October2024

GBON National Gap Analysis Guinea Bissau

Systematic Observations Financing Facility

Weather and climate data for resilience

WEATHER CLIMATE WATER

Screening of the National Gap Analysis (NGA) of Guinea Bissau

WMO Technical Authority screens the GBON National Gap Analysis to ensure consistency with the GBON regulations and provides feedback for revisions as needed. *The screening of the NGA is conducted according to the SOFF Operational Guidance Handbook, version: 04.07.2023 and the provisions in Decision 5.7 of the SOFF Steering Committee.*

Following iterations with peer advisor and beneficiary country, WMO Technical Authority confirms that the National Gap Analysis is consistent with GBON regulations. While the WMO GBON Global Gap Analysis identified the need for 1 surface stations 1 upper air stations over land to meet the GBON horizontal requirement, the **WMO Technical Authority confirms the NGA results which indicate the need for 3 surface land stations and 1 upper station based on specific national circumstances.**

Date: 28/08/2024

Signature:

Albert Fischer

Director, WIGOS Branch, Infrastructure Department, WMO

GBON National Gap Analysis Report
[Guinea Bissau]

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1. Country information from the GBON Global Gap Analysis

Guinea Bissau is located in West Africa with the Atlantic Ocean to the west, Senegal to the north and Guinea Conakri to the south and east. With a land area of36.000 square kilometers and a sea area of 8.120 square kilometers, Guinea Bissau has a total coastline of 350 kilometers and its highest point is Mountain Futa Jalon with an elevation of 300meters.

Despite being a small country, with a population of around 1.9 million inhabitants, GuineaBissau has a wide variety of ethnic groups, languages and religions.

The country is divided into eight administrative regions, Bafatá, Biombo, Bolama, Cacheu, Gabu, Oio, Quinara, Tombali and the Autonomy Sector of Bissau. Regarding the coastline of the country, Bijagós Archipelago is composed by 88 Islands, but only about 20 islands have resident inhabitants.

In terms of climate, Guinea Bissau has an intertropical climate, with two seasons. The rainy season lasts 5 months (from June to October) and the dry season lasts another 5 months (from December to May). In the transition months, from May to November, usually the precipitation is irregular.

Figure.1 - Map from Guinea Bissau Mainland and Archipelagos

Three precipitation zones can be distinguished: the Southern zone (Tombali, Quinara and Bolama-Bijagós) characterized by an annual average exceeding 2000 mm; the Northwest zone (Bissau, Biombo, Cacheu and Oio) characterized by an annual average from 1500 to 1800 mm and the Eastern zone (Bafatá and Gabú) with an average annual precipitation from 1300 mm to 1500 mm.

In recent years, some decrease in rainfall has been recorded due to the progressive approach of the Sahel phenomenon and uncontrolled deforestation of forests for agricultural purposes.

In agricultural terms, the country has potential fertile land with favorable conditions for agriculture and is made up of 8 regions (Cacheu, Oio, Biombo, Bafata, Gabu, Bolama/Bijagós, Quinara and Bissau).

Most of its terrain is composed of low coastal plains with swamps and mangroves, as well as forest–savannas characteristic in the eastern part of the country.

Resulting from the three online meetings and one in-person, organized under SOFF workshop in Cabo Verde, with the National Meteorological Institute from Guinea Bissau (INM-GB)focal-points the task team could identify the following references to meteorological, climatologic and hydrological stations from the described optimal meteorological station network defined in the INM-GB national plan (figure2).

- 7 synoptic (only one is declared operational)
- 4 marine (none declared operational)
- 7 agro-meteorological (none declared operational)
- 60 pluviometrycollectors (sixteen declared operational)

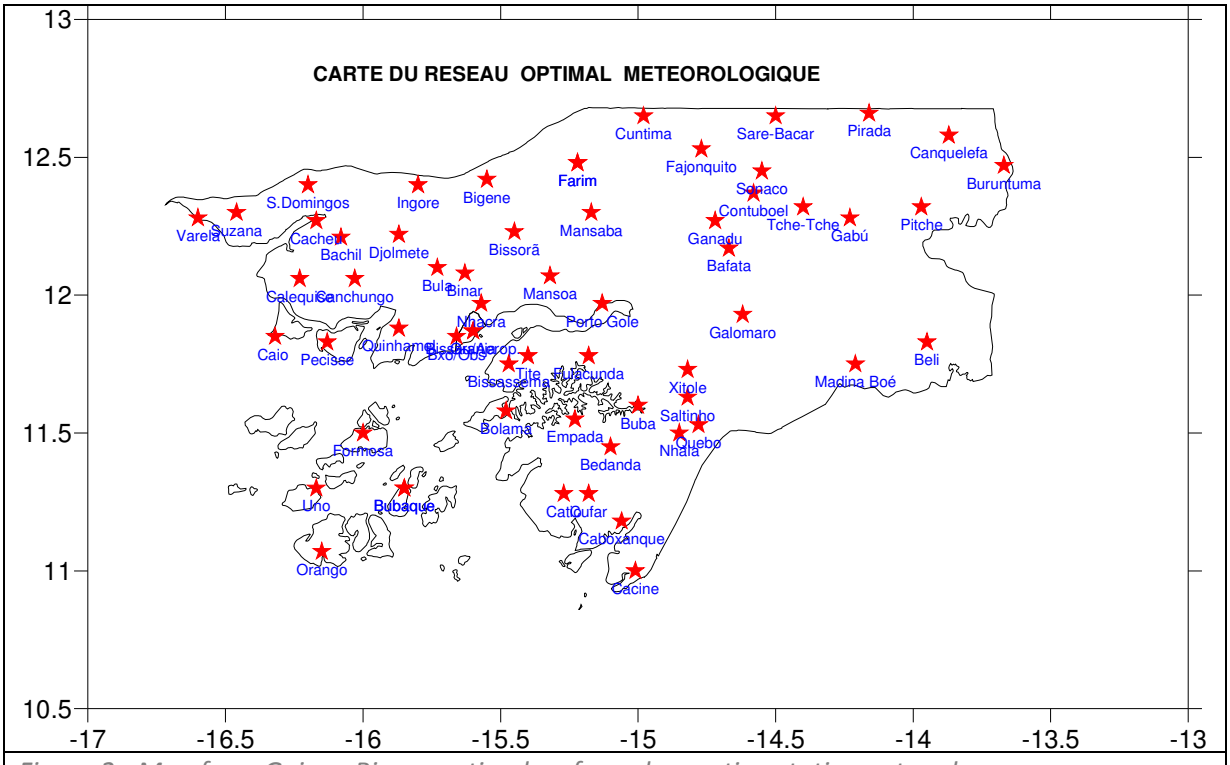

Figure.2 - Map from Guinea Bissau optimal surface observation station network

From the identified stations and taking into account the WMO OSCAR system, there are currently three surface observation stations from INM-GB reported in WIGOS as operational, and two identified with unknown status.

In the Global WIGOS Data Quality Monitoring System (WDQMS) there are three surface observation stations reporting from the country. However, the temporal reporting interval of the stations does not fill the requirements from GBON.

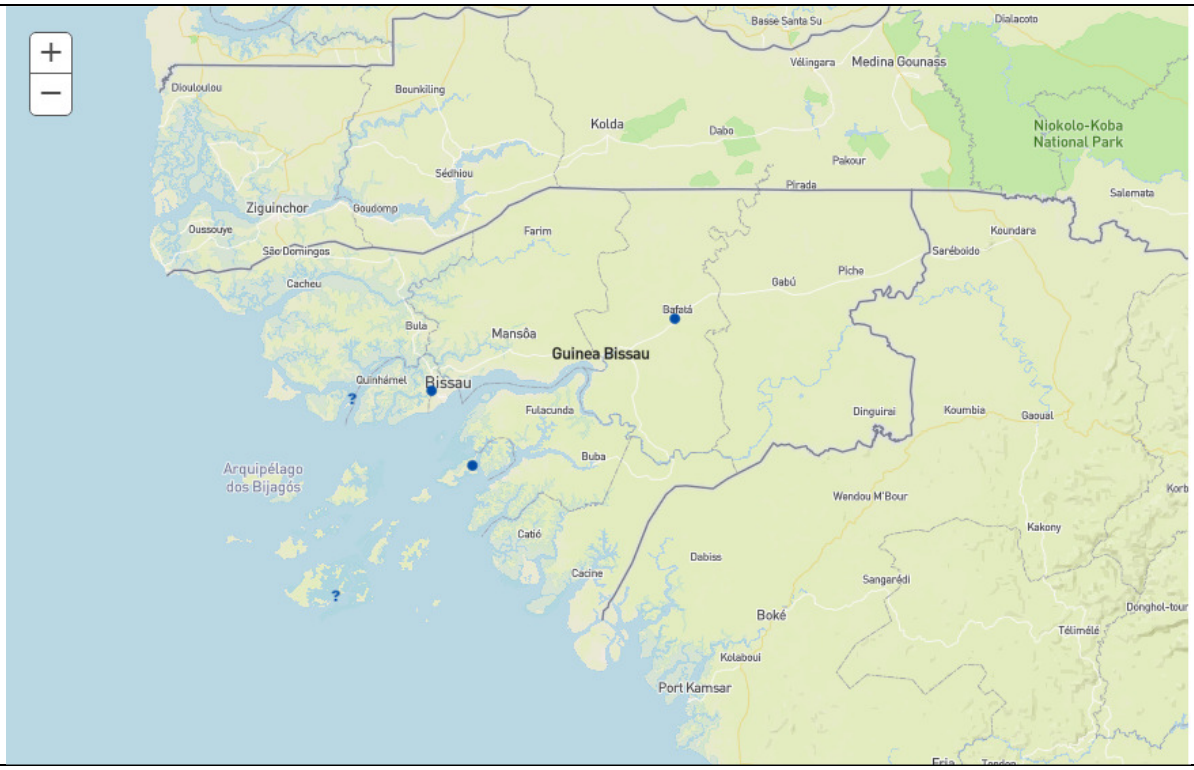

Figure.3 - Map from Guinea Bissau surface observation station network reported on OSCAR platform from WMO.

Using the information in OSCAR we find three meteorological stations with a status reference as operational, in OSCAR and WDQMS platform:

- weather station from BAFATA WSI 0-20000-0-61781,declared in GBON, status Operational, no data in WDQMS
- weather station from BOLAMA, WSI 0-20000-0-61769, declared in GBON, status Operational, no data in WDQMS
- weather station from BISSAU AIROPORT, WSI 0-20000-0-61766, declared in GBON, status Operational, data in WDQMS
- weather station from BISSAU OBSERVATORY WSI 0-624-0-61782, declared in GBON, status Unknown, no data in WDQMS
- weather station from BUBAQUE, WSI 0-624-2-2, not declared in GBON, status Unknown, no data in WDQMS

Figure.4 - Map from Guinea Bissau surface observation station network reported on WDQMS from WMO.

Please provide in this Table the country information as provided by the WMO Global GBON Gap Analysis.

Table I.WMO GBON Global Gap Analysis (June 2023). Illustration of the information that the WMO Secretariat provides to each country

A. GBON horizontal resolution requirements	B. Target	C. Reporting (GBON compliant)[1]	D. Gap to improve	E. Gap new	F. Gap total
	[# of stations]				
Surface stations Standard density[2]200 km	1	0	1	0	1
Upper-air stations over land Standard density**Erro! Argumento desconhecido de parâmetro.**500km	1	0	0	1	1

[1]The rationale for classifying surface and upper-air stations as reporting is based on the WIGOS Data Quality Monitoring System (WDQMS) for the chosen time period (WMO GBON Global Gap analysis, June 2023). Stations with data availability more than 80% on at least 80% of days, are considered as reporting. Other listed stations are counted as having the possibility to be improved.

[2]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.

2. Analysis of existing GBON stations and their status against GBON requirements

Regarding the reporting in WDQMS observational program from the stations of Guinea Bissau, it can be found that meteorological data are not being published in an hourly schedule. For most of the days Bissau Airport is reporting data between 6 and 18h local time.

To meet the GBON requirement observational programs, the meteorological stations must change to hourly reports.

In terms of the horizontal station density, and considering GBON requirements, it is important to mention that Guinea Bissau:

- is in a region with lack of surface and upper air meteorological observations;
- is in an area that can be defined as a climate transition region, in terms of the Köppen-Geiger Climate Classification;
- is in a region very sensible to climate change, regarding the potential impacts in Guinea Bissau economical tissue and activities;
- regarding the spatio-temporal distribution of precipitation, we can find three distinct zones and types of agriculture practiced in each of these zones (Planalto, shalow waters and Mangrove)

These aspects support the recommendation for SOFF to install additional surface meteorological stations with basic instruments, even if such stations are placed at distances inside the limits between stations.

Other relevant aspect is that the equipment's (meteorological and support) are also obsolete. All the meteorological stations that INM-GB operates are classic stations, which means that all instruments are analogical. For example, operational measurements use mercury thermometers to measure air temperature, thermohygrometers for air relative humidity, barometers for atmospheric pressure, and mechanic anemometers for wind parameters. In order to allow its transmission ,data must be digitalized manually and then sent to dissemination process.

Observation equipment's currently in use in Guinea Bissau represent three types of problems that must be considered:

- Supply of spare parts - Spare parts may no longer be available or take too long to recover, which may cause a long delay in putting the instruments back to operational mode;
- Availability of calibration services - less companies have calibration services available; and
- Minamata Convention on Mercury requirements in terms of reducing the use of mercury thermometers.

For all these reasons, we recommend that the equipment used within the operational observational program is replaced by digital technology.

Please complete the two tables below and add remarks and Annexes with technical details as needed.

Table II. Assessment of existent stations per their operational status and network ownership

GBON Requirements	Existing observation stations (# of stations)			
	NMHS network		Third-party network	
	Reporting(GBON compliant)[3]	To improve	Reporting(GBON compliant)[3]	To improve
Surface land stations Standard density [4] 200km Variables: SLP, T, H, W, P, SD	**0**	**0**	**0**	**0**
Upper-air stations operated from land Horizontal resolution[4]: 500km Vertical resolution: 100m, up to 30 hPa Variables: T, H, W	**0**	**0**	**0**	**0**
Surface marine stations in Exclusive Economic Zones:[7] 500 km Variables: SLP, SST	**0**	**0**	**0**	**0**
Upper-air stations operated in Exclusive Economic Zones:[5] 1000 km Vertical resolution: 100m, up to 30 hPa Variables: T, H, W	**0**	**0**	**0**	**0**

Table III. Assessment of existing GBON stations per station characteristics. Station type: S: Surface, UA: Upper-Air; M: Marine; Owner of the station: NMHS or name of third-party; GBON variables: SLP: Atmospheric pressure; T: Temperature; H: Humidity; W: wind; P: Precipitation; SD: Snow depth; SST: Sea surface temperature; Reporting cycle: Number of observation reports exchanged internationally per day (0-24); GBON compliance: whether the station is GBON compliant or not (see GBON guide on compliance criteria).

[3]The rationale for classifying surface and upper-air stations as reporting is based on the WIGOS Data Quality Monitoring System (WDQMS) for the chosen time periodduring the development of National Gap Analysis Stations with data availability more than 80% on at least 80% of days, are considered as reporting. Other listed stations are counted as having the possibility to be improved.

[4]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.

[5]Although GBON marine stations and stations in EEZ are not part of initial SOFF scope, peer advisors are encouraged to analyze in this step when considered relevant e.g. SIDS, the status of current marine stations for future GBON marine observations investments.

Station name	Station type (S/UA/ M[6])	Owner (NMHS/ 3rd party)	Funding source	GBON variable measured							Reporting cycle (obs/day)	GBON Compliant (Y/N)
				SLP	T	H	W	P	SD	SST		
BAFATA	S	NMHS	INM-GB	N	Y	N	N	N	N	N	0	N
BISSAU OBSERVATORY	S	NMHS	INM-GB	Y	Y	Y	N	Y	N	N	6	N
BOLAMA	S	NMHS	INM-GB	N	Y	N	N	Y	N	N	0	N
BISSAU AIRPORT	S	3rd party	ASECNA	Y	Y	Y	Y	Y	N	N	6	N

3. Results of the GBON National Gap Analysis

The requirement of high density horizontal resolution of the GBON surface stations isfulfilled for only two stations in Guinea Bissau. However, considering the arguments of reporting data from the observational programs, the horizontal station density, the meteorological equipment status, and the lack of meteorological/climate data from the region, we strongly recommend that additional stations could be financed through SOFF to fill current gaps.

We strongly propose that the following additional meteorological stations are set up to extend the GBON network:

- One meteorological station in the interior north and another in the south near to the coastline and the third one in the central regionof the Country- these stations will increase the coverage of Guinea Bissau mainland and islands territory; and
- The station must integrate atmospheric variables and soil parameters.

Additionally, and this point is very relevant, in order to achieve the required reporting interval of one hour and to replace obsolete technology (especially mercury thermometers), we strongly recommend that the selected GBON meteorological stations are automatic in what regards the GBON variables (SLP, T, H, W, P).

The automatic weather stations - AWS (sensors, logger, data collection, communication and energy)to be installed in Guinea Bissau should:

- be installed in a secure area (governmental administrative facilities);
- select places for the AWS where already meteorological observations were made and there is still equipment installed and meteorological technicians working, example of the station of Gabu;
- rely on sustainable energy sources (photovoltaic and battery);
- have a good communication signal coverage; and
- have a data collection system, based in open source solution

[6] Please see guidance on marine stations in Section 2 on Scope.

Regarding the upper-air observations, actually INM-GB does not operate any upper-air station. Nevertheless is planned that Agency for the Safety of Air Navigation in Africa and Madagascar (ASECNA) will support all the cost of the installation of a upper-air station in the Bissau Airport facilities and the observational program (ballons, radiosondes and gas) therefore request for UAS from SOFF is n`t needed

In order to increase the data availability of the existing network and proposed additional stations, and align with GBON requirements, we also recommend the following courses of action:

- Create a stock of spare parts for preventive and reactive maintenance;
- Recruit new technicians with capabilities to perform the required stations' maintenance, in order to allow for a sustainable and regular maintenance of the whole network;
- AWS sensors verification system that could be used in regular verification procedures;
- Organize periodic training actions on equipment's and systems maintenance with corporative meteorological partners; and
- Install a basic calibration laboratory facilities and provide it with adequate operational human capacity as a way to ensure station maintenance and data quality.

Finally, it is worth mentioning that the courses of action proposed can be achieved by establishing cooperation partnerships with other meteorological services.

Please complete the two tables below and add remarks and technical details in Annexes as needed.

Table IV. Results of the GBON national gap analysis. SLP: Atmospheric pressure; T: Temperature; H: Humidity; W: wind; P: Precipitation; SD: Snow depth; SST: Sea surface temperature**.**

GBON requirements	Global GBON target	Approved national target	Reporting	Gap	
				To improve	New
	[# of stations]				
Surface land stations	1	3	0	3	0
Upper-air stations operated from land	1	1*	0	0	0
Surface marine stations in Exclusive Economic Zones:[7] Density 500 km Variables: SLP, SST Observing cycle: 1h	0	0	0	0	0

[7]Although GBON marine stations are not part of initial SOFF scope, peer advisors are encouraged to analyze in this step when considered relevant e.g. SIDS, the need for future GBON marine observations investments according to the GBON requirements.

Upper-air stations operated in Exclusive Economic Zones:[8] Density 1000 km Vertical resolution: 100 m, up to 30 hPa Variables: T, H, W Observing cycle: twice a day	0	0	0	0	0

* Upper-air station to be installed and operated by Agency for the Safety of Air Navigation in Africa and Madagascar (ASECNA)

3.1 Recommended existing surface, upper-air and marine[10] stations to be designated to GBON

According with the information provided by INM-GB regarding the optimal meteorological network, we recommend the designation of four surface stations to be added to the GBON network (see Table V). The stations should have a synoptic and agro climate profile.

In the locations of the stations to be designated to GBON, current meteorological stations date from the fifties, except for the case of Bissau Observatory that has been set up in beginning of the twentieth century.

According to the planned the upper-air observational station that will be installed by ASECNA, can be defined as GBON station and it should be recommend to perform 2 launches per day, 00UTC and 12UTC, to fulfill the GBO requirements.

Upper-air station to be installed by Agency for the Safety of Air Navigation in Africa and Madagascar (ASECNA)

Table V. Recommended existing surface, upper-air and marine stations to be designated to GBON.

Station name	Station type (S/UA/M[11])
Bissau Observatory	S
Cacine	S
Gabu	S
Bissau Airport*	UA

* Upper-air station to be installed by Agency for the Safety of Air Navigation in Africa and Madagascar (ASECNA)

[8]Although GBON marine stations are not part of initial SOFF scope, peer advisors are encouraged to analyze in this step when considered relevant e.g. SIDS, the need for future GBON marine observations investments according to the GBON requirements.
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[10]Although GBON marine stations are not part of initial SOFF scope, peer advisors are encouraged to analyze in this step when considered relevant e.g., SIDS, the need for future GBON marine observations investments according to the GBON requirements.
[11] Please see guidance on marine stations in Section 2 on Scope.

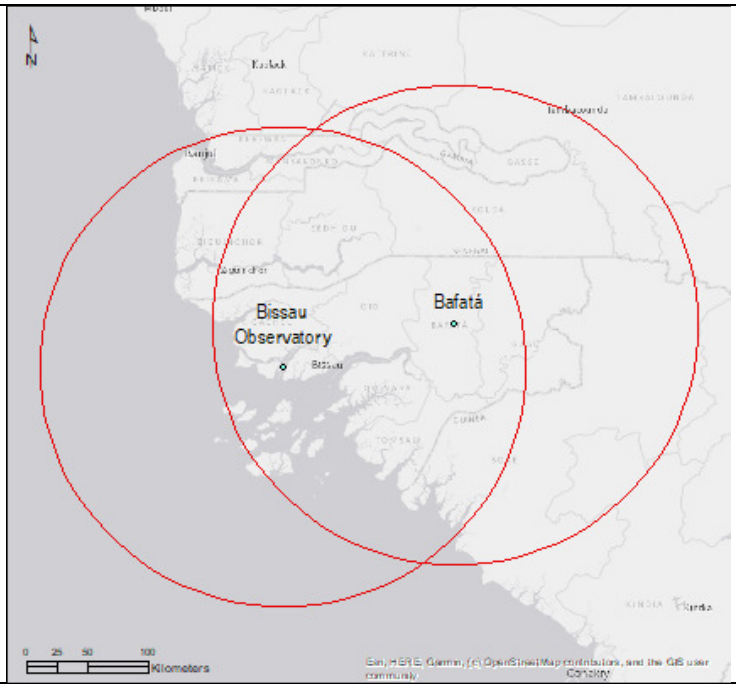

Figure 5. Map of existing surface meteorological stations declared as GBON stations in Guinea Bissau

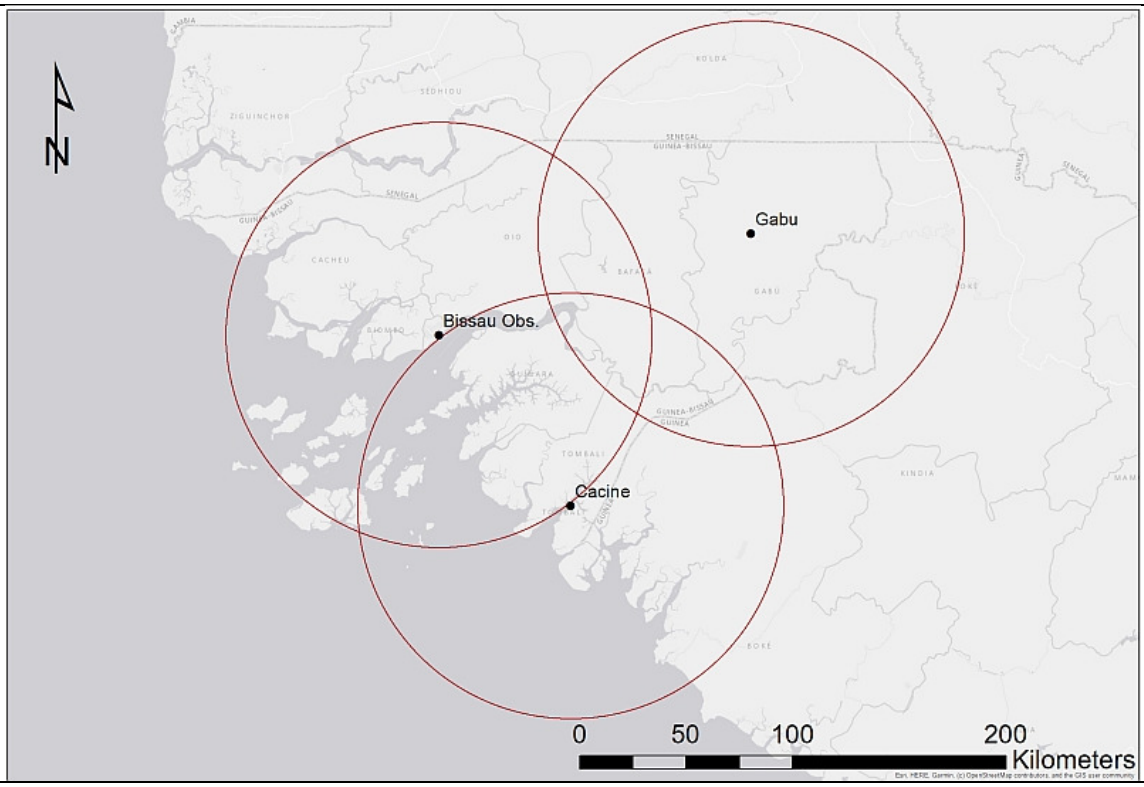

Figure 6. Map of the proposed surface meteorological stations to be included as GBON stations in Guinea Bissau

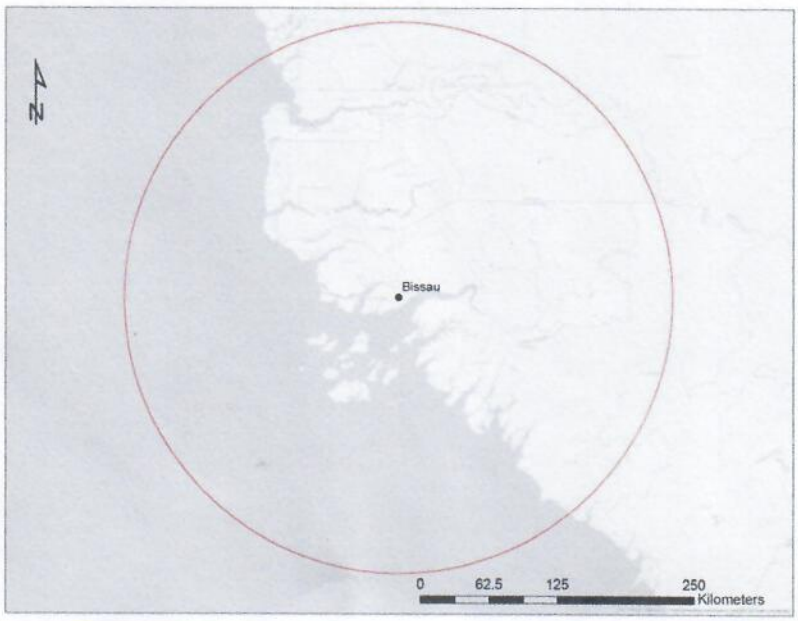

Figure 7. Map with the location of upper air station to be included as GBON stations in Guinea Bissau. The Upper-air station to be installed by Agency for the Safety of Air Navigation in Africa and Madagascar (ASECNA)

[**Add here (i) a map of existing surface and upper-air stations with 200km/500 (diameter) km circles (500km/1000km for SIDS) to indicate the coverage of existing stations; and (ii) optional: Include newly proposed stations in the map in (i)**]

4. Report completion signatures

Peer Advisor signature

Telmo Carvalho Digitally signed by Telmo Carvalho Date: 2024.10.25 14:30:30 +01'00'

Beneficiary Country signature

Presidente do Conselho da Administração do INM - GB Representante permanente da Guiné-Bissau junto de OMM.

WMO Technical Authority screening signature