

26th September 2024



GBON National Gap Analysis - Cambodia

Systematic Observations
Financing Facility

**Weather
and climate
data for
resilience**





Screening of the National Gap Analysis (NGA) of Cambodia

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: 21 October 2024

Signature:

Albert Fischer

Director, WIGOS Branch, Infrastructure Department, WMO

GBON Gap Analysis Report CAMBODIA

Beneficiary Country Focal Point	Mr So Im Monichoth, Cambodia Department of Meteorology
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	5	9	0	0	0
Upper-air stations Horizontal resolution: 500km	1	0	0	1	1

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*	85	0	0
Upper-air stations Horizontal resolution: 500km Vertical resolution: 100m, up to 30 hPa Variables: T, H, W	0	0	0	0

**No observations are presently being transmitted to the WIS in accordance with WDQMS*

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		
Koursrov	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Kbal Thnol	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Chantrea	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Romeas Haek	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Svayteab	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Mesang	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Preyveng	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Sithor kandal	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Kranglev	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Kompong Chhnang	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Steung trang	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Prey chhor	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Cheng prey	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N

Krouch Chhmar	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Dombae	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Pogna kraek	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Memot	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Kong chey	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Tbongkhmom	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Snuol	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Kratie	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Chet Borei	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Siem Bouk	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Talaboriwat	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Koun Mom	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Bar Kaev	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Banlong	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Lumphat	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Koh Nheaeak	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Pechreada	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Ou Reang	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Senmonorom	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Kaev Seima	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Chi Kraeng	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Varin	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Banteaysrey	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Svay Leu	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Koh Tom	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Sa Ang	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
7 Makara Dam	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Vihear Loung	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Phnom Srouch	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Tasal Dam	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Chbamorn	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Boset	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N

Oral	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Thpong	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Bait District	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Sam Rong District	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Borey Cholsar	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Kirivong	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Donkeo	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Tram Kok	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Chum Kiri	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Kompot	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Angkor Chey(Tani)	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Dong Tung District	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Krong Kep	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Chamksan	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Kompongpronak	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Chey Sen	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Chory Thmor	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Kompong seila	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Preah Sihanouk	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Sre Ambel	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Thmar Bang	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Botum Sakor	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Koh Kong	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Kirisakor	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Kohkong	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Porsat	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Mongreusey	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Battambang	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Ratanakmondol	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Phnompreuk	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Pailin	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Sireysophorn	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N

Ochrev	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Banteay Ampil	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Samrong	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Stungstong	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Sandan	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Brasatsambo	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Stungsen	S	NMHS	Government	Y	Y	Y	Y	Y	N	>24	N
Santuk	S	NMHS	Government	Y	Y	Y	Y	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). Proposed GBON stations 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 <ul style="list-style-type: none"> Horizontal resolution: 200km Variables: SLP, T, H, W, SD Observation cycle: 1h 	5	0	0	5*
Upper-air stations <ul style="list-style-type: none"> Horizontal resolution: 500km Vertical resolution: 100m, up to 30 hpa Variables: T, H, W Reporting cycle: twice a day 	1	0	1	0

* The 5 GBON sites have suitable AWSs with the required parameters and improvement to communications and data transmission to WIS2.0 is required to meet full GBON compliance. SOFF investment could be leveraged to enable data transmission from additional stations in Cambodia and thus potentially exceed GBON compliance.

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

Station name	Station type (S/UA/M ¹⁶)
Chet Borei (Kratie)	S
Koun Mom (Ratanakiri)	S
Svay Leu (Siemreap)	S
Thmar Bang (Kohkong)	S
Kbal Thnol (Phnom Penh)	S
Kbal Thnol (Phnom Penh)	UA

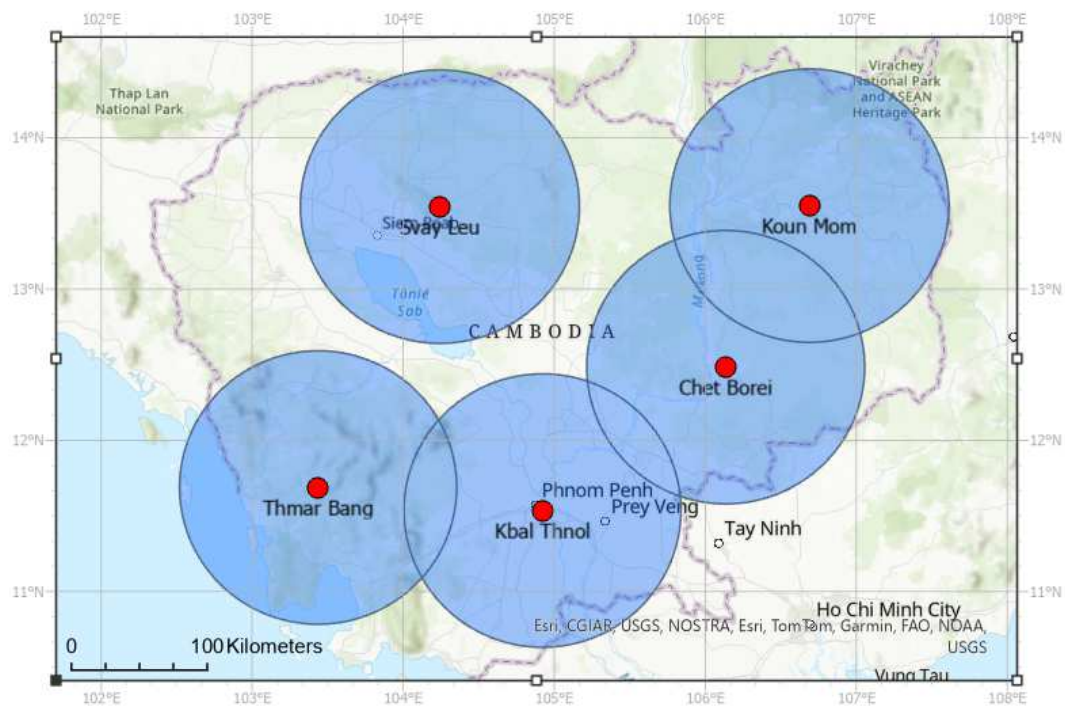


Figure 1 Proposed GBON surface stations in red showing 200km diameter circles



Figure 1 Proposed GBON upper air station in red showing 500km diameter circle

4. Report completion signatures

Peer Advisor signature  Helen Bye - Head of International Engagement Met Office 30/09/2024
Beneficiary Country signature  SOIM MONICHOTH Director, Department of Meteorology
WMO Technical Authority signature 

Appendices:

Current GBON contribution & regional context:

The initial GBON Global Gap Analysis undertaken by WMO indicated that the country of Cambodia (land area 181,040km²) has a requirement for 5 surface and 1 upper air observation stations to meet GBON standard requirements. At present no data are shared internationally from Cambodia Department of Meteorology observations.

National Observing Network

The Cambodia Department of Meteorology currently operate an extensive network of surface observations, comprising 85 automatic weather stations (AWS) and 25 manual stations. Of the 85 AWS 39 are reported as being in good condition, 40 have reduced functionality due to issues with individual sensors modem or data loggers and 6 are currently non-functional. The AWS network is comprised of stations from 3 manufacturers SUTRON (35), ADCON (24) and WEATHEX (26). The SUTRON and ADCON stations measure wind speed and direction, temperature, humidity, rainfall, pressure, evaporation, soil temperature, soil moisture and global radiation while the 26 WEATHEX stations do not measure evaporation, soil temperature and moisture and global radiation parameters.

The 25 manual surface observation stations are located in each of Cambodia's 24 provinces as well as in Phnom Penh. 17 of the 25 stations are co-located with AWS. All 25 stations collect rainfall and temperature data and the station in Phnom Penh also collects wind speed and direction and humidity data. Local staff take daily readings between 8 and 9 am and relay this data to the Department of Meteorology Climate Office.

There are currently no upper air observations in Cambodia and 1 new upper air observing site will be established as part of the SOFF project.

Regional Context

The design of the GBON network has been developed with consideration to the suitability of the existing sites within Cambodia as well as the regional context of the proposed network. Neighbouring Thailand has an extensive network of surface observations to the north and west and Vietnam to the south and east (though WQMS indicates data availability issues with the Vietnam sites, see **Error! Reference source not found.**). Additionally, Laos to the north is also a SOFF beneficiary country and the Peer Advisors have collaborated to ensure coverage of the GBON network in the North of Cambodia and far south of Laos. There are also potential opportunities for further regional collaboration, in particular with respect to regional training (e.g. WIS2.0), procurement and calibration.

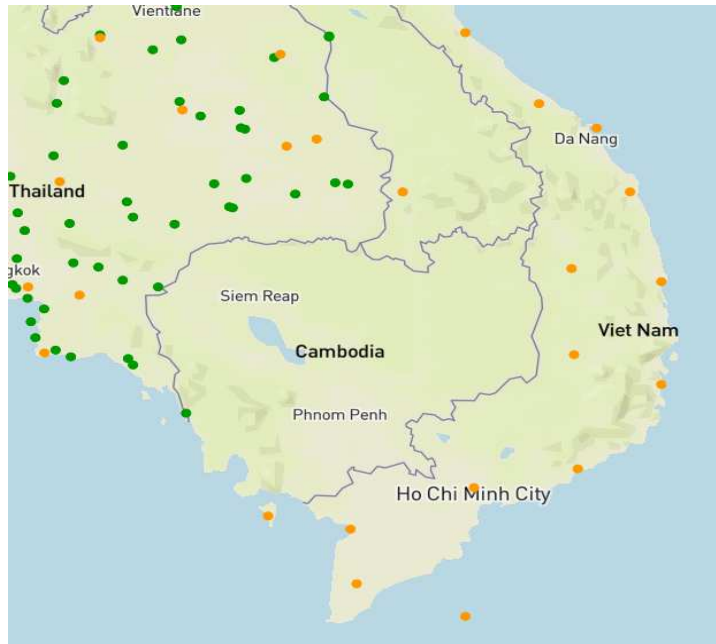


Figure 2 - WDQMS GBON surface observations

With respect to the upper air network, there is a GBON-compliant upper air station currently operated near to Ho Chi Minh City to the south east of Phnom Penh and a further station to the north east near Bangkok though this is currently non-compliant (see Figure 3). While the distance between the existing Tan Son Hoa site in Vietnam and the potential Kour Srov site in Cambodia would be less than the standard 500km GBON station separation distance, this location has been chosen on the basis of the feasibility of the site (a government compound with reliable access to power, comms security) and the logistics of central staff from Phnom Penh accessing the Kour Srov location to carry out maintenance. Regionally, the Kour Srov location would add significant value between these two stations in resolving complex modelling challenges around the seasonal movement of the Monsoon. This will have practical implications for the accuracy of flood or tropical cyclone warnings around the main population centres while also enabling better forecasts of the arrival of much-needed rains for agriculture.



Figure 3 - WDQMS GBON/GCOS upper air observations