2nd October 2023

GBON National Gap Analysis

Systematic Observations Financing Facility

Weather and climate data for resilience

WEATHER CLIMATE WATER

Screening of the National Gap Analysis (NGA) of Belize

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 1 surface land and 1 upper air stations, the **WMO Technical Authority confirms the NGA results which indicate the need for 2 surface land and 1 upper air stations to ensure adequate horizontal resolution for GBON.**

Date: 21 Oct 2023

Signature:

Albert Fischer

Director, WIGOS Branch, Infrastructure Department, WMO

GBON Gap Analysis Report
BELIZE

Beneficiary Country Focal Point	Ronald Gordon, National Meteorological Service of Belize
Peer Advisor Focal Point and Institute	Tim Donovan, Met Office, UK
WMO Technical Authority	

1. Country information from the GBON Global Gap Analysis

Table I. WMO GBON Gap Analysis June 2023

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

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

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	Improve	Reporting	Improve
Surface stations Horizontal resolution: 200km Variables: SLP, T, H, W, P, SD	0	71	0	0
Upper-air stations Horizontal resolution: 500km Vertical resolution: 100m, up to 30 hPa Variables: T, H, W	1	0	0	0

Table III. Assessment of existing stations per station characteristics.

Station name	Station type (S/UA)	Owner (NMHS/third-party)	Funding source	GBON variable measured			Reporting cycle				GBON Compliance (Y/N)
				SLP	T	H	W	P	SD		
Phillip Goldston Intl. Airport	UA	NMHS	Government		Y	Y	Y			2	N
Philip Goldson Int'l Airport	S	NMHS	Government	Y	Y	Y	Y	Y	N	10	N
Libertad	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
Towerhill	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
La Milpa	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
Belmopan	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
Hershey	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
Bellize Zoo	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
LA Democracia	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
Central Farm	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
Barton Creek	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
Spanish Lookout	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
Chaa Creek	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N

Savannah	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
Melinda	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
Middlesex	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
Pomona	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
Baldy Beacon	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
Mayan King	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
Bigfalls	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
Punta Gorda Agri	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
Blue Creek	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
Farm 11	S	NMHS	Government	Y	Y	Y	Y	Y	N	1	N
Chunox	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Yo Chen	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
SIRDI	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Little Belize	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Douglas	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Yo Creek	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
San Estevan	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
August Pine Ridge	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Shipyard	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Santa Martha	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
PGIA/Ladyville(M)	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Barton Creek (M)	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Hershey (M)	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
La Gracia	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Belmopan(M)	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Central Farm(M)	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Silk Grass	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Middlesex (M)	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Melinda(M)	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
PG AGRI(M)	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Blue Creek(M)	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Red Bank	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N

Farm 11 (M)	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Ranchito	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Libertad(M)	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Towerhill(M)	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
San Carlos	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Municipal	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
POB	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Baldy Beacon(M)	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Dangriga	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Kendal	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Placencia Airstrip	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Punta Gorda Airstrip	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
San Pedro	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
La Milpa/Rio Bravo(M)	S	NMHS	Government	N	Y	N	N	Y	N	>24	N
Hill Bank	S	NMHS	Government	N	Y	N	N	Y	N	>24	N
Altun Ha	S	NMHS	Government	N	Y	N	N	Y	N	>24	N
Gales Point	S	NMHS	Government	N	Y	N	N	Y	N	>24	N
Hattieville	S	NMHS	Government	N	Y	N	N	Y	N	>24	N
Spanish Lookout(M)	S	NMHS	Government	N	Y	N	N	Y	N	>24	N
Chaa Creek(M)	S	NMHS	Government	N	Y	N	N	Y	N	>24	N
Douglas da Silva	S	NMHS	Government	N	Y	N	N	Y	N	>24	N
Caracol	S	NMHS	Government	N	Y	N	N	Y	N	>24	N
Pomona(M)	S	NMHS	Government	N	Y	N	N	Y	N	>24	N
Savanah(M)	S	NMHS	Government	N	Y	N	N	Y	N	>24	N
Bella Vista	S	NMHS	Government	N	Y	N	N	Y	N	>24	N
Golden Stream	S	NMHS	Government	N	Y	N	N	Y	N	>24	N
Corazon	S	NMHS	Government	N	Y	N	N	Y	N	>24	N

***Notes*: Assessment of existing GBON stations per station characteristics.** Station type: S: Surface, US: Upper-Air; Owner of the station: NMHS or name of third-party; GBON variables: SLP: Sea-level pressure; T: Temperature; H: Humidity; W: wind; P: Precipitation; SD: Snow depth; Reporting cycle: Number of observation reports exchanged internationally per day (0-24); GBON compliance: weather the station is GBON compliant or not (see GBON guide on compliance criteria). Current GBON stations shown in RED, proposed additional GBON station shown in ORANGE.

3. Results of the GBON National Gap Analysis

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	Target (# of stations)	GBON Compliant stations (#)	Stations gap	
			New	Improved
Surface stations • **Horizontal resolution**: 200km • **Variables**: SLP, T, H, W, SD • Observation cycle: 1h	2	0	0	2
Upper-air stations • **Horizontal resolution**: 500km • **Vertical** resolution: 100m, up to 30 hpa **Variables**: T, H, W • **Reporting cycle**: twice a day	1	1	0	0

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

Station name	Station type (S/UA/M[16])
Phillip Goldston Intl. Airport	S
Philip Goldson Intl. Airport	UA
Punta Gorda Airstrip	S

Figure 1 and 2 below show the locations of the existing and proposed GBON observation sites respectively, for further detail see the attached annex.

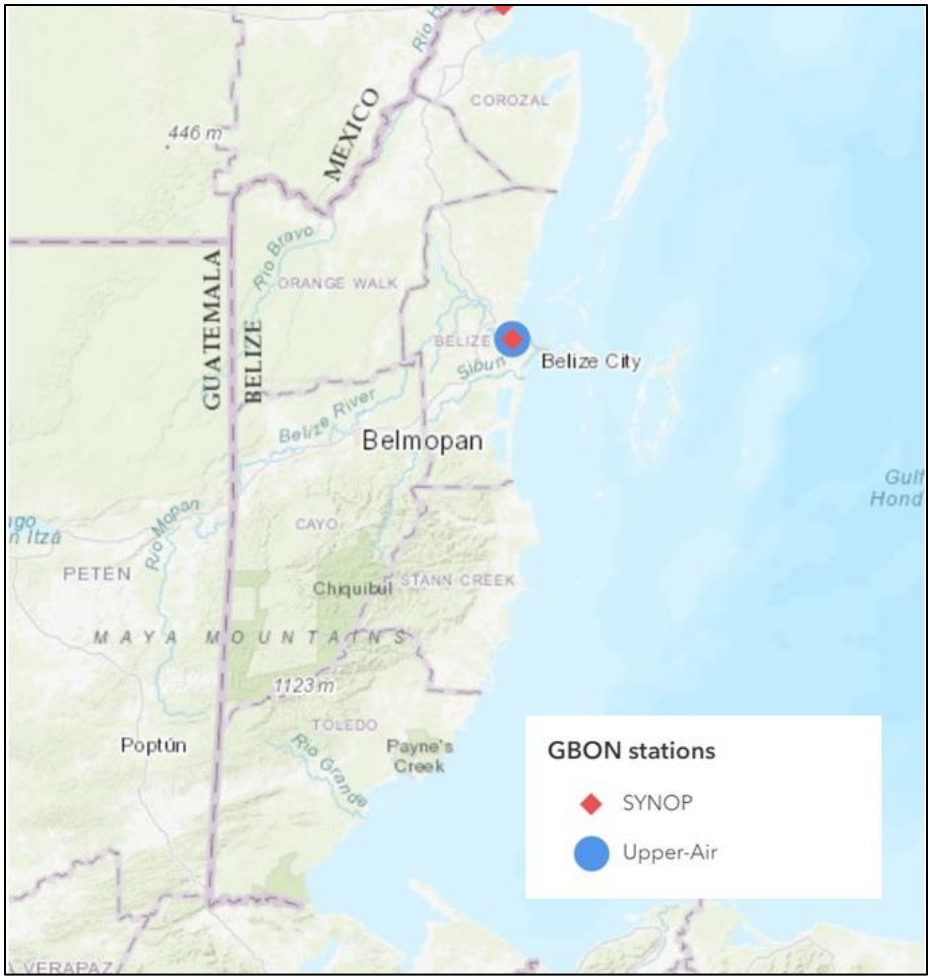


Figure 1 Existing GBON stations

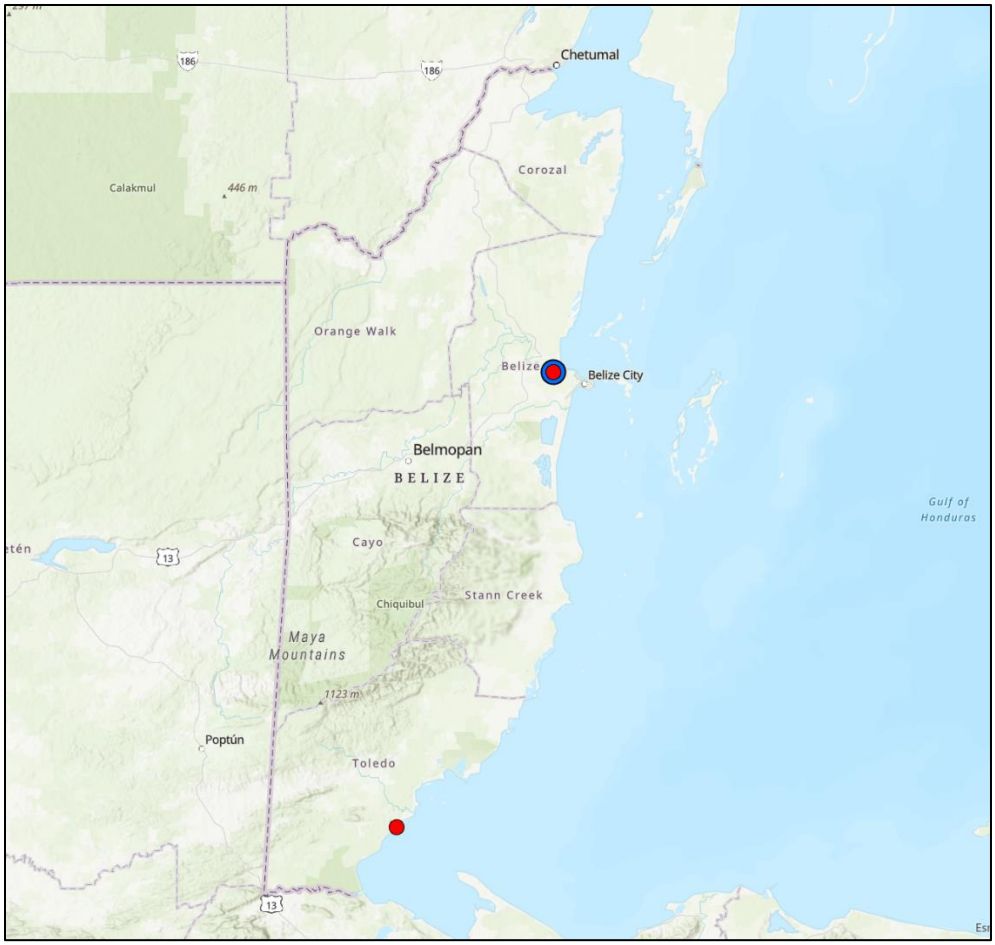
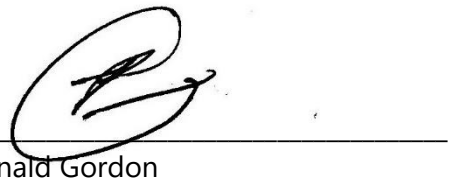


Figure 2 Proposed GBON stations

4. Report completion signatures

Peer Advisor signature 
WMO Technical Authority screening remarks and signature 
Beneficiary Country remarks and signature  Ronald Gordon Chief Meteorologist and Belize's WMO Focal Point National Meteorological Service of Belize

Appendices:

Current GBON contribution & regional context:

The initial GBON analysis undertaken by WMO indicated that the country of Belize (land area 22,000km^2, total area 56,000km^2) has a requirement for 1 surface and 1 upper air observation station to meet GBON standard requirements.

At present the surface and upper air observations from Philip Goldston International Airport (0-20000-0-78583) are exchanged internationally. This station reports hourly manual observations during working hours (16 observations per day), plus two radiosonde launches per day.

The surface observations report all GBON parameters excluding snow-depth, which is not applicable, however the station does not currently meet the GBON requirement for hourly observations 24 hours per day.

The WMO GBON analysis was based upon monitoring data from January 2022 and implied that Belize was not meeting GBON requirements for upper air observations at this time. Upon investigating this further it is clear that Belize is undertaking two radiosonde launches per day, reporting in high-resolution BUFR format and routinely attaining the target height of 30hPa, thereby meeting these requirements. The upper air observations in Belize are currently supported by the US National Weather Service due to their importance in relation to forecasting of tropical storms and hurricanes in the region.

There are currently no marine observations collected in Belize and the introduction of marine observations around the coast has been discussed by Belize NMS and the Ministry of Blue Economy and Civil Aviation in relation to forecasting of algae blooms due to their impact on tourism and fishing. Marine observations should be considered for funding support through SOFF at the appropriate stage.

When viewed at a regional scale, it is clear that the standard spatial requirement for upper air observations is currently being achieved.

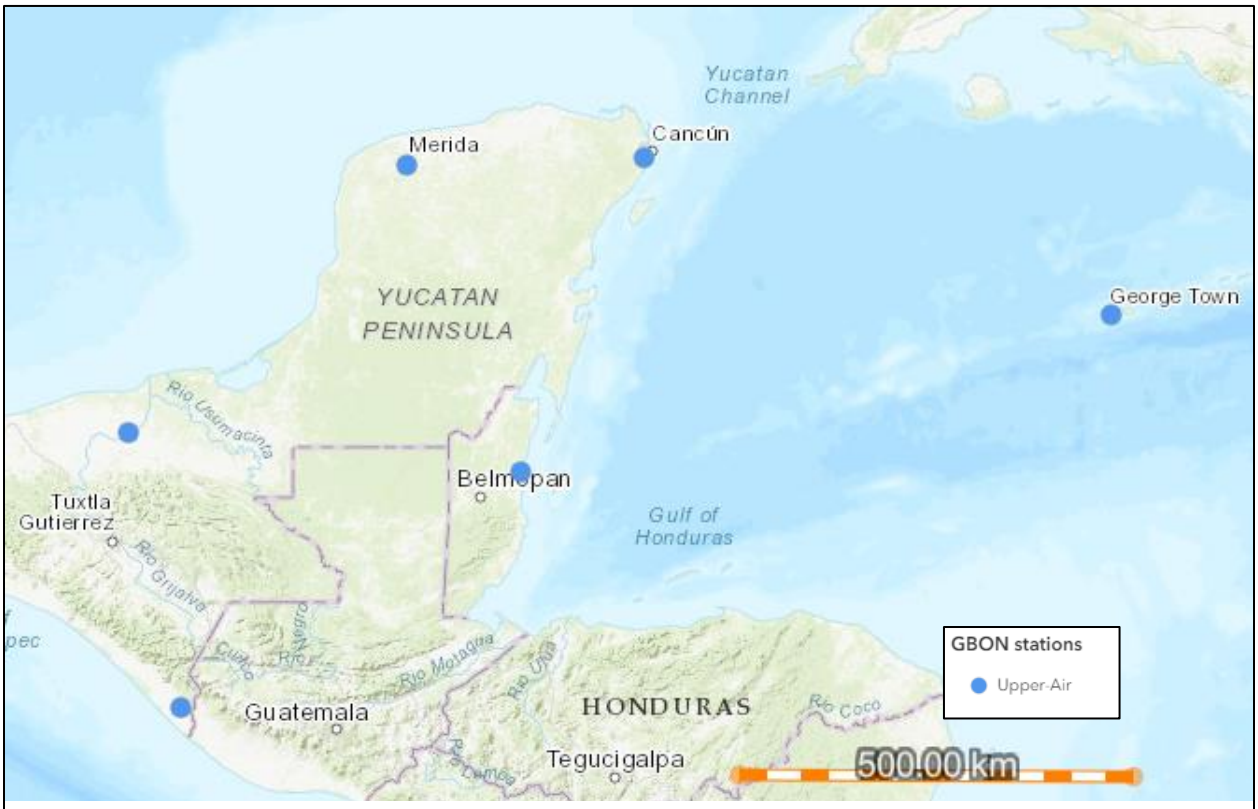


Figure 3 Existing upper air GBON stations in the region

The surface observation GBON requirements are not currently being achieved in the region, in part due to the absence of GBON nominated stations in neighboring Guatemala as indicated in Figures 4 and 5. As such, the recommendation to nominate 2 surface observation stations to GBON in Belize will contribute to meeting the lower threshold of spatial resolution for the GBON network in Belize and in the wider region. Additionally, the GBON site just beyond the northern border of Belize and in Mexico, CHETUMAL Q.ROO is not currently GBON compliant as it does not report pressure measurements. An additional site in the north of Belize could be nominated to GBON to supplement the network in the region, but this is not being proposed at this time on the understanding that the site in Mexico will be improved to meet GBON requirements.

Given the extent of the existing observation network in Belize, the nomination of an additional GBON site at an established observation site (Punta Gorda airstrip, see Table 1) in the south of the country will enable Belize to meet the GBON spatial requirements across the whole of the country. The proposed location, Punta Gorda airstrip in the south of Belize, currently has a manual observation site and an AWS with reliable power and communications as well as access for maintenance. It represents a relatively low-cost development to improve the resolution of the network in the region and provides Belize NMS the opportunity to sustain the network without imposing further financial and logistic burden.

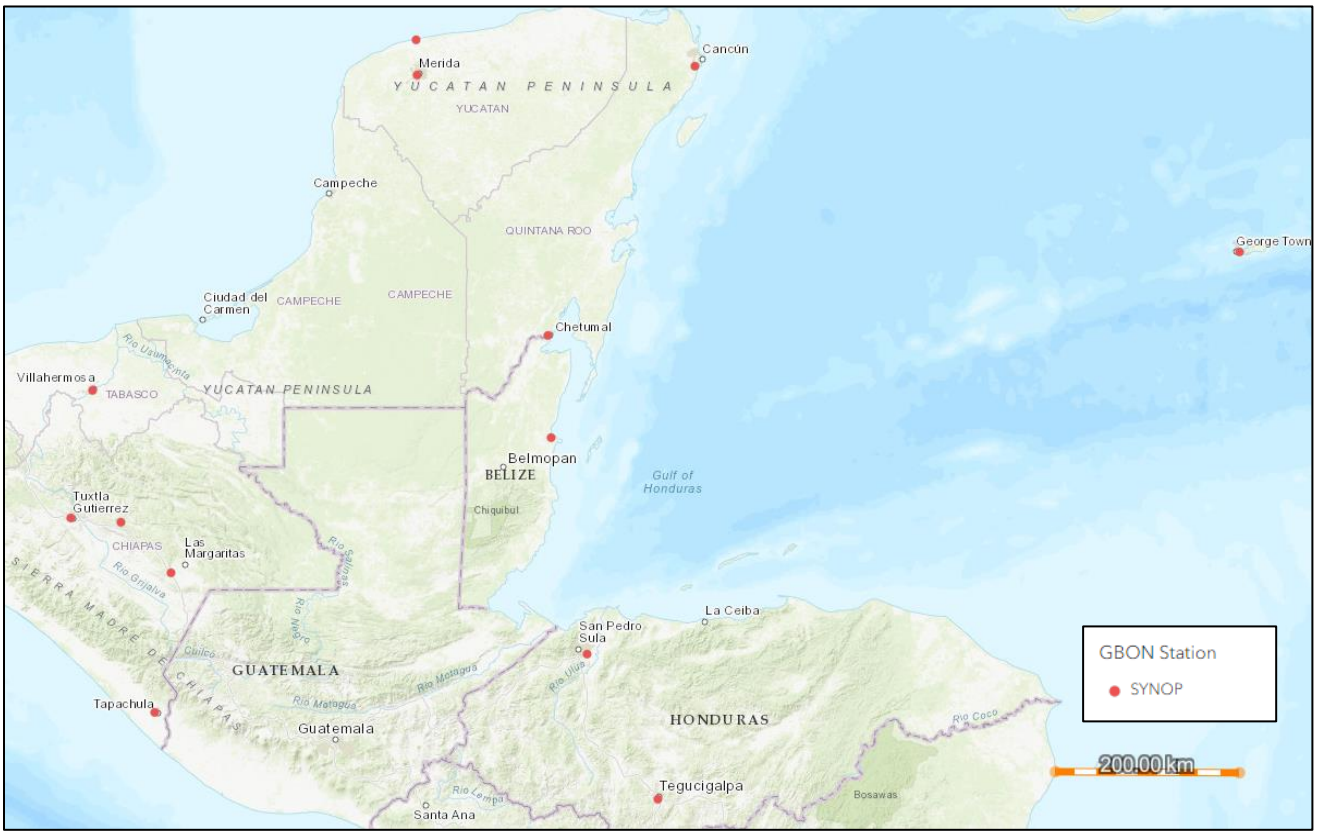


Figure 4 Regional GBON surface observation stations [data from WMO GBON designation web tool, 4th May 2023]

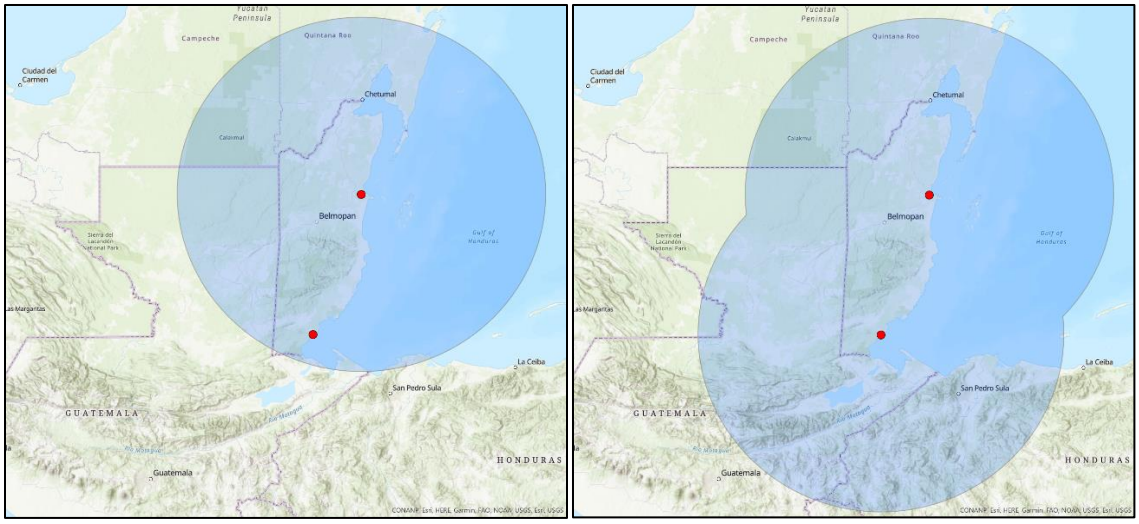


Figure 5 Extent of GBON lower threshold (200km) coverage for existing (left) and proposed (right) Belize GBON stations

National Observing Network

The National Meteorological Service of Belize currently operate an extensive surface observation network comprising 49 automatic (5 of which are not currently operational) and 22 manual observation stations (10 of which are not currently operational).

35 of the existing automated stations report the required GBON parameters with the exception of snow depth. Observations from the automatic network are reported sub-hourly, though no data from this network are currently exchanged internationally.

The radiosonde station detailed previously provides the single source of upper-air observations for the country. Launches are performed manually, using hydrogen filled balloons carrying the GRAW GP20 radiosonde.

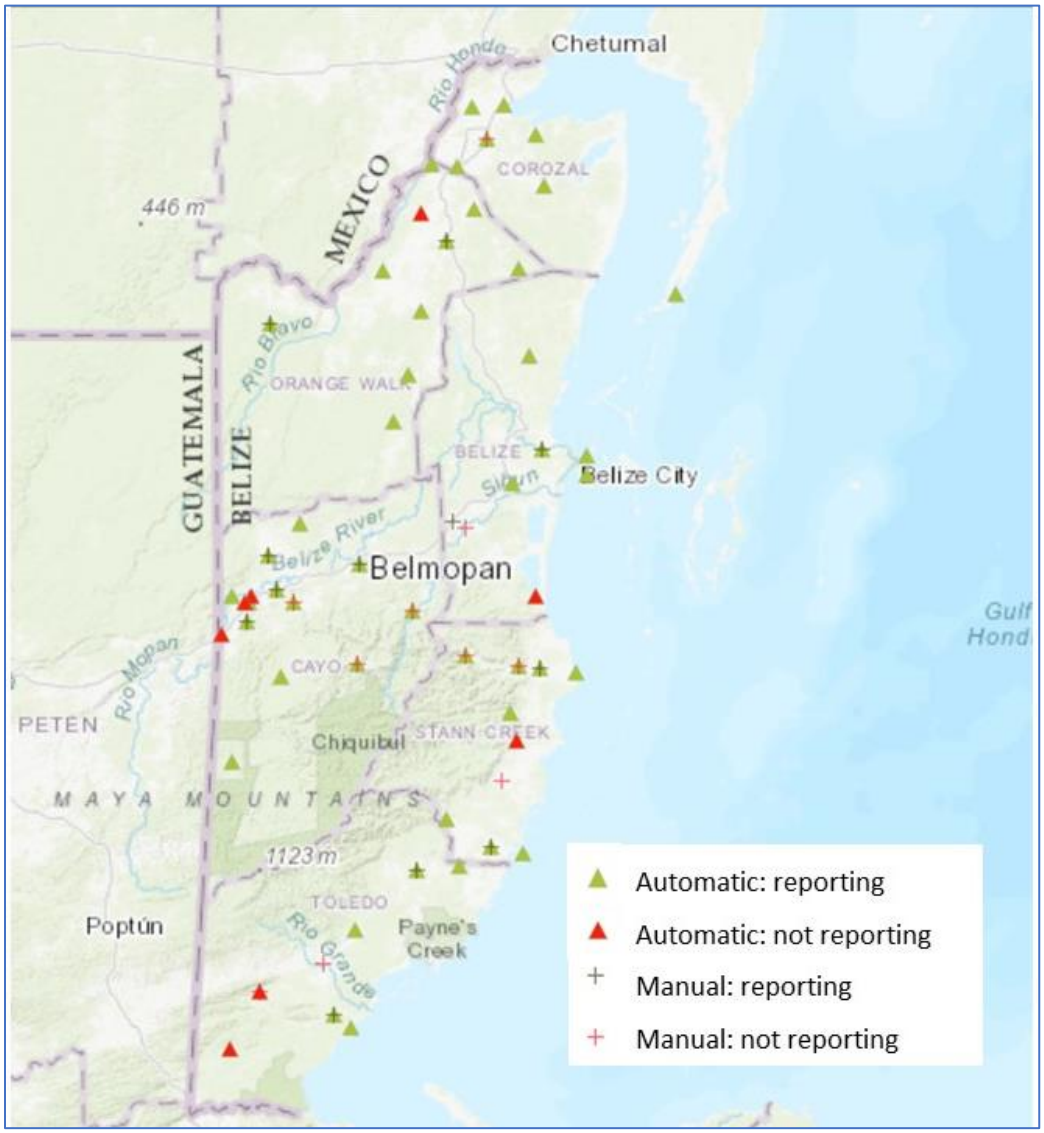


Figure 6: National surface observation network of Belize

The National Meteorological Service of Belize is in the process of upgrading a number of existing automatic stations, plus installing an additional 31 automatic stations as part of the Energy Resilience for Climate Adaptation Project, due for completion in September 2023.

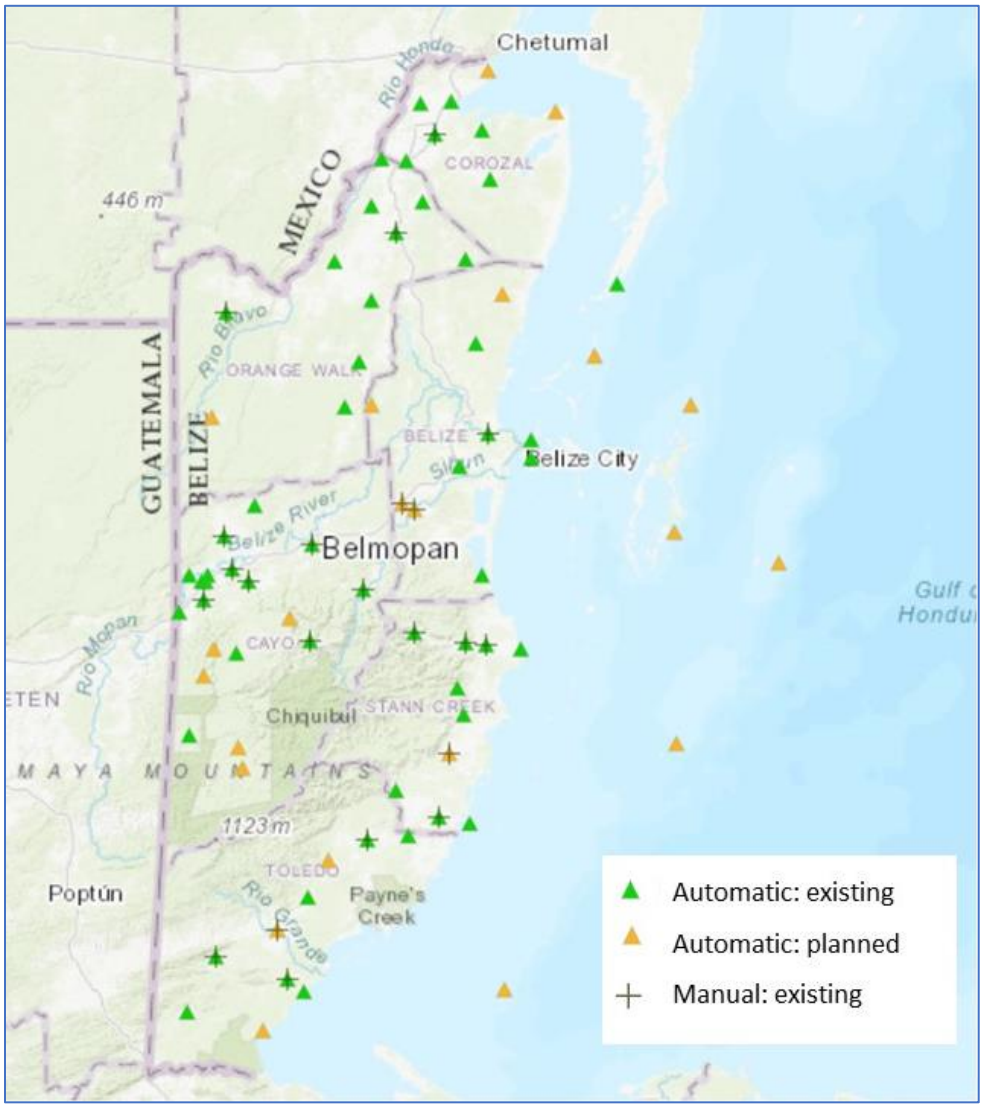


Figure 7: Future surface observing network of Belize