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GBON National Contribution Plan of Nauru

Systematic Observations Financing Facility

Weather and climate data for resilience

GBON National Contribution Plan

Nauru

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Introduction

The Global Basic Observing Network (GBON) was agreed at the World Meteorological Congress in 2019 and came into force in January 2023. The GBON is a surface-based weather observing network designed at a global scale to support Numerical Weather Prediction. It aims to address global variability in network density and reporting frequency to improve global weather forecasting and resilience.

In recognition of the challenges for WMO members from Small Island Developing States (SIDS) and Least Developed Countries (LDCs) in meeting GBON requirements, the Systematic Observations Financing Facility (SOFF) was established alongside GBON. SOFF is a United Nations Multi-Partner Trust Fund established by the WMO, the United Nations Environment Programme and the United Nations Development Programme. SOFF provides funding to uplift weather observations in SIDS and LDCs to meet GBON requirements.

The SOFF model is to partner each beneficiary country with a peer advisor country to provide peer support, and with an implementing entity to implement and oversee the SOFF investment. Nauru has chosen the Australian Bureau of Meteorology (Bureau) as peer advisor and the United Nations Environment Program (UNEP) as implementing entity.

In the first phase of the SOFF project, the Readiness phase, the beneficiary and peer advisor work together to assess the existing weather networks against GBON requirements, identify gaps, and develop plans for filling these gaps. The peer advisor and beneficiary country then document these plans together in a GBON National Contribution Plan (NCP), which supports an investment proposal for the next SOFF Investment Phase.

This document provides the GBON National Contribution Plan (NCP) for Nauru. It has been developed together by the Nauru Meteorological and Hydrological Service (NMHS) with the Australian Bureau of Meteorology (Bureau) as peer advisor, and the United Nations Environment Program (UNEP) as implementing entity. It draws on a review of existing documentation and engagement with NMHS and other Nauruan weather stakeholders during a visit to Nauru on the 12th and 13th of October 2023. The in-country visit included meetings with NMHS at their head office in Yaran, stakeholder meetings with Nauru Air Services and observation site visits to the existing manual weather station and proposed Automatic Weather Station and Upper Air site Topside.

The document:

- outlines the current state of weather observations in Nauru, highlighting the gaps between the existing network and capabilities and the GBON requirements;
- proposes the planned future state for Nauru's weather networks to become GBON-compliant; and
- details the recommended activities needed to reach this future state.

Module 1. National Target toward GBON compliance

1.1 Summary of Current State

Nauru's national meteorological and hydrological service (NMHS) maintains a small team of observing and forecasting personnel. These teams maintain:

- 1 staffed weather station
- Nil automatic weather stations (at present)
- Nil upper air stations (at present)

However, NMHS faces major challenges in training, logistics, sourcing of equipment and spares, maintenance and communications, leading to quality and reliability issues. As a result, Nauru currently has no GBON-compliant surface stations.

There is substantial opportunity for SOFF to support Nauru to address these challenges, as outlined in the description of GBON targets below.

1.2 Principles for GBON Targets

Nauru is a country consisting of one island with a contiguous exclusive economic zone (EEZ) of 308,480 km^2. In its global GBON gap analysis, the WMO applied the GBON marine surface and upper air station density requirements to the EEZ to develop its land-based targets for Nauru. This resulted in targets of 2 surface stations and 1 upper air station.

In developing targets for this Nauru GBON National Contribution Plan, the following attributes of the country were taken into account:

- Nauru is a country with minimal land area and a small population. The vast majority of the country's territory consists of marine EEZ. Therefore, the marine GBON requirements, as used in the global gap analysis, are considered more relevant than the land requirements.
- Nauru consists of one island, with a contiguous EEZ associated with this island.
- Weather observations are only practical on this one populated island. Improvements in Numerical Weather Prediction (NWP) from additional observations will have the most benefit in this populated location.
- The Tropical Atmosphere Ocean (TAO) moored buoy network, supported by the USA and Japan, provides an excellent supplementary source of data for NWP and has a presence in the west of the Nauru EEZ.
- Maintaining AWS at unstaffed sites has historically been less successful in terms of data quality and reliability in Nauru and other SIDS of similar resources. Staffed stations have historically proven to be significantly more reliable, highest quality and most resilient.

1.3 GBON Targets

Based on the above factors, the following GBON targets for Nauru are proposed:

- **Surface stations**:
  - Two GBON compliant stations comprising:
    - The one existing staffed station at the international airport to be improved to report internationally; and
    - One automatic station to be installed at the future NMHS Head office site (to be co-located with the upper air station).
  - Non GBON sites (for reference only)
    - The soon-to-be installed Nauru Airport AWOS (which may become the backup site for the manual GBON site).
    - A potentially upgraded Nauru sea level site to report most if not all GBON elements (not a GBON candidate, but a reliable back-up site).
- **Upper air stations**
  - One upper air station will be established as a GBON station near the future NMHS Head office site.

Type of station	Baseline (Results of the GBON National Gap Analysis)				GBON National Contribution Target	
	Target (# of stations)[1]	GBON-compliant stations (#)	Gap		To improve	New
			New	To improve		
Surface	2	0	1	1	1	1
Upper-air	1	0	1	0	0	1
Marine	***when applicable**					

Table1. GBON National Contribution Target

[1] 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.

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

The Nauru Meteorological and Hydrological Service (NMHS) is the primary organisation of relevance to the operation and maintenance of GBON in Nauru. As detailed below, it maintains the one current weather station in Nauru, manages the weather data, but does currently lack a direct legislated mandate to do this.

The only other organisation looking to operate a compliant weather station in Nauru is the Civil Aviation Authority of Nauru. As part of the Australian government Pacific aviation initiative, it will likely be responsible for one future automatic weather observing system (AWOS) at the Nauru international Airport. The timeline for this station to be installed and operational is tight, and they are currently 'in planning' but requests for quote have already been obtained by the relevant group.

There are some non-GBON compliant AWS systems on Nauru operated by Geoscience Australia and the Nauru Power Authority (one each) and evidence of several AWS systems installed previously which have been removed or are unserviceable.

It is anticipated, but not certain that the aviation AWOS will provide data to NMHS systems. They may well use a different technology to the NMHS weather stations, and as NMHS does not have operational control nor ownership of these stations, it may be difficult for NMHS to ensure the reliability and quality of this data. Consequently, this plan assumes that the GBON requirements will be met with alternative infrastructure owned and operated by NMHS.

There are no private actors who have a base nor significant presence in Nauru. Actors such as NIWA, Vaisala and OTT operate in the pacific region and may be ongoing maintenance partners for GBON.

2.2. Assessment of potential GBON sub-regional collaboration

Coordination was undertaken with peer advisors for neighbouring countries during development of the National Contribution Plan. The proposed stations will contribute to a broader well-distributed multi-country network across a critical region for Numerical Weather Prediction (NWP) encompassing other SOFF-funded stations in nearby countries including Kiribati, Tuvalu, Solomon Islands and PNG.

The National Contribution Plan has also been structured to be flexible to accommodate future regional coordination initiatives such as regionally-focused equipment calibration services, training, procurement of common equipment types, and maintenance services. These will be pursued through several forums in which NMHS is active participant (**Activity 2.1**) including:

- Regional SOFF coordination workshop in early 2024

- WMO RA V committee
- Pacific Meteorological Council and its committees
- South Pacific Regional Environmental Programme, particularly the Weather Ready Pacific plan.
- Climate and Ocean Support Program in the Pacific (COSPPac)
- Pacific Community.

During the Investment Phase, NMHS, UNEP and BOM will also pursue opportunities for regional synergies for maintenance services that can be implemented during the Compliance Phase, such as coordinated procurement of spare parts and calibration services.

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

NMHS's annual core budget is estimated at approximately AUD $226,500, including staff cost. This is very low by world standards. The existing budget does not allow NMHS to cover equipment and maintenance costs, support staff training or fund operational requirements. For example, the budget for financial year 2022-23 saw NMHS allocated a very small budget for plant repairs/maintenance and for stores, with no allocation for instruments, consumables, building maintenance, motor vehicles, personal protective equipment or other costs associated with running an observations network[2]. The NMHS falls under the Department and the Ministry of the National Emergency Services.

In order to meet requirements of the NCP, significant additional funding resources will be required. Given the reliability of existing government processes, the existing skill level in the NHMS, its limited legislated mandate (see 2.5 below), and the remoteness and lack of existing private sector operators in Nauru, the preferred business model is the *Public/Private model – Full State/NMHS owned and operated but privately maintained*. There is opportunity for a substantial private sector role in supporting the NMHS by including weather stations installation, ongoing maintenance, calibration and training in the procurement contracts. Similarly, there is reference for a private sector role in the ongoing support for the ICT systems and equipment.

The previous successful operation for fifteen years of an advanced research-quality upper air station in Nauru (which was decommissioned in 2013), funded by the US Department of Energy and maintained by the Australian Bureau of Meteorology, demonstrates that such a partnership model is viable[3].

This will require structuring the procurement in a manner than the supplier relationship can continue over the life span of the equipment. This could include procurement being done through UNEP with provisions to transfer support and maintenance contracts to NMHS, or alternatively procurement for both supply and support could be done via an external entity. Prior to procurement, UNEP will engage with prospective suppliers and undertake a review of possible procurement approaches and develop a procurement plan (**Activity 2.2**). This plan will designate the 'Executing Entity' for each element of procurement and ensure the procurement model can include supplier support for the life of the equipment. Note that the

[2] Republic of Nauru 2022-23 Budget Paper No 1
[3] https://www.arm.gov/news/facility/post/23404

Bureau of Meteorology is not a prospective supplier and is intending to maintain an advisory role.

The financial plan for operating the modernised infrastructure is for staff costs to be borne by NMHS, with 100% of funding for maintenance, repairs, consumables and transportation to be covered by SOFF partner funding. It is not envisaged that additional staffing will be required to operate the modernised infrastructure at this point.

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

The Nauru NMHS was established on 11 May 2015 under the Department and the Ministry of the National Emergency Services. Nauru has a Strategic Roadmap for Emergency Management 2021-2023, which is focused on high level considerations for the National Disaster Risk Management (NDRM) Council and Department. The Roadmap sets four goals:

1. Disaster Management Arrangements and incident management system in place;
2. Disaster Risk Management Arrangements are supported by integrated and operational emergency management communication strategies;
3. Nauru has a disaster management training and skills development strategy to guide DRM skills development;
4. Nauru has established Disaster Management Committees.

The operations of the NMHS are most aligned with Goal 2, but also encompass broader support for climate, agricultural, marine and aviation services and economic development in general for Nauru.

There are no stand-alone plans or strategies for the NMHS.

Existing or planned projects relating to observing networks in Nauru are summarised in Table 1 along with recommendations on activities to ensure consistency and complementarity with the NCP.

Table 1 - Existing or planned projects relating to observing networks in Nauru

Related Initiative	Description	Relevance to GBON and recommendations
UNDP Disaster Resilience for Pacific Small Island Development States (RESPAC) program.	This program was to install 1 AWS in Nauru. This unit is in storage pending resources for installation.	Investigate opportunity to use existing AWS equipment in storage (see **Activity 3.4**)
Australian government Pacific aviation project	The Australian government is assisting Nauru to upgrade aviation weather services. This includes, among other activities, installing one new AWOS (noted in 2.1 above) and providing aviation weather training activities	Investigate opportunities for AWOS to provide data to NMHS systems as part of **Activity 2.3** below. However, as outlined in Section 2.1, as NMHS does not have operational control nor ownership of these stations, it may be difficult for NMHS to ensure the

		reliability and quality of this data. Consequently, this plan assumes that the GBON requirements will be met with alternative infrastructure owned and operated by NMHS.
Climate and Oceans Support Program in the Pacific (COSPPac)	This Australian government program is looking to assist Nauru by installing a CliDE Climate Data Management System server in the near future, with accompanying training.	Investigate incorporating CliDE into the data management solution for Nauru (see **Activities 4.1** and **4.2**)
Weather Ready Pacific	This is a broader planned 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. Synergies will be pursued throughWIS regional forums in which NHMS is an active participant (see **Activity 2.1**)

Opportunities to leverage these initiatives have been considered in the Module 3 Infrastructure Development below. As aid programs in the region are dynamic, it is also recommended that at the start of the Investment phase, UNEP and NMHS undertake a comprehensive environment scan of planned development activities related to GBON to identify any other opportunities for leverage and to ensure the planned works will be complementary (**Activity 2.3**).

2.5. Review of the national legislation of relevance for GBON

There is no Meteorological Act in Nauru, but legislation in the form of the Natural Disaster Risk Management Act 2016 did establish the Nauru Meteorological Service and provides a mandate for the NMHS to provide national public weather, marine and climate data. The Civil Aviation Act 2011 provides a mandate to provide public weather forecasting and meteorological warning services for aviation in a timely and efficient manner. The Act provides some authority and responsibility for NMHS to establish and operate the GBON stations and share the data internationally.

In general, national legislation does not particularly help nor hinder the implementation of GBON, provided that funding for the installation and maintenance of equipment and the provision of consumables is provided by an external agency. Direct legislation through the creation of a Meteorological Act would increase confidence in the ability of NMHS to provide regular and ongoing support to GBON stations in addition to that provided by external agencies responsible for ongoing maintenance.

In this light, a 2022 UNDRR Assessment[2] recommended several priority actions for Nauru, including a Meteorology Act: *"It is essential to develop a strategy to maintain longer term records of data and cascading hazard events. It is essential to draft a Meteorology Act defining the roles and responsibilities of the Nauru Meteorological Service to improve the service delivery."*

At this stage, drafting of such an Act is in progress, in collaboration with the Justice Department. Depending on this progress, Nauru may need further assistance in progressing the Act to completion.

The Department of Finance Treasury Division is responsible for procurement. Part 3A of the Public Finance (Control and Management) Act 1997 provides the framework for the Government's procurement arrangements. The regulations provide that procurement over $3,000 must be conducted by a procurement agent, and there are currently three government authorised procurement agencies.

As outlined in Section 2.3 above, NMHS and UNEP will engage with the Department of Finance and other regional organisations to develop a procurement plan for weather stations and ICT equipment that allows for 'supply and support' contracts over the life of the equipment (**Activity 2.2**). The contracts will provide ongoing operational support for items such as maintenance, training, calibration, advice and spare part supply.

[2] UNDRR (2022). Disaster Risk Reduction in the Republic of Nauru: Status Report 2022, United Nations Office for Disaster Risk Reduction (UNDRR), Sub-Regional Office for the Pacific.

Module 3. GBON Infrastructure Development

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

Existing state

Existing weather stations in Nauru are shown in **Error! Reference source not found.Error! Reference source not found.**. These include one staffed weather station, and one third-party sea level station. Currently, none of the stations are fully GBON-compliant and further, the sea level station is not designed for this purpose. Details of each station type are provided in the following sections.

Staffed Surface Stations

NMHS maintains 1 staffed weather station at the international airport (NAURU AIRPORT, WSI 0-20000-0-91530), across from their office in the fire station (Figure 2).

This staffed station has a complement of manually read monitoring equipment, including:

- Dry bulb and Wet bulb temperature probes in a Met Spec 01 Stevenson Screen (recording and displaying wet bulb, dry bulb, max, min temperatures)
- Vaisala PTB 330 barometer in fire station observing office
- Manual 203mm rain gauge
- Vaisala ultrasonic anemometer at 10m on roof of fire station.

There are currently 8 observing staff at the airport which enable this station to operate 24 hours a day with a target of hourly observations (hourly METAR/SPECI). Due to siting and maintenance challenges, some of the instruments provide unreliable data, requiring the observers to estimate or omit parameters. In some cases, due to equipment or communications issues, observations are less frequent than the target.

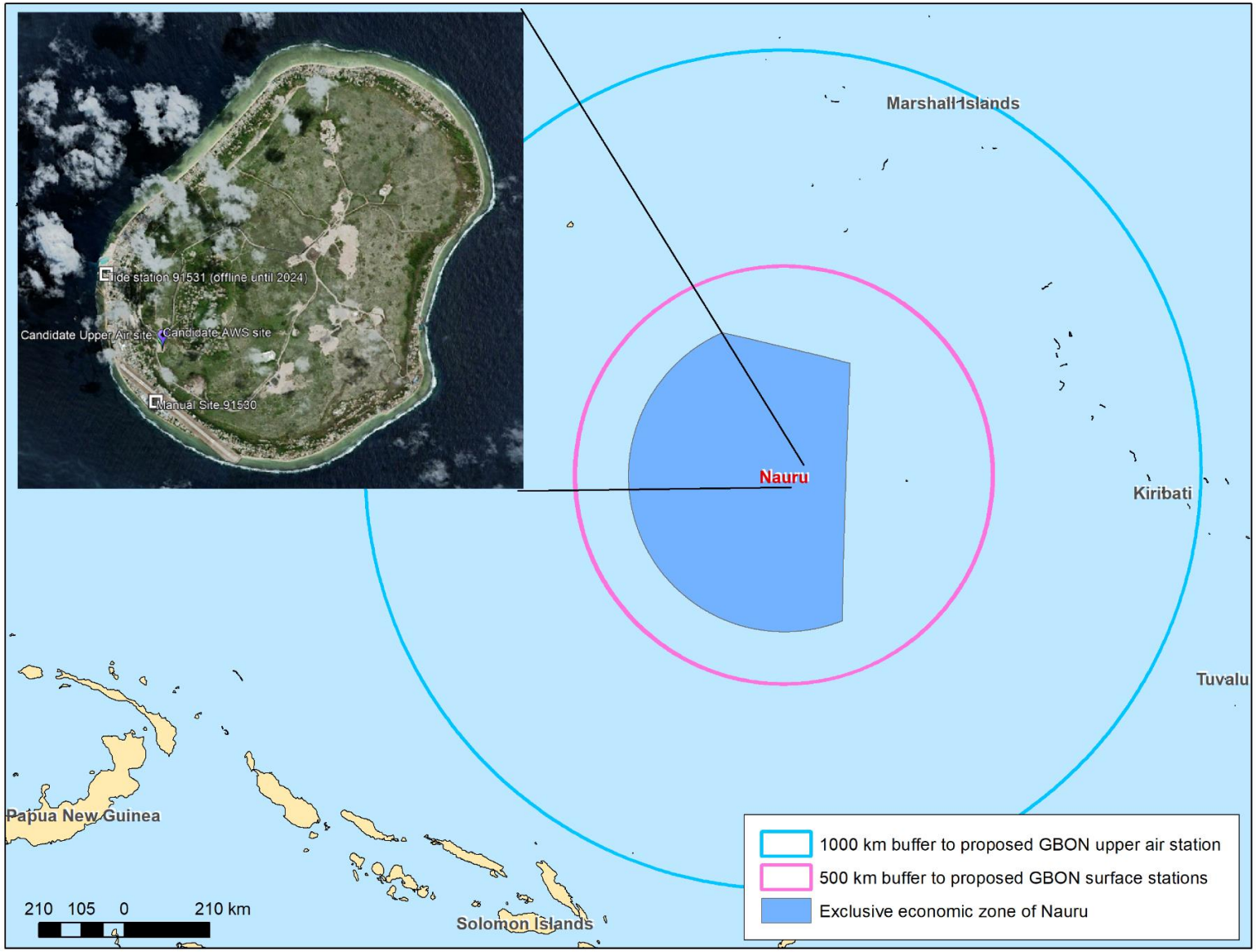


Figure 1. Weather stations in Nauru

Figure 2 Manually read instrumentation at the weather station at Nauru International Airport, Yaren, Nauru.

Automatic Weather Stations

There are no currently reporting AWS or AWOS systems in Nauru that share information with NMHS. There are some non-compliant AWS systems on Nauru operated by Geoscience Australia and the Nauru Power Authority (one each) and evidence of several AWS systems installed previously which have been removed (Atmospheric Radiation Measurement Program – ARM project) or are out of commission (an un-serviceable AWS is located at the east end of the runway).

There is reference in CLiDE to a HS TB3 Tipping Bucket raingauge at a site referred to as NRC Workshop at Topside, but apparently this is also unserviceable at present (station 91533 is closed).

Figure 3 Former NRC Workshop TBRG (91533).

Upper Air Stations

There are no current upper air stations in Nauru, however there is evidence of two non-concurrent sites performing upper air soundings over time, the first being at the former Radio Station site in the 1970's and the second at the ARM site (WMO 91532) ceasing in 2013.

Marine stations

One sea level monitoring station is maintained in Nauru by the Australian Bureau of Meteorology (Bureau) under the Pacific Sea Level and Geodetic Monitoring project (WSI: 0-20000-0-91531). It is located on a wharf at Orro and monitors atmospheric pressure as well as sea level, temperature and wind (Nauru - Baseline_Pacific_metadata). Only sea level is currently transmitted internationally from the Bureau to the WMO Information System (WIS).

The United States National Oceanic and Atmospheric Administration (NOAA) and Japanese Agency for Marine-Earth Science and Technology (JAMSTEC) also maintain a large network of moored 'equator buoys' in the Pacific region. At least one of these buoys is located near Nauru's marine exclusive economic zone (EEZ) (refer Figure 4). These buoys record and transmit to the WIS air temperature, humidity and sea surface temperatures. NOAA advised there are plans to upgrade a number of these buoys to also record sea level air pressure.

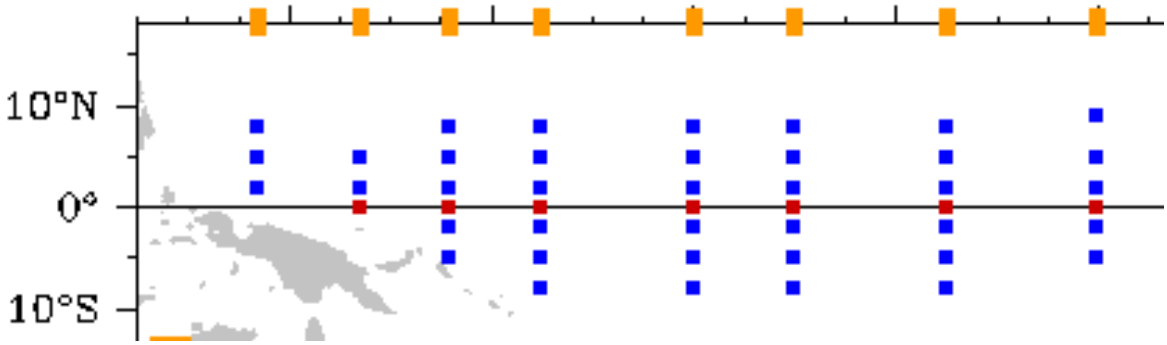


Figure 4 schematic of the TAO/TRITON Array maintained by NOAA.

Maintenance

The NMHS team have no access to calibration transfer standard equipment. There does not seem to be scheduled inspections or maintenance on their one weather station, however NMHS do leverage off visiting Bureau and Fiji Meteorological Services (FMS) technical staff visits to undertake periodic instrument verification. While there is some evidence of metadata, namely site photos being recorded (in the climate database CLiDE), this does not seem to be systematic or scheduled at present.

Budget constraints within the NMHS have meant that the NMHS staff have not had the opportunity to attend nor receive training in basic instrument maintenance to date. NMHS do not have a dedicated technician resource but do have one very capable ICT manager.

Sourcing of parts and materials is also a major challenge. With no local supplier, all parts must be procured from overseas with lengthy delivery times and costly freight. These issues combined with budgetary constraints within NMHS, have meant that NMHS rarely has a sufficient stock of spare parts, and often is unable to make repairs to or replace unserviceable equipment.

Due to budget constraints, the serviceability of former AWSs has not been possible and may again be an issue should ongoing funding for training, spare parts and communications not come forth.

General security and maintenance of vegetation at the current weather station are undertaken by the airport staff. The site surrounds and vegetation get periodic maintenance, although there is evidence that at times the site is allowed to drift out of WMO siting specifications.

Target state and recommended activities

Surface Stations

The primary approach for GBON surface stations in Nauru is for two stations, comprising:

- the one existing staffed weather station at the international airport; and
- one new AWS to be installed at the future Topside location (Figure 1, Candidate AWS Site).

This approach was chosen for the following reasons:

- Maintenance of unattended AWS to GBON reliability standards is challenging in Nauru due to major logistical challenges (lack of funding for training, replacement

parts, harsh environmental conditions, etc.). Having a manual staffed site is essential to ensure sufficient up-time to meet GBON standards.

- The presence of skilled staff on-site will provide quality control and allow for quick, reactive maintenance in the event of equipment problems at a manual site.
- Having an AWS at the future Topside location will provide additional information for the inland areas which are higher above sea level and climatically slightly different to the coastal strip. Being at a staffed location, this AWS should also benefit from proximity to trained staff able to perform light maintenance.
- Having both manual and automatic observations will provide redundancy for down-time of the AWS equipment (e.g. due to delays in shipping parts) as well as any issues at the manual site. The two stations will provide a level of redundancy to support reliable GBON reporting.
- Staff on-site will be able to provide security and grounds maintenance (e.g. mowing) to ensure both sites comply with WMO siting requirements.

NMHS currently maintains one staffed station at the airport. This station is functional but some staff training in observations and equipment maintenance is required to meet GBON requirements. Back-up communications, a local observations display and uninterruptable power supply (UPS) for the NMHS office would also help increase the data being transmitted internationally.

One additional automated station at Topside is planned, which could be both a synoptic and upper air site. Documentation from the Weather Ready Pacific project indicates there are plans to move the NMHS Head Office to this location; however despite a lease being signed funding is not currently available due to an internal budget shortfall and lack of identified donor funding to date. NMHS do not currently support a second manual station at this location.

In addition, NMHS have a new OTT Hydromet Sutron AWS in storage which may be utilised (if serviceable) at the Topside location. This will require addressing existing maintenance, logistics, communications and security issues.

The surface stations to be upgraded or installed as part of this plan are listed in Table 2. The proposed instruments and observing systems for these stations are detailed in Table 3. Selection and installation of instruments will be compliant with *WMO-No. 8 Guide to Instruments and Methods of Observation*. Sample tender specifications for GBON AWS are available from TT-GBON approved material | World Meteorological Organization (wmo.int) Document 6.1.

Table 2 - Planned GBON surface stations

Station name	Locality	Existing station status	Planned GBON configuration
Nauru Airport	Yaren	Existing staffed station	Upgraded staffed station reporting 24/7
Topside	Boe	Planned automatic station	AWS reporting 24/7

Table 3 – Instruments and observing systems for planned GBON surface stations

Manual synoptic sites:	Automated synoptic sites:
Instruments	Instruments
• Electronic temperature and humidity sensors @1.25 – 2m with digital readout. • Wind vane (estimated values) or wind sensors (measured value) @10m. • Standard 8 inch (203mm) or 5 inch (127mm) manual rain-gauge, rim @ 0.3m, or no more than 1m as required. • Other manual instruments (evaporation, sunshine, soil temperatures) as required. • Any electronic instruments required to supplement manual observations (digital barometer)	• Resistance Temperature Device (RTD) dry bulb probe and relative humidity probe @1.25m – 2m. • Wind speed and direction sensors @10m. • Standard 8 inch (203mm) tipping bucket rain-gauge, rim @ 0.3m, or no more than 1m as required. • Other automated instruments (barometer, evaporation, solar radiation, soil temperatures) as required. • AWS processor to collate data (preferably with a 7-30 day buffer) and send messages at the required intervals.
Structures	Structures
• Instrument shelter (Stevenson style), gloss white and double louvered, with stand, to achieve bulb/sensor height of 1.25-2m. • Tilting counterweighted 10m mast. • Post to 0.7m to support raingauge as required. • Fencing, adequate for the required security of the site.	• Instrument shelter (Stevenson style), gloss white and double louvered, with stand, to achieve sensor height of 1.25-2m. • Tilting counterweighted 10m mast. • Post to 0.7m to support raingauge as required. • Fencing, adequate for the required security of the site. • Housing for the AWS processor, barometer and power supply separate from other sensors.
Facilities	Facilities
• An observations enclosure sufficient to ensure exclusion of obstacles impacting on readings (WMO 25 x 25m, BOM 18 x 18m). • A nearby building to house observing consumables, cleaning materials, station records and stationery, and a work station for the manual observer. • Sufficient PCs to ensure storage and uploading of climate data/transmission of real time observations with redundancy (more than 1 system prefer 3-4). • A local display for any electronic data (T/RH/WS/WD) recorded on site. • A power supply to enable communication of coded messages. • An uninterruptable power supply to ensure message transmission. • Supply of clean water for cleaning and wet bulb readings.	• An observations enclosure sufficient to ensure exclusion of obstacles impacting on readings (WMO 25 x 25m, BOM 18 x 18m). This includes site preparation and levelling of the enclosure and a surrounding exclusion area up to 40 x 40m. • Mains (240V, 10A to be stepped down to 12V or 24V as required) and/or solar power supply (12 or 24V as required with up to 240W of panels) to site. • Batteries (up to 240Ah) to support solar, and/or to act as UPS for message transmission. • Signage to inform or deter the public.
Communications	Communications

Manual synoptic sites:	Automated synoptic sites:
• Robust cellular or satellite communications to ensure regular, timely message transmission. • Backup HF or other common communication method.	• Robust cellular or satellite (preferred) communications to ensure regular, timely message transmission. • Redundant communications system where feasible.

To improve the existing station at the airport to meet GBON requirements, the following activities will be undertaken:

- **Activity 3.1:** Undertake audit of existing equipment and facilities at Nauru Airport to identify all items that require upgrade, relocation or procurement.
- **Activity 3.2:** Procure 1 x uplifted manual observing equipment under 'build and support' contracts, including site works, structures, facilities and communications infrastructure.

To establish the new automatic GBON surface station at the Topside site, the following activities will be undertaken:

- **Activity 3.3**: Secure land access to open an automated station at Topside. Undertake all required site preparation tasks for observations enclosure and power supply.
- **Activity 3.4:** Undertake an audit of previous AWS equipment issues to identify technical and communication faults and lessons learned. Audit existing OTT-Hydromet AWS equipment in storage to determine serviceability and suitability for the Topside site.
- **Activity 3.5**: Procure a 'supply and support' contract to install a refurbished or new AWS at the Topside location, as per the audit, to ensure they communicate reliably in real-time to GBON standards. The existing OTT-Hydromet system may be used if suitable.

For both stations:

- **Activity 3.6:** Engage with NMHS or other relevant authority to ensure caretaker arrangements for the existing and proposed sites are robust.

Upper air stations

An upper air station is intended to be co-located with the automated surface station (AWS) at Topside once it is established. This station is anticipated to have mains power and access to water, providing a good opportunity for adding upper air observations.

This upper air station will be manual and operated by existing NMHS observing staff. A hydrogen generator will be required due to the logistical challenges of sourcing and delivering bottled hydrogen in the remote island environments.

Access to reliable 24/7 power and communications will need to be a major consideration for this proposed upper air location.

The upper air station to be constructed as part of this plan is listed in Table 4. There is a proposed NMHS/NES Head Office facility and forecasting/climate/maintenance centre to be constructed at this location. It would be cost effective and beneficial to incorporate elements

of the proposed upper air station into this building to remove duplication of facilities and capability. This could be accomplished through part or full funding of this building via SOFF.

The proposed instruments and observing systems for this station are detailed in Table 5. Selection and installation of instruments will be compliant with *WMO-No. 8 Guide to Instruments and Methods of Observation*. Sample tender specifications for GBON upper air equipment are available from TT-GBON approved material | World Meteorological Organization (wmo.int) Document 6.2.

Table 4 - Planned GBON upper air stations

Station name	Locality	Existing station status	Planned GBON configuration
Topside	Boe	None	New manual upper air station

Table 5 – Instruments and observing systems for planned GBON upper air stations

Manual balloon release system
Instruments/consumables
• Radiosondes (environmental sustainable model) • Balloons (environmental sustainable model) • 'Met' string (environmental sustainable/biodegradable model) • Parachutes (as required) • Personal Protective Equipment (PPE) suitable for dealing with explosive environments.
Structures
• Balloon shed or remote balloon launcher where manually constructed balloon trains can be safely inflated and released. • Separate (or partitioned) Hydrogen generation shed (or storage shed if bottled H2 is available). • Fencing, adequate for the required security of the site. • Exclusion zones (painted lines), beacons/lighting and paths within the site.
Facilities
• An enclosure sufficient to ensure exclusion of the public and obstacles that may impact or be impacted by balloon releases. This includes site preparation and raising of the balloon filling and releasing site to approximately 2m above the surrounding terrain. • A nearby building to house upper air consumables, cleaning materials, various computer and communications systems supporting the upper air observations, and a workstation for the manual observer to assemble balloon trains. Ideally, this would be the planned NES building, where SOFF funding could be used to fully or partially contribute to its construction. • A local display for the radiosonde profile and access to sensors for ground check data (T/RH/WS/WD/press). • A suitable power supply to enable H2 generation and monitoring, constant communication with the radiosonde and the transmission of coded messages. • A hydrogen generation system (HOGEN) and H2 storage facility to ensure adequate supply for the anticipated upper air program. • An uninterruptable power supply to ensure the above. • Supply of clean water for hydrogen generation. • Provision and funding of ongoing costs of a vehicle to transport staff and consumables between NMHS staffed locations in support of the upper air program.
Communications
• Communications systems integral to the upper air program (to receive sonde data, normally supplied with the Upper Air system). • Robust cellular or satellite communications to ensure regular, timely message transmission.

To ensure this station meets GBON requirements, the following activities will be undertaken:

- **Activity 3.7**: Secure land access for the upper air station at Topside. Undertake all required site preparation tasks for upper air facility, including raising the balloon filling and releasing area approximately 2m above current level as well as water and power supply.
- **Activity 3.8:** Procure 1 x upper air station equipment under 'build and support' contract, including site works and all ancillary infrastructure as outlined in Table 5.
- **Activity 3.9**: At commencement of investment phase, evaluate the status of the planned NES building and engage with other possible funding agencies, to investigate, and if appropriate pursue, opportunities for the upper air facility and supporting infrastructure to be incorporated into its design and build, with SOFF support.
- **Activity 3.10**: At commencement of investment phase, procure, and provide funding for ongoing costs for a vehicle to transport staff and consumables between NMHS staffed locations in support of the upper air program.

Marine Stations

Although not part of SOFF, the Readiness Phase investigations have identified an "easy win" for NWP. The Bureau will upgrade the data transmission specifications for its existing sea level station at Orro such that it reports internationally to the WMO Information System (WIS) (**Activity 3.11**). This station can then be designated as a marine GBON station for the variable sea level pressure.

Maintenance

The ongoing operation of the observing equipment requires both preventative and corrective maintenance. This is important to maintain routine operations, address faults as they arise and ensure the safety of the staff. Examples of maintenance tasks are shown in Table 6.

The SOFF investigation highlighted that maintenance is one of the main challenges for meeting GBON requirements. Maintenance is therefore a critical focus of the contribution plan. The planned approach is for the procurement contracts for upper air, AWS and manual weather station equipment to be a "Supply & Support" contracts for the lifespan of the equipment (refer Section 2.3 and **Activity 2.2**). The contracts will include:

- Supply of all required equipment to be installed, including all required calibration equipment (e.g. transfer standards).
- Training, including
    - Ongoing training in basic equipment maintenance and instrument verification (up to level 2 maintenance – see table 6) for the NMHS field observers so they can make basic repairs on-site without needing a costly trip by a technician.
    - Ongoing training for field staff in operation of upper air equipment.
- Ongoing advice service via phone or videoconference to support NMHS staff when problems arise ('call-a-friend').

- Continuous supply of spares to be held in-country. Supply to be proactive based on estimated replacement frequencies.
- All other required calibration and maintenance services that are not done by NHMS personnel.
- Opportunity for contract renewal when equipment reaches end-of-life.

It is proposed that a Pacific regional solution be identified for (i) level 3 maintenance and repair (see Table 6), (ii) instrument calibration and (iii) train-the-trainer services. Due to the small number of staff at most Pacific Island NMHS, regionally based teams that can support multiple Pacific Island Countries will be both effective and sustainable.

Table 6 – Example maintenance tasks for GBON stations

Level	Description	Surface tasks (examples)	Upper Air tasks (examples)
1	Basic tasks requiring few consumables or parts carried out by local personnel (NMHS staff or contractors). Staff follow basic instructions and SOPs. *And at sites with an upper air program:* Moderately complex tasks carried out by local NMHS staff following standard operating procedures (SOPs). Tools, parts and consumables will be required. Specific instruction on hydrogen safety is required.	• Clean Stevenson screen • Change wet-bulb wick • Cut grass/ vegetation	• Attach sondes and launch balloons • Change over hydrogen cylinders
2	Technical tasks carried out by staff following SOPs. Tools, parts and consumables may be required. NHMS staff who have undertaken basic meteorological technician training will carry out this work.	• Collect station metadata • Replace sensors • Verify performance of sensors	•
3	Specialised maintenance actions carried out by trained staff. Procedures are complex and fault-finding is a required skill. Pacific Region maintenance resources Advanced meteorological technician training *** Note, NMHS do not currently have a Meteorological Technician role.**	• Replace infrastructure • Set up and configure new equipment and sensors • Advanced fault-finding	• Annual maintenance of UA system • Advanced fault-finding • Set up and configure new equipment and sensors • Install data communications system
4	Specialised repair or replacement by manufacturer or agent	• Return to agent/ manufacturer of component	• Return to agent/manufacturer of component

3.2. ICT infrastructure and services & 3.3. Data management system

Existing state

Data collection and transmission

Observations from the one manual staffed station are currently recorded by the observers in notebooks and transcribed into METAR/SPECI messages on a desktop computer. **At present NMHS do not undertake SYNOP observations.** These METAR/SPECI messages are then sent to various stakeholders including Fiji and Papua New Guinea Met Services via e-mail. The messages are also passed via the same method (email) to the Nauru airport tower.

The messages are currently not sent internationally to the WMO Global Telecommunications System (GTS).

Currently Nauru has no functional AWS or AWOS systems, although evidence of previous systems at various points around the island exists.

Power failures were not noted and are apparently not common in the Nauru Met Office building. However, any future power issues would delay the transmission of data to stakeholders as the NMHS site does not currently have a back-up power system. All instruments for the one manual weather station (temp/humidity, pressure and wind speed/direction sensors) have battery back-up.

Climate Data Management System

NMHS has access to a cloud version of the Climate Data for the Environment (CliDE) database (Figure 5). CliDE is a climate database management system developed by the Bureau under the International Climate Change Adaptation Initiative. It provides data entry, storage, observations metadata management, basic visualisation and extraction tools for weather and climate data. It can process data in near-real-time.

The NMHS version was hosted on a NMHS server at their Yaran head office, but this is no longer functional. The cloud version of CliDE for Nauru is functional and accessible from their office. Data from the staffed station is currently not entered by NMHS staff into CliDE from the METAR messages recorded by observers. And as stated previously, SYNOP messages are not currently being recorded.

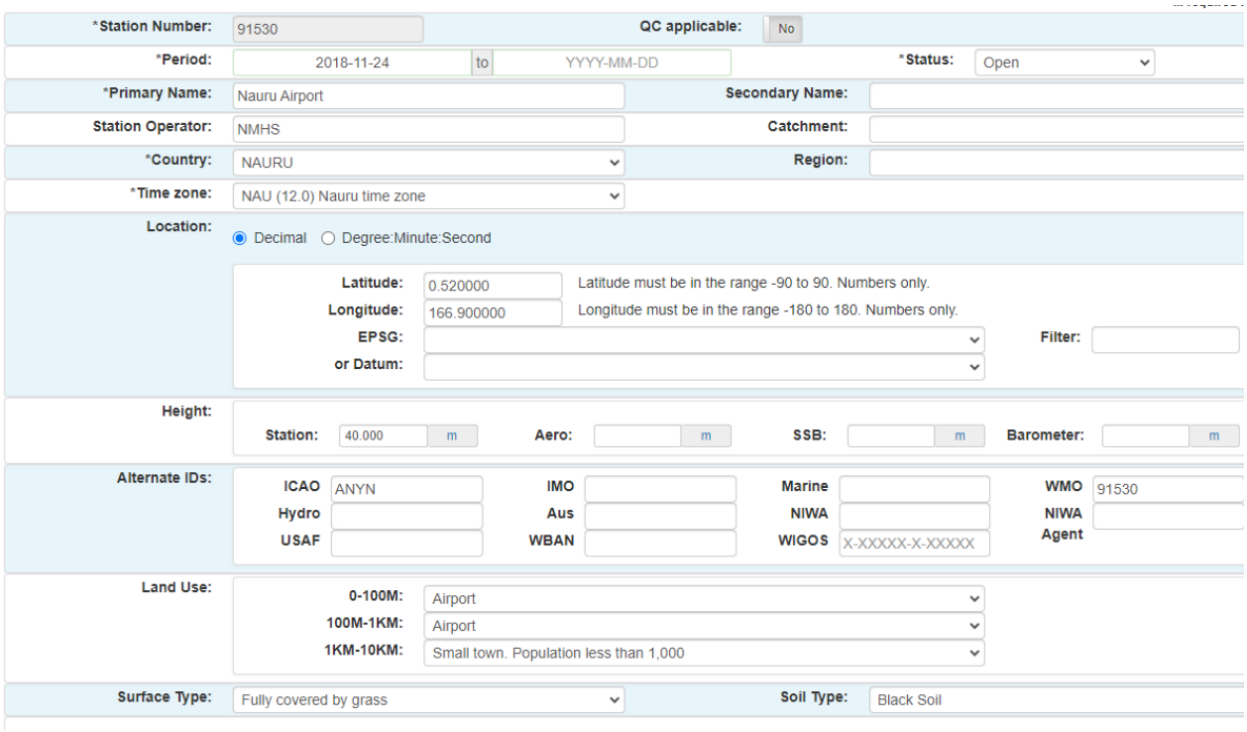


Figure 5. CliDE climate data management system interface

The CliDE cloud database can be accessed by NMHS staff based at the NMHS office in Yaran as there are internet enabled computing stations located here. However, at present staff do not input data and subsequently there is no recent climate data to interrogate.

Other than recipients of METAR emails, the observations from the one NMHS observing station are not accessible to other stakeholders or the public.

Target state and activities

Achieving sustainable, reliable reporting to GTS/WIS at hourly frequencies from both proposed GBON surface stations will require comprehensive training of existing NMHS observing staff as well as upgrades to NMHS's ICT and data management systems.

For meteorological data management, a simple cloud-based system is proposed given the limited number of stations, limited ICT capability in Nauru and requirement for operational resilience. This system could potentially be based around the WMO's 'WIS2 in a box' open source implementation of a WIS2 node.

The system would need the following capabilities:

Data collection system from observing station to collection point:

The staffed manual station will collect readings manually on paper forms, and then manually enter them into the MDMS. This may be via either transcribing the readings into SYNOP or METAR/SPECI messages and then submitting these via an interface or via e-mail, or by directing entering the readings into a web and/or mobile-accessible interface. The MDMS should be capable of both approaches. The staffed station will require robust cellular or satellite (preferred) network connectivity in order to ensure the data can be entered into the MDMS in a timely manner.

The automatic weather station will also need to be equipped with robust cellular or satellite (preferred) communications. It will be configured to send data to the MDMS via a suitable data transfer protocol such as MQTT (Message Queue Telemetry Transport). Data must be sent in a format well documented and easy to process such as comma separated values (CSV) or JSON (JavaScript Object Notation).

Redundant data communications (satellite & cellular) communications from all sites is recommended.

- ***Data transmission to WIS 2.0:*** The MDMS will have the capability to undertake basic automated QC, then convert the data received from both automatic and manual stations to BUFR format before making the data available to WIS 2.0 through an HTTP service.
- ***Data services:*** The MDMS should have the capability for data services to enable NMHS to access the data, use it operationally and make it available to stakeholders. Although NHMS does not have significant capacity to integrate operational data using data services as present, these capabilities may be developed in future through initiatives such as the Pacific Aviation Project or Weather Ready Pacific. To enable flexibility in future development, it is preferred that the MDMS have the capability for a range of data services such as Web API (OGC-API); Web Accessible Folder (WAF); Publication/subscription service (MQTT); Shared filesystem (Samba, NFS, S3, etc.).
- ***Climate data management:*** A Climate Data Management System (CDMS) will access data from the MDMS. This could be the existing installation of CliDE, modified to receive data from the MDMS, or another suitable system selected in the design/procurement process. The CDMS should be compliant with *WMO No. 1131 Climate Data Management Systems*. The CDMS will be used to store, view and extract all climate data and metadata collected by NMHS. In addition to observations metadata, the CDMS should be capable of being used to store and retrieve discovery metadata such as information on data quality, spatial representation and reference systems. Appropriate processing to produce quality-controlled data and statistics for climate purposes will be performed in the CDMS.

Through the entire value chain of data collection, transmission, processing, storage and distribution, NMHS will retain total control and custodianship over their data.

A public-facing webpage drawing on data in the MDMS and CDMS will also be developed to disseminate key meteorological and climate data to other Nauru stakeholders and the public. Given the maritime nature of the country, there will also likely be strong public interest for marine safety. Disseminating the data widely under the NMHS banner will increase public and government support for the important work done by NMHS to collect and steward these data, supported by SOFF.

Activities to uplift data systems as described above are:

- **Activity 3.12**: Procure expert data management consultancy to design a simple Meteorological Data Management System and WIS 2.0 implementation suitable to Nauru conditions.
- **Activity 3.13**: Procure, install and commission a suitable upgraded MDMS and CDMS through a 'supply and support' contracting approach. The CDMS should be compatible with CliDE.

- **Activity 3.14**: Develop a webpage to provide real-time and historical weather data products to stakeholders and the public.

- **Activity 3.15**: Procurement of PCs, workstations and servers (as required) as well as mobile telephony for out of hours contact with operational staff. Construction of a climate-controlled computer/server room, preferably incorporated into the future NES building utilising SOFF funding.

3.4. Environmental and sustainability considerations

Environmental and sustainability considerations will be included in the procurement process, as a selection criterion for suppliers. This will enable UNEP and NMHS to consider opportunities for reusable instruments or biodegradable materials such as:

- Biodegradable string (e.g. biotwine) for radiosondes;
- biodegradable balloons and parachutes (coloured blue or green to reduce ingestion by turtles and marine birds);
- reduction in size of radiosondes, incorporating biodegradable materials where feasible;
- environmentally sustainable packaging such as cardboard and paper;
- ensuring instruments do not contain mercury;
- careful use of batteries to reduce toxic waste.

In addition, prior to site works for upgrading stations or installing new stations, an environmental management plan will be prepared (**Activity 3.16**) considering local conditions and approaches to minimise the environmental impact of construction activities such as:

- use of solar or wind power at sites as appropriate;
- sustainable materials used for construction, including reduction in site footprint;
- sites should be maintainable with basic tools (i.e. use of ladders and climbing harnesses should be avoided);
- plan for safe removal of waste at end of construction.

Module 4. GBON Human Capacity Development

4.1. Assessment of human capacity gaps

The staffing education profile of NMHS, based on a report within the Weather Ready Pacific assessment, is shown in Table 7. The total number of staff positions as of October 2023 is 14.

Several teams are critical to the sustainability and quality of observations, NMHS has two of the three categories represented:

- Nauru has no technical and engineering staff.
- The observing team, headed by the Director currently has 8 personnel based at the head office (across the road from the one Observing site).
- NMHS has one IT specialist.

Only a small number of staff have undertaken advanced meteorological training (BIP/M(T)), with two observers trained to BIP/MT, and no forecasters trained to BIP/M standards. The main limitation on external training for NMHS staff is lack of available of funds and scholarships, in addition to a general lack of tertiary qualifications. NMHS does not currently have a budget for external training.

NMHS has a similar gender balance to many Pacific meteorological services at about 86% male, 14% female.

Table 7 - Staffing profile of NMHS. Sources: Weather Ready Pacific Proposal, Pacific Meteorological Council 2021 & CHD Report Nauru

Branch	No. of staff	Doctorate/ MSc/BIP-M	BIP-MT	Bachelor/ Diploma	Other	Quals Total
Administration	1					**0**
Forecast, Warning & Climate	2*				2	**2**
Hydrology, Oceanography	1					**0**
Observations	8		2			**2**
Engineering	0					**0**
ICT	1			1		**1**
General services	0					**0**
Totals	14	0	2	1	2	**5**

** Forecasting staff also perform Climate duties in Nauru.*

Key gaps in human capacity necessary to ensure GBON compliance of observations are:

- As per information from 2021, only two of the observing personnel currently have BIP-MT qualifications which are considered essential to ensuring the sustainability and quality of observations. One of these is the Director who would not be available to perform observations.

- The are no technical personnel capable of maintaining future automatic (AWS) or upper air observations systems critical to transmission of real-time data for GBON compliance (although the ICT manager has may with suitable training be able to fill this role).
- Observers require basic automatic and manual observing equipment maintenance skills to address equipment problems out of hours to ensure reliability of observations.
- Observers have no skills in operating upper air equipment.
- NMHS has one trained ICT technician at the head office in Yaran. This should ensure the successful implementation of the proposed upgraded Climate Data Management System (CDMS).

The financial plan for staffing requirements for the operation of the new / rehabilitated GBON stations is as follows:

- Existing NHMS-funded observations staff will operate the existing staffed GBON surface station located at the airport, supported with additional training provided with SOFF funds.
- The new Topside upper air station will be operated by existing NHMS staff rostered on shift at the new station. This will be supported with additional training provided with SOFF funds, and with support provided by the private sector upper air system supplier under the 'Supply and Support' contract.
- Existing NHMS personnel will undertake basic maintenance tasks (Level 1 and 2 maintenance as per Table 6) for both surface and upper air stations following capacity building and training support funded through SOFF. Specialised repairs and maintenance (Level 3 and 4 in Table 6) will be undertaken by the private sector suppliers of this equipment under the 'Supply and Support' contracting arrangements.

In order for NHMS to adequately service the requirements for the new and rehabilitated GBON stations, NHMS will need operational and financial support, as well as training as outlined in Activities 4.1 to 4.8 listed below.

NHMS has sufficient personnel employed to undertake the tasks allocated to NHMS above. Therefore, recruitment of additional observing personnel is not anticipated to be required as part of the SOFF program.

4.2. Design capacity development activities for technical staff

The following capacity development activities are proposed to address the gaps identified above:

- **Activity 4.1** Provide manual synoptic and aviation observations training to NMHS staff as a matter of priority.
- **Activity 4.2**: Provide training in basic automatic and manual weather station verification and maintenance (Level 1 and 2 maintenance in Table 6) at the start of the Investment Phase for all NMHS observers, with ongoing training through the Compliance Phase. The training should be specific to the equipment types that will be installed. This would ideally be included in a 'supply and support' contract as part of the equipment procurement.
- **Activity 4.3**: Provide training in cellular and satellite communications and router configuration during the Investment Phase to NMHS ITC manager. Similarly, this

training could be included in a 'supply and support' contract as part of equipment procurement.

- **Activity 4.4**: In tandem with 4.1 above, offer training leading to BIP-MT qualifications to all of NMHS's observing personnel. This could be organised through the Bureau of Meteorology, NZ Met Service or Fiji Met Service.
- **Activity 4.5**: Provide training in OSCAR/Surface and WDQMS operation to selected members of the Observations ITC teams.
- **Activity 4.6**: Provide training to the ICT manager, in network, database and communications technology critical to WIS2.0, MDMS and CDMS.
- **Activity 4.7**: Provide training to all 8 observing staff in upper air operations to support the new upper air station. This could be done by the private sector supplier as part of the Supply and Support contract.

4.3. Design capacity development activities for senior management

The following capacity development activities are recommended to address the gaps identified above:

- **Activity 4.8**: Provide a SOFF-funded program/project manager to oversee equipment procurement, installation and commissioning during the Investment phase, with the position to ideally continue for the life of the equipment during the Compliance phase funded with SOFF compliance funding.
- **Activity 4.9**: Provide SOFF-funded training in finances, staff management and strategic planning for the NMHS senior management team.

4.4. Gender and CSOs considerations

The following capacity development activities are recommended to address the gaps identified above:

- **Activity 4.10**: Organise stakeholder engagement consultations with civil society organisations (CSOs) focused on women's empowerment. This could include:
    - Direct contact with government departments and NGOs working with women and girls in Nauru to promote employment opportunities in NMHS (e.g. Nauru Women's Affairs Department; Nauru National Women's Council; Nauru Young Women's National Council,)
    - Presentations at Community meetings
    - Presentations to school groups
- **Activity 4.11:** Develop a Gender Gap Analysis and 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 the following:
    - Targets for female participation in the role areas associated with SOFF Investment and Compliance phases in Nauru.

- Inclusion of gender targets in procurement documents where human resources are part of the procurement,
- Annual reporting of achievement of the above targets.
- Development of ongoing campaign in schools and communities to promote female participation in roles linked to NMHS.

Module 5. Risk Management Framework

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

As part of the development of the National Contribution Plan, 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**).

Table 8 - Risk analysis

Identified Risk	Mitigation Measures	Responsibility	Monitoring and Evaluation
Lack of training for Observing staff, leads to no SYNOP messages and no international transmission of METAR/SPECI.	Training to the BIP-MT level for all observing staff.	UNEP	Resumption of SYNOP message recording and transmission
Lack of equipment maintenance and calibration due to lack of spare parts and reference standards leads to equipment malfunction	Procurement of equipment under 'supply and support' contract including continuous supply of spare parts	UNEP	Monthly spare parts inventory reporting, annual check of instrument comparison.
Loss of data due to long lead-times for repairs due to travel distance, complicated logistics	Co-locate automatic weather stations with staffed offices or stations. Manual observers to provide basic maintenance and redundancy. Operate two GBON compliant stations.	NMHS and UNEP	Monthly review of WDQMS and GBON compliance
Unknown data quality due to lack of QC processes and procedures.	Introduce a MDMS with a basic automated QC function. Review of data that fails automated quality checks	NMHS and UNEP NMHS	Monthly review of WDQMS and GBON compliance Weekly review of quality flagged data
Potential for poor internet connections	Equip all stations with redundant cellular and/or satellite communications	UNEP	Monthly review of WDQMS and

lead to data transmission delays			GBON compliance
Unreliable power leads to communications outage and data delay	Equip all stations with batteries, uninterruptible power supply and solar/wind power generators	UNEP	Monthly review of WDQMS and GBON compliance
Lack of dedicated accommodation for equipment leads to potential degradation of condition	Include building accommodation audit and upgrade if required in procurement for staffed station uplift	UNEP	Annual quality audit by NMHS quality manager
Insufficient technical skills to install or maintain stations and ICT system	SOFF to provide support for training of observing and ICT staff during Investment and Compliance phase Secure private sector support for installation and ongoing maintenance through 'supply and support' contracts. Build public and government support for NMHS to ensure its budget is supported by: • Improved visibility of observations through stakeholder dissemination via uplifted data management systems and webpage • Improved weather services through access to modelling centre products during compliance phase Workforce planning to address attrition	UNEP UNEP and NMHS UNEP and NMHS NMHS	Annual human resources audit by NMHS

Module 6. Transition to SOFF investment phase

This module involves supporting the beneficiary country and the IE in preparing the Investment phase funding request based on the recommendations provided in the Plan.

Please provide any additional recommendation relevant for the translation of the National Contribution Plan into an Investment Phase Funding Request.

Activity 6.1. Develop investment proposal, incorporating activities from this GBON National Contribution Plan (UNEP, NMHS, with support from Bureau).

Summary of GBON National Contribution Plan

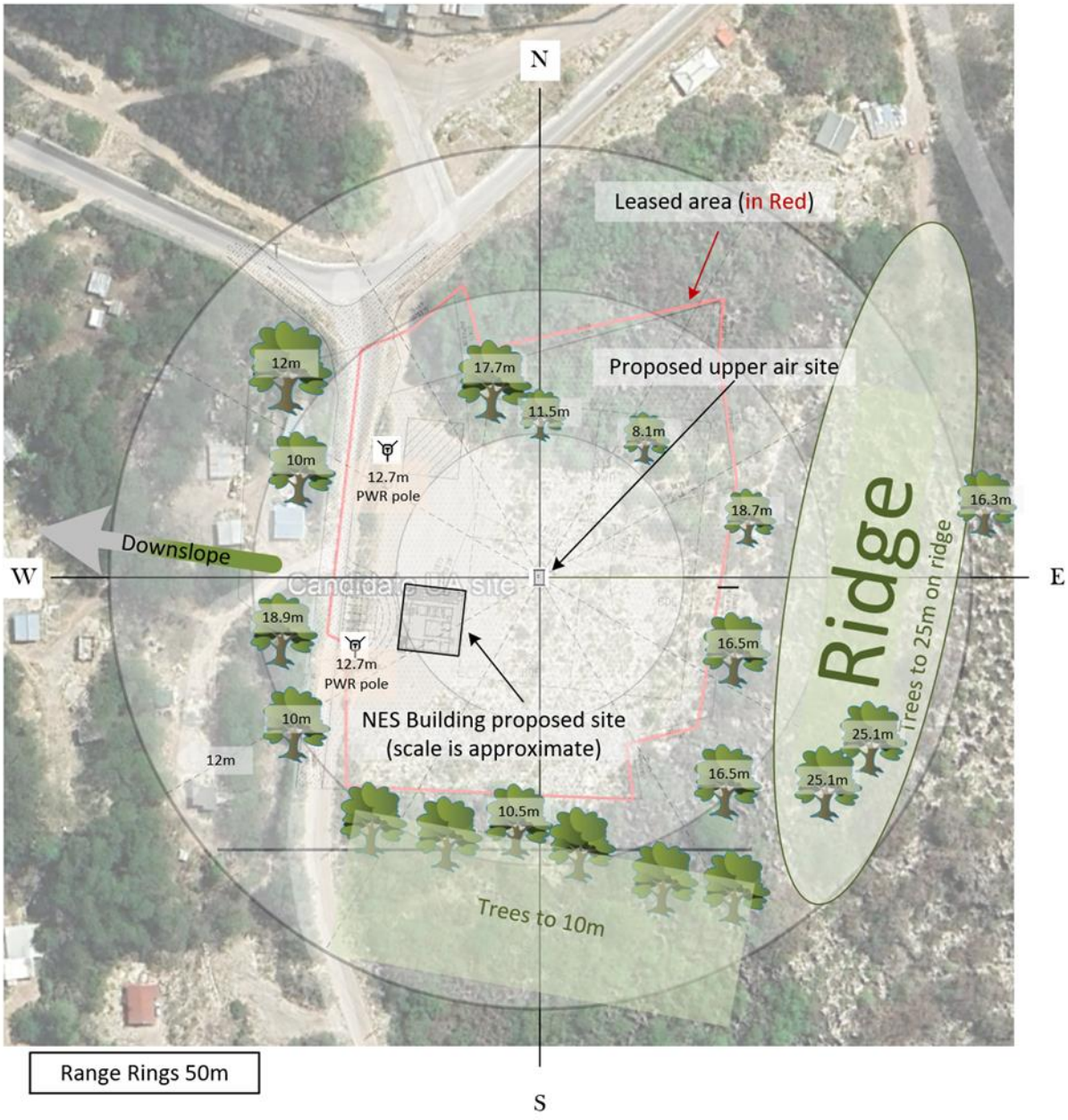
Components	Recommended activities
Module 2. GBON business model and institutional development	1. Engage in regional forums to pursue opportunities for regional coordination in Investment Phase and Compliance Phase elements such as calibration, training, common equipment types.
	2. Develop procurement plan that allows for procurement of equipment to include private sector ongoing support (e.g. maintenance, training, advice, spare parts, etc.) for the life of the equipment during both Investment and Compliance phases.
	3. Undertake a comprehensive environment scan at start of Investment Phase of planned development activities related to GBON to identify opportunities for leverage and to ensure works are complementary.
Module 3. GBON Infrastructure Development	1. Undertake audit of existing equipment and facilities at Nauru Airport to identify all items that require procurement.
	2. Procure 1 x uplifted manual observing equipment under 'build and support' contracts, including site works, structures, facilities and communications infrastructure.
	3. Secure land access to open an automated station at Topside. Undertake all required site preparation tasks for observations enclosure and power supply.
	4. Undertake an audit of previous AWS equipment issues to identify technical and communication faults and lessons learned and existing OTT-Hydromet AWS equipment in storage to determine serviceability and suitability for the Topside site.
	5. Procure a 'supply and support' contract to install a new AWS at the Topside location, as per the audit, to ensure they communicate reliably in real-time to GBON standards.
	6. Engage with NMHS or other relevant authority to ensure caretaker arrangements for the existing and proposed sites are robust (both AWS and Upper air station).
	7. Secure land access for the upper air station at Topside. Undertake all required site preparation tasks for upper air facility, including raising the balloon filling and releasing area approximately 2m above current level as well as water and power supply.
	8. Procure 1 x upper air station equipment under 'build and support' contract, including site works and all ancillary infrastructure

	9. At commencement of investment phase, evaluate the status of the planned NES building and determine the likelihood that the upper air facility and supporting infrastructure can be incorporated into its design and build, with SOFF support.
	10. At commencement of investment phase: procure, and provide funding for ongoing costs for, a vehicle to transport staff and consumables between NMHS staffed locations in support of the upper air program.
	11. Update data transmission systems for existing sea level station at Orro to report to WIS (Bureau).
	12. Procure expert data management consultancy to design a simple Meteorological Data Management System and WIS 2.0 implementation suitable to Nauru conditions.
	13. Procure, install and commission a suitable upgraded MDMS and CDMS through a 'supply and support' contracting approach. The CDMS should be compatible with CliDE.
	14. Develop a webpage to provide real-time and historical weather data products to stakeholders and the public.
	15: Procurement of PCs, workstations and servers (as required) as well as mobile telephony for out of hours contact with operational staff. Construction of a climate controlled computer/server room, preferably incorporated into the future NES building utilising SOFF funding.
	16. Develop environmental management plan for investment activities prior to site works.
Module 4. GBON human capacity development	1. Provide manual synoptic and aviation observations training to NMHS staff as a matter of priority.
	2. Provide training in basic automatic and manual weather station verification and maintenance at the start of the Investment Phase for all NMHS observers, with ongoing training through the Compliance Phase. The training should be specific to the equipment types that will be installed. This would ideally be included in a 'supply and support' contract as part of the equipment procurement.
	3. Provide training in cellular and satellite communications and router configuration during the Investment Phase to NMHS ITC manager. Similarly, this training could be included in a 'supply and support' contract as part of equipment procurement.
	4. In Tandem with 4.1 above, offer training leading to BIP-MT qualifications to all NMHS observing personnel. This could be organised through the Bureau of Meteorology, NZ Met Service or Fiji Met Service.

	5. Provide training in OSCAR/Surface and WDQMS operation to selected members of the Observations ITC teams.
	6. Provide training to the ICT manager, in network, database and communications technology critical to WIS2.0, MDMS and CDMS.
	7. Provide training to at least 8 observing staff in upper air operations to support the new upper air station. This could be done by the private sector supplier as part of the Supply and Support contract.
	8. Provide a SOFF-funded program/project manager to oversee equipment procurement, installation and commissioning during the Investment phase, with the position to ideally continue for the life of the equipment during the Compliance phase funded with SOFF compliance funding.
	9. Provide SOFF-funded training in finances, staff management and strategic planning for the NMHS senior management team.
	10. Organise stakeholder engagement consultations with civil society organisations (CSOs) focused on women's empowerment.
	11. Develop a Gender Gap Analysis and Gender Action Plan during the Investment Phase to guide the mainstreaming of gender and social inclusion initiatives into SOFF investments.
Module 5. Risk Management	1. Implement measures outlined in the NCP risk management framework
Module 6. Transition to SOFF investment phase	1. Develop investment proposal, incorporating activities from this GBON National Contribution Plan (UNEP, NMHS, with support from Bureau)

Annex 1: Proposed NES building, AWS and Upper Air location

Proposed National Emergency Services (NES) Building location. Nauru Meteorological and Hydrological Service (NMHS) Head Office, Observations Site and Forecasting Office.



Location (WGS84): Latitude -00.53896, Longitude 166.91715, Elevation 40m (approx.).

Note, AWS siting would be a secondary consideration once Upper Air location confirmed.

Report completion signatures

Peer Advisor signature (Bureau of Meteorology) 
Beneficiary Country signature (Nauru) 
WMO Technical Authority signature