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GBON National Contribution Plan of Vanuatu

Systematic Observations
Financing Facility

**Weather
and climate
data for
resilience**



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List of acronyms

AWOS	Automated Weather Observing System (Aviation)
AWS	Automated Weather Station
BIP-M	Basic Instruction for Meteorologists
BIP-MT	Basic Instruction for Meteorological Technicians
Bureau	Bureau of Meteorology, Australia
CDMS	Climate Data Management System
CIEWS	Climate Information Early Warning System
CIS-Pac5	Enhancing Climate Information and Knowledge Services for resilience in the 5 island countries of the Pacific Ocean
cliDE	Climate Data for the Environment
cliDEsc	Climate Data for the Environment Services Client
CMSS	Central Messaging Switching Service
COSPPac	Climate and Oceans Support Programme in the Pacific
EEZ	Exclusive Economic Zone
FMS	Fiji Meteorological Service
GBON	Global Basic Observing Network
GCF	Green Climate Fund
GCOS	Global Climate Observing System
GSN	GCOS Surface Network
GTS	Global Telecommunications System
GUAN	GCOS Upper Air Network
ICT	Information and Communications Technology
LDC	Least Developed Country/ies
JICA	Japan International Cooperation Agency
MetService	Meteorological Service of New Zealand
METAR	Meteorological Aerodrome Report
NCP	National Contribution Plan
NMHS	National Meteorological and Hydrological Service
NIWA	National Institute of Water and Atmospheric Research (NZ)
PMC	Pacific Meteorological Council
RESPAC	UNDP Disaster Resilience for Pacific Small Island Developing States project
RIC	Regional Instrument Centre
RTC	Regional Training Centre
SIDS	Small Island Developing States
SPC	Secretariat for the Pacific Community
SOFF	Systematic Observations Financing Facility
SOP	Standard Operating Procedure
SPREP	Secretariat of the Pacific Regional Environment Programme
VMGD	Vanuatu Meteorology and Geohazards Department
UKMO	United Kingdom Meteorological Office
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USP	University of the South Pacific

WIGOS	WMO Integrated Observing System
WIS	WMO Information System
WMO	World Meteorological Organization
WRP	Weather Ready Pacific Decadal Programme

Module 1. National Target toward GBON Compliance

1.1 Conduct the national GBON gap analysis

Table 1 - GBON National Contribution Target

Type of station	WMO GBON Global Gap Analysis, June 2023				GBON National Contribution Target	
	Target ¹ (no. of stations)	GBON-compliant stations (no. of stations)	Gap		To improve	New
			To improve	New		
Surface	3	2	1	0	2	0
Upper-air	1	0	1	0	1	0

Whilst nominally, the station at Bauerfield is GBON compliant, it relies upon manual observations and data is delivered in obsolete code formats. The work required to uplift the compliant station is listed in Section 3.1.

1.2 Establishment of the National Target toward GBON Compliance

For surface stations, full compliance is achievable within a short timeframe, less than one year from the commencement of the investment phase. For upper air, full compliance is dependent on changes to manual surface observations, and is achievable within two to three years.

¹ 1 For SIDS, for the WMO GBON Global Gap Analysis in January 2022, 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.

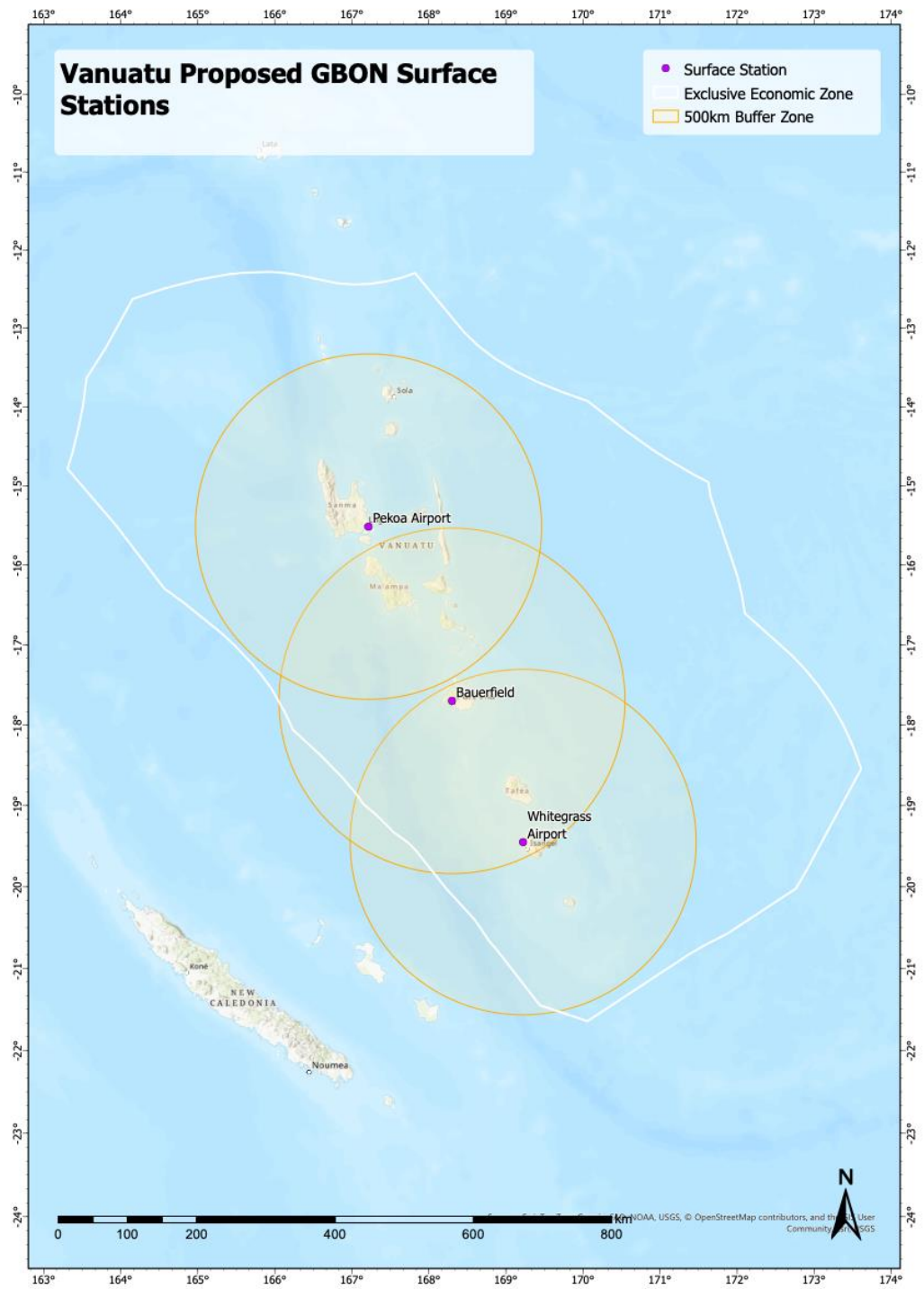


Figure 1 – Proposed GBON Surface stations showing 500 km circles

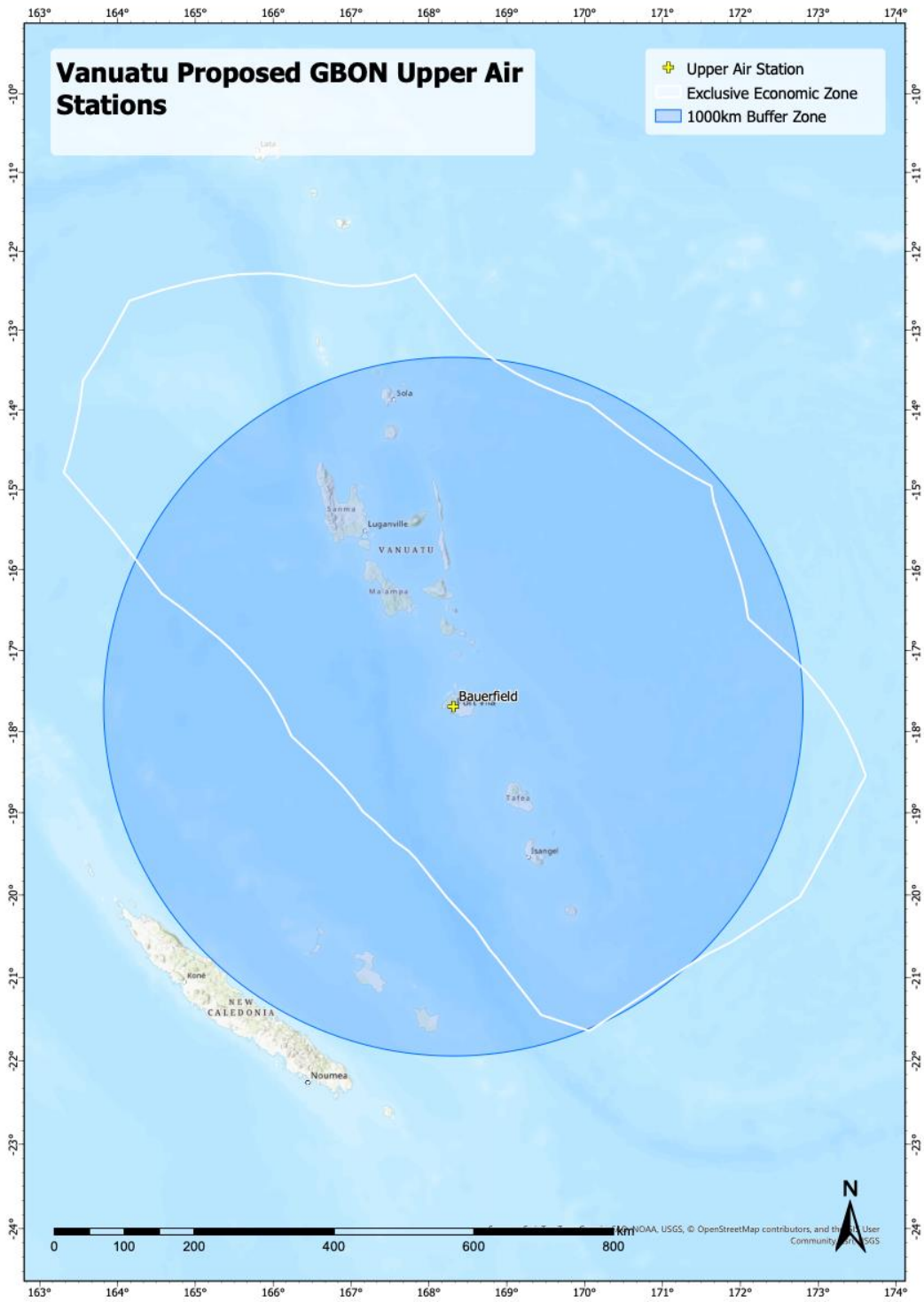


Figure 2 - proposed GBON upper air stations showing 1000 km circles

Module 2. GBON Business Model and Institutional Development

2.1. Assessment of national governmental and private organizations of relevance for the operation and maintenance of GBON

In Vanuatu, meteorological, climate and geohazards information and services are provided by the Vanuatu Meteorological and Geohazards Department (VMGD). The department and its functions are set out in the Meteorology, Geological Hazards and Climate Change Act (2016). There are no significant private sector operators of meteorological observing equipment. As such, VMGD is the primary organization of relevance to the operation and maintenance of GBON observations in Vanuatu.

There are no other operators providing meteorological observations.

In terms of its ability to support GBON observations in the long term, VMGD is faced with a number of serious challenges. These challenges, share with other countries in the region, include a lack of sufficient skilled personnel, difficult and expensive logistics, sourcing and procurement of equipment and spares, and unreliable data communications. Together, these lead to reliability and data quality issues. As part of the GBON implementation and compliance phases, **additional funds are sought to support additional staff members and training of current staff on AWS maintenance and radiosonde operations.**

VMGD faces a significant challenge in managing its observing network. There are 28 automatic weather stations installed across the country, from a range of donors and manufacturers. In order to reach GBON compliance for the three designated stations, these stations will need to be prioritised in terms of maintenance and return to service.

To manage the GBON stations, and the broader network, a comprehensive financial plan for ongoing operational and maintenance will need to be developed, including the total cost of ownership over the life cycle of the infrastructure/system. This needs to include spare parts, freight and travel costs to ensure VMGD technicians can visit sites for proactive and reactive maintenance, communications costs, logistics costs and all other ongoing costs required to ensure GBON compliance.

To address these challenges, as part of the Investment Phase, VMGD will engage with the Ministry of Finance and other potential partners such as SPREP and SPC, to develop a plan for ongoing procurement and funding of essential services to ensure ongoing quality and reliability of the network **(Activity 2.1)**.

Customs Duties may be imposed for equipment and instrumentation that needs to be sent offshore for calibration and/or maintenance. It is recommended that potential Custom Duties waivers be investigated by VMGD and the World Bank (as the Implementing Entity) **(Activity 2.2)**.

2.2. Assessment of potential GBON sub-regional collaboration

The south-west Pacific region includes numerous small countries and, through SPREP and SPC, there is a strong foundation for regional collaboration and numerous examples of this in practice.

The development of this plan has been undertaken in coordination with peer advisors for neighbouring countries. The proposed observations network for Vanuatu considers other national networks from Fiji, Kiribati, Nauru, Samoa, Solomon Islands and Tuvalu (Figure 3). Collectively, these contribute to a broader regional network across a critical region where there are limited *in situ* observations available for global numerical weather prediction systems.

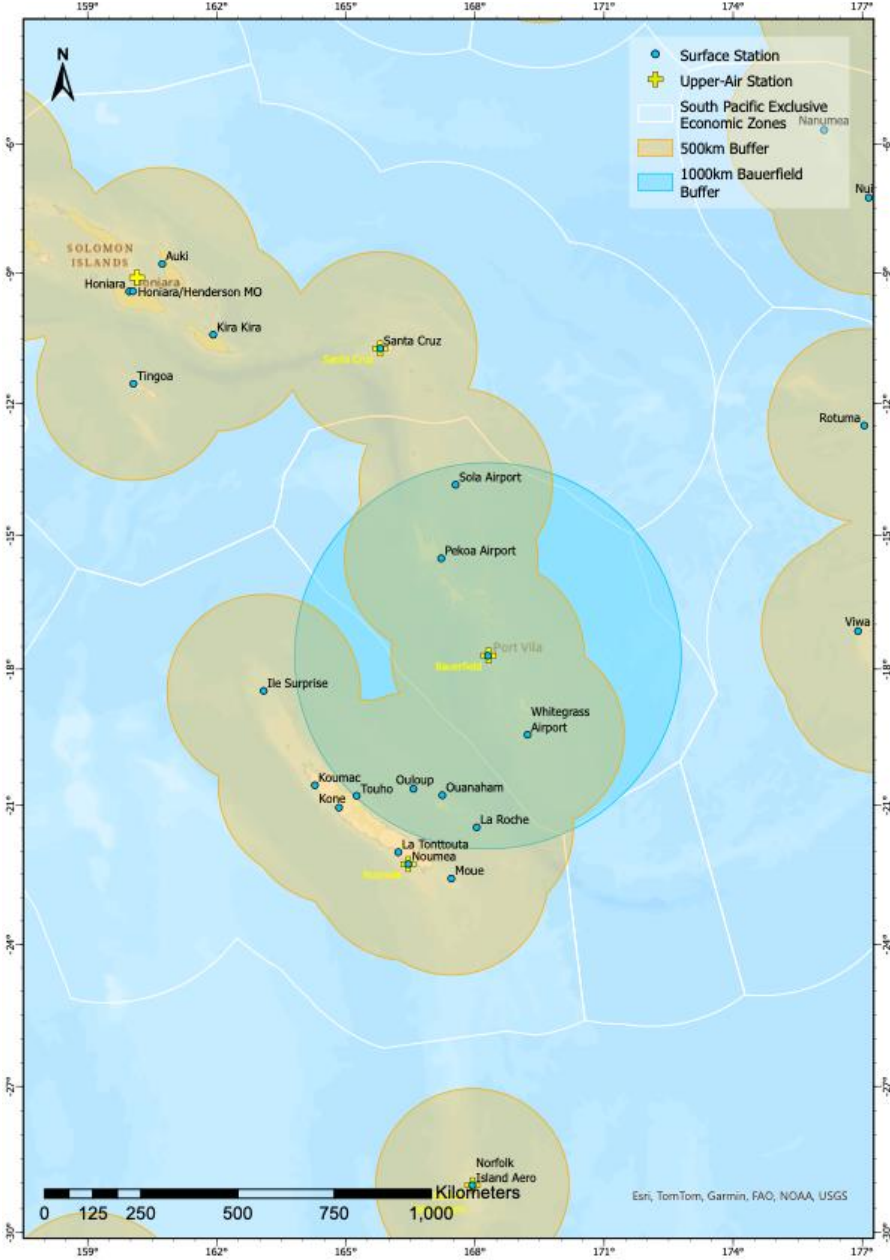


Figure 3 - Regional GBON Coverage showing Neighbouring Countries

This National Contribution Plan provides the flexibility to allow for future regional coordination initiatives such as regional calibration and maintenance services, training, and procurement of common equipment types. In this regard, the NCP is developed in the broader context of the decadal program of Weather Ready Pacific (WRP) which has the aim of improving and supporting capacity across the region.

To facilitate regional coordination, VMGD will continue to be an active participant in relevant regional forums (**Activity 2.3**) including:

- Regional SOFF coordination workshop
- WMO RA-V committee
- Pacific Meteorological Council (PMC) and its sub-committees

VMGD also has strong engagement with regional structures including:

- South Pacific Regional Environmental Programme (SPREP)
- Pacific Community (SPC)
- Weather Ready Pacific (WRP).

To support verification and calibration of instruments, the Regional Instrument Centre, being funded by JICA and constructed in Fiji, will be a key supporting capability for ensuring that GBON stations operated by VMGD are producing quality, traceable observations (**Activity 2.4**).

During the Investment Phase, VMGD and the World Bank (as the Implementing Entity) will investigate further opportunities for regional synergies that can be implemented during the Compliance Phase. In particular, a regional approach will be necessary for calibration services and could be beneficial for equipment maintenance, training, procurement of common equipment types, and development of a common operations and maintenance plan.

2.3. Assessment of a business model to operate and maintain the network

VMGD receives an annual operating budget of around USD \$1.35m (2022 figure) and this has been relatively stable in the past 3-5 years. Around 90 per cent of this is committed to staff costs, leaving a relatively small amount for services, logistics and equipment purchases. The remaining funds are insufficient for VMGD to fund its basic operations such as equipment and consumable purchases, travel, staff training, or communications. For a significant portion of its operations, VMGD has been reliant on donor funding. For VMGD to meet its WMO obligations and be GBON compliant, ongoing operations funding support will be required. Taking into account the lack of any private sector operators and the highly distributed nature of the observing stations, the preferred model is the *Public model – Full state/NMHS owned and operated*. Within this model there remains a significant opportunity for the private sector to support the NMHS in areas such as training, calibration, procurement of equipment and spares, and ICT.

A possible way forward is to structure the procurement of observing equipment to include some level of vendor support over the lifetime of the equipment (**Activity 2.5**). This could complement and enhance the capability of the in-country technical staff.

2.4. Assessment of existing national strategies and projects related to observing networks

The VMGD Vision and Mission are laid out in the Vanuatu Meteorology and Geo-Hazards Department Strategic Development Plan 2014-2023. At the time of writing, the strategy has undergone revision, with the support of CREWS, and is due to be released in late 2025. There is no formal implementation plan for the strategy in place.

Some existing relevant projects include:

- Van-KIRAP - a five-year, USD \$22 m project funded by the Green Climate Fund and implemented by the Secretariat of the Pacific Regional Environment (SPREP), focusing on Climate Information Systems and investing across the value chain, including observations infrastructure. The project is installing AWS² and automated rain gauges. In total, Van-KIRAP will install eight rain gauges and 8 AWS on different islands of Vanuatu, with work commencing in 2023.
- V-CAP Phase II – a six-year, USD \$12.5m project being implemented by the United Nations Development Program (UNDP) with financial support from the Least Developed Country Fund (LDCF) of the Global Environment Fund. V-CAP2 is scheduled to end in 2028. The project is installing 6 AWS and 6 automatic river gauges. Specifically, the AWS will be installed at Hiu in Torres at Torba Province, North Maewo airport in Penama Province, Port Olry at East Santo and Wusi at West Coast Santo in Sanma Province, Port Quimie at South Epi in Shefa Province, Ipota at North Erromango in Tafea Province³.
- Australian Government Pacific Aviation Initiative. The Australian government is assisting Vanuatu to upgrade aviation weather services. This includes restoration of the upper air station at Bauerfield and installation of three AWOSs at three aerodromes (Bauerfield, Whitegrass (Tanna) and Santo-Pekoa).
- Climate and Oceans Support Program in the Pacific (COSPPac). This Australian government programme is, among other activities, assisting Vanuatu to maintain its CliDE Climate Data Management System. Funded support for the web-based content management system and product generator Climate Data for the Environment Services Client (CliDEsc) is supplemented by support from the New Zealand government. Under this project there are AWS associated with the sea level stations on Tanna and Malakula.
- Weather Ready Pacific. This is a broader regional multi-donor initiative to comprehensively strengthen the full hydro-meteorological system across the whole value chain in the Pacific region. Weather Ready Pacific can leverage the improved observations from SOFF investment as part of its broader focus on hydro-meteorological services. WRP is supported by the Australian and New Zealand Governments.

² <https://www.sprep.org/news/new-automated-weather-monitoring-equipment-a-major-upgrade-to-vanuatus-climate-resilience>

³ <https://mocca.gov.vu/index.php/news-events/vcap-2-project-installing-6-automatic-weather-stations-and-6-automatic-river-gauges>

In addition, a number of past projects have installed observing equipment:

- NIWA installed 15 AWS⁴ in 2017-18 under a project funded by the Global Environment Facility, and implemented by the Vanuatu Ministry of Climate Change and the United Nations Development Programme (UNDP).
- The Disaster Resilience for Small Island Developing States (RESPAC)⁵, a United Nations Development Programme (UNDP)-funded project delivered 9 rain gauges, one AWS on Loh Island in the Torres Islands and an Airport Weather Observing System (AWOS) at Pekoa Airport.

There are a number of development programmes in the region that are contributing to supporting capabilities, with opportunities for VMGD to leverage these.

Of particular note, a project is underway to establish a Regional Instrument Centre in Fiji, staffed by Fiji Meteorological Service (FMS), and supported by JICA. This will be a necessary and important component for maintaining GBON compliance, supporting the maintenance and calibration of national and regional standards, and the ability of VMGD to verify its observation equipment.

Opportunities to leverage these activities have been considered in Module 3 below. In particular, the AWS that have been installed under multiple projects are an opportunity to quickly attain GBON compliance.

It is recommended that, during the implementation phase, the World Bank and VMGD keep up to date with planned development activities relevant to GBON to identify other opportunities for leverage and to ensure all planned works are complementary especially with Weather Ready Pacific (**Activity 2.6**).

⁴ <https://niwa.co.nz/news/improved-climate-information-and-services-vanuatu>

⁵ https://www.dailypost.vu/news/new-weather-machines-from-respac/article_4ce0dec8-c3f7-11eb-a3b2-cb1fc00589d7.html

2.5. Review of the national legislation of relevance for GBON

The Meteorology, Geological Hazards and Climate Change Act (2016) establishes VMGDS as the sole national authority to provide official meteorological, climate, flood and geohazards prediction, information, warnings and related services including dissemination of long-term and seasonal forecasts. This provides the mandate and outlines the functional responsibilities for VMGD.

The legislation also places responsibility on VMGD to

co-operate with the authorities administering the:

(i) meteorological services of other countries; and

(ii) World Meteorological Organisation; and

(iii) International Civil Aviation Organisation; and

(iv) any other relevant international organisation,

in relation to any of the functions and powers stated under this Part, and in particular, supporting the principle of free and unrestricted exchange of meteorological data between national meteorological services.

The current Act is adequate in terms of the responsibilities and powers given to VMGD.

In terms of legislation relating to procurement and importation, this is outside the remit of this assessment but there is nothing prohibiting import of equipment or supplies. Activity 2.2 addresses this issue.

Module 3. GBON Infrastructure Development

3.1. Design the surface and upper-air observing network and observational practices

3.1.1 Current State

Existing and planned stations in Vanuatu (Figure 4) include seven staffed weather stations, 22 automatic weather stations (AWS), automated weather observing stations (AWOS) at airports, an upper air station, and two sea level stations.

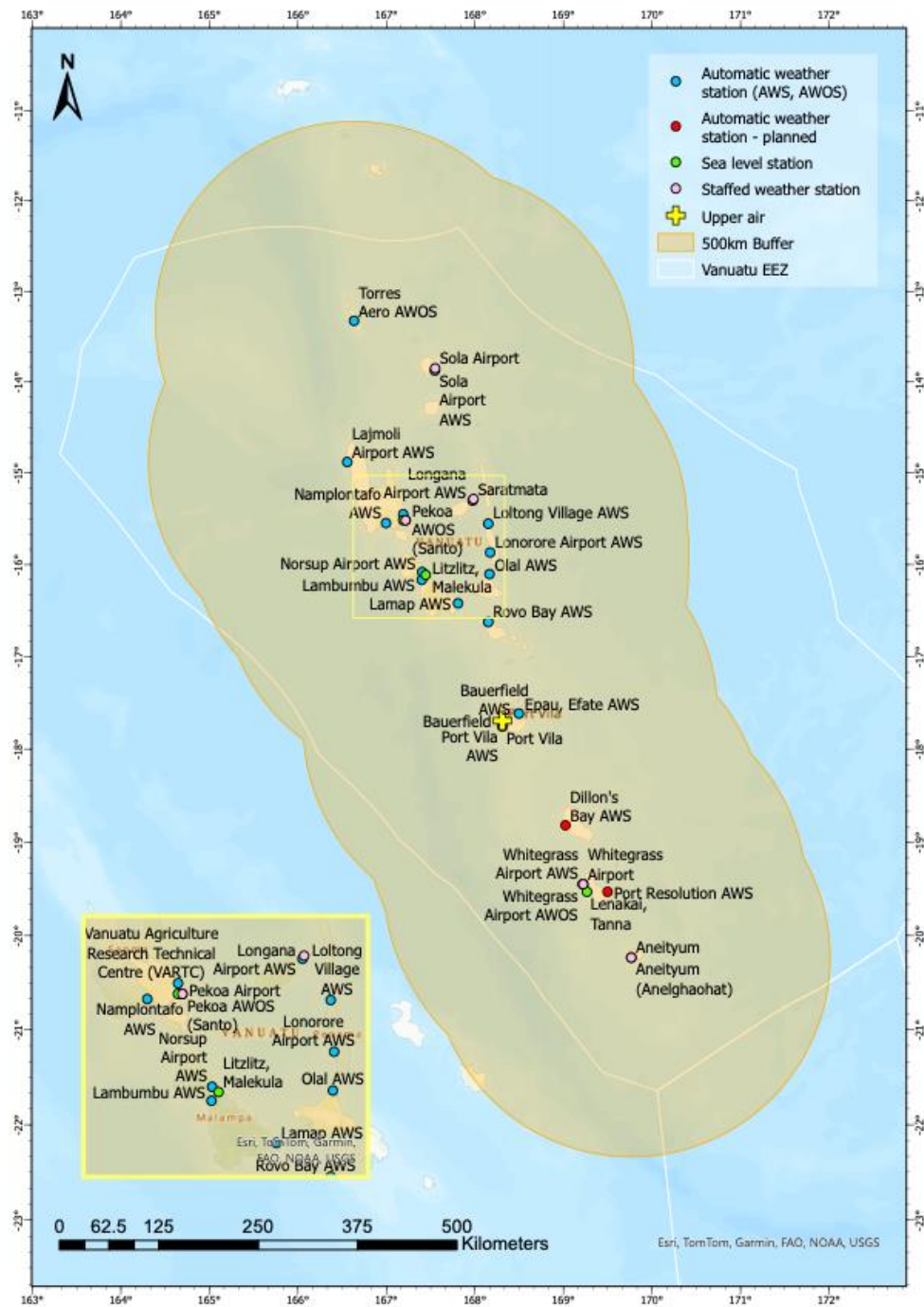


Figure 4 Map of existing and planned stations

Station	Assessed reporting status	Station type	Latitude	Longitude	Programs/Network affiliation
ANEITYUM	Operational	Manual	-20.2344	169.7821	GSN: Operational, RBON: Operational
BAUERFIELD (EFATE)	Operational	Manual, AWS and Upper Air	-17.6947	168.3129	GBON: Operational, GUAN: Operational, RBON: Operational
LAMAP (MALEKULA)	Unknown	Manual	-16.4217	167.8089	RBON: Partly operational
PEKOA AIRPORT (SANTO)	Partly operational	Manual and AWS	-15.5072	167.2186	GBON: Operational, GSN: Operational, RBON: Operational,
SARATAMATA	Operational	Manual	-15.2869	167.9885	
SOLA (VANUA LAVA)	Partly operational	Manual	-13.8743	167.547	GBON: Operational, RBON: Operational
WHITEGRASS AIRPORT	Partly operational	Manual	-19.4592	169.2279	GBON: Operational, RBON: Operational

Table 2 - Vanuatu Staffed Observing Sites

The staffed stations at Bauerfield and Pekoa Airport are nominally providing hourly observations; however, observations at Pekoa Airport are hourly during the daylight hours, but drop to three-hourly overnight, averaging closer to 16 observations per day (as of May 2025). These are manual observations, with temperature, humidity, pressure and wind read from the AWS display and manual input of cloud and current weather observations. Observations from the other staffed stations are provided less frequently, at 3-hourly or longer intervals.

Observations from Whitegrass Airport, Bauerfield, Pekoa Airport and Sola are shared internationally although the other staffed stations are also registered in WMO OSCAR. Data are provided in deprecated formats (TEMP and PILOT) via the VMGD connection to the GTS, via the Bureau of Meteorology in Australia. Currently, there is no interaction with the Regional WIGOS Centre in terms of metadata management or data quality monitoring.

The extensive AWS network provides good observational coverage across the country but with a significant overhead in terms of maintenance and calibration. As a result of the actions of multiple donors, as noted in Section 2.4, VMGD has a range of AWS makes and models. This complicates maintenance and requires multiple sets of spares and broader training of technical staff.

VMGD technicians have access to verification standards (air temperature, relative humidity and pressure) to enable station inspections and verifications.

Due to budget limitations, maintenance is largely reactive and verifications are done on an opportunistic basis. Sourcing instruments, parts and materials is a significant challenge. For the observing network, all parts and components must be procured from overseas, with at times lengthy delivery times and costly freight. Some tools and spares for the AWS have been supplied with the donor projects, however these are limited.

Station Name	Lat	Long	Station Type
Dillon's Bay AWS	-18.8193	169.0232	Automatic weather station – planned
Whitegrass Airport AWOS	-19.4500	169.2167	Automated Weather Observing System (aviation) – planned
Port Resolution AWS	-19.5322	169.4986	Automatic weather station – planned
Torres Aero AWOS	-13.3257	166.6336	Automated Weather Observing System (aviation)
Sola Airport AWS	-13.8744	167.5470	Automatic weather station
Lajmoli Airport AWS	-14.8795	166.5577	Automatic weather station
Longana Airport AWS	-15.3021	167.9734	Automatic weather station
Vanuatu Agriculture Research Technical Centre (VARTC)	-15.4511	167.1895	Automatic weather station
Pekoa AWOS (Santo)	-15.5167	167.2167	Automated Weather Observing System (aviation) – planned
Namplontafo AWS	-15.5472	166.9953	Automatic weather station
Loltong Village AWS	-15.5537	168.1509	Automatic weather station
Lonorore Airport AWS	-15.8683	168.1724	Automatic weather station
Norsup Airport AWS	-16.0812	167.4035	Automatic weather station
Olal AWS	-16.1037	168.1648	Automatic weather station
Lambumbu AWS	-16.1662	167.3999	Automatic weather station
Lamap AWS	-16.4218	167.8090	Automatic weather station
Rovo Bay AWS	-16.6256	168.1509	Automatic weather station
Epau, Efate AWS	-17.6163	168.4961	Automatic weather station
Bauerfield AWS	-17.6947	168.3129	Automated Weather Observing System (aviation)
Port Vila AWS	-17.7495	168.3148	Automatic weather station
Whitegrass Airport AWS	-19.4510	169.2231	Automated Weather Observing System (aviation) – planned
Aneityum (Anelghaohat)	-20.2333	169.7667	Automatic weather station

Table 3 - Vanuatu Automated Observing Sites

General security and maintenance of the weather stations and surrounds, including cutting of vegetation is undertaken by the observing staff on site at the four offices.

The *Partnerships for Aviation* (P4A) initiative funded by the Australian Department of Foreign Affairs (DFAT) is in the process of installing Aviation Weather Observing Systems (AWOS) at Bauerfield Airport (already installed), Whitegrass Airport and Pekoa Airport. The stations consist of an AWS with additional sensors for aviation purposes (ceilometer, visibility meter and present weather sensor). Implementation is by the Australian Bureau of Meteorology.

The Upper Air Station at Bauerfield was recently restored, also under the (P4A) initiative (Figure 5). The commissioning and resumption of operations took place in December 2024. The project has provided consumables for one balloon release daily until the end of 2025 and there is funding available to continue this program until the end of 2026. Data are provided in TEMP format via the GTS connection. The station currently launches one balloon per day.



Figure 5 Bauerfield Balloon Shed – subsequent to refurbishment.

There are no calibration facilities in Vanuatu and the workshop and laboratory facilities are inadequate and not suitable for the maintenance and testing of AWS components and systems. As a result, the verification standards noted above are unable to be calibrated in Vanuatu and need to be sent offshore.

Vanuatu make use of neighbouring existing Regional Instrument Centres (RIC) in Australia, or to send to New Zealand or FMS for calibration services of their instruments and travelling standards.

3.1.2 GBON Surface Stations

As noted in the National Gap Analysis, the three proposed GBON stations are Bauerfield (Figure 6), Pekoa Airport (Figure 7) and Whitegrass Airport (Figure 8). Each of these locations has a staffed office, and as noted also an existing or planned Automated Weather Observing System (AWOS) for aviation.

At the time of writing, the staffed stations at Bauerfield and Pekoa Airport are nominally providing hourly observations and therefore could be GBON compliant; however, observations at Pekoa Airport are closer to 16 times per day (as of May 2025). Observations at Whitegrass Airport are three-hourly only.

The AWOS systems at each station consist of an AWS with additional sensors for aviation purposes (ceilometer, visibility meter and present weather sensor). As these stations are recently refurbished, fully automated and have a high uptime requirement for aviation services support, they are the logical choice to be designated as the three GBON stations for Vanuatu. For this report we will refer to the AWS as being the non-aviation components of the AWOS (i.e. pressure, temperature, humidity, wind and precipitation).



Figure 6 - Port Vila International Airport (Bauerfield) - Aviation Weather Observation System



Figure 7 - Peko International Airport - Aviation Weather Observation System



Figure 8 - Whitegrass International Airport – Automatic Weather Station

Due to the large expanses of ocean between sites, centralised maintenance and repair is challenging. Taking into account that each of these sites also has a staffed weather office, the proposed approach is for the AWOS/AWS to be designated as the primary GBON data source. On-site support, first-in maintenance and backup will be provided by the staff on site. The surface stations to be designated as GBON as per this plan are listed in Table 4.

Table 4. Planned GBON surface stations.

Station name	Existing station status	Planned GBON configuration
Pekoa Airport	AWS at staffed station	AWOS with on-site staff support
Bauerfield	AWOS at staffed station	AWOS with on-site staff support
Whitegrass Airport	AWS at staffed station	AWOS with on-site staff support

This approach has the following benefits:

- The AWS will provide reliable and regular observations in standard formats.
- Designating the AWS as primary means that there is no need to increase staff to provide 24 hours/day observations.
- Having trained staff and spares on site is a cost-effective way of providing front line maintenance and return to service, ensuring sufficient uptime to meet GBON requirements.
- Having both manual and automated observations provides a degree of redundancy in the case of sensor/equipment failure. In the event of AWS downtime, the frequency of manual observations could be increased as needed.
- The presence of trained staff on site will provide quality control and allow for quick fault identification and restoration of equipment.
- Staff on site will be able to provide security and grounds maintenance to ensure the station continues to comply with WMO siting requirements.

Given that the staffed stations and AWS already exist (or are in the process of being installed) and are co-located, the main requirement is to establish operational systems and procedures to allow the AWS data to be shared internationally in standard formats. It should be noted that the aviation-specific observations are not part of the GBON requirements, and these should not be funded by SOFF.

The activities required to achieve this are:

- Designating the AWS as the GBON stations, updating operating procedures and updating the information in OSCAR/Surface (**Activity 3.1**).
- Updating AWS software to provide compliant formats (**Activity 3.2**).
- Developing on-site procedures for verification using manual measurements (**Activity 3.3**).

For GBON purposes, one staff member per site is required, and this should be supported by SOFF, freeing up the very tight resources in VMGD for other high-priority activities (**Activity 3.4**). Staff located on site will require training in basic AWS maintenance (**Activity 3.5**) and this training may need to be repeated at intervals.

As part of the transition to full GBON compliance, procedures should be put in place to link VMGD with the Regional WIGOS Centre for the purposes of metadata management and data quality monitoring (**Activity 3.6**).

There are limited spares (instruments, components, consumables) for both manual and AWS surface stations. A complete set of spares should be procured to ensure manual observations are able to continue in the event of breakages or failures (**Activity 3.7**).

Additional calibration kits are required to ensure that GBON stations provide traceable data. At least one working calibration kit is needed to service the three GBON sites and perform validation and calibration at the required intervals, most likely 6 monthly (**Activity 3.8**).

The proposed minimum set of instrumentation and systems for these stations are summarized in Table 5. Selection and installation of instruments will be compliant with WMO-No. 8 Guide to Instruments and Methods of Observation and the GBON Tender Specification for AWS. The automated equipment is already in place or scheduled to be installed under the Partnerships for Aviation initiative.

It is recommended for Vanuatu to continue to exchange 3 hourly data from its staffed stations and to expand this to the broader AWS network if possible. This will provide additional data to global NWP systems and improve the quality of forecasts for Vanuatu and the region.

AWS Sites	Manual Backup Sites
Instruments	Instruments*
<ul style="list-style-type: none"> • Barometer (Class A) • Air temperature (Platinum resistance thermometer at 1.25 m above ground level) • Relative humidity (Capacitance sensor) at 1.25 m above ground level. • Wind sensors (measured wind speed and direction) at 10 m • Raingauge (≥ 200 mm diameter, tipping bucket) • AWS processor to collate and transmit data. (Minimum buffer storage to be 30 days.) • Ceilometer * • Visibility meter * • Present weather sensor * 	<ul style="list-style-type: none"> • Digital readout from all AWS sensors. • Manual (alcohol in glass thermometer) • Wet and dry bulb thermometers (alcohol in glass) • Maximum/minimum thermometer (alcohol in glass) • 5" (127mm) manual raingauge
Structures	Structures
<ul style="list-style-type: none"> • Stevenson screen, double louvered (may be same screen as used for manual observations if co-located in same enclosure) • 10 m tilting mast if sensors installed (may be co-located with AWS) 	<ul style="list-style-type: none"> • Stevenson screen, double louvered (may be same screen as used for manual station if co-located in same enclosure)
Facilities	Facilities
<ul style="list-style-type: none"> • Suitable sized enclosure to meet exposure requirements as specified by WMO. • Mains and/or solar power supply to AWS including batteries to support solar, and/or to act as UPS for message transmission. • An uninterruptable power supply to ensure message transmission. 	<ul style="list-style-type: none"> • Suitable sized enclosure to meet exposure requirements as specified by WMO (shared with automatic instruments). • A power supply for the operation of any digital instruments and displays. • Ability to house and store observing consumables, cleaning materials, station records and stationery, and preferably, a workstation (with PC and monitor/s) for the manual observer. • A local display for any electronic data (T/RH/WS/WD/PP) recorded on site. • Supply of clean water for cleaning and wet bulb readings.
Communications	Communications
<ul style="list-style-type: none"> • Satellite communications to ensure regular, timely message transmission. 	<ul style="list-style-type: none"> • Cellular, e-mail or HF radio backup.

Table 5 - Instruments and observing systems for planned GBON surface stations.

* Required for aviation purposes but not funded or supported by SOFF.

3.1.3 GBON Upper Air Station

As previously mentioned, the upper air station at Bauerfield (Table 6) is functioning well and provides reliable and regular soundings once per day. Funding is available from the Australian Government to support one flight per day until the end of 2026.

Station name	Existing station status	Planned GBON configuration
Bauerfield	Existing staffed station. One flight per day.	Increase flights to two per day.

Table 6 - Proposed GBON Upper Air Station

Manual balloon release system
Instruments and consumables
<ul style="list-style-type: none"> • Radiosondes • Balloons • Personal Protective Equipment (PPE) suitable for dealing with explosive environments
Structures
<ul style="list-style-type: none"> • Balloon shed where manually constructed balloon trains can be safely inflated and released. • Separate (or partitioned) Hydrogen generation shed and storage tanks • Fencing, adequate for the required security of the site. • Exclusion zones (painted lines), beacons/lighting and paths within the site
Facilities
<ul style="list-style-type: none"> • An area sufficient to ensure exclusion of the public and obstacles that may impact or be impacted by balloon releases. • Ability to store upper air consumables, cleaning materials, various computer and communications systems supporting the upper air observations, and a work area for the manual observer to assemble balloon trains as appropriate. • A local display for the radiosonde profile and access to sensors for ground check data (T/RH/WS/WD/press). • A hydrogen generation system and storage facility to ensure adequate supply for the anticipated upper air program. • Power supply to enable hydrogen generation and monitoring, constant communication with the radiosonde and the transmission of coded messages. • An uninterruptable power supply to ensure the above. • Supply of clean water for hydrogen generation
Communications
<ul style="list-style-type: none"> • Communications systems integral to the upper air program (to receive sonde data, normally supplied with the Upper Air system). • Robust communications to ensure regular, timely message transmission.

Figure 9 - Instruments and observing systems for planned GBON upper air stations

To improve this upper-air station to meet GBON requirements, the following activities should be undertaken:

- **Activity 3.9:** reconfigure the upper air system to provide data in WMO-compliant BUFR format.
- **Activity 3.10:** Secure funding for provision of consumables, and extra staffing if

required, to increase the schedule from one to two flights per day. (see also Activity 3.5).

- **Activity 3.11:** In the medium term, secure funding for sufficient consumables to allow two flights per day.
- **Activity 3.12:** Secure sufficient ongoing funding for a roster of staff covering the two balloon launch times (see also Activity 3.5).

Selection and installation of instruments will be compliant with WMO-No. 8 Guide to Instruments and Methods of Observation and the GBON Tender Specification for Upper air stations.

3.1.4 Maintenance

Equipment maintenance and calibration is one of the most significant challenges for VMGD to meet its GBON requirements. Maintenance (see also **Module 4**) is therefore a critical focus of the contribution plan.

Maintenance is crucial to maintain routine operations, address faults as they arise and ensure the safety of the staff. Examples of typical maintenance tasks are shown in Table 7.

Freight costs within Vanuatu and the region are very high, especially relative to operational budgets (See also Module 2 and Activities). There is also freight logistics and handling to deal with, adding to the challenges and budget constraints faced by VMGD.

Therefore, it is important that a detailed Operations and Maintenance plan be developed (**Activity 3.13**) and that this be fully costed and budgeted for (see Activity 2.1) for the GBON observation network and systems, including both preventive and reactive maintenance. This will necessarily include sensor/instrument regular maintenance and calibration, with instrument calibration being carried out in Fiji, New Zealand or Australia.

The cost of calibration equipment and the ongoing operational costs of maintain calibration equipment is prohibitive for VMGD, and for many NMHS in the region. A key recommendation is to centralise calibration, including calibration of travelling references used by technical staff. This must also be conducted in collaboration with WRP (**Activity 3.14**)

The radiosonde system includes complex components and requires specialised maintenance. For this reason, it is recommended that annual maintenance of the balloon facilities, including the hydrogen generation system, be performed by expert staff from New Zealand MetService, the Australian Bureau of Meteorology or the equipment manufacturer (**Activity 3.15**).

Level	Description	Surface tasks	Upper air tasks
1	<ul style="list-style-type: none"> Basic tasks requiring few consumables or parts carried out by local personnel, local staff or contractors. Basic instruction required e.g., via BIP-MT Moderately complex tasks carried out by staff following standard operating procedures (SOPs). <p>Tools, parts and consumables will be required. Specific instruction on hydrogen safety also required for staff at Upper Air stations.</p>	<ul style="list-style-type: none"> Clean Stevenson screen. Change wet-bulb wick. Cut grass/ vegetation. 	<ul style="list-style-type: none"> Attach sondes and launch balloons. Change over hydrogen cylinders. Cleaning of balloon shed and equipment
2	<ul style="list-style-type: none"> Technical tasks carried out by staff following SOPs. Equipment specific. Some instruction required via supplier, and/or VMGD technical staff. <p>Tools, parts and consumables will be required. Instrument specific training required.</p>	<ul style="list-style-type: none"> Collect station metadata. First line maintenance e.g., unblocking and checking raingauge. Under guidance of remote technicians, replace and verify performance of sensors. 	<ul style="list-style-type: none"> Check operation of HoGen Check gas lines for leaks Check operation of water spray
3	<ul style="list-style-type: none"> Specialised maintenance actions carried out by trained staff. Procedures are complex and fault-finding is a required skill. <p>Advanced meteorological (instrument) technician training required.</p>	<ul style="list-style-type: none"> Replace infrastructure. Set up and configure new equipment and sensors. Advanced fault finding. Verification and/or calibration of sensor/instruments. Install data communications system. 	<ul style="list-style-type: none"> Annual maintenance of UA system. Advanced fault-finding. Set up and configure new equipment and sensors. Install data communications system.
4	<ul style="list-style-type: none"> Specialised repair or replacement by manufacturer or agent 	<ul style="list-style-type: none"> Return to agent/ manufacturer of component 	<ul style="list-style-type: none"> Return to agent/manufacturer of component.

Table 7 - Example maintenance tasks for GBON stations

Funding for ongoing essential services such as logistics, travel and communications, during both the Investment and Compliance phases will be key to ensuring the reliability of the GBON stations. As outlined in **Module 2**, the World Bank and VMGD will develop a plan for ongoing procurement of essential services to support VMGD to operate and maintain the stations to a GBON standard through both Investment and Compliance phases.

This funding mechanism will need to support freight and travel costs to ensure VMGD technicians can ship equipment for calibration, visit sites for the regular proactive maintenance and for reactive repairs when required. It will also need to support station communication costs (satellite) travel costs (air, boat), logistics costs and all other ongoing costs required to ensure GBON compliance.

As most Pacific Island NMHS have a small staff, an effective and sustainable approach to maintenance would be to establish regionally-based teams that can support multiple Pacific Island Countries. Therefore, it is proposed that a Pacific regional solution also be identified for maintenance and repair, instrument calibration and train-the-trainer services (see also Module 4, Section 4.2).

3.2 Design of the ICT infrastructure and services

3.2.1 Data collection and transmission

Internet connectivity in Vanuatu is via undersea cable. There has been significant investment in connectivity for Vanuatu's government and citizens. The Vanuatu Government Broadband Network (GBN)⁶ uses microwave, satellite, and fiber-optic networks to connect government offices and a central data center. A recent cyberattack significantly impacted the GBN, disrupting online services and highlighting the need for redundant systems⁷.

Internet bandwidth to VMGD Headquarters is provided via the GBN but bandwidth is limited to 10 mbps and can be unreliable. A backup service is available via a commercial provider, but at significant cost. Staffed offices are connected to the VMGD wide area network which runs over the GBN. Anecdotally, the reliability of this network in the outer islands is around 80 to 90 per cent.

Currently, observations from the staffed stations are recorded by the observers in logbooks and transcribed into coded messages that are then then relayed to the Port Vila Headquarters for entry into systems that place the observations on the GTS. This process is labour intensive and has the possibility to introduce errors at multiple points in the process.

For the three proposed GBON surface sites, data from the AWOS is sent to the air traffic control tower and to the local observing office via radio modem. The observing offices are connected to the VMGD local area network and data is returned to Bauerfield using this mechanism.

Upper air observations are produced in TEMP format and provided via the GTS connection.

To maximise reliability, a backup communications solution is recommended for the Whitegrass Airport and Pekoia sites (**Activity 3.16**) to allow data communications to Bauerfield to be maintained in the event of an outage in the VMGD network.

In order to enable the data from the GBON stations to be internationally exchanged, a WIS2.0 node should be established in VMGD (**Activity 3.17**), replacing the existing GTS connection. This will have the additional benefit of facilitating improved access to international observations, model fields and satellite data.

3.3. Design the data management system

Data from AWS in Vanuatu are ingested into the Climate Data for the Environment (CliDE). CliDE is a well-established Climate Database Management System (CDMS) used in 14 Pacific Island Countries. Each country maintains a local version of CliDE database along with a product generator, CliDEsc.

CliDE provides many functions including data entry, storage, basic visualization and extraction tools for weather and climate data, comprehensive metadata, instrument/equipment tracking and reporting. VMGD have expressed a desire for the AWOS data to be ingested into CliDE, which is the preferred system for data visualisation.

⁶ <https://www.itu.int/en/ict-sdg-award/2015/Pages/vanuatu.aspx>

⁷ <https://islandsbusiness.com/news-break/vanuatu-govt-network-paralysed-by-cyber-attack/>

There will be some minor work to ensure that data from the three GBON stations is archived and accessible in CliDE (**Activity 3.18**). The establishment of the WIS2.0 node will also ensure that data is available in the Synergy system.

3.4. Environmental and sustainability considerations

Preventative maintenance programs are important to extend the life of installed equipment and should be built into the regular work schedules at the stations. Shipment of items in wooden, cardboard or paper packaging rather than plastics is simple to specify and comply with. These materials can be repurposed or recycled.

Education and repeated and progressive training are key to improving the maintenance, repair and reuse of equipment, where practicable, and therefore reducing levels of waste. This can start with relatively simple tasks such as keeping equipment clean to extend its useful life. This can be particularly applicable to masts and housings.

Mercury instruments are in the process of being phased out. Digital systems are used for air temperature (including maximum and minimum) and pressure at the staffed offices. Any remaining mercury-in-glass thermometers and barometers at the proposed GBON sites will need to be disposed of appropriately (**Activity 3.19**).

Improving coordination between various projects and programmes is crucial. A particular challenge is the proliferation of different systems that are currently being installed. It is important that ongoing operational support (maintenance, fault resolution, data access) are built into any activities. Having multiple types of equipment, such as AWS, increases significantly the training required, the complexity of work and the need to hold multiple types of spare parts.

Module 4. GBON Human Capacity Development Module

4.1. Assessment of human capacity gaps

VMGD has a full-time staff of 77 including the director.

	Division	Number
Director	Administration	1
Clerical Officer	Administration	9
Meteorologist	Forecast Section	12
Climate Services	Climate Section	7
Observers	Technical Section	21
Field technician and ICT	Technical Section	16
Geohazards staff	Geohazards Section	11

There are 51 male and 26 female staff. The ratio of female to male staff has increased significantly in the past few years.

The key gaps, or vulnerabilities, in human capacity necessary for continued GBON compliance are:

- Limited number of technical staff when considering the amount of installed equipment
- Observation staff have no training in basic (first line) maintenance of AWS.
- Technical staff have limited training in "end to end" AWS maintenance and operation.
- Technical staff have limited training in satellite communications and the various tools to support these systems.
- Additional observing staff may be required to support the increased observation programme – specifically two upper air soundings per day.
- Lack of basic electronics training for technical staff

A common request from the region is for accredited training. Outside of tertiary qualifications, this is difficult. The WMO Education and Training Office focus on competency-based training and assessment. The BIP-MT as conducted by the Regional Training Centre in Fiji (RTC Fiji) has Diploma status and future changes to the qualification may increase its relevance to modern automated observing systems.

4.2. Design capacity development activities for technical staff

Although the majority of the necessary infrastructure is already in place, there is a significant amount of technical work to bring the existing stations up to GBON compliance, and set up international data exchange. It is therefore recommended that there be a SOFF-funded programme/project manager to oversee network and programme management during the Investment phase (**Activity 4.1**). The works could be completed within one year.

Technical training, especially on AWS maintenance, needs to be ongoing, regular and progressive. The UNEP CIS-Pac5 project is a good example of a project that includes two-week training on AWS maintenance (includes Metadata, references WMO guidance) hosted

in New Zealand in years 1, 3, and 5 as well as on the ground training during the installation phase.

AWS training is complex, especially when factoring in the onsite maintenance, calibration, network management and ICT. A multi-level approach is recommended to get the best outcomes. See Module 3, Section 3.1 for an example of this.

Each country's contribution to GBON needs to be considered in the context of the neighbouring countries and it is important to view capacity development activities through a regional lens. A Pacific Regional approach is the most effective and sustainable way forward. It is recommended that the Pacific Island Education, Training and Research (PIETR) panel, with SOFF funding support, be tasked with preparing advice and recommendations to develop a detailed training plan for the PMC and its members (**Activity 4.2**). This should leverage current WMO and WRP activities.

To address some of the vulnerabilities and gaps identified, the following additional capacity development activities are recommended:

- **Activity 4.3:** Conduct training in basic automated and manual weather station maintenance and field checks for observation staff. This training must be specific to the equipment installed and is essential.
- **Activity 4.4:** Conduct advanced training in automated and manual weather station maintenance and field checks.
- **Activity 4.5:** Conduct training in radiosonde operations and hydrogen safety for all staff involved in balloon operations.
- **Activity 4.6:** Conduct training in WMO WIGOS tools OSCAR/Surface and WDQMS and CliDE/CliDEsc to selected members of the Observations, Climate, and Technical teams for system monitoring and maintenance. This also needs to include compilation and maintenance of discovery and descriptive metadata and use of CliDE for maintaining metadata.
- **Activity 4.7:** SOFF to support VMGD to recruit and fund any additional staff required to meet the expanded observation programme required for GBON compliance. (See also Activities 3.3 and 3.6)

4.3. Design capacity development activities for senior management

Key training for senior management should include aspects important for GBON operations, in particular financial management, asset management, strategic thinking and project/portfolio management.

- **Activity 4.8:** work with Weather Ready Pacific to ensure that the training program delivered to NMHS Directors and senior staff includes the skills necessary to operate and sustain national observing networks.

4.4. Gender and CSOs considerations

With the inclusion of staff in the Geohazards Division and project staff, VMGD currently has 53 male staff and 15 female staff. Recent projects have attempted to address the imbalance.

VMGS recognises gender equality and the need to support vulnerable populations in its Strategic Plan:

The VMGD accepts the need to operate and deliver services in ways that address and promote the principles of gender equality and the needs, both internally of the Department and in the development and delivery of the VMGD services, to the most vulnerable in Vanuatu society.

During the Investment Phase, recruitment and training should follow these guidelines:

- Women should represent at least 50% of all participants in SOFF-related and supported training
- Women should represent at least 50% of all participants in SOFF consultations, planning workshops, etc.
- Women should represent at least 50% of staff for operating and maintaining GBON stations
- Women should represent at least 50% of decision-making and project management positions, where applicable

Recommendations to further address these issues:

- **Activity 4.9:** Engagement with civil society organisations (CSO). This could include working with other programmes and/NGOs, community and school group presentations.
- **Activity 4.10:** Active inclusion of gender considerations in SOFF-related recruitment activities.
- **Activity 4.10:** Develop a Gender Action Plan during the Investment Phase to guide the mainstreaming of gender and social inclusion initiatives into SOFF investments. The Gender Action plan could include targets for female participation with SOFF Investment and Compliance phases in Vanuatu (staff recruitment) and the development of ongoing campaign in schools and communities to promote female participation in roles linked to VMGD. Include metrics and KPIs to be measured over time.

The WMO Gender Action Plan provides guidance on potential activities to be included in the Gender Action Plan:

- Increase the participation of women by:
 - identifying and nominating female experts from NMHSs or other national institutions to participate in the work of WMO governance bodies and their working structures and
 - seeking equality in the composition of delegations to sessions.

- Strive for gender balance, including in management and working structures
- Develop monitoring mechanisms at the national level by:
 - adapting the WMO gender monitoring indicators or
 - using an existing national framework
- Develop the capacity of NMHS staff on unconscious bias, inclusive leadership, gender mainstreaming, and gender responsive service delivery through trainings and workshops

Module 5. Risk Management Framework

5.1 Assess the risks of the observing network and propose mitigation measures

A high-level risk assessment has been undertaken focusing on risks that were identified during the readiness phase, with planned mitigation measures. The mitigation measures will be implemented during the investment phase (**Activity 5.1**).

The risks along with mitigating measures are included in Table 8.

Table 8. Risk analysis

Identified Risk	Mitigation Measures	Responsibility	Monitoring and Evaluation
<p>Failure to meet GBON targets due to inadequate equipment maintenance or delays in return to service</p> <p>Risk level is high.</p>	<p>Create a costed operations and maintenance plan.</p> <p>Limit the number of different technologies and systems used. Use common technology and instruments and therefore reduce costs, and risks, of the overhead of operating multiple systems.</p> <p>Establish funding mechanism and protocols for routine procurement of spares and consumables.</p> <p>Establish a funding mechanism for travel to remote stations.</p> <p>Ensure adequate spares are held at all remote stations.</p> <p>Co-location of automated weather stations with manual stations.</p> <p>Train manual observers to provide basic maintenance and redundancy</p>	VMGD/WORLD BANK	<p>Regular (annual) review of O&M and budgets.</p> <p>Monthly reporting on logistics needs and activities.</p> <p>Monthly review of GBON compliance via CliDE and WDQMS</p> <p>Annual review of staff training records</p>
<p>Poor data quality or lack of data from unattended AWS due to degradation of site (environmental) conditions, vandalism or theft.</p> <p>Risk is high.</p>	<p>Proactive maintenance by VMGD staff funded through establishment of 'logistics fund'</p> <p>Community engagement of importance of reliable data.</p> <p>Fencing protection from wandering animals (dogs, pigs)</p> <p>Review of data that fails automated quality checks</p>	VMGD and WORLD BANK	<p>Monthly review of CliDE, WDQMS and GBON compliance.</p> <p>Weekly review of quality flagged data.</p>

<p>Poor data quality due to inadequate workspace and tools for servicing, repair and calibration of equipment and sensors.</p> <p>Risk is high.</p>	<p>Provision of appropriate facilities and tools at Funafuti for repair and maintenance of equipment and instruments.</p> <p>Make use of regional neighbours and partners for calibration.</p> <p>Establish a funding mechanism for transport of instruments for calibration.</p>	<p>VMGD and WORLD BANK</p>	<p>Annual quality audit by VMGD quality manager</p>
<p>Poor internet connections or unreliable power leading to communication outages and data transmission delays.</p> <p>Risk is high.</p>	<p>Equip all stations with alternative communication methods e.g., Chatty Bettle, HF Radio.</p> <p>Equip all stations with battery backups.</p>	<p>VMGD and WORLD BANK</p>	<p>Monthly review of CliDE, WDQMS and GBON compliance.</p>
<p>Inadequate and/or fragmented storage or workspaces for equipment leading to degradation of equipment.</p> <p>Risk is high.</p>	<p>Provision of appropriate facilities for storage of equipment to protect from environment and fauna.</p>	<p>VMGD and WORLD BANK</p>	<p>Annual quality audit by VMGD quality manager</p>
<p>Insufficient human resources or technical skills to install or maintain stations, equipment and ICT system</p>	<p>Develop training and capacity building plan for technical staff.</p> <p>Regular, and repeated, training of technical and observing staff during Investment and Compliance phase.</p> <p>Recruitment of additional skilled staff during both Investment and Compliance Phase as outlined in Module 4.</p> <p>Workforce planning to address attrition.</p> <p>Use of common technology and instruments to limit the number of different technologies and systems used.</p>	<p>VMGD and WORLD BANK</p>	<p>Annual human resources audit by VMGD Including review of staff training records.</p>

Module 6. Transition to SOFF investment phase

The activities outlined in this National Contribution Plan will provide the basis for developing the Investment Proposal for the Vanuatu National GBON Network. The Investment Proposal will be developed by the World Bank (as Implementing Entity) and VMGD, with input from New Zealand (MetService and NIWA) **(Activity 6.1)**.

Summary of GBON National Contribution Plan

Components	Recommended activities
<p>Module 2. GBON business model and institutional development</p>	<p>1. Engage with the Ministry of Finance, and other potential partners, to develop a robust plan for ongoing funding and procurement of essential services such as travel, communication, and consumables.</p>
	<p>2. Engage with the appropriate Ministry to investigate potential for waiver of customs duties for meteorological equipment for maintenance and calibration.</p>
	<p>3. Actively engage in regional forums to pursue opportunities for regional coordination in Investment Phase and Compliance Phase elements such as maintenance, calibration, training, common equipment types.</p>
	<p>4. Actively support the development and utilization of the Regional Instrument Centre within Regional forums and in the context of Weather Ready Pacific</p>
	<p>5. Develop procurement plan that allows for the procurement of equipment to include private sector ongoing support (e.g. maintenance, training, advice, spare parts, etc.) for the life of the equipment.</p>
	<p>6. Undertake a comprehensive scan at start of Investment Phase of planned development activities related to GBON to identify opportunities for leverage and to ensure activities are complementary.</p>
<p>Module 3. GBON infrastructure development</p>	<p>1. Designate the AWS as GBON stations, updating operating procedures and updating the information in OSCAR/Surface.</p>
	<p>2. Update AWS software to provide data in compliant formats (WMO BUFR).</p>
	<p>3. Develop procedures for on-site verification using manual measurements.</p>
	<p>4. Provide support for one staff member at Whitegrass Airport and Pekoa Airport to support the operation of the GBON stations.</p>
	<p>5. Provide training to co-located staff on basic AWS maintenance, verification and fault finding.</p>

	6. Link VMGD with the Regional WIGOS Centre for the purposes of metadata management and data quality monitoring
	7. Procure sufficient spares for each of the three sites to allow swapping of sensors and components in the event of failure.
	8. Procure and maintain sufficient calibration kits to facilitate an ongoing program of verification.
	9. Reconfigure the upper air system to provide data in WMO-compliant BUFR format.
	10. Secure funding for provision of consumables, and extra staffing if required, to increase the schedule of radiosonde launches from one to two flights per day.
	11. In the medium term, secure funding for sufficient consumables to allow two flights per day.
	12. In the medium term, secure funding for sufficient consumables to allow two flights per day.
	13. Develop a detailed and fully-costed operations and maintenance plan for the GBON stations.
	14. Centralise calibration and verification activities in cooperation with Weather Ready Pacific
	15. Plan for and secure funding for yearly maintenance of the upper air system and hydrogen generator by the vendor, or staff from the Bureau of Meteorology or MetService.
	16. Establish backup communications systems for the Whitegrass Airport and Pekoia sites.
	17. Establish a WIS2.0 node at to replace the existing GTS connection.
	18. Ensure data from GBON stations is archived and accessible in CliDE
	19. Any remaining mercury-in-glass thermometers and barometers at the proposed GBON sites will need to be disposed of appropriately
Module 4. GBON human capacity development	1. Recruit programme/project manager to oversee works during the Investment Phase.
	2. Support the PIETR Panel in preparing advice and recommendations to take to PMC for developing a

	<p>detailed Pacific region training plan covering all aspects of the data chain.</p>
	<p>3. Conduct training in basic automated and manual weather station maintenance and field checks for observation staff. This training must be specific to the equipment installed and is essential.</p>
	<p>4. Conduct advanced training in automated and manual weather station maintenance and field checks.</p>
	<p>5. Conduct training in radiosonde operations and hydrogen safety for all staff involved in balloon operations.</p>
	<p>6. Conduct training in WMO WIGOS tools OSCAR/Surface and WDQMS and CliDE/CliDEsc to selected members of the Observations, Climate, and Technical teams for system monitoring and maintenance. This also needs to include compilation and maintenance of discovery and descriptive metadata and use of CliDE for maintaining metadata.</p>
	<p>7. SOFF to support VMGD to recruit and fund any additional staff required to meet the expanded observation programme required for GBON compliance.</p>
	<p>8. Work with Weather Ready Pacific to ensure that the training program delivered to NMHS Directors and senior staff includes the skills necessary to operate and sustain national observing networks.</p>
	<p>9. Engagement with civil society organisations (CSO). This could include working with other programmes and/NGOs, community and school group presentations.</p>
	<p>10. Active inclusion of gender considerations in SOFF-related recruitment activities.</p>
	<p>11. Develop a Gender Action Plan during the Investment Phase.</p>
<p>Module 5. Risk Management</p>	<p>1. Implement mitigation measures as outlined in the risk management framework.</p>
<p>Module 6. Transition to SOFF investment phase</p>	<p>1. Develop the investment proposal, incorporating activities from this GBON national contribution plan.</p>

Report completion signatures

Peer Advisor signature



Beneficiary Country signature



WMO Technical Authority signature

