation and agree on any corrective measures on the implementation of plan if necessary. The flow of funds from UNDP to DCCMS will be defined in a legally binding Letter of Agreement between DCCMS and UNDP, leveraging an existing LoA between UNDP and DCCMS with similar activities. This LoA will include detailed information on financing tranches, claims, reporting, monitoring etc. Procurement of assets will be mostly managed by the implementing Entity, both in Malawi and at its Headquarters with extensive experience in procurement of goods and services and including international purchases. At the beginning of the project, a joint procurement plan will be developed and agreed between DCCMS and UNDP to analyse specific periods of procurement for all assets, technical considerations, potential need for storage, lead times among other things. DCCMS with support from the peer advisor will be responsible for the specification of technical requirements of goods and services to be procured, including drafting and revision of ToRs, proposals and other documents. The Implementing Entity will be responsible for process management, ensuring transparent and competitive processes as per UNDPs supply chain and procurement guidelines. DCCMS will ensure adequate information flows and coordination between central and local level representations from DCCMS. DCCMS will ensure adequate data flow to the Regional MET Centres. **Peer Advisory:** The Peer Advisor for this project is the Norwegian Meteorological Institute (MET Norway) in collaboration with Icelandic Meteorological Office (IMO). The peer advisory services are detailed in Annex 4.
Private sector involvement	DCCMS is currently under discussion with Telecom Network Malawi (TNM), a mobile service provider. Formal agreement with telecommunication providers would be beneficial for reliable communication for real time data transfer. In addition, DCCMS will endeavour to establish partnerships with private sector on maintenance of stations. Private sector partners will be invited to join stakeholder engagement workshops.

Civil society participation	The roll out of the GBON network is spread across the regions of Malawi. DCCMS will conduct a national stakeholder's awareness campaign to sensitise stakeholders at different levels including communities on the important role the data collected from the Weather observation infrastructure is playing towards climate resilience and food security. During the workshops to be conducted the role of CSOs in different regions of Malawi will be defined. Communities will be adequately informed and involved in the initiative by DCCMS in close coordination with CSOs. This will aim to translate into better understanding of the initiative at local level, and consequently to a reduction of vandalism of the observation network and improve on data availability. When appropriate, necessary agreements with private sector entities will be established as part of public private partnerships in supporting the data collection and transmission. DCCMSs current agreements with private sector entities will be leveraged for this initiative if relevant. In September 2023, DCCMS and peer advisors hosted a stakeholder's meeting in Lilongwe, Malawi, bringing together various stakeholders across the meteorological value chain in Malawi, including governmental ministries, UN agencies, foundations, regional knowledge-based institutions, NGOs, CSOs, the private sector, and academia. Such stakeholder meetings will be promoted during the investment phase, and CSOs working on women's empowerment and advocacy will be invited to participate in the two gender workshops to help strengthen gender equality in governance, strategy, programs, and decision making, as well as to lay the groundwork for gender policy development at DCCMS. The gender assessment analysis will help to uncover gender gaps and facilitate progressive efforts to mainstream gender, thereby establishing a gender policy with affirmative steps to bridge the gap.
Fiduciary systems	UNDP will develop a legally binding Letter of Agreement with the DCCMS outlining the responsibilities of the two parties including reporting, monitoring, evaluation, audit, payments, purpose, term, amendments and termination for the duration of the SOFF financing. UNDP will leverage the existing MCLIMES project Financial Standard Operating Procedures agreed with parties including DCC for the project to manage the SOFF funds. To implement any partnership, UNDP ensures that clear and robust fiduciary arrangements are in place before the implementation starts. These include financial management and procurement aspects which enable transparency, accountability, and effectiveness in the utilisation of funds mobilised. **Financial Management -**UNDP Financial management in fiduciary arrangements typically encompasses the following: **Budgeting** - Setting a clear and detailed budget for the project, which outlines the expected expenses and sources of funds. **Financial Reporting** - Periodic financial reporting to stakeholders, which gives an overview of the funds received, expended, and any discrepancies or issues. Audits - Regular audits, both internal and external, are conducted to ensure compliance with financial standards and to detect any anomalies or misuse of funds.

	Risk Management - Risk assessments are conducted to identify any financial risks associated with the project, and mitigation measures are put in place. **Fund Disbursements** - A clear procedure for the disbursement of funds to ensure that money is used for the intended purpose and there is accountability at every level. **Accounting and Record Keeping** - Proper accounting methods are used, and records of all transactions are kept meticulously. **Procurement:** Procurement procedures are put in place to ensure that goods, works, and services are acquired in a transparent, efficient, and cost-effective manner. The main aspects include: **Planning** - Before starting the procurement process, there's a need for clear planning, which defines what is to be procured, why, and how. **Sourcing** - Identifying potential suppliers or contractors and evaluating them based on predetermined criteria. **Tendering** - Inviting bids or proposals from potential suppliers. This can be through open tendering, limited tendering, request for quotations, or direct contracting, depending on the nature and value of the procurement. **Evaluation** - Evaluating bids or proposals based on predefined criteria, which could be the lowest cost, best value for money, or other factors. **Contracting** - Once a supplier or contractor is selected, a contract is drawn up which outlines the terms and conditions of the procurement. **Contract Management** - Monitoring the performance of the supplier or contractor, ensuring they meet their obligations as per the contract. **Ethics and Fair Play** - Ensuring that the procurement process is free from corruption, favouritism, and any form of unethical behaviour. **Grievance Redress Mechanism** - A system through which aggrieved bidders can raise complaints and get them addressed. As UNDP collaborates with the Department of Climate Change and Meteorological Services to implement SOFF Investment Phase, both entities shall align their fiduciary procedures. The UNDP will ensure that its Meteo Rwanda comply with the highest standards of financial management and procurement. This will not only build trust among stakeholders but also ensures the success and sustainability of the projects they undertake together.
Social and environmental safeguards	The project will adhere to UNDPs and Social and Environmental Standards UNDP SES which applies to all UNDP project and programme activities and the required standards will be included in agreements with all cooperating partners. The UNDPs Environmental and Social Safeguards policy framework is based on existing 'do no harm' provisions mandated by UNDPs Environmental Policy and 'Leaving no one behind' of the sustainable development goals (SDGs). The UNDP safeguards

	framework is fully aligned with the Model Approach to Environmental and Social Standards in UN Programming. **Social safeguards:** The implementation of the SOFF investment phase will be made through taking a note of human rights considerations and making sure that no human rights are violated by any of the activities. In fact, the results of the project will support human well-being and social equity, and further, reduce the environmental risks posed by climate change and natural disasters. **Gender policy:** Peer-advisors will help promoting gender equality through gender assessment leading to an action plan, and conduct workshops to advocate for gender equality in the SOFF activities at institutional level. **Upper-air radio sounding:** The GBON compliant sounding system is recommended to be located at a site where permanent staff works on a daily basis. This will decrease unnecessary travelling as well as burdening financial and environmental implications when the sounding station requires the attention of staff. The tender process should emphasise quality criteria related to composability in material selection where applicable. The investment in the sounding system is made for 20-30 years, and thus, care must be taken to ensure that annual maintenance is ensured throughout its lifecycle. 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. **Automatic Weather Stations:** To comply with GBON requirements, SOFF will support the upgrade of the three existing Automatic Weather Stations by replacing old version sensors with modern sensors. There will be no requirement to build new infrastructure which would cause land excavation, destruction of the physical environment and/or biodiversity loss. However, the diodes (which are electronic components) from the replaced sensors are not harmful to the environment by themselves as they are made of materials such as silicon, germanium, or gallium arsenide, which are not toxic or hazardous. Therefore, UNDP and DCCMS will work with the Environment Affairs Department to ensure that disposal of such is in line with the existing standards.
Dispute resolution mechanism	UNDP ensures full accountability to the people it serves ; accountability, participation and empowerment through meaningful and consistent engagement are the key principles for mainstreaming protection. This means that ensuring that affected populations, their families, and diverse community organisations representation young people, elderly, indigenous peoples, people living with HIV/AIDS, and persons with disabilities participate in the decisions that affect their lives, receive the information they need to make decisions and have access to safe and responsive mechanisms for providing feedback. Effective project management recognizes the importance of addressing complaints and resolving conflicts promptly to maintain stakeholder trust, ensure project sustainability, and achieve desired outcomes. The UNDP, like many development organisations, incorporates mechanisms to manage complaints and resolve conflicts in its projects. Here's an overview of the key elements in project implementation complaints management and conflict resolution:

	a) Establishment of a Complaints Management Mechanism (CMM) **Accessibility:** There should be a clear and easily accessible channel for stakeholders, including project beneficiaries, to raise complaints or concerns. More information can be obtained from the UNDP Social and Environmental Standards. Concerns can be raised through dedicated email addresses, helplines, physical drop boxes, or online platforms. **Anonymity and Protection:** The mechanism should allow for anonymous complaints to ensure the protection of the complainant, especially in sensitive contexts. Whistleblower protections should also be in place. **Categorization of Complaints:** Once received, complaints should be categorised based on their nature, urgency, and impact to ensure an appropriate and timely response. **b) Complaints Handling Process** **Acknowledgment** - Upon receiving a complaint, an acknowledgment of receipt should be sent to the complainant, reassuring them that their concern is being addressed. **Investigation** - A neutral team or individual should investigate the complaint. The depth and method of the investigation would depend on the nature of the complaint. **Feedback** - After the investigation, feedback should be provided to the complainant, detailing the findings and any actions taken. **Redress and Remediation** - If the complaint is validated, appropriate remedial actions should be taken, which might include compensation, corrective actions, or other measures. **Conflict Resolution Mechanisms** **Preventive Measures** - Awareness and training sessions on conflict sensitivity, cultural awareness, and stakeholder engagement can be conducted to reduce the likelihood of conflicts arising. **Mediation** - Neutral third-party mediators can be involved to facilitate dialogue between conflicting parties and help them reach a consensus. **Arbitration** - If mediation fails, an independent arbitrator can be appointed to hear the grievances and make a binding decision. **Stakeholder Dialogues** - Regular dialogues and forums with stakeholders can be organised to address any potential issues before they escalate into major conflicts. **d) Monitoring and Learning:** **Regular Review** - The effectiveness of the complaints management and conflict resolution mechanisms should be reviewed periodically. **Learning** - Lessons learned from addressing complaints and resolving conflicts should be documented and integrated into future project planning and implementation. **Transparency** - Sharing aggregated data on complaints received, their nature, and the

	actions taken can enhance transparency and trust among stakeholders. Incorporating the above elements ensures that project implementation remains on track and that any issues or grievances from stakeholders are addressed in a timely and effective manner. This proactive approach not only helps in mitigating risks but also promotes trust, inclusiveness, and ownership among all stakeholders, essential for the success of any project UNDP will leverage the already existing Grievance Redress Mechanism (GRM) that was set up under Modernised Climate Information and Early Warning System project (MCLIMES) which has necessary grievances record books and redressal systems on any reported grievances from community at District and National Level. The GRM system covers all hydromet installations that DCCMS and DWR have installed across Malawi. DCCMS will actively monitor and follow up all recorded grievances and how they have been addressed by the established GRM committees.
Additional relevant policies and procedures	UNDP is a Green Climate Fund and Green Environmental Facility accredited entity, partners in the EW4ALL global initiative. UNDP has a robust Programme and Operational Policies and Procedures (POPP) framework UNDPP POPP. This framework provides comprehensive guidance for project and programme implementation, ensuring effectiveness, transparency, and accountability in all operations. When considering the context of implementing entities, especially when UNDP is working in partnership with the Department of Climate Change and Meteorological Services, the UNDP POPP will guide the SOFF implementation in Malawi.

6. Investment Phase Monitoring and Reporting

The implementing entity, with the support of the peer advisor, is expected to monitor the implementation of the Investment Phase following an output-based approach. The Investment Phase outputs as well as respective indicators and targets are presented below.

Output 1. GBON institutional and human capacity developed	Indicator	Target Y1	Target Y2	Target Y3	Target Y4
1.1 **National consultations** including with CSOs, and other relevant stakeholders conducted (Stakeholder Engagements)	Inception Workshop Conducted	1			
	Number of Consultations/Stakeholder engagements conducted (Quarterly engagements – 4/ year)	4	4	4	4
	Number of CSOs/Private Sector engaged	2	2	2	2
	% of female participants during consultations	50%	50%	50%	50%
1.2 **NMHS institutional capacity** required to operate the GBON network developed	Project implementation team established	1			
	Number of benchmarking visits	1			
	O&M and IT SoPs developed		2		
	Numbers of gender action planning and reporting workshops	1	1	1	1
1.3 **NMHS human capacity** required to operate the GBON network developed	Numbers of staff trained on SOFF related components (O&M, IT, Data mgt, Gender)	17			

	% of female staff participating in SOFF trainings	50%	50%	50%	50%
Output 2. GBON infrastructure in place	**Indicator**	**Target Y1**	**Target Y2**	**Target Y3**	**Target Y4**
2.1 **New land-based** stations and related equipment, ICT systems, data management systems and standard operating practices in place	# stations as per the GBON National Contribution Plan				
2.2 **Improved land-based** stations and related equipment, ICT systems, data management systems and standard operating practices in place	# stations as per the GBON National Contribution Plan	4			
2.3 **New upper-air** stations and related equipment, ICT systems, data management systems and standard operating practices in place	# stations as per the GBON National Contribution Plan		1		
2.4 **Improved upper-air** stations, related equipment, ICT systems, data management systems and standard operating practices in place	# stations as per the GBON National Contribution Plan				
Outcome: Sustained compliance with GBON	**Indicator**	**Target Y1**	**Target Y2**	**Target Y3**	**Target Y4**
3.1 **GBON land-based stations'** commissioning period completed, country-specific standard cost for operations and maintenance established, and data sharing verified by WMO Technical Authority	# stations as per the GBON National Contribution Plan *NB: Maintenance will target all 4 stations each year.*		4	4	4
3.2 **GBON upper air stations'** commissioning period completed, country-specific standard cost for operations and maintenance established, and data sharing verified by WMO Technical Authority	# stations as per the GBON National Contribution Plan		1	1	1

The implementing entity is expected to report on progress as described below.

- **Quarterly updates** to the SOFF Secretariat: A simple standardised form providing a progress update against the Investment Phase Outputs' indicators (and Outcome, where applicable) and flagging major issues that are delaying implementation, if any.
- **Annual narrative and financial reports** according to the UN MPTF reporting requirements indicated in the legal agreements. The annual narrative report reports on progress on the delivery of the Investment Phase Outputs, measured by the Investment Phase Indicators. It also includes a review of the Investment Phase risks and an update on environmental and social safeguards, including gender.
- **Final narrative and financial reports** according to the UNMPTF reporting requirements indicated in the legal agreements. The final narrative report confirms the completion of all the activities and reports on the number of stations that have completed the commissioning period (outcome). The WMO technical authority verifies GBON compliance of the indicated stations and provides a verification report to the SOFF Secretariat. Upon WMO verification, the Investment Phase can be considered completed. The Final Report should describe the Investment Phase results achieved and lessons learned; and it should also specify the long-term institutional arrangements to secure sustained GBON compliance with SOFF Compliance Phase support.

7. Investment Phase Risk Management Framework

The Investment Phase Risk Management Framework should be based on the SOFF Risk Management Framework, incorporating relevant programmatic risks and including additional country-specific risks. Please follow the methodology established by the Multi-Partner Trust Fund Office (MPTFO) presented below.

		Impact				
		Insignificant (1)	**Minor (2)**	**Moderate (3)**	**Major (4)**	**Extreme (5)**
	Very Likely (5)	Medium (5)	High (10)	High (15)	Very High (20)	Very High (25)
	Likely (4)	Medium (4)	Medium (8)	High (12)	High (16)	Very High (20)
	Possible (3)	Low (3)	Medium (6)	High (9)	High (12)	High (15)
	Unlikely (2)	Low (2)	Low (4)	Medium (6)	Medium (8)	High (10)
	Rare (1)	Low (1)	Low (2)	Medium (3)	Medium (4)	High (5)

Risk	Risk level	Likelihood	Impact	Risk Mitigation Measures
Non-compliance with fiduciary and procurement standards in some SOFF activities	Medium	Unlikely	Major	UNDP has strict corporate financial and procurement procedures as well as fiduciary systems which will be used and adhered to at all levels.
SOFF-funded investments cause environmental or social impacts	Low	Unlikely	Insignificant	UNDP has a corporate Environment and Social Safeguards policy and a dedicated SES Tool kit which will guide the screening in this initiative. DCCMS will adopt and implement ESMPs for installation of Hydromet Infrastructure in Malawi. For instance ESMP for installation of AWS from MCLIMES project
NMHS staff depart after being trained	High	Possible	Major	UNDP, DCCMS will ensure that there is a good working environment at DCCMS by ensuring institutional capacity is enhanced to counter the negative effects of staff departure. The DCCMS will ensure that there are strong Knowledge Management systems that will guarantee Institutional memory at all times.

Slow implementation and delays in procurement, installation and capacity building activities	High	Possible	Major	UNDP and DCCMS will develop a detailed work plan based on all required activities under the initiative. An effective administrative planning will be implemented, with support from UNDP CO, which will include procuring equipment at an early stage. UNDP and DCCMS will coordinate closely to manage any delays in activities or procurements.
After the conclusion of the Investment phase, GBON data are not collected or shared or are shared of insufficient quality	Medium	Unlikely	Major	DCCMS will continue to ensure maintenance and quality checks. Corrective actions will be taken to address any emerging challenges that may affect GBON data collection beyond the investment phase. Necessary capacity building activities will be conducted to ensure continuous flow of the GBON data.
Destruction or theft of SOFF-financed equipment and infrastructure	Medium	Unlikely	Major	Installation will be done on secure/institutional land with maximum security. In addition, the equipment will be housed within a secure fence. Awareness raising activities will be undertaken in target communities to highlight the importance of the installed equipment.
Countries cannot make optimal use of data, including accessing or using improved forecasts products from the Global Producing Centers throughout the hydromet value chain	High	Possible	Moderate	Data sharing mechanisms, protocols and agreements will ensure that all eventualities are covered, including technical failures, with appropriate backup and access mechanisms for all relevant stakeholders. Cost recovery measures may also be applied to ensure costs of databases and tailored product operationalizing are covered
Land ownership: In the past there have been problems with accessing land areas for meteorological observing stations. There is a risk of stations being removed.	Medium	Unlikely	Moderate	Written agreements with the land owners will ensure that project activities do not face any challenges in terms of establishment and installation of the systems.

Annex 1: National Gap Analysis

Malawi GBON National Gap Analysis[5]

5 Malawi GBON National Gap Analysis

Annex 2: National Contribution Plan

Malawi GBON National Contribution Plan[6].

6 Malawi GBON National Contribution Plan

Annex 3: Country Hydromet Diagnostics

CHD-Report-Malawi

Annex 4: Terms of Reference for the provision of technical advisory services during the SOFF Investment Phase

1. Purpose and scope

These Terms of Reference describe the provision of technical advisory services by Met Norway to the Department of Climate Change and Meteorological Services of Malawi to contribute to the delivery of the SOFF Investment Phase outputs as described in Section 3.

The Terms of Reference are based on the SOFF Operational Manual, Section 4.4.3 on the Operational Partners and Section 4.5.2 on the Investment Phase; as well as on the SOFF Investment Phase Framework, Section 4.5 on the Peer Advisors and WMO Technical Authority.

2. Roles and responsibilities

Beneficiary country National Meteorological and Hydrological Service

- Is responsible for implementing the activities of the SOFF Investment Phase activities with the support of the Implementing Entity and the peer advisor.
- Submits the SOFF Investment Phase funding request using the standardized template provided by the SOFF Secretariat, including the Terms of References for the peer advisor's technical advisory services during the Investment Phase.
- Is responsible for collaborating with the Implementing Entity to provide all the necessary information, participate in and facilitate the national activities that the Implementing Entity and peer advisor need to conduct in order to deliver the SOFF Investment Phase outputs.
- Confirms the completion of all the Investment Phase activities and provides comments as needed on the final report prepared by the Implementing Entity.

Peer advisor

- Is accountable to the beneficiary country and the Implementing Entity.
- Is contracted via the WMO pass-through mechanism and operates on a cost-recovery basis.
- Provides technical advisory services to support beneficiary countries and Implementing Entities in the design and implementation of the SOFF Investment Phase activities.
- Contributes to the final report of the SOFF Investment Phase.

Implementing Entity

- Prepares the Investment Phase funding request in collaboration with the beneficiary country and the peer advisor, including the Terms of References for the provision of technical advisory services during the SOFF Investment Phase.
- Manages the Investment Phase activities following the terms specified in the funding request and in collaboration with relevant national partners, including civil society organizations.
- Delivers the Investment phase outputs and is responsible for their quality and timely delivery, in coordination with the country and the peer advisor.
- Provides quarterly updates to the SOFF Secretariat according to a simple standardized form and annual reports according to the United Nations Multi-Partner Trust Fund Office's reporting requirements indicated in the legal agreements.
- Informs the SOFF Secretariat of circumstances that could materially impede the implementation of the Investment phase or any considerable deviation in the conditions of the funding request to achieve its objectives.

- Submits the final report to the SOFF Secretariat including the beneficiary country's comments and the peer advisors' feedback. The final report describes the institutional arrangements to secure sustained operation and maintenance of the investments made.

WMO Technical Authority

- Provides basic on-demand technical assistance to the beneficiary country, Implementing Entity and peer advisor on GBON regulations, including on monitoring and assessing the data-sharing status of the stations using the WDQMS web tool6
- Is responsible for the verification of data sharing of the new or rehabilitated surface and upper -air stations as per GBON regulations.
- WMO provides a verification report to the SOFF Secretariat, upon which the Investment Phase can be considered completed.
- Establishes and administers the pass-through mechanism for contracting and funding of the advisory services provided by the peer advisors.

SOFF Secretariat

- Facilitates communication, coordination and collaboration between the beneficiary country, the Implementing Entity, the peer advisor and WMO Technical Authority.
- Reviews the SOFF Investment Phase funding request, including the Terms of Reference for the provision of technical advisory services and provides feedback as needed. Then transmits the funding request to the SOFF Steering Committee for their decision.
- Compiles quarterly updates and annual reports and monitors implementation based on information received from the Implementing entity, the peer advisor and the beneficiary country. Regularly informs the Steering Committee of progress.
- Coordinates regional implementation approaches to the SOFF Investment Phase.
- Confirms receipt of the final report by the Implementing Entity and completion of the
- Investment Phase based on WMO verification of data sharing.
- Organises exchange of knowledge and experiences and captures lessons learned.

3. Peer advisors' activities during the SOFF Investment Phase

As provided in the National Contribution Plan for Malawi, the peer advisor in collaboration with UNDP will support investment phase through the following activities:

Output 1. GBON institutional and human capacity developed	Peer advisory services
1.1 **National consultations**	• Facilitate stakeholder engagement (Media/Private, CSO, Communities, etc.) through workshops in support of building synergies for sustained observation infrastructure at DCCMS. • Advice for the generation of private public partnerships and engagement. • Promote gender equality workshops to advocate for gender equality in the SOFF activities.
1.2 **NMHS institutional capacity**	• Continued support in competence development in line with the Institutional Support and Capacity Building for Weather and Climate Services SAREPTA project between DCCMS and MET Norway. • Capacity building in project and portfolio management and coordination through benchmarking with Norwegian Meteorological Institute. • Support on development of Standard Operating Procedures and quality control and quality assurance mechanisms. • Provide support with regards to gender assessment including facilitating gender policy implementations with affirmative actions to bridge the gap between female and male staff at DCCMS.
1.3 **NMHS human capacity**	• Experience sharing and SOP development on IT infrastructure for effective GBON and SOFF implementation. • Provide on-demand advisories and capacity building on calibration of meteorological equipment, ICT requirements and data management. • On-demand advisories on AWS data integration, climate database management systems, data archiving and post-processing, and so forth. • Benchmarking observation process and practices for upper-air sounding, including development of observation process and practices for upper-air sounding
Output 2. GBON infrastructure in place	
New and improved land-based stations	• Provide general technical advisory services to support AWS tender process, radio sounding tender process, IT hardware tender process and calibration facilities tender process. • Benchmark good practices. • Technical support on management, IT and communication tenders and purchasing processes. • Advice and support on sub-regional dialogues and co-ordinations to facilitate best practices for procurement, network maintenance plans and human capacity development (resource optimization). • Support in development of operational processes
Sustained compliance with GBON	

3.1 **GBON land-based stations' commissioning period completed**,	● Review and provide advisory on the observations commissioning procedure. ● Ensure continuous data transmission for GBON compliance. ● Contribution to final reporting.