
January 2024

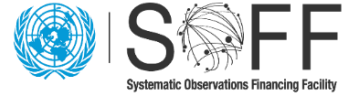
GBON National Gap Analysis

Trinidad and Tobago

Systematic Observations
Financing Facility

**Weather
and climate
data for
resilience**





Screening of the National Gap Analysis (NGA) of Trinidad and Tobago

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.

Date: 22.04.2026

Signature: 

GBON Gap Analysis Report Trinidad and Tobago

Beneficiary Country Focal Point	Shakeer Baig, TTMS
Peer Advisor Focal Point and Institute	Anni Karttunen, FMI

1. Country information from the GBON Global Gap Analysis

Table 1. WMO Global GBON Gap Analysis June 2023.

GBON horizontal resolution requirements	GBON target	Reporting	Gap improve	Gap new	Gap total
Surface stations Horizontal resolution: 200km	1	2	0	0	0
Upper-air stations Horizontal resolution: 500km	1	0	1	0	1

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

Trinidad and Tobago have two manual surface weather stations registered and reporting in the WDQMS GBON database and one upper-air sounding station. Both surface weather stations are manual and located in Piarco International Airport in Trinidad and Crown Point Airport in Tobago. The stations report once every hour. The messages are shared centrally from Piarco Observation Office.

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) ¹	To improve	Reporting (GBON compliant) ³	To improve

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 during 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.

Surface land stations Standard density ² 200km Variables: SLP, T, H, W, P, SD	2	2	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	1	0
Surface marine stations in Exclusive Economic Zones: ⁷ 500 km Variables: SLP, SST	-	-	-	-
Upper-air stations operated in Exclusive Economic Zones: ³ 1000 km Vertical resolution: 100m, up to 30 hPa Variables: T, H, W	-	-	-	-

The Trinidad and Tobago meteorological services has a network of two manual surface weather stations, automatic weather stations including climatological and agrometeorological stations and a network of 3D printed stations (3D Paws). The 3D Paws stations do not yet have WMO compliance and are mainly used as back-up and additional input for agrometeorological services.

Most surface observation stations report all GBON parameters excluding snow-depth which is not applicable in the country (some climatological stations do not report wind parameters). Many of the stations have been procured or donated in different projects and are from several suppliers and models.

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).

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.

³Although 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 ⁴)	Owner (NMHS /3rd party)	Funding source	GBON variable measured							Reporting cycle (obs/day)	GBON Compliant (Y/N)
				SLP	T	H	W	P	SD	SST		
Piarco International Airport	S	NMHS	NMHS	X	X	X	X	X	-	-	Hourly	Y
Crown Point Airport	S	NHMS	NHMS	X	X	X	X	X	-	-	Hourly	Y
Rawinsonde Office Piarco	UA	NOAA	NOAA	-	X	X	X	-	-	-	Once a day	N

Trinidad and Tobago meteorological services has one upper-air sounding station at Rawinsonde Office in Piarco. The station is part of the Cooperative Hurricane Upper Air Station network and therefore supported by US National Weather Service (NWS). NWS has provided the sounding equipment including hydrogen generator and continues to provide the consumables for twice daily soundings and maintenance of the system. The sounding system, filling table and hydrogen tank have newly been upgraded. TTMS provides the housing for the system and the human resources to operate it.

During the time of WMO initial gap analysis in June 2023, upper-air soundings operations were down due to malfunctioning hydrogen generator. NWS has provided a new generator and the operations have been restarted. At the moment soundings are done only once per day due to lack of sounding operator.

3. Results of the GBON National Gap Analysis

According to WMO set criteria one surface station and one sounding station will fulfill GBON requirements for the area of Trinidad and Tobago. TTMS has registered two surface weather stations to WDQMS database with less than 100 km between them thus exceeding GBON requirements. Both of the stations are located at airports and are strategically important for TTMS to keep operational and up-to-date. Both registered stations are manual and strive to report observations once every hour. Full GBON compliancy has been achieved at both stations lately.

⁴ Please see guidance on marine stations in Section 2 on Scope.

Observations from the Crown Point Airport in Tobago are shared via slack to Trinidad from where they are transferred manually to wis2box platform.

The manual station sensor setup needs upgrading from obsolete technologies (mercury-based temperature sensors still in use) to modern solutions to support sustainable calibration practices and spare part availability for future. It is recommended to upgrade both registered GBON stations to automatic stations to ensure reliable data availability and sustainable operation. Both stations are recommended to be upgraded as they are already successfully part of the GBON network reporting at the required times, strategically important for the national operations and representing the islands weather conditions and to recognize the country’s dual island status with two operational units contributing to the GBON effort. Moreover, the geographical coverage of the islands of Trinidad and Tobago justifies two GBON stations as the distance from the south-western point of Trinidad to north-eastern corner of Tobago exceeds 200 km. The technical staff capacity has to be increased by supporting the recruitment of one additional technical officer to TTMS.

The upper air station has recently been renewed with a new hydrogen tank and balloon filling platform. Renewing of the hydrogen generator (NWS has indicated generator model to become obsolete) will be considered to ensure the operations sustainability. Difficulties in delivering the required twice a day soundings stem from lack of human resources. It is recommended to support the recruitment of one additional operator to TTMS.

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	1	2	1	0
Upper-air stations operated from land	1	1	1	1	0
Surface marine stations in Exclusive Economic Zones: ⁵ Density 500 km Variables: SLP, SST	-	-	-	-	-

⁵ 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.

Observing cycle: 1h					
Upper-air stations operated in Exclusive Economic Zones: ⁶ Density 1000 km Vertical resolution: 100 m, up to 30 hPa Variables: T, H, W Observing cycle: twice a day	-	-	-	-	-

3.1 Recommended existing surface and upper-air stations to be designated to GBON

GBON sounding station in Trinidad and Tobago

Name	Lat	Lon
Rawinsonde Office, Piarco	10 ° 35' 35" N	61 ° 20' 53" W

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

Station name	Station type (S/UA)
Piarco International Airport	S
Rawinsonde Office, Piarco	UA

⁶ 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.

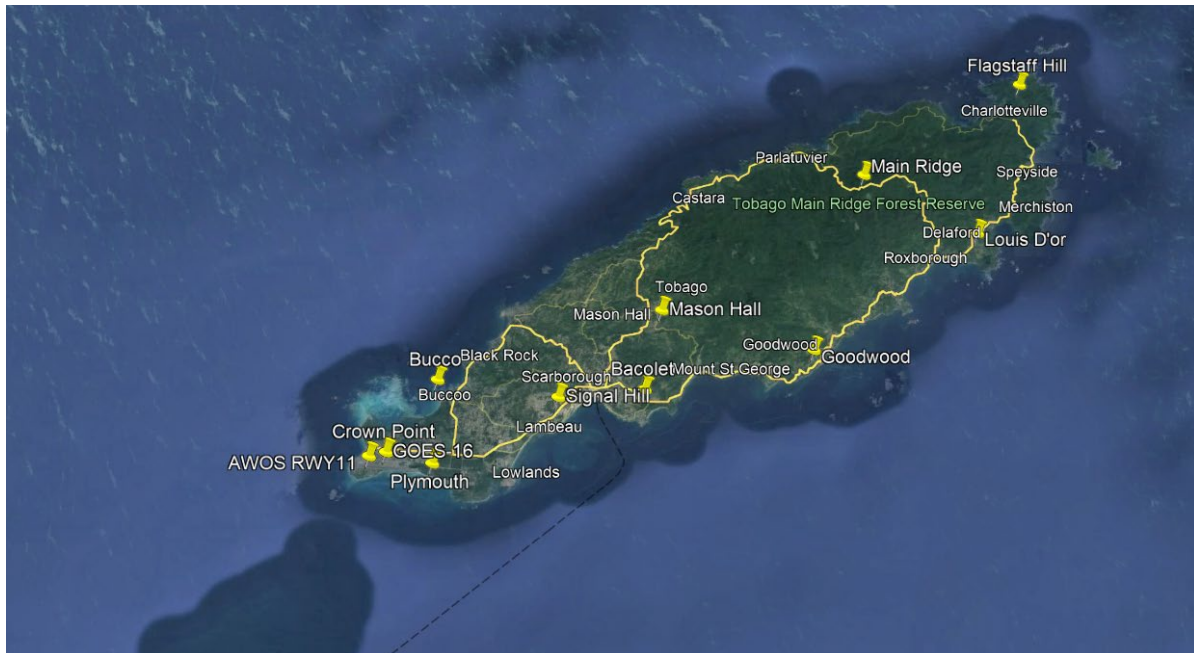


Figure 1. Map of surface weather stations in Tobago.

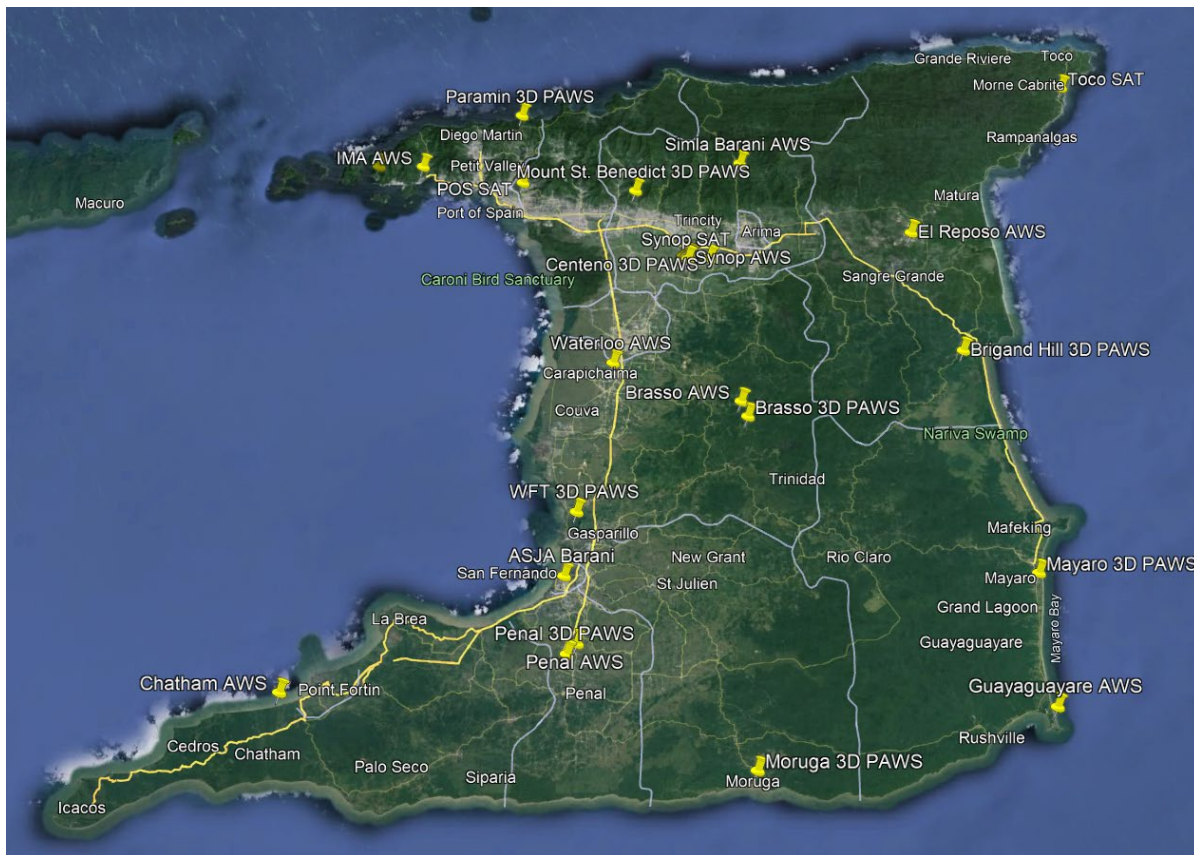


Figure 2. Map of surface weather stations in Trinidad. 3D Paws network consists of WMO sub-standard stations.

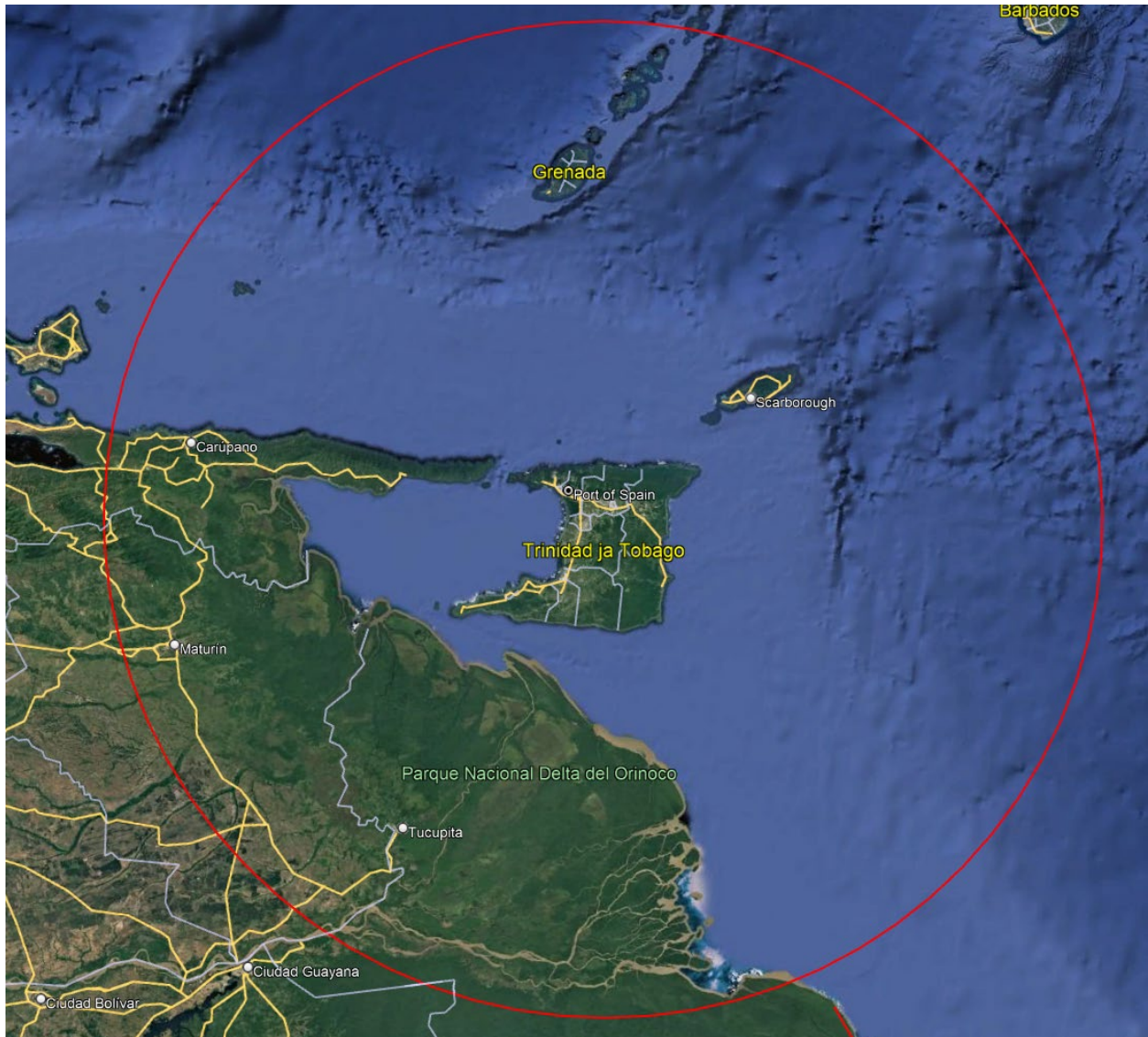


Figure 3. GBON surface weather station on Piarcó International Airport. Circle indicated with 250km radius.

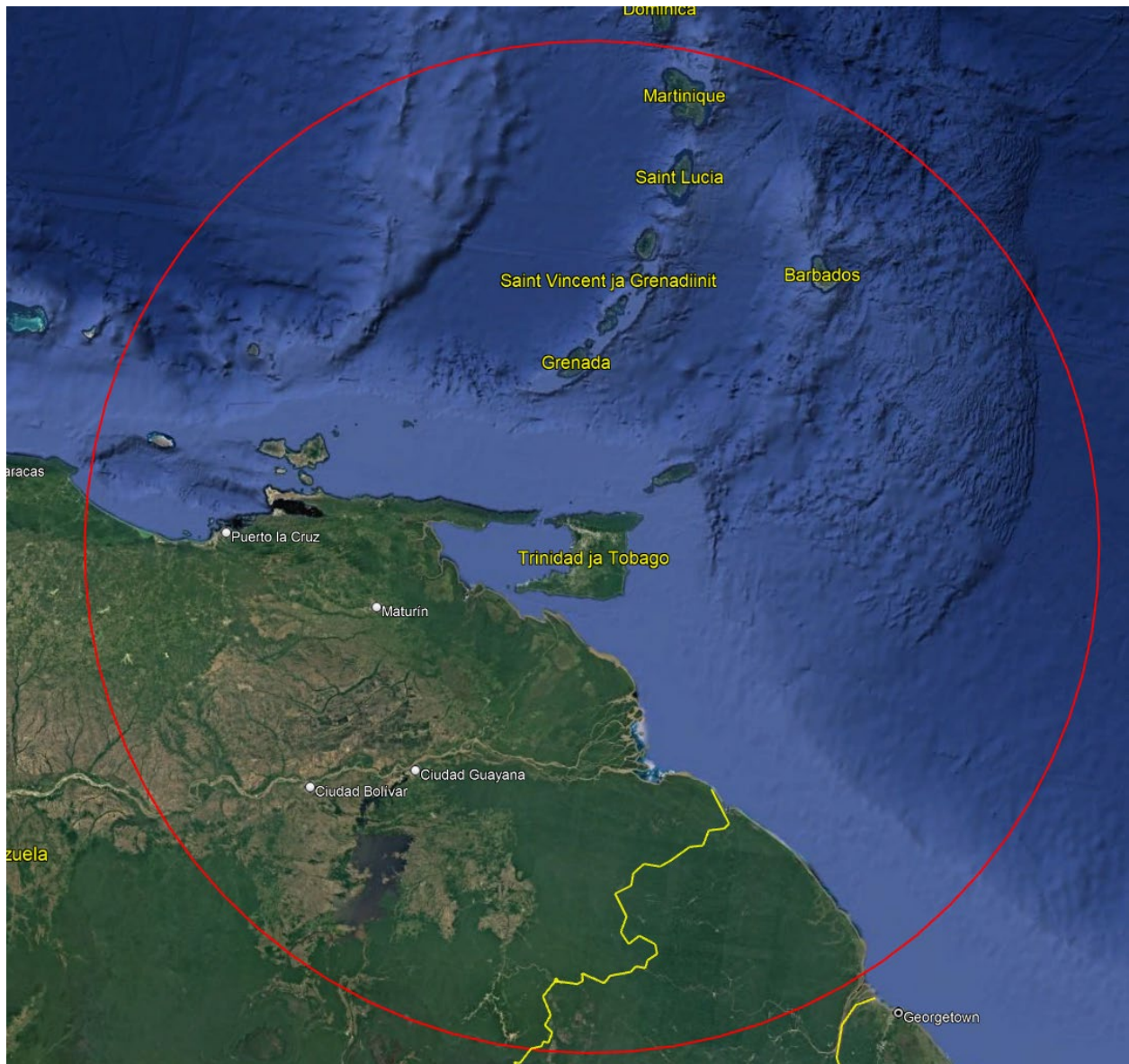





Figure 4. Upper-air station in Piarco International Airport. Circle coverage indicated with 500km radius.

4. Report completion signatures

<p>Peer Advisor signature</p> <p> ANNI KARTTUNEN</p> <p></p>
<p>WMO Technical Authority screening remarks and signature</p> <p> 22.04.26</p>
<p>Beneficiary Country remarks and signature</p> <p> 22-04-26.</p> <p></p>

Annex 1.

Review of GAPS in capacity

In addition to number of GBON compliant observation stations, the discussions of Gap Analysis included a short review of Quality Management System (QMS), the status and capacity gaps in data transfer, database management, sensor maintenance and calibration, metadata, and quality control.

QMS

TTMS is implementing QMS but has not been certified. Preparing to get certification for aviation services with ISO9001:2015 standard by 2025.

Identified gaps:

- No sub-process for surface station excluding aviation
- QMS activities under one key person, need to train more staff for the operations.

Central database

Central database is ca. 10 years old and in need of hardware upgrades. Not all observation sources are stored on the same database due to lack in storage capacity. The current configuration of the database will require upgrading to handle data coming from automatic stations. Data management, improvements in quality control mechanisms, capability to communicate with APIs for importing and exporting open data are needed. It will be important to store data from different sources in one place to simplify the system of data pipeline.

Identified gaps:

- IT support in observation data, transmission, quality control, processing and archiving. Hardware and robust software for database management.
- Limited number of staff with sufficient skillset.
- Benchmarking other organizations.

Data transfer

Data reading and transfer processes vary including manual readout, internet, radio and satellite transmission depending on the station. TTMS has started to implement wis2box data transfer system and first pilot projects have been completed. TTMS hosts a part of the RA IV WIGOS Center and has committed to support the other English-speaking countries in the Caribbean region with WIS2.0 implementation. Development is needed for the automated data transfer processes including automatic hourly transfer via WIS2.0.

Soundings data is currently shared to the global community via NWS NCEP platform.

Identified gaps:

- Need for additional training to improve staff capacity.
- Benchmarking other organizations.

Metadata

Metadata is collected manually and stored locally.

Identified gaps:

- Metadata to be updated to GBON station web tool and national database.

Data quality control and assurance

Data quality control is currently made manually on the spot when observations are made and manually prior to archiving to database. There is a need to improve the capacity for automated data quality assurance (QA) and control (QC) throughout the value chain of observation.

Identified gaps:

- Insufficient staff capacity, including programming skills.
- Automated QC/QA methods and algorithms
- Benchmarking other organizations.

Sensor maintenance and calibration

TTMS does not carry out calibrations of sensors in laboratory. Previously calibration has been mainly done in the regional calibration centre CIMH in Barbados. This practise has not been active during recent years due to the lack of CIMH capability to perform calibrations (at the moment only the pressure calibration is working). TTMS is also considering calibrating sensors at national level if the National Bureau of Standards has the capability to do this. Rejuvenating the regional calibration services would be advisable and beneficial for the larger region.

TTMS is short on technical staff to maintain the observation infrastructure, especially the network of surface weather station and has had recurring difficulties in obtaining sufficient spare parts for the systems. Maintenance procedures should be included in the Quality Management System that is being developed.

Maintenance of upper-air sounding system is done based on maintenance manual recommendations from the system supplier.

Identified gaps:

- Insufficient staff capacity to calibrate and maintain sensors.
- Need to recruit additional member for technical staff.
- Maintenance toolkit needs upgrading.
- Regional calibration services need strengthening to cover all needed basic parameters.
- Insufficient budget for maintenance (including spare parts)

Annex 2.

Additional information on the national network.

Station name	Station type (S/UA)	Owner (NMHS/third-party)	Funding source	GBON variable measured						Reporting cycle	
				SLP	T	H	W	P	SD		
Automatic surface stations (5) Trinidad	S	NMHS	NMHS		X	X	X	X	X	-	Hourly
Automatic surface stations (9) Tobago	S	NMHS	NMHS		X	X	X	X	X	-	
Agrometeorological surface station (3)	S	NMHS	NMHS		X	X	X	X	X	-	Hourly
Climatological stations (6)	S	NMHS	NMHS		X	X	X		X	-	-
CCCCC Stations (3)	S	NMHS	NMHS		X	X	X	X	X	-	-
3D Paws stations (10)	S	NMHS	NMHS		X	X	X	X	X	-	-

Reporting cycle is in most cases hourly but also shorter for some stations depending on the use-case and project.