December 2023

Systematic Observations Financing Facility

GBON National Contribution Plan of Solomon Islands

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Weather and climate data for resilience

GBON National Contribution Plan

Solomon Islands

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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. Solomon Islands has chosen the Australian Bureau of Meteorology (Bureau) as peer advisor and the United Nations Development Programme (UNDP) 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, which supports an investment proposal for the next SOFF Investment Phase.

This document provides the GBON National Contribution Plan (NCP) for Solomon Islands. It has been developed together by the Solomon Islands Meteorological Service (SIMS) with the Australian Bureau of Meteorology (Bureau) as peer advisor, and the United Nations Development Programme (UNDP) as implementing entity. It draws on a review of existing documentation and engagement with SIMS and other Solomon Islands weather stakeholders in a country visit between 19-23 June 2023. The in-country visit included meetings in the capital Honiara, as well as with the provincial government in Gizo (Western Province, the largest province and a key tourism development area), and observation site visits at Gizo, Munda (site of Solomon Islands' second international airport), Honiara, and Henderson International Airport on Guadalcanal Island.

The document:

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

Module 1. National Target toward GBON compliance

Table 1 GBON National Contribution Target

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	7	0	0	7	8	0
Upper air	2	0	2	0	0	3

1.1 Summary of Current State

Solomon Islands' national meteorological service (SIMS) comprises skilled and motivated teams of observing, technical and forecasting personnel. These teams maintain seven staffed weather stations and up to 12 automatic weather stations (AWS) although many of the AWS were not operational at the date of the country visit.

SIMS faces major challenges in skilled and sufficient personnel, logistics, sourcing of equipment and spares, maintenance and data communications. Consequently, as of June 2023, the Solomon Islands has no GBON-compliant surface stations and no upper air observations. International sharing of weather data is limited to the seven existing staffed weather stations that report internationally between 2 and 8 times per day. These stations experience quality and reliability issues due to maintenance and calibration challenges and maintenance budget shortfalls.

There is substantial opportunity for SOFF to support the Solomon Islands to address these challenges, as outlined in the Target State below.

1.2 Principles for GBON Targets

Solomon Islands is a country of many islands with a very large marine exclusive economic zone (EEZ), In its global GBON gap analysis, the WMO applied the GBON marine surface and upper air station density requirements to the land and EEZ area to develop its land-based targets for Solomon Islands. This resulted in targets of 7 surface stations and 2 upper air stations.

[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.

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

- The Solomons Islands is a seafaring country and its main mode of transportation is by boat. The waters between islands are the country's critical transport corridors and are analogous to roads or railways in continental countries. For GBON purposes, these areas should be considered similarly to land.
- The Solomon Islands and its marine area are a critical zone for cyclogenesis in the Pacific region (Figure 1). Observations in this region, particularly upper air, are critical for forecasting cyclones that threaten not just Solomon Islands but major population centres such as Papua-New Guinea, Indonesia and eastern Australia.
- Topographically, Solomon Islands is a mixture of steep volcanic ranges rising to over 2000 m, coral islets, lagoons, and open ocean. Wind flows are strongly influenced by the topography, in addition to diurnal heating. Ideally, the surface synoptic network will observe the main elements of these flows, to allow verification of model downscaling.
- Maintaining isolated, unstaffed AWS has historically been less successful in terms of data quality and reliability in Solomon Islands and other SIDS of similar resources. Staffed stations have historically proven to be significantly more reliable, highest quality and most resilient.

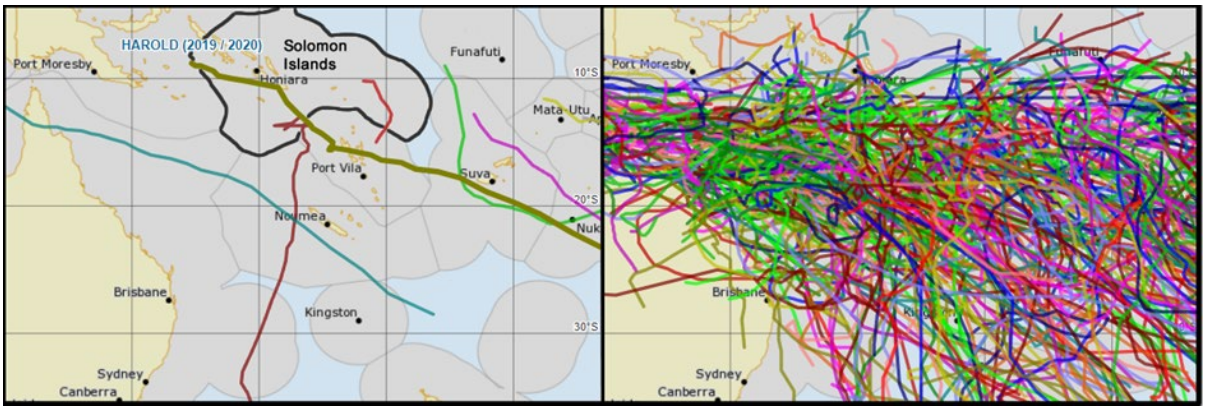

Figure 1 Tropical cyclones occurring during the 2019/2020 season (left), and for all years (right). Solomon Islands is shown within its Exclusive Economic Zone (black outline). Source: Southern Hemisphere Tropical Cyclone Data Portal, Bureau of Meteorology

1.3 GBON Targets

Taking into account the above factors, the approach for calculating targets in Solomon Islands was as follows:

- The area including and enclosed by the Solomon Islands' 24 nautical mile contiguous zone was taken as an indication of important marine transport corridors. This area was combined with the land area to give an indicative overall 'land and major marine corridor' area of about 360,000 km^2.

- For surface stations, this area was used with the low density land-based GBON target of 200 km resolution, giving a corresponding GBON target of 9 surface stations. This was modified to 8 following feedback from the WMO technical authority on the station density that could be supported from a GBON perspective.
- For upper air stations, the GBON land-based resolution requirement of 500 km was used. As Solomon Islands is elongate in the east-west direction, to ensure adequate coverage across the east-west transect, grid cells of 500 x 500 km were arranged so as to cover most of the major 'land and major marine corridors' area (Figure 2). This resulted in a target of 3 upper air stations, with one to be located in each grid cell.

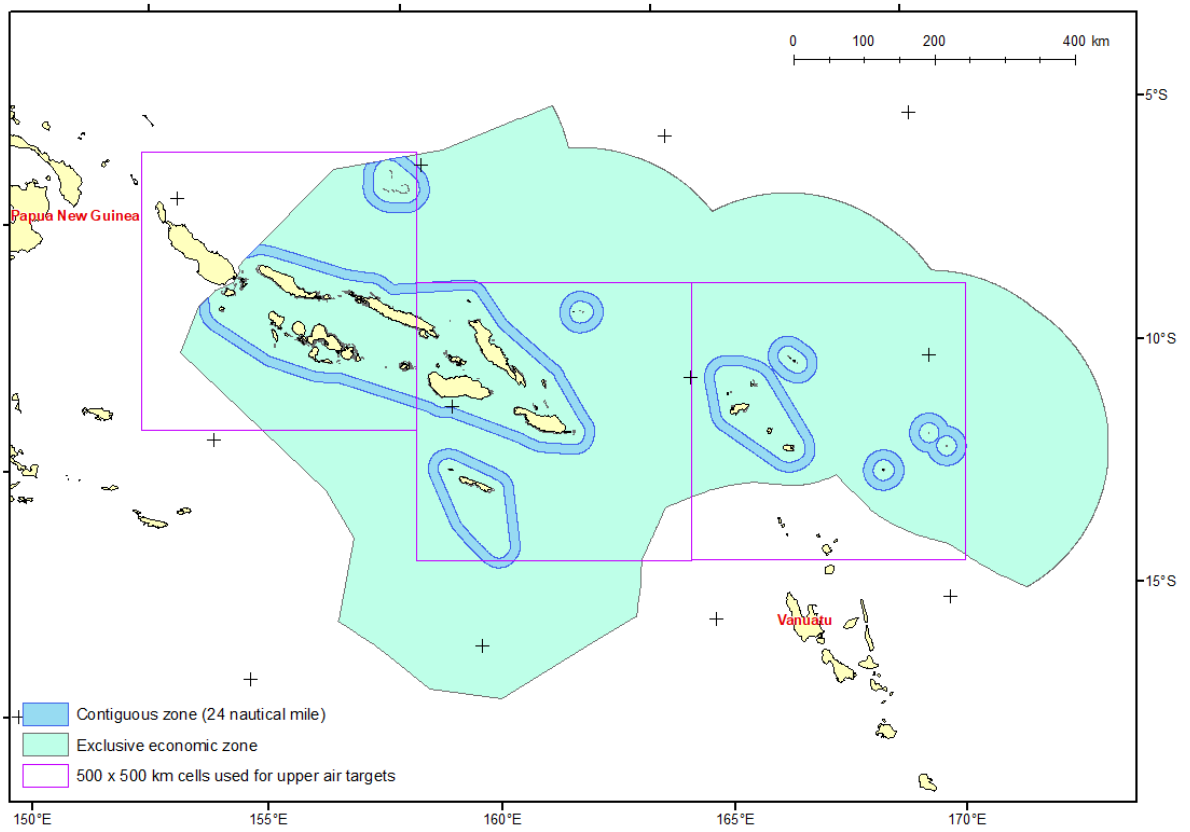

Figure 2 Map showing Solomon Islands 24 nautical mile contiguous zone and 500 x 500 km gridcells used to define upper air station target

The resulting targets will be implemented as follows:

- **Surface stations**:
  - Nine stations, comprising staffed stations with co-located AWS will be improved to GBON standard or installed as new, including:
    - Seven existing staffed stations in Taro, Munda, Auki, Honiara, Henderson Airport, Rennell/Tingoa and Santa Cruz/Lata
    - One closed staffed station at Kira Kira

- **Upper air stations**
    - Three new upper air stations will be established as GBON upper air stations, co-located with GBON surface stations. These will be located at:
        - Tulagi, in the central part of the country in Central Province
        - Taro, in the east in Choiseul Province
        - Santa Cruz/Lata in the west in Temotu Province.

1.4 Exemptions

With implementation of the GBON National Contribution Plan, the Solomon Islands is anticipated to fully comply with the GBON requirements. No exemptions to the GBON requirements will therefore be required for Solomon Islands.

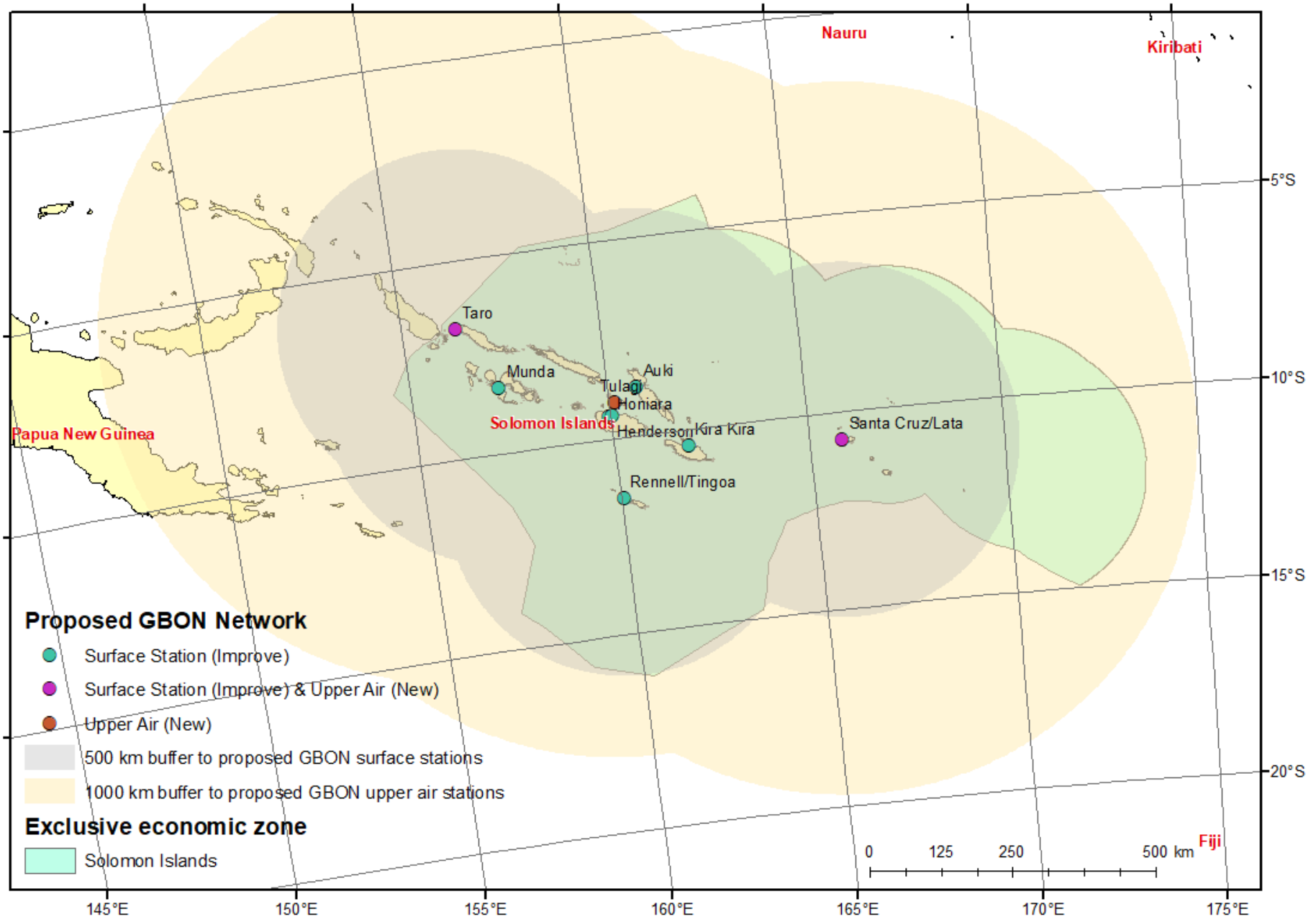

Figure 3 Map of proposed surface and upper-air stations for GBON

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 Solomon Islands Meteorological Service (SIMS) is the primary organisation of relevance to the operation and maintenance of GBON stations in Solomon Islands. As detailed below, it maintains almost all the weather stations in Solomon Islands, manages almost all the weather data, and has a legislated mandate to do this.

Water resources and hydrology in the Solomon Islands are managed by the Water Resources Management Division (WRMD) of the Ministry of Mines. The WRMD undertakes river and rainfall monitoring and operates a series of hydrometric stations. However these record only one GBON variable, rainfall, and do not generally report in real-time. In addition, due to loss of key staff from attribution and retirement, the capability of the WRMD in weather monitoring was limited at the time of the country visit. For these reasons, the WRMD has not been considered to play a key role in the GBON plan for Solomon Islands.

The only other organisation presently operating weather stations in Solomon Islands is the Civil Aviation Authority of Solomon Islands (CAASI). It maintains three automatic weather observing systems (AWOS) at key airports including Henderson (Honiara), Kira Kira and Munda. (Figure 4). The Munda AWOS was not operational as of the date of the country visit for the SOFF program due to maintenance challenges. The aviation AWOS do not provide data to SIMS systems. As SIMS does not have operational control nor ownership of these stations, it is difficult for SIMS to ensure the reliability and quality of these data. Consequently, this plan assumes that the GBON requirements will be met with alternative infrastructure owned and operated by SIMS.

Figure 4 Automatic weather observing system (AWOS) at Munda Airport with CAASI personnel

A longer-term goal for SIMS is the implementation of cost-recovery from the aviation sector for the costs of providing meteorological services. This has the potential to contribute to ongoing sustainability of weather observations, particularly at airports. The forthcoming revision of the Meteorology Act presents an opportunity to improve these arrangements. Further engagement with aviation stakeholders regarding cost recovery will therefore be undertaken as a key activity as part of this plan (**Activity 2.1**).

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 station layout, especially for upper air, takes into account other regional SOFF activities. 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 Papua New Guinea. Nauru and Vanuatu.

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 SIMS is active participant (**Activity 2.2**) including:

- Regional SOFF coordination workshop in March 2024
- WMO RA V committee
- Pacific Meteorological Council (PMC) and its committees
- South Pacific Regional Environmental Programme (SPREP)
- Pacific Community (SPC).

During the Investment Phase, SIMS and UNDP 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

The SIMS annual budget was report as USD $500k in 2023. According to the draft National Strategy for Meteorological Services and Framework for Weather, Climate, and Ocean Services 2023-2028 (see 2.4 below), this is “is not adequate for enhancing the services”. This was confirmed in country. In order to meet requirements of this GBON National Contribution Plan, significant additional funding resources will be required.

Given the existing skill level and capacity in the NHMS, its legislated mandate (see 2.5 below), and the remoteness and lack of existing private sector operators in water services in the Solomon Islands, the preferred business model is the *Public model – Full State/NMHS owned and operated*. However, there is opportunity for a substantial private sector role in supporting the NHMS by including ongoing operational support in the procurement contracts for weather stations and ICT equipment (e.g. maintenance, training, calibration, advice, spare part supply, etc.).

This critical ongoing private sector role 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 UNDP with provisions to transfer support and maintenance contracts to SIMS in Compliance Phase, procurement for both supply and

support being done via the Solomon Islands Government as the Executing Entity supported by UNDP, or potentially for elements of supply and/or support to be procured as part of a regional solution through a central organisation such as SPREP or SPC.

Prior to procurement, SIMS and UNDP will engage with prospective suppliers, the Ministry of Finance and Treasury and regional organisations including such as SPREP and SPC to undertake a review of possible procurement approaches and develop a procurement plan (**Activity 2.3**). This plan will designate the 'Executing Entity' for each element of procurement and ensure the procurement model can accommodate supplier support for the life of the equipment.

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

At time of the country visit for this National Contribution Plan, a comprehensive National Strategy for Meteorological Services and Framework for Weather, Climate, and Ocean Services 2023-2028 had been prepared. In some cases, the planning is highly budget dependent and aspirational in terms of the ability to plan against resources available to produce the desired outcomes.

SIMS has an active quality management program for aviation with regular reports produced regarding the quality of aviation services. However, the further expansion of formal quality management is constrained by budget factors.

Existing or planned hydromet development activities related to GBON in Solomon Islands include:

- UNDP Integrated Disaster Risk Management Project (IDRM). This program, funded by Australian government, is supporting the installation of four standalone AWS, the acquisition of server equipment for data storage, capacity building of the engineering team on managing data from the hydrometeorological stations, and the construction of the National Weather Forecasting Office. The project currently has five staff at the Project Management Unit who have been working closely with SIMS on all the AWS installations and capacity building over the past three years. Following commissioning ongoing maintenance of the AWS will need to be done and funded by SIMS.
- Climate and Oceans Support Program in the Pacific (COSPPac). This Australian government program is, among other activities, assisting Solomon Islands to maintain its CliDE Climate Data Management System.
- Weather Ready Pacific. This is a broader proposed 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. Weather Ready Pacific currently only has seed funding and full funding is not guaranteed.

Opportunities to leverage these initiatives have been considered in Module 3 – Infrastructure Development below. As development programs in the region are dynamic, it is also recommended that at the start of the Investment phase, UNDP and SIMS 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 2.4**).

2.5. Review of the national legislation of relevance for GBON

The Solomon Islands Meteorological Service (SIMS) operates under the 1985 Meteorology Act. The Act defines the general purposes and functions of SIMS. These include, among others, the following functions relevant to GBON:

- (d) establish and maintain a national network of meteorology stations and observing stations ensuring a high standard of quality;
- (h) collect, collate, archive and make available meteorological data as requested for the purposes of assisting persons and authorities engaged in primary production, industry, trade and commerce;
- (j) participate in the work of the appropriate international organisations particularly in the World Meteorological Organisation and the International Civil Aviation Organisation;
- (l) arrange means of communication for the transmission and reception of meteorological reports and information in Solomon Islands or outside Solomon Islands,

The Act therefore provides authority and responsibility for SIMS to establish and operate the GBON stations and share the data internationally.

Procurement of goods and services in Solomon Islands is regulated by the Procurement Regulations 2021 and the Solomon Islands Government Procurement Manual 2022, implemented by the Ministry of Finance and Treasury. Significant procurement activities above SBD$500,000 must be procured through the Solomon Islands Central Tender Board and approved by Permanent Secretary for the Ministry of Finance and Treasury. This process can be lengthy and can pose challenges for timely procurement by SIMS of spare parts, tools, equipment, communications services, logistics and travel, and other essential components of a reliable, high-quality weather network.

As outlined in Section 2.3 above, SIMS and UNDP will engage with the Ministry of Finance and Treasury 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 2.3**). The contracts will provide ongoing operational support for items such as maintenance, training, calibration, advice and spare part supply.

Funding for ongoing logistics, travel and communications is also a key limitation on maintenance of station reliability and can be challenging for SIMS within the Solomon Islands governmental procurement framework. To develop a strategy for addressing these challenges, during the Investment Phase, the UNDP and SIMS will engage with the Ministry of Finance and Treasury and other potential partners such as SPREP, the Australian High Commission and the SPC, to develop a plan for ongoing procurement and funding of essential services to ensure ongoing quality and reliability of the network (**Activity 2.5**). These services include freight and travel costs to ensure SIMS technicians can visit sites for proactive and reactive maintenance, communications costs (satellite and cellular), travel costs (air, road and boat), logistics costs and all other ongoing costs required to ensure GBON compliance. This plan could include, for example, establishing a trust fund via one of these entities to receive SOFF compliance funds, and hold and disburse the funds for ongoing compliance activities.

Module 3. GBON Infrastructure Development

For each section of this module, the existing state of weather observations infrastructure in Solomon Islands is outlined, followed by the target state and planned activities to achieve the target.

3.1. Surface and upper-air observing network and observational practices

Existing state

Existing weather stations in the Solomon Islands are shown in Figure 5. These include staffed weather stations, automatic weather stations (including both standard AWS and aviation-specific AWOS) and sea level stations. Currently none of these stations are GBON-compliant. Details of each station type are provided in the following sections.

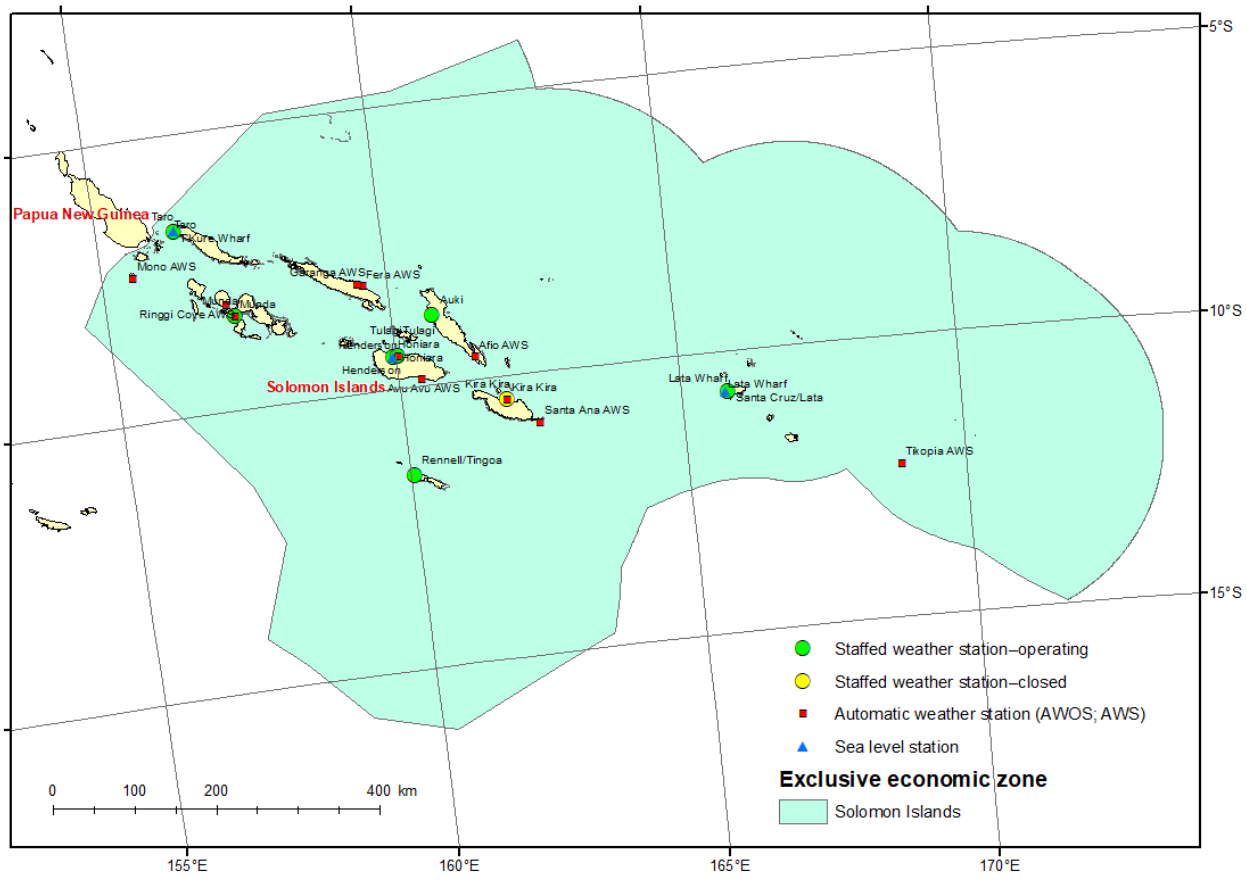

Figure 5 Existing weather stations in the Solomon Islands

Staffed stations

SIMS maintains seven staffed weather stations, two in Guadalcanal Province (Henderson Airport and the SIMS Vavaya Ridge office in Honiara), and one in each of five other provinces (Western, Malaita, Temotu, Rennel and Bellona, and Choiseul). Most are associated with regional airports. An eighth staffed station in Kira Kira, Makira-Ulawa Province, closed in the

early 2000s during ethnic tensions, but SIMS retains the land and building. There are no staffed stations in Central and Isabel provinces.

The staffed stations have a complement of manually-read monitoring equipment, generally including some or all of: thermometers in Stevenson Screen (wet bulb, dry bulb, max, min); barometer; rain gauge; wind vane; anemometer; evaporation pan; and sunshine recorder.

Stations have two or three staff each. Henderson operates 24 hours a day and the others operate 11-18 hours/day depending on the shifts in place. Measurements are targeted to be hourly at Henderson and 3-hourly elsewhere. Due to maintenance challenges, many of the instruments are unserviceable, requiring the observers to estimate parameters. In many cases, due to staffing, equipment or communications issues, observations are less frequent than the target.

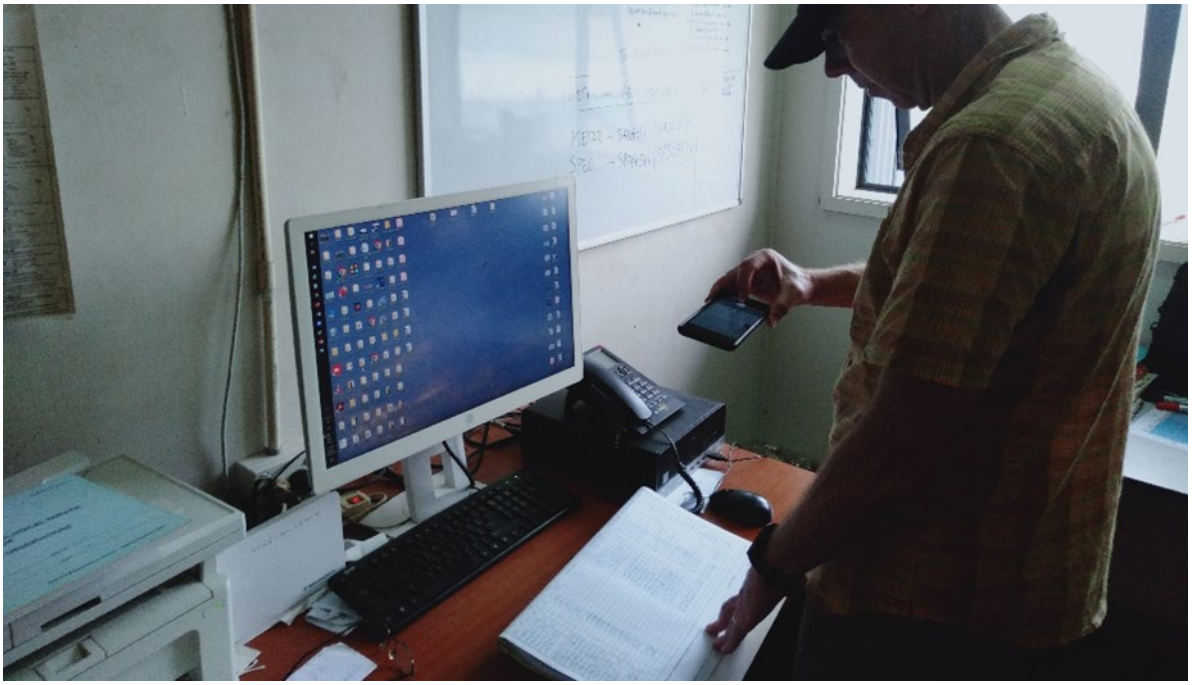

Figure 6 Staffed weather station office at Munda, Western Province

Automatic Weather Stations

There are at least 15 AWS in Solomon Islands that have been installed under development projects for several government agencies for a range of customer purposes. These include:

- Automatic Weather Observing Stations (AWOS) at Henderson, Munda and Kira Kira airports installed for the Solomon Islands Aviation Services to provide weather data to the control towers;
- 4 hydromet AWS installed for the Water Resources Department for water research and planning purposes;
- 4 AWS recently installed by UNDP for agricultural climate resilience and planning;
- Several AWS installed by New Zealand Institute of Water and Atmospheric Research (NIWA) for climate adaptation.

Ten of these AWS are Vaisala models installed by NIWA. Four are OTT/Sutron-Hydromet models recently installed by UNDP. One AWOS is an Advanced Weather Inc model, installed by GECI Group (airport lighting supplier) and two are OTT-Hydromet models.

The condition of the AWS is variable. At least eight SIMS AWS have been identified by SIMS as currently not operational due to maintenance challenges and at least one aviation AWOS is also offline. There are no records of when their performance and instruments were checked.

SIMS also maintains 13 Automatic Rain Gauges (ARG) throughout the country. These have not been considered in detail here as they record only one of the five GBON variables.

Figure 7 Automatic weather station and manual observing equipment at Henderson Airport

Upper Air

There is one historical upper air station in the Solomon Islands at the SIMS Vavaya Ridge meteorology offices. The station has not operated for about 10 years due to lack of consumables and is no longer serviceable. A new SIMS forecast office is under construction directly adjacent to the upper air equipment. This new office precludes re-commissioning of the upper air operations in future due to safety concerns with the storage and use of hydrogen in close vicinity to the office.

Figure 8 Honiara upper air station (not operational)

Marine stations

Three sea level monitoring stations are maintained in Solomon Islands by the Australian Bureau of Meteorology (Bureau) under the Pacific Sea Level and Geodetic Monitoring project. These are located in coastal areas and monitor atmospheric pressure as well as sea level. One, in Honiara, also monitors humidity, temperature and wind (Figure 8). The other two are in Lata (Temotu Province) and Taro (Choiseul Province).

Figure 9 Sea level station at Honiara (anemometer mast is at an angle having been damaged by collision)

Maintenance

The SIMS technical team at the Vavaya Ridge office in Honiara maintain a set of equipment for calibration travelling standards. The team aims to proactively visit staffed stations and AWS at least once per year to inspect and calibrate equipment. They also aim to reactively visit stations following critical equipment failure to make repairs.

However, travel and logistics are very expensive and complex in the Solomon Islands, with lengthy and costly air and boat travel required to reach most sites. Budget constraints within the Solomon Islands government have meant that the technical team has not generally been able to visit sites as frequently as the goals described above.

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. The process of approval for overseas procurement in the Solomon Islands government is also complex and lengthy. These issues combined with budgetary constraints within SIMS, and budget cuts due to Covid, have meant that SIMS rarely has a sufficient stock of spare points, and often is unable to make repairs or replacements to unserviceable equipment.

SIMS maintains a risk register log for its provincial staffed stations. The log lists 13 faults with extreme or high risk, some of which have been present for over 10 years. Examples include faulty barometer, faulty anemometer, missing thermometer, etc. Similarly, SIMS personnel advise that at least eight of their AWS are currently not operational due to equipment problems, lack of spare points, and/or lack of travel budget to attend and make repairs.

General security and maintenance of vegetation at weather stations is undertaken by the observers at staffed stations and the site surrounds and vegetation tend to be well-maintained at these stations. At AWS, SIMS aims to appoint a local caretaker, who may receive a nominal fee for maintaining the site. The condition of these stations is variable and often they can be overgrown, or have problems with theft of equipment (e.g. solar panels).

Figure 10 Example of overgrown Automatic Weather station at Gizo

Target state and recommended activities

Surface Stations

The plan for GBON surface stations in the Solomon Islands is to co-locate staffed weather stations with an AWS. This approach was chosen for the following reasons:

- Co-locating the AWS with the staffed stations will enable the stations to provide 24 hours observations.
- Maintenance of unattended AWS to GBON reliability standards is challenging in Solomon Islands due to major logistical challenges (lack of roads, requirement for boat access, harsh environmental conditions, etc.). Having staff on-hand to performance basic maintenance is essential to ensure sufficient up-time to meet GBON standards.
- Having both manual and automatic observations will provide redundancy for down-time of the AWS equipment (e.g. due to delays in shipping parts). When the AWS is down, the frequency of manual observations can be temporarily increased to hourly.
- The presence of skilled staff on-site will provide quality control and allow for quick, reactive basic maintenance in the event of equipment problems.
- Staff on-site will be able to provide security and grounds maintenance (e.g. vegetation mowing) to ensure the site complies with WMO siting requirements.

SIMS currently maintains seven staffed stations. An eighth station at Kira Kira was closed during ethnic tensions in the early 2000s but is proposed to be reopened with SOFF funding.

SIMS proposes to use SOFF funding to co-locate an AWS at each of these stations, to upgrade the manual observing equipment to GBON standards and to upgrade structures, facilities, power and communications to support these services.

These stations will cover all nine provinces in the Solomon Islands except Isabel and Central Province. Over the longer term, SIMS aims to have staffed stations in all provinces, and has ambitions to open a new station in Isabel (likely Buala due to the airport at this location). Should this occur, one of the Guadalcanal stations could be downgraded from GBON status and replaced with Buala.

While Solomon Islands Telekom has a long-term goal to provide reliable cellular internet coverage to the whole country, internet services are currently variable. To ensure continuity and reliability of data communication from GBON stations, all AWS and all staffed stations will be equipped with robust cellular or satellite (preferred) communications to ensure regular, timely message transmission.

The surface stations to be upgraded as part of this plan are listed in Table 2. The proposed instruments, facilities and observing systems for these stations are summarised in Table 3. Selection and installation of instruments will be compliant with *WMO-No. 8 Guide to Instruments and Methods of Observation*.

Table 2 - Planned GBON surface stations

Station name	Province	Existing station status	Planned GBON configuration
Henderson	Guadalcanal	Existing staffed station	Co-located staffed and AWS
Honiara	Guadalcanal	Existing staffed station	Co-located staffed and AWS
Taro	Choiseul	Existing staffed station	Co-located staffed and AWS

Munda	Western	Existing staffed station	Co-located staffed and AWS
Auki	Malaita	Existing staffed station	Co-located staffed and AWS
Rennell/Tingoa	Rennell and Bellona	Existing staffed station	Co-located staffed and AWS
Lata/Santa Cruz	Temotu	Existing staffed station	Co-located staffed and AWS
Kira Kira	Makira-Ulawa	Former staffed station	Co-located staffed and AWS

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. • 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. • 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 -where 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 where 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 stationary, and a work station (with PC and monitor/s) for the manual observer. • A local display for any electronic data (T/RH/WS/WD) recorded on site. • A power supply to enable communication of coded messages.	• An observations enclosure sufficient to ensure exclusion of obstacles impacting on readings (WMO 25 x 25m, BOM 18 x 18m). • Mains and/or solar power supply to site. • Batteries to support solar, and/or to act as UPS for message transmission. • Signage to inform or deter the public.

• An uninterruptable power supply to ensure message transmission. • Supply of clean water for cleaning and wet bulb readings.	
Communications	Communications
• 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 these stations to meet GBON requirements, the following activities will be undertaken:

- **Activity 3.1**: Secure land access for reopening staffed station at Kira Kira and new station at Tulagi.
- **Activity 3.2:** Undertake audit of existing manual equipment and facilities at staffed stations to identify all items that require procurement.
- **Activity 3.3:** Procure 7 x uplifted manual observing equipment, 1 x new manual observing equipment and 8 x new AWS for the staffed sites under 'build and support' contracts, including site works, structures, facilities, power and communications infrastructure.

Upper air stations

The non-operational upper air site at Honiara is not an option for recommissioning due to the construction of the new SIMS forecasting office at that location.

Instead, SIMS has identified a suitable replacement site at Tulagi, about 25km to the north in Central Province. The NCP also considered co-locating the replacement for the closed Honiara upper air station at one of the existing staffed stations. The nearest is at Honiara Henderson Airport, and the next nearest is at Auki, in Malaita Province, about 120km away by boat.

The Tulagi location is preferred for several reasons:

- The Henderson Airport station is airside which complicates upper air station establishment.
- SIMS has already identified their preferred site at Tulagi, and progressed arrangements for land access.
- The site is only a half-hour boat ride from the SIMS head office in Honiara, so logistics of maintenance, consumable supply and staffing are much easier than the more distant islands including Auki.
- The site is much closer to the country's main international airport than Auki.

The other two new upper air stations will be co-located with staffed stations at Taro in Choiseul Province in the far west and Lata in Temotu Province in the far east.

Upper air stations will be manual to minimise equipment complexity and maintenance challenges. The equipment will be operated by the SIMS observing staff rostered on shift at

each of the stations. A hydrogen generator will be required due to the logistical challenges of sourcing and delivering hydrogen in the remote island environments.

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

The upper air stations to be established as part of this plan are listed in Table 2. The proposed instruments and observing systems for these stations are summarised in Table 5. Selection and installation of instruments will be compliant with *WMO-No. 8 Guide to Instruments and Methods of Observation*.

Table 4 - Planned GBON upper air stations

Station name	Province	Existing station status	Planned GBON configuration
Tulagi	Central	No existing station	New manual upper air station
Taro	Choiseul	No upper air; existing staffed surface station	New manual upper air station
Lata	Temotu	No upper air; existing staffed surface station	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 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. • 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. • A local display for the radiosonde profile and access to sensors for ground check data (T/RH/WS/WD/press). • A 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.

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 establish these stations to meet GBON requirements, the following activities will be undertaken:

- **Activity 3.4**: Secure land access for upper air stations at Tulagi, Taro and Lata
- **Activity 3.5:** Procure 3 x upper air station equipment under 'build and support' contract, including site works and all ancillary infrastructure.

Other 'Easy Wins'

While logistical challenges with maintenance and security mean the unstaffed standalone AWS in the Solomon Islands may not meet GBON reliability requirements, there would be value in ensuring this information is available to the international NWP community through the WMO information System (WIS).

SIMS will seek SOFF support for an "easy win" to audit its existing AWS, identify those that are serviceable or repairable, and uplift their communications and IT systems to ensure these stations report internationally via the new Meteorological Data Management System described below (**Activity 3.6**). There may be around 8 of these AWS can be uplifted.

As another "easy win", the Bureau is also prepared to upgrade the data transmission algorithms and systems for the existing three sea level stations such that they report internationally (**Activity 3.7**). This can be done concurrently with the SOFF investment. These stations can be designated marine GBON stations 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 the largest challenge 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 "Supply & Support" contracts for the lifespan of the equipment (refer Section 2.3 and **Activity 2.3**). The contracts will include:

- Supply and installation (where relevant) of all required equipment, including all required calibration equipment (e.g. transfer standards).
- Training, including
    - Ongoing, regular training in detailed maintenance and calibration methods for the SIMS technical team.
    - Ongoing training in basic equipment maintenance for the SIMS 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 on-demand advice service via phone or teleconference to support SIMS 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 SIMS personnel.
- Opportunity for contract renewal when equipment reaches end-of-life.

Funding for ongoing essential services such as logistics, travel and communications during both the Investment and Compliance phases is also a key limitation on maintenance of station reliability. As outlined in Module 2, during the Investment Phase, UNDP and SIMS will engage with the Ministry of Finance and Treasury and other potential partners such as SPREP, the Australian High Commission and the SPC, to develop a plan for ongoing procurement of essential services to support SIMS to operate and maintain the stations to a GBON standard through both Investment and Compliance phases. This plan could include establishing a trust fund to receive, hold and disburse maintenance funding (refer Section 2.5 and **Activity 2.5**).

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

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 Local staff or contractors Basic instruction *And at sites with an upper air program:* In-country observations staff Moderately complex tasks carried out by staff following standard operating procedures (SOPs). Tools, parts and consumables will be required. Specific instruction on hydrogen safety.	• 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. In-country observations staff Basic meteorological technician training	• Collect station metadata • Replace sensors • Verify performance of sensors	•
3	Specialised maintenance actions carried out by trained staff.	• Replace infrastructure	• Annual maintenance of UA system

	Procedures are complex and fault-finding is a required skill. Pacific Region maintenance resources Advanced meteorological technician training	• Set up and configure new equipment and sensors • Advanced fault-finding	• 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 existing staffed stations are recorded by the observers in logbooks and transcribed into METAR/SPECI and SYNOP messages on a desktop computer. These messages are then e-mailed to the Henderson field station. The Henderson observers then forward the METAR/SPECI messages onto Air Services for dissemination to pilots and add them to the SIMS public webpage for public dissemination. They also convert the SYNOP messages to weather reports and publish these four times daily on the SIMS webpage.

Both message types are then forwarded to the Bureau's Central Messaging Switching Service (CMSS) in Australia via e-mail. The CMSS then converts the messages to BUFR format and submits them to the WMO's Global Telecommunications System (GTS).

Problems with the reliability of cellular-based internet services at some field stations has often led to significant delays in e-mail transmission of up to several hours.

Transmission of AWS data depends on the AWS type:

- NIWA AWS send data at 10 minute intervals via BGAN satellite to NIWA servers in New Zealand. NIWA servers then forward to the data on to the SIMS CliDE database on a server in the Honiara Outback House offices (see Figure 11 below).
- OTT-Hydromet AWS send data at 10-minute intervals via Iridium satellite to Iridium servers. The data are then polled by a server at the SIMS Vavaya Ridge forecasting office and downloaded and stored locally.
- Several other AWS (e.g. the Water Resource Department hydromet systems) store the data locally and require it to be downloaded on site during periodic field visits.

None of the AWS data are transmitted to the GTS/WIS.

Power failures and load shedding are a regular occurrence at the SIMS head office in Honiara and cause significant delays in the receipt and transmission of data from field stations and from AWS.

The sea level monitoring stations send data via BGAN satellite back to Bureau servers in Australia, where it is stored and made available on the Bureau webpage. Sea level data are transmitted to the GTS but other weather variables are currently not supplied internationally.

Climate Data Management System

SIMS maintains a local version of the Climate Data for the Environment (CliDE) database. CliDE is a climate database management system developed by the Bureau under the International Climate Change Adaptation Initiative. It provides data entry, storage, basic visualisation and extraction tools for weather and climate data.

The SIMS version is hosted on SIMS servers at their Outback House office in Honiara (separate from the Vavaya Ridge forecast office). Data from the staffed stations are manually entered into CliDE from the SYNOP messages emailed by field observers. Data from the NIWA AWS are transmitted hourly from NIWA servers to the CliDE database. The database is backed up daily to Bureau servers in Australia.

Data from the four OTT-Hydromet AWS are stored on a server held in the SIMS Vavaya Ridge forecasting office. These data do not currently flow to CliDE, although, a script is in development to enable this to occur.

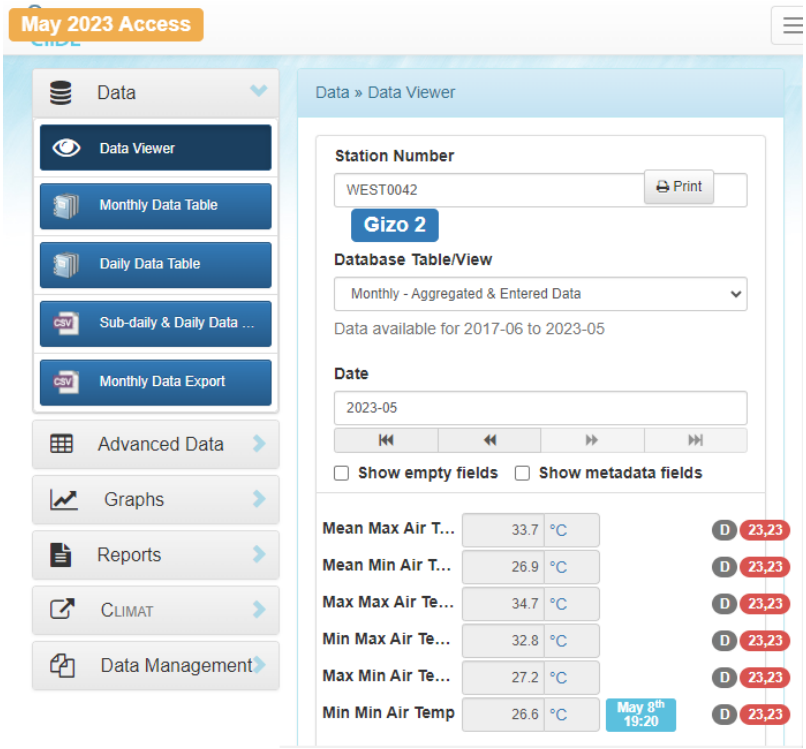

Figure 11 CliDE climate data management system interface

The CliDE database can only be accessed by climate and other managerial SIMS staff based at the Outback House office in Honiara. Data from the OTT-Hydromet AWS can only be accessed by field staff in the Vavaya Ridge office. Forecasters at the Vavaya Ridge office cannot access either database.

Realtime data from the NIWA AWS can also be accessed from NIWA's NZ servers via NIWA's Neon web tool. Although not intended by NIWA to be a weather data visualization tool, this tool is used by the forecasters to see view recent observations as part of their forecast preparation. Forecasters also have access to the raw coded e-mail messages from the staffed field stations.

Other than the daily weather reports on the SIMS webpage, and the limited data reported internationally and available via third-party sites like Ogimet, the observations from SIMS AWS or field stations are not accessible to other stakeholders or the public.

Target state and activities

Achieving sustainable, reliable reporting to WIS at hourly frequencies from all 9 proposed GBON surface stations will require a significant upgrade to the SIMS ICT and data management systems including implementing a new Meteorological Data Management System (MDMS). Given the lack of reliable power supply, it is likely that a cloud-based solution will be most suitable.

At the start of the investment phase, an audit of existing power supply, ICT equipment and data flows will be undertaken to establish the detailed architecture of a Meteorological Data Management System (MDMS) compliant with WIS 2.0.

The MDMS must not be a single point of failure. This must be avoided with redundancy of the MDMS hardware, network connections and processing workflows or by deploying the MDMS on cloud-based services with the required level of resilience.

Key anticipated elements of the data system are described at conceptual level below.

- ***Observing station data collection***
  As part of the upgrade of manual and automatic weather stations, all stations will be equipped with robust cellular or satellite (preferred) communications to ensure regular, timely message transmission. Redundant data communications (satellite & cellular) communications from all sites is recommended.

  AWS will be configured to send data to the MDMS via a suitable data transfer protocol (e.g. MQTT or SFTP). The MDMS should have the ability for observers to supply manual observations via e-mail in the existing SYNOP or METAR/SPEC format, as well as through more modern methods such as a web or mobile-accessible interface.

- ***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 will also provide data services (e.g. APIs, shared filesystem, publication/ subscription service) to enable SIMS to access the data, use it operationally and make it available to stakeholders.

- ***Climate data management***
  A Climate Data Management System (CDMS) will access data from the MDMS. The CDMS could be an updated and potentially cloud-based version of CliDE, or another suitable system selected in the 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 SIMS. Appropriate processing to produce quality-controlled data and statistics for climate purposes will be performed in the CDMS.

- **Webpage**
  A public-facing webpage will also be developed to disseminate key meteorological and climate data to other Solomon Islands stakeholders and the public. Consultation with

stakeholders such as the Water Resources Division, the Maritime Safety Authority and the Disaster National Operations Centre, highlighted a strong demand for weather observations for situational awareness. Given the maritime nature of the country, there is also strong public interest. Disseminating the data widely under SIMS banner will increase public and government support for the important work done by SIMS to collect and steward these data, supported by SOFF.

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

Activities to uplift data systems as described above are:

- **Activity 3.8**: Procure expert audit of power supply, ICT equipment and data flows at start of Investment Phase, to develop detailed architecture for the Meteorological Data Management System and WIS 2.0 implementation.
- **Activity 3.9**: Procure, install and commission a Meteorological Data Management System (including WIS 2.0 capability) through a 'supply and support' contracting approach, including ongoing training and maintenance support.
- **Activity 3.10**: Procure, install and commission a suitable upgraded Climate Data Management System through a 'supply and support' contracting approach.
- **Activity 3.11**: Develop a webpage to provide weather data products to stakeholders and the public.

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 UNDP and SIMS 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 3.12**) considering local conditions and approaches to minimise the environmental impact of construction activities such as:

- use of solar or wind power at sites;
- 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

SIMS has 62 staff, including 34 observers at manual observation sites (Table 7). Staff have a mixture of qualifications, with (as of 2020) one PhD candidate, 4 MSc qualifications (including two in Water Resources), 6 with BSc, and 7 with WMO Class 2-4 qualifications.

Table 7 - Staff profile as of July 2023 (courtesy SIMS)

2023 TRAINEES	OBSERVERS	CLIMATE & OCEAN	FORE-CASTERS	MANAGE-MENT	RESEARCH	QUALITY	TOTAL
7	34	4	12	2	1	2	62

Two teams are critical to weather observations at the Solomon Islands Meteorology Service (SIMS). The technical team, headed by the Chief Technical Officer (CTO), includes 5 skilled technicians, including an IT specialist, electronics engineer and an observations expert trained at the Bureau of Meteorology (Bureau) in Australia. The observing team, headed by the Chief Meteorological Officer (CMO), currently has 27 personnel trained in manual weather observations based at 7 field stations across the country. At the date of the country visit, the CMO was recruiting an additional 7 personnel for the observations team to allow for a full complement of shifts across all of SIMS staffed stations.

The SIMS gender balance is highly skewed toward males, with 5 women out of 62 staff, mainly in professional roles such as climate or forecasting.

Figure 12 Key members of the Solomon Islands Meteorological Service team with Bureau peer advisors

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

- Few of the engineering, technical or observing personnel currently have BIP-MT qualifications which are considered essential to ensuring the sustainability and quality of observations.
- The technical personnel have no formal training in cellular and satellite communications which are critical to transmission of real-time data for GBON compliance.
- Additional observers will be required for the reopened Kira Kira staffed surface station, and for the three new upper air stations at Tulagi, Taro and Lata.
- Observers require basic automatic and manual observing equipment maintenance skills to address equipment problems at remote stations in a timely manner to ensure reliability of observations. Given the costly and complex logistics of travel, this is much more efficient for basic maintenance than requiring reactive visits by technicians based on the head office in Honiara.
- SIMS has no specific ICT personnel. In order to successfully implement a new Meteorological Data Management System (MDMS) compliant with WIS2.0, further ICT expertise will be required in data and communications systems including HTTP, MQTT, APIs and WIS2.0 data exchange systems
- Enhanced program and project management capability is required within SIMS to oversee the roll-out and maintenance of the GBON equipment across 12 stations.

4.2. Capacity development activities for technical staff

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

- **Activity 4.1**: Provide training in basic automatic and manual weather station verification and maintenance at the start of the Investment Phase for SIMS 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 4.2:** Provide comprehensive training in weather station maintenance for all SIMS technical staff both at the start of Investment Phase and ongoing through Compliance Phase. This would ideally similarly be structured into 'supply and support' contract.
- **Activity 4.3**: Provide training in cellular and satellite communications and router configuration during the Investment Phase to all SIMS technical and engineering personnel. Similarly, this training could be included in a 'supply and support' contract as part of equipment procurement.
- **Activity 4.4**: Offer training leading to BIP-MT qualifications to SIMS'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 and Technical teams.

- **Activity 4.6**: SIMS to be supported by SOFF to recruit new observers to operate the reopened Kira Kira staffed surface stations and the new upper air stations at Tulagi, Taro and Lati. Support will be required both during Investment and Compliance phase.
- **Activity 4.7**: SIMS to be supported by SOFF to recruit at least one new ICT professional, skilled in network, database and communications technology critical to WIS2.0, MDMS and CDMS. Support will be required both during Investment and Compliance phase.

4.3. 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.

4.4. Gender and CSOs considerations

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

- **Activity 4.9**: Organise stakeholder engagement consultations with civil society organisations (CSOs) focused on women's empowerment. This could include:
    - Direct contact with NGOs working with women and girls in Solomon Islands to promote employment opportunities in SIMS (e.g. Women's Rights Action Movement);
    - Presentations at Community meetings;
    - Presentations to school groups.
- **Activity 4.10:** 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 Solomon Islands;
    - 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 SIMS.

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 equipment maintenance due to lack of spare parts leads to equipment malfunction	Procurement of equipment under 'supply and support' contract including continuous supply of spare parts	UNDP and SIMS	Monthly spare parts inventory reporting
Lack of equipment maintenance due to lack of funding for travel and logistics	Establishment of funding mechanisms to efficiently receive, hold and disburse logistics funding during both Investment and Compliance phase for life of equipment	UNDP and SIMS	Monthly reporting on logistics needs and activities. Regular quality audits.
Loss of data due to long lead-times for repairs due to travel distance, complicated logistics	Co-locate automatic weather stations with manual weather stations. Manual observers to provide basic maintenance and redundancy.	SIMS and UNDP	Monthly review of WDQMS and GBON compliance
Poor data quality or lack of data from unattended AWS due to degradation of site conditions, vandalism or theft	Proactive maintenance by SIMS staff funded through establishment of 'logistics fund' Review of data that fails automated quality checks	SIMS and UNDP SIMS	Monthly review of WDQMS and GBON compliance Weekly review of quality flagged data
Poor internet connections lead to data transmission delays	Equip all stations with redundant cellular and/or satellite communications	UNDP	Monthly review of WDQMS and GBON compliance
Unreliable power leads to communications outage and data delay	Equip all stations with batteries, uninterruptible power supply and solar/wind power generators	UNDP	Monthly review of WDQMS and GBON compliance

Unsuitable accommodation for equipment leads to degradation of condition	Include building accommodation audit and upgrade if required in procurement for staffed station uplift	UNDP	Annual quality audit by SIMS quality manager
Insufficient human resources or technical skills to install or maintain stations and ICT system	SOFF to provide support for training of technical and observing staff during Investment and Compliance phase. SOFF to fund recruitment of additional skilled staff during both Investment and Compliance Phase as outlined in Module 4 Build public and government support for SIMS 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	UNDP UNDP UNDP and SIMS SIMS	Annual human resources audit by SIMS

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 Solomon Islands National GBON Network. The Investment Proposal will be developed by UNDP and SIMS, with input from the Bureau (**Activity 6.1**).

Summary of GBON National Contribution Plan

Components	Recommended activities
Module 2. GBON business model and institutional development	1. Engagement with aviation stakeholders to develop plans for aviation cost recovery to support ongoing funding for SIMS.
	2. Engage in regional forums to pursue opportunities for regional coordination in Investment Phase and Compliance Phase elements such as calibration, training, common equipment types.
	3. 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 through Investment and Compliance phases.
	4. 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.
	5. Engage with the Ministry of Finance and Treasury and other potential partners, to develop a robust plan for ongoing procurement of essential services, parts and consumables (e.g. trust fund)
Module 3. GBON infrastructure development	1. Secure land access for reopening staffed station at Kira Kira and new station at Tulagi.
	2. Undertake audit of existing equipment and facilities at staffed stations to identify all items that require procurement.
	3. Procure 7 x uplifted manual observing equipment, 1 x new manual observing equipment and 8 x new AWS at for the staffed sites under 'build and support' contracts, including site works, structures, facilities, power and communications infrastructure.
	4. Secure land access for upper air stations at Tulagi, Taro and Lata
	5. Procure 3 x upper air station equipment under 'build and support' contract, including site works and all ancillary structures, facilities and infrastructure.
	6. Audit existing AWS, identify those that are serviceable or repairable and uplift their communications and IT systems to enable them to report internationally via the new MDMS
	7. Update data transmission systems for the three existing sea level stations to report to WIS (Bureau).
	8. Procure expert audit of power supply, ICT equipment and data flows at start of Investment Phase, to develop detailed architecture for the Meteorological Data Management System and WIS 2.0 implementation.

	9. Procure, install and commission a Meteorological Data Management System through a 'supply and support' contracting approach, including ongoing training and maintenance support.
	10. Procure, install and commission a suitable upgraded Climate Data Management System (CDMS).
	11. Develop a webpage to provide weather data to stakeholders and the public.
	12. Develop environmental management plan for investment activities prior to site works.
Module 4. GBON human capacity development	1. Provide training in basic automatic and manual weather station verification and maintenance at the start of the Investment Phase for all SIMS observers, with ongoing training through the Compliance phase, ideally included in a 'supply and support' contract.
	2. Provide comprehensive training in weather station maintenance for all SIMS technical staff both at the start of Investment Phase and ongoing through Compliance Phase.
	3. Provide training in cellular and satellite communications and router configuration during the Investment Phase for all SIMS technical and engineering personnel. Similarly this training could be included in a 'supply and support' contract as part of equipment procurement.
	4. Offer training leading to BIP-MT qualifications to all of SIMS's 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 to selected members of the Observations and Technical teams.
	6. SIMS to be supported by SOFF to recruit new observers to operate the reopened Kira Kira and new Tulagi staffed surface stations and the new Tulagi, Lata and Taro staffed upper air stations. Support will be required both during Investment and Compliance phase.
	7. SIMS to be supported by SOFF to recruit at least one new ICT professional, skilled in network, database and communications technology critical to WIS2.0 and CDMS. Support will be required both during Investment and Compliance phase.
	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. Organise stakeholder engagement consultations with civil society organisations (CSOs) focused on women's empowerment.
	10. 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 (UNDP, SIMS, with support from Bureau)

Report completion signatures

Peer Advisor signature

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General Manager International Development
14-Dec-2023

Beneficiary Country signature

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