10 March 2025

GBON National Gap Analysis of Guyana

Systematic Observations Financing Facility

Weather and climate data for resilience

WEATHER CLIMATE WATER

Screening of the National Gap Analysis (NGA) of Guyana

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 the 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 2 surface stations and 1 upper air station over land to meet the GBON horizontal requirement, the **WMO Technical Authority confirms the NGA results which indicate the need for 6 surface land stations and 1 upper air stations based on specific national circumstances.**

Date: 11 March 2025

Signature:

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GBON National Gap Analysis Report
Guyana

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1. Country information from the GBON Global Gap Analysis

Small Island Developing States (SIDS) are a group of 39 States and 18 Associate Members that share common challenges and vulnerabilities, including climate change, biodiversity, limited resources and natural disasters. They are recognized by the United Nations since the 1992 U.N. Conference on Environment and Development held in Rio de Janeiro, Brazil. Although Guyana is geographically not an island, it encounters analogous difficulties and susceptibilities being therefore part of the SIDS group.

The GBON Global Gap Analysis conducted by WMO in June 2023 (Table 1), considering Guyana as SIDS, stated that the country is responsible of providing data from 2 surface stations only. However, as Guyana is a continental country with a significantly larger size compared to other SIDS members, the real GBON requirement of internationally shared stations sums up to 6. Currently, only one of Guyana's surface stations is GBON compliant, and the Guyanese Hydrometeorological Department (GHD) does not operate upper air stations.

As a part of an international project, AWSs were purchased and installed in the country. However, the stations have encountered severe issues leading GHD to utilize its own available national funds and resources to slowly progress with the installation of functioning equipment. Unlike the initial AWS, these newly acquired AWSs have proven to function well in the harsh conditions of the Guyanese hinterland. In addition, the technical staff has meanwhile learnt all the maintenance procedures and actions required for these specific stations. With this experience and learning process, there is a high confidence that the GHD has now established the technical and logistical capacity, together with the needed know-how, required to operate and maintain a network of such stations. Nevertheless, the financial capacity of the GHD is not sufficient to warrant a considerable, but needed, increase of the AWS network. Besides the AWS network, it is also worth mentioning that GHD considers to deploy additional AWSs on buoys in the Exclusive Economic Zone (EEZ) of Guyana, which would well complement the base network in the future.

Considering the current situation, Guyana is more than able to meet the surface GBON low-resolution targets in a relatively short time and with a relatively minor investment. However, it requires a well-coordinated approach where different projects are leveraged, with SOFF being a critical element of the approach. Moreover, even a full high-resolution compliance could be achieved within reasonable resources and time horizon. The main support from different international projects should include the acquisition of AWSs, proven to function in Guyana, as well as the development of a calibration lab. It should also be noted here that the choice of the location of the current and proposed stations had to take into account that most of the

hinterland offers limited access to no access at all as well as potential security issues, especially in the deep south of the country. Hence, currently, it is impossible to have a very homogeneous coverage of the country.

Such an activity would not only benefit and serve the neighboring countries but would also establish a regional perspective leading to overall regional gains.

Guyana does not operate any upper-air station. While GHD is considering the installation of one upper air station in the near future, the continuous costs of such a station, especially in the form of consumables, might be a significant issue.

In summary, Guyana is generally in a good position to achieve the low-resolution, and eventually even the high-resolution GBON-compliance. Addition of new AWSs, together with the necessary labs, could lead to substantial increase in the availability and reliability of the observational data in a sustainable way. This would result in the improvement of the quality of global NWP models' outputs including products and forecasts at the national and regional levels. A further investment in the vast EEZ of Guyana could lead to improvements in global model quality, especially over the tropical Atlantic Ocean and the Caribbean Sea, an area prone to hurricane development.

Table 1. GBON Global Gap Analysis

A. GBON horizontal resolution requirements	B. Target	C. Reporting to req.	D. Gap to improve	E. Gap new	F. Gap total
Surface stations Standard density 500 km	2	1	1	0	1
Upper-air stations over land Standard density 1000km	1	0	0	1	1

- Target – the number of GBON low-resolution required stations; Reporting to Req. – The existing stations reporting according to the GBON's standards; Gap to improve – number of existing stations, which might be upgraded to fulfil GBON's requirements; Gap new – the number of required new stations; Gap Total – number of stations requiring an investment (existing/new)

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

Surface stations

The current observational network consists of 6 manual stations (tables 2 and 3), only one of which (the station at the Cheddi Jagan International Airport (Timehri Airport) is providing hourly observations day and nighttime, another one is providing hourly observations, but only daytime and the rest are providing observations every four hours, but only during daytime. It should be added that there are some additional gaps within the observations, either due to human factors, transmission challenges (the cellular network does not cover the entire country and in many areas, it is too weak or/unstable) or, more rarely, also due to damaged instruments.

The GHD has received two large donations of AWSs through the USAID CCAP Project (Nov, 2017). Since their installation, these stations were either providing erroneous data or were unable to establish a continuous transmission. An investigation conducted by the technical staff revealed that all these stations were having a similar technical issue. Namely the enclosures could have not been hermetically closed, leading to observation errors due to environmental conditions as well continuous damage to the instruments inside. As the main criterion for choice in the tender was the price, the stations were not selected considering the existing harsh environmental conditions). Despite a large investment of resources (out of the quite constrained resources of the GHD), the existing defects could not be repaired and hence, recently, the GHD took the decision to stop attempts aimed at reactivating these stations. Subsequently, the GHD started to acquire, from its own budget, AWSs from a different manufacturer. Until now, four of these were installed in quite challenging areas in order to evaluate their capability to withstand local harsh conditions, whereas these stations are properly functioning and are suitable for Guyana's environment, the needed expansion of the network is a challenge due to the elevated costs of the stations compared to the national funds of GHD. Therefore, additional funding will be required to provide for the expansion and maintenance of the network.
The private sector, in particular the oil sector and large farms operate privately owned observation stations. The GHD has no complete information about the number or location of the stations and has no access to the station data.

No additional observation stations are being operated by any other governmental agency.

Upper-air stations

The GHD does not currently operate any upper-air stations.

Table 2. Assessment of existent stations per their operational status and network ownership

GBON Requirements	Existing observation stations (# of stations)			
	NMHS network		Third-party network	
	Reporting to req.	To improve	Reporting to req.	To improve
Surface land stations Standard density 200km Variables: SLP (Surface Level Pressure), T, H, W, P, SD (Snow Depth)	1 (but still recommended to be replaced with an AWS in the future)	6	0	0
Upper-air stations operated from land Horizontal resolution: 500km Vertical resolution: 100m, up to 30 hPa Variables: T, H, W	**0**	**1**	**0**	**0**
Surface marine stations in Exclusive Economic Zones: 500 km Variables: SLP, SST (Sea Surface Temperature)	**0**	**0**	**0**	**0**

Upper-air stations operated in Exclusive Economic Zones: 1000 km Vertical resolution: 100m, up to 30 hPa Variables: T, H, W	**0**	**0**	**0**	**0**

Table 3. 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).

Station name	Station type (S/UA/M)	Owner (NMHS/3rd party)	Funding source	GBON variable measured							Reporting cycle (obs/day)	GBON Compliant (Y/N)
				SLP	T	H	W	P	SD	SST		
Georgetown	S	NMHS	Gov	X	X	X	X	X	-	-	12	N
Kamarang	S	NMHS	Gov	X	X	X	X	X	-	-	3	N
Lethem	S	NMHS	Gov	X	X	X	X	X	-	-	3	N
Mabaruma	S	NMHS	Gov	X	X	X	X	X	-	-	3	N
New Amsterdam	S	NMHS	Gov	X	X	X	X	X	-	-	3	N
Timehri Airport	S	NMHS	Gov	X	X	X	X	X	-	-	24	N

3. Results of the GBON National Gap Analysis

Surface stations

According to the GBON low-resolution criteria, (table 4) Guyana should operate at least 6 surface stations, providing hourly measurements on a 24/7 basis (with the following requirements: a. the minimum number of internationally available reports should be not less than 80% of the total number of Reports for the period. B. delayed reports should not conceive more than 5% of the total number. In addition, c. rejected reports, due to insufficient quality, should not conceived more than 5% of the total number of Reports). However, as already stated in the previous section, the existing actual observational network consists only of 6 manual stations, of which only one is fully GBON compliant. Moreover, some of the stations do not even provide these insufficient data regularly and constantly due to technical issues and limited number of observers.

Nevertheless, this analysis together with the Country Hydromet Diagnostics (CHD) demonstrate that the GHD does have the general technical and logistical capacity to operate and maintain a modern AWS network. The main limitation of the GHD in doing so is the financial resources for robust AWS acquisition and maintenance. As soon as the required funds are available, it is recommended to install the new AWSs in the same locations where

the manual stations operate (Table 5, except for the old station in Georgetown, which can be well represented by the Timehri Airport Station), both for inter-comparison and calibration as well as for logistical and safety reasons. These stations should be re-assigned as GBON stations. Though the Timehri Airport manual station is currently fully GBON-compliant, it would be recommended also, for the sake of future sustainability, to install there an AWS, which will replace in due time the old manual one.

Figure 1 shows that the existing stations cover most of the country, except for the southern and eastern parts.

However, there are other major challenges involved with installing and maintaining such stations:

a. Security - especially of the stations located in the hinterland.
b. Accessibility – Large parts of Guyana, especially its hinterland, is only accessible by air and/or water (also heavily depending on the season and the weather), which makes the logistics much more complicated and expensive. Many areas are actually not accessible throughout large parts of the year.
c. Data communication and transmission – the current manual stations report using the cellular network, but this network is far from covering the entire country with reasonable stability and bandwidth. The new stations will transmit using the NOAA satellites. However, it has additional implications – as additional power supply and the need to purchase additional modems for all of the stations.
d. Station resilience – the conditions in most of Guyana are harsh, so only AWSs that were proven to function well under these constraints should be installed.

It should be emphasized that most of the territory of Guyana belongs to the main Amazonas basin, which is one of the most important regions for the planetary ecological system and a higher-resolution stations grid could provide researchers from all over the world with a much better opportunity to provide a more comprehensive assessment of the state the Amazon rainforests.

Upper-air stations

The GHD does not operate any upper-air stations. However, the GHD has considered the location for such a station. The GHD has decided, to choose the already existing surface station at the Cheddi Jagan International Airport (Figure 2.) as the preferred location, for reasons of locally available staff, safety and accessibility. The authors of this Report fully support this decision.
SOFF support will be required for the procurement, installation and maintenance of such a station, especially through acquiring consumables. As abovementioned, the GHD has the technical capacity as well as the personnel to run such a station for a longer-term. From a budgetary perspective, it might be possible later to harness government funding to support the future required consumables for the station.

Marine surface and upper-air stations

Guyana possesses a very large EEZ (equivalent to almost half of its territory). Currently, the GHD does not operate any marine observations, but considering the fast-evolving exploitation of the massive oil reservoirs found underneath, this might trigger growing interest of the

Guyanese government as well as the private sector with regard to the weather conditions offshore.
At the same time, the construction of oil drilling platforms and the growing maritime transportation infrastructure will facilitate the installation and the maintenance of potential marine stations, also compared with the partly poor infrastructure and the harsh conditions inland. An additional upper-air station might be of major interest for the expanding air transportation over the region.

Table 4. 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	**2**	**6**	**1**	**6**	**0**
Upper-air stations operated from land	**1**	**1**	**0**	**0**	**1**
Surface marine stations in Exclusive Economic Zones:[1] Density 500 km Variables: SLP, SST Observing cycle: 1h	**4**	**0**	**0**	**0**	**4**
Upper-air stations operated in Exclusive Economic Zones: [2] Density 1000 km Vertical resolution: 100 m, up to 30 hPa Variables: T, H, W Observing cycle: twice a day	**1(?)**	**0**	**0**	**0**	**1**

Table 5. Recommended existing and proposed surface and upper-air stations to be designated to GBON.

Station name	Station type (S/UA/M)
Kamarang	S
Lethem	S
Mabaruma	S

[1] 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.
[2] 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.

New Amsterdam	S
Elbini	S
Timehri Airport	S
Timehri Airport	U (though there is no upper-air station currently there, the existing GHD facilities there can be used in order to build up a new upper-air station)

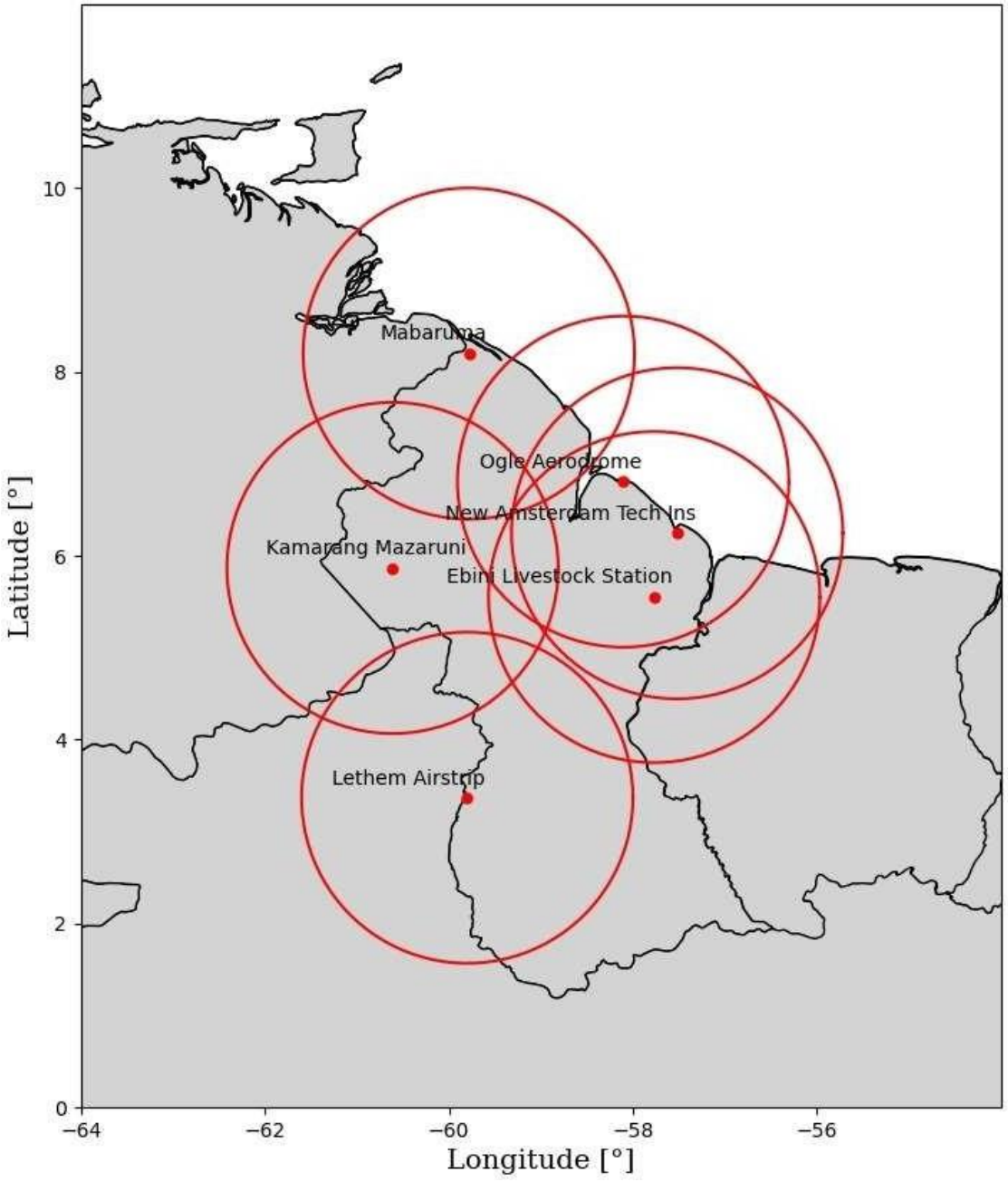
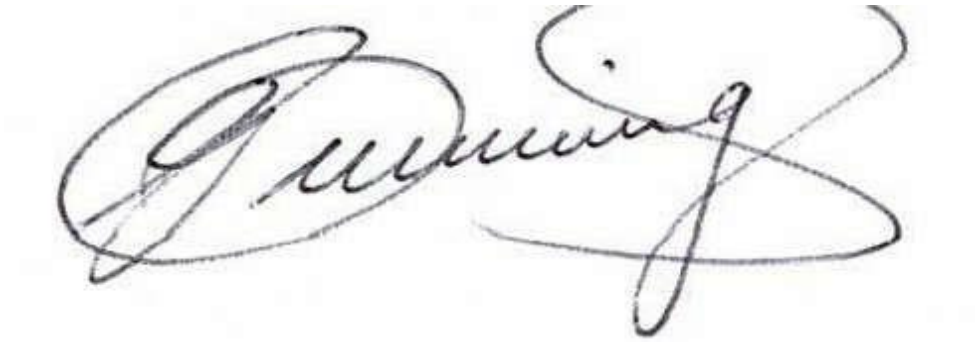


Figure 1. A map with the existing and proposed surface stations for GBON

Figure 2. A map with the proposed upper-air station

4. Report completion signatures

Peer Advisor signature 
WMO Technical Authority screening signature 
Beneficiary Country signature 

Annex 1: High-resolution Surface Stations

As mentioned in the report, in case of an additional funding support, Guyana can aspire towards a high-resolution surface stations network. In such a case, additional 16 AWSs should be procured, deployed and installed, thus bringing the surface network to a total of 22 stations. The list of these additional stations are given in table 1, and their actual locations in figure 1.

Table 1. Recommended additional surface stations to be added to the station of network and designated to high-resolution GBON.

Station name	Station type (S/UA/M)
Georgetown (Botanical Gardens)	S
Port Kaituma	S
Moruca	S
Anna Regina	S
Leonora Corner	S
Burma	S
Copeman Conservancy	S
Orealla	S
Isseneru	S
Kaieteur	S
Kato	S
Tumatumari Falls	S
Aishalton	S
Kwakwani	S
Mabura Hill	S

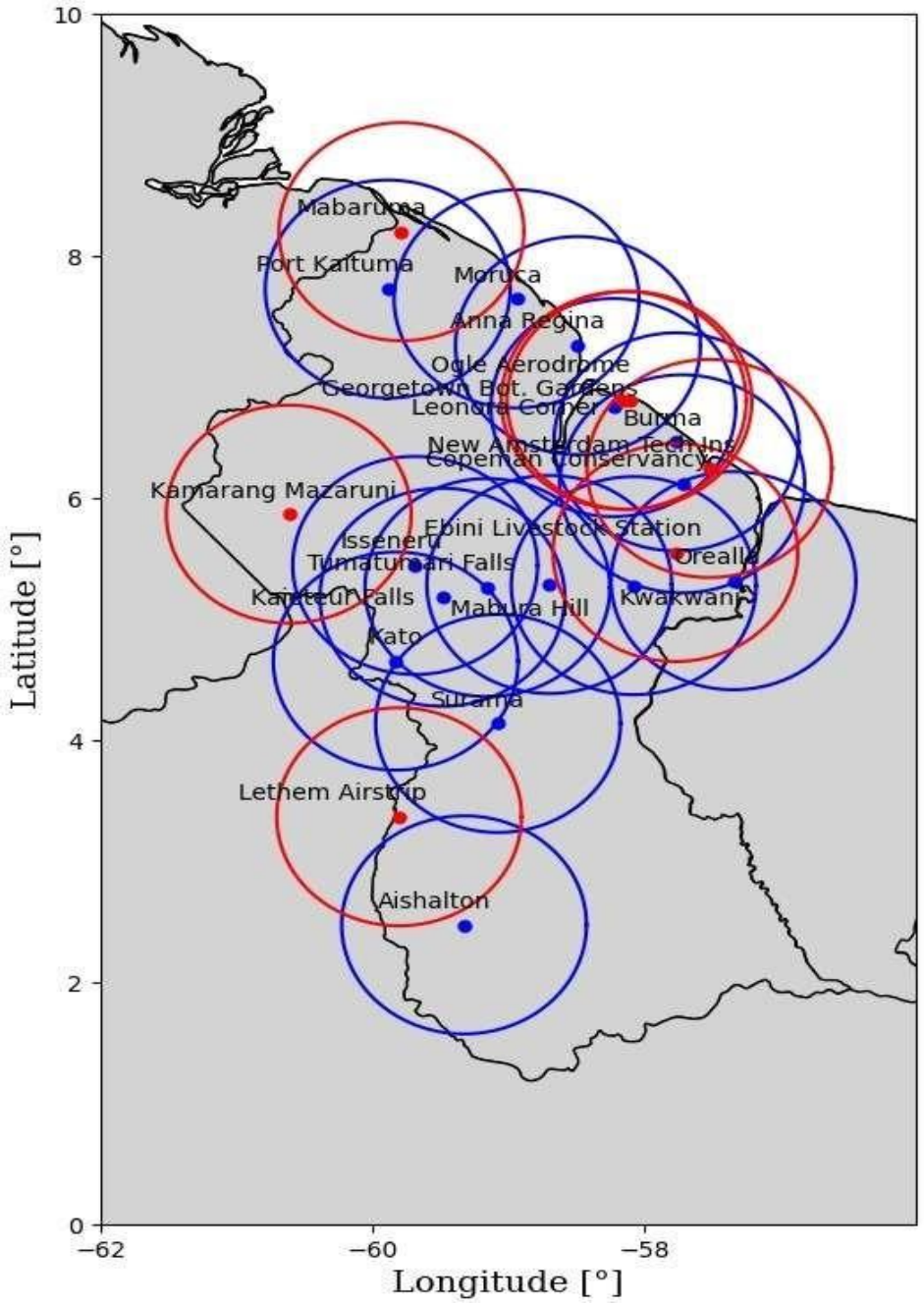


Figure 1. A map with the existing and proposed surface stations for a high-resolution GBON (low-resolution stations from table 5 are marked by blue circles; additional stations to reach high-resolution GBON are marked by red circles)