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GBON National Contribution Plan of Burkina Faso

Systematic Observations
Financing Facility

**Weather
and climate
data for
resilience**



GBON National Contribution Plan Burkina Faso

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Module 1. National Target toward GBON compliance

1.1 Conduct the national GBON Analysis

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	7	0	0	7	7	0
Upper air	2	0	1	1	1	1
Marine	*When applicable					

Table1. GBON National Contribution Target

The proposal here is a compromise between observation needs at global level, the need for supporting ANAM as NHMS, mid- and long-term safety concerns for maintenance staff and national expected contributions from ASECNA.

1.2 Establishment of the National Target toward GBON compliance

Burkina Faso, is a landlocked country in western Africa with an area of 274,200 km² (105,900 sq mi), bordered by Mali to the northwest, Niger to the northeast, Benin to the southeast, Togo and Ghana to the south, and the Ivory Coast to the southwest. As of 2021, the country had an estimated population of 20,321,378. The country occupies an extensive plateau, and its geography is characterized by a savanna, that is grassy in the north and gradually gives way to sparse forests in the south. The capital, Ouagadougou, is in the center of the country and lies about 500 miles (800 km) from the Atlantic Ocean. UN categorized Burkina Faso as least developed country.

The conclusions of the evaluation after the mission are the following:

- It is proposed to keep GBON surface stations in Bobo Dioulasso and Ouagadougou airports managed by ASECNA with ANAM support. New AWS should be installed to replace manual observations as SYNOP source but without abandoning them. WIS 2.0 should be provided as a communication tool.
- Five sites from ANAM network are selected to complete GBON in Burkina Faso. Sites are selected for their safety and long-term maintenance and access considerations. Those five + two surface stations will be the GBON in the country without prejudice that ASECNA national will keep the other 7 surface stations reporting internationally based on manual observations and improve 2 of them: Dedougou and Fada N'Gourma with an AWS as national contribution.
- Pilot radio sounding in Bobo Dioulasso should be improved to radiosonde station. Hydrogen generator, trained staff, and building facilities are present

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

- Fada N´Gourma is proposed as a new site for radio sounding. Is about 500 km eastwards of Bobo Dioulasso and on the axis of rainfall systems movement from East to West at the summer monsoon season

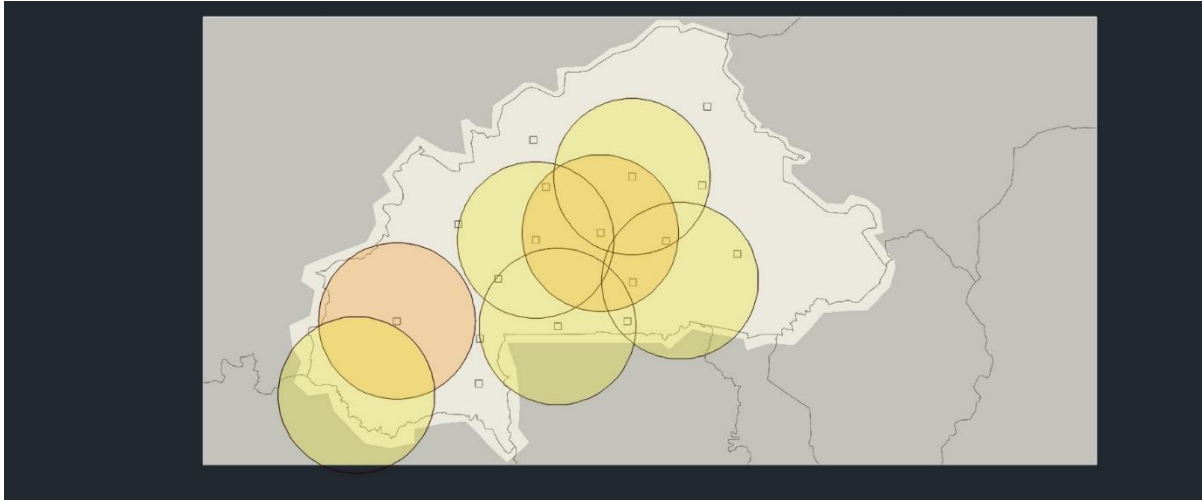


Figure 1 - Surface stations proposed with 100 km radius circles. Orange is ASECNA managed stations, Bobo Dioulasso and Ouagadougou airports, now GBON reporting and yellow are ANAM managed new sites proposed for GBON (Kaya, Koudougou, Leo, Tenkodogo, Niangoloko).

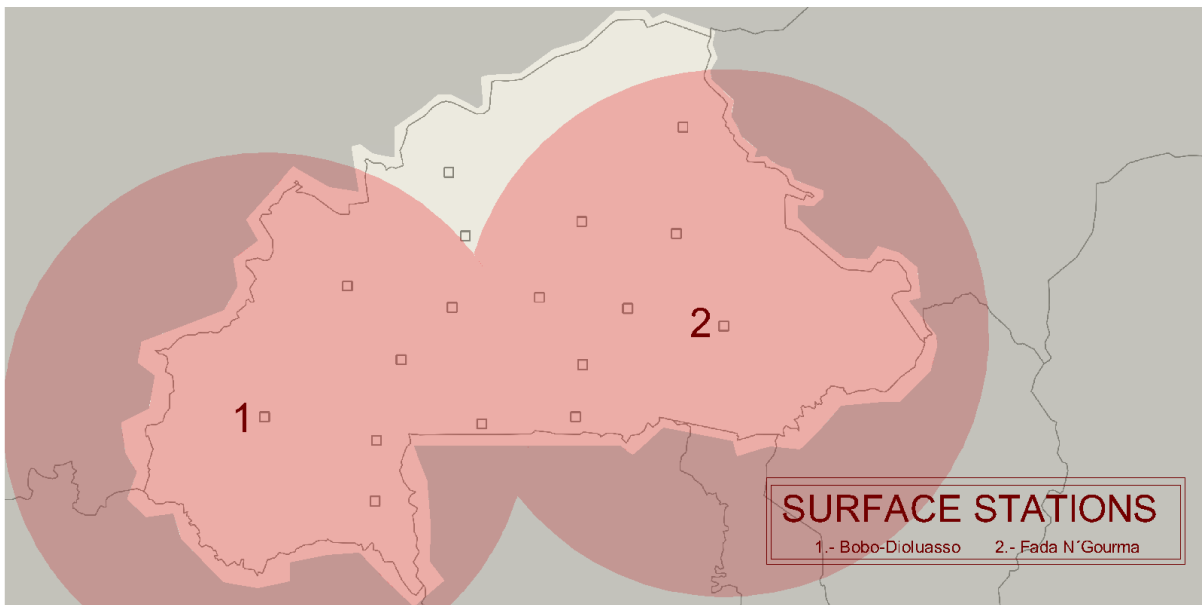


Figure 2 - Upper air stations proposed with 250 km radius circles. 1- Bobo Dioulasso for improvement from pilot sounding. 2- Fada N´Gourma for a new radiosonde site

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

In Burkina Faso, hydro-meteorological services are provided by two Services: Meteorological Services are being provided by Agence Nationale de la Météorologie (ANAM) while Hydrological Services, by the Burkina Faso Hydrological Service. The ANAM is currently domiciled within the Ministry of Transport.

At present, there is no legal framework for ANAM or its operations, but it has transformed into an Agency of Government by Decree (Décret N°2016-1157/PRES/PM/MTMUSR/MINEFID). Nevertheless, the functions/responsibilities of the Agence Nationale de la Météorologie (ANAM) in its present format include but are not limited to the following:

1. Continue to improve the coverage of the national territory by our network of weather stations and its modernization to ensure the continuous availability of quality climate data.
2. Ensure a National Weather Watch 24 hours a day, allowing uninterrupted monitoring of the entire territory with the issuance of weather bulletins and alerts on sensitive and / or dangerous weather phenomena for the benefit of populations through all available communication channels.
3. Provide government and decision-makers with reliable weather and climate information that is as accurate as possible to inform decision-making.
4. Contribute effectively to the protection of lives and property by actively participating in early warning systems on multi-hazard risks.
5. Contribute significantly to sustainable development by acquiring capacities to provide on-demand services for the benefit of all climate-sensitive socio-economic sectors, including Buildings and Public Works, Energy, Mining, Transport, Tourism and Leisure, etc.”

ANAM in recent years has benefited and participated in the implementation of some internationally funded HydroMet projects, such as Hydromet, Climate Risk Early Warning Systems (CREWS), Flood and Drought Management and Early Warning for Climate Change Adaptation in the Volta Basin (VFDM), Building Resilience and Adaptation to Climate Disasters (BRACED) and Intra-ACP Climate Services and Related Applications (ClimSA) projects.

There are some partnerships with other Government institutions but without formal agreement. This results in a lack of coordination across the institutions producing HydroMet information with those that require products, services, and their applications. This requires the ANAM to facilitate consultations to find and develop a national mechanism to coordinate the use of weather, climate, and water information. For effective partnership, there is need for more collaboration and partnership for efficient service delivery. There is no specific legislation restricting private organizations from the provision of hydrometeorological information and services to the NMHS alone in Burkina Faso.

The cooperation between ASECNA and ANAM has been positive and continues to evolve. As with many regional partnerships involving multiple institutions and countries, implementation is influenced by differences in governance structures, regulatory frameworks, operational procedures, and national priorities. Additional challenges include the coordination of resources, technical capacities, and funding mechanisms across participating entities. Nevertheless, these

factors have not prevented steady progress, and both organizations remain committed to reinforcing their collaboration through enhanced coordination mechanisms, joint planning, and continuous technical cooperation.

The following private operators have been identified as potential partners for ANAM:

1. SOS ENERGIE Burkina Faso: focus on training and awareness project on climate change. It aims to promote sustainable development, renewable energies and income-generating ecological activities.
2. Nuru Burkina Faso: Nuru works with agribusinesses, putting agricultural value chains to work to boost incomes for people experiencing extreme poverty is exactly the kind of possibility-shifting investment that the Dovetail Impact Foundation is proud to support.
3. Fondation Naturama: this is an independent organisation which aims to contribute to the conservation and sustainable use of natural resources in Burkina Faso in order to help improve the living conditions of the population.
4. Activ Environnement: a Burkinabé company specialized in the development of bioclimatic architecture in Burkina Faso. Its work aims to improve housing comfort through a sustainable development approach.

Recommendations

- i. Establishment of formal MoUs and agreements with government and non-governmental institutions involved in the weather and climate value chain.
- ii. Identify and build working relationships with companies operating in Burkina Faso who can contribute to the sustainability of GBON stations in their localities.

2.2. Assessment of potential GBON sub-regional collaboration

In the regional and international stage, ANAM is an active participant in regional programs such as Regional Climate Outlook Forum (RCOF), anchored by ACMAD and AGRHYMET; and also, ClimSA supported trainings, capacity building at AGRHYMET and ACMAD. There is informal relationship between ANAM and Research Institute but there is no evident joint research or existing collaborations projects.

Potential Regional Collaborators – Organizations

- **Alliance of Sahel States (AES) and other regional bodies:** The ANAM has a good partnership and working relationship with meteorological services within the region. They maintain an active membership of the African Ministerial Conference on Meteorology (AMCOMET) and regularly participates in the Regional Climate Outlook Forum (RCOF), which underscores their dedication to regional meteorological cooperation and advancement. These existing partnerships, relationships, and collaborations, if further strengthened, will contribute to improved service delivery for ANAM.
- **AGRHYMET and ACMAD:** Burkina Faso shares border with Niger, which play host to both AGRHYMET (a Regional Climate Centre for West Africa) and the African Centre of Meteorological Application for Development (ACMAD – a Continental Climate Centre). These centres have been instrumental in providing technical training to ANAM and will be in a good place to keep supporting the Agency during after SOFF implementing phase.

Regional partners are expected to play an active operational and technical role throughout and beyond the SOFF implementation phase. Their contributions include delivering specialized technical training, supporting the implementation of WMO standards and recommended practices, facilitating regional coordination, promoting data exchange and interoperability, assisting with quality management and network monitoring, and providing technical advice on the operation and maintenance of observing systems. They also contribute to peer learning, knowledge sharing, and the long-term sustainability of national meteorological services by fostering regional cooperation and strengthening institutional capacities.

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

Annual salaries budget for ANAM personnel comes from the Government via the Ministry of Transport, as the ANAM does not generate any revenue on its own. Also, the revenue has been decreasing over the years. A small percentage of ASECNA revenue is paid to the Ministry of Transport, from which ANAM get its budgetary allocations. As of 2024, the annual budget of ANAM (covering salaries, operations, investment, etc.) stood at \$5,773, 624. As a result, ANAM requires more support in human and infrastructure development to meet its obligations, especially regarding the provision of early warnings for current weather, climate and water threats and future climate- and water-related impacts. Closing these capacity deficits would have positive impacts on their contributions to national socio-economic development.

It is therefore recommended that the observation network in Burkina Faso that are GBON-compliant continues to be publicly owned. ASECNA has, over the years, operated some of the stations that are designated for GBON. Therefore, opportunity to improve on the existing commercial partnership with ASECNA should be explored to sustain these surface and upper air stations.

The partnership with the Climate Risk and Early Warning Systems (CREWS), as well as other international development partners in projects to improve the density of the observation network in Burkina Faso, which includes rehabilitating climate stations, installing automatic stations, training forecasters and meteorologists should also be considered an integral part of the sustainability plan for all GBON stations.

SOFF represents the primary strategic investment for achieving and sustaining GBON compliance in Burkina Faso. Its support provides the critical baseline infrastructure, institutional capacity, and operational framework required for a sustainable national observing system. Investments from other development partners should be considered complementary, leveraging the foundation established by SOFF to further enhance network density, operational resilience, technical expertise, and the delivery of high-quality meteorological observations. This coordinated approach maximizes the effectiveness of international investments while ensuring the long-term sustainability of the national observing network.

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

The observational structure of the ANAM consists of 10 ground-stations but just 2 are manned (Ouagadougou and Bobo Dioulasso). There are 2 Upper-Air stations, but 1 is functional (Bobo Dioulasso) with only wind parameter being received by GRAW, while the other one at Ouagadougou is completely down. There are 22 Automatic Weather Observing Station (AWS) observation station in Burkina Faso. The ANAM has not started to implement a Quality Management System.

ANAM has 10 functional ground-based observation stations: 2 Upper-Air stations (1 operational, not transmitted internationally) and 323 AWS. The 10 land stations are registered with GBON and are currently transmitting data to WDQMS and are already in compliance with GBON regulations in terms of data exchange.

There is Satellite Receiving System for nowcasting and specialized products (PUMA & CLIMSA). There are also internet facilities. However, there are no additional observations used for nowcasting and specialized purposes, as ANAM does not issue nowcasting.

ANAM is currently implementing newer approaches to observations (automated and digital instruments) in line with WMO guidelines and recommended practices. The ANAM network of observation is about 80 percent automatic stations, presently operational and are transmitting data to the GTS via Niamey – Dakar to Morocco (GISC). There is no National WIGOS Implementation Plan adopted/approved.

Previous development initiatives have made substantial investments in Burkina Faso's hydrometeorological infrastructure. In particular, the World Bank- and Green Climate Fund-financed HYDROMET project rehabilitated and equipped meteorological stations, constructed new synoptic facilities, strengthened forecasting and data-management systems, and developed ANAM's technical and maintenance capacities. CREWS and other WMO-supported initiatives complemented these investments through observing-network diagnostics, WIGOS and GBON guidance, data-exchange improvements, technical training, and the preparation of an Operation and Maintenance Plan. Nevertheless, project completion assessments have identified continuing risks related to recurrent O&M financing, access to spare parts and consumables, specialized technical maintenance, equipment management, communications, and the institutionalization of standard operating procedures.

SOFF support should therefore be regarded as a priority investment to protect and operationalize these earlier capital investments. By financing the recurrent operation, preventive maintenance, international data exchange and performance monitoring of the designated GBON stations, SOFF can help ensure that installed infrastructure delivers sustained, reliable and GBON-compliant observations rather than becoming dependent on intermittent project-based support.

The central issue is therefore not simply the absence of stations. Previous projects have created a substantially improved infrastructure base. The ***remaining challenge*** is to ensure that a ***selected core network can reliably collect, transmit and internationally exchange GBON-compliant observations over the long term.***

It is recommended:

- Ensure the maintenance of existing equipment, define a maintenance plan, and formalize an agreement with the private sector.
- Use the horizontal cooperation mechanism **available in the region** to exchange experts related to the calibration and maintenance of equipment.
- Analyze the establishment of a technical team with maintenance experts.
- Development of National WIGOS Implementation Plan.

2.5. Review of the national legislation of relevance for GBON

Decree Décret N°2016-1157/PRES/PM/MTMUSR/MINEFID mandated Agence Nationale de la Météorologie (ANAM) with the responsibility of ensuring the continued improvement in the coverage of the national territory with network of weather stations and its modernization to ensure the continuous availability of quality climate data, as well as ensuring a National Weather Watch 24 hours a day, allowing uninterrupted monitoring of the entire territory. The Agency is also responsible for the issuance of weather bulletins and alerts on sensitive and/or

dangerous weather phenomena for the benefit of populations through all available communication channels. Whereas all hydrological services are overseen by the Burkina Faso Hydrological Service.

DECRET N°2017-0049/PRES/PM/MINEFID – (portant procédures de passation, d'exécution et de règlement des marchés publics et des délégations de service public.), provides guidance on public procurement procedures and processes for Burkina Faso. The document addressed procurement by third parties or donor agencies in Article 30 under Section 2: Des entités de contrôle et de régulation des marchés publics et des délégations de service public. The section specified that:

- i. If the donor agency requires a prior review of the procurement process, the related documents are not subject to prior review by the national control structure.
- ii. If the procurement is jointly financed by external resources and state resources:
 - a. If the donor agency's contribution is greater than the state's, the process is not subject to prior review by the national control structure.
 - b. If the state's contribution is greater, the national control structure must provide prior approval, provided this does not conflict with the financing agreements.
- iii. If the procurement is entirely financed by the national counterpart to external funding, it remains subject to prior review by the national control structure.
- iv. If the donor agency does not require prior or post-review and aligns with national procedures, the procurement process is subject to prior review by the national control structure, provided it does not conflict with financing agreements.
- v. Direct agreement procedures for specific services are subject to authorization by the competent authority after review by the national control structure, regardless of the source of funding.

For SOFF projects, the Implementing Entity (IE) will be expected to follow the rules of UN procurement process and focuses on competitive, fair, and transparent purchasing of goods, services, and transport. This covers national and international shipments, which are managed through the IE's Logistics Division (Procurement service), responsible for contracting land, sea, and air transport services for timely delivery. All procurement will operate under UN Financial Regulations, the UN Procurement Manual, and the IE's own procurement policies, which will together serve as the governing framework.

During the compliance phase, ANAM may face several constraints related to the procurement and timely availability of consumables and spare parts required for the operation of GBON stations. Burkina Faso is a landlocked country, and international procurement processes can be affected by long lead times, customs procedures, limited availability of specialized meteorological equipment, and fluctuations in international supply chains. In addition, some station components are proprietary and can only be sourced from specific manufacturers, increasing procurement complexity and delivery times.

To mitigate these risks, ANAM intends to establish framework procurement arrangements where feasible, maintain minimum stocks of critical consumables and high-failure spare parts, standardize equipment as much as possible to reduce the diversity of spare parts required, and strengthen preventive maintenance practices. SOFF support during the implementation and compliance phases will also contribute to developing procurement planning, maintenance schedules, and inventory management procedures, while strengthening national technical capacity. These measures are expected to reduce equipment downtime and facilitate a gradual transition towards nationally funded operation and maintenance.

Module 3. GBON Infrastructure Development

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

The National Meteorological Office (ANAM) is responsible for operating and maintaining 323 surface weather stations deployed throughout the country and 3 Upper-air stations. The network of meteorological observations comprises manual and automatic stations. Manual observations are carried out by observers every three hours at the synoptic stations, every hour at the aeronautical stations, once a day at the climatological stations, and every ten minutes at the automatic weather stations.

ANAM stations are classified as follows:

- 10 aeronautical and synoptic,
- 0 synoptic,
- 6 climatic (thermo-pluviometric)
- 14 agrometeorological
- 323 Automatic (AWS)
- 3 UA

The following table provides details of ANAM's network of surface and high-altitude observing stations. 285 stations have been declared in OSCAR, of which 27 are integrated in the WIGOS system.

ANAM plans to implement the WIS2.0 system, which will facilitate the dissemination of information from the stations that will be included in GBON.

Station type	Total stations	OSCAR/Surface		WIS 2.0 (Stations with interchange)	WDQMS
		Declared status	Evaluated status		
Surface	285	285	28: partly operational 5: operational 2: silent 250: unknown	27	27
Upper-air	3	0	0	0	0

Table 2: Details of the network of surface and upper-air observation stations

3.1.a. Surface and height observation network and list of new or rehabilitated stations.

The following table shows the surface stations planned for the GBON network in Burkina Faso.

Station Name	WIGOS-ID	Station type (S/UA)	Owner (NMHS/ 3rd party)	Funding source	GBON Compliant (Y/N)	Type	Installation Date	Required
Kaya	0-854-0-045 primary	S	ANAM	ANAM	N	Climatologic	2017-01-01	Improvement
Koudougou	0-854-0-049 primary	S	ANAM	ANAM	N	Synoptic	2017-01-01	Improvement
Leo	0-854-0-053 primary	S	ANAM	ANAM	N	Agrometeorologic	2016-01-01	Improvement
Tenkodogo	0-854-0-093 primary	S	ANAM	ANAM	N	Climatologic	2017-01-01	Improvement
Bobo Dioulasso - Airport	0-20000-0-65510 primary	S	3rd party	International ASECNA	N	Aeronautic /Synoptic	1927-01-01	Improvement
Niangoloko	0-854-0-070 primary	S	ANAM	ANAM	N	Synoptic	2017-01-01	Improvement
Ouagadougou-airport	0-20000-0-65503 primary	S	3rd party	International ASECNA	N	Aeronautic /Synoptic	1952-01-01	Improvement
Bobo Dioulasso Airport	0-20000-0-65510 primary	UA	3rd party	International ASECNA	N	Radiosonde station (PTUV)	-	Improvement
Fada N'Gourma	0-20000-0-65507 primary	UA	ANAM	ANAM	N/A	Radiosonde station (PTUV)		New

Table 3: List of new or improved surface observation stations and upper-air observation stations.

3.1.b. List of instruments and observation systems by site

The technical evaluation of GBON's surface station network indicated that 7 of the automatic stations should be upgraded, 1 upper-air station should be upgraded and 1 upper-air station should be acquired and installed, including infrastructure and civil works. Additional information on instruments can be found in annex 1.

Station name	Pressure	T/H	Wind (direction and intensity)	Precipitation (amount and Intensity)	Datalogger	Communications protocol
Ouagadougou- airport	X	✓	✓	X	X	GSM/GPRS
Kaya	✓	✓	✓	✓	✓	GSM/GPRS*
Koudougou	✓	✓	X	✓	X	GSM/GPRS
Leo	✓	✓	✓	✓	X	GSM/GPRS
Tenkodogo	✓	✓	✓	✓	X	GSM/GPRS
Bobo Dioulasso Airport	X	X	X	X	X	GSM/GPRS
Niangoloko	✓	✓	✓	✓	X	GSM/GPRS
Bobo Dioulasso Airport	X	X	X	X	X	** UHF Radio
Fada N'Gourma	X	X	X	X	X	UHF Radio

Legend: ✓: Working X: Renew/New Acquisition

Table 4: Current status of the instrumentation that makes up the AWS observation systems by site

**It is necessary to use the BUFR format in the data files.*

***These stations automatically record meteorological data and transmit it via GPRS/2G/3G/4G/ to a data hub at ANAM headquarters at set intervals without any human intervention.*

The technical evaluation also included an analysis of other important components that make up the observation system at each of the stations that will make up the GBON network, as shown in the following tables.

Stations name	AWS	Power supply	Solar panels	Battery	Lightning rod	Grounding system	Terminal and junction box
Ouagadougou-airport	✓	✓	✓	✓	✓	✓	✓
Kaya	✓	✓	✓	✓	✓	✓	✓
Koudougou	✓	✓	✓	✓	✓	✓	✓
Leo	✓	✓	✓	✓	✓	✓	✓
Tenkodogo	✓	✓	✓	✓	✓	✓	✓
Bobo Dioulasso Airport	✓	✓	✓	✓	✓	✓	✓
Niangoloko	✓	✓	✓	✓	✓	✓	✓
Bobo Dioulasso Airport	✓	✓	✓	✓	✓	✓	✓
Fada N'Gourma	X	X	X	X	X	X	X

Caption: ✓: In good or functional condition X: Does not currently exist.

Table 5: Current status of other components (I) that make up the observing systems per site

Stations name	AWS Mast	Bracket T/H	Support for the Pluviometer	Perimeter fence	Support of the solar panel	Cabin for the batteries	AWS Mast and Accessories
Ouagadougou-airport	✓	✓	✓	✓	✓	✓	✓
Kaya	✓	✓	✓	✓	✓	✓	✓
Koudougou	✓	✓	✓	✓	✓	✓	✓
Leo	✓	✓	✓	✓	✓	✓	✓
Tenkodogo	✓	✓	✓	✓	✓	✓	✓
Bobo Dioulasso Airport	✓	✓	✓	✓	✓	✓	✓

Niangoloko	✓	✓	✓	✓	✓	✓	✓
Bobo Dioulasso Airport	✓	✓	✓	✓	✓	✓	✓
Fada N'Gourma	X	X	X	X	X	X	X

Legend: ✓: In good or functional condition X: Deteriorated or does not currently exist.

Table 6: Current status of other components (II) that make up the observing systems.

3.1.c. Investments and activities necessary for the installation of new stations and the improvement of existing stations.

In order to explain clearly and thus achieve a better understanding of the process designed for the implementation of the investments and activities necessary for the installation and rehabilitation of the new and existing stations that will make up the GBON network, it is necessary to divide the observation network into several systems, adapting them to the specific needs of each of the surface stations. The aforementioned systems are:

- ✓ Sensor system.
- ✓ Power supply system.
- ✓ Communications system.
- ✓ Infrastructure.

• Sensor system

The technical evaluation of the sensors indicated that 8 stations, the useful life of some of the sensors is almost at its maximum.

Stations name	Atmospheric pressure	Temperature/ Humidity	Wind speed/ direction	Precipitation: Amount/ Intensity	Datalogger
	600-1060 hPa	-40 °C +60 °C/ 0-100 %	0-75 m/s / 0-360 °	0-500mm/h	
Ouagadougou-airport	✓	✓	✓	✓	✓
Kaya	✓	✓	✓	✓	✓
Koudougou	✓	✓	✓	✓	✓
Leo	✓	✓	✓	✓	✓
Tenkodogo	✓	✓	✓	✓	✓
Bobo Dioulasso Airport	✓	✓	✓	✓	✓
Niangoloko	✓	✓	✓	✓	✓

Bobo Dioulasso Airport	✓	✓	✓	✓	✓
Fada N'Gourma	n/a	n/a	n/a	n/a	n/a

Caption: ✓: Needs immediate rehabilitation X: Does not need immediate

Table 7: Instrumentation system upgrade

* New acquisitions should be n/a

- **Power supply system**

All surface stations are currently solar powered. The equipment is in good working order and only the acquisition of the power system for the new UA station is contemplated.

- **Communications system**

ANAM will need to acquire two computer servers that will be required to host any applications related to the project, such as data retrieval, management and dissemination. One of these servers will mirror the other ensuring the system's operation at all times. One of the servers would be housed at ANAM Headquarters in Ouagadougou, and the other at Bobo Dioulasso Airport.

ANAM's weather stations will have a GPRS modem, depending on coverage or availability. It is expected that in the near future all GBON stations in the Burkina Faso will be using WIS 2.0 technology.

- **Infrastructure**

The assessment concluded that the proposed GBON stations require complete renewal following a detailed technical evaluation of their current condition rather than solely their age. Most of the existing automatic stations were installed under previous development projects and have now reached a stage where several critical components are approaching the end of their operational life. In addition, the equipment consists of different generations and manufacturers, making the long-term procurement of compatible spare parts increasingly difficult and less cost-effective.

While replacement of individual components could temporarily restore functionality in some cases, this approach would not necessarily ensure the long-term reliability, maintainability and GBON performance required throughout the compliance period. The proposed investment therefore aims to establish a standardized network based on modern equipment, reducing maintenance complexity, simplifying spare-parts management and improving operational sustainability.

The final procurement strategy will be determined during project implementation in accordance with the Implementing Entity's procurement rules. Where a technical assessment demonstrates that rehabilitation through replacement of specific components represents a more efficient and economically justified solution, this option will be considered, provided that it ensures compliance with GBON performance requirements and long-term operational sustainability.

- **Investment Proposal**

Taking into account the necessary components previously analyzed and detailed, the investment proposal for the rehabilitation of the selected stations and the acquisition of the new station that will make up the GBON surface network is presented below, considering that the estimated prices included in the following table are those

corresponding to factory costs as of July 2024. Customs, taxes, operational expenses, etc., should be considered.

Goals	Component	Amount	Cost (USD)
Spare parts for automatic weather stations	Atmospheric pressure	5	26,000
	Air temperature	5	11,500
	Relative Humidity		
	Wind speed	5	4,000
	Wind direction	5	4,500
	Precipitation	5	5,700
	Datalogger	8	29,300
	Accessory kit	8	24,000
Full Synoptic weather stations	7 Complete weather stations with data logger and sensors for temperature, relative humidity, rainfall, solar radiation and ultrasonic wind speed, support, Atmospheric pressure...	2	70, 000
	Installation costs	2	16,000
Power Supply System	Diesel Generator	2	40,000
	Solar Kit	9	108,000
	Materials for the support of the Solar Panel Kit	9	14,400
	Battery bank	9	19,800
	Battery Cabin	9	5,850
	Materials for channeling and wiring	9	26,550
	Accessories for electrical distribution board	9	27,000
	Solar Regulators	9	9,000
	Installation costs	9	55,700
Grounding system and lightning rod	Active lightning rod	9	63,000
	Lightning rod installation kit	9	27,000
	Pole	9	22,500
	Accessories for ground connections	9	18,000
	Protection against transients	9	27,000

	Installation costs	9	76,800
Communications System	Router FortiGate 200G and Gigabit Switch	2	14,000
	Optical fiber Cabling and internet connexion	12	55, 000
	Tools, accessories and materials for installation	9	6,750
	Installation and training costs	9	25,000
Infrastructure system	Perimeter fence(parc) and support for AWS	9	158,000
	Installation accessory kit	6	9,000
	Installation costs	9	25,000
			1,023,950

Table 8: Investment proposal for the improvement of existing facilities, acquisition of spare parts and installation of the new requirements.

Goals	Items	Total Cost (USD)
Buildings and Facilities (Infrastructure and protections systems)	Infrastructure	113 200
	Shock protection system	40,000
	off-road maintenance vehicles	175, 000
	Grounding system	20,000
	Accessories for electrical supply	9,000
	Electric generator	40,000
	Direct water supply system	7,000
Hydrogen generation system	Hydrogen generator	679,000
Hardware, Power Supply and Communications Systems	radiosonde system	158,000
	Hardware	5,000
	Execution Costs	59,300
Parts and consumables	Consumables	1,587,000
		2,892,500

Table 9: Investment proposal for the improvement of existing facilities, acquisition of spare parts and installation of the new requirements.

Activities required for the installation and improvement of meteorological stations

All actions described in the following table that do not fall under the direct responsibility of ANAM will be accompanied, monitored and validated by ANAM.

Activities	Actions
1. Re-evaluation of field conditions at project start date.	1.1 Review visit of the conditions/condition of the equipment to be refurbished and survey of the area for the installation.

2. Procurement of materials and equipment	2.1 Procurement Process by the Implementing Entity
3. Station identification, evaluation and preparation	3.1 Field visit to plan the design of the installation of the different systems
	3.2 Execution of the required basic civil works
4. Equipment installation	Installation of meteorological instrumentation Installation of communications systems Installation of the Solar Energy Kit Assembly and certification of the grounding system and lightning arrester acquired. Sensor and communications testing

Table 10: Phases of distribution of the actions to be carried out for the fulfillment of the planned activities in the installation of the surface observation networks (new and rehabilitated).

Activities	Actions
Acquisition of materials and equipment	1.1 Acquisition Process by the implementing entity
	1.2 Transfer of equipment
Station identification, evaluation and preparation	2.1 Visit of technical specialists to the station to plan the design for the assembly of the different systems
	2.2 Execution of the required basic construction works
	2.3 Technology and knowledge transfer
	3.1 Assembly and certification of the acquired grounding and lightning rod system
	3.2 Assembling the purchased power supply system
	3.3 Assembly of the acquired communications systems
Preparation of equipment for installation	4.1 Configuration and assembly of radiosonde station equipment
	4.2 Transfer of radiosonde station equipment
Equipment installation	5.1 Installation of the purchased instrumentation system

	5.2 Checking the rest of the subsystems that constitutes the observation system
	5.3 Certification of radiosonde station security systems
	5.4 Communication test and correct operation of the installation
Other activities necessary to complete the observation system	6.1 Training of on-site personnel in required observation practices
	6.2 Monitoring of the tasks necessary for the correct operation of the station according to the essential requirements for a station in the GBON.

Table 11: Phases of distribution of the actions to be carried out for the fulfillment of the planned activities in the installation of the UA observation networks (new and rehabilitated).

3.1.d. Observational practices for the observation network.

The optimal performance of a surface observation network depends on the skills, training and competencies of the technical personnel responsible for the network. The main tasks include installation of instrumentation and communication systems, maintenance of instruments and other systems, as well as fault diagnosis, repair of defective systems and monitoring of the performance of communication and instrumentation systems.

Equally important, understanding the operation of meteorological sensors and observation methods, classifying sites for specific variables, performing preventive and corrective maintenance of sensors, and other systems in accordance with Standard Operating Procedures (SOPs) to ensure the quality and availability of observations, as well as sensor calibration and metadata management.

ANAM ensures that the personnel of the stations where AWS are installed or rehabilitated are responsible for the first level of maintenance. To this end, they will receive training on the operation and maintenance of automatic weather stations. It is also very important the availability of an instruction manual for these same personnel, which must be in tune with the standard operating procedures (SOP) to guarantee the quality and availability of the observations, as well as the minimum GBON requirements.

3.1.e- Preliminary maintenance plan for existing stations and new upgrades, including calibration practices

To ensure that the quality of observations from the automatic weather stations is maintained at the level required throughout their useful life by the standards established by the World Meteorological Organization (WMO), a specific maintenance plan will be developed for the ground-based surface observation stations that will make up ANAM's GBON network. Efficiency in the maintenance of the meteorological stations will depend to a large extent on the existence and availability of spare parts accessories.

ANAM has been managing the current observation network since its foundation, thus ensuring the availability of data for national and international exchange, with limited resources. The country is continuously affected by extreme natural phenomena, which, added to the deficit of sensors and spare materials needed due to the low institutional budget, hinders the stable operation of the surface observation networks.

GBON imposes strict data availability and quality requirements that are very difficult to maintain stable with current resources. It is recommended that during this process the capacity of the Meteorological Technical Assistance Department be improved, as well as the collaboration with other meteorological services in the region that have a Calibration Laboratory, which will allow the calibration of the semi-patterns used in the calibration of the stations. In order to guarantee compliance with the minimum requirements demanded by the GBON network, as well as the stability in the operation of said network.

On the other hand, the very organization of the surface meteorological observation system in the Burkina Faso means that the response time for the restoration and maintenance activities of the surface stations in the face of all types of threats or extreme situations is short, as long as the necessary resources are available for their mitigation.

The specialized technical part is currently concentrated at the Institution's Headquarters, located in Ouagadougou, with the Meteorological Technical Assistance Department, which is responsible for:

- Performing preventive and corrective maintenance on weather stations and associated equipment;
- Coordinating the logistics of technical and operational missions in the field;
- Administering digital systems, servers and weather and climate databases;
- Supervising the operation of the high-performance computing (HPC) system for modelling and forecasting purposes;

- **Maintenance**

ANAM's planned maintenance intervals and activities are defined for each observing system independently, all in accordance with WMO manuals, guidelines and SOPs and as recommended by equipment manufacturers or suppliers.

It would be necessary to contemplate in this system the possibility of having additional spare parts for each of the installed stations (whether or not they need immediate rehabilitation), in order to facilitate subsequent calibration, maintenance and breakdown cycles, thus making these processes feasible and optimizing them and reducing response times. This would also provide a great solution to the main sustainability problem of the institution, which is the acquisition of spare parts.

For a correct explanation of the design of the maintenance plan, which is composed of two fundamental stages: corrective maintenance and preventive maintenance.

ANAM performs station inspections twice a year, in which data and instruments are validated. If necessary and possible, the calibration of any sensor with problems will be performed in the field. When the problem cannot be solved in situ, the sensor is removed so that it can be replaced.

ANAM plans to implement a daily first monitoring schedule, as well as preventive maintenance every 90 days (3 months) for GBON stations according to their national operation and available resources. Corrective maintenance activities are performed to address technical or communication failures of GBON stations. Network failures are expected to be attended to within no more than three days to ensure that the station meets the WMO's and the country's monthly data availability performance target.

Currently, all installation and maintenance activities are performed by the technical team located at ANAM's headquarters in Ouagadougou, but the implementation of the maintenance plan is subject to the availability of the field test equipment, transportation, and human resources.

Items	Number of visits per year	Number of stations	Total visits per year	Annual cost (USD)	Total Cost (4 years) (USD)
Preventive maintenance. Calibration	4	4	16	9600	38400
Corrective maintenance	1	4	4	4000	16000
Rain gauge calibration kit (2 units)	n/a				600
Totals				8400	55000

Table 12: Estimation of operating maintenance costs

The expenses considered in the above table contain prices corresponding to factory costs as of July 2024, and/or without taxes, operating expenses, etc., which should be taken into account.

Calibration will also be performed throughout the year. Corrective maintenance will be performed as needed.

Level	Description	Surface tasks (examples)	Upper Air tasks (examples)
1	Basic tasks requiring few consumables or parts carried out by local staff every month	Clean TH Shelter. Clean the rain gauge. Check wiring, cabinets, good visual conditions of wind sensors. Check cabinet warnings Cut grass/vegetation	Attach sondes and launch balloons. Change over hydrogen cylinders. Moderately complex tasks carried out by staff following standard operating procedures (SOPs). Tools, parts and consumables will be required. Specific instruction on hydrogen safety.
2	Technical preventive tasks carried out by staff following SOPs every three months. Tools, parts and consumables may be required. Basic meteorological technician training needed	Collect station metadata Replace sensors Verify performance of sensors	Ensuring daily and semi-annual preventive maintenance, as well as corrective maintenance

3	Specialized maintenance actions carried out by trained staff every time corrective maintenance happens. Procedures are complex and Advanced meteorological technician training needed	Replace infrastructure Set up and configure new equipment and sensors. Advanced fault-finding	National training of personnel in the various systems that require maintenance at the radiosonde station
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Table 13– Typical maintenance tasks

- **Calibration**

ANAM has mobile instrument and/or meteorological sensor calibration equipment to calibrate temperature, humidity and pressure sensors.

Calibrator	Pattern	State
Temperature, humidity and pressure	PTU digital calibrator	Good

Table 14: Current status of sensor calibration equipment

The budget in table 12 includes the acquisition of two rain gauge calibration devices.

For the calibration of wind sensors, it will be necessary to implement sub-regional collaboration on the NMHS that can be provided by external calibration.

Unless the manufacturer's specifications state otherwise, wind sensors can be calibrated every 18 months.

ANAM proposes to carry out the activities included in the following table.

Activities	Shares
Capacity building in the different systems of the observation network	Design of procedures aimed at achieving good housekeeping practices for sensor verification and repair. 1.2 Edition of a maintenance and fault control manual Training of personnel on the various observation network equipment
Performing maintenance	2.1 Ensuring daily monitoring (with first-level maintenance if necessary) 2.2 Quarterly maintenance assurance (Calibration shall also be performed at the last maintenance of the year) 2.3 Corrective maintenance assurance

Table 15: Phases of distribution of the actions to be carried out to keep the GBON stations in good condition.

3.1.f. Technical specifications of new instruments and observation systems for the acquisition process.

a.- Atmospheric Pressure

ID	Requirement Heading	Requirement
27	Measurement Range	The measurement range must be 500 – 1080 hPa (for both station pressure and mean sea level pressure). [The NMHS may adapt this range in response to expected pressure range for the installation region]
29	Sensor Performance Constant	The instrument time constant, under controlled conditions must be 2 s or shorter.
31	Operational Conditions	As a minimum, the equipment installed outdoors must be capable of operating in a Temperature Range [–40 °C to +55 °C], Humidity Range [0–100 %RH, Non-condensing] and Wind Speed up to 50 m/s. Resistance to (vibration) shocks must be included. The NMHS may modify this requirement to meet meteorological conditions normally expected.
508 (and 40)	Achievable Sensor Uncertainty	The sensor uncertainty must be 0.15 hPa or better. For the tendency it must be equal or better than 0.2 hPa. Maximum difference: 0.3 hPa/year [Normal Use]. No more than 0.3 hPa/30 °C temperature change. For the tendency it must be equal or better than 0.2 hPa. Hysteresis less than 0.3 after change of 50 hPa and back again.
42	Static Head	To achieve the required uncertainty of the pressure measurements, a static head, should be used. If used, the static head should be located in an open environment, not affected by the proximity of buildings. The supplier should provide documentation specifying any additional uncertainty introduced by the use of their static head.
502	Sensor Type	The sensor/instrument for measuring pressure must be based on an electronic pressure sensor. However, any sensor type compliant with the requirements in this section must be considered.
524	Temperature Correction in Calibration	If the instrument is applying a correction for the ambient air temperature (measured internally or with a separate thermometer), the temperature compensation function should be fully taken into account in the calibration procedure.
28	Reporting Resolution	The resolution of reported measurement and tendency must be 0.1 hPa.
30	Sampling Frequency	The pressure should be sampled at least 4 times over the interval of the sensor time constant. For example, if the sensor time constant is 2 seconds, then there should be a sample at least every 0.5 s.
56	Units	Whatever physical quantity measured, pressure must be presented in/by the instrument/ system in hectopascals (hPa).
32	Calculated Parameters	Averages of all valid samples of pressure must be produced over 1-minute intervals. The 1-minute average must be used as the instantaneous value for pressure.

35	Rate of Change Check	After each signal measurement, the current value should be compared to the preceding one. If the difference between two samples is more than 0.3 hPa, the current sample is identified as suspect and is not used for the computation of an average.
38	Stuck Sensor	If over a 60-minute interval the value of 1-minute values of pressure have not changed by 0.1 hPa, then the data should be flagged as suspect for further investigation.
39	Jump Check	If the difference between consecutive 1-minute averages is more than 0.5, the difference is more than 2 hPa, then the data should be flagged as erroneous for further investigation.
949	Derived Parameters	The pressure tendency should be determined using the difference between the current pressure measurement, and the pressure values over the previous 3 hours
1015	Derived Parameters 2	The NMHS may request that QFE and QNH be calculated by the sensor, as well as statistics (maximum, minimum, standard deviation) to meet local or Regional Association requirements. These should be outlined here.
1123	Derived Parameters 3	A Mean Sea Level should be determined, and WGS-84/EGM96 be applied to determine the altitude (to which the station pressure relates) with respect to Mean Sea Level

b.- Air Temperature

ID	Requirement Heading	Requirement
1	Measurement Range	The measurement range must be -80 °C to +60 °C.
4	Sensor Performance Constant	The instrument time constant under controlled conditions must be 20 s or shorter over the entire operational range. For field measurements in non-actively aspirated radiation screens this may not be achievable.
6	Operational Conditions	As a minimum, the equipment installed outdoors must be capable of operating in a Temperature Range [-40 °C to +55 °C], Humidity Range [0-100 %RH, Non-condensing] and Wind Speed up to 50 m/s. Resistance to (vibration) shocks must be included. A NMHS may modify this requirement to meet meteorological conditions normally expected.
25	Sources of Error	The Tendered equipment must demonstrate that the following common sources of error have been adequately compensated for: a) Self-heating of the thermometer element b) Inadequate compensation for lead resistance c) Inadequate compensation for non-linearities in the sensor or processing instrument d) Sudden changes in switch contact resistance.
400	Achievable Sensor Uncertainty	The sensor uncertainty must be 0.2 °C or better.
2	Units	Whatever physical quantity is measured Air Temperature must be presented in/by the instrument/system in degrees Celsius (°C).
3	Reporting Resolution	The resolution of the reported temperature must be 0.1 °C.

5	Sampling Frequency	The air temperature should be sampled at least 4 times over the interval of the sensor time constant. For example, if the sensor time constant is 20 seconds, then there should be a sample at least every 5 seconds,
7	Calculated Parameters	Averages of all valid samples of Air Temperature must be produced over 1-minute intervals. The 1-minute average must be used as the instantaneous value for air temperature.
8	Observation Extremes	The maximum and minimum temperature 1-minute (average) temperature values measured over a 24-hour period must be determined [=daily maximum/minimum]. The time of occurrence must also be stored.
34	Rate of Change Check	After each signal measurement, the current value should be compared to the preceding one. If the difference between two samples is more than 2 °C, the current sample is identified as suspect and is not used for the computation of an average.
36	Jump Check	If the difference between consecutive 1-minute averages (calculated one minute apart) is more than 3 °C, then the data should be flagged as suspect for further investigation. If the difference is more than 10 °C, then the data should be flagged as erroneous for further investigation.
37	Stuck Sensor	If over a 60-minute interval the value 1-minute values of air temperature have not changed by 0.1 °C, then the data should be flagged as suspect for further investigation.
1012	NMHS Calculated Parameters	Additional Air Temperature Statistics should be requested by the NMHS, to meet local or Regional Association requirements. These should be inserted here.

c.- Humidity

ID	Requirement Heading	Requirement
69	Sensor Performance Constant	The instrument time constant under controlled conditions must be 40 s or better over the entire operational range. If used for Dewpoint Temperature measurement, then the sensor time constant must be 20 s. For the field measurements in non-actively aspirated radiation screens this may not be achievable.
160	Operational Conditions	As a minimum, the equipment installed outdoors must be capable of operating in a Temperature Range [-40 °C to +55 °C], Humidity Range [0-100 %RH, Non-condensing] and Wind Speed up to 50 m/s. Resistance to (vibration) shocks must be included. A NMHS may modify this requirement to meet meteorological conditions normally expected.
475	Sensor Type	The sensor/instrument for measuring RH should be based on an electrical capacitance measurement probes. Sensors for measuring Dew Point directly are usually based on dewpoint mirror. However, any sensor type compliant with the requirements in this section should be considered by the customer.
481	Achievable Sensor Uncertainty	The sensor measurement uncertainty must be better than 3 %RH. If the sensor reports directly a Dew Point Temperature, the sensor uncertainty must be 0.25 °C.

57	Units	Whatever physical quantity measured, humidity must be presented in/by the instrument/system in %RH.
61	Measurement Range	The maximum measurement range must be 0-100 %RH. If presented as Dew Point Temperature, the maximum temperature range must be -80 °C to +35 °C.
68	Reporting Resolution	The Reporting Resolution for humidity must be 1 %RH (or better). If reported as Dew Point Temperature, the reporting resolution must be 0.1 °C
138	Sampling Frequency	The humidity should be sampled at least 4 times over the interval of the sensor time constant.
139	Calculated Parameters	Averages of all valid samples of humidity must be produced over 1-minute intervals. The 1-minute average must be used as the instantaneous value for relative humidity
141	Rate of Change Check	After each signal measurement, the current value should be compared to the preceding one. If the difference between two samples is more than 5 %RH, the current sample is identified as suspect and is not used for the computation of an average.
142	Jump Check	If the difference between consecutive 1-minute averages is more than 10 %RH, then the data should be flagged as suspect for further investigation. If the difference is more than 15 %RH, the data should be flagged as erroneous for further investigation.
143	Stuck Sensor	if over a 60-minute interval the value of the one-minute values of RH have not changed by 1 %RH and RH < 95 %, then the data should be flagged as suspect for further investigation.
462	Dewpoint Temperature calculations from Air Temperature and RH	If Dewpoint Temperature is calculated from Humidity and Air Temperature, the 1 and 10-minute averages of Dewpoint Temperature should be calculated from the instantaneous Humidity and Air Temperature measurements, after which the averages for Dewpoint Temperature can be calculated. It is not allowed to calculate averages for Dewpoint Temperature from averages of Air Temperature and Humidity.
947	Derived Parameters	If relative humidity is measured, then a Dew Point Temperature should also be calculated, using the formula from the <i>Guide to Instruments and Methods of Observation</i> (WMO-No. 8), Volume I, Chapter 4, Annex 4.B.
1014	NMHS Calculated Parameters	Additional Humidity Statistics should be requested by the NMHS, to meet local or Regional Association requirements. These should be inserted here.

d.- Horizontal Wind Direction

ID	Requirement Heading	Requirement
71	Sensor Performance Constant	For Mechanical Wind Sensors, the Sensor Damping Ratio must be > 0.3.

157	Operational Conditions	As a minimum, the equipment (and supporting infrastructure) installed outdoors must be capable of operating in a Temperature Range [-40 °C to +55 °C], Humidity Range [0-100 %RH Non-condensing] and Wind Speed up to maximum wind speed required to be observed. Resistance to (vibration) shocks and lightning protection must be included. A NMHS may modify this requirement to meet meteorological conditions normally expected.
650	Sensor Type	The sensor/instrument for measuring WD must be an electrical recording wind direction instrument. The most common instruments in use are vanes, combined propeller anemometers/vane and ultrasonic instruments for measuring both wind speed and wind direction. However, any sensor type compliant with the requirements in this section must be considered. [[NMHS may edit if they have a preference for a particular sensor type]]
657	Achievable Sensor Uncertainty	The sensor uncertainty must be 5°.
973	Sampling Frequency	If the sensor is to be used to report wind gust, then wind speed should be sampled at 1 Hz or greater (4 Hz is preferred).
59	Units	Whatever physical quantity measured, Wind Direction must be presented in/by the instrument/system in degrees clockwise from true north.
63	Measurement Range	The maximum measurement range must be 0-360 degrees.
66	Reporting Resolution	The Reporting Resolution for Wind Direction must be 1 degree.
651	Wind Direction Sensor Orientation	Wind direction is defined as and must be reported as the direction from which the wind blows, and it is measured clockwise from geographical north, namely, true north (referred to the World Geodetic System 1984 (WGS-84) and its Earth Geodetic Model 1996 (EGM96)).
654	Practical Range	The maximum measurement range must be 0 – 360°. If two successive samples differ by more than 180°, the difference is decreased by adding or subtracting 360° from the second sample to obtain a wind direction between 0 – 360°.
78	Vector Averaging	Vector averaging should be used for the average values of wind speed and direction.
83	Minimum Data	At least 75% of the wind direction samples should be available to enable the computation of both the 2-minute and 10-minute averages. If insufficient data, the 2-, 10-minute average should be marked as invalid/missing.
87	Stuck Sensor	If the average values of wind direction do not vary by more than 10 degrees over a 60-minute interval, the data should be flagged as suspect for further investigation.

e.- Horizontal Wind Speed

ID	Requirement Heading	Requirement
70	Sensor Performance Constant	For a mechanical wind speed sensor, the distance constant must be in the range 2–5 m. [A distant constant is not required for an ultrasonic sensor]
73	Sampling Frequency	If the sensor is to be used to report wind gust, then wind speed should be sampled at 1z or greater (4 Hz is preferred).
158	Operational Conditions	As a minimum, the equipment (and supporting infrastructure) installed outdoors must be capable of operating in a Temperature Range [–40 °C to +55 °C], Humidity Range [0–100 %RH Non-condensing] and Wind Speed up to maximum wind speed required to be observed. Resistance to (vibration) shocks and lightning protection must be included. A NMHS may modify this requirement to meet meteorological conditions normally expected.
613	Sensor Type	The sensor/instrument for measuring Wind Speed must be based on an electrical anemometer. The most common instruments in use are cup anemometers, propeller anemometers and ultrasonic anemometers. However, any sensor type compliant with the requirements in this section must be considered.
619	Achievable Sensor Uncertainty	The sensor uncertainty must be 0.5 m/s for Wind Speed ≤ 5 m/s and 10% > 5 m/s.
60	Units	Whatever physical quantity measured, Wind Speed and Wind Gust must be presented in/by the instrument/system in metres per second (m/s).
64	Measurement Range	The maximum measurement range must be 0–75 m/s. In regions of extremely high winds, an extended range of 0–100 m/s should be requested. Wind Gust may reach 150 m/s.
65	Reporting Resolution	The Reporting Resolution for Wind Speed must be 0.5 m/s. The Reporting Resolution for Wind Gust (if measured) must be 0.1 m/s.
72	Calculated Parameters	Averages of all valid wind speed samples over 10-minute intervals must be produced. This 10-minute average must be used as the instantaneous value for wind speed. A standard deviation of wind speed must also be calculated. If the wind sensor is in support of an aerodrome, then an additional 2-minute average must be calculated.
74	Calculated Parameters 2	If an observation of wind gust is required, then this must be the running mean of all valid wind speed samples in a 3-second period.
77	Vector Averaging	Vector averaging should be used for the average values of wind speed and direction.
82	Minimum Data	At least 75% of the wind speed samples should be available to enable the computation of both the 2-minute and 10-minute averages. If insufficient data, the 2-, 10-minute average should be marked as invalid/missing
84	Rate of Change Check	If the difference between a wind speed sample and the preceding one is more than 20 m/s, then the data should be

		flagged as a suspect for further investigation and not used for the calculation of the average.
85	Jump Check	If the difference between consecutive 2-minute wind speed averages is more than 10m/s the data should be flagged as a suspect for further investigation. If the difference is more than 20m/s it should be flagged as erroneous for further investigation.
86	Stuck Sensor	If the average values of wind speed do not vary by more than 0.5 m/s over a 60-minute interval, the data should be flagged as a suspect for further investigation

f.- Precipitation Amount/Intensity

ID	Requirement Heading	Requirement
559	Sensor Type (Intensity)	The sensor/instrument for measuring precipitation intensity must be based on an electronic recording instrument. Any sensor type compliant with the requirements in this section must be considered. The Precipitation Amount and Intensity Sensor should be the same piece of equipment.
110	Collecting Gauge Orifice Area	In case the sensor/instrument for measuring Precipitation is based on collection of precipitation, the area of the collector orifice must be at least 200 cm ² and no larger than 500 cm ² . The area of the orifice must be known to the nearest 0.5%, and the construction must be such that this area remains constant while the gauge is in normal use. The construction must be such as to minimize wetting areas. The container must also have a narrow entract and be sufficiently protected from radiation to minimize the loss of water by evaporation.
159	Operational Conditions	As a minimum, the equipment (and supporting infrastructure) installed outdoors must be capable of operating in a Temperature Range [-40 °C to +55 °C], Humidity Range [0-100 %RH Non-condensing] and Wind Speed up to maximum wind speed required to be observed. Resistance to (vibration) shocks and lightning protection must be included. A NMHS may modify this requirement to meet meteorological conditions normally expected.
531	Sensor Type	The sensor/instrument for measuring Precipitation must be based on an electronic recording instrument. Any sensor type compliant with the requirements in this section must be considered.
568	Sensor Time Constant (Intensity)	The instrument time constant under controlled conditions must be better than 30 s.
538	Achievable Sensor Uncertainty	The sensor uncertainty must be the larger of 5% or 0.1 mm.

566	Achievable Sensor Uncertainty (Intensity)	The sensor uncertainty must be: • Under constant flow conditions in laboratory: ○ 5% for > 2 mm/h, ○ 2% for > 10 mm/h. • In the field: ○ 5 mm/h, ○ 5% above 100 mm/h.
541	Heating	If appropriate for local conditions, the precipitation sensor should be equipped with rim heating and funnel heating (tipping bucket). The heating should be controlled by a thermostat and it should be switched on below an ambient temperature of 5 °C. The heating should avoid snow and ice building up at the rim, and it should melt solid precipitation falling into the funnel. The heating should keep the rim and funnel above 0 °C, but the heating should be as little as possible to avoid evaporation of the precipitation. For other types of instruments heating should be offered as required for the local conditions.
58	Units	Whatever physical quantity measured, Precipitation Amount must be presented in/by the instrument/system in millimetres.
561	Units (Intensity)	Precipitation intensity must be presented in mm/hour (based on a 1-minute average).
62	Measurement Range	The maximum measurement range must be 0-500 mm/day. This should be increased to meet local conditions.
562	Measurement Range (Intensity)	The maximum measurement range must be: 0.02 – 2,000 mm/hour.
67	Reporting Resolution	The Reporting Resolution for Precipitation Amount must be 0.1 mm. If reporting daily totals, 0.2 mm should be used. If reporting weekly or monthly totals, 1 mm should be used.
564	Reporting Resolution (Intensity)	The resolution of reported measurement must be: 0.1 mm/hour.
111	Calculated Parameters	The individual measurements are providing the instantaneous readings. The system must calculate/make available amounts over 1 minute, 3 hours and 24 hours.

g.- Datalogger

It would be desirable the following specifications for the datalogger.

- Operating temperature range: -55° to +85°C (-55° to +85°C)
- Maximum scanning speed: 1000 Hz
- Analog inputs: 16 in single-end mode or 8 in differential mode (configurable).
- Two analog inputs for 4 to 20 mA or 0 to 20 mA current loop.
- Four analog inputs that can provide I/O functions.
- Pulse counters: 10
- Excitation voltage terminals: 4 with maximum current ±40 mA
- Communications ports: Ethernet, USB, RS-232, RS-422 and RS-485.
- Data storage port for microSD
- 12 volt switched outputs: 2
- Digital I/O: 8 configurable terminals for digital input and output. Includes high frequency pulse counter, UART, RS-232, RS-485, SDM, SDI-12 and I2C.
- Analog voltage accuracy (sensor and measurement noise not included)

- ✓ - $\pm(0.04\%$ of the measurement + compensation) from 0° to 40°C
- ✓ - $\pm(0.06\%$ of the measurement + compensation) from -40° to +70°C
- ✓ - $\pm(0.08\%$ of the measurement + offset) from -55° to +85°C
- 24-bit ADC converter
- Power supply 10 to 18 V DC input
- Real-time clock accuracy ± 3 min. per year
- Internet Protocols Ethernet, PPP, RNDIS, ICMP/Ping, Auto-IP (APIPA), IPv4, IPv6, UDP, TCP, TLS (v1.2), DNS, DHCP, SLAAC, Telnet, HTTP(S), SFTP, FTP (S), POP3/TLS, NTP, SMTP/TLS, SNMPv3, CS IP I/O, MQTT
- CPI, PakBus, SDM, SDI-12, Modbus, TCP, DNP3, UDP, NTCIP, NMEA 0183, I2C, SPI and other communication protocols
- Data storage 4 MB SRAM + 72 MB flash
- Idle current drain, average < 1 mA (@ 12 V DC)
- Active current drainage, average
 - ✓ - 1 mA (1 Hz scan at 12 V DC)
 - ✓ - 55 mA (20 Hz scan at 12 V DC)

Reference documentation:

- ✓ Deliverable 6.1 – GBON Tender Specifications for AWSs
- ✓ Guide to Meteorological Instruments and Methods Observation. WMO No-8. Edition 2018
- ✓ Guide to the Global Observing System. WMO No-488. Edition 2010. Updated in 2017
- AWS Tender Specifications. (<https://community.wmo.int/en/activity-areas/wigos/gbon/implementation-global-basic-observing-network-gbon/task-teams/task-team-gbon-implementation-tt-gbon/tt-gbon-approved-material>)

3.2. Design of the ICT infrastructure and services

3.2.a Detailed description of the ICT infrastructure and services design

ANAM's ICT infrastructure must be upgraded to meet GBON requirements. The system must be renewed from the stations to the ANAM Central computer server, including the acquisition systems, database, climate data management and WIS 2.0 node.

The server, duplicated for security purposes, will be dedicated to collect information from GBON stations, to perform the data quality verification process and to be a node for sending information via WIS 2.0.

ANAM's fundamental server room needs to be refurbished so that it is isolated and properly air-conditioned, since it currently shares space with IT personnel. These servers include the computer server for the collection and dissemination of data from GBON stations.

Computer equipment and works	Cost (USD)
Insulation work on the computer server room	10,000
Air-conditioning of the computer server room	5,000
2-(Rack/UPS) and accessories	6,000
2-Computer servers (ANAM Headquarters and Bobo Dioulasso)	10,000
2- Rugged Laptop	11,000
CPU network monitoring	1,000
43" Network monitoring display	500
Total:	43,500

Table 16: Estimated costs of computer equipment and associated works

3.2.a. Technical specifications for the data collection system from the observation station to the collection point.

The data flow of the automatic stations begins with data sampling in the datalogger, storage and statistical calculations, which is performed automatically every 10 minutes.

Automatic stations must be configured with a datalogger. Data transmission is currently done via UHF radio every ten minutes. The improvement of this transmission system has been contemplated in the investment proposal. The data are currently received on a server, then transmitted to ANAM system, so it is necessary to acquire a server with more features than the current one for ANAM's headquarters, as well as a similar one as a mirror at another location.

3.2.b. Technical specifications of data services (compatible with WIS 2.0 requirements)

The following services will be provided:

- Web API (OGC-API)
- Publishing/subscription service
- File sharing/repository system

Applications used by forecasters, scientists, warning systems, and government and research organizations will access and use the data through available data services. Web-based access to the data will be guaranteed from remote locations with optional access control to designated data sets. The wide range of applications and programming languages capable of connecting to the web APIs (R, Python, Excel, etc.) will ensure a system of data processing and visualization solutions as well as graphical user interfaces in web environment. Data services should be sufficient to meet the needs of existing operational platforms through traditional data transfer, direct access to data through shared file systems or modification of existing software to access data through the Web API service.

3.2.c. Detailed description of measures to ensure resilience and continuity of the entire data processing chain.

To ensure the resilience and continuity of the entire data processing system, the following actions will be undertaken to ensure the reliability of the data management system:

- To ensure surface station connection that will be part of GBON.
- Ensure the necessary storage of data, achieving traceability of the climate database.
- Design of a data control management flow and associated manual.

3.3. Design the data management system

In light of the current challenges and risks associated with data quality and loss, it is necessary to enhance the system by enabling automation of all its processes. This includes data reception, quality control, data processing, data analysis, and product generation. The system will incorporate a primary data collection and storage node via the Database at the ANAM Office, which will encompass data from GBON stations.

To consolidate the data management system, ANAM will have to take the following actions:

Component	Action
Data collection	Remote access to data in AWS
Quality control system	Quality control on: • Instrumental or physical limits. • Climatological limits. • Maximum temporal variability allowed. • Consistency checks between variables
Database System	Upload meteorological variables in the Database.
Monitoring System	Monitor the operational status of the stations.

Configuration	Define indicators for monitoring
	Metadata defined
Sharing	WIS 2.0 operational
	Database open?
	Climatological database
	ANAM Web page

Table 17. Summary of tasks performed by the subsystems of the Data Management Systems.

3.4. Environmental and sustainability considerations

The system's components will adhere to environmental regulations. We will make use of the existing infrastructure whenever possible. Solar energy will power the surface stations we install. ANAM follows an environmental commitment that sets out procedures to identify, prevent, address, and manage environmental risks in all our interventions. All our actions will comply with international regulations concerning best practices and global environmental sustainability standards.

SOFF projects are expected to contribute to the improvement of climate and weather services. However, the surface observing networks, infrastructure, and operations may have environmental impacts. Therefore, environmental and sustainability considerations should be included in the procurement process as a selection criterion for suppliers. This will enable the implementing entity and ANAM to consider opportunities for reusable instruments or biodegradable materials, such as:

- Biodegradable string for radiosondes.
- Reduction in the size of radiosondes, incorporating biodegradable materials where feasible.
- Environmentally sustainable packaging such as cardboard and paper.
- Ensuring instruments do not contain mercury.
- Careful use and disposal of batteries to reduce toxic waste.
- Plan for safe removal of waste at the end of construction.

Environmentally sustainable approaches should also be adopted in the following aspects:

1. The use of solar as an alternative source of energy should be considered.
2. Where applicable and necessary, a GBON-compliant weather station is recommended to replace an existing AWS with civil infrastructure (e.g., electricity, wind mast, etc.) that is reusable. Additionally, scheduled preventive maintenance and calibration should be adopted to lengthen the lifecycle of sensors as long as appropriate.
3. GBON-compliant sounding systems (fully or semi-automatic) are recommended to be located at sites with staff. The tender process should emphasize quality criteria related to composability in material selection where applicable.
4. Raise awareness at all levels of governance about the critical importance of preserving meteorological equipment.
5. Enhance capacities for remote system diagnostics and alarms crucial to minimise maintenance trips, to reduce carbon footprint.

Module 4. GBON Human Capacity Development Module

4.1. Assessment of human capacity gaps

ANAM has a staff strength of 56 personnel, working in the different divisions of the Agency, including Management Staff, Meteorologists, Meteorological Technicians (Observers), Technicians (Engineers), and Others/Administrative Staff.

Staff Categories	Value (self-reported)
Number of Staff (Management)	6
Meteorologist	10
Meteorological Technician	10
Hydrologist	0
Hydrological Technician	0
Climate Services	8
Researcher	5
Other	15
Total Staff number Male (Male): Female (F)	56 (M= 45, F=11)

Table 18. Distribution by areas and gender of personnel in ANAM.

Key gaps in human capacity necessary to ensure GBON compliance with observations are:

1. An inadequate number of instrument engineers and technicians to adequately carry out routine maintenance on the vast observation network across the country.
2. ANAM lacks the staff strength to effectively carry out 24/7 weather monitoring, observation and international data exchange.

4.2. Design capacity development activities for technical staff

ANAM may require the support of SOFF to recruit new observers and technical staff, as the current personnel are grossly inadequate. The proposed upper air stations will also need new staff with the required skill sets. This support will be required both during the Investment and Compliance phases.

Activity 4.1: Provide training in basic automatic and manual weather station verification and maintenance from the start of the Investment Phase through the Compliance Phase, for all ANAM observers. The training should be specific to the equipment types that will be installed.

Activity 4.2: Offer training leading to BIP-MT qualifications to all of ANAM's observation personnel.

Activity 4.3: Provide training to the ICT manager in network, database, and communications technology critical to WIS2.0, MDMS, and CDMS.

Activity 4.4: Provide training to all intended staff of the proposed upper air station to support the new station.

Activity 4.5: Provide comprehensive training in weather station maintenance and metadata collection for the new technical officer to provide backup support, both at the start of the Investment Phase and through the Compliance Phase.

Activity 4.6: Provide training in OSCAR/Surface and WDQMS operation to selected members of the Observations and Technical teams.

Activity 4.7: Provide training in the use of meteorological software, data analysis tools, and numerical models, including specialised training on satellite and radar technology for weather monitoring and analysis.

Activity 4.8: Capacity development plan covering the following course topics:

- i. Assembly, integration, and maintenance of automatic surface weather stations.
- ii. Assembly, certification, integration, and maintenance of lightning protection systems.
- iii. Assembly, certification, integration, and maintenance of calibration systems.
- iv. Assembly, integration, and maintenance of communications equipment.
- v. Real-time monitoring of data from weather stations.
- vi. Updates on data quality techniques.

Activity 4.9: Develop and implement a fault management and maintenance workflow, including automated monitoring, fault reporting, prioritization, maintenance response procedures, spare parts management, and post-maintenance verification using WDQMS and OSCAR/Surface.

The estimated budget for this activity would be **around 90,000 USD per year**.

4.3. Design capacity development activities for senior management

ANAM has a broad and diverse range of responsibilities, and as the impact of climate change increases, demand for more and diverse services from them is also increasing. It is often assumed that capacity pre-exists at the management level, but this assumption may add a burden to ANAM management and consequently put the SOFF investments at risk. To ensure improvement in ANAM's strategic organization, each senior executive needs additional skills to effectively manage resources within the organization. Therefore, management personnel must be trained primarily in the following subject areas:

Activity 4.10: Provide a SOFF-funded program/project manager to oversee equipment procurement, installation, and commissioning during the Investment phase, with the position to ideally continue for the life of the equipment during the Compliance phase, funded with SOFF compliance funding.

Activity 4.11: Provide SOFF-funded training in finances, staff management, and strategic planning for the NMHS senior management team.

Activity 4.12: Offer specialized training on crisis and disaster management, preparing senior managers to respond effectively to weather-related emergencies and natural disasters.

Activity 4.13: Train senior management in effective communication strategies for engaging with internal and external stakeholders, including government agencies, international organizations, and the public.

Activity 4.14: Further training is will also be needed on

- i. Use of strategic planning tools
- ii. Strategic planning
- iii. Reacting effectively and quickly to technological changes within the organization
- iv. Risk management
- v. Personnel management
- vi. Project management skills
- vii. Quality management skills

To provide senior management with these necessary skills, the project will ensure that management personnel are trained in the aforementioned aspects. The project will leverage existing experience in the region as well as national contributions under the GAA strategy plan.

Activity 4.15: Develop and implement Standard Operating Procedures (SOPs) for the operation and maintenance of the GBON network, including preventive and corrective maintenance, fault management, procurement planning, spare parts management, metadata management, and quality assurance, supported by training for the relevant operational and management staff.

Activity 4.16: Provide training on procurement planning, inventory management, supplier management, contract administration and life-cycle management of GBON equipment to technical and administrative staff responsible for network operation.

The budget for this activity would be around **30,000 USD by year**.

4.4. Gender and CSOs considerations

ANAM has about 20% female representation of the total employees, which is below the recommended 50% on SOFF projects. However, the Agency ensures that staff development opportunities are offered equally to both genders. Participation is open to all individuals, without discrimination based on personal characteristics, and is based solely on their dedication and interest in professional and institutional growth.

Civil Society organizations have always played a significant role in the work of the meteorological service. There is a strong relationship with CSOs, and joint projects are carried out, especially in collaboration with foundations that work closely with communities.

The SOFF initiative aims to enhance the partnership between ANAM and the private sector. This will involve exploring mechanisms to support the implementation of the SOFF Investment Program, as appropriate.

In the Investment Phase, ANAM's implementing team is expected to have 50% participation of women in capacity-building activities and 50% participation of women in consultations with developmental partners. The following activities during SOFF implementation in Burkina Faso as recommended by SOFF, are provided in **Table 16**.

Activity	Indicator
Deliver capacity-building activities on gender-sensitive topics in the context of SOFF operations.	Report on technical capacity building workshop at ANAM on gender-sensitive topics to mainstream the government strategies and development plans on gender concerns.
Organise stakeholder engagement workshops/consultations, including, where possible, developmental partners focused on women's empowerment.	Further stakeholders' engagement activities that involve developmental partners focused on women's empowerment are recommended in the National Contribution Plan.
Promote gender equality by establishing minimum thresholds for female participation in SOFF-related activities.	In an ideal situation, women should be represented at least • 50% of all participants in SOFF-related and supported training. • 50% of all participants in SOFF consultations, planning workshops, etc. • 50% of staff for operating and maintaining GBON stations. • 50% of decision-making and project management positions where applicable.

Conduct a gender assessment analysis as part of the human capacity assessment (including areas such as gender discrimination, harassment, gender balance, etc.) and provide recommendations accordingly.	Reports on the gender assessment analysis, highlighting findings and recommendations on affirmative action to bridge gaps where necessary.
Establish a mentoring and coaching programme for female technical staff involved in observing systems, ICT, and upper-air operations	Number of female staff participating in mentoring activities. Percentage of participants reporting increased technical confidence and career development opportunities.
Ensure that field working conditions for GBON station operation and maintenance provide an inclusive and safe working environment for both women and men.	Assessment completed and recommendations implemented for GBON stations. Number of identified actions implemented during the project
Develop and implement a Gender Action Plan for the SOFF project, aligned with ANAM's institutional policies.	Gender Action Plan approved, implemented and reviewed annually, with progress reported through project monitoring

Table 19: Gender considerations for SOFF activities in Burkina Faso

Furthermore, ANAM should adopt the WMO Gender Action Plan for Members, which provides the following supporting guidance (*Gender-Action-Plan_2024-2027*):

- Increase the participation of women by: (i) identifying and nominating female experts from NMHSs 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 NMHS 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 training and gender webpage, and information on key activities) in the induction of new PRs and NMHS 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 training and workshops (3.1.5(c) in WMO Gender Action Plan)

- Offer internships to young professionals, especially females, and secondments of staff from meteorological services on a rotational basis. (3.4.2(c) in WMO Gender Action Plan)
- Engage with international organisations' 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).

Module 5. Risk Management Framework

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

Risks	Level	Likelihood	Impact	Mitigating measures	Responsible
Delays in procurement and delivery of equipment, spare parts and consumables	High	unlikely	High	Prepare detailed procurement plans, undertake early market assessments, standardize equipment where possible, establish framework agreements with suppliers, maintain strategic stocks of critical spare parts and consumables, and allow sufficient contingency in the implementation schedule.	Implementing Entity, ANAM
Inadequate funding for upgrading observation,	High	Likely	High	Develop a Post-SOFF Sustainability Plan, progressively integrate GBON O&M costs into ANAM's annual budget, coordinate complementary investments with development partners, and monitor implementation through annual sustainability reviews.	ANAM, Ministry of Transport
Vandalism/Theft of installed equipment	Medium	unlikely	High	Install secure fencing, engage local authorities and communities, implement regular site inspections, provide insurance where appropriate, and use	ANAM

				remote monitoring to rapidly detect outages.	
Inadequate preventive and corrective maintenance	Medium	Likely	High	Implement preventive maintenance schedules, establish SOPs, train technical staff, maintain inventories of spare parts, and monitor maintenance performance through WDQMS and internal maintenance records..	ANAM
Failure of Data quality management system	Medium	unlikely	Medium	Implement routine WDQMS monitoring, assign responsibilities for fault analysis, establish fault-response procedures, update OSCAR/Surface metadata, and verify station performance following maintenance..	ANAM
Loss of trained personnel or insufficient technical capacity	Medium	likely	High	Train multiple staff for critical functions, implement refresher training and Training-of-Trainers programmes, document SOPs, and maintain updated technical manuals.	SOFF, ANAM

Poor internet connections lead to delays in data transmission	Medium	unlikely	High	Equip all stations with redundant cellular and/or satellite communications	SOFF, ANAM
Sustainability	Low	likely	Medium	GBON SOFF efforts should guarantee sufficient resources and a post-SOFF sustainability plan.	ANAM, Ministry of Transport
Security conditions limiting access to GBON stations	Medium	unlikely	High	Conduct periodic security assessments, coordinate with local authorities, prepare contingency maintenance procedures, and prioritize remote diagnostics where physical access is temporarily restricted.	ANAM
Lack of synergy with SOFF complementary programs	Low	unlikely	Medium	Coordination between SOFF and other developmental partners involved in the weather and climate value chain operating in the country is critical.	ANAM, Implementing Entity
Site accessibility constraints due to weather or logistics	Medium	unlikely	High	Select sites with sustainable access arrangements, schedule preventive maintenance outside difficult seasons where feasible, maintain local logistical support, and pre-position essential spare parts when necessary.	ANAM

Failure to maintain GBON compliance throughout the Compliance Phase	High	unlikely	High	Monitor GBON performance indicators regularly, conduct periodic compliance reviews, implement corrective actions through SOPs, maintain adequate technical capacity and secure long-term financing for operation and maintenance.	ANAM
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Table 17. Risk Analysis

Module 6. Transition to SOFF investment phase

The transition to the SOFF investment phase will be based on the results and recommendations of the Preparation Phase. This National Contribution Plan has been prepared in conjunction with the beneficiary country, NiMet, and AEMET. More detailed information will be provided as necessary. Upon receipt of this document, the request for funding for the SOFF implementation phase will begin. The main efforts will focus on jointly carrying out this Contribution Plan and the preparation of a national country project that must contain all investment activities. The four main steps are:

1. Installation
2. Maintenance
3. Training
4. Actions to guarantee sustainability.

Summary of GBON National Contribution Plan

Provide a summary of the GBON National Contribution Plan by filling this table

Components	Recommended activities
Module 2. GBON business model and institutional development	1. Strengthen cooperation with national institutions and the private sector that may have interest in GBON. 2. Regional collaboration.
Module 3. GBON infrastructure development	1. Improve two stations and consolidate one. 2. Carry out the maintenance and calibration plan to ensure the correct operation of the stations over time. 3. Update OSCAR and affiliate station to RBON 4. New ITC infrastructures, specific rooms 5. Main server, backup server, SAI/Rack, etc., to manage GBON stations and RBON stations. 6. Compliance with environmental regulations
Module 4. GBON human capacity development	1. Capacity Building for GBON network. 2. Training course in High Level management 3. Take into account gender considerations, according to country and WMO policies. 4. A module on gender balance and corporate social responsibility will be included in all training courses. 5. Annual workshop join CSO regarding gender topics. Assessment and recommendation.
Module 5. Risk Management	1. Identify potential risks during the execution and investment phases and suggest activities to minimize them.
Module 6. Transition to SOFF investment phase	1. Implementing Entity assigned as soon as possible. URGENT 2. Prepare the SOFF project funding request.

Table 18. Summary of National Contribution Plan activities.

Annex 1

Additional information List of instruments and observation systems by site

Stations	Code	Type de stations/fabricant	capteur installé	Paramètre mesuré	Etat de fonctionnement	Observations	Nouveau besoins
KAYA	0-854-0-070	Synoptique automatique Campbell	Pluviomètre	Précipitations	OK	Installation récente, pas de capteur de rayonnement	Pieces de rechanges complets
			Thermomètre	Température de l'air	OK		
			Hygromètre	Humidité relative	OK		
			Baromètre	Pression atmosphérique	OK		
			Anémomètre	Vitesse du vent	OK		
			Girouette	Direction du vent	Ok		
Koudougou	0-854-0-049	Synoptique automatique ADCON	Pluviomètre	Précipitations	ok	mât incliné faussant probablement les données de vent	Pieces de rechanges complets
			Thermomètre	Température de l'air	ok		besoin de nouveau mat frabriqué en local
			Hygromètre	Humidité relative	ok		
			Baromètre	Pression atmosphérique	ok		
			Anémomètre	Vitesse du vent	ok		
			Girouette	Direction du vent	ok		
			Pyranomètre	Rayonnement solaire	ok		
Léo	0-854-0-053	Agrométéorologique automatique ADCON	Pluviomètre	Précipitations	OK		Pieces de rechanges complets
			Thermomètre	Température de l'air	OK		besoin de nouveau mat frabriqué en local
			Hygromètre	Humidité relative	OK		nécessité de trouver un nouveau site
			Baromètre	Pression atmosphérique	OK		
			Anémomètre	Vitesse du vent	OK		
			Girouette	Direction du vent	OK		

			Pyranomètre	Rayonne- ment solaire	OK		
			température dans le sol	Tempéra- ture du sol jusqu'à 1 m de profon- deur	OK		
			humidité dans le sol	Humidité du sol jusqu'à 1 m de pro- fondeur	non Ok		
Tenkodogo	0-854- 0-093	Agrométéorolo- gique automati- que Pulsonic	Pluviomètre	Précipitati- ons	ok		nécessité de trouver un nou- veau site
			Thermomètre	Tempéra- ture de l'air	ok		Pieces de re- changes com- plets
			Hygromètre	Humidité relative	ok		besoin de nou- veau mat fabri- qué en local
			Baromètre	Pression at- mosphéri- que	ok		
			Anémomètre	Vitesse du vent	ok		
			Girouette	Direction du vent	ok		
Bobo- Dioulasso	0- 20000- 0-65510	Station classi- que synoptique	Parc météo		Ok	Gérer par l'ASECNA Pas de station automati- ques	Besoin de sta- tion automa- tiques synop- tiques complets
Niangoloko	0-854- 0-070	Synoptique au- tomatique ADCON	Pluviomètre	Précipitati- ons	Ok		pieces de re- changes com- plets
			Thermomètre	Tempéra- ture de l'air	Ok		besoin de nou- veau mat fabri- qué en local
			Hygromètre	Humidité relative	Ok		
			Baromètre	Pression at- mosphéri- que	Ok		
			Anémomètre	Vitesse du vent	Ok		
			Girouette	Direction du vent	Ok		
			Pyranomètre	Rayonne- ment solaire	Ok		
			température dans le sol	Tempéra- ture du sol jusqu'à 1 m de profon- deur	Ok		

			humidité dans le sol	Humidité du sol jusqu'à 1 m de profondeur	Ok		
Ouagadougou	0-20000-0-65503	Station classique synoptique	Parc météo		Ok	Gérer par l'ASECNA Pas de station automatisées	Besoin de station automatisées synoptiques complets

Annex 2

Summary of investments (without taxes)	
Concept	Total Cost (4 years) (USD)
Infrastructures	3,916,450
Maintenance	55,000
ITC	43,500
Capacity building for technical staff	364,000
Capacity building for a senior manager	90,000
	Total: 4,468,950

Table 18. Summary of investments

Report completion signatures

Peer Advisor signature

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Beneficiary Country signature



Dr Mariam Ti DIGA
2026-09-22.

WMO Technical Authority signature



Disclaimer on cost estimates

The cost estimates presented in this National Contribution Plan (NCP) are considered indicative and have not been approved by the Technical Authority to SOFF, and should not be considered as a final investment budget or a commitment of funding under SOFF. Detailed investment requirements and associated costs should be further developed and reviewed during the Investment Phase, in accordance with the applicable SOFF processes and requirements.