08 January 2024

GBON National Gap Analysis Bangladesh

Systematic Observations
Financing Facility

Weather
and climate
data for
resilience

Screening of the National Gap Analysis (NGA) of Bangladesh

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 4 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 5 surface land stations and 1 upper station based on specific national circumstances.**

Date: 16 December 2024

Signature:

Albert Fischer

Director, WIGOS Branch, Infrastructure Department, WMO

GBON National Gap Analysis Report
Bangladesh

Beneficiary Country Focal Point and Institute	Dr. Md. Shameem Hassan Bhuiyan, Bangladesh Meteorological Department
Peer Advisor Focal Point and Institute	Teferi Demissie, Norwegian Meteorological institute

1. Country information from the GBON Global Gap Analysis

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

Table I. WMO GBON 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 to req. [1]	D. Gap to improve	E. Gap new	F. Gap total
Surface stations Standard density[2] 200 km	4	0	4	0	4
Upper-air stations over land Standard density[21] 500km	1	4	0	0	0

Bangladesh is 147,570 sq km

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[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

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 to req. [3]	To improve	Reporting to req. [21]	To improve
Surface land stations Standard density [4] 200km Variables: SLP, T, H, W, P, SD	0	4*	0	0
Upper-air stations operated from land Horizontal resolution[23]: 500km Vertical resolution: 100m, up to 30 hPa Variables: T, H, W	0	1	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				

Summary:

BMD operates just over 300 observation station networks of varying classes. There are 58 manual (synoptic) observatories, out of which five have irregular observations due to less manpower, 61 are AWS, 125 agricultural AWS, 65 automatic rain gauge stations and five 5 upper air stations. All the country's synoptic and AWS stations are installed at the same position. Out of the 61 AWS, 35 are newly installed in 2023 under a World Bank (WB) project in Bangladesh. 13 AWS were installed 3 or 4 years ago while 12 AWS were installed in 2013 but stopped working after 3 yrs of installation. BMD is taking initiatives for recovering these stations. Improvement on the 12 AWS was made in 2022.

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[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 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.

[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.

Data from these AWS are mainly used for operations purposes at BMD. The ICT infrastructure and services at BMD need to be re-designed for complete data processing and data transmission from the observing stations to the Global NWP centers in real-time through WIS 2.0. BMD relies on the GTS for international data transmission.

All weather observation networks in Bangladesh are installed and maintained by BMD. Presently BMD does not use other organization's (3rd party station) data. There however exist some agricultural institutes that run rainfall observation stations in Bangladesh. These stations don't have proper observation routines.

Bangladesh currently has no marine stations. BMD will need SOFF support for at least one marine station installation based on the 500 km horizontal resolution at the Bay of Bengal

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: weather the station is GBON compliant or not (see GBON guide on compliance criteria).

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		
DHAKA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
DHAKA	UA	BMD	GoB		x	x	x				12-hourly	Y**
RANGPUR	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
BOGRA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
BOGRA	UA	BMD	GoB		x	x	x				24-hourly	N
SYLHET	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
SYLHET	UA	BMD	GoB		x	x	x				24-hourly	N
ISHURDI	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
JESSORE	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
FENI	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
BARISAL	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
BARISAL	UA	BMD	GoB		x	x	x				24-hourly	N
CHITTAGONG	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
CHITTAGONG	UA	BMD	GoB		x	x	x				24-hourly	N
COX'S BAZAR	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
SAYEDPUR	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
DINAJPUR	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
MYMENSINGH	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
RAJSHAHI	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
TANGAIL	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
SRIMANGAL	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
CHUADANGA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
FARIDPUR	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
COMILLA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
MADARIPUR	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
CHANDPUR	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
SATKHIRA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
KHULNA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
BHOLA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
MANGLA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
PATUAKHALI	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
HATIYA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
SANDWIP	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
SITAKUNDU	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
KHEPUPARA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
KUTUBDIYA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
TEKNAF	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
TETULIA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
DIMLA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
RAJARHAT	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
BADOLGACHI	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
NETROKONA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N

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

TARASH	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
KUMARKHALI	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
GOPALGONJ	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
NIKLI	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
KOYRA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
RAMGOTI	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
ARICHA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
BANDARBAN	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
ASHUGANJ	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
BAGHABARI	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
HIJLA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
MAWA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
NARSINGDI SADAR	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
KAWKHALI	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
MONPURA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
SAINT MARTIN	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
DIGHINALA	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N
NARAYANGANJ	S	BMD	GoB	x	x	x	x	x	NA*	NA*	3-hourly	N

GoB Government of Bangladesh
* NA: not applicable

Summary of the station list:
- Surface observatories: Ashuganj, Kawkhali, Saint Martin & Dighinala have not been used due to shortage of manpower. – They take observations partially (not at night). Automatic stations have been installed alongside these stations
- 55 surface stations, None is GBON compliant
  Based on the WDQMS webtool, surface observations from 17 BMD stations have been received but with availability issues.
- 5 Upper Air stations,
  - One upper air station is indicated as GBON compliant in that there are two soundings per day.
  - For GBON compliance observed data needs to be available more than 80% in the [WDQMS monitoring system](#) at least 80% of days. This is however not the current situation.
    **Dhaka upper air soundings have not been received in a while in the WDQMS monitoring system. For this reason, and based on the GBON requirements, we conclude that Bangladesh is not GBON compliant on upper-air soundings. Data exchange internationally in real-time needs improvement such that complete sounding is received for GBON compliance. This is an easy fix and the needs will be assessed in the GBON contribution plan.
- BMD has an automatic station network, observing all the GBON variables, but the main challenge for GBON compliance is lack of reliable ICT infrastructure capabilities including skilled IT specialists for the increased data processing. This will be mapped out in the National Contribution Plan.
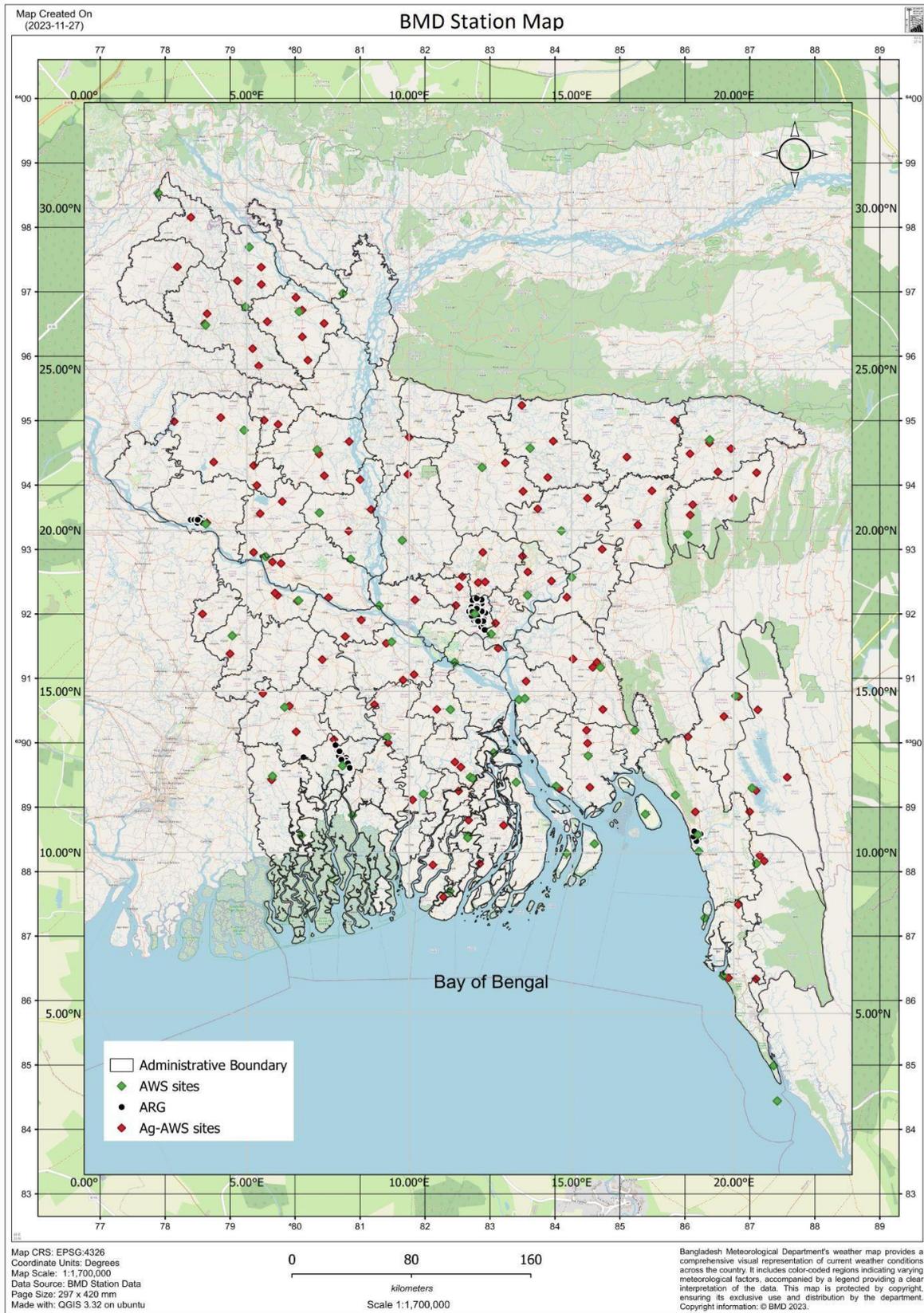
Fig 1: Map of Bangladesh with locations of existing surface automatic weather stations–AWS (green), automatic rain gauge stations (black) and agricultural AWS stations (red)

3. Results of the GBON National Gap Analysis

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:

GBON requirements	GBON target (# of stations)	GBON Compliant stations (#)	Stations gap	
			To improve	New
Surface land stations Standard density[7] 200km Variables: SLP, T, H, W, SD Observing cycle: 1h	4	0	**5**	**0**
Upper-air stations operated from land Standard density[27] 500km Vertical resolution: 100m, up to 30 hpa Variables: T, H, W Observing cycle: twice a day	1	0	**1**	0
Surface marine stations in Exclusive Economic Zones:[8] Density 500 km Variables: SLP, SST Observing cycle: 1h	0	0	**0**	1
Upper-air stations operated in Exclusive Economic Zones:[9] Density 1000 km Vertical resolution: 100 m, up to 30 hPa Variables: T, H, W Observing cycle: twice a day				

Humidity; W: wind; P: Precipitation; SD: Snow depth; SST: Sea surface temperature.

Remarks

While the WMO GBON Gap Analysis (June 2023) results found four upper air stations in Bangladesh to be GBON compliant, our analysis shows that only one upper air station in Dhaka fulfills the GBON observation requirement with two daily soundings. However, the upper air soundings have not been received in a while in the WDQMS. There is therefore a need to address the data transmission and data management system challenges at BMD before the upper air station can be declared GBON complaints. This is a potential easy fix. Additionally, BMD will require five surface stations (see Fig 2) to fulfill the 200 km resolution GBON requirement to cover central parts of Bangladesh. The fifth station is an existing automatic station that needs similar improvement, hence an easy fix. Information about the station is provided in Table V.

Weather hazards in Bangladesh are often due to strong tropical cyclones hitting Bangladesh from the Bay of Bengal. The result is strong winds, storm surge and a lot of rain, and can potentially do a lot of damage in the coastal areas. In the ocean areas high waves are dangerous to fishing vessels. It is crucial for Bangladesh to operate a marine station in the Bay of Bengal, and the SOFF

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[7] 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.

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

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

support would be very beneficial.

3.1 [10]Recommended existing surface, upper-air and marine[11] stations to be designated to GBON

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

| Station name	Station type (S/UA/M[12])
Dhaka (23° 47' N, 90° 23' E)	UA
Rangpur (25° 44' N, 89° 14' E)	S
Sylhet(24°54' N, 91° 53' E)	S
Chittagong(22° 13' N, 91° 48' E)	S
Barishal(22° 53' N, 90° 30' E)	S
Tangail (24° 15' N,89°54'E)	S
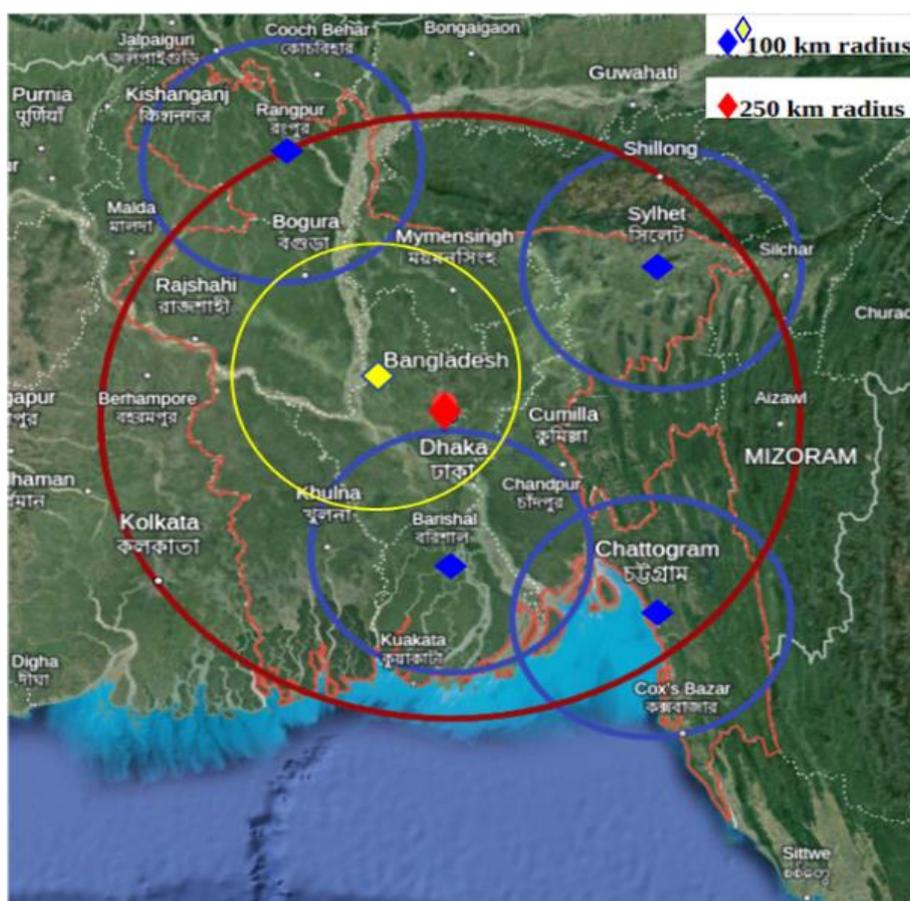
Fig 2: Map of Bangladesh with locations of four surface stations (blue circle) and upper air stations to be improved (red circle). The fifth surface station (yellow circle) is added for SOFF consideration.

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

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

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

4. Report completion signatures

Peer Advisor signature Kristiansand, 08.08.2024   Roar Skålin, Director General, MET Norway
WMO Technical Authority screening signature
Beneficiary Country signature Md. Azizur Rahman, Director, Bangladesh Meteorological Department
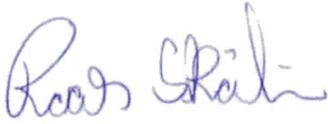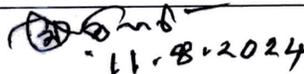
Annex 1

The Gap analysis assessment was performed through a variety of methods, including bi.weekly online meetings, email exchange and, one in-person consultation session in Dhaka Bangladesh held during the peer-review process. The following members contributed to this Bangladesh gap analysis report.

- Elinah Khasandi Kuya (MET Norway)
- Kristine Gjesdal (MET Norway)
- Hildegunn V. Dyngeseth Nygård (MET Norway)
- Tor Ivar Mathisen (MET Norway)
- Razia Sultana (BMD)
- Md Abdul Matin (BMD)
- Md Shameem Hassan Bhuiyan (BMD)