



# Vanuatu Klaemet Infomesen Blong Redy, Adapt Mo Protekt (Van-KIRAP)

Infrastructure and Climate Information Services (CIS):  
Policy Review, Action and Communication Plan





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*The Pacific environment, sustaining our livelihoods and natural heritage in harmony with our cultures*

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Cover photograph: Essential road infrastructure in Vanuatu. Photo Credit: Anita Roberts, Vanuatu Daily Post.

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## Acronyms

APCC	APEC Climate Centre
AWS	Automatic Weather Station
BoM	[Australian] Bureau of Meteorology
CDMS	Climate Data Management System
CLEWS	Climate Early Warning System
ClIDE	Climate Data for the Environment
ClIDesc	Climate Data for the Environment Services Application Client
CSIRO	Commonwealth Scientific and Industrial Research Organisation (Australia)
EEZ	Exclusive Economic Zone
FAD	Fish Aggregation Device
FAO	Food and Agricultural Organization (of the United Nations)
GCF	Green Climate Fund
GEF-LDCF	Global Environment Facility-Least Developed Countries Fund
GFCS	Global Framework for Climate Services
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (Germany)
NAPA	[Vanuatu] National Adaptation Programme of Action
NCOF	National Climate Outlook Forum
NIWA	National Institute of Water and Atmospheric Research (New Zealand)
NOAA	National Oceanographic and Atmospheric Administration (USA)
NOP	National Ocean Policy (2016)
PRSCS	Pacific Roadmap for Strengthened Climate Services
SDP	[National] Sustainable Development Plan 2016—2030
SNC	[Republic of Vanuatu] Second National Communication to the UNFCC
SPCZ	South Pacific Convergences Zone
SPC	The Pacific Community

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SPREP	Secretariat of the Pacific Regional Environment Programme
UNDP	United Nations Development Programme
Van-KIRAP	Vanuatu Klaemet Infomesen blong Redy, Adapt mo Protekt (formerly known as Climate Information Services for Resilient Development [CISRD] in Vanuatu Project)
VCU	Vanuatu Climate Update
VMGD	Vanuatu Meteorology and Geohazards Department

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## Executive Summary

The Vanuatu Klaemet Infomesen blong Redy, Adapt mo Protekt (Van-KIRAP) Project is delivering climate science to support decision makers and communities in Vanuatu to prepare for and adapt to climate variability and change. Although Vanuatu has been identified as a carbon sink, it is significantly affected already by changing weather patterns and the start of slow-onset climate change, such as warming oceans.

Assessments of vulnerability to climate change undertaken over the last two decades have identified Vanuatu as highly exposed to climate variability and change, and at risk of impacts, with the country ranked 9th globally under the Climate Risk Index for 1998–2017<sup>1</sup>. The Government of Vanuatu and development partners have developed policies and strategies to improve access to reliable climate information and to ensure it is used effectively to minimise impacts. Both these objectives are expensive and difficult to achieve, and so the integration of climate information into planning processes has been slow.

Van-KIRAP will support VGMD to provide five target sectors, including the Ministry of Infrastructure and Public Utilities (MIPU) and its stakeholders, with climate information ready to be used in current and planned activities. A sector coordinator in MIPU will co-ordinate implementation of the Infrastructure and Climate Action and Communication Plan to advance the mainstreaming of climate information services into infrastructure policy, planning, design and delivery.

This document reviews existing information on climate variability and change as they affect Vanuatu's fisheries sector and summarises current policies, strategies and frameworks. It provides the Fisheries Climate Action Plan and Communication Plan developed through a collaboration between the Department of Fisheries and the Vanuatu Meteorology and Geohazards Department (VMGD).

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<sup>1</sup> German Watch (2019) Global Climate Risk Index 2019: Who Suffers Most from Extreme Weather Events? Weather-related loss events in 2017 and 1998 to 2017. Authors: David Eckstein, Marie-Lena Hutfils and Maik Winges, Munich, Germany.



## 1. Background

The VMGD, in partnership with the Secretariat of the Pacific Regional Environment Programme (SPREP) and funded by the Green Climate Fund (GCF) is leading the Vanuatu Klaemet Infomesen blong redy, adapt mo protekt (Van-KIRAP) Project.

Van-KIRAP “will increase the ability of decision makers, communities and individuals across five target sectors (agriculture, fisheries, infrastructure, tourism and water) to plan for and respond to the long- and short-term impacts of climate variability and change”.

The project is building capacity to harness and manage climate data, develop and deliver practical Climate Information Services (CIS) tools, support the coordination and dissemination of tailored information, enhance CIS related information technology and infrastructure, improve the accessibility of CIS to sectors and communities, and support the application of CIS through real-time processes.

CIS provides people and organisations with timely, tailored climate-related information and tools that can be used to minimise the impacts of climate variability and change on lives, livelihoods, natural resources, property and infrastructure. CIS supports better policy, planning, and decision-making across sectors, and at national and community scales in the long- and short-term.

The Project is responding to priorities identified in the Vanuatu Framework for Climate Services (2016) and the VMGD Strategic Development Plan 2014–2023, developed through a national consultation and design process.

Without timely and tailored information about the impacts of climate variability and change, development sectors, governments and communities risk significant losses and damage from extreme events such as drought, heat waves, cyclones and flooding, and from slow onset changes, such as rising temperatures, sea-level rise and ocean acidification.<sup>2</sup>

In support of these objectives, Van-KIRAP commissioned the development of sector specific Climate Information Services (CIS) Action and Communication Plans. This document reflects the requirements of the infrastructure (public works) sector as it relates to CIS in Vanuatu.

## 2. Climate in Vanuatu

Vanuatu is one of the world’s most vulnerable countries to natural disasters. It experiences droughts, floods, cyclones, volcanic eruptions, landslides, tsunamis and coastal inundation. Its location in the ‘warm pool’ of the South Pacific Convergence Zone (SPCZ) means its population is highly exposed to tropical cyclone activity.

The landscape is characterised by six island groups (Provinces), of mostly mountainous volcanic origin; steep catchments lead to narrow coastal plains vulnerable to flooding. It has a tropical climate, moderated by southeast trade winds from May to October, and moderate rainfall from November to April, often affected by cyclones from December to April. Vanuatu has a population of approximately

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<sup>2</sup> SPREP, RFT: Climate Information Services Policy Review, Sector-Action and Communications Plan Consultancy, 2018

278,000 that is concentrated along the coastal environment that plays a vital role in the subsistence and commercial life of ni-Vanuatu.

Increased human activity in this coastal environment is placing greater pressure on sensitive areas such as beaches, coral reefs, seagrass and mangroves. Atolls, low-lying islands, and low-lying coastal areas of Vanuatu are particularly vulnerable to climate change consequences. Some of these climate related risks include the following:

- by 2040, daily temperatures will increase from 1995 levels by 1.2°C;
- sea level rise will continue and accelerate, so risks of coastal inundation will be high when combined with storm surges and high seas;
- ocean acidification may degrade 80% of coral reefs within 20 years;
- extreme temperatures will reach higher levels and become more frequent;
- extreme weather events, including cyclones and storms, will increase in intensity but not necessarily in frequency; and
- dry periods will last longer and extreme rainfall will be more frequent and intense, so Vanuatu will be susceptible to intensified erosion and flooding.

The economy is based primarily on small-scale agriculture, which provides a living for about two-thirds of the population (and is a particular source of income and livelihood for women). Fishing, offshore financial services, and tourism (with nearly 197,000 visitors in 2008), are other mainstays of the economy. Most of the population does not have access to a reliable supply of potable water, though 94.5% has access to 'improved' water sources, and deforestation exists as a major environmental challenge.

The main climate hazards for Vanuatu include tropical cyclones with high winds and wave energy, heavy rainfall resulting in flooding, extended periods without rain causing drought, rising sea levels threatening coastal environments and property, as well as sea temperature increase and ocean acidification impacting highly valuable coastal ecosystems and resources (including coral reefs, seagrass and fisheries). Pacific region adaptation costs across all vulnerable sectors are estimated to be between US\$158 – 775 million per annum until 2050 to prepare for best to worst case future scenarios (with US\$447 million under business-as-usual) (ADB 2013).<sup>3</sup>

### **3. Climate Services in Vanuatu**

#### **3.1 Vanuatu Meteorology and Geohazards Department (VMGD)**

VMGD's mandate is decreed by the Meteorology, Geological Hazards and Climate Change Act (2016) — Act No.25 of 2016. The Act gives the VMGD wide ranging powers with respect to the execution of meteorological, geological and climate change related services.

VMGD is headed by the Director of VMGD, who is accountable to the Director General of the Ministry of Climate Change, Meteorology, Geo-Hazards, Energy, Environment and Disaster Management. The Director General is also co-chair of the National Advisory Board (NAB) on Climate Change (CC) and

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<sup>3</sup> SPREP, GCF Funding Proposal: Climate Information Services for Resilient Development in Vanuatu, 2016

Disaster Risk Reduction (DRR) which facilitates and endorses the development of new DRR and CC programs, projects, initiatives and activities, acts as a focal point for information-sharing and coordination on CC/DRR, and guides and coordinates the development of national climate finance processes.<sup>4</sup>

VMGD is responsible for the collection, quality control, processing, storage and retrieval of meteorological and climatological data so that it may be utilised by a wide variety of stakeholders. One of its primary responsibilities is the preparation and publication of seasonal climate forecasts and long-term climate change predictions. VMGD provides technical expertise to the National Disaster Management Office (NDMO) and various climate-sensitive sectors during ENSO events, and disseminates advisories on significant climate events such as El Niño and La Niña. It also pursues climate variability and climate change research in support of national development strategies. In addition, VMGD has an active focus on community engagement, which includes raising awareness of its climate information and services, and how these might be utilised by various end-users.<sup>5</sup>

#### National climate products from VMGD

1. Vanuatu Climate Update (VCU) – the VCU is produced monthly and is an outlook of expected climate for the upcoming three months. It includes information on seasonal rainfall, tropical cyclones and sea surface temperature. The VCU is disseminated via the VMGD website and email and comes in both English and Bislama.<sup>6</sup> (Figure 1)
2. ENSO (El Niño–Southern Oscillation) update
3. Climate Services: Report for Agriculture – produced from AWS data at a site and available via the VMGD website
4. Media release – El Niño, or La Niña, TC outlook
5. Tropical Cyclone Outlook – usually released early November
6. Klaod Nausara Animation – explains the impacts of El Niño and La Niña
7. Brochures – La Niña and El Niño in English
8. ENSO handbook (DVD, brochures and a games toolkit)
9. Vanuatu Ocean Outlook – in trial
10. Early Alert Rainfall Watch – in trial
11. Rainfall data request – rainfall, temperature, etc.

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<sup>4</sup> World Meteorological Organization, *Enhancing Early Warning Systems to build greater resilience to hydro and meteorological hazards in Pacific Small Island Developing States (SIDS): National consultation report*, Jan 2018

<sup>5</sup> SPREP, GCF Funding Proposal: Climate Information Services for Resilient Development in Vanuatu, 2016

<sup>6</sup> SPREP, Vanuatu Framework for Climate Services, 2016

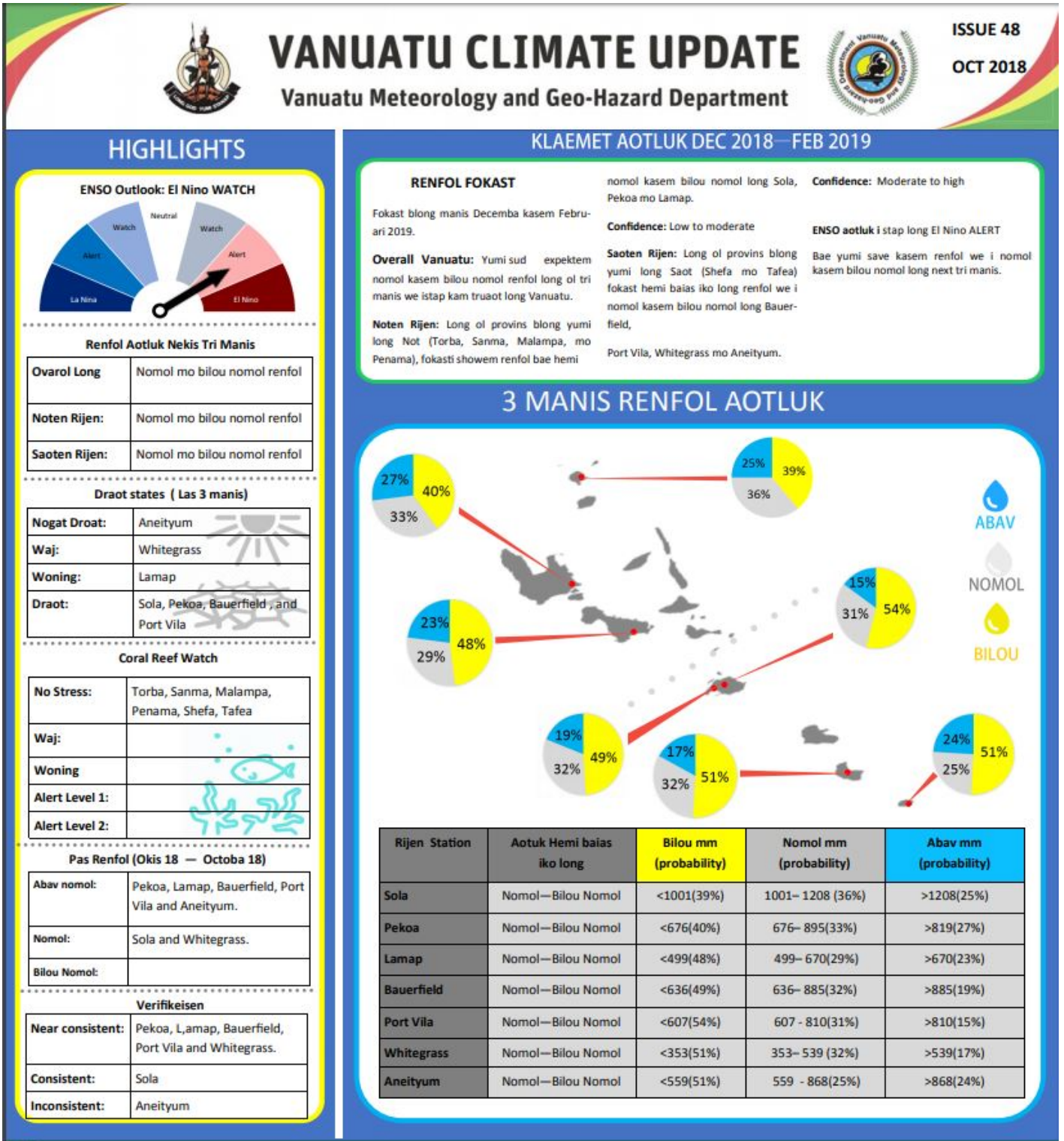


Figure 1: Vanuatu Climate Update (Source: VMGD)

### National Climate stakeholder liaison by VMGD

1. VMGD Monthly climate briefings – Presentation on the climate summary and outlook information
2. VMGD 3-Monthly climate briefings – Presentation on the climate summary and outlook information
3. VMGD National Climate Outlook Forum
4. Media briefings – Radio talkback monthly.

### Regional Climate products supported by partners

#### SPREP

1. Early Action Rainfall (EAR) Watch
2. Traditional Knowledge program (housed at VMGD) – survey form, database system
3. Climate Information Toolkit for the Pacific (<http://clikp.sprep.org/>) (supported by APCC)
4. Pacific Island Countries Advanced Seasonal Outlook (PICASO) – rainfall threshold predictions (<http://clikp.sprep.org/>) (supported by APCC)
5. SCOPIC/Seasonal Forecasting (in partnership with BoM) – 3 month prediction (<https://www.pacificmet.net/products-and-services/climate-bulletin>)

#### Australian Bureau of Meteorology (BoM)

Services covered:

1. COSPPac Bulletin (<https://www.pacificmet.net/products-and-services/climate-bulletin>)
2. SCOPIC/Seasonal Forecasting – 3 months (<https://www.pacificmet.net/products-and-services/climate-bulletin>)
3. Drought Monitoring Tool (has an ability to set thresholds for different water requirements)
4. ENSO Wrap-up (<http://www.bom.gov.au/climate/enso/>)
5. CliDE (climate data for the environment) (and CliDEsc which is supported by NIWA)
6. Sea-level information products (real time data monitoring and tide calendars)
7. Pacific Climate Change Data Portal (<http://www.bom.gov.au/climate/pccsp/>)
8. TC portal (<http://www.bom.gov.au/cyclone/history/tracks/>)
9. ACCESS-S dynamic model (in development) – outlook for season, month, fortnight and week
10. POAMA dynamic model – 3 to 9 month forecasts (SST+, hot spots, bleaching risk etc.)
11. ReefTemp Next Gen – 1 to 14 days SST, SST+, hot spots and bleaching risk maps)

#### Commonwealth Scientific and Industrial Research Organisation (CSIRO)

1. Climatology of Vanuatu: Past, present and future
2. Technical Report and non-technical country brochure
3. Regional Climate Consortium in Asia-Pacific (RCCAP) Portal
4. Websites and portals:
  - [www.pacificclimatechangescience.org](http://www.pacificclimatechangescience.org)
  - [www.pacificclimatefutures.net](http://www.pacificclimatefutures.net)
  - [www.pacificmet.net/rcc](http://www.pacificmet.net/rcc)
  - [www.rccap.org](http://www.rccap.org)

## Other Organisations

1. Pacific Ocean Portal (formerly BoM and now supported by SPC)
2. Tide Predictions Calendar (<http://www.bom.gov.au/pacific/projects/pslm/>) (SPC)
3. RiskScape – Land-use planning tool that includes sea level, rainfall, elevation (NIWA)
4. Coral Reef Watch – 9-month SST+ and bleaching projections (NOAA and used by VMGD) (<https://coralreefwatch.noaa.gov/satellite/baa.php>)
5. Bleaching Futures – downscaled coral bleaching return interval projections to 2100 for Vanuatu (NOAA/Symbioseas)<sup>7</sup>

## 4. Infrastructure in Vanuatu

Infrastructure plays a vital role in generating economic growth. Much of the infrastructure, including the main commercial centres of Port Vila and Luganville, are located on the perimeter of the major islands. These centres are only a few meters above sea level. Moreover, much of the road network is also situated on the perimeter of the islands. The infrastructure and other fixed assets are extremely vulnerable to cyclones and storm surges. Enhanced human activities in the coastal areas, including sand extraction and mangrove and other coastal vegetation removal has increased the sensitivity of these important coastal buffers to climate and sea level variations.<sup>8</sup>

Over 250,000<sup>9</sup> people live on 64 of Vanuatu's 80 widely distributed islands (2009 national census; Figure 2). This makes travel difficult and costly. The distance from the southern to northern islands is over 800 km. About 75% of the population lives in rural areas, and 55% live on islands with no significant urban centres. Just under a quarter of the population lives in the two urban areas of Port Vila and Luganville, and these are the only two areas with any significant formal urban services.

	Shefa	Sanma	Torba	Penama	Malampa	Tafea	Total	Port Vila	Luganville
Population	78,723	45,855	9,359	30,819	36,724	32,540	234,020	43,275	12,786
% of population	33.6	19.6	4.0	13.2	15.7	13.9	100.0	18.5	5.5
No. of households	15,930	9,213	1,766	6,620	7,991	5,853	47,373	9,054	2,552

Figure 2: Population by Province and Urban Areas (Source: National Census, 2009)

Vanuatu's geography also makes it difficult to build infrastructure efficiently and economically. Small population clusters make economic and financial justification difficult. Logistical problems of moving large construction equipment from island to island deter contractors and increase prices. Once built, limited capacity and resources to maintain infrastructure leads to asset deterioration. Consequently, there are significant gaps in providing and operating physical infrastructure, particularly in poor and remote rural areas. In the late 1990s and early 2000s, development partner assistance was focused

<sup>7</sup> Maynard, J., Heron, S., van Hooidek, R., Tracey, D. 2018; Past and projected future impacts of coral bleaching on the reefs of Vanuatu. Report to the Secretariat of the Pacific Regional Environment Programme (SPREP), Apia, Samoa (19 pp).

<sup>8</sup> Government of Vanuatu; Second National Communication to UNFCC, 2016.

<sup>9</sup> The 2009 National Census, the latest available, recorded a total population of 234,020. For subsequent years, the National Statistics Office (NSO) assumes a 2.5% growth rate up to 2025.

on policy reform, reducing public investment in infrastructure, which Government of Vanuatu (GoV) further constrained as it reduced its debt burden. Infrastructure deficiencies reduce access to essential social services and hinder economic development.<sup>10</sup>

## 4.1 Infrastructure Services in Vanuatu

### 4.1.1 Infrastructure Institutional Arrangements relating to Climate

The Ministry of Infrastructure and Public Utilities is the key partner agency for VMGD to work with on integrating climate information into infrastructure planning and activities. A Memorandum of Understanding (MOU) between the Ministry and VMGD with Standard Operation Procedures (SOPs) and Service Level Agreements (SLAs) is desirable.

### 4.1.2 Current use of climate information by the Infrastructure sector

The Ministry of Infrastructure and Public Utilities currently uses weather forecasts and tide information for aviation and ports/marine operations.

All Ministry staff receive the Vanuatu Climate Update and Monthly Climate Summary, but these products are currently not used operationally.<sup>11</sup>

## 4.2 Main climate impacts on Infrastructure

The main climatic impact affecting infrastructure and public utilities work is higher-than-normal rainfall and flooding. Excessive rainfall causes lots of potholes in urban roads and makes managing many infrastructure projects (such as road, bridge and culvert maintenance) very difficult. El Niño (i.e. drier-than-normal conditions) is a good time for infrastructure maintenance. Flooding often causes damage to infrastructure (especially roads and bridges), and storm surges can damage coastal defences such as sea walls, wharves and ports. Cloudy conditions (particularly low cloud) can have an impact on operations at airports and will affect aviation safety, while stormy conditions will affect maritime safety.<sup>12</sup>

Tropical cyclones Uma, Anne and Bola that hit Vanuatu during 1987 – 88, were the cause of significant economic and social costs. Approximately 50 deaths were reported, a number of inter-island coastal trading vessels were lost, and massive damages sustained by the agriculture and tourism industries. The total destruction of property was valued at over US\$152 million. In 1999, heavy rain associated with tropical cyclone Dani caused serious damage, estimated at US\$8m to infrastructure.<sup>13</sup>

About 85% of the buildings and population in Port Vila are exposed to *moderate* levels of risk from earthquakes and cyclones and 15% are exposed to *high* levels of risk.<sup>14</sup>

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<sup>10</sup> Government of Vanuatu, Vanuatu Infrastructure Strategic Investment Plan 2015-2024.

<sup>11</sup> SPREP, Vanuatu Framework for Climate Services, 2016

<sup>12</sup> SPREP, Vanuatu Framework for Climate Services, 2016

<sup>13</sup> Government of Vanuatu; National Adaptation Plan for Action, 2007.

<sup>14</sup> Connell, 2018.

## 5. Stakeholder Consultations Relating to Climate and Infrastructure

### 5.1 VMGD consultation

The VMGD regularly interacts with a number of sectors through their 3 monthly climate stakeholder engagement and their annual national climate outlook forum (NCOF). VMGD has also undertaken joint engagements with the Infrastructure sector over the last few years including through the development of the Vanuatu Framework for Climate Services, the Vanuatu Coastal Inundation Project and most recently through the Van-KIRAP project. The outcomes of these interactions are incorporated into this document.

### 5.2 Van-KIRAP Sector Consultations

From January to December 2018, several workshops and consultations were held with the Van-KIRAP team and the Infrastructure sector in which recommendations, actions and communication plans were developed and refined. The summary section below articulates the outcomes.

#### 5.3.1 Van-KIRAP Inception Workshop – January 2018<sup>15</sup>

The Technical Inception Workshop for Van-KIRAP, funded by the Green Climate Fund (GCF), was held on 22 February 2018 at the Holiday Inn in Port Vila. “Its purpose was to officially launch and commence the project, refresh awareness of the stakeholders about the project, and review project activities and implementation arrangements.”

One of the outcomes of the workshop was to identify the key project priorities for each sector. The priorities identified by Infrastructure are listed below:

- Identification of strategic policy drivers, engineering requirements and associated CIS decision support priorities for the Vanuatu infrastructure sector.
- Mapping of the CIS capacity of the Vanuatu infrastructure sector to identify training and capacity development priorities.
- Implement preliminary CIS training and capacity development for sectoral stakeholders including engineers, policy makers and others, as appropriate.
- Collection of all existing climate data, climate tools and other data required in designing infrastructure investments. Data collected should include:
  - Rainfall data
  - Rainfall intensity
  - Water catchment area calculation
  - High tide level
  - King tide level
- Combining spatial mapping data and climate database CIS into an integrated Decision Support System (DSS) for the infrastructure sector.
- Incorporate into the DSS, standard design/technical specifications, i.e. culvert sizes for different volume flows, jetty height increments for sea level rise, etc.
- Undertake climate vulnerability and risk assessments for critical infrastructure over multiple timescales and climate scenarios.
- Complete training of Public Works Department Engineers on the use of the software.

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<sup>15</sup> SPREP, Inception Report: Climate Information Services for Resilient Development Planning in Vanuatu (Van-CIS-RDP), 2018



- Trial software on 5 sites, in each of the five Public Works Department (PWD) Divisions in each Province.
- Train communities on basic maintenance of infrastructure (which includes maintenance funds for community contracts).
- Ensure that engineers understand and apply climate science data and information into the design of roads and take into account future projections for floods, storm surge and cyclones.

### 5.3.2 Van-KIRAP Sector Workshops – October 2018

The VMGD “with funding support from the GCF and the Secretariat of the Pacific Regional Environment Programme (SPREP), organised a Sector Consultation Workshop for Developing Climate Action and Communication Plans from 23 October – 2 November 2018.”<sup>16</sup> Pacific Science Solutions (PSS) facilitated and led the consultations with the workshop participants.

The workshop was structured in three parts. The first part was held in Port Vila attended by the Project Delivery Partners, sectors and other science organisations. Sector representatives were supported to draft action and communication plans relating to their use of climate information. The second part of the workshop was held in Santo where provincial sector representatives were asked to review the draft sector action and communication plans written by their Port Vila colleagues. The last part of the workshop was held in Port Vila, where senior sector representatives reviewed and finalised their draft action and communication plans.

See the Workshop Report for more information.

### 5.3.3 Van-KIRAP Follow-up Sector Consultations – December 2018

From 3 – 7 December 2018, Pacific Science Solutions and SPREP conducted follow-up consultations with representatives from four sectors (agriculture, tourism, fisheries and water) to discuss their draft sector plans and seek their respective Directors’ preliminary endorsements. The draft plans incorporated the outcomes of the consultation workshops (Section 5.2.3.2). Infrastructure noted that they were satisfied with their draft plan therefore no meetings were scheduled with PWD.

## 6. Summary of Outcomes for Infrastructure

The following information comes directly from the policy review and the consultations with VMGD and the Public Works Department (PWD). The tables outline the proposed recommendations for the Infrastructure sector’s use of climate services. The proposed actions should be undertaken in conjunction with a communication plan to ensure effective communication between the Infrastructure sector, its primary stakeholders and VMGD.

### 6.1 Recommendations

The recommendations from the VFCS and the priorities identified at the Van-KIRAP Inception workshop were reviewed, updated and prioritised by staff from PWD at the Van-KIRAP Sector Consultation workshops (Table 1). Participants added information and clarity to the recommendations.

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<sup>16</sup> SPREP, Van-KIRAP sector consultation workshop report, 2018

*Table 1: The final list of the Recommendations*

RANK	RECOMMENDATION
1	Decision Support System (DSS)
2	Use the DSS to design a climate resilient infrastructure
3	The Design is Constructed
4	Provide consistent tailored information into the DSS and into annual business workplans
5	Utilise climate information in annual workplan development

## 6.2 Alignment of Recommendations with National and Regional Policies and Plans.

A review of the top 5 national and regional policies and plans associated with Infrastructure and Climate were assessed for alignment with the recommendations. The documents reviewed were: Vanuatu Resilient Roads Manual 2014 (VRRM); Rural Road Access Strategy (RRAS) 2016; Vanuatu Infrastructure Strategic Investment Plan (VISIP) 2015—2024; Vanuatu Framework for Climate Services (VFCS); and VMGD Strategic Development Plan (SDP) (Table 2).

Table 2: Recommendations aligned with National and Regional policies and plans

RANK	RECOMMENDATION	Alignment with National and Regional policies and plans
1	Decision Support System	<b>VRRM:</b> Contains a decision tree analysis for designing climate resilient roads that will likely be included as the Roads section of the DSS.
2	Use the DSS to design a climate resilient infrastructure	<b>RRAS:</b> The Rural Roads Access Strategy work plans are devised using the PWD's Roadworks Prioritisation Tool. This tool consists of a sequential process that uses measurable characteristics, and prioritisation principles to inform the strategy objectives. This methodical approach to rural roads access should be used by the DSS.
3	The Design is Constructed	
4	Provide consistent tailored information into the DSS and into annual business workplans	<b>RRAS:</b> The Strategy notes that year-round connectivity facilitated by a robust road network increases disaster resilience.
		<b>VISIP:</b> Regionally, SPC's Geoscience Commission (formerly SOPAC) provides oversight on climate risk and disaster management in the Pacific. In particular it manages the Pacific Catastrophe Risk Information System (PacRIS). PacRIS has information on 14 Pacific Island countries and on Timor-Leste. The system houses a comprehensive historical catalogue of earthquakes and tropical cyclones, a database of geo-referenced fixed assets, and probabilistic analyses and risk mapping. One NACCC project is particularly relevant to VISIP: the pilot study into vulnerability and adaptation on the Epi island. The study is assessing and measuring the actual potential impacts on the island and its infrastructure. Study outcomes will include estimates of the cost of adaptation for infrastructure (roads, small wharf, airfield). The results of this study will be particularly useful for estimating adaptation costs for VISIP projects and other infrastructure projects.
		<b>VFCS:</b> The development, through consultation with key stakeholders, of tailored climate products (including training on their use); and Improvements to and formalisation of mechanisms for communicating and disseminating climate information (including the use of Ministerial directives giving authority for action). All Government Strategic Policies should be reviewed and if necessary revised to include strategies and actions linked to the provision of climate information from VMGD. A follow-up recommendation is the establishment if necessary, of inter-departmental Memoranda of Agreement (MoAs) and the integration of climate information into Standard Operating Procedures (SOPs), Service Level Agreements (SLAs) and extension officer job descriptions.
5	Utilise climate information in annual workplan development	<b>VMGD Strategic Development Plan (SDP):</b> Key Performance Indicators (KPI)-CS14 Monthly to Seasonal climate information, forecasts, services and warnings for Vanuatu developed and produced. KPI-CS15 Mechanisms for easy and regular access to climate information, forecasts, services and warnings developed and operational. KPI-CS16 Early warning systems for ENSO developed, established, implemented and maintained/sustained.
		<b>RRAS:</b> The strategy references PWD's Vanuatu Roads Standards and Specifications Manual, which includes measures to mitigate the risks of global climate change-induced increased rainfall intensity and higher sea levels/tidal surges.
		<b>VISIP:</b> Climate change information has been mainstreamed into most infrastructure projects, in accordance with development partner safeguard requirements, to ensure climate impacts are minimised, reduced, or addressed. However, as this work is just beginning, it is insufficiently documented to enable a meaningful scoring under VISAP 2015. The VISIP contains a prioritisation criterion to help ensure operational sustainability. Under this criterion are questions such as: Will the project be resilient to future climate change and natural disaster risks? Does the project increase protection for the local population from natural disasters? Does the project contribute to environmental improvement (compared to project alternatives), or does project design lessen potential negative impacts? Climate change will affect most of VISIP's sectors/sub-sectors. Climate change adaptation is now a key driver of future infrastructure development in Vanuatu. Development partner interest and funding commitment are strong. Under the VISIP Overall Results Framework one of the sub-objectives is increasing resilience to climate risks.
		<b>VMGD SDP:</b> Key Outcome 5 under the Administration and Corporate Services Division requires that "communication systems [be] developed for key management information outputs for Ministry requirements".

## 6.3 Policies and Plans relating to Infrastructure and Climate

Several national and sectoral policies, strategies, frameworks and plans support the need for the development and application of tailored climate information in the Infrastructure sector. This section outlines the references to climate and infrastructure in these documents and in related stakeholder engagement platforms. The Global Framework for Climate Information Services is also referenced. The review of these documents focusses on the integration of climate information services into the Infrastructure sector, and the findings of the review are provided in the Summary section below. Refer to Annexes for specific references from the documents below, on the provision and integration of climate information in the Infrastructure sector.

### 6.3.1 Rural Road Access Strategy (RRAS) 2016<sup>17</sup>

The RRAS “supports the Policy, which commits Ministries of Infrastructure and Public Utilities (MIPU) to maximising basic rural road access for the most number of rural ni-Vanuatu, while at the same time, supporting the country’s economic development. The Strategy details the Policy’s objectives and how implementation will be measured and managed. The Strategy looks ahead at the next 15 years.”

The Strategy’s theme is mainstreaming climate change and disaster risk reduction in the Ministry Corporate Plan 2015—2017. Both elements are specifically addressed in PWD’s Rural Roads Access Policy and Strategy, as follows:

- Climate change: The Strategy references PWD’s Vanuatu Roads Standards and Specifications Manual, which includes measures to mitigate the risks of global climate change-induced increased rainfall intensity and higher sea levels/tidal surges.
- Disaster risk management: Year-round connectivity increases disaster resilience.

### 6.3.2 Vanuatu Resilient Roads Manual (VRRM) 2014

The Vanuatu Resilient Roads Manual is documented as a practical guide to designing a climate resilient road which if “correctly designed now is no different to a climate resilient road in 2050”.<sup>18</sup> The manual provides climate change screening which identifies vulnerable roads and priority locations. It proposes guidance for road performance, water and drainage, maintenance, decision tree analysis etc.

### 6.3.3 Vanuatu Infrastructure Strategic Investment Plan (VISIP) 2015—2024

“The Vanuatu Infrastructure Strategic Investment Plan 2015—2024 (VISIP 2015) sets out an optimal set of strategic infrastructure investments for Vanuatu. The VISIP roles are as follows:

- updates list of infrastructure projects in the draft infrastructure plan prepared in 2012, but never formally adopted, to include sectoral progress and new policy development since 2012;
- recommends prioritising infrastructure projects by their linkages with other governmental policies and strategies;
- considers new projects, including in the social infrastructure sectors (health, education, justice, internal affairs) that may support sustainable socio-economic development; and
- recommends how VISIP can become a dynamic infrastructure project pipeline development process rather than just a static list of priority projects.”<sup>19</sup>

<sup>17</sup> Government of Vanuatu; Rural Road Access Strategy, 2016.

<sup>18</sup> Government of Vanuatu; Resilient Roads Manual 2014.

<sup>19</sup> Government of Vanuatu; National Infrastructure Strategy Investment Plan, 2015 – 2024.

### 6.3.4 Vanuatu Framework for Climate Services (VFCS)

The VFCS “is principally guided by the five pillars of the Global Framework for Climate Services, the VMGD Strategic Development Plan and by various national level stakeholder consultations. The stated goal of the VFCS is to “...ensure climate services for Vanuatu are of world-class standard, sustainable, are reaching all end-users, and are effectively helping people manage and adapt to climate variability and change in Vanuatu” (SPREP 2016). This Framework identifies the most pressing needs as:

- The development, through key stakeholder consultation, of tailored climate products (including training on their use), and
- Improvements to and formalisation of mechanisms for communicating and disseminating climate information.

The Framework makes 18 specific recommendations, based around the five pillars and associated structure of the GFCS, as priority actions to be implemented as part of a Vanuatu Climate Services Roadmap designed to strengthen climate information development, provision, understanding and use throughout Vanuatu. The Framework, in combination with priorities of the VMGD Strategic Development Plan variously refers to aspects of:

- Capacity of both providers and receivers (source and Next/End-Users) of climate services
- The interface platforms and networks used for dissemination of climate information and its value
- The kind of products that can be produced and tailored to user needs
- The research gaps that still require filling, and
- The requirement for high quality climate observations fundamental to all services.”<sup>20</sup>

The VFCS “identifies the most pressing needs as tailored climate products and formalisation of mechanisms for communicating and disseminating climate information. It makes four recommendations for Infrastructure as climate information needs which are the highest priority for the Ministry are access to sub-hourly (e.g. 10 minute) rainfall intensity data (including return period analyses) for the catchments they are designing bridges/roads for. Accurate weather forecasts are needed for day-to-day management of infrastructure projects, such as roading upgrades and maintenance.”<sup>21</sup>

Seasonal forecasting would be useful to inform project planning and resource mobilisation, while climate change assessments are needed for future infrastructure investment planning. Climate services could include notifications/bulletins with simple messaging such as ‘rainy season approaching; more rain than normal expected; so, check and clear debris from drainage channels, bridges and culverts.’ Regular posting on the VMGD website of up-to-date location-specific climate information would be useful and there is a pressing need for automatic climate stations to be installed at all provincial airports.<sup>22</sup> ENSO forecasts could allow PWDs to plan major work for drier, El Nino-affected months.

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<sup>20</sup> SPREP, Vanuatu Framework for Climate Services, 2016

<sup>21</sup> SPREP, Vanuatu Framework for Climate Services, 2016

<sup>22</sup> SPREP, Vanuatu Framework for Climate Services, 2016

### **6.3.5 Vanuatu Meteorology and Geohazards Department Strategic Development Plan (VMGD SDP) 2014-2023**

The Vanuatu Meteorology and Geohazards Department Strategic Development Plan “sets the strategic context and direction for strengthening the capacity of the VMGD, with emphasis on developing and supporting “...state of the art technical services...” collectively through enhanced capacity, coordination and partnerships. The Strategy focuses on the following priorities (amongst others):

- Improved weather, climate and climate change services (including across multiple hazards, stakeholders and time frames)
- Improved observations and associated monitoring networks, and
- Enhanced capacity for both administrative/project management and research and development, outreach and communications.

The Strategy summarises the current situation (capacity, activities, products and services) for the relevant Divisions of the VMGD including Weather Forecasting and Services, Climate, Climate Change and Disaster Risk Reduction, Observations, and Information Communication Technology and Engineering.<sup>23</sup>

Under the Climate Division section there are specific Key Outcomes (KO) that are relevant for Infrastructure: these relate to improving the quality of environmental datasets, generating monthly to seasonal forecasts and drought information, obtaining VMGD access to external datasets and developing climate services research.

### **6.3.6 Vanuatu National Climate Change Adaptation Strategy (NCCAS)**

The National Climate Change Adaptation Strategy (NCCAS) is designed to guide the implementation of efficient and effective activities to manage climate change impacts on the land-based resource sectors in Vanuatu. The NCCAS sets out a systematic, long-term approach for embedding climate change adaptation into core sectoral functional activities. Sector specific action plans detail substantive interventions to address adaptation needs and specify the allocation of responsibilities and definitive implementation timelines.”<sup>24</sup> The Infrastructure sector plays an essential role in the economy of Vanuatu and contributes to livelihoods and the general well-being of people and the country as a whole.

### **6.3.7 National Sustainable Development Plan (NSDP) 2016—2030**

The National Sustainable Development Plan “charts the vision and overarching policy framework for achieving a stable, sustainable and prosperous Vanuatu within the next fifteen years. It sets out the national priorities and context for the implementation of the Sustainable Development goals over the same period.”<sup>25</sup> Vanuatu’s development priorities are classed under the three pillars of society, environment and economy.

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<sup>23</sup> SPREP, GCF Funding Proposal: Climate Information Services for Resilient Development in Vanuatu, 2016

<sup>24</sup> Government of the Republic of Vanuatu, National Climate Change Adaptation Strategy for Land Based Resources 2012 - 2022, 2011

<sup>25</sup> Government of the Republic of Vanuatu, Vanuatu 2030 The people’s plan: National sustainable development plan 2016 - 2030, 2015

Under its environmental pillar the NSDP has several goals and policy objectives. Three of the environmental goals:

- ENV2: Green Economic Growth
- ENV3: Climate and Disaster Resilience and
- ENV5: Ecosystems and biodiversity

have infrastructure related policy objectives. Under the Economy pillar, three goals:

- ECO2: Improving Infrastructure
- ECO3: Strengthen rural communities and
- ECO4: Create jobs and business opportunities

has infrastructure-related policy objectives.

### **6.3.8 National Energy Roadmap (NERM) 2016—2030**

The National Energy Roadmap 2016—2030 (NERM) is the policy framework for developing the energy sector in Vanuatu. The overall vision is to energise Vanuatu’s growth and development through the provision of secure, affordable, widely accessible, high quality, clean energy services for an educated, healthy, and wealthy nation.<sup>26</sup>

The NERM “focuses resilient development in the face of external events like climate change and natural disasters (such as Cyclone Pam). The strategy recognises the important role the updated NERM can play in achieving this goal—in particular by facilitating low-carbon development based on renewable energy and more efficient energy use. Mitigating climate change through renewable energy and energy efficiency remains a key objective of the NERM. The 2013 version of the NERM identified this as one of five priorities.

“The Government’s focus in this area has been reinforced by the more recent Intended Nationally-Determined Contribution (INDC), which highlighted the important contribution the NERM can make to achieving national climate change mitigation goals.

NERM also focuses on the concept of green growth for Vanuatu’s energy sector, founded on the principles that renewable energy and energy efficiency will improve energy security and affordability, and contribute to achieving climate change adaptation, resilience and mitigation as a co-benefit. Improved energy security and affordability in Vanuatu can and should also enable economic development.<sup>27</sup>

### **6.3.9 Republic of Vanuatu National Climate Change and DRR Policy 2016—2030**

Vanuatu’s national policy provides the overall vision, principles, strategic goals, priorities and strategies for climate change and disaster risk reduction. Vanuatu’s strategic goal for climate change and disaster risk reduction is resilient development.

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<sup>26</sup> Government of Vanuatu; National Energy Roadmap, 2016-2030.

<sup>27</sup> Government of Vanuatu; National Energy Roadmap 2016-2030

Strategic priorities are categorised under systems and themes. Systems include governance, finance, and knowledge and information. Strategic priorities that are categorised as themes include climate change adaptation and disaster risk reduction, low carbon development, and response and recovery.<sup>28</sup>

The Republic of Vanuatu National Climate Change and DRR Policy “identifies climate change and disaster risk management as one of five objectives driving planning and operations. As new corporate and business plans are developed, climate change and disaster risk reduction must be integrated to ensure that activities are aligned with risk reduction and sustainable development policy, and that roles and responsibilities are clear. It also notes that some of the projected consequences of climate change are increased damage to infrastructure.”<sup>29</sup>

The Policy has established mechanisms to assess and redress loss and damage incurred as a result of climate change—this is valuable in quantifying impacts for international advocacy purposes and funding proposals. Through international platforms such as the Warsaw International Mechanism for Loss and Damage, Vanuatu has engaged in dialogue on a broader concept of risk reduction, sharing and transfer, insurance and rehabilitation.

The Policy takes an ecosystem-based approach, prioritising “soft” ecosystem-based adaptation over “hard” engineered infrastructure to maximise ecosystem functioning—this means that coastal revegetation would be preferred to construction of sea walls, for instance. It requires the design and construction of public and other major infrastructure and development projects to recognise current and projected risks to minimise loss and damage. It advocates developing and adhering to climate-proofed building codes, environmental impact assessments, regulations and development guidelines.

### **6.3.10 Vanuatu National Adaptation Programme of Action (NAPA)**

Vanuatu completed its National Adaptation Programme of Action (NAPA) in 2007. The NAPA outlines the most urgent and immediate needs with respect to climate change and identified several priority sectors (Agriculture/Food Security, Coastal Zones and Marine Ecosystems, Water Resources and Public Health) for action.<sup>30</sup>

The NAPA focuses on Infrastructure by “mainstreaming climate change into infrastructure design and planning. Much of the infrastructure, including the main commercial centres of Port Vila and Luganville, is located on the perimeter of the major islands. These centres are only a few metres above sea level. Moreover, much of the road network is also situated on the perimeter of the islands. The infrastructure and other fixed assets are extremely vulnerable to cyclone and, storm surges. These areas will be affected by even small increases in sea levels due to the larger surges associated with increased frequency and intensity of tropical cyclones. Enhanced human activities in the coastal areas, including sand extraction and mangrove and other coastal vegetation removal has increased the sensitivity of these important coastal buffers to climate and sea level variations. This is due to either a lack of enforcement of existing legislations or because of ignorance and the lack of proper management systems.”<sup>31</sup>

<sup>28</sup> World Meteorological Organization, *Enhancing Early Warning Systems to build greater resilience to hydro and meteorological hazards in Pacific Small Island Developing States (SIDS): National consultation report*, Jan 2018

<sup>29</sup> Government of the Republic of Vanuatu, *Vanuatu Climate Change and Disaster Risk Reduction Policy 2016 - 2030*, 2015

<sup>30</sup> World Meteorological Organization, *Enhancing Early Warning Systems to build greater resilience to hydro and meteorological hazards in Pacific Small Island Developing States (SIDS): National consultation report*, Jan 2018

<sup>31</sup> Government of the Republic of Vanuatu, *National Adaptation Programme for Action (NAPA)*, 2007



### 6.3.11 Republic of Vanuatu Second National Communication to the UNFCC (SNC)

The Second National Communication (SNC) highlights Vanuatu's greenhouse inventory (GHG) as a baseline for the country to measure its progress towards reduction of greenhouse gases. The inventory for the base year 2000 and subsequent years 2005 and 2010 indicates that Vanuatu is a net sink for CO<sub>2</sub> emissions.

Vanuatu's SNC also generates and updates information about how projected climate change, climate variability and extreme events may affect Vanuatu's economic and social sectors as part of its vulnerability and adaptation assessment. Climate change and changing weather patterns are already having a negative impact on all the priority sectors – namely agricultural production, fisheries, human health, tourism and well-being. There is the indication that climatic change has consequences for decreasing national income and increasing key social and infrastructure costs.<sup>32</sup>

The SNC “has seven strategic priorities to achieve the national Vision, which also include: Primary sector development, environment, climate change, and disaster risk management; and Economic Infrastructure and Support Services and there are policy objectives with associated strategies to achieve the objectives.

It notes that the Government is committed to deliver vital social services and basic infrastructure including electricity to enable the well-being of all citizens – households, communities and institutions –and in a timely manner, irrespective of where they live. The least cost electrification strategic approach has been tailored considering the varied topography and varying degree of nucleation of the individual communities and households. Also, economic development is hindered by Vanuatu's poor transportation infrastructure, dependence on relatively few commodity exports, vulnerability to natural disasters and by the long distances between main markets and constituent islands.<sup>33</sup>

### 6.3.12 Global Framework for Climate Services (GFCS)<sup>34</sup>

The Global Framework for Climate Services (GFCS), formed as the principal outcome of the 2009 World Climate Conference 3. The GFCS provides a worldwide mechanism for coordinated actions to enhance the quality, quantity and application of climate services. The five priority areas under GFCS are: Agriculture and Food Security; Disaster Risk Reduction; Energy; Health; and Water. The Framework is built through user–provider partnerships that include all stakeholders.

The GFCS is built upon the following five components, or pillars (see Figure 3 below):

- i. **User Interface Platform (UIP):** a structured means for users, climate researchers and climate information providers to interact at all levels;
- ii. **Climate Services Information System (CSIS):** the mechanism through which information about climate (past, present and future) is routinely collected, stored and processed to generate products and services that inform often complex decision-making across a wide range of climate-sensitive activities and enterprises;

<sup>32</sup> World Meteorological Organization, *Enhancing Early Warning Systems to build greater resilience to hydro and meteorological hazards in Pacific Small Island Developing States (SIDS): National consultation report*, Jan 2018

<sup>33</sup> Government of the Republic of Vanuatu, *Second national communication to the United Nations Framework Convention on Climate Change (UNFCCC)*, 2014

<sup>34</sup> <http://www.wmo.int/gfcs/>

- iii. **Observations and Monitoring (O&M):** to ensure that climate observations and other data necessary to meet the needs of end-users are collected, managed and disseminated and are supported by relevant metadata;
- iv. **Research, Modelling and Prediction (RMP):** to foster research towards continually improving the scientific quality of climate information, providing an evidence base for the impacts of climate change and variability and for the cost-effectiveness of using climate information;
- v. **Capacity Development (CD):** to address the particular capacity development requirements identified in the other pillars and, more broadly, the basic requirements for enabling any Framework-related activities to occur.<sup>35</sup>

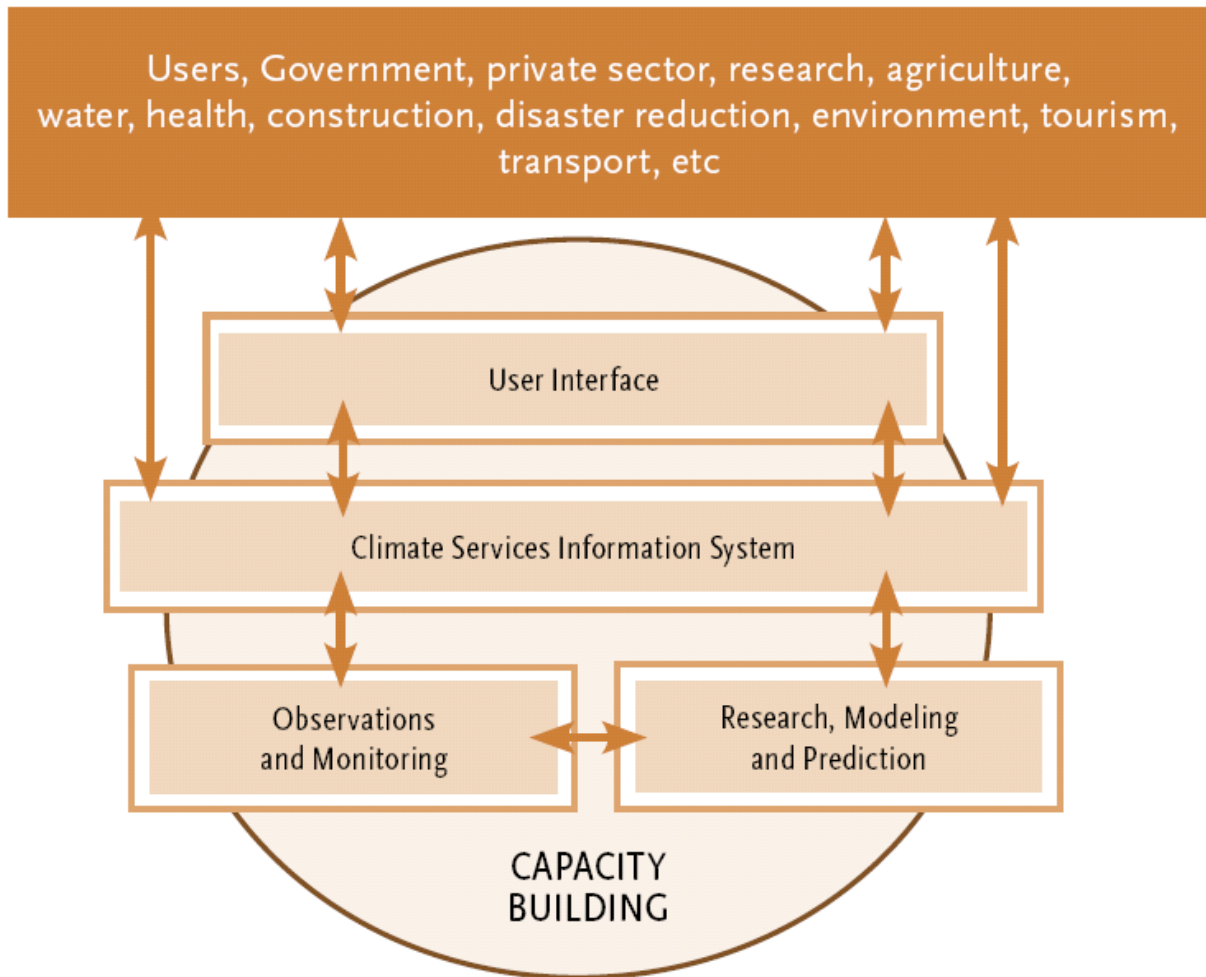


Figure 3: A schematic depicting the functional components of the GFCS (Source: WMO)

The primary focus of the GFCS is to enable better access to and use of climate information by users.

<sup>35</sup> WMO, A step-by-step guide for establishing a national framework for climate services, 2017

## 6.4 Climate Information Services (CIS) Action Plan

Based on the final recommendations (Section 6.1), officers from the Ministry of Infrastructure and Public Utilities developed the CIS Action Plan and the Communication Plan at the Van-KIRAP Sector Consultation workshops (Table 3). The participants identified short-term, mid-term and long-term actions and sub-actions for each recommendation: short-term for periods of up to 6 months, mid-term ranging from 6 months to 2 years, and long-term ranging from 2 to 4 years. Required resources and budget implications are included but they will need to be revised and the actual cost estimated through further consultations amongst the key stakeholders. The following table outlines high level actions and sub-actions: a detailed workplan with costing and timeline will be agreed before the implementation of each recommendation. A Monitoring and Evaluation Plan will help to ensure successful implementation of the actions.

The key objectives of the Action Plan are:

1. To ensure Ministry of Infrastructure and Public Utilities personnel and stakeholders are aware of and understand climate information and products; and
2. To enable them to readily access and effectively use this climate information for planning and decision-making at local and national levels.

Table 3: The Action Plan for the Infrastructure Sector

Rank	Recommendation	Proposed Action	Proposed Sub-action	Responsible Parties	Timing (ST, MT, LT)	Resources Required	Training Required	Budget Implication	Assumption/Comments
1	Decision Support System (DSS)	The DSS is built from the methodology identified in the Vanuatu Rural Roads Manual, which includes calculating flood height for drainage of culverts, using rainfall data of mm/hour or mm/day for a 1 in 10-year event, etc.	Infrastructure Coordinator works with the App Developer and CSIRO to build this system	SPREP/VMGD/PWD/CSIRO	ST	App developer, GIS licences, Computer/server	Training on DSS system	SPREP funded, additional funding for equipment	Possible Van-KIRAP funding through Activity 2.2.2
2	Use the DSS to design climate resilient infrastructure investments	Train the Engineers on the use of the DSS, and as part of the training, design the proposed infrastructure	Infrastructure Coordinator trains Divisional Engineers	SPREP/VMGD/PWD/CSIRO	ST	DSS system, Computer, training materials		SPREP funded, additional funding for training	
3	The Design is Constructed	The Design is tendered out using PWD processes, and a Contractor is awarded the contract to build the design.	Infrastructure Coordinator supervises the construction, with ad hoc supervision from the Divisional Engineers	PWD	MT	Contractor		SPREP funded	
4	Provide consistent tailored information into the DSS and into annual business workplans	Develop special climate information package	MOU Identify sector actions and required climate information	VMGD/PWD	MT		Training		Possible Van-KIRAP funding through Activity 2.1.1
4	Utilise climate information into annual workplan development	Implement communications plan		VMGD/PWD	ST	VMGD/PWD current resources	Climate Awareness Training	VAN-KIRAP for training Implementing plan will be VMGD/PWD existing resources	Possible Van-KIRAP funding through Activity 1.3.1
		Divisional Engineers to incorporate climate information into their workplan	Organise PWD Superiors approval for the workplan	Operation Manager/ Divisional Manager	ST	DSS/existing PWD Staff/existing VMGD staff	Training	VAN-KIRAP	

## 6.5 Climate Information Services (CIS) Communication Plan

A communication plan is a policy-driven approach to providing stakeholders with information. The Plan formally defines **who** should be given specified (**what**) information, **when** that information should be delivered and what communication channels (**how**) will be used to deliver the information.<sup>36</sup> This section outlines the Communication Plan's objectives, the current status of the communication mechanism, and the content of the Plan. The Plan should be regularly reviewed and updated.

### 6.5.1 The Objectives of the Communication Plan for Ministry of Public Works

- To ensure that PWD personnel and contractors are receiving timely and relevant climate information and products for planning and decision-making at local and national levels.
- To ensure an effective and efficient channel for communication and information dissemination exists between VMDG and PWD, and within the infrastructure sector.

### 6.5.2 Linking climate information and products to sector specific operations

Table 4 outlines the types of climate information required for specific operational or decision-making processes within the Infrastructure sector. This information feeds into the Communication Plan (Table 5).

Table 4: Climate Information required for Infrastructure operation and decision-making processes

Sector operation or decision-making process	Information/Product/Tool	Responsible person	Comment
Inception Phase (IP)	Decision Support System	Engineers and Decision Makers	This phase is where all the climate data is utilised to support the design
Design Phase (DP)	Design Software tools such as AutoCAD	Engineers / draftsman /architects	The design is made according to outcome of DSS
Implementation Phase (ImP)	Weather (one week or two-week forecast)	Contractor / Divisions / Engineers / Supervisors	To assist contractor in planning construction works
All three phases (IP/DP/ImP)	Three months rainfall information	VMGD/PWD Engineers/Contractors/App developers	
All three phases (IP/DP/ImP)	Tide calendar including extremes	VMGD/PWD Engineers/Contractors/App developers	

<sup>36</sup> <https://whatis.techtarget.com/definition/communication-plan>

### 6.5.3 The current situation in the Infrastructure Sector

- The Ministry of Infrastructure and Public Utilities currently uses weather forecasts and tide information for aviation and ports/marine operations.
- All Ministry staff receive the Vanuatu Climate Update and Monthly Climate Summary, but these products are currently not used operationally.

### 6.5.4 Table Description

*Responsibility:* Nominates or delegates the personnel or agency responsible for sending the identified information or products to the intended audience (Figure 4).

*Audiences/Receiver:* Personnel or parties who should receive the information or the products. The diagram below outlines the flow of climate information dissemination from VMGD to various personnel within MIPU.

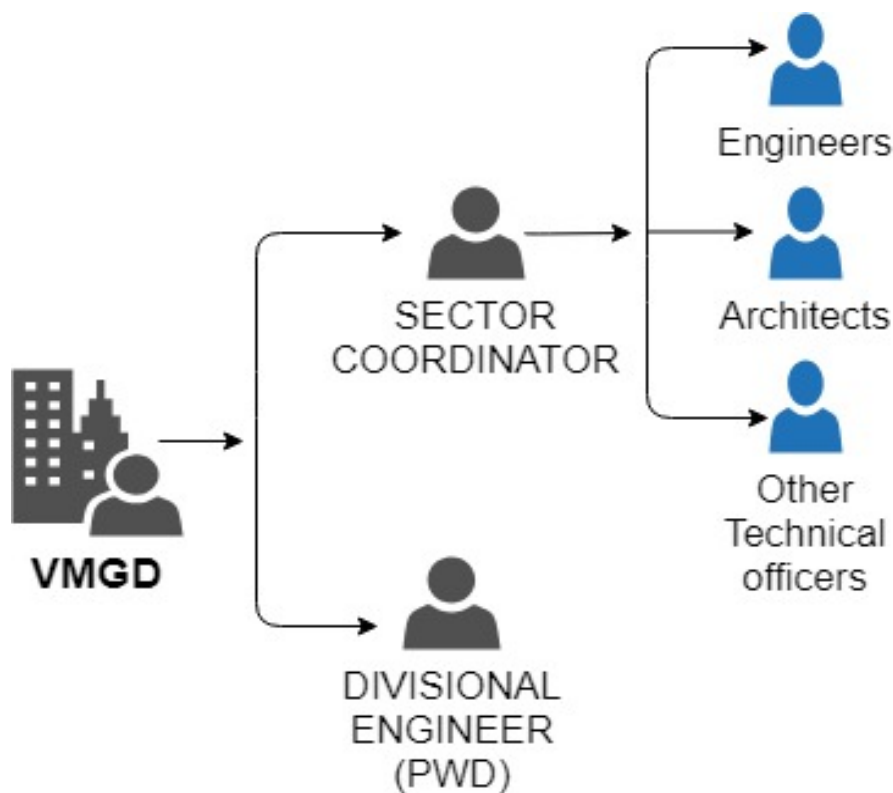


Figure 4: Climate information and products dissemination structure

*Mode of Information Dissemination:* Effective channels or communication medium that can be used to disseminate the information and the products. This may include: email, phone, Internet/webpage, social media (Facebooks), face, to face meetings, print etc.

*Other Information:* Describes the format (e.g. bulletin, brief summary, Excel etc.) and the most appropriate language (i.e. Bislama, English or French) for information or products.

*Frequency and timing:* frequency indicates how often the information is required or disseminated (i.e. weekly, fortnightly, monthly or annually). Timing indicates when in a defined period the information is required or made available (e.g. Vanuatu Climate Updates are available by the second week of each month).

### Feedback Mechanism:

It is vital to measure results to understand whether objectives have been achieved. The regular evaluation process allows managers to make necessary adjustments during implementation in response to unexpected results and changed circumstances. Several feedback mechanisms are suggested for evaluating the effectiveness and the efficiency of the Communication Plan: regular surveys, feedback forms, follow up via phones, monthly reports, email, and face to face meetings. The timing and the mechanism for feedback can be mutually determined by the Responsible Party and the Audience. Feedback may be scheduled quarterly, six-monthly or yearly.

### **6.5.5 Updating the Communication Plan**

During the life of Van-KIRAP, the Sector Coordinator will be responsible for:

- Initiating and scheduling feedback sessions with VMGD;
- Initiating and following-up on feedback sessions for other Responsible Parties, and providing feedback to VMGD;
- Negotiating changes and incorporating agreed changes in the Plan; and
- Circulating the Plan to all Responsible Parties and Audience after each update.

After the Van-KIRAP, it is recommended that this responsibility be taken up another relevant officer in MIPU if the Sector Coordinator position no longer exists. This can be the Communication Officer.

Table 5: A detailed Communication Plan for the Infrastructure Sector

Responsibility (sender)	Audience (receiver)	Type of Info/product	Language	Format required	Frequency	Timing	Feedback mechanism
VMGD	Sector Coordinator	All data required in the DSS for Inception/Design Phase: historical rainfall data (including rainfall intensity), sea level rise, temperature.	Raw data	Excel for ingestion into the DSS	Quarterly	First month of every quarter	Survey
		All data required for Implementation Phase: weather forecast for one week to three months, daily weather forecast			Daily and Weekly	6am daily, Monday weekly	Survey
VMGD	Division Engineer (PWD)	Tides, monthly rainfall	English	Table	Monthly	Second week of the month	NCOF, Survey
		Vanuatu climate update (VCU)	Bislama	Bulletin	Monthly	2nd-3rd week of the month	Regular survey, feedback forms, follow up (extension officers/phone calls), email requested feedback
		Vanuatu Ocean Outlook (VOU)	English	Bulletin	Monthly		Report in the NCOF
		Time series data (ocean and climate)	Raw data	Excel	As required		Email, face to face meeting, survey
Sector Coordinator	Engineers / Architects/ and other Technical personnel i.e. Provincial Managers & Engineers (PWD)	All data required in the DSS for Inception/Design Phase: historical rainfall data (including rainfall intensity), sea level rise, temperature.	Raw data	Excel for ingestion into the DSS	Quarterly	First month of every quarter	Survey
		All data required for Implementation Phase: weather forecast for one week to three months, daily weather forecast	English		Daily and Weekly	6am daily, Monday weekly	Survey



## 7. References

Government of the Republic of Vanuatu, National Adaptation Programme for Action (NAPA), 2007

Government of the Republic of Vanuatu, National Climate Change Adaptation Strategy for Land Based Resources 2012 – 2022.

Government of the Republic of Vanuatu; National Energy Roadmap 2016-2030.

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## 8. Annexes

### National Energy Roadmap 2016—2030

The Government remains committed to making progress in each of these areas. It is also keen to provide more clarity on these sector objectives and priorities, and to place added emphasis on how climate change and green growth are influencing energy policy and strategy in Vanuatu.

Addressing climate change also remains a key objective of the NERM. The updated NERM treats this as part of a broader outcome of ‘sustainable energy’—which also captures wider environmental and social aspects of energy, such as local air pollution, deforestation, and health and safety. Renewable energy and energy efficiency can improve the sustainability of energy supply and use by helping to reduce adverse environmental impacts of energy use and mitigate climate change. As such, they are discussed under ‘sustainable energy’.

The risks to energy supply do not only revolve around markets and prices. The effects of Cyclone Pam reiterated Vanuatu’s vulnerability to natural hazards and the effects of climate change, and the importance of developing resilient infrastructure and energy supply chains that can continue to support communities post-disaster. For example, the design of power lines and wind turbines should reflect the risk of extreme weather events, the design of new hydro generation and solar facilities should take into account the possibility of changes in rainfall patterns and cloud cover, and biomass energy should be developed based on climate-resilient crops.

#### 2.4.1 Renewable energy, energy efficiency, and climate change

Renewable energy and energy efficiency are discussed here under the ‘sustainable energy’ priority due to their potential to reduce GHG emissions and local pollution. Nevertheless, they can also contribute to all of the other NERM priorities. Rather than seeking to promote renewable energy solely or primarily for climate change objectives, the NERM recognises that increasing the share of renewable energy substantially in Vanuatu—on-grid and off-grid—may be the most cost-effective way to develop the sector. The NERM pursues renewable energy for its economic, energy security, energy access, and environmental benefits.

#### A.5 Progress on Climate Change

The NERM’s original priorities to mitigate climate change through renewable energy and energy efficiency were to increase the proportion of electricity generated from renewable sources; examine options for increasing renewable energy and improving energy efficiency and conservation; and establish comprehensive data in order to set realistic targets and begin energy efficiency initiatives. The priority area also included the target to improve diesel-generation efficiency, which is discussed under affordability.

### Vanuatu Resilient Roads Manual

Main Climate Resilience Considerations. The main considerations for climate resilient infrastructure are vulnerability to the following:

- Sea Level Rise (SLR) is currently measured to be 6 mm per year throughout Vanuatu. It may rise faster than this if Global Warming continues.

- Wharves / jetties have a life of 50 years. Allow 0.5 meters SLR for 50 years into the future
- Storm surges cause wave overtopping of coastal roads. Any locations currently experiencing flooding during storms will experience more severe events in the future. Move roads 50 - 100m away from coastlines.
- Extreme weather events will increase. Rainfall will become more intense, of shorter duration but may happen more often. Allow for more drainage.
- Steep slopes will become more difficult to climb. Use concrete. Add drainage.
- Roads may become impassable from flooding. Lift road on embankment. Add cross drainage
- Roads may be impassable from stream crossings in flood. Use concrete drifts.
- Indicate safe depths for pedestrians or vehicles.
- Temperatures will increase. Longer periods of drought can be expected.
- Anticipate less water availability.
- Safety criteria; Whilst the aim of climate resilience is to produce all weather roads which remain open 24/365 this is unlikely to be attained at present. Indeed experience shows that even in highly developed economies this level is never actually reached. If it is accepted that the road may be blocked by flooding for a certain period, then it must also be accepted that persons will attempt to cross. Safety considerations should be taken into account and if necessary, pedestrian footbridges should be provided.
- Safety is of primary concern and it is reported that 10 deaths per year occur in Vanuatu when people attempt to cross flooded crossings. Drivers may underestimate how fast small streams can rise in some parts of the country during a flood. Even 300 mm of water can float a car or truck causing it to lose control and 600mm can cause it to overturn.
- Although coastal erosion is not necessarily attributable to climate change it makes coast lines more vulnerable to sea level rise and wave overtopping.

1. Vulnerable Roads: To identify vulnerable areas one should check if roads are in areas of:

- Close proximity to shoreline where erosion is self-evident.
- Close proximity to shoreline where overtopping by storm waves is known to occur.
- Flat areas prone to flooding which take long time to dry out.
- If inland on steep gradient > 10%.
- Road below steep slopes which are prone to landslides.
- Roads crossing water courses.

2. Priority Locations: To identify priority areas, one should check:

- Road close to hospitals, clinics.
- Road links centers of population.
- Road close to Airport.
- Road close to port, shipping wharf, jetty.
- Road close to schools.

## Vanuatu Infrastructure Strategic Investment Plan 2015—2024

- To alleviate these shortcomings, the sector planning policy framework will be strengthened to allow for developing or updating sector plans, especially in investment-heavy economic and social sectors: transportation, energy, ICT, tourism, agriculture, climate change and disaster management, health and education.
- The seven priorities are not ranked including Primary Sector Development, Environment, Climate Change, and Disaster Risk Management. GoV recognises that these goals are interdependent and must proceed together. Of chief relevance to VISIP 2015 is priority vii although there are elements of priority iv and vi. that also need to be taken into account. Under priority iv, key sub-tasks are to improve climate resilience by protecting coastlines and water supplies through reduced pollution and to finalise and implement the Vanuatu climate change policy including its integration in the PAA, sector plans, and ministry corporate plans.
- 3 Sustainable natural resource and environmental management and development focused on protecting the environment and natural resources and reducing climate change/disaster risks, with priorities to:
  - maintain and capture the value of critical ecosystem services, even in remote and rural areas;
  - enforce comprehensive, clear, and conservative development controls to ensure that the economy does not
  - grow detrimentally to the environment;
  - ensure protection for the diverse natural and social resources (including indigenous foods); and
  - integrate climate change and disaster risk policy and action, so that risk is managed holistically and effectively

## Vanuatu Meteorology and Geohazards Division Strategic Development Plan: 2014-2023

Of particular importance under the Climate Division are the following Key Outcomes (KO), Strategic Outputs (SO) and Key Performance Indicators (KPI):

- KO 2. Improved and sustained quality of meteorological, hydrological and other related environmental datasets on the VMGD Headquarters server
- KO 4. Monthly to seasonal climate information, forecasts, services and warnings are continually developed and routinely improved.
- KO 5. Drought information, forecasts, services and warnings are developed and routinely improved.
- KO 7. Climate Division is provided access to relevant external datasets
- KO 8. Climate services related research capacity and priorities are developed
  - SO 5.1 Climate Division has prioritised a set of research topics annually to deliver results on annually.

## National Sustainable Development Plan 2016-2030

“The NSDP articulates the country’s main development priorities for the next 30 years. Of particular importance under the environmental goals and policy objectives are:

The economy pillar seeks to ensure we have a stable economy based on equitable, sustainable growth that creates jobs and income earning opportunities accessible to all people in rural and urban areas.

- ENV 2 – Blue – Green Economic Growth<sup>37</sup>
  - ENV 2.2 – Ensure new Infrastructure and development activities cause minimal disturbance to the natural land and marine environment
  - Promote renewable sources of energy and promote efficient energy use
- ENV 3 – Climate and Disaster Resilience<sup>38</sup>
  - ENV 3.2 – Improve monitoring and early warning systems.
  - ENV 3.4 – Promote and ensure strengthened resilience and adaptive capacity to climate related, natural and man-made hazards.
- ENV 5 – Ecosystems and Biodiversity<sup>39</sup>
  - ENV 5.6 – Enhance environmental monitoring, evaluation and research with relevant, open and transparent data sharing among relevant agencies
- ECO 2 – Improve Infrastructure
  - ECO 2.3 - Ensure that all public infrastructure, including health, education and sports facilities are safe, accessible, secure and maintained in compliance with building codes and standards.
  - ECO 2.4 - Enact clear infrastructure governance, legislative frameworks and standards for resilient infrastructure and maintenance
- ECO 3 – Strengthen Rural Communities
  - ECO 3.1 Promote broad-based growth by strengthening linkages between tourism, infrastructure, agriculture and industry in rural areas and diversify the rural economy

## Vanuatu National Climate Change Adaptation Strategy for Land Based Resources 2012-2022

impacts on infrastructure including closure of roads, airports and bridges due to flooding and landslides, and damage to port facilities (impacting other sectors and services including tourism, agriculture, the delivery of health care, clean water, food security and market supplies.

## Republic of Vanuatu National Climate Change and DRR Policy 2016-2030

The document notes that “potential impacts of climate change on Vanuatu’s agriculture, fisheries, forestry, tourism, health, transport and infrastructure sectors were considered. Projected consequences of climate change include:

damage to infrastructure”<sup>40</sup>

The nation’s many small islands spread across vast areas of ocean, and diverse cultures and languages and limited infrastructure make their remoteness a challenge.

<sup>37</sup> Government of the Republic of Vanuatu, Vanuatu 2030 The people’s plan: National sustainable development plan 2016 - 2030, 2015

<sup>38</sup> Government of the Republic of Vanuatu, Vanuatu 2030 The people’s plan: National sustainable development plan 2016 - 2030, 2015

<sup>39</sup> Government of the Republic of Vanuatu, Vanuatu 2030 The people’s plan: National sustainable development plan 2016 - 2030, 2015

<sup>40</sup> Government of the Republic of Vanuatu, Vanuatu Climate Change and Disaster Risk Reduction Policy 2016 - 2030, 2015

#### **7.4.4 Loss and damage**

Vanuatu will establish mechanisms to assess and redress loss and damage incurred as a result of climate change. Dialogue has been undertaken on a broader concept of risk reduction, sharing and transfer, insurance and rehabilitation, through international platforms such as the Warsaw International Mechanism for Loss and Damage.

Action:

- ensuring that the design and construction of public and other major infrastructure and development projects consider current and projected risks in order to minimise loss and damage, especially by developing and adhering to climate-proofed building codes, environmental impact assessments, regulations and development guidelines.

#### **7.4.5 Ecosystem-based approaches**

Vanuatu's diverse ecosystems are being threatened by climate change as are the livelihoods and wellbeing of the ni-Vanuatu people who rely on them for income and food. Ecosystems provide cost-effective adaptation services, and effective natural resource management can minimise the risks of climate change and disasters while enhancing livelihoods resilience. This policy is aligned with the National Environment Policy that prioritises climate change adaptation and disaster risk reduction measures.

Action:

- prioritising "soft" ecosystem-based adaptation over "hard" engineered infrastructure for ecosystem function maintenance (e.g. coastal revegetation versus sea walls);

#### **7.6 Response and recovery**

The objective here is to strengthen and build capacity in the areas of disaster preparedness, planning, response and recovery.

The broad range of disaster risks facing Vanuatu creates many challenges. This is heightened by the isolation of many islands, diverse languages, low education levels and lack of infrastructure. There is an urgent need to build the resources and capacity of the disaster management system in Vanuatu to avoid gaps in planning, coordination, community awareness and engagement with other government agencies and stakeholders. Mainstreaming disaster response and recovery requires a holistic approach at the international, national, provincial and community levels.

#### **8.5 Mainstreaming**

Notably, the Ministry of Infrastructure and Public Utilities Corporate Plan 2015–2017 identifies climate change and disaster risk management as one of five objectives driving planning and operations. As new corporate and business plans are developed, climate change and disaster risk reduction needs to be incorporated to ensure that activities are aligned with risk reduction and sustainable development policy, and that roles and responsibilities are clear.

Findings:

- provide sustainable, resilient, and appropriate infrastructure and services;

## Vanuatu National Adaptation Programme of Action

It notes that that the main climate issues and possible adaptation options in each province are<sup>41</sup>:

33. Much of the infrastructure, including the main commercial centres of Port Vila and Luganville, is located on the perimeter of the major islands. These centres are only a few metres above sea level. Moreover, much of the road network is also situated on the perimeter of the islands. The infrastructure and other fixed assets are extremely vulnerable to cyclone and, storm surges. These areas will be affected by even small increases in sea levels due to the larger surges associated with increased frequency and intensity of tropical cyclones. Enhanced human activities in the coastal areas, including sand extraction and mangrove and other coastal vegetation removal has increased the sensitivity of these important coastal buffers to climate and sea level variations. This is due to either a lack of enforcement of existing legislations or because of ignorance and the lack of proper management systems.

## Republic of Vanuatu Second National Communication to the UNFCC

Transportation infrastructure development is one of the priority sectors for Vanuatu and with this view the Government has initiated a long-term Vanuatu Transport Sector Support Program (VTSSP). GoV is also focusing on mitigation options for emissions from land, sea and air transport sectors. Measures include public transportation awareness programmes, vehicle emission standards, promoting fuel efficient and alternative fuel vehicles, improving public transport services, introducing financial incentives to encourage energy efficiency and promoting non-motorised transport.

The Government is committed to deliver vital social services and basic infrastructure including electricity to enable the well-being of all citizens – households, communities and institutions - and in a timely manner, irrespective of where they live. The least cost electrification strategic approach has been tailored considering the varied topography and varying degree of nucleation of the individual communities and households.

The GoV's priorities and action agenda (2006 – 2015) has seven strategic priorities to achieve the national Vision, which include: (1) Private Sector Development and Employment Creation; (2) Macroeconomic Stability and Equitable Growth; (3) Good Governance and Public Sector Reform; (4) Primary sector development, environment, climate change, and disaster risk management; (5) Provision of Better Health Services, especially in rural areas; (6) Education and human resource development and (7) Economic Infrastructure and Support Services and there are policy objectives with associated strategies to achieve the objectives.

Economic development is hindered by Vanuatu's poor transportation infrastructure, dependence on relatively few commodity exports, vulnerability to natural disasters and by the long distances between main markets and constituent islands.

### 3.4.5 Transport & Infrastructure

Air and sea is the only route to connect Vanuatu from outer world and the group of islands. Vanuatu has very few roads and the limited road networks are confined to the larger islands mainly around the

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<sup>41</sup> Government of the Republic of Vanuatu, National Adaptation Programme for Action (NAPA), 2007

major population centres situated on the coasts. Many of the smaller islands do not even have airstrips. In terms of infrastructure, Vanuatu has 29 airports (5 paved and 24 unpaved) and approximately 1,894km of roadways (111km paved and 1,783km unpaved) and two main ports and terminals, Port Vila and Santo. Inter-island and intra-island travel and communications is difficult and expensive. Extreme climatic events are already leading to irregular air and shipping services to remote and outer islands.