

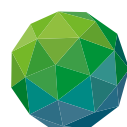


Facilitators Handbook: **CLIMATE SCIENCE TRAINING FOR SECTORS**

Training for 5 Climate Sensitive Sectors in Vanuatu

ABSTRACT

Learn how climate science and its application can help climate sensitive sectors plan, prepare and respond to climate hazards in Vanuatu.



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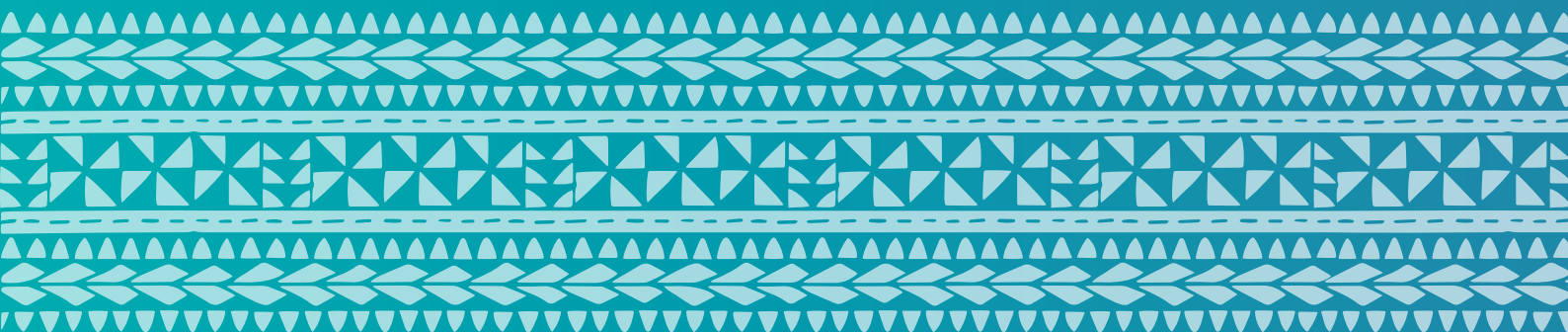
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Our vision:

**A resilient Pacific environment sustaining our livelihoods
and natural heritage in harmony with our cultures.**

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Introduction

This handbook is used by the facilitator to provide further support and information to deliver a successful and effective training session on climate science. The course material will provide essential climate science information at its most elementary level, so those with no science background can

a) understand the fundamentals of climate, b) where and how to access climate information and c) make assessments and decisions on how to utilise climate and ocean information for their role and d) They understand how their sector will be impacted by climate change.

Objectives of the Handbook

There are three main objectives of the handbook:

1. Provide clear instruction and guidance for the facilitator so that he/she can deliver the training in an effective and confident manner
2. Provide a rationale behind the assessments and learnings so the facilitator can best explain the exercise and the reasoning behind it
3. Provide additional background information on sectors for the trainer to familiarise him/herself with sector specific climate change challenges and better relate and guide the targeted audience in their learnings.

Objectives of the Course

This course supports the learning and training of basic to intermediate climate science and its real-life application into the Vanuatuan economy and sectors. As specified (in a great more detail) in the Sector Background section, Vanuatu and its economy, like many Pacific nations, is more vulnerable to climate and climate change than many other nations around the world.

Capacity building through education is a crucial component in improving and increasing a country's resilience to climate change. By teaching climate science to operatives, on the ground, who plan, implement and communicate climate change responses to the wider Vanuatuan society, the attendees will be taking a knowledge based approach to disaster risk reduction and climate change; rather than responding and planning after a disaster has already

occurred and the damage done¹.

The purpose of this course is to provide climate science information to those in climate sensitive sectors that do not have a climate science background but may need such information to make decisions and plan on the ground. The course helps capacity building through:

- Increasing and improving knowledge-based approach to climate change decisions and decision making
- Raising awareness of climate hazards and their various potential impacts to employees, operative and others in climate sensitive sectors
- Identifying appropriate action to when identifying risks.

Target Facilitator

The facilitator should have a climate science background, ideally a climatologist. The intention of the course is that the participants will be able to apply knowledge acquired in the course to their specific industry and in a specific scenario (i.e. particular geo/hydro hazard) both during the course and then afterwards in their field, on the ground. This means that the facilitator must understand the material beyond the written format that they will initially receive. They must be able to take basic climate science and apply it within the workshop/course where the complexity or the details of the questions cannot be anticipated.

Ideally the facilitator will have more than two years' experience in presenting because the material is extensive, and the concepts and visual aids need excellent level of

articulation.

Lastly, if the facilitator had some understanding of the Vanuatuan sectors and their vulnerability to climate and climate change then their ability to relate to the participants and understand where the gaps in their knowledge is and how this can be

the questions of an experienced sector orientated audience, one must be able to understand the material outside its written format and apply it specific scenarios and sectors.

Have some understanding of Vanuatu's climate sensitive sectors in order

¹ Climate hazards and disasters: the need for capacity building Gordon McBean and Caroline Rodgers

Target Audience

The target audience is essentially for government and non-government personnel that work in fields that are impacted upon by climate and climate change. This includes both the technical and non-technical employees within the Vanuatuan government in various departments and at different levels. This training is also for those that work in key sectors in the Vanuatuan economy where climate and climate change, impact the effectiveness and continuation of their business and livelihoods.

Other participants many include NGO, contractors, teachers, health professionals and others in the frontline of climate change. The course aims to improve the understanding of those with limited climate science background on key climatological concepts and phenomena and how to respond to such events depending on what has occurred and what is likely to be the impact. Factors such as what the geo/hydro hazard is, where and when it has hit, how long is it set to last etc. These hazards can affect sectors, government departments and individuals differently and therefore each affected party must tailor their response.

Expected level of skill and experiences of participants

- a) At least 2 years' experience in the VMGD or related government agencies or
- b) At least two years' experience in one of the key sectors (Agriculture, Fisheries, Water, Tourism and Infrastructure) where an understanding of weather forecasting and planning is required or necessary or
- c) Two years' experience in a related industry or role where the dynamics of weather and climate understanding is necessary or required.

Satisfactory completion of final year secondary school, or equivalent, all attended should have completed a minimum of High school certification as the course material including visual aids contain scientific jargon. The concepts are complex as well as the course with the jargon and concepts of a scientific nature and the language.

Competency Outline

Course Name:	Understanding and Application of Climate Information in Climate-Sensitive Sectors
Course:	Understanding and application of climate information in climate-sensitive sectors
Credit	TBA
Unit Descriptor	This Unit describes the performance outcomes, skills and knowledge required to applying climate information to 5 climate sensitive sectors in Vanuatu.
Pre-requisite	TBA
Co – requisite	TBA
ELEMENT	PERFORMANCE CRITERIA
1. General climate drivers and those specific to the pacific region. (Session 2)	<p>Performance Criteria</p> <p>1.1 Identify timescale for key climate drivers in the pacific</p> <p>1.2 Identify key differences between El Niño and La Niña?</p> <p>1.3 Knowledge of impact of ENSO in the pacific?</p>
2. Understanding Climate Change (Session 3)	<p>2.1 Understand the difference between enhanced greenhouse effect and global warming</p> <p>2.2 Understand how heat impacts land masses and oceans differently</p> <p>2.3 Understand how climate change affects global temperatures and rainfall</p> <p>2.4 Identify the impacts of sea level rise in the pacific</p>

3. Climate in Vanuatu (Session 4)	<p>3.1 Knowledge of Vanuatu’s climate, including understanding wet and dry seasons and tropical cyclone season.</p> <p>3.2 Knowledge of rainfall patterns across Vanuatu and what climate drivers affect it.</p> <p>3.3 Knowledge of the impact of climate change on weather and climate variables in Vanuatu</p>
4. Seasonal Climate Forecasts and Drought Monitoring (Session 5)	<p>4.1 Understanding seasonal forecasting as undertaken by VMGD</p> <p>4.2 Understanding terciles and averages with regards to rainfall.</p>
5. Ocean Information and Products (Session 6)	<p>5.1 Knowledge of VMGD Ocean Products and the Ocean, in particular the causes of Coral bleaching, factors affecting sea level and the nature of upwelling.</p> <p>5.2 Knowledge of the impacts of climate change on fisheries and tourism</p>
6. Climate and ocean information sector Applications (Session 7)	<p>6.1 The ability to understand and plan responses from current VMGD products and information.</p> <p>6.2 The ability to identify potential risks and benefits for the participants sector based on VMGD ocean and climate information.</p> <p>6.3 The ability to apply cost and benefit logic to their decision-making processes when using climate and ocean information.</p> <p>6.4 The ability to work collaboratively in a group setting</p>

KEY COMPETENCIES

Initiative	<ul style="list-style-type: none"> • Adapting to new situations • Developing a strategic long-term vision Identifying opportunities not obvious to others • Translating ideas into action • Generating a range of options • Initiating innovative solutions
Teamwork	<ul style="list-style-type: none"> • Working with people of different ages, gender, race, religion or political persuasion • Working as an individual and as a member of a team
Problem solving	<ul style="list-style-type: none"> • Identify where and when a problem may occur • Developing practical solutions • Showing independence and initiative in identifying problems • Solving problems in teams • Applying a range of strategies to problem solving • Applying problem-solving strategies across a range of areas

Self-Management	<ul style="list-style-type: none"> • Having a personal vision and goals • Evaluating and monitoring own performance • Having knowledge and confidence in own ideas and vision
Planning	<ul style="list-style-type: none"> • Managing time and priorities • Developing a vision and a proactive plan to accompany it
Decision Making	<ul style="list-style-type: none"> • Decisiveness in approach in resolving issues. • Taking responsibility for and demonstrating commitment to appropriate decisions • Ensuring that decisions are made based on the correct information and applicable source

Required knowledge

- Knowledge and experience of local weather, climate and climatic variations.
- First-hand knowledge of a sector, local village or community.
- Some knowledge of local traditional wisdom and cultural practices.

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below.

Climate variability describes changes in climate that take place over months, seasons and years.

Climate Driver Any atmospheric or ocean conditions that influence climate. Natural and anthropogenic substances and processes that alter the Earth's energy budget are drivers of climate change.

Climate change is a long-term change in global or regional climate patterns i.e. longer-term change in the pattern of weather, and related changes in oceans, land, surface etc. occurring over decades or longer.

Climatic zones are: major belts around the earth classified by their temperature. We can distinguish between polar, temperate, sub-tropical and tropical zones.

El Nino refers to a broad scale warming of water in the central and eastern tropical Pacific Ocean. In summary El Niño is the reversal of the Walker Circulation. El Niño brings extensive warming of the central and eastern Pacific and weaker than normal (easterly) trade winds leading to a major shift in weather patterns across the Pacific. Typical El Niño conditions in the northern hemisphere winter result in the western Pacific experiencing very dry conditions and the central Pacific around the equator experiencing wetter conditions.

La Nina During a La Niña event, the Walker Circulation intensifies with greater convection over the western Pacific and stronger trade winds. As the trade winds strengthen, the pool of warmer water is confined to the far western tropical Pacific, resulting in warmer than usual sea surface temperatures in the region north of Australia. Sea surface temperatures across the central and eastern tropical Pacific Ocean become cooler than usual and the thermocline moves closer to the surface – cool waters from the deep ocean are drawn to the surface as upwelling strengthens. Convection and hence cloudiness over the region north of Australia increases as stronger winds provide more moisture to the overlying atmosphere and the Walker Circulation intensifies.

ENSO (El Niño–Southern Oscillation) is the oscillation between El Niño and La Niña conditions.

Global warming is the increases of the Earth's average surface temperature due to increases in greenhouse gases in the atmosphere.

Vanuatu's Seasonal Variation: Vanuatu's climate varies considerably from year to year due to the El Niño- Southern Oscillation. This is a climate pattern that occurs across the tropical Pacific Ocean and affects weather around the world. There are two extreme phases of the El Niño-Southern Oscillation: El Niño and La Niña. There is also a neutral phase. In both Port Vila and Aneityum El Niño events tend to bring drier conditions as well as a late start to the wet season and cooler than normal dry seasons. The opposite occurs during La Niña events.

Sea level is affected by three factors:

- Water mass variation increases and decreases in the volume of water in the ocean. Increases can be from rain over the ocean, run-off from the rivers, and glaciers melting. Decreases can occur from less runoff due to construction of new artificial reservoirs, evaporation, increased precipitation over land and the development of glaciers.
- Density variations: Salinity and temperature determine the density or buoyancy of sea water. Generally, in the

open ocean, warmer water with a lower salinity (less salty) is less dense and has a higher sea surface height than denser cooler water with a higher salinity.

- Ocean circulation changes: The movement of surface water in the ocean can change the sea level
- Sea Surface Temperature.

Upwelling: Water then rises up from beneath the surface to replace the water that was pushed away. This process is known as “upwelling.” Upwelling occurs in the open ocean and along coastlines. Water that rises to the surface as a result of upwelling is typically colder and is rich in nutrients.

Sea surface temperature (SST) is the water temperature close to the ocean’s surface.

Drought is a complex, natural phenomenon that can have significant social, economic, and environmental impacts. It occurs when there is less than normal precipitation/rainfall over an extended period, which may last from a few weeks to many years and occurs in virtually all climate zones.

EVIDENCE GUIDE

<p>The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.</p>	<p>Context of Assessment</p> <p>Assessment of underpinning knowledge and communication of ideas can be done in the course through the following methods:</p> <ul style="list-style-type: none"> • Observations • Discussions • Test format of questions and answers <p>Assessment of the application of knowledge into decision making and articulation of key concepts can be done through the following methods:</p>
<p>Evidence of the following knowledge, skills and attributes is essential:</p>	<p>Resource Implications</p> <p>Assessment process and resources must ensure:</p> <ul style="list-style-type: none"> • Participants have note paper, pens, and other tools to assist them take down the learnings delivered. • There are no other resource implications for this course
<p>Understanding key features of climate variability, the key climate drivers in the pacific. Including ENSO.</p>	<p>Assessment Methods</p> <p>Self-Assessment to illicit from participants where their learnings around climate science and its application may need further attention.</p> <p>Tests (various kinds) on key concepts and definitions to ensure that participants have understood the material delivered both orally and visually.</p> <p>Questions and answers at the several session from climate expert with participants to directly gauge understanding and uptake of information. Expert questioning is a very useful in a way by putting forth questions based on participant’s needs and expectations. In this method, expert does not present but only responds to questions and concerns put forward by the participants.</p>
<p>Knowledge of climate change and its impact on the pacific and the globe. This includes rising temperatures, sea level and greenhouse gases</p>	<p>Group exercises that engage participants to understand the topics, allowing a greater flow of ideas and knowledge, increasing the learnings.</p> <p>Group presentations to demonstrate articulation of complex concepts and collaboration</p> <p>Scenario based learning to ensure that participants can apply knowledge to actual real time climate events.</p> <p>Evaluation - Written reflection by participants at the end of course.</p> <p>For more information, a detailed rationale of the assessments is provided in the Facilitators handbook.</p>

Assessment Rational

SESSION	ASSESSMENT TYPE	ASSESSMENT RATIONAL
Session 1	Self-Assessment – Climate Knowledge	<p>The Self-Assessment exercise at the beginning of this course, is based on what climate science will be covered in the course and how the participant would rate their current knowledge of the topics.</p> <p>This is done at the beginning of this course to allows the participants to honestly assess their current knowledge and where the gaps are. Remember the profile of participants are that they work within the sectors or government and have exposure and existing knowledge. The course aims to take this knowledge build on it and then help them apply it to real life events.</p> <p>This type of assessment allows participants “take control of their own learning and assessment and giving them the chance to manage their own learning and development more independently”².</p> <p>The sharing icebreaker in the introduction has a two-fold intent. It has the traditional use of a sharing information but as it is based on sharing how they use/utilise climate information, there is a learning aspect.</p>
	Icebreaker	Icebreaker have three advantages, it opens the door for communication, where previously there was no opportunity. It helps build empathy in a group, where you hear similar experiences from people with a similar professional background and this experience helps build both community and empathy with the group.
Session 2	Individual Tests Multiple Choice/Fill in the Blank and Circle the correct answer.	<p>The amount of information covered in session 2 (climate drivers) is both comprehensive and complex.</p> <p>A multiple-choice assessment in this section allows the trainer to cover large areas of knowledge very quickly & correct & process very quickly as well³. The same for Fill in the blank question/answers. These type of test questions allows the participant to gauge what they missed before they move onto the next session on climate change in a clear concise manner. (wide range of higher-order thinking skills)</p>
Session 3	Individual Test	As this topic is on Climate change and is about understanding and learning about different aspects of climate change, globally and in the pacific a test of knowledge on these subjects is given.
Session 4	Individual Test	One test question on rainfall patterns across Vanuatu (and what climate drivers affect it). In relation to climate change in Vanuatu, one question on knowledge of the impact of climate change on weather and climate variables in Vanuatu. As stated above question and answer tests allow for a quick testing and assessment period while covering a decent amount of subject material.

² <https://academ.com.au/importance-student-self-assessment/>

³ <https://help.surveyanypace.com/en/support/solutions/articles/35000042297-multiple-choice-question>

SESSION	ASSESSMENT TYPE	ASSESSMENT RATIONAL
Session 5	Tercile Exercise	The Tercile Exercise is very similar to a role play exercise, where the learning comes through physicality and self-realisation. By each person in the room being assigned a year and then their individual height being translated into rainfall. The participants are then asked to group and regroup in different scenarios. Through this method participants can grasp the complex statistical data set known as tercile which are used in VMGD seasonal forecasting Information.
	Paying for Predictions	<p>This participatory activity aims to support experiential learning and dialogue on the concept of climate-based disaster risk reduction. Experiential theory in Learning proposes a more holistic approach to learning than just abstract conceptualization, it emphasizes how experiences, including cognition, environmental factors, and emotions, influence the learning process.</p> <p>The Paying for prediction exercise take participants through a range of emotions as the game intensifies and the consequences of participants decisions can negatively or positively impact their community, region or country.</p>
Session 6	Individual Test	Two tests, the first one Multiple choice based on Ocean Information and Products and the second test is a True and False format on Impacts of Climate change on fisheries and tourism. Again, the rational behind this is that the assessment of a large uptake amount information that can be quickly check is best done in a question/answer format.
Session 7	Scenario Sector based session	<p>Scenario-based learning (SBL) uses interactive scenarios to support active learning strategies such as problem-based or case-based learning.</p> <p>Knowledge, critical thinking and problem-solving skills are utilised in a safe, real-world context.</p> <p>In this course, this type of assessment can demonstrate where the real strengths are in the participants knowledge and where the gaps are and help participants to reflect on this as well as their decision-making skills: and since this exercise is done in a group setting, participants can also work on their collaboration and teamwork skills. knowledge.</p> <p>There is also an opportunity to provide detailed feedback and support because one can review the knowledge and decision making at each stage in the process and where adjustments were needed or not needed; unlike a test based assessment where only at the end do you know you were either right or wrong.</p> <p>The benefit of scenario-based learning is that it is self-contained, in that completing the scenario is the entire task.</p>
Closing		'Course Evaluation' section contains a handout to be filled out by participants at the conclusion of the course. It will be used by the facilitator to establish the overall effectiveness or ineffectiveness of different aspects of the course and identify specific areas for improvement. Lastly, there will be one question on how the participant has done against the initial self-assessment from session one. This can be used to really understand how participants think the application of VMGD products and the climate science behind them can be utilised by them as soon as they go back to their role in sector or government.

Session Guide

Guide to Course Material

The Course material for Climate Science Training for Sectors has several components, including this Facilitators' Handbook. The course material also includes Course Administration, which comprises of all the practical aspects of the course, from Sign in sheet, Participants Agenda, Run Sheet and Materials Checklist. The Run sheet outlines the Facilitators Agenda versus the Participants Agenda, and maps out all aspects of the day, from a PowerPoint presentation to a group activity or self-reflection.

The next component of the course material is the Session slides (PowerPoint), accompanied by the exercise handouts for each session as well as the corresponding answer sheet for the Facilitator.

Session 1 - Introduction of Climate Science Training for Sectors is the shortest session which includes the welcome and sign in, as well as an icebreaker and self-assessment. There is also a brief background on how the course came into inception and what the objectives are.

Session 2 - Key Climate Drivers covers the difference between weather and climate, climate and climate variability and other climate influences are in Vanuatu. There are two individual tests in this section, the first test includes a multiple choice on the topics covered and the other section is a fill in the blank component. The second test also includes a fill in the blanks section as well as a section where one circles the correct answer.

Session 3 - Climate Change including global trends including greenhouse gases, the session also covers how climate change impacts the 5 key sectors in Vanuatu. There is only one individual tests in this session, comprising of three parts, there are two fill in blanks and one component of True and False questions.

Session 4 – Vanuatu Climate, covers climate and climate change in Vanuatu. Also covered is the future of climate in Vanuatu and VMGD products used by sectors to plan for their businesses, depending on the climate outlook. Like session 3, there is one individual test. This test has a component of answering questions and another that section circling the correct answers.

Session 5 - Seasonal Climate Forecasts and Drought Monitoring is where participants start applying the knowledge they have acquired in previous sessions. The topics under this session are Understanding drought and Seasonal Forecasting, as well as looking at two VMGD products (Seasonal Climate Outlook and the Early Action Rainfall Watch).

There are two exercises in this session. The first exercise is around understanding averages and terciles in relation

to rainfall through physicality, by using the difference in the participants height to demonstrate tercile/averages. The second exercise, developed by the International Federation of Red Cross allows participants to act within a scenario based environment where on climate-based disaster risk reduction concepts.

Recommendation for Paying for Prediction: It is recommended that the facilitator watch the IFRC video on this game (<https://www.climatecentre.org/resources-and-games/games/2/paying-for-predictions>) . The game is both complex and difficult to explain, the learnings are incremental, so as the game proceeds, the learnings are revealed. The IFRC video shows how the exercise is played, however the facilitator should note that the version in Climate Science for Sectors is slightly different to the video version as it is tailored to VMGD /Sector participant rather than Red Cross Representative. Further the game does not have the Humanitarian Component because in this course it is not covered. The game also uses different resources to the video particularly paperclips rather than beans.

Session 6 - Oceans Information and Products, is specific to Vanuatu. The areas covered are Global ocean observation systems, VMGD ocean products and the types of ocean information available. Sector specific information is also provided such as the impact of climate change on fisheries and coral. The session also covers why ocean information is important for tourism.

















There are two exercises in Session 6, both are test orientated. The first exercise on knowledge of Ocean Information and Products is multiple choice, whilst the second test on the Impacts of Climate change on fisheries and tourism is True or False orientated.
























Session 7 - Climate and ocean information sector applications, is a whole day session, where all the knowledge that the participants has acquired about both, climate science and VMGD products are utilised and applied to scenario-based learnings. The first part of the day will be a PowerPoint presentation on Why climate and ocean information can be useful for sectors and the decision-making processes in sectors. After this there will be 3 group exercises based on previous and current VMGD forecasts, the ability to extract the pertinent information is part of the exercise as well as what planning outcomes would be derived from the information extrapolated. After the first two sessions there will be a group discussion on how and why decisions were made and what were some of the learnings. The third group exercise will be based on the current forecast and the participants will be almost be working in real time and take the learnings back to their current role.

The Facilitator will ask if there are any questions and then hand the end of course Evaluation form.

The facilitator will then close the course with whatever information the VMGD would like to pass on to participants.

Recommendation. As mentioned above, the profile of participants is that they generally do not have a science background, however, have completed High School certification as a minimum. The complexity of the course, the amount of information required before the application process begins (latter session of the course) and the length of some of the exercises means that this course should run up to 5 days. It is only possible to shorten the course by 1-2 days if ALL participants have a science background.

SESSION	SUBTOPICS	TIMING	FACILITATION/TECHNIQUE	TOOLS
1. Introduction	<ul style="list-style-type: none"> Objectives Expectations Key sectors Agenda <ul style="list-style-type: none"> Exercise 1: Self Introduction (Icebreaker) Exercise 2: Self-assessment Housekeeping Questions 		 PowerPoint  Group Activity  Self Assessment  Ask Questions	 PowerPoint  Self Assessment
2. Key Climate Drivers	<ul style="list-style-type: none"> The difference between weather, climate variability and climate change Understanding climate variability Key climate drivers <ul style="list-style-type: none"> Exercise 1: Pacific Climate Drivers Other climate influences <ul style="list-style-type: none"> Exercise 2: What do you know about ENSO? Questions 		 PowerPoint  Test  Ask Questions	 PowerPoint  Test
3. Seasonal Climate Forecasts and Drought Monitoring	<ul style="list-style-type: none"> Recap Understanding climate change and greenhouse gases <ul style="list-style-type: none"> Exercise 1: Global warming vs. Climate change Global climate change trends Impacts of climate change on sectors <ul style="list-style-type: none"> Exercise 2: Climate Change Quiz Questions 		 PowerPoint  Test  Ask Questions	 PowerPoint  Test

SESSION	SUBTOPICS	TIMING	FACILITATION/ TECHNIQUE	TOOLS
4. Climate in Vanuatu	<ul style="list-style-type: none"> Recap Climate of Vanuatu Vanuatu's changing climate Vanuatu's future climate VMGD Climate Products <ul style="list-style-type: none"> Exercise 1: Vanuatu Climate Exercise 2: Climate Change in Vanuatu Questions 		 PowerPoint  Test  Ask Questions	 PowerPoint  Test
5. Seasonal Climate Forecasts and Drought Monitoring	<ul style="list-style-type: none"> Understanding Seasonal Forecasting Seasonal Climate Outlooks from VMGD <ul style="list-style-type: none"> Exercise 1: Understanding averages and terciles Understanding Draught Early Action Rainfall Watch <ul style="list-style-type: none"> Exercise 2: Paying for Predictions Questions 		 PowerPoint  Group Activity  Ask Questions	 PowerPoint  Board Butchers Paper
6. Ocean Information and Products	<ul style="list-style-type: none"> Global ocean observation systems VMGD ocean products Types of ocean information available <ul style="list-style-type: none"> Exercise 1: Ocean Information Products Impact of climate change on fisheries and coral Why ocean information is important for tourism? <ul style="list-style-type: none"> Exercise 2: Impacts of Climate change on fisheries and tourism Questions 		 PowerPoint  Test  Ask Questions	 PowerPoint  Test
7. Climate and Ocean Information Sector Applications	<ul style="list-style-type: none"> Why climate and ocean information can be useful for sectors Decision making processes in sectors <ul style="list-style-type: none"> Group exercises – using climate and ocean information in decision making processes Questions Evaluation Close 		 PowerPoint  Group Activity  Group Discussion  Ask Questions  Evaluation	 PowerPoint  Evaluation  Board Butchers Paper

Glossary

BoM	Australian Bureau of Meteorology	PRSCS	Pacific Roadmap for Strengthening Climate Services
CFC	Chlorofluorocarbon	RESCCUE	Restoration of Ecosystem Services and Adaptation to Climate Change
CIS	Climate Information Services	SCO	Seasonal Climate Outlook
CoT	Crown of Thorns	SDP	Strategic Development Plan
DGMWR	Department of Geology, Mines and Water Resources	SOI	Southern Oscillation Index
EARW	Early Action Rainfall Watch	SPC	Secretariat of the Pacific Community
EEZ	Exclusive Economic Zone	SPCZ	South Pacific Convergence Zone
EIA	Environmental Impact Assessment	SPREP	Secretariat of Pacific Regional Environmental Programme
ENSO	El Niño Southern Oscillation	TC	Tropical Cyclone
GFCS	Global Framework for Climate Services	TK	Traditional Knowledge
GHE	Greenhouse Effect	VASP	Vanuatu Action and Sector Plan
GHG	Greenhouse Gas	VCU	Vanuatu Climate Update
GoV	Government of Vanuatu	VCS	Vanuatu Climate Summary
HDA	Hydrological Drought Advisory	VFCS	Vanuatu Framework for Climate Services
IPCC	International Panel on Climate Change	VMGD	Vanuatu Meteorology and Geohazards Department
ITCZ	Inter-tropical Convergence Zone	VNACCC	Vanuatu National Advisory Committee on Climate Change
IWRM	Integrated Water Resource Management	VNWS	Vanuatu National Water Strategy
MCS	Monthly Climate Summary	VOO	Vanuatu Ocean Outlook
MJO	Madden-Julian Oscillation	VSTAP	Vanuatu Strategic Tourism Action Plan
NDMO	National Disaster Management Office	VTSSP	Vanuatu Transport Sector Support Program
NFSP	National Fisheries Sector Policy	WC	Walker Circulation
NOAA	National Oceanic and Atmospheric Administration	WMO	World Meteorological Organization
NSDP	National Sustainable Development Plan	WPM	West Pacific Monsoon
PACCSAP	Pacific-Australia Climate Change Science and Adaptation Planning	WPWM	West Pacific Warm Pool
PDO	Pacific Decadal Oscillation	WRD	Water Resource Division
PICPP	Pacific Islands Climate Prediction Project	WWB	Western Wind Burst
PITD	Pacific Island Training Desk		

ANNEX – 5 Sector Background Information

Facilitators Handbook

This workshop has been developed from the funding of the The Vanuatu Klaemet Infomesen blong redy, adapt mo protect (Van-KIRAP) project. Through the use of climate science, the Van-KIRAP Project aims to increase the abilities of decision makers, development partners, communities and individuals across five target sectors to plan for and respond to the immediate and long-term impacts of climate change⁴.

The Government of Vanuatu and its development partners have created policies and proposed strategies to improve Vanuatu's access to reliable climate information and to ensure it is used effectively to mitigate impacts⁵. The Van-KIRAP Project responds to priorities identified in the Vanuatu Framework for Climate Services (VFCS) and the Vanuatu Meteorology and Geohazards Department (VMGD) Strategic Development Plan. Both documents were developed through a national consultation and design process.

Agriculture

Background Information

"Vanuatu is an agrarian-based economy in which 80% of the population depends entirely on subsistence agriculture for their daily sustenance and well-being"⁶. Vanuatu's agriculture sector can be divided into three distinctive subsectors: subsistence, semi-commercial and commercial. The subsistence subsector accounts for more than 75% of the total agricultural production and a growing semi-commercial subsector contributes to around 15%. Lastly, the commercial subsector contributes to approximately 10% of total production in the sector"⁷.

"The subsistence subsector is predominantly centred around root crops (taro, yam, cassava and sweet potato)... and is characterized by a total reliance on rain irrigation and rudimentary implements...There exists a notable level of risk and uncertainty regarding the magnitude of potential

One of the most effective ways of combating the effects of climate change is through capacity building and education in the fundamental principles of climate science. This will allow impacted groups to improve their understanding of why weather patterns are changing and how they can make more informed decisions to better mitigate the adverse effects of climate change.

This workshop focuses on five economically valuable sectors (Agriculture, Fisheries, Infrastructure, Tourism and Water) that are most vulnerable to climate change in Vanuatu. A description of the most important climate issues affecting each sector can be found below to enhance the facilitator's understanding. Additionally, information is also provided on programmes and projects the Vanuatu government has initiated with regards to major issues relating to climate change.

yield at any given time thus giving rise to food insecurity and vulnerability to shocks"⁸.

The semi-commercial subsector generally operates near urban centres where three factors ensure its growth: high population growth rates, the development of the tourism industry and high rates of urban unemployment.

"The commercial subsector is dominated by four main cash crops: cocoa, kava, coffee and coconut. However, the 2009 population census registered a significant drop in the number of households planting kava, coconut and cocoa. Such a decline may be related to fluctuations in world commodity prices, emerging markets for novel crops, loss of basic farming knowledge or conversion of prime agricultural land to cater for rapidly expanding urban populations."⁹

Agriculture and Climate Change

In Vanuatu "agriculture often relies on rain-fed agricultural production systems. Any changes in rainfall distribution, both in terms of the amounts of rain and its spatial as well as temporal distribution could have severe impacts on production. Intense and prolonged rainfall in planting

seasons could damage seedlings, reduce growth and provide conditions that promote plant pests and diseases. Moreover, this could lead to greater frequency and intensity of flash floods leading to soil erosion and flooding of agricultural land."¹⁰ Further, "more pronounced dry seasons,

4 SPREP, GCF: Van-KIRAP Infrastructure and Climate Information Services: Policy Review, Action and Communications Plan, 2019

5 SPREP, GCF: Van-KIRAP Agricultural and Climate Information Services: Policy Review, Action and Communications Plan, 2019

6 Government of the Republic of Vanuatu, Vanuatu Agriculture Sector Policy, 2014

7 Government of the Republic of Vanuatu, Vanuatu Agriculture Sector Policy, 2014

8 Government of the Republic of Vanuatu, Vanuatu Agriculture Sector Policy, 2014

9 Government of the Republic of Vanuatu, Vanuatu Agriculture Sector Policy, 2014

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

warmer temperatures and greater evaporation could reduce harvests” and impact the health of livestock.^{11 12}

“The impacts of climate change on the agricultural sector include reduction in crop yields and damage from cyclonic activity, increases in evapotranspiration, changes in growing

seasons and reduction in water availability. There is also growing evidence of soil erosion and loss of soil fertility due to improperly managed deforestation and environmental degradation”¹³ as well as more pests and diseases of animals, crops and trees.¹⁴

Key Government Agencies Working with the Agricultural Sector

- Department of Agriculture
- Vanuatu Meteorology and Geohazards Department (VMGD)

Agricultural Initiatives

The Department of Agriculture and VMGD run climate field schools “in all the provinces and include training on modifying

agricultural practices (including planting different crops and varieties) during drier- and wetter-than-normal conditions.”¹⁵

Where Does Climate Science Training Fit Within Vanuatu’s Official Strategy to Combat Climate Change in the Agriculture Sector?

VASP 2014-2023: Policy Directives & Strategies No 2.1.1 “Develop appropriate agriculture training syllabus and modules based on the needs of the sector”.

VFCS: Recommendation No 15 looks at partnering with Pacific International Training Desk (PITD) on the potential of developing training courses for the provision and interpretation of climate information.

NSDP 2016-2030:

ENV 3.1 “Institutionalize climate change and disaster risk governance and build institutional capacity and awareness”;

PRSCS: Highlights the importance of capacity building and training programs on the use of climate products and services.

ENV 4.7 “Build capacity and support local communities to manage natural resources”.

Where Does Climate Science Training Fit Within the Global Framework for Improving Climate Services in the Agriculture Sector?

The Global Framework for Climate Services (GFCS) provides a worldwide mechanism for coordinated actions to enhance the quality, quantity and application of climate services. The

five stated priority areas are: Agriculture and Food Security; Disaster Risk Reduction; Energy; Health; and Water.¹⁶

Fisheries

Background Information

“Vanuatu’s fisheries sector is an important provider of employment, food and income. As is the case in many Pacific Islands, fish resources provide the principal source of animal protein for ni-Vanuatu communities, especially those living in the country’s many remote islands.”¹⁷

“Vanuatu’s fisheries resources are divided into three main groups: various species of tuna, deep-water bottom fish and reef fish. Current fishing activities in Vanuatu can be classified into the following broad categories:

- Subsistence: near-shore reef fishing activities that target reef associated and lagoon fish, shellfish and small pelagic fish, reef gleaning, and shell collecting;
- Artisanal: small-scale commercial fishing activities that principally target shallow and deep- water bottom snapper (poulet) species, and FAD associated pelagics using trolling and long-lining techniques;
- Big game/sports fishing: commercial charter boat sport fishing for tourists targeting billfish, tuna and large coastal pelagic fish species;

11 Global Environment Fund (GEF), Pacific Adaptation to Climate Change (PACC): Vanuatu, 2010

12 SPREP, Vanuatu Framework for Climate Services, 2016

13 World Bank, Climate Risk and Adaptation Country Profile: Vanuatu, 2011

14 SPREP, Vanuatu Framework for Climate Services, 2016

15 SPREP, Vanuatu Framework for Climate Services, 2016

16 <https://gfcs.wmo.int>

17 Amos.,J,A, 2007; Vanuatu Fisheries Resource Profile – International Water Project Pacific Technical Report, 2007

- Locally based long-liners: pelagic long-line fishing for albacore and yellow-fin tuna, plus some bottom set long-lining for snapper and groupers; and,
- Foreign access industrial fishing: primarily long-lining, but also some multilateral purse-seining.”¹⁸

“[A] village subsistence fishing survey conducted in 1983 indicated that over 50% of the country’s rural population engaged in fishing of which 93% was for subsistence consumption. Most fishing within the reefs and lagoons has been at the subsistence and artisanal levels. Reef and lagoon fish, as well as non-fish marine animals such as lobsters, are becoming increasingly important at the artisanal level.”¹⁹

“Vanuatu has a large locally-based long-line fishery for tuna that operates both within and outside its exclusive economic

zone (EEZ), and a purse-seine fishery that operates only outside the EEZ. Recent average catches (2004–2008) by these fisheries totalled more than 72,000 tonnes per year, worth more than USD 130 million. Vanuatu also licenses foreign long-line fleets to fish for tuna in its EEZ. These fleets made average annual catches of more than 4200 tonnes, worth USD 10 million between 1999 and 2008.”²⁰

“Traditional management practices have been used to conserve stocks, although with advances in fishing techniques/equipment, and increasing pressure for financial rewards from fishing, customary methods of fishing have declined in some areas. Although in some communities, village level management methods are reportedly making a comeback.”²¹

Fisheries and Climate Change

Climate change and rising sea levels are likely to impact on marine resources through their effects on corals and reef ecosystems. Coral bleaching could accelerate as a result of increased temperatures and there are also concerns about the possible increase in ciguatera poisoning due to heightened temperatures of the oceans, marine pollution from land-based activities and sedimentation of coastal areas and water run-off.

Changes in ocean circulation patterns, may affect fish populations and the aquatic food web as species seek conditions suitable for their lifecycle. Higher ocean

acidity (resulting from carbon dioxide absorption from the atmosphere) could affect the marine environment through deficiencies in forming calcium carbonate, affecting shelled organisms and coral reefs.

“The damage to coral reefs from cyclone events can be considerable as was the case with reefs around Efate from Tropical Cyclone (TC) Ivy in 2003”²². This impacts fishing in and around the reefs. Worryingly, Vanuatu is experiencing increasing intensifying cyclones the damage could be further damaging to the industry.

Key Government Agencies Working with the Fisheries Sector

- Department of Fisheries
- VMGD
- National Oceanic and Atmospheric Administration (NOAA)
- Secretariat of the Pacific Community (SPC)
- Secretariat of Pacific Regional Environmental Programme (SPREP)

There is currently limited use of climate data or information on the fisheries industry in Vanuatu.²³

Where Does Climate Science Training Fit Within Vanuatu’s Official Strategy to Combat Climate Change in the Fisheries Sector?

NFSP: “Constraints, issues and challenges within the fisheries sector”, Issue No 5: Identifies a shortage of human & financial resources within the Fisheries Department, specifically the lack of information, communication, technology and fisheries officer.

VMGD SDP: Climate Change and Risk Reduction: the

need for sufficient resources to manage and operate the implementation of climate change and risk reduction programmes.

NSDP: Access available financing for climate change adaptations and disaster risk management.

18 Amos.,J,A, 2007; Vanuatu Fisheries Resource Profile – International Water Project Pacific Technical Report, 2007

19 Government of Vanuatu; Vanuatu National Fisheries Sector Policy – 2016-2031

20 SPC; Vulnerability of tropical Pacific fisheries and aquaculture to climate change.

21 Amos.,J,A, 2007; Vanuatu Fisheries Resource Profile – International Water Project Pacific Technical Report, 2007.

22 FAO; An Assessment Of The Impact Of Climate Change On Agriculture And Food Security - A Case Study In Vanuatu

23 SPREP, GCF: Van-KIRAP Fisheries and Climate Information Services: Policy Review, Action and Communications Plan, 2019

Where Does Climate Science Training Fit Within the Global Framework for Improving Climate Services in the Fisheries Sector?

The five priority areas under GFCS are: Agriculture and Food Security; Disaster Risk Reduction; Energy; Health; and Water.²⁴

Infrastructure

Background Information

Infrastructure is one of the key sectors in Vanuatu's economy. It plays a vital role in generating economic growth but is also one of the main areas of the economy susceptible to climate change. The VMGD works closely with the Ministry of Infrastructure and Public Utilities in the planning and maintenance of infrastructure across the Vanuatu.

The population of Vanuatu is spread sparsely across 64 inhabited islands, with over three quarters of the population living in rural areas. Vanuatu has one of the fastest growing populations in the world and an increasing number are settling along the coastal perimeters, yet most islands still have no major urban centre and transport between islands is both difficult and expensive.²⁵ Much of the Vanuatu's infrastructure, including commercial centres and much of

the road network, are located on the perimeter of the major islands. These are only a few meters above sea level and are extremely vulnerable to cyclones and storm surges.²⁶

"Air and sea are the only route to connect Vanuatu to outer world. Vanuatu has very few roads and the limited road networks are confined to the larger islands mainly around the 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), approximately 1,894km of roadways (111km paved and 1,783km unpaved) and two main ports/terminals, Port Vila and Santo. Extreme climatic events are already leading to irregular air and shipping services to remote and outer islands.²⁷

Infrastructure & Climate

"The main climatic impacts 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 infrastructure projects very difficult, therefore, El Niño 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."²⁸

Infrastructure Initiatives

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-motorized transport.

Future Resilience Targets for Infrastructure (SPREP: GFC & Van-KIRAP Infrastructure Policy Review 2019)

- Sea level rising impacting wharves/jetties -need to lift these structures
- Storm surges affecting coastal roads – move coastal roads further inland
- Steep slopes will become more difficult to climb. Use concrete. Add drainage
- Potential for extreme weather event's such as increased rainfall, need to improve draining
- Roads may become impassable from flooding. Lift road on embankment. Add cross drainage

²⁴ <https://gfcs.wmo.int>

²⁵ Government of the Republic of Vanuatu, Vanuatu Infrastructure Sector Policy, 2014

²⁶ Government of the Republic of Vanuatu, Vanuatu Infrastructure Sector Policy, 2014

²⁷ Government of the Republic of Vanuatu, Vanuatu Infrastructure Sector Policy, 2014

²⁸ SPREP, Vanuatu Framework for Climate Services, 2016

Where Does Climate Science Training Fit Within Vanuatu's Official Strategy to Combat Climate Change in the Infrastructure Sector?

Van-KIRAP Sector Workshops (October 2018): One of the outcomes of the workshop was to identify the key project priorities for each sector. The priority identified by Infrastructure is to “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”.²⁹

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

National Climate Change and DRR Policy 2016-2030:

Tourism

Background Information

Tourism is another critical sector for the Vanuatu economy. In 2016 it contributed to 45% of the national GDP.³² In 2008 approximately 197,000 visitors visited Vanuatu³³ and by 2018 this number was predicted to reach almost 500,000³⁴. Tourist activity is concentrated around the two main urban centres (90% of Vanuatu's hotel capacity is focused in Port Vila), however, it is also expanding rapidly into rural areas (Statistics Office, 2000).

“Vanuatu possesses a number of features that mark it out as an attractive destination for tourists. The country boasts a striking array of natural and cultural attractions – diverse cultural groups, active volcanoes, white and black sand beaches, pristine coral reefs, shipwreck dive-sites and French cuisine – which opens the country both to mainstream tourist markets as well as diverse niche markets

Tourism & Climate

“Climate change will affect the natural attractions of Vanuatu through coral bleaching, sea level rise and coastal inundation. The main climate change issues and vulnerabilities identified by the Republic of Vanuatu as affecting the various provinces of Vanuatu are: 1) coastal erosion; 2) cyclones; 3) flooding; 4) salt water intrusion; 5) scarcity of water resources; 6) El Niño events resulting in drought; 7) landslides associated

Aims to achieve the following through basic science training, the ability to identify long and short term climate events and understanding the implications on infrastructure staff:

- Ensure that the design and construction of public and other major infrastructure and development projects considers current and projected risks. This is in order to minimise loss and damage.³⁰

“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.”³¹

and demographics.”³⁵ Furthermore, “Vanuatu has also developed a booming cruise tourism sector. In fact, by 2006, arrivals by sea surpassed arrivals by air and this trend has continued. Visitors arriving by cruise ship essentially doubled between 2005 and 2009.”³⁶

“Australia dominates arrivals to Vanuatu accounting for 66% of the market, followed by New Caledonia (13%), New Zealand (9%), Europe (5%) and North America (2%). According to the 2004 Vanuatu Visitor Survey, Vanuatu has a high level of repeat visitation (29%), an indicator of visitor satisfaction. Local residents also travel considerably around the archipelago for a variety of purposes including visiting friends and relatives, business and holidays. The most recent estimate is that domestic tourists number around 67,250, or 22% of the overall market.”³⁷

with prolonged and intense rainfall; 8) declining crop production; 9) changes in temperatures; and 10) distribution of mosquitoes.”³⁸

“During El Niño periods, streams and rivers can run low or dry up completely where tourism activities take place (e.g. swimming, waterfalls, rafting etc). Droughts also impact locally-grown vegetables which affects supply to hotels.

29 Government of the Republic of Vanuatu, Vanuatu Infrastructure Sector Policy, 2014

30 Government of the Republic of Vanuatu, Vanuatu Infrastructure Sector Policy, 2014

31 SPREP, Vanuatu Framework for Climate Services, 2016

32 GEF, Vanuatu Coastal Adaptation Project: Climate Information and Services, Summary Sector tables, 2017

33 SPREP, GCF Funding Proposal: Climate Information Services for Resilient Development in Vanuatu, 2016

34 Government of Vanuatu, 2014; Vanuatu Tourism Action Plan- 2014-2018

35 Regina Scheyvens and Matt Russell, Sharing the Riches of Tourism in Vanuatu, 2013

36 Regina Scheyvens and Matt Russell, Sharing the Riches of Tourism in Vanuatu, 2013

37 Regina Scheyvens and Matt Russell, Sharing the Riches of Tourism in Vanuatu, 2013

38 http://epubs.surrey.ac.uk/534351/3/Wong_Climate_Change.pdf

Impacts tend to be more severe in the outer islands where there is a reliance on natural water sources. Further, tropical cyclones (such as TC Pam) are a big issue for tourism in Vanuatu and can result in a significant downturn in tourist numbers for many months and even years afterward.³⁹

in Vanuatu have occurred in some locations. This also applies to tourism developments, particularly resorts and hotel developments in sensitive coastal areas on Efate. Lack of monitoring capacity and enforcing environmental standards is an issue.⁴⁰

In addition, “[a]dverse environmental impacts of development

Key Government Agencies Working with the Fisheries Sector

- VMGD
- Department of Tourism
- Tourism Association: Has provincial and council links⁴¹

What Climate Information is Utilised by the Department of Tourism?

“The Department of Tourism specifically requests Volcanic Alert information from VMGD, and they also disseminate information that they receive from VMGD (e.g. Vanuatu Climate Update). Additionally, “Provincial Tourism Associations have a Provincial Officer who regularly receives climate information/warnings and passes these on to tourism operators.”⁴²

Where Does Climate Science Training Fit Within Vanuatu’s Official Strategy to Combat Climate Change in the Tourism Sector?

Van-KIRAP Inception Workshop – Jan 2018⁴³:

- Promote traditional knowledge of climate as a product for the tourism industry, to be used by local tourist operators.
- Disseminate tailored climate information

VSTAP Recommendation 5: The dissemination of tailored climate information is addressed as it is stated that “there are several climate change projects... [that] target adaptation and disaster risk reduction, and are coordinated by the National Advisory Board on Climate Change and Disaster Risk Reduction, which is within the VMGD”.

PRSCS: Provides a regional overview of the tourism sector and notes that tourism is both multifaceted and complex; as climate represents both a vital resource to be exploited and an important limiting factor that poses risks to be managed. All tourism destinations and operators are climate-sensitive

to a degree and climate is a key influence on travel planning and the travel experience⁴⁴. The section ends with some recommended actions which include: Capacity Building- “Identify through workshops and other consultative processes the climate and ocean services that will address the specific needs of the Pacific tourism sector”.

VFCS: 8.2 It was noted that individual farmers and mariners typically make an effort to listen to weather and climate information over the radio, but it is not known if they are applying this climate information to their activities.

Climate Information Services (CIS) Action Plan: To ensure Department of Tourism personnel and stakeholders are aware of and understand climate information and products.

National Sustainable Development Plan 2016—2030 ENV 3.4:⁴⁵ Promote and ensure strengthened resilience and adaptive capacity to climate related, natural and man-made hazards.

Water

Background Information

The water sector is a critical element of the Vanuatu economy as it services many other sectors such as agriculture and tourism and access to safe drinking water is critical to the

health and lives of all Ni-Vanuatu. The vision of the Vanuatu National Water Strategy of 2008-2018 is “sustainable and equitable access to safe water and sanitation for the people

39 SPREP, Vanuatu Framework for Climate Services, 2016

40 Government of Vanuatu, Vanuatu Strategic Tourism Action Plan 2014-2018, 2013

41 SPREP, Vanuatu Framework for Climate Services, 2016

42 SPREP, Vanuatu Framework for Climate Services, 2016

43 SPREP, Inception Report: Climate Information Services for Resilient Development Planning in Vanuatu (Van-CIS-RDP), 2018

44 Weather and Climate Information for Tourism, D. Scott and C. Lemieux. World Climate Conference 2010, Procedia Environmental Sciences Volume 1, 2010, Pages 146-183

45 Government of the Republic of Vanuatu, Vanuatu 2030 The people’s plan: National sustainable development plan 2016 - 2030, 2015

of Vanuatu to support improved public health and promote social and economic development". This demonstrates the importance of the water sector in the Vanuatu economy.

"The larger mountainous islands of Vanuatu have good ground and surface water resources whilst the low-lying islands have limited fresh ground water in shallow aquifers and rely heavily on rainwater. The mountainous terrain also creates challenges for traditional water carriers - women and children - especially where sources are far from villages. There is generally abundant rainfall although this varies from the north to south of the country and high mountainous islands create rain shadows on their leeward side.

"Port Vila water supply is provided by a private company (UNELCO) under contract with the Government. The water supply for Luganville, Isangel and Lakatoro are managed by the Public Works Department. Water quality is generally good with chlorine used for water treatment in Port Vila and

Luganville. There are at least 6 known private water suppliers around Port Vila operating outside the UNELCO concession area. These suppliers are not regulated and no monitoring activity is known. "Outside these areas water supply is either taken from groundwater via open wells and bores, from surface water sources, or rainwater collection with storage in ferro-cement or polyethylene tanks. Demand for irrigated water is extremely low and limited to a few small horticultural sites. In these rural areas there is a range of different problems with the delivery of safe drinking water including intermittent supply caused by drought or damaged infrastructure, contaminated water and competing uses for drinking water causing conflict in communities.

"Water reuse has not yet been considered and desalination has only been considered for disaster management. Bottled water is commonly available in supermarkets in urban centres."⁴⁶

Water & Climate Change

"El Niños, often associated with a drier-than-normal wet season, have a significant negative impact on the collection of freshwater resources from springs and streams. Fresh water abstraction is also affected by severe rainfall and flooding. During both drier- and wetter-than-normal periods, water quality can be poor due to excess sedimentation, contaminants and/or bacteria."⁴⁷

The main climate impacts on water supply in Vanuatu are drought and flooding related to ENSO and tropical cyclones. "Floods and droughts are predicted to become more extreme with weather pattern changes.

Furthermore, flooding and poor farming practices have resulted in erosion, threatening land stability and the health of rivers and marine life. In general, the islands with active volcanoes have all suffered reduced water quality due to contamination from a mixture of fluoride, hydrochloric acid, and sulphuric acid. This has created problems for rainwater collection systems and some surface water quality."⁴⁸

"Remote communities are particularly at risk, as people have to walk long distances to reach alternative sources of water or notify NDMO that they require emergency supply."⁴⁹ "The following table summarizes the current impacts and sensitivities to climate change, as well as the current adaptive capacity."⁵⁰

46 Government of Vanuatu, Vanuatu National Water Strategy 2008-2018, 2007

47 Ibid

48 Government of Vanuatu, Vanuatu National Water Strategy 2008-2018, 2007

49 SPREP; Vanuatu Framework for Climate Services, 2016

50 Government of the Republic of Vanuatu, National Climate Change Adaptation Strategy for Land Based Resources 2012 - 2022, 2011

SECTOR		WATER	
Impacts	Current Sensitivity to Climate Change	Current Adaptive Capacity	
<ul style="list-style-type: none"> • Droughts • Heat spells • Cyclones • Wind gusts • Floods • Sea level rise / salt water intrusion 	<ul style="list-style-type: none"> • lack of water storage and distribution infrastructure • lack of financial resources for infrastructure maintenance • lack of potable water caused by contamination • no water monitoring system in place • no water resource database of the quality, quantity and location of water resources in place • competition of water use • no water reuse 	<ul style="list-style-type: none"> • existing rainwater harvesting systems in some communities • introduction of an Integrated Water Resource Management (IWRM) concept (based on the National Water Strategy) • bottled water available in and around urban centres 	

Figure 1: Water sector sensitivity to climate change and adaptive capacity (Source: GoV)

Water Institutional Arrangements Relating to Climate

“Government Ministries and Departments are using VMGD information, combined with their own monitoring and modelling, very effectively. For example, the Water Resources Division of the Department of Geology, Mines and Water Resources (DGMWR) issues a Hydrological Drought Advisory

with associated actions and safety warnings, which is informed by climate information and forecasts. The DGMWR have indicated that they are willing to share their rainfall, river flow and borehole data records with VMGD.”⁵¹

Where Does Climate Science Training Fit Within Vanuatu’s Official Strategy to Combat Climate Change in the Water Sector?

VFCS:

- Capacity Building: Conduct capacity building of M&E Unit staff.
- 11.1: Training should include a component on understanding what influences the climate of Vanuatu. Such training should be conducted at least every two years (plus regular short refresher courses) and could be done at the same time as training for provisional area secretaries and provincial government sector representatives.
- Climate information (e.g. as presented in the VCU) needs to have less jargon and be translated into simple terms - using pictures and incorporating traditional knowledge

NSDP SOC2.4: Increase higher education opportunities, including technical and vocational training and skills.

CIS Action Plan: Ensure Water Resources Division personnel and stakeholders are aware of and understand climate information and products.

51 SPREP; Vanuatu Framework for Climate Services, 2016



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