COUNTRY HYDROMET DIAGNOSTICS

Informing policy and investment decisions for high-quality weather forecasts, early warning systems, and climate information in developing countries.

July 2025

Vanuatu Peer Review Report

Reviewing Agency: Meteorological Service of New Zealand

THE WORLD BANK

SOFF Systematic Observations Financing Facility

WORLD METEOROLOGICAL ORGANIZATION

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List of acronyms

ACCESS	Australian Community Climate and Earth-System Simulator
ARG	Automated Raingauge
AWOS	Automated Weather Observing System
AWS	Automated Weather Station
BIP-M	Basic Instruction for Meteorologists
BIP-MT	Basic Instruction for Meteorological Technicians
BOM	Bureau of Meteorology, Australia
CAP	Common Alerting Protocol
CHD	Country Hydromet Diagnostics
COSPPac	Climate and Oceans Support Programme in the Pacific
CREWS	Climate Risk and Early Warning Systems
DFAT	Department of Foreign Affairs and Trade (Australia)
ECMWF	European Centre for Medium-Range Weather Forecasts (model)
EEZ	Exclusive Economic Zone
FMS	Fiji Meteorological Service
GBON	Global Basic Observing Network
GCF	Green Climate Fund
GEF	Global Environment Facility
GCOS	Global Climate Observing System
GDP	Gross Domestic Product
GIZ	German Corporation for International Cooperation
GUAN	GCOS Upper Air Network
IBFWS	Impact-Based Forecast and Warning Services
ICT	Information and Communications Technology
LDC	Least Developed Country/ies
JICA	Japan International Cooperation Agency
MetService	Meteorological Service of New Zealand
METAR	Meteorological Aerodrome Report
MFAT	Ministry of Foreign Affairs and Trade (NZ)
MHEWS	Multi Hazard Early Warning System
MoCCA	Ministry of Climate Change and Adaptation
NCOF	National Climate Outlook Forum
NDC	National Disaster Committee
NDMO	National Disaster Management Office
NMHS	National Meteorological and Hydrological Service
NIWA	National Institute of Water and Atmospheric Research (NZ)
PIMS	Pacific Islands Meteorological Strategy
PMC	Pacific Meteorological Council
RESPAC	UNDP Disaster Resilience for Pacific Small Island Developing States Project
RSMC	Regional Specialised Meteorological Centre
SIDS	Small Island Developing States
SPC	Secretariat for the Pacific Community
SOFF	Systematic Observations Financing Facility
SOP	Standard Operating Procedure
SPREP	Secretariat of the Pacific Regional Environment Programme
SWFP	Severe Weather Forecasting Programme
TAF	Terminal Aerodrome Forecast
UKMO	United Kingdom Meteorological Office
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USP	University of the South Pacific
VCAP	Vanuatu Coastal Adaptation Project
VCAP 2	Vanuatu Coastal Adaptation Project 2
Van-KIRAP	Vanuatu Climate Information Services for Resilient Development Project
VMGD	Vanuatu Meteorology and Geohazards Department
VNU	Vanuatu National University
WIGOS	WMO Integrated Global Observing System
WMO	World Meteorological Organization
WRP	Weather Ready Pacific Decadal Programme

Executive Summary

The Republic of Vanuatu is an archipelagic country in Melanesia, located in the South Pacific Ocean consisting of about 83 relatively small islands of volcanic origin (65 of them inhabited), with about 1,300 kilometres between the most northern and southern islands. The country lies between latitudes 10°S and 23°S and longitudes 160°E and 175°E and has a population of approximately 335,000.

Located in the Pacific Ring of Fire, Vanuatu is subject to a range of hydrometeorological and geological hazards including tropical cyclones, flash flooding, thunderstorms, drought, tsunami, earthquakes, volcanic eruptions and large waves and swells. The country experiences frequent earthquakes and volcanic eruptions and is among the most vulnerable countries on earth to the increasing impacts of climate change, including climate-related natural disasters and the effects of slow-onset events such as sea-level rise and ocean acidification.

The Vanuatu Meteorology and Geohazards Department (VMGD) has responsibility for meteorological and geohazard matters within Vanuatu.

Overall, VMGD is nearly sufficiently staffed to cover its mandate and meet its responsibilities; however with close to 85% of its budget allocated to personnel costs, there is a large reliance on donor programs such as Climate and Oceans Support Programme in the Pacific (COSPPac), Japan International Cooperation Agency (JICA), Vanuatu Climate Information Services for Resilient Development Project (van-KIRAP) and Vanuatu Coastal Adaptation Project (VCAP) for sustained operations and infrastructure and service improvements.

There are issues relating to the observations and ICT programs which operate a range of disparate technologies and projects requiring support from a limited pool of staff. VMGD also experiences difficulties in complying with global observational standards, and particularly in relation to servicing multiple makes and models of weather stations that have been installed by multiple organisations.

The VMGD Strategic Development Plan (2025 – 2029) is about to be released, and initiatives such as the Systematic Observation Financing Facility (SOFF) and the Weather Ready Pacific (WRP) will be crucial in supporting VMGD into the future.

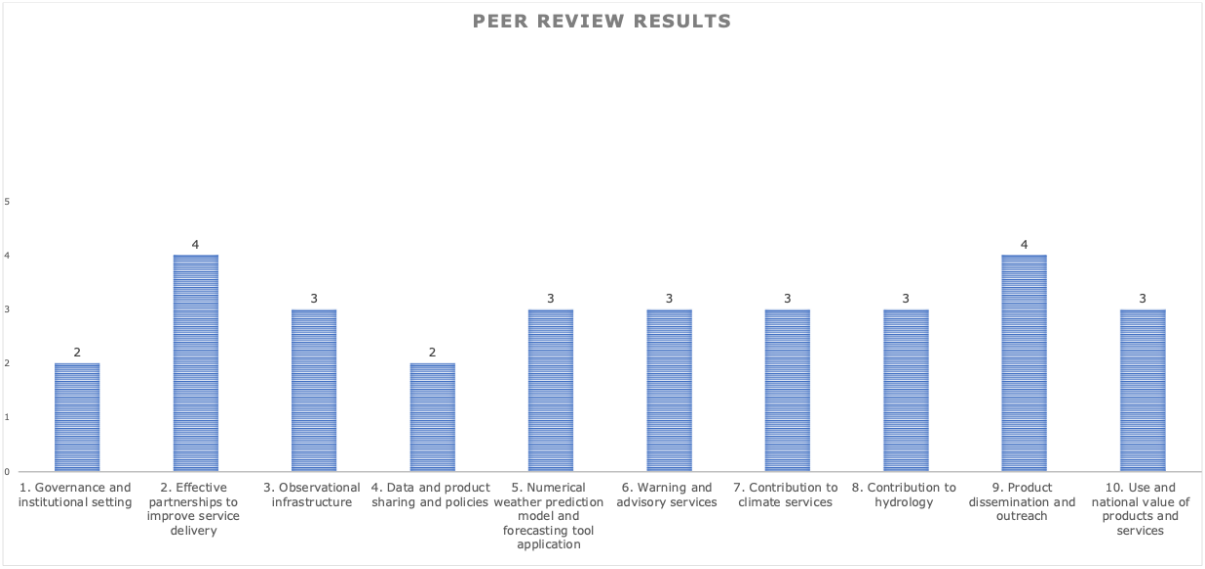

Figure 1: Summary of assessed ratings for the ten Country Hydromet Diagnostics elements. Each rating is out of five, with five reflecting a relatively high degree of maturity.

Element	Maturity level score
1. Governance and institutional setting	2
2. Effective partnerships to improve service delivery	4
3. Observational infrastructure	3
4. Data and product sharing and policies	2
5. Numerical weather prediction model and forecasting tool application	3
6. Warning and advisory services	3
7. Contribution to climate services	3
8. Contribution to hydrology	3
9. Product dissemination and outreach	4
10. Use and national value of products and services	3

Table 1: As for Figure 1, in tabular form

Chapter 1: General information

Introduction

The Republic of Vanuatu is a country in Melanesia, located in the South Pacific Ocean, consisting of 83 relatively small islands of volcanic origin, with about 1,300 kilometres between the most northern and southern islands. The country lies between latitudes 13°S and 21°S and longitudes 166°E and 171°E.

Vanuatu has a total land area of 12,189 km^2, with an Exclusive Economic Zone of 663,251 km^2. Around 65 of the islands are inhabited, with 14 of the islands having surface areas greater than 100 km^2. The nation's largest towns are Port Vila, the capital, on the island on Efate, and Luganville on the island of Espiritu Santo, 250km to the north.

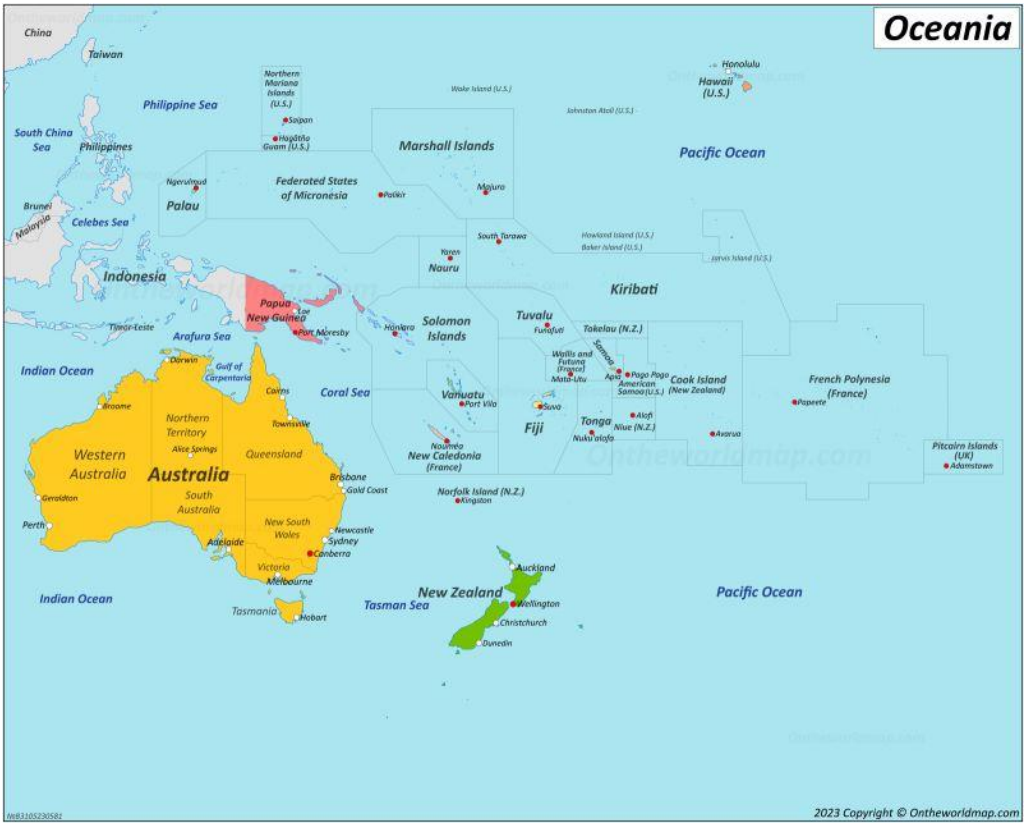

Figure 2: Map of Oceania (Source: https://ontheworldmap.com/oceania/

Many of the islands have steep geography, with unstable soils and little permanent fresh water. The shoreline is mostly rocky with fringing reefs and no continental shelf, dropping rapidly into the ocean depths.

Vanuatu's population is currently 335,900 (2023 estimate) and is increasing at around 2.5 per cent per year. The growing population is placing increasing pressure on land and resources for agriculture, grazing, hunting, and fishing. Around 90% of Vanuatu households fish and consume fish, which has caused intense fishing pressure near villages and the depletion of many near-shore fish species.

Vanuatu is subject to a range of meteorological, hydrometeorological and geological hazards that includes tropical cyclones, flash flooding, thunderstorms, hailstorm, drought, tsunami, earthquakes, rainfall and earthquake-induced landslides, volcanos and large waves and swells. As a result, Vanuatu is one of the countries most vulnerable to

the increasing impacts of climate change, including climate-related natural disasters and the effects of slow-onset events such as sea-level rise and ocean acidification.

Figure 3: Map of Vanuatu (Source: https://ontheworldmap.com/Vanuatu/

Located in the Pacific 'Ring of Fire', there are several active volcanoes in Vanuatu with an ever-present danger of a major eruption.

As a result of the deforestation and degradation of many upland watersheds, and possibly a warming climate, fresh water is becoming increasingly scarce.

Vanuatu's climate varies with latitude, from a wet tropical climate in the northern islands, which receive over 4,000 mm of annual rainfall, to the dryer subtropical in the southern extremes of the archipelago, where annual average rainfall measures 1,500 mm. Average temperatures range from 21°C to 27°C, and, unlike many of the Pacific island nations, seasonal temperatures in the capital city of Port Vila exhibit high variability with summertime highs exceeding 30°C and minimum temperatures often below 20°C.

Seasonal and interannual variations in climate, especially rainfall, are driven by changes associated with El Niño, which affect every aspect of the climate.

Cyclones are common during the warm months of November to April, but are also possible in October and May. Severe tropical cyclones (category 5) have affected Vanuatu in the past, most notably Cyclone Pam in March 2015, which brought loss of life and widespread damage, and Cyclone Harold in April 2020, also causing widespread damage. In March 2023, Vanuatu was impacted by two category 3 cyclones within the space of 3 days.

The annual GDP in Vanuatu is USD 3,231 per capita, ranking it at number 196 among the international economies. If purchasing power parity is considered, Vanuatu falls among the poorest countries in the world.

CHD methodology

The methodology followed that as laid out in the SOFF manual and included desktop studies and in-country meetings and interviews.

Initial desktop studies were conducted using material supplied from the World Meteorological Organisation (WMO), WMO Integrated Observing System (WIGOS) tools, VMGD and partners.

Interviews were conducted with senior staff within VMGD and project coordinators for the large van-KIRAP and VCAP2 projects. Discussions were also held with the Bureau of Meteorology in relation to the Partnerships for Aviation project.

Site visits were made to Bauerfield Airport on Efate and to Espiritu Santo where different station types were visited, including the Pekoa Airport Met Office. A planned visit to White Grass Airport on the island of Tanna was cancelled due to flight cancellations.

A follow-up meeting was conducted with the VMGD Director and staff in June 2025 to revise the status of some elements and finalise the report.

Chapter 2: Country Hydromet Diagnostics

Element 1: Governance and institutional setting

1.1 Existence of Act or Policy describing the NMHS legal mandate and its scope

The Vanuatu Meteorology and Geohazards Department (VMGD) is a department within the Ministry of Climate Change and Adaptation, Meteorology, Geo-Hazards, Energy, Environment and Disaster Management. VMGD consists of six divisions: Administration, Weather Forecasting and Services, Climate, Geo-Hazards, Observations, and ICT/Engineering.

The mandate and functions of the Department are set out in the *Meteorology, Geological Hazards and Climate Change Act No. 25 of 2016*. Under the Act, the functions of the Director of Meteorology include all functions relating to meteorology, as well as the issuing of warnings and alerts for *floods, gale, storm, drought and any other extreme weather condition likely to endanger life or property.*

The Act specifies that the Director of Meteorology has the power to restrict the rights of any person or agency to undertake meteorological services for public use.

Under the Act, the Director of the Department of Geological Hazards has the authority and responsibility to issue warnings for geological hazards, including tsunamis and landslides.

The Act also establishes the National Advisory Board on Climate Change and Disaster Risk Reduction, which includes the Directors of Meteorology and Geological Hazards, Climate Change and other relevant departments.

Water resources and management and hydrology are the responsibility of the Department of Water Resources, under the Ministry of Lands and Natural Resources. Their main focus is on water resource management.

Whilst not explicit in the Act, the services provided by VMGD include services to agriculture, covered under the broad headings of *promoting safe navigation, shipping and civil aviation services,* and supporting *trade, tourism, commerce and industry services*.

Arrangements for disaster risk management are defined in the *Disaster Risk Management Act No. 23 Of 2019*. This establishes a National Disaster Committee, chaired by the Director-General of the Ministry responsible for Meteorology, Geological Hazards and Climate Change, and including the Director of Meteorology.

For civil aviation, VMGD provide a range of services including the generation of METAR and SPECI reports, Area Forecast (ARFOR) and Terminal Area Forecasts (TAFs).

1.2 Existence of Strategic, Operational and Risk Management plans and their reporting as part of oversight and management.

The vision of the VMGD is *to be a world class meteorological and geohazards institution that contributes to the sustainable development of Vanuatu, and the Pacific region.*[1]

Its stated mission is to be a *fully professional institution comprising skilled and motivated staff using updated and state of the art science and technology within an efficient and effective organization, providing high quality meteorological and geohazards*

[1] *https://www.vmgd.gov.vu/about-vmgd*

services that are widely available and accessible, effectively applied, beneficial and highly valued by all sections of the community in Vanuatu.[2]

The Vision and Mission are laid out in the *Vanuatu Meteorology and Geo-Hazards Department Strategic Development Plan 2025-2029.* At the time of writing, the strategy has been drafted and is due to be launched in August 2025. Revision of the strategy was undertaken with the assistance of the Climate Risk and Early Warning Systems (CREWS) initiative.

There is no formal implementation plan for the strategy in place.

At the time of writing, VMGD does not have a formal risk management framework except for aviation services, where it forms part of the overall quality system.

1.3 Government budget allocation consistently covers the needs of the NMHS in terms of its national, regional, and global responsibilities and based, among others, on cost-benefit analysis of the service. Evidence of sufficient staffing to cover core functions.

Current levels of funding for the NMHS are not adequate for it to deliver on its strategic objectives or meet its obligations to WMO.

VMGD receives an annual operating budget of around USD $1.60m (2024 figure) and this has been relatively stable in the past 3-5 years. Around 85% of this is committed to staff costs, leaving a relatively small amount for services, logistics and equipment purchases.

There is no cost-recovery for aviation services, but VMGD are working on reviewing the current revenue regulation and working towards certification which would allow this to happen.

As a result, VMGD is very dependent on donor funding to support its operations. Major donors include the World Bank, UNDP, GCF, WMO-CREWS and GEF.

1.4 Proportion of staff (availability of in-house, seconded, contracted- out) with adequate training in relevant disciplines, including scientific, technical, and information and communication technologies (ICT). Institutional and policy arrangements in-country to support training needs of NMHS.

VMGD has a full-time staff of 77 including the director (Table 2).

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

Table 2 - VMGD Staff Table

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

1.5 Experience and track record in implementing internationally funded hydromet projects as well as research and development projects in general.

Vanuatu has been the recipient of a significant number of internationally-funded hydromet projects. A key challenge, as for other countries in the region, has been to

[2] *Ibid.*

sustain the project-funded infrastructure and capabilities once the project support is terminated.

There are three major hydrometeorological and related projects currently underway in Vanuatu:

- Van-KIRAP[3] - a five-year, USD $22 m project funded by the Green Climate Fund and implemented by the Secretariat of the Pacific Regional Environment (SPREP), focusing on Climate Information Systems and investing across the value chain, including observations infrastructure.
- V-CAP Phase II[4] – a six-year, USD $12.5m project being implemented by the United Nations Development Program (UNDP) with financial support from the Least Developed Country Fund (LDCF) of the Global Environment Fund. V-CAP2 is scheduled to end in 2028.
- Partnerships for Aviation – a project funded by the Australian Department of Foreign Affairs and Trade (DFAT) that is providing Automated Weather Observations Systems at three airports and a refurbished upper-air system at Bauerfield.

Other recent projects include:

- Disaster Resilience for Pacific SIDS (RESPAC) – this was implemented by UNDP with the supply of some AWS and ARG. The project is completed but there are two years of ongoing support.
- CREWS – this was implemented by GIZ with the supply and installation of AWS.
- Van-Redi – this project was focused on the geo-hazards aspects and was supported by JICA.

Summary score and recommendations for Element 1

VMGD are assessed as **Level 2** for Element 1 of the CHD. This is defined as 'Effort ongoing to formalize mandate, introduce improved governance, management processes and address resource challenges.'

Element 1: Governance and Institutional Setting				Description: The level of formalization of the NMHS mandate and its implementation, oversight, and resourcing.
Level one: Weakly defined mandate; serious funding challenges; essential skills lacking; little formalized governance and future planning.	Level two: Effort ongoing to formalize mandate, introduce improved governance, management processes and address resource challenges.	Level three: Moderately well mandated, managed and resourced and clear plans for, and sufficient capacity to address operational gaps.	Level four: An effective service but with a few shortcomings related to its mandate, governance, and resourcing and in the process to address the gaps.	Level five: Strong and comprehensive mandate, highly effective governance, secure funding, and readily available skills base.

VMGD provide an effective service that is well mandated and managed. The limiting factor is the limited resourcing. To reach the next level of maturity, additional government or stable external resources need to be secured, the strategic plan updated and implemented, and a risk management approach adopted. A clarification of the mandate through an updated Act could assist around clarifying responsibilities for hydrological services.

[3] https://www.greenclimate.fund/project/fp035
[4] https://www.undp.org/pacific/projects/vanuatu-coastal-adaptation-project-phase-ii

Recommendations

To improve its performance in this area, it is recommended for VMGD to:

- Update the relevant Act to clarify the mandate and responsibility for hydrological services, in particular flood warnings;
- Work with the Vanuatu Government and potential donors to secure stable ongoing funding sufficient to support operations; and
- Update the Strategic Plan and develop a roadmap for its implementation.

Element 2: Effective partnerships to improve service delivery

2.1. Effective partnerships for service delivery in place with other government institutions.

In 2014, Vanuatu created a cross-cutting Ministry of Climate Change Adaptation, Meteorology and Geo-Hazards, Energy, Environment and National Disaster Management. This was done with the purpose of strategically aligning those Departments with responsibility for natural disaster response and sustainable development of the environment.

This Ministry comprises of five departments: the Department of Climate Change, the Department of Meteorology & Geo-Hazards, the Department of Energy and the Department of Environmental Protection & Conservation.

This organisational structure facilitates effective coordination between Departments and functions very well. Broader coordination across government is facilitated through a formal National Advisory Board on Climate Change and Disaster Risk Reduction. This includes the Directors of Meteorology, Geological Hazards, Climate Change, the National Disaster Management Office and relevant departments from other ministries, including Public Works, Agriculture, Fisheries, and Tourism.

The Van-KIRAP project has also worked to strengthen links to the Department of Local Authorities, and through this, to the provincial centres for community engagement.

2.2. Effective partnerships in place at the national and international level with the private sector, research centres and academia, including joint research and innovation projects.

Under the Meteorology, Geological Hazards and Climate Change Act 2016, VMGD is the sole provider of meteorological and climate services unless permission is expressly given by the Director of Meteorology. As such, there is limited private sector involvement in service delivery.

In terms of service delivery and communications, VMGD has a working relationship with the with Vanuatu Broadcasting and Television Corporation for the dissemination of forecasts and warnings.

The VMGD regularly interacts with the agricultural sector through their 3-monthly climate stakeholder engagement and annual National Climate Outlook Forum (NCOF). VMGD also conducts joint engagement with the agricultural sector through the Vanuatu Framework for Climate Services, the Vanuatu Coastal Inundation Project and most recently through the Van-KIRAP project.

VMGD is an active participant in regional activities, and the Director is a member of the Pacific Meteorological Council (PMC) and the Weather Ready Pacific Steering Committee.

The activities of VMGD are very focused on operational service delivery and, as such, VMGD does not have an active research program.

2.3. Effective partnerships in place with international climate and development finance partners.

As previously mentioned, VMGD and Vanuatu have well-established partnerships with development and finance partners, in particular the Green Climate Fund (GCF), Global Environment Facility (GEF), UNDP, UNEP, WMO and the World Bank. These partnerships have been built up over many years through a succession of hydromet and related capacity development projects. There are strong bilateral links to New Zealand, Australia and China.

2.4. New or enhanced products, services or dissemination techniques or new uses or applications of existing products and services that culminated from these relationships.

Vanuatu and VMGD have been the beneficiary of multiple capacity development projects over the past 5 years. Many of these have been focused on climate services and, under the Van-KIRAP Project, there has been a significant uplift in capability to deliver services. An example is the Vanuatu Climate Futures Portal[5], developed under Van-KIRAP, which provides detailed spatial information on past weather and climate, and future climate outcomes under a range of different climate change scenarios.

Summary score, recommendations, and comments for Element 2

The VMGD is assessed as **Level 4** for this element of the CHD. VMGD has effective partnerships with equal status in most relationships and Vanuatu is approaching relevant funding opportunities in a coordinated manner.

Element-2: Effective partnerships to improve service delivery			Description: The level of effectiveness of the NMHSs in bringing together national and international partners to improve the service offering.	
Level one: Works in isolation and does not value or promote partnerships. .	Level two: Limited partnerships and mostly excluded from relevant finance opportunities	Level three: Moderately effective partnerships but generally regarded as the weaker partner in such relationships, having little say in relevant financing initiatives.	Level four: Effective partnerships with equal status in most relationships and approaching relevant funding opportunities in a coordinated manner.	Level five: NMHS is regarded as a major national and regional role player. It has extensive and productive partnerships and is viewed as an honest broker in bringing parties together and provide national leadership on relevant finance decisions.

VMGD is regarded as a significant national and regional role player. It has extensive and productive partnerships with other parts of government and a range of development partners.

Recommendations

To improve its performance in this area, it is recommended for VMGD to:

- Regularise the stakeholder engagement activities established under development projects to ensure that they continue into the future; and
- Explore linkages to research institutions to further enhance its service offerings.

[5] https://vanclimatefutures.gov.vu

Element 3: Observational infrastructure

3.1. Average horizontal resolution in km of both synoptic surface and upper-air observations, including compliance with the Global Basic Observing Network (GBON) regulations.

The national territory of Vanuatu covers a very large area of ocean comprising more than 80 islands. There are currently seven synoptic surface stations and one upper-air observation station in Vanuatu (Table 3). The average distance between synoptic stations is approximately 100 km and the spatial resolution of the existing stations exceeds GBON requirements for Small Island Developing States.

The synoptic stations provide manual observations, with temperature, humidity, pressure and wind read from the AWS and manual input on cloud and weather.

The Bauerfield upper air station has recently been refurbished under the *Partnerships for Aviation* project, funded by the Australian Department of Foreign Affairs and Trade (DFAT), and upper air soundings commenced in April 2025.

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

Table 3 - Staffed Surface Stations

In addition to the synoptic stations, there are currently 22 automatic weather stations located across the islands (Figure 4). These have been installed progressively under a range of different aid projects and donors. As a result, there is a range of different equipment installed from different manufacturers.

At each of the staffed observing stations there is an AWS or AWOS co-located, with the exception of Saratamata which is manual only.

The distributed nature of the network, the logistical challenges of accessing remote islands, and the relatively small number of technical staff mean that maintenance and calibration of the stations is an ongoing challenge.

Station Name	Lat	Long	Station Type	**Reporting Status** (functional, partially functional, non-functional)
Dillon's Bay AWS	-18.8193	169.0232	Automatic weather station	Functional - some faulty sensor
White Grass Airport AWOS	-19.4500	169.2167	Aviation Weather Observing System – planned	To be installed this year
Port Resolution AWS	-19.5322	169.4986	Automatic weather station	Functional - some faulty sensor
Torres Aero AWOS	-13.3257	166.6336	Aviation Weather Observing System	Non-Functional
Sola Airport AWS	-13.8744	167.5470	Automatic weather station	Partially Functional - some faulty sensor
Lajmoli Airport AWS	-14.8795	166.5577	Automatic weather station	Functional - some faulty sensor

Longana Airport AWS	-15.3021	167.9734	Automatic weather station	Functional - some faulty sensor
Vanuatu Agriculture Research Technical Centre (VARTC)	-15.4511	167.1895	Automatic weather station	Functional
Pekoa AWOS (Santo)	-15.5167	167.2167	Aviation Weather Observing System	To be installed this year
Namplontafo AWS	-15.5472	166.9953	Automatic weather station	Functional - some faulty sensor
Loltong Village AWS	-15.5537	168.1509	Automatic weather station	Functional - some faulty sensor
Lonorore Airport AWS	-15.8683	168.1724	Automatic weather station	Partially functional - some faulty sensor
Norsup Airport AWS	-16.0812	167.4035	Automatic weather station	Non-Functional
Olal AWS	-16.1037	168.1648	Automatic weather station	Functional
Lambumbu AWS	-16.1662	167.3999	Automatic weather station	Functional - some faulty sensor
Lamap AWS	-16.4218	167.8090	Automatic weather station	Partially functional - some faulty sensor
Rovo Bay AWS	-16.6256	168.1509	Automatic weather station	Functional
Epau, Efate AWS	-17.6163	168.4961	Automatic weather station	Functional - some faulty sensor
Bauerfield AWS	-17.6947	168.3129	Aviation Weather Observing System	Functional
Port Vila AWS	-17.7495	168.3148	Automatic weather station	Functional
Whitegrass Airport AWS	-19.4510	169.2231	Automatic weather station	Functional - some faulty sensor
Aneityum (Anelghaohat)	-20.2333	169.7667	Automatic weather station	Functional – some faulty sensor

Table 4 - Automatic Weather Stations

3.2. Additional observations used for nowcasting and specialized purposes.

In addition to the meteorological stations, there are four sea level stations located at Luganville, Litzlitz (Malekula), Port Vila and Lenakel (Tanna).

VMGD also operates a network of 61 manual rain gauges across the country. These are manual gauges, read by volunteer observers who send in paper reports to the Climate Services division once a month.

A weather radar is scheduled to be installed on the island of Efate in 2025/26 under the Van-KIRAP Project.

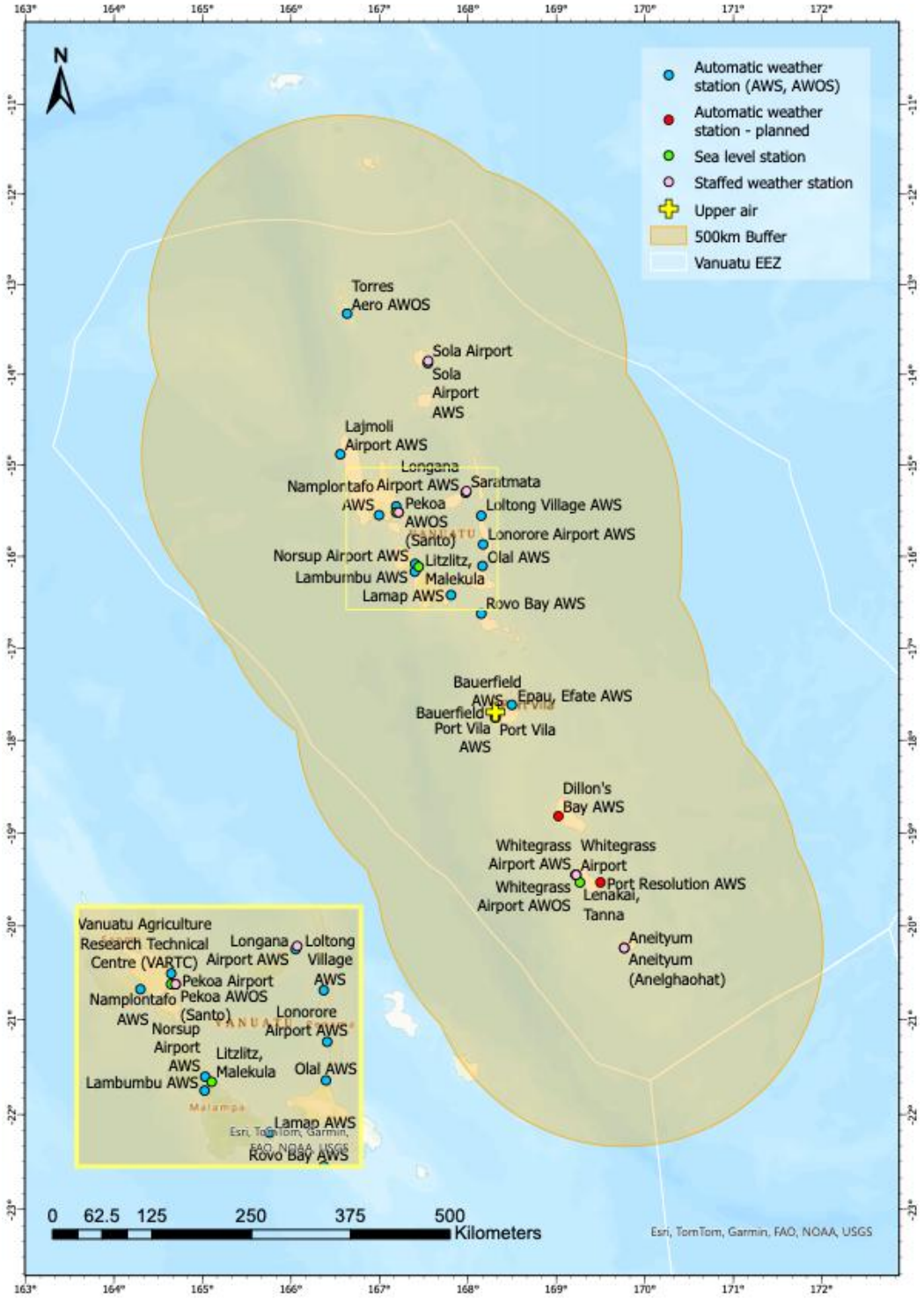

Figure 4 - Map of weather observation stations

3.3. Standard Operating Practices in place for the deployment, maintenance, calibrations and quality assurance of the observational network.

VMGD staff are fully trained in the installation of AWS and automated raingauge (ARG) stations and have been completing the installation of the new stations under the Van-KIRAP project with limited remote support from New Zealand.

VMGD have developed a maintenance schedule, but this is limited by the number of staff available. Workshop space for carrying out maintenance tasks is also limited.

There are no instrument calibration facilities in Vanuatu; however, VMGD have field verification kits which are periodically sent to Fiji or New Zealand for calibration. VMGD also have a store of spare instruments, data loggers and other components to support maintenance tasks.

Overall, maintaining the relatively large number of observing stations may exceed the capacity of the small number of technical staff in VMGD. The management of the network is further complicated by the variety of manufacturers and models of equipment.

3.4 Implementation of sustainable newer approaches to observations.

There is no WIGOS implementation plan in place.

In terms of sustainability and environmental impact, mercury in glass thermometers are in the process of being phased out across the network.

3.5. Percentage of the surface observations that depend on automatic techniques.

As previously noted, the synoptic observations that are shared internationally are all manual, even though there are AWS installed at most of the stations. The quite extensive AWS network provides observations across most of the country.

Summary score, recommendations, and comments for Element 3

The Vanuatu Meteorological and Geohazards Department is assessed as **Level 3** for this CHD element. This describes a moderate network with some gaps with respect to WMO regulations and guidance and with some data quality issues.

Element-3: Observational Infrastructure			Description: The level of compliance of the observational infrastructure and its data quality with prescribed WMO regulations and guidance.	
Level one: No or limited, basic surface observations and no upper-air observations.	Level two: Basic network, large gaps, mostly manual observations with severe challenges and data quality issues.	Level three: Moderate network with some gaps with respect to WMO regulations and guidance and with some data quality issues.	Level four: Comprehensive mostly automated network providing good traceable quality data fully compliant with WMO regulations and guidance.	Level five: Comprehensive and highly automated advanced network including additional measurements and remote sensing platforms providing excellent data fully compliant with WMO regulations and Guidance.

The current network is extensive and covers most of the population. Vanuatu would benefit from sharing additional data internationally, over and above the minimum GBON requirements. The main concerns relate to the ongoing sustainability of the network in terms of maintenance and technical support. SOFF funding will assist with this for the GBON-designated stations, but the rest of the network will continue to be a challenge to operate and maintain without additional assistance.

Recommendations

To improve its performance in this area, it is recommended for VMGD to:

- Improve its surface network to meet GBON targets for tempopral resolution;
- Increase upper air observations to two flights per day; and
- Share internationally the observations from the broader AWS network to improve the accuracy of NPW over Vanuatu and the surrounding area.

Element 4: Data and product sharing and policies

4.1. Percentage of GBON compliance – for how many prescribed surface and upper-air stations are observations exchanged internationally. Usage of regional WIGOS centres.

At the time of writing, the surface stations at Port Vila (Bauerfield) and Luganville (Pekoa Airport) are providing hourly observations. Observations from the other stations are provided every three hours and no data from Lamap is received internationally. In terms of temporal resolution, at the time of writing only Bauerfield can be considered to be GBON compliant.

Data are provided in the deprecated SYNOP code via the VMGD connection to the GTS, through the Bureau of Meteorology in Australia.

As mentioned, the upper air station at Bauerfield was recently restored and is undertaking one balloon launch per day. Data are provided in the deprecated TEMP/PILOT format via the GTS connection. DFAT have provided VMGD with consumables to support one balloon release per day until the end of 2025 and there is potential funding available to continue this program until the end of 2026.

At the time of writing, VMGD does not receive any support from the Regional WIGOS centre.

VMGD has not yet migrated to WIS2.0 and this will be an important component of future investment in observing systems.

4.2. A formal policy and practice for the free and open sharing of observational data.

There is no explicit data policy, however the *Meteorology, Geological Hazards and Climate Change Act 2016* states that VMGD is to:

co-operate with the authorities administering the:

- *(i) meteorological services of other countries; and*
- *(ii) World Meteorological Organisation; and*
- *(iii) International Civil Aviation Organisation; and*
- *(iv) any other relevant international organisation,*

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

This text is sufficient to ensure the ongoing commitment to the free and open exchange of data under the WMO Data Policy. A more specific data policy has been developed under the Van-KIRAP project and will be released soon.

Observations data are archived and accessed through Climate Data for the Environment (CliDE). CliDE is a Climate Data Management System (CDMS) originally developed as part of the Pacific Climate Change Science Program (PCCSP), funded by DFAT. Ongoing development and support to CliDE has been provided through the Climate and Oceans Support Program in the Pacific (COSSPac), also funded by DFAT. CliDE provides a central database for climate records, with key entry forms, quality assurance tools, reports and data dumps.

4.3. Main data and products received from external sources in a national, regional and global context, such as model and satellite data.

VMGD access a range of products from external sources, including charts, gridded data, satellite imagery and other guidance. Satellite observations from Himawari are accessed via the internet using the JMA-provided SatAID platform.

Internet bandwidth is limited (10 Mbps) and is unreliable. A backup service is available, but at significant cost.

Summary score, recommendations, and comments for Element 4

The Vanuatu Meteorological and Geohazards Department is assessed as **Level 2** for this CHD element. A limited amount of GBON-compliant data is shared internationally. The existing practices and infrastructure severely hamper two-way data sharing. One station is effectively GBON-compliant and there is an established connection to the GTS.

Element-4: Data and Product Sharing and Policies			Description: The level of data and product sharing on a national, regional and global level.	
Level one: No observational data is shared internationally, either because not available to be shared or due to the lack of data sharing policies or practices, or the existing infrastructure does not allow data sharing.	Level two: A limited amount of GBON compliant data is shared internationally. The existing data sharing policies or practices or the existing infrastructure severely hamper two-way data sharing.	Level three: Moderately well mandated, managed and resourced and clear plans for, and sufficient capacity to address operational gaps.	Level four: Fully meeting GBON data sharing compliance with a data policy and practices and infrastructure in place. These support free and open sharing of data nationally and, for some products, regionally or internationally as well as the in-house use of external data.	Level five: Exceeding GBON data sharing compliance and additional data (marine, radar, etc.) contributing to regional and international initiatives with policies that promote free and open two-way sharing of data and products

All available data from the synoptic and upper air stations is shared internationally, however there are a number of compliance issues and resourcing issues that need to be addressed.

Data formats used are obsolete alphanumeric code forms. To ensure that Vanuatu receives the maximum benefit from the observations shared, this needs to be addressed. As part of this transition, VMGD should implement a WIS 2.0 node to enable the sharing of data in compliant formats and the reception of data products from global and regional centres.

Recommendations

To improve its performance in this area, it is recommended for VMGD to:

- Implement a WIS2.0 node to enable the rapid sharing of data in modern formats, and improve access to external data and observations;
- Improve internet connectivity to VMGD Headquarters and ensure there are backup communications available; and
- Update the formats for surface and upper air observations to ensure maximum value is extracted for local benefit.

Element 5: Numerical model and forecasting tool application

5.1. Model and remote sensed products form the primary source for products across the different forecasting timescales.

VMGD produces its own forecasts using a range of input data. These include Severe Weather Forecasting Programme (SWFP) products accessed through the MetConnect Pacific platform provided by New Zealand, preformatted charts and images from GFS (US), ECMWF and ACCESS-G (BoM, Aust), and gridded data from the AROME model (MeteoFrance).

Access to data is largely reliable, and this is visualised using the Synergy platform, developed and supported by MeteoFrance. Local forecasts are generated from deterministic models (gridded data) with some ensemble data provided by MetConnect Pacific in the form of graphical products. Below is a summary of the resolution (grid) for the models used in Synergy:

Summary Table

Model	Given Value	Approx. Resolution (Grid Spacing)
ARP-NC	1.5	1.5 km (High-res regional) or 0.1° (Regional)
GFS	0.5	0.5° (roughly 50-55 km)
Arome-NC	0.025	0.025° (roughly 2.5 km)

Forecasts for the general public are generated for 7 days in advance, marine forecasts are generated for 3 days, and aviation forecasts for 24 hours in advance.

Staff are trained in using the various data types and platforms, but this is limited to on the job and one-off training.

5.2. a) Models run internally (and sustainably), b) Data assimilation and verification performed, c) appropriateness of horizontal and vertical resolution.

There are no models run internally to VMGD. Forecasts are generated based on external guidance products and externally-provided model data. The resolution of the global models is not sufficient to pick up local effects due to island topography.

Forecast verification is performed routinely.

5.3. Probabilistic forecasts produced and, if so, based on ensemble predictions.

As mentioned, some pre-formatted ensemble products are used from SWFP and MetConnect Pacific but there is no post-processing of these products. The products are verified on an annual basis.

Summary score, recommendations, and comments for Element 5

The Vanuatu Meteorological and Geohazards Department is assessed as **Level 3** for this CHD element – 'Prediction based mostly on model guidance from external and limited internal sources (without data assimilation) and remoted sensed products in the form of maps, figures and digital data and cover nowcasting, short and medium forecast time ranges.'

Element-5: Numerical Weather Prediction Model and Forecasting Tool Application			Description: The role of numerical weather prediction model output and other forecasting tools in product generation. Whether local modelling is sustainably used to add value to model output from WMO Global Data-processing and Forecasting System (GDPFS) centres.	
Level one: Forecasts are based on classical forecasting techniques without model guidance and only cover a limited forecast time range.	Level two: Basic use of external model output and remote sensed products in the form of maps and figures, covering only a limited forecast time range.	Level three: Prediction based mostly on model guidance from external and limited internal sources (without data assimilation) and remoted sensed products in the form of maps, figures and digital data and cover nowcasting, short and medium forecast time ranges.	Level four: Digitized model output from internal (with data assimilation) and/or external (regional) sources and remote sensed products and data used and value-added through post-processing techniques extended into longer ranges.	Level five: Optimal combination of global, regional and local models, remote sensed data, post-processing techniques and automated probabilistic product generation over weather and climate time scales with minimal human intervention supported by up-to-date verification statistics.y sharing of data and products

Recommendations

To improve its performance in this area, it is recommended for VMGD to:

- Expand staff capability in the use and interpretation of ensemble prediction systems, including training in probabilistic product interpretation and communication for public and sectoral services;
- Develop a small suite of locally post-processed forecast products, using bias correction or simple statistical downscaling to improve the relevance of externally sourced model guidance for island-scale conditions; and
- Formalise a programme of regular forecast verification, including event-based reviews, to support continuous improvement and strengthen user confidence in forecast reliability.

Element 6: Warning and advisory services

6.1. Warning and alert service cover 24/7.

The warning and alert service operated by VMGD is staffed 24/7 and operates continuously.

At present, there are no formal Multi-Hazard Early Warning Systems (MHEWS) in place, but there are some components under development. It is anticipated that some impact-based services and products will be operational by the end of 2025.

Monitoring and forecasting systems operate largely independently for multiple hazards occurring simultaneously or cumulatively and any integration of warnings occurs at the senior management level during times of crisis.

Despite the lack of formal MHEWS, VMGD make extensive use of social media for public engagement and VMGD staff conduct regular Q&A sessions on public radio.

6.2. Hydrometeorological hazards for which forecasting and warning capacity is available and whether feedback and lessons learned are included to improve warnings.

A comprehensive set of warning services are provided across a range of meteorological, hydrometeorological and geophysical hazards, including volcanic ash, tropical cyclones, thunderstorms, hailstorm and heavy rain, marine warnings, strong wind, flood, storm surges and coastal inundation.

User feedback mechanisms have been established through the VMGD website and mobile app and there is some ability through this mechanism to verify warnings, although this is done more on an ad hoc basis.

In addition, there are questionnaires used for outreach to communities to better understand their needs and measure the effectiveness of service delivery and coordination. Following tropical cyclones, there are post-cyclone reviews internally and with the NDMO.

VMGD uses some guidance products provided by the RSMCs, notably volcanic ash alerts from MetService New Zealand. For tropical cyclone, RSMC Fiji names the system, then VMGD produces its own TC forecast bulletins & TC tracks.

Warnings and forecasts for priority hazards are archived electronically. Historical observation data is accessible using the CliDE system, with limited metadata available.

Whilst the national MHEWS is not subjected to regular system-wide tests and exercises, there are pre-season refreshers. For tsunamis, alarms are checked annually during drills. The alarms were upgraded as part of the Van-KIRAP project. Tsunami sirens operate only in Port Vila and Luganville.

Back-up generators are installed at the VMGD headquarters and Bauerfield. The V-CAP project is providing power backup to the Pekoa Airport Met Office on Espiritu Santo. Sustaining the power backup following V-CAP has been captured within VMGD planning.

6.3. Common alerting procedures in place based on impact-based services and scenarios taking hazard, exposure and vulnerability information into account and with registered alerting authorities.

VMGD with the support of WMO and CREWS began the implementation of Impact-based Forecast and Warning Services (IBFWS) throughout 2024[6]. This included a series of

[6] *Impact-based Forecast and Warning Services (IBFWS) and the Common Alerting Protocol for Vanuatu | World Meteorological Organization*

workshops aimed at building the organisational capability for IBFWS and operationalising the Common Alerting Protocol (CAP). Warnings in CAP format have been issued operationally since February 2025.

Overall maturity on impact-based forecasts is improving and the warnings issued by VMGD do include advice on actions to be taken to reduce risks.

Summary score, recommendations, and comments for Element 6

The Vanuatu Meteorological and Geohazards Department is assessed as **Level 3** for this CHD element. VMGD operates a weather-related warning service with good public reach and good working relationships with relevant institutions, including disaster management agencies.

Element-6: Warning and Advisory Services			Description: NMHS' role as the authoritative voice for weather-related warnings and its operational relationship with disaster and water management structures.	
Level one: Warning service not operational for public preparedness and response.	Level two: Basic warning service is in place and operational but with limited public reach and lacking integration with other relevant institutions and services.	Level three: Weather-related warning service with modest public reach and informal engagement with relevant institutions, including disaster management agencies.	Level four: Weather-related warning service with strong public reach and standard operational procedures driving close partnership with relevant institutions, including disaster management agencies.	Level five: Comprehensive, impact-based warning service taking hazard, exposure and vulnerability information into account, with strong public reach. It operates in close partnership with relevant national institutions, including disaster management agencies and registered Common Alerting Protocol alerting authorities.

Achieving the next level of maturity requires the completion of current work around implementation of MHEWS and the development of impact-based forecasts for priority hazards. Additionally, a formal feedback mechanism should be introduced for verification of warnings and for assessing their effectiveness.

Recommendations

To improve its performance in this area, it is recommended for VMGD to:

- Complete the implementation of a national Multi-Hazard Early Warning System, integrating meteorological, hydrological and geophysical hazards within a unified operational and communications framework;
- Establish a formal feedback and verification mechanism for warnings, drawing on community input and post-event analyses to strengthen warning effectiveness; and
- Accelerate the operationalisation of Impact-Based Forecast and Warning Services (IBFWS) for priority hazards and expanding CAP-based alerts.

Element 7: Contribution to Climate Services

7.1. Where relevant, contribution to climate services according to the established capacity for the provision of climate services.

For ranking climate services, the Country Hydromet Diagnostics uses a six-point rating scale, ranging from 'Not Applicable', through 'Less than Basic', 'Basic', 'Essential', 'Full' and 'Advanced'. The scale is applied across six categories, in alignment with the WMO Checklist for Climate Services Implementation.[7]

Climate Services Governance

A Climate Services Framework for Vanuatu was developed in 2016 which set out a number of key recommendations for Vanuatu to increase its maturity in this area. The Meteorological Act delineates responsibilities between meteorology and climate and, in defining the responsibilities of VMGD, limits climate responsibilities to monitoring component.

The VMGD includes a climate services area with seven staff (including the head). The climate section covers research, seasonal prediction, management of the rainfall network, data analysis and homogenisation, and integration of traditional knowledge.

Overall, climate activities are well coordinated within Vanuatu as described in previous sections and there has been significant investment through projects over many years. As a result, Vanuatu's capacity is ranked as 'Full' in this area.

Basic systems

As discussed in the previous sections, the overall climate observing network, data management, monitoring and forecasting systems for Vanuatu's climate services are assessed as 'Essential'.

Some data rescue is performed but the position supporting this is currently vacant.

User Interface

Vanuatu has a set of advanced tools for providing climate information to the community and advanced users. The Vanuatu Climate Futures Portal, developed under the Van-KIRAP project is a sophisticated portal allowing access to historical and projected climate information.

Monitoring and evaluation of the benefits occurs under the development projects, in particular V-CAP2 is undertaking this work.

Taking these aspects into account, Vanuatu is ranked as 'Full' in this area.

Provision and application of Climate Services

VMGD has a dedicated climate services area and provides a range of services including monthly climate summaries, climate outlooks, ocean outlooks and two-weekly rainfall outlooks. VMGD also provide sectoral products for the agriculture, fisheries, Infrastructure and tourism sectors.

Taking this into account, Vanuatu is ranked as 'Full' in this area.

[7] *https://extranet.wmo.int/edistrib_exped/grp_has/_en/Archives%202011_2022/Archives%202020/18582-2020-S-CS-Checklist_en.pdf*

Monitoring and evaluation of the socio-economic benefits

Whilst the service delivery tools and capabilities are impressive, VMGD has limited capacity to measure the socio-economic benefits of its climate services. There are no formal processes in place and for this aspect, VMGD is reliant on the monitoring and evaluation components of donor projects and are rated as 'Basic' for this criterion. In particular, the V-CAP 2 project is doing monitoring and review.

Capacity Development

VMGD does not conduct any formal capacity development of other agencies or departments. However, development projects do provide workshops and training in climate awareness and the use of climate tools. The Van-KIRAP project has run a number of outreach and capacity development activities to the agriculture, tourism and water resources sectors that are well established. As such, VMGD are rated as 'Essential' for this criterion.

Summary score, recommendations, and comments for Element 7

The Vanuatu Meteorological and Geohazards Department is assessed as **Level 3** for this CHD element. It has an essential level of capacity for climate services provision.

Element-7: Contribution to Climate Services				Description: NMHS role in and contribution to a national climate framework according to the established climate services provision capacity.
Level one: Less than basic Capacity to provide Climate Services	Level two: Basic Capacity for Climate Services Provision	Level three: Essential Capacity for Climate Services Provision	Level four: Full Capacity for Climate Services Provision	Level five: Advanced Capacity for Climate Services Provision

VMGD has impressive capabilities for provision of climate services and is assessed as 'Full' for governance, user interface and service provision. Other elements are not as strong and, in particular VMGD is heavily reliant on donor projects for monitoring and evaluation, and for capacity development. If these aspects are addressed, it would bring Vanuatu to the next level of maturity.

Recommendations

To improve its performance in this area, it is recommended for VMGD to:

- Strengthen VMGD's capacity for monitoring and evaluating the socio-economic benefits of climate services, reducing reliance on project-based M&E frameworks;
- Reinstate and resource data rescue activities, ensuring that historical records can support high-quality climate analyses and user applications; and
- Develop a sustained national programme of sector-focused capacity development, building on Van-KIRAP and V-CAP2 to support long-term institutional strengthening beyond project cycles.

Element 8: Contribution to hydrology

8.1. Where relevant, standard products such as quantitative precipitation estimation and forecasts are produced on a routine basis according to the requirements of the hydrological community.

VMGD produce standard public precipitation forecasts and warnings of severe precipitation events. There are no quantitative precipitation forecasts produced but estimates of past rainfall are generated using data from Vanuatu's rain gauge network.

8.2. SOPs in place to formalize the relation between Met Service and Hydrology Agency, showing evidence that the whole value chain is addressed.

Standard operating procedures between VMGD and the Department of Water Resources are under development. The Van-KIRAP and V-CAP 2 Projects are both addressing this issue.

8.3. Data sharing agreements (between local and national agencies, and across international borders as required) on hydrological data in place or under development.

Data sharing agreements are informal at this point. VMGD provide rainfall data to the Ministry of Lands and Natural Resources to assist them with water recharge monitoring and management. As mentioned in the previous point, these are under development with the help of donor projects.

8.4 Joint projects/initiatives with hydrological community designed to build hydrometeorological cooperation.

The Van-KIRAP and V-CAP 2 projects are funding new rain gauges across the country in support of climate information and specifically for the agriculture sector. V-CAP has also supported the installation of two river gauges as a joint project between VMGD and the Department of Water Resources. These projects are driving closer cooperation between the two departments.

Summary score, recommendations, and comments for Element 8

The Vanuatu Meteorological and Geohazards Department is assessed as **Level 3** for this CHD element. The responsibilities of VMGD and other departments are clear but would benefit from further development of data sharing arrangements and standard operating procedures.

Element-8: Contribution to Hydrology				Description: NMHS role in and contribution to hydrological services according to mandate and country requirements.
Level one: No or very little meteorological input in hydrology and water resource management.	Level two: Meteorological input in hydrology and water resource management happens on an ad hoc basis and or during times of disaster	Level three: There is a moderately well-functioning relationship between the meteorological, hydrological and water resources communities but considerable room for formalizing the relationship and SOPs.	Level four: The meteorological, hydrological and water resources sectors have a high-level formal agreement in place and an established working relationship and data sharing take place, but institutions still tend to develop products and services in isolation.	Level five: The meteorological, hydrological and water resources sectors have robust SOPs and agreements in place to work closely in developing new and improved products and providing seamless and advanced services.

Recommendations

To improve its performance in this area, it is recommended for VMGD to:

- Finalise and formalise Standard Operating Procedures between VMGD and the Department of Water Resources to clarify roles, data flows and joint responsibilities across the hydrometeorological value chain;

- Establish formal data-sharing agreements to ensure timely exchange of rainfall, river level and hydrological information for flood monitoring, drought assessment and water resource management; and
- Develop joint hydrometeorological products and services, such as rainfall intensity analyses, drought indices or simple flood guidance tools, in collaboration with the Department of Water Resources.

Element 9: Product dissemination and outreach

9.1. Channels used for user-centred communication and ability to support those channels (for example, does the NMHS operate its own television, video or audio production facilities? Does it effectively use cutting-edge techniques?).

Under legislation, VMGD is the only institution authorised to issue warnings.

In December 2024 VMGD released its 'VMGD" mobile application, which provides current weather, forecasts and warnings, and geohazard alerts in Vanuatu. In addition, for tsunami warnings and tropical cyclones, warnings are sent via text messages.

VMGD has a comprehensive website which is kept up to data and which has links to the Climate Futures Portal. Information on the website is provided in English, with some bulletins also provided in the national language, Bislama. VMGD also makes extensive use of Facebook as a means of getting information quickly to users.

VMGD supports live broadcast to TV and radio stations. Audio is recorded and sent to radio and TV stations for broadcast. There are toll-free numbers available which also contain this audio information.

9.2. Education and awareness initiatives in place.

Raising awareness is done at the Department level, in particular the Department of Local Authorities which coordinates outreach to local communities in partnership with various stakeholders, including non-governmental organisations (NGOs). These efforts cover topics such as hazard awareness and related issues.

The Van-KIRAP and V-CAP 2 projects have also made significant investments in strengthening community understanding of hazards and climate issues more broadly. Activities include regular Q&A sessions with VMGD staff on local radio.

9.3. Special measures in place to reach marginalized communities and indigenous people.

There are a range of last mile activities that reach out to remote communities, including the establishment of community climate centres and the appointment of climate champions across the six provinces. These initiatives also make use of Community Action Plans (CAPs), which incorporate Google Alert–based protocols to support timely information sharing.

Climate centre activities target schools and community centres.

Summary score, recommendations, and comments for Element 9

The Vanuatu Meteorological and Geohazards Department is assessed as **Level 4** for this CHD element. A large fraction of the population is reached using various communication techniques and platforms, in collaboration with partners, and a user-friendly and informative website. Outreach and education activities occur regularly. A moderately effective communication and dissemination strategy and practices are in place, based largely on in-house capabilities and supported by donor projects.

Element-9: Product Dissemination and Outreach			Description: The level of effectiveness of the NMHS in reaching all public and private sector users and stakeholders.	
Level one: Dissemination using only limited traditional channels such as daily newspapers and the national broadcaster and with little control over messaging and/or format.	Level two: Traditional communication channels and a basic dedicated website is used to disseminate forecasts and basic information.	Level three: A moderately effective communication and dissemination strategy and practices are in place, based only on in-house capabilities and supported by user-friendly website.	Level four: A large fraction of the population is reached using various communication techniques and platforms, in collaboration with partners, and a user-friendly and informative website and apps. Outreach and education activities occur regularly.	*Level five: Advanced education, awareness and communication strategy, practices and platforms in place using various technologies tailored to reach even marginalized communities and in close cooperation with several partners.*

Recommendations

To improve its performance in this area, it is recommended for VMGD to:

- Develop a national communication strategy for hydrometeorological and geohazard services, consolidating web, mobile app, radio, television and social media channels into a coherent framework;
- Expand education and outreach programmes, using schools, community centres and provincial authorities to institutionalise awareness activities beyond project-supported initiatives; and
- Strengthen last-mile communication systems, including tailored messaging for remote and marginalised communities, building on existing mobile app and SMS systems.

Element 10: Use and national value of products and services

10.1. Formalized platform to engage with users in order to co-design improved services.

A formalised platform to engage with stakeholders is under development through the Van-KIRAP Project. This involves a monthly forum including Departments of Agriculture, Public Works, Energy, Water, Tourism, Fisheries, Health and the NDMO. Civil Organisations are also included such as the Red Cross, World Vision, Save the Children. This is generally led by VMGD, otherwise by other sectors if outside the regular climate update.

There are several national committees which VMGD is a part of including the National Disaster Committee and the National Advisory Board on Climate Change and Disaster Risk Reduction.

There is no formalised mechanism for the co-design and/or co-production of tailored products and services, however there are several proactive examples of this. Some other examples include incorporating climate impacts into road design, drones for mapping with Public Works Dept, river gauge monitoring, and agriculture case studies on different islands. A mechanism is under development through the Van-KIRAP Project.

Standard aviation services are provided such as TAFs, TTF, SPECI, ROFOR and area forecasts. Audits do take place and VMGD is aiming for Part 174 certification and accreditation under ISO9001:2015.

A number of studies on the social and economic benefits (SEB) of weather, climate and water hydrological services been undertaken, notably under the Van-KIRAP Weather Radar project where a cost-benefit analysis was required.

10.2. Independent user satisfaction surveys are conducted, and the results used to inform service improvement.

VMGD does not conduct formal user satisfaction surveys. There is some feedback provided at the director level through the National Disaster Committee after extreme events.

10.3. Quality management processes that satisfy key user needs and support continuous improvement.

There are currently no formal quality management processes in place.

VMGD is in the process of implementing a QMS for aviation and aspire to expand to other services. Aviation QMS is still at pre-audit phase. The initial audit has occurred (via the Pacific Aviation Safety Office) and VMGD are currently working through its findings and recommendations.

Summary score, recommendations, and comments for Element 10

The Vanuatu Meteorological and Geohazards Department is assessed as **Level 3** for this CHD element. Service development draws on regular dialogue with major stakeholders.

Element-10: Use and National Value of Products and Services			Description: Accommodation of public and private sector users and stakeholders in the service offering and its continuous improvement.	
Level one: Service development lacks any routine stakeholder feedback practice.	Level two: Service development draws on informal stakeholder input and feedback.	Level three: Services development draws on regular dialogue with major stakeholders.	Level four: Service development draws on survey data and regular dialogue based on formal relationships with major stakeholders to ensure continuous improvement.	*Level five: Strong partnerships, formal and objective survey and review processes exist with all major stakeholders enabling service co-design and continuous improvement.*

To maintain this level, it will be important for VMGD to build on the strong foundation delivered through projects and maintain the dialogue with its stakeholders.

Recommendations

To improve its performance in this area, it is recommended for VMGD to:

- Formalise a platform for co-design and co-production of services, building on the emerging Van-KIRAP monthly forum to support tailored products across agriculture, public works, fisheries, health and other sectors;
- Introduce regular user satisfaction surveys and sector-specific feedback loops, ensuring that insights are systematically incorporated into service improvement processes; and
- Expand quality management processes beyond aviation services, progressively establishing a department-wide QMS to ensure consistency, reliability and continuous improvement of all service areas.

Annex 1 Consultations (including experts and stakeholder consultations)

Stakeholders spoken to include:

- VMGD Director and staff
- Project leaders for VAN-CAP 2 and Van-KIRAP
- Project coordinator for Partnerships for Aviation project

Annex 2 Urgent needs reported

- There is an urgent need for thermometers, with the phasing out of mercury. These are to be replaced with alcohol in glass or digital thermometers.
- There is a need to standardize all AWS, from data loggers to sensors, to reduce the maintenance and training burden on VMGD.
- There is a need to improve upper-air sounding charts, with a fully-documented chart of the sounding path.

Annex 3 Information supplied through WMO

Information supplied by WMO was limited to the observation system. Observing system metadata was extracted from OSCAR/Surface. The performance of the observing system, in terms of international exchange, was determined using the WIGOS Data Quality Monitoring System (WDWMS).

Annex 4 List of materials used

Materials used:

- VMGD Strategic Plan
- VMGD Website
- Vanuatu Climate Futures Portal
- Project documentation (see footnotes)
- Relevant acts of Parliament