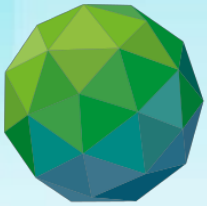
Vanuatu Rapid Climate Risk Assessment Framework – Tourism Sector Case Study Report

2024



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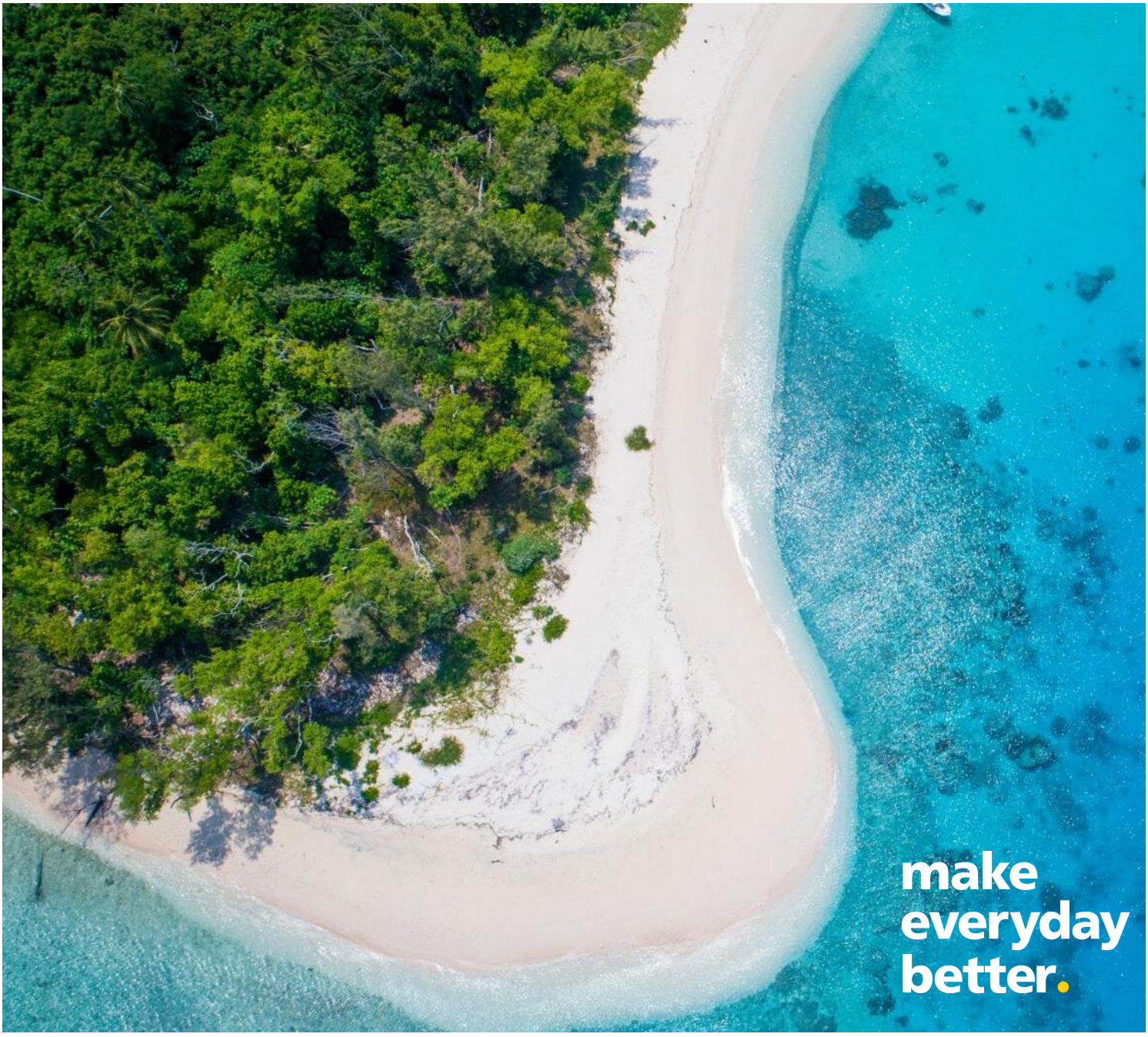
SPREP PROE

Vanuatu Rapid Climate Risk Assessment Framework Tourism Case Study Report

FINAL

Prepared for Secretariat of the Pacific Regional Environment Programme (SPREP)
Prepared by Beca International Consultants Ltd

29 May 2024



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Appendices

Revision History

Revision Nº	Prepared By	Description	Date
1	Kayla Baker, Erin Connolly and Carlos Carvajal	Draft for internal review	21/12/2023
2	Kayla Baker, Erin Connolly and Carlos Carvajal	Working Draft for client review	14/02/2024
3	Erin Connolly	Final Report	29/02/2024
4	Kayla Baker, Carlos Carvajal	Reissue – Final Report	05/06/2024

Document Acceptance

Action	Name	Signed	Date
Prepared by	Kayla Baker, Erin Connolly and Carlos Carvajal		06/06/2024
Reviewed by	Kristin Renoux		06/06/2024
Approved by	Cushla Loomb		06/06/2024
on behalf of	Beca International Consultants Ltd		

Executive Summary

Please note that this report is a desktop case study. Due to disruptions caused by Cyclone Lola in 2023, the anticipated critical tourism stakeholder input has not been available for this study.

This report has primarily relied on material in the Van-Kirap portal and desktop research to support application of the Rapid Climate Risk Assessment Framework and tool (developed as part of the wider project) to a tourism sector case study.

Beca International Consultants Limited (Beca) has been commissioned by the Secretariat of the Pacific Regional Environment Programme (SPREP), at request of the Vanuatu Department of Tourism to develop a Rapid Climate Risk Assessment Framework (RCRAF) and risk screening tool and apply it to a tourism sector case study associated with infrastructure and fisheries (the 'Project').

Beca has undertaken virtual consultation with key stakeholders identified by SPREP and the Vanuatu Department of Tourism to understand their climate risk assessment needs, their roles and the contributions they can make to this project. The engagement with these stakeholders and information gathered has been used to inform the development of the RCRAF, its application to a tourism sector case study with association to the fisheries and infrastructure sectors, and the selection of the dive industry as the focus of the case study (this report).

Van-KIRAP has developed future projections for climate hazards and a hazard-based impact assessment guideline. This Project expands on the Van-KIRAP work to create a rapid climate risk assessment tool that enables a representative from an industry or sector, who has operational expertise, but may have limited experience regarding climate hazards, to complete a rapid high-level risk screening of their operations. The risk assessment identifies areas within their operations that are at risk from climate hazards in the future.

A desktop case study has been completed for the dive industry of the tourism sector. The dive industry was chosen due to its incorporation of fisheries and infrastructure elements, meeting the project requirement. The climate hazard information used in the RCRAF and the case study is sourced from the Van-KIRAP project. However, the information on fisheries, infrastructure and tourism were not able to be used as sufficient stakeholder engagement was not received. Consequently, the case study was largely informed by a desktop study.

Application of the RCRAF to the case study profile developed on the dive industry has identified and prioritised the top 5 climate risks for the dive industry (non-spatially), taking into consideration the reliance on infrastructure and fisheries.

The top five elements at risk within the dive industry as identified in this case study at the **present day** are:

- Coastal / Marine Ecosystems
- Outdoor Coastal Activities
- Airports / Airfields
- Stormwater / Flood Management
- Inhabited Buildings.

The climate hazards that have the greatest risk to the dive industry as identified in this case study at the **present day** are:

- Tropical Cyclones
- Extreme Rainfall
- Marine Heatwaves
- Coastal Inundation.

As climate change increases in the **future** at mid-end century under a high change scenario, the top five elements at risk for the diving industry change slightly with water supply, transportation assets, and uninhabited buildings requiring long-term adaptation planning.

Potential adaptation measures with levels of urgency for each risk have been identified using the PARA (Protect, Accommodate, Retreat, and Avoid) adaptation framework for risks that pose immediate significant threat, or for those where there are other adaptation programmes planned or underway that short-term adaptations could be added to. The key points arising from this step are that the reefs themselves are critical natural features to the dive industry with limited ability to adapt to climate change pressures, but also are experiencing compounding pressures from environmental pollution, invasive species and bleaching events. In contrast, the built features (such as buildings or wharves) are manmade and can be adapted or upgraded in response to climate change pressures.

Non-climate hazards are out of scope of the case study but should be included in future studies as they influence the decision-making process associated with the evaluation of climate risks, adaptation option evaluation, and performance of adaptation solutions.

In summary, application of the RCRAF to the dive industry of the tourism sector in Vanuatu has identified the top present day and future elements at risk from climate change allowing for these to be prioritised, potential adaptation options and opportunities, and a series of practical steps to develop adaptation options, including a recommendation for further on island engagement with tourism sector stakeholders to ensure full value is derived.

1 Introduction

1.1 Background

Beca International Consultants Limited (Beca) has been commissioned by the Secretariat of the Pacific Regional Environment Programme (SPREP) to develop a Rapid Climate Risk Assessment Framework (RCRAF) and screening tool (EXCEL Workbook) and to apply the framework, methodology and tool on a sector case study – Tourism and associated Infrastructure and Fisheries sector (the 'Project').

Vanuatu is subject to multiple natural hazards that have historically caused devastating damage, including tropical cyclones, earthquakes, intense rainfall, volcanic eruptions, and tsunamis. The 'on the ground' damages, severity and intensity of many of these natural hazards, alongside climatic hazards, will be exacerbated by climate change in the future. To minimise the future impacts of climate hazards, it is important that key industry sectors in Vanuatu have a sound understanding of the overall risks climate change poses to their existing and future operations and how these risks may change over time. This will enable informed decision making in future planning to increase the resilience of communities and sectors in Vanuatu.

The goal of this wider project was to develop a RCRAF and methodology that can be applied to five selected sectors (Infrastructure, Fisheries, Water, Agriculture and Tourism) within Vanuatu to allow them to consistently identify where they are most at risk from climate change. The framework, methodology and assessment tool were developed and delivered to SPREP in late 2023. The Vanuatu RCRAF and Methodology Report is included as Appendix A of this report.

The framework is 'rapid' because it is intentionally at a high level to allow for a consistent and achievable screening across industry sectors of relevant climate hazards, to identify existing or future operations or features that would be at risk from climate hazards, and how these risks change in the future. This RCRAF enables prioritisation of adaptation planning and response actions. (Noting adaptation responses is not the focus of the tool).

The RCRAF has been developed to be used alongside climate hazard products and data produced by Van-KIRAP and partners Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Vanuatu Meteorology and Geohazards Department (VDMG). This desktop case study utilises this climate hazard information within the RCRAF.

The scope and requirements for this case study is to apply the RCRAF (tool) and methodology using the following updated specifications from the Inception Meeting Report (Appendix E):

- A site, either countryside or district / island scale, will be defined with the Department of Tourism ahead of case study stakeholder consultation
- Information provided by CSIRO as part of the Van-KIRAP project will support the application of RCRAF for the case study
- Stakeholder information will be obtained through targeted virtual stakeholder engagement
- Map potential adaptation measures to each of the 4 - 5 top risks identified using the PARA (Protect, Accommodate, Retreat, and Avoid) framework.

1.2 Rationale for Selection of Case Study

The dive industry was proposed as the case study within the tourism sector following stakeholder engagement consultation for the development of the RCRAF and then further stakeholder engagement with the tourism sector for this case study (two rounds of engagement), which involved discussion with representatives within the tourism sector and provided valuable insights into the dive industry.

The rationale behind the selection of the dive industry as the tourism case study is that:

- It is large contributor to the economy and employs people around the country
- It includes activities that visitors to the island frequently take part in whether they arrive by cruise ship or airport
- It is connected to the fisheries sector and a range of associated infrastructure, including wharves, airports, and road transportation infrastructure
- It is a compact industry with representatives engaged in the wider Van-KIRAP project
- It supports development of the financial projection mechanism piece of the wider project.

The dive industry case study was confirmed with Department of Tourism and SPREP as an appropriate choice for the case study.

Dive industry specific stakeholder engagement took place over two virtual 3-hour workshops. The number of workshops was refined from three to two at the Inception Meeting to accommodate the tight delivery timeframes. The objectives of these workshops were:

- To test the application of the RCRAF and tool and its application to the dive industry
- To understand whether there are currently any adaptation projects underway for risks previously identified in the Van-KIRAP project
- To understand the adaptation shortfalls to inform the identification of urgent adaptation measures.

Due to virtual engagement limitations, the stakeholder engagement input was supplemented by desk-top research using publicly available Vanuatu government plans and strategies for national adaptation (Republic of Vanuatu, 2007), the tourism sector (Vanuatu Department of Tourism, 2015) (SPREP, 2018) investment (Government of the Republic of Vanuatu), Van-KIRAP tourism ‘infobytes’ (Van-KIRAP) and specific websites for dive operators in Vanuatu and Vanuatu Tourism (Appendix B).

It is recommended that a more detailed case study be undertaken in the future which includes in country consultation with operators to obtain a more detailed perspective of the risks and vulnerability specific to the tourism sector, supporting the general application of the RCRAF and tool across the five sectors and identify potential areas for modification.

1.3 Context of this Report

This report demonstrates application of the RCRAF and tool to the tourism sector’s dive industry by providing background of the tourism sector and dive Industry in Vanuatu and outlining the steps taken to apply the RCRAF framework and tool.

The report follows the Project Inception Report (Appendix E) outlining the project objectives, Stakeholder Consultation Report (Appendix F) summarising stakeholder consultation feedback, and Vanuatu Rapid Climate Risk Assessment Framework and Methodology Report (Appendix A).

Background information gathered on the Vanuatu tourism sector and dive industry is detailed in Section 2 and Section 3 respectively. A case study profile developed to apply the RCRAF is described in Section 5. The results of applying the RCRAF to the case study profile is presented in Section 6.3.

The following table reflects our tasks and approach:

Tasks		Approach	Report Section
(i)	Identify and Rate Current and Future Risks	Using climate information products from the Van-KIRAP project, where this was limited, information was supplemented with a desktop study.	Section 3
(ii)	Undertake Stakeholder Workshops	2 x 3-hour stakeholder workshops were held. Information flyer was provided regarding the project and the case study, email consultation supplemented the workshops.	Section 4
(iii)	Map Urgent Adaptation Actions	Potential urgent adaptation options for the top 5 elements at risk at present day are provided.	Section 6.4 and 6.5
(iv)	Prepare Case Study in Simple, Visual Format	Prepare a visual graph of the scope of the dive industry scope. Use tables to simplify information.	Whole report

1.4 Limitations

The following are the limitations, their reasons, our approach to mitigate them, and future solutions:

Limitations	Reasons	Approach	Future Solutions
No On-island Engagement for Case Study	Engagement coordination limited due to Cyclone Lola and tight project timeline preventing travel logistics and on-island stakeholder coordination.	Held virtual stakeholder engagement and sent additional email information through SPREP to key stakeholders following workshops to try and increase engagement.	On-island stakeholder engagement to review and test case study context and results.
Limited Virtual Stakeholder Engagement for Case Study	Weather events (cyclone), on-island communication, organisational, and technological issues.	Used information gathered during online engagement during inception meetings, RCRAF development supported by desktop review and Beca internal Pacific work experience.	On-island stakeholder engagement to review and test case study context and results.

2 Tourism Sector

Vanuatu's Tourism Sector is a significant contributor to the country's economy and international reputation and consists of picturesque beaches, freshwater swimming holes, world-class snorkelling and diving, immersive traditional culture, abundant seafood restaurants, and eco and adventure tourism opportunities (PSDI, 2021).

Direct flights from nine international destinations as well as cruise ships deliver tourists from around the world most commonly from Australia and other Pacific nations. Tourists can travel around Vanuatu via domestic flights to and from the nation's 29 airports or via boats.

Prior to the COVID-19 pandemic, tourism generated 35% of total employment and it is estimated the wider sector (including indirect effects) contributes to up to 36% of Vanuatu's GDP (World Travel & Tourism Council, 2021). The COVID-19 pandemic in 2020 halted tourism revenues until borders reopened in July 2022 (United Nations, 2022).

The tourism sector has already faced challenges in the face of natural hazards, including tropical cyclones. Tropical cyclone Pam in 2016 cause significant damage, equivalent to 60% of Vanuatu's GDP, from which the country was still recovering in early 2020 when it was affected by the COVID-19 pandemic and tropical cyclone Harold which caused further damage.

In 2023 alone, the country was affected by multiple tropical cyclones, including Irene (19 January), Tropical Cyclones Judy and Kevin which were category 4 & 5 cyclones that hit Vanuatu in succession during a 48-hour window from 1 to 3 March, and Lola as a category 4 in October 2023. Judy and Kevin caused severe damage to housing, infrastructure, agriculture, and aquaculture, and impacted an estimated 250,000 people, whilst during Lola at least 10,000 households were affected by the storm.

Other natural hazards that impact tourism are extreme rainfall and flooding, drought, and heatwaves, as well as non-climate related events such as earthquakes, tsunamis, and volcanic activities (Australian Government, Accessed November 2023).

The Vanuatu 2023 Q1 Quarterly Economic Report states there has been a reduction in tourism due to challenges for Air Vanuatu, and that reduced tourist activity will impact the Services sector (wholesale and retail trade, transport, accommodation, and food services), as well as the country's GDP. The government's fiscal policies have been developed to stimulate economic activities and growth, particularly in tourism, contributing to projected increases in GDP (Government of Vanuatu: Department of Finance & Treasury, 2023).

3 Dive Industry Context

Context for the Dive Industry in Vanuatu was informed through multiple sources. To supplement information gathered from the Van-KIRAP portal and the limited input from the tourism and dive sector operators in consultation, this case study has been informed by additional desk research, supplemented by our general understanding of tourism in the Pacific. Whilst this information is supplementary, it does not effectively replace crucial stakeholder engagement. Every effort has been made to ensure all information included is accurate and up to date at the time of writing (December 2023 - January 2024). In the application of the RCRAF, it is recommended that additional contextual information be sourced from tourism stakeholders through further in country engagement.

3.1 Background

The dive industry was discussed in both sets of consultation. This industry was noted as a large contributor to the economy, employed many people around the country, and was an activity that visitors to the island frequently take part in whether they arrive by cruise ship or airport.

The dive industry in Vanuatu has 11 operators that cover a range of diving related activities in locations across Vanuatu. To have an operation in the Dive Industry in Vanuatu, with a licence to undertake dive tourism activities, the operator is required to be a member of the Vanuatu Scuba Operators Association (VSOA). The activities involved in the operation include dive training, experiences diving trips (covering either reef or wreck diving), snorkelling, shore diving and equipment rental.

Efate, the island in which Port Vila is located, is known for both its reef and wreck diving sites. There are also operations that cover Tranquillity Island, Tanna, and the east coast of Santo (particularly in operation of reef diving). All trips orchestrated by these dive operators are day trips, noting no live-a-board trips take place in Vanuatu. The majority of trips taken are by boat to the sites in question, but a small number of operators are undertaking shore diving from Port Vila locations.

3.1.1 Link to Fisheries Sector

The dive industry operates where the tourism and fisheries sectors crossover. Both rely on natural resources within the marine environment, benefit from healthy marine ecosystems, and draw on the productivity and shelter of coral and reef fish species. Coral reefs are especially important beyond the local reef itself as they provide coastal protection and influence beach formation.

Other areas of the tourism sector include marine activities that are dependent on having healthy fish populations for tourism such as, diving, snorkelling, kayaking, paddle boarding, kitesurfing and island day tours.

3.1.2 Link to Infrastructure Sector

There are many infrastructure assets and services that are vital to the on-going operations of the dive industry. These are owned publicly (e.g. public wharves, roads) privately (e.g. buildings and vessels). International tourists require a point of entry into Vanuatu, either a port or airport infrastructure. Tourists then travel domestically between islands, requiring ports if they are on a cruise ship or wharves if they are using smaller ferries and boats or airports. When on each island, tourists utilise roading infrastructure for transportation, inhabited buildings for accommodation and food and beverage services that are housed in an inhabited

building. Tourists increase the number of people that are using the water supply, wastewater, telecommunications, and electricity infrastructure.

The 'built features' of the infrastructure sector are categorised below, with specific examples from the dive industry.

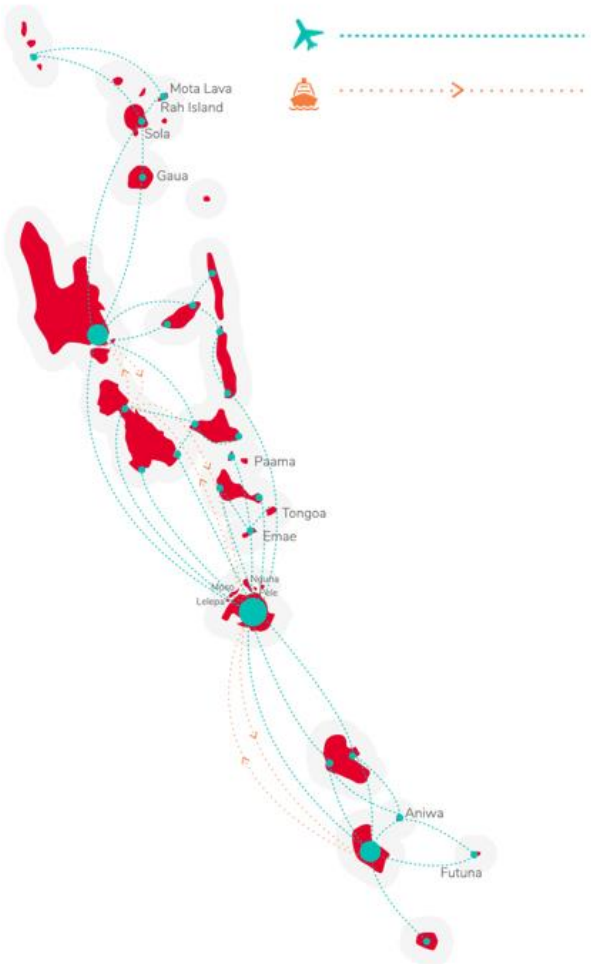

Figure 1: Main Transportation Routes via Air and Sea Within Vanuatu (Vanuatu Travel, n.d.)

3.1.3 Employment

Some dive industry operators have their own shop fronts with equipment rentals, training facilities and dive boats. These organisations have multiple employees for each operation on a year-round basis.

If tourists are undergoing dive training, they can spend anywhere from a day to three days in a single location becoming certified (PADI, Accessed 2023), using local services for accommodation, food and beverages and transport, all of which require employees.

3.1.4 Dive Sites

The fisheries sector includes marine activities that are dependent on having healthy fish populations for tourism such as, diving, snorkelling, kayaking, paddle boarding, kitesurfing and island day tours.

It was determined during a stakeholder workshop that Port Vila, Efate and Tranquillity Island along with Tanna Island, and Luganville, Espiritu Santo islands are the main dive tourism centres. Diving tours visit shipwrecks, large coral reefs, smaller coral reefs and blue holes, a summary of these locations is below, compiled from references in

Appendix B – Dive Operators and Vanuatu Tourism Websites.

Reef Dive Locations		
Boat Dive		
Mele Reef	Efate	Located close to Port Vila, this dive spot offers coral gardens, diverse marine life including turtles and colourful fish.
Coral Gardens	Espiritu Santo	Known for its coral formations and marine ecosystem.
Cindys Reef	Espiritu Santo	This reef is known for its array of colourful corals and a variety of fish species.
Pele Island	Pele Group	Corals and marine life including turtles and dolphins.
The Cathedral	Efate	A cave entrance leading to coral formations and diverse marine life.
Twin Bommies	Efate	Two bommie reefs next to each other.
Shore Dive		
Blue hole one and two	Tanna Island	Variety of sinkholes with swim throughs and caves.
Wreck Dive Locations		
Boat Dive		
USS Tucker	Espiritu Santo	A US Navy destroyer that was sunk during the war, the USS Tucker is a wreck dive featuring intact structures and artifacts.
Konanda	Efate	Island trader that was damaged in a 1987 cyclone.
Tasman	Efate	An ex-Qantas flying boat that hit a reef on take-off in 1951, after being salvaged it sank during a cyclone.
Star of Russia	Efate	A historic sailing ship that dates back to the 19th century and now rests underwater.
MV Semle Federsen	Efate	Former island trader sunk in 1985 after being declared unseaworthy.
Shore Dive		
SS President Coolidge	Espiritu Santo	The SS President Coolidge was an ocean liner that sank during World War II and now serves as an artificial reef with an abundance of marine life.
Million Dollar Point	Espiritu Santo	A dumping ground of World War II artifacts with marine life.

Vanuatu has more than 1,200km² of coral reef and became a signatory to the Convention on International Trade of Endangered Species in 1989, outlining a number of marine species that are endangered. Additionally, the Vanuatu Fishing Regulation Order in 2009 highlights multiple endangered species that are not allowed to be fished for, removed from the ocean, or purchased. These species include the following:

- Trochus
- Green Snail
- Trumpet Shell
- Rock Lobsters
- Slipper Lobster
- Coconut Crab

- Marine Turtles and Mammals
- Marine Ornamental Products (reef fish species, anemones, jellyfish, sponges, crustaceans, molluscs, coral)
- Coral in the Coenothecalia, Stolonifera, Antipatharia and Scleratinia families.

3.2 Climate Hazards

The tourism sector in Vanuatu has many elements vital to its operation that could be vulnerable to the impacts of climate change. These elements include coastal and marine ecosystems, a range of infrastructure and assets (e.g. wharves, dive shops, electricity and telecommunications), and activities (e.g. land and water transportation, outdoor marine activities).

Below shows the key climate hazards in Vanuatu that are included in the RCRAF and their potential impact on the dive industry.

Coastal Inundation (see Van-KIRAP explainer here)
Description: Coastal inundation is flooding caused by a range of coastal processes, including a combination of tides, storm surges, storm waves, interannual sea level variability and future sea level rise. Inundation is also affected by tectonic processes such as seismic uplift or subsidence.
Observations: Tropical Cyclone Pam in 2015 caused significant coastal inundation that has been recorded in North-Eastern Efate, along with many other islands (Pacific Community (SPC), 2017). Tropical Cyclone Ivy in 2003 and Tropical Cyclone Harold in 2020 caused increased wave heights to be recorded at the Luganville and Port Vila tide gauges (CSIRO, 2023).
Projections: Climate change will increase the severity of coastal inundation events, due to sea level rise and changes to storms which generate large wave events.
Impact on the Dive Industry: Flooding of buildings from coastal inundation that are located near the coastline and have a low elevation will impact the Dive Industry. In particular, buildings that provide accommodation, food and beverage services or the dive operator shops. A flooded dive building will reduce the ability to carry out land-based training and complete equipment rentals, checks and maintenance. Coastal inundation could make ports and wharves unusable when the relative sea level exceeds the height of the wharf. Storm waves can cause damage to moored boats or boats that are berthed on wharves. Coastal erosion can result from storm waves, causing destruction to shallow reefs that dissipate wave energy, and sandy coastlines as sand is readily eroded. This will impact any asset or activity that the dive industry relies on that is located near the coast, like, coastal roading. Additionally, destruction to shallow reefs will have a direct impact on the dive industry, reducing the locations available to take tourists.

Drought (see Van-KIRAP explainer here)
Description: Drought is an acute lack of water compared to normal conditions due to a lack of rainfall over an extended period, usually more than a few months. Water shortage can impact activities, groups, sectors, and related natural resources.
Observations: An extreme drought was observed for 47 months from 1992 to 1996. A severe drought was experienced for 14 months from 1998 to 1999 and two moderate droughts have been experienced in 2000 and 2003 (Van-KIRAP, 2023).
Projections: Climate change is projected to increase the frequency, duration, and intensity of drought events. With the greatest droughts having the largest increase in frequency, duration and intensity. As a consequence, the severe droughts will get more severe (Van-KIRAP, 2023).
Impact on the Dive Industry: Periods of drought will impact the dive industry by limiting the ability to provide safe and effective freshwater wash downs of equipment and the cleaning of boats. These are both sanitary measures and preventative steps to combat erosion of equipment from saltwater contact.

Extreme Rainfall (see Van-KIRAP explainer here)

Description: The risk of extreme rainfall is due to a combination of factors, including tropical cyclones, interannual rainfall variability (wet season from November – April), and the El Niño Southern Oscillation. The total amount of rainfall can be used as an additional indicator of extreme rainfall.

Observations: Cyclone Irene in January 2023, Cyclone Judy and Cyclone Kevin in March 2023, Cyclone Lola in October 2023 all caused widespread and flash flooding in Vanuatu.

Projections: Extreme rainfall events are expected to increase in intensity due to climate change in the future.

Impact on the Dive Industry: Extreme rainfall can lead to flooding if the stormwater infrastructure becomes overwhelmed. This will impact the dive industry if buildings providing accommodation, food and beverage services of housing the dive operator shops flood with heavy rain events. Similarly, if the heavy rainfall event causes slips, scouring or other impacts to transport routes, then the recovery from a storm event back to usual operations will be delayed. Extreme rainfall can overwhelm and pollute freshwater catchment.

Tropical Cyclones (see Van-KIRAP explainer here)

Description: Tropical cyclones are rotating storms that develop over tropical oceans that are over 25.5°C and within 5 degrees of latitude from the equator where there is sufficient Coriolis force to create the rotation. In the South Pacific Ocean, a tropical cyclone is defined by a 10-minute sustained wind speed of 17.5 metres-per-second or greater. Tropical cyclones cause strong winds, heavy rainfall, and storm surges. The risk of tropical cyclones is greater during the southern hemisphere's 'cyclone season' from November – April.

Observations: Vanuatu has many recent occurrences of Tropical Cyclones causing damage, including Tropical Cyclone Pam in 2015 and Tropical Cyclone Harold in 2020 (Van-KIRAP, 2023).

Projection: The frequency of tropical cyclones within 500km of Vanuatu is expected to decrease, but the intensity of these events will increase with climate change in the future (Van-KIRAP, 2023).

Impact on the Dive Industry: Tropical cyclones have negative impacts on the dive industry infrastructure. These impacts can include destruction to wharves, boats, roading, buildings and storage etc. It was noted during one of the workshops that dive operators remove pontoons and their boats from their usual mooring locations during cyclone warnings and relocate them to bays or parts of the island that will be sheltered from the wind.

Tropical cyclones have the ability to impact natural features by causing damage to reef structures or shifting wreck sites, as has happened for the USS Coolidge and the MV Semle Federsen.

Tropical cyclones transfer energy from the ocean to the atmosphere. This can provide a cool effect, by lowering the sea surface temperature, reprieving the ocean of marine heatwaves.

Ocean Acidification (see Van-KIRAP explainer here)

Description: Ocean acidification is a reduction of the ocean's pH. Atmospheric CO_2 concentrations is in equilibrium with dissolved CO_2 concentrations in the ocean, as atmospheric CO_2 increases, so will the concentration dissolved in the ocean. This increase will change the dissociation of CO_2, effectively reducing the amount of carbonate ions available, effecting marine organisms that have calcium carbonate shells or skeletons.

Observations: Some occurrences of ocean acidification presently, but it is not an imminent threat.

Projections: Aragonite Saturation State is a proxy for ocean acidification. The reduction of aragonite in the ocean strongly correlates to changes in ocean pH.

Ocean acidification is projected to increase in severity towards the end of the century, with a continual trend in decreasing ocean pH (Van-KIRAP, 2023).

Ocean Acidification (see Van-KIRAP explainer here)

Impact on the Dive Industry: Ocean acidification can weaken coral structures, slowing the rate that coral can generate calcium carbonate. Under severe ocean acidification, coral skeleton can dissolve, making coral more susceptible to coral bleaching events. The effects to other marine organisms that create calcium carbonate shells or skeleton is similar. Their growth is slowed under minor acidification, but their shells and skeletons can dissolve under severe ocean acidification. Additionally, ocean acidification can impact shipwrecks which are frequented by the dive industry. On shipwrecks, concretion forms as a protective layer when rust interacts with saltwater, organic matter and micro-organisms. Ocean acidification can begin to remove the concretion layer, making the shipwreck vulnerable to crumbling as metal fasteners disintegrate (Litynski, McKenna and Maryland Historical Trust, 2021). Ocean acidification will disrupt the balance within marine ecosystems, leading to reduced fish populations.

Extreme Temperature (see Van-KIRAP technical report here)

Description: There is spatial distribution of temperature patterns throughout Vanuatu. This includes the mean daily temperature, mean annual temperature, the hottest day, and the coolest night. The coolest and drier months are from July to September, while the warmest and wettest months are from January to March. Additionally, the Northern region tends to be hotter and wetter than the Southern region.

Observations: The hottest day of the year does not vary much each year. From 1986 - 2005 the hottest day for each year on average was 32 - 33°C with the hottest day over the entire period being 33.5°C (Van-KIRAP, 2023).

Projection: Under the worst-case scenario (RCP8.5) would experience an increase in the yearly hottest day by 0.6 - 1.8°C (by 2050 and 1 - 3.5°C by 2100 (Van-KIRAP, 2023).

Impact on the Dive Industry: Extreme temperatures can have impacts on workers who are outside. These impacts can be through heat stress (if there is also high humidity levels), decreased productivity levels, dehydration and sunstroke. Although ocean breezes can provide a cooling effect, the risk of sunstroke is often higher on the ocean due to the reflective nature of the water surface.

3.3 Non-Climate Hazards

Vanuatu is also exposed to non-climate hazards, being frequently affected by earthquakes, tsunamis, and volcanic activity. Vanuatu lies in the tropics between 13 and 18 degrees south of the equator, on an active tectonic plate boundary on the western convergent boundary of the Pacific Plate, and it is part of the 'Ring of Fire' volcano chain around the edge of the Pacific Plate. While these non-climate hazards are not included in the RCRAF, and therefore not part of the dive industry case study, it is recommended they be included in detailed risk assessments following application of the RCRAF. The impacts of these non-climate hazards may be exacerbated by, or leave Vanuatu more vulnerable to, climate hazards.

4 Stakeholder Workshops

During the multisector stakeholder engagement for the development of the RCRAF, we shared preliminary information about tourism and dive sector to assess stakeholder interest about the case study focus.

Assisted by SPREP and our on-island representative, Hannington Alatoa, we provided the stakeholders of the dive industry with the opportunity to coordinate the dates for the 3-hour workshops with the purpose of gathering information to inform the case study.

The 3-hour workshops were scheduled for Wednesday 1 November and Monday 6 November 2023.

The first workshop had no attendance other than the Beca team and SPREP.

The second workshop was attended by:

Attendee Affiliation
• Vanuatu Environmental Science Society (VESS)
• Tourism Councillor of Vanuatu Chamber of Commerce
• Department of Tourism
• SPREP
• Van-KIRAP
• Beca

The Stakeholder Consultation Report is attached as Appendix F.

The Country Manager for Tropical Agencies Limited, provided input into a workshop that informed the development of the RCRAF regarding his role coordinating with cruise ships and their activities. This input has been used for the case study.

To mitigate the low participation during virtual engagement, we distributed an additional information paper to the tourism stakeholders to communicate the project objectives and to obtain their input.

Beca's experience is that this type of industry-specific consultation would benefit from on-ground meetings such that the dive industry representatives are booked and more likely to attend compared to the online meetings attempted above. We communicated with the client the potential advantages of in-country engagement, but this was not part of the scope for this study.

5 Case Study Profile

For the purposes of this exercise, we are assuming that PADI certification is not offered by this operator, and all customers have the required qualification.

The profile information below includes information about the facilities, locations and activities of the operator, their patrons, and the dive sites they visit:

- The operator has its main shop in Port Vila the capital of Vanuatu on Efate, and two smaller bungalow shops, one on Malo and the other on Ambae.
- The main shop is the head of operations with a desk and reception area for administration tasks and taking booking and payments, using internet and electricity. We have equipment storage and maintenance area where we can refill our tanks with the required gas mixture, depending on the dive depth. We sell a handful of souvenirs and dive accessories including caps, sunscreen and rash shirts. We offer scuba diving to tourists that already hold PADI certification and snorkelling tours. All our tours are day tours. In Port Vila, the shop is located within 100m from the coastline, it is protected from coastal inundation currently because it is elevated from the sea level, with the shop accessible from the seawall walkway. In the past 3 years we have made improvements to the rainwater harvesting from the roof, increasing capacity so that it doesn't overflow and flood our shop.
- The two smaller bungalow shops offer snorkelling tours, for customers wanting to scuba-dive, we transport them to our Port Vila shop. These shops have not had any improvement made in the 15 years we have been using the buildings. They are both located with 100m from the coastline, and we can have issues with flooding during heavy rain.
- The majority of our customers are tourists from Australia, New Zealand or other Pacific Islands who have arrived via plane or cruise ship. Tourists arriving by plane typically stay in resorts, hotels or private apartments or bungalows. The customers will walk, cycle or be transported by car / van from their accommodation to the dive shop.
- Interactions of the operator and their customers with the relevant infrastructure can be seen in Figure 2. This begins at the accommodation, using transport infrastructure to get to the dive shop for training and equipment sizing, travelling to a wharf or dock to board a boat to be transported out to the dive site/s for the day, and then the reverse as they travel back to the dock and then to accommodation.
- Basic food and drinks are available for patrons onboard the vessels for the outward and homeward journeys.

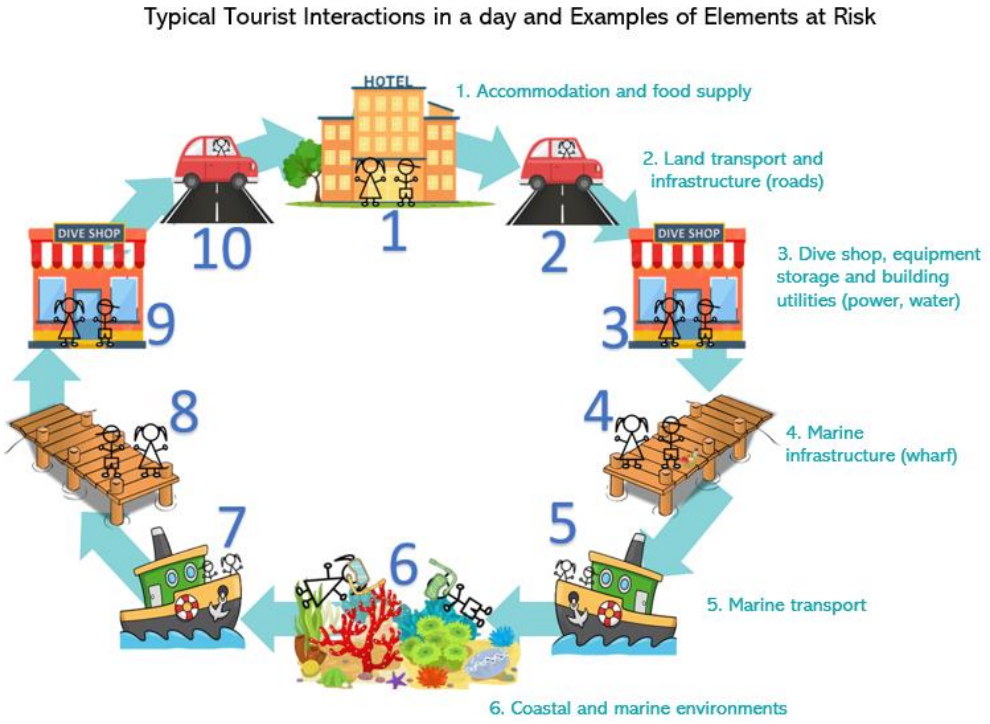

Figure 2: Cycle of a Dive Tourist in a Typical Day and Examples of Elements at Risk

6 RCRAF Applied to Case Study: Dive Industry

The RCRAF process uses 6 steps for identifying the climate risks to the dive industry, as presented in Appendix A. An overview of this process is included below as Figure 3.

- Step **1** and **2**, the Objective and User of the assessment and have been addressed in Section 1 of this report.
- Step **3**, the inputs, have been sourced from the Van-KIRAP Climate Futures portal, and desktop research (see Section 0 of this report).
- Steps **4** and **5**, the analysis, utilises the RCRAF tool developed for this framework to score exposure and vulnerability of the operator to different climate hazards, as discussed below.

The inputs to the tool including commentary and assumptions of the inputs are covered in Appendix C.

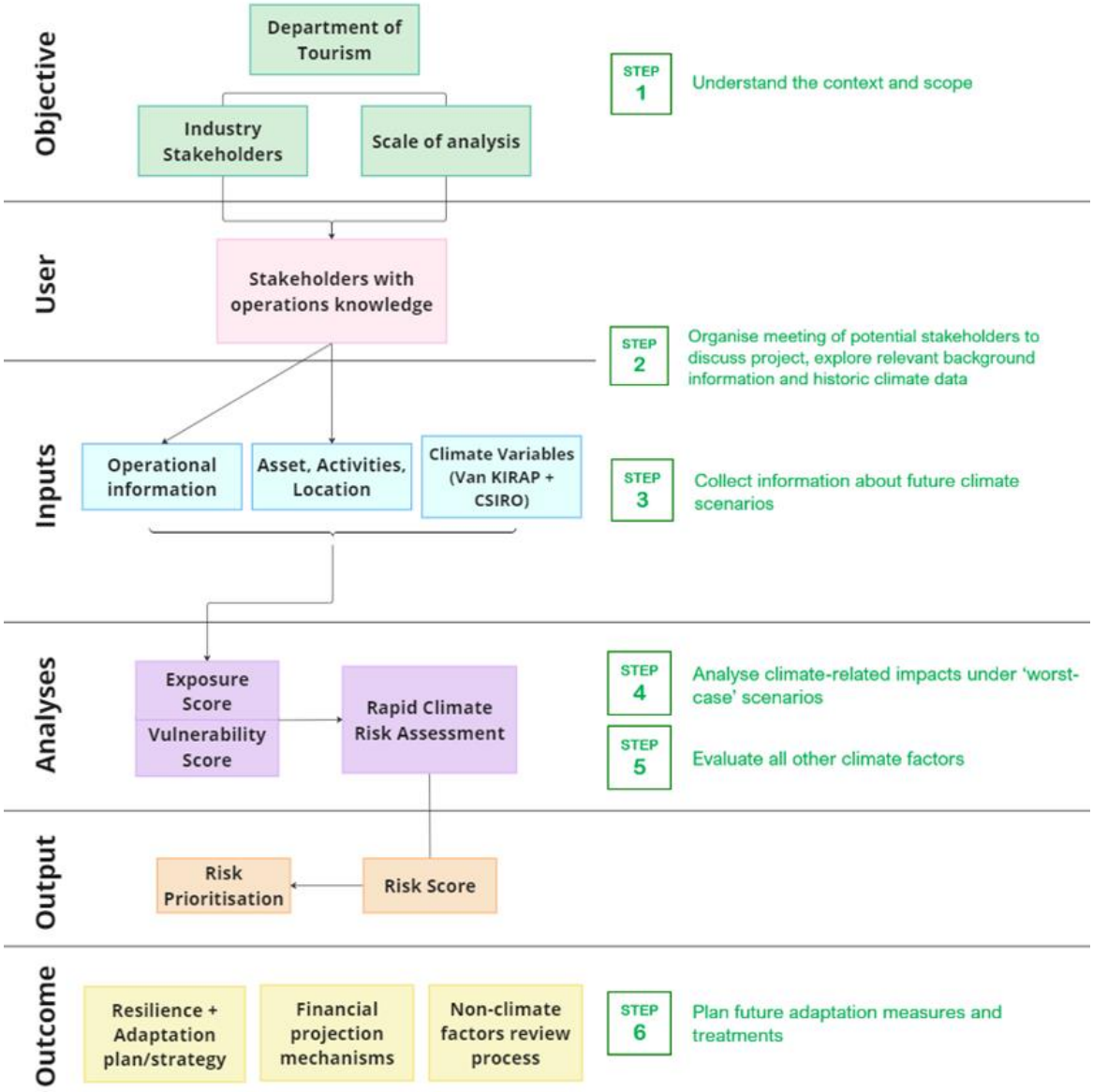

Figure 3: Flow Chart Showing the Vanuatu RCRAF Process

6.1 Impact Screening

The RCRAF Excel Tool asks multiple questions to determine which natural and built features and the types of operations and activities that the industry is involved in.

This case study has been primarily informed by desktop research to build the case study profile as inputs from stakeholders was limited.

6.2 Exposure

The exposure of the operation to climate hazards is partly informed by the user, by indicating which climate hazards have impacted them in the past.

For this case study, it was determined that the operator has been impacted by coastal inundation, extreme rainfall, tropical cyclones, marine heatwaves and extreme temperature in the past. This was based on climate hazards information gathered in the desktop study described in Section 3.1.3.

As described in Section 5, the operator has three shops located within 100m from the coast within 10m from the sea level and not near a river or stream that has a history of flooding. This was determined by the locations of multiple dive operator outfits within Vanuatu and their spatial locations. The fisheries side of the operation relies on healthy and abundant reefs and marine species. We have assumed fisheries operations require natural water supply to maintain and clean equipment between users. We have also assumed that the operator has been affected by high temperatures in the past, as they operate year-round in the outdoor environment.

The exposure of each of the natural and built features and operations elements (identified in the impact screening (Section 6.3) to the climate hazards, is scored to reflect the present-day exposure score. Due to the limited stakeholder engagement, these scorings are based on the desktop study with reasonings recorded in Appendix C. Default scoring options were used when there was insufficient information to provide an alternative score, for example, the exposure scores for evacuation structures were left as the defaults because from our desktop study, they aren't operated, maintained or solely used by the dive industry. In country engagement and training would improve the accuracy of this case study, by inputting exposure values that are a reflection of actual dive operators, not a desktop study.

6.2.1 Vulnerability

Vulnerability to climate hazards in the RCRAF tool is calculated using the user inputs from the above steps, this process is described in Appendix A. An initial vulnerability score is calculated by the tool, that can be updated where required.

The default vulnerability scores for each of the elements at risk and the climate hazards were used. These scores were not updated because we were unable to source sufficient industry context to ensure that changes made were accurate and reflective of the dive industry in Vanuatu. Following in country consultation, these scores can be updated to reflect the experiences and knowledge of dive operators.

6.2.2 Risk Management

From the desktop study, it was determined that within the dive industry there has been multiple risk management procedures implemented:

- A seawall was recently constructed in Port Vila to manage the coastal inundation risk.
- The Government of the Republic of Vanuatu National Disaster Management Office has multiple Disaster Risk Management documents, including response plans, cyclone support plans and the Disaster Risk Management Act (NDMO, Accessed 2023).
- The VMGD provide monthly forecasts for tourism and fisheries related climate conditions including, El Nino Southern Oscillation, sea surface temperature, rainfall, sea level, maximum and minimum

temperature, chlorophyll concentrations, tides and moon phases. This information can be used to forecast marine heatwaves.
- The VMGD provide public weather forecast for the six provinces in the country consisting of 7-day hourly weather forecast, 3-day severe weather outlook, tropical cyclone outlook, and tidal information.
- The Vanuatu National Fisheries Sector Policy 2016 - 2031 combined with the forecasting from VMGD helps to mitigate the risk of ocean acidification.

The benefits of having and the usage of the disaster risk management plans, and VMGD forecasting within the dive industry and this case study profile has been assumed.

6.2.3 Adaptative Capacity

Adaptive capacity is the ability, in this case for the five industries, to adjust to potential damage, to take advantage of opportunities and to respond to consequences arising from top risks identified through the RCRAF tool.

RCRAF tool presents the PARA (Protect, Accommodate, Retreat and Avoid) framework to provide potential options to increase the adaptive capacity.

We have assumed for this case study profile that:

- One Protect action has been taken, a seawall has been constructed in Port Vila to provide protection to coastal inundation.
- One Accommodate actions have been taken, this is part of the case study profile that has been developed.
  - The rainwater harvesting infrastructure at the Port Vila shop has been upgraded so that it can store an increased supply of water and will not get polluted during extreme rainfall or tropical cyclones, this has meant that during the tropical cyclones this year the shop did not flood when it normally would. Shade sails have been installed on all of the dive vessels, this provides shelter for staff and customers during the peak of summer where they are at risk of heatstroke from extreme temperatures.
- One Avoid actions (e.g. restricting construction of new structures within 100m of the coast) have been taken.
  - We can pick the dive locations that we visit based on ocean currents and the time of year to get optimal water visibility, avoiding areas that are being impacted by coral bleaching, invasive species or overfishing.

6.3 Results

The results report from the RCRAF tool are presented in Appendix D.

The elements at risk identified for the dive tourism case study are shown Table 2. The elements at risk are a weighted average of all the risks for that element from each of the climate hazard variables. They are ordered by severity of risk in the present day.

Table 1 Ranked Elements at Risk

Elements at Risk	Rating Present	Rating 2050	Rating 2100
Coastal / Marine Ecosystems	High	High	Extreme
Outdoor Coastal Activities	High	High	Extreme
Airport / Airfields	High	High	Extreme
Stormwater / Flood Management	High	High	High
Inhabited Buildings	High	High	Extreme
Transportation Assets	High	High	Extreme
Office / Shop / Admin Activities	High	High	High
Land Transportation Activities	High	High	High
Ports / Wharves	High	High	High
Outdoor Marine Activities	High	High	High
Water Supply	Moderate	High	Extreme
Uninhabited Buildings	Moderate	High	Extreme
Evacuation Structures	Moderate	High	High
Goods Supply Activities	Moderate	High	High
Water Transportation Activities	Moderate	Moderate	Moderate
Wastewater Infrastructure	Moderate	High	High
Electricity	Moderate	Moderate	High
Telecommunications	Moderate	Moderate	High

At present day, there are ten elements at high risk. One of these is a natural feature, Coastal / Marine Ecosystems, which has the highest present-day risk increasing too extreme for 2100 under RCP8.5. Five of the high present-day risks are built features (Airports / Airfields, Stormwater / Flood Management, Inhabited Buildings, Transportation Assets, and Ports / Wharves). The remaining four risks that are high at present day are operations and activities of:

- Outdoor Coastal Activities
- Office / Shop / Admin Activities
- Land Transportation Activities
- Outdoor Marine Activities.

All other elements are expected to have a risk rating of high by 2100 aside from Water Transportation Activities due to the nature of the dive.

The top five elements at risk, when ranked by their present-day risk score, are shown in Table 2. Coastal / Marine Ecosystems is the element with the highest risk, due to its exposure and vulnerability to coastal inundation, tropical cyclones, marine heat waves and ocean acidification. Outdoor Coastal Activities is the second ranked element at risk due to exposure and vulnerability to costal inundation, extreme rainfall, and tropical cyclones. Airports / Airfields and Inhabited Buildings are the third and fifth ranked element at risk respectively due to their exposure and vulnerability to Coastal Inundation and Tropical Cyclones. Stormwater / Flood Management is the fourth ranked element at risk due to its exposure and vulnerability to extreme rainfall and tropical cyclones.

Below the five elements at risk ranked by the RCRAF tool following overall risk score at present and then overall future risk (2050 & 2100) are used for the identification of potential adaptation measures.

Table 2 Top 5 Elements at Risk

Top Elements at Risk	Overall Present Risk Score	Overall Future Risk (2050 & 2100)	Associated Hazards
Coastal / Marine Ecosystems	High	Extreme	Coastal Inundation, Tropical Cyclone, Marine Heat Waves, and Ocean Acidification
Outdoor Coastal Activities	High	Extreme	Coastal Inundation, Extreme Rainfall, and Tropical Cyclone
Airport / Airfields	High	High	Coastal Inundation, and Tropical Cyclone
Stormwater / Flood Management	High	High	Extreme Rainfall, and Tropical Cyclone
Inhabited Buildings	High	Extreme	Coastal Inundation and Tropical Cyclone

6.4 Adaptation Measures

Adaptation is the process of adjustment to actual or expected climate change and its impacts. Within communities, people can work together to reduce the impact of climate hazards, through social networks, nature-based or hard-engineering solutions, upgrades to existing buildings and infrastructure and by being better prepared (New Zealand Ministry for the Environment, 2022).

The adaptation approach to address prioritised risks will typically involve a combination of measures implemented together and measures over time. Appropriate adaptation measures will depend on the vulnerability of the element at risk, climate hazard and the people, property and systems / processes impacted and the long-term goals for the industry / sector. A collaborative process to gather input and perspectives from those who will be directly affected by climate change will help ensure that adaptation measures are inclusive, equitable, and aligned with local needs and priorities.

Adaptation measures fall within the categories of Protect, Accommodate, Retreat, and Avoid (PARA). These are graphically shown in Figure 4:

- **Protecting** elements from risk, for example by building structures such as sea walls to minimise coastal erosion from rising sea levels.
- **Accommodating** risk (or sometimes referred to '**Accept**' risk), is continuing to accept the risk but managing the impacts (for example accepting an area will be flooded periodically but having response plans in place to assist in recovery).
- **Retreating** from risk, for example by relocating existing development away from high-risk areas.
- **Avoiding** risk, for example reducing the exposure of the element to the hazard (such as locating development away from areas prone to hazards).

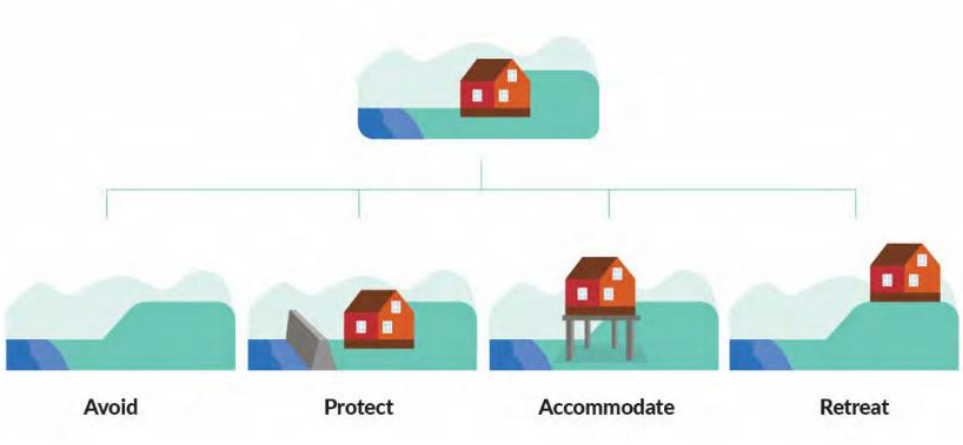

Figure 4: Adaptation Options for Responding to Rising Sea-Levels - Avoid, Protect, Accommodate, Retreat

The top 5 risks for the dive tourism sector identified above are used as the basis for the identification of potential urgent adaptation measures for each of the risks, using the PARA framework. It is important to note that these adaptation options described below are for the purposes of this case study only following information gathered through the limited virtual engagement and desktop review.

The adaptation options are for a theoretical dive operator assuming the operator using the tool has considered the risks and identified possible PARA responses. Due to the theoretical nature of the case study, we have narrowed the adaptation options to address only one or two hazards.

The level of urgency on adaptation options actions are high, medium, and low based on the risk ranking through time (present, 2050 & 2100) and level of adaptation option complexity.

Table 3 Summary of Elements at Risk, Top Climate Hazards, Impacts and Adaptation Options for the Dive Industry

Element at Risk	Top Climate Hazards Posing Risk	Key Dive Industry Impacts (Refer Section 3.2 for Further Detail)	Protect	Accommodate	Retreat	Avoid
Coastal / Marine Ecosystems	Tropical Cyclones Marine Heatwaves Coastal Inundation Ocean Acidification	*Damage to ecosystems, which are key dive destinations, caused by climate hazards may reduce demand and result in economic impacts.*	**Medium Urgency:** National level policy, e.g., Reef to Ridge, Vanuatu National Ocean Policy.	**Medium Urgency:** Reef restoration programmes, e.g., Coral gardens, and translocating coral into unhealthy reefs.	Not applicable since the element at risk cannot retreat from the hazard.	**High Urgency:** Diversifying the tourism offered in Vanuatu to not be as reliant on the coastal / marine ecosystem.
Outdoor Coastal Activities	Tropical Cyclone Extreme Rainfall Coastal Inundation	*Outdoor activities associated with the dive industry can be impacted by flooding (particularly activities near shore), as well as extreme rainfall and cyclones. This will disrupt services and have an economic impact with more frequent disruptions anticipated in future.*	**Medium Urgency:** Build protective infrastructure, e.g. Seawall, break water or groynes.	**High Urgency:** Continue awareness of tropical cyclones season to shift activities where needed. Readiness and response. **Medium Urgency:** Behavioural / societal changes. Improve stormwater management to reduce sediment and nutrient loading in coastal environment.	**Low Urgency:** Move to outdoor marine activities when the coastal environment is impacted.	**Medium Urgency:** Diversify the tourism offered in Vanuatu to not be as reliant on outdoor coastal activities.
Airports / Airfields	Tropical Cyclone Extreme Rainfall	*Damage to airport infrastructure caused by coastal inundation and tropical cyclones will disrupt the movement of tourists in and out of*	**Medium Urgency:** Build protective infrastructure from coastal inundation. E.g. Seawall or breakwater. **Medium Urgency:**	**High Urgency:** Readiness and response plans. Airport web page for upcoming weather event alerts.	**Medium Urgency:** Managed retreat of airports further from the coast.	**Low Urgency:** Increase restrictions on airport infrastructure development away from high-risk areas or that could exacerbate risk.

Element at Risk	Top Climate Hazards Posing Risk	Key Dive Industry Impacts (Refer Section 3.2 for Further Detail)	Protect	Accommodate	Retreat	Avoid
		the country reducing demand and having economic impact.	Increase cyclone resilience of aerial infrastructure.			
Stormwater / Flood Management	Tropical Cyclone Extreme Rainfall	*Stormwater infrastructure may be ineffective or damaged by extreme rainfall and tropical cyclones causing flooding and impacting services and facilities. This will reduce demand for dive activity, increase health and safety risks, and have an economic impact.*	**Medium Urgency:** Improve water conveyance. E.g. Enhance existing and new drainage systems.	**Medium Urgency:** Property level interventions of the built environment. E.g. building elevations.	**Low Urgency:** Managed retreat of operations, activities and assets from high flood risk areas.	**High Urgency:** Increased restrictive building / development standards away from high-risk areas or that could exacerbate risk.
Inhabited Buildings	Tropical Cyclone Coastal Inundation	*Damage to inhabited buildings caused by coastal inundation and tropical cyclones will disrupt the diving activities, present health and safety risks and have an economic impact.*	**Medium Urgency:** Build protective infrastructure from coastal inundation. E.g. Seawall or break water.	**High Urgency:** Increase cyclone resilience of buildings. E.g. roof securing types. Readiness and response plans. **Medium Urgency:** Property level interventions for inhabited buildings.	**Low Urgency:** Managed or reactive retreat of buildings from the coast of areas susceptible to high winds.	**High Urgency:** More restrictive building / development standards. No new development or redevelopment that may exacerbate risks.

6.5 Interpretation

This case study demonstrates that creating effective adaptation options for the dive industry within the tourism sector requires multiple solutions that should be adopted at different stages in time (Step 6 - Vanuatu RCRAF process).

We suggest a simplified and practical framework in alignment with the New Zealand 10-step decision framework for climate change adaptation to develop, evaluate, implement, and monitor adaption options (New Zealand Ministry for the Environment, 2017). The modified steps are outlined below:

1. Engage and partner with stakeholders:
    a. Stakeholder engagement is at the core of process and should be incorporated at every step.
2. Understand “what is happening now” step:
    a. Following the results from RCRAF, the top 5 elements at risk should be further evaluated through a detailed climate risk assessment (exposure and vulnerability to climate hazards) to understand details at asset or site-specific level.
3. Determine “what matters most” step:
    a. Determine objectives and values that will frame the adaptation options process.
4. Analyse adaptation options step:
    a. The RCRAF provides an introduction to the PARA framework assisting the evaluation of current and future potential adaptation options.
    b. Each option needs to be evaluated in detail.
5. Implement and monitor step:
    a. Create a strategy for implementing the most suitable options considering that a combination of solutions may be required over time.
    b. Monitor the implementation, review and adjust based on the outcomes of the adaptation solutions.

In this case study we provide high-level potential adaptation solutions that will need further detailed evaluation due to the rapid nature of the RCRAF. Hence, the presented adaptation options are only part of step 2 (Understand “what is happening now”) of the suggested steps above. However, at the sector level, these results and the potential adaptation options highlight the consideration for diversifying the tourism sector, actively educating operators about climate hazards and their emergency warning systems and increasing focus on regulatory and management systems that respond to climate change risks and opportunities.

The resulting opportunities from those options could range from a tourism sector that can withstand climate risks due to economic stability and investment confidence, well informed operators about climate risks who can make sustainable planning decisions, and communities that feel safe, protected, and supported by proactive and preventative government systems in place.

7 Summary

This report presents the results of a Rapid Climate Risk and Adaptation Framework (RCRAF) applied to the tourism sector (and associated infrastructure and fisheries), and specifically the dive industry in Vanuatu.

The RCRAF is a tool that assesses the climate risks and opportunities for a given sector and helps to inform the identification of potential adaptation solutions to enhance climate resilience.

The purpose of the report is to demonstrate the applicability and usefulness of the RCRAF for the Government of Vanuatu, where tourism is a vital economic and social activity that is highly exposed and sensitive to climate change impacts. The scope of the report covers the methodology and data sources of the RCRAF, the case study of the dive industry within the tourism sector, and the key findings and recommendations.

The dive industry case study shows that the industry faces significant climate risks from extreme events such as tropical cyclones, extreme rainfall, marine heatwaves, and coastal inundation as well as gradual changes in ocean acidification. These climate hazards affect the dive industry's infrastructure, services, attractions, and demand, as well as the natural and cultural assets that underpin the industry's value proposition. The RCRAF also identifies some climate adaptation opportunities for the diving industry. Based on the risk and opportunity assessment, we suggest a range of potential adaptation solutions within the PARA framework, such as diversifying the tourism products and markets, strengthening the emergency preparedness and response systems, improving the water and energy efficiency and security, enhancing the protection and restoration of natural and cultural resources, and increasing the awareness and engagement of stakeholders and visitors. These options remain at high level; however, they are an initial step towards the prospective use of RCRAF across multiple sectors and industries.

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A

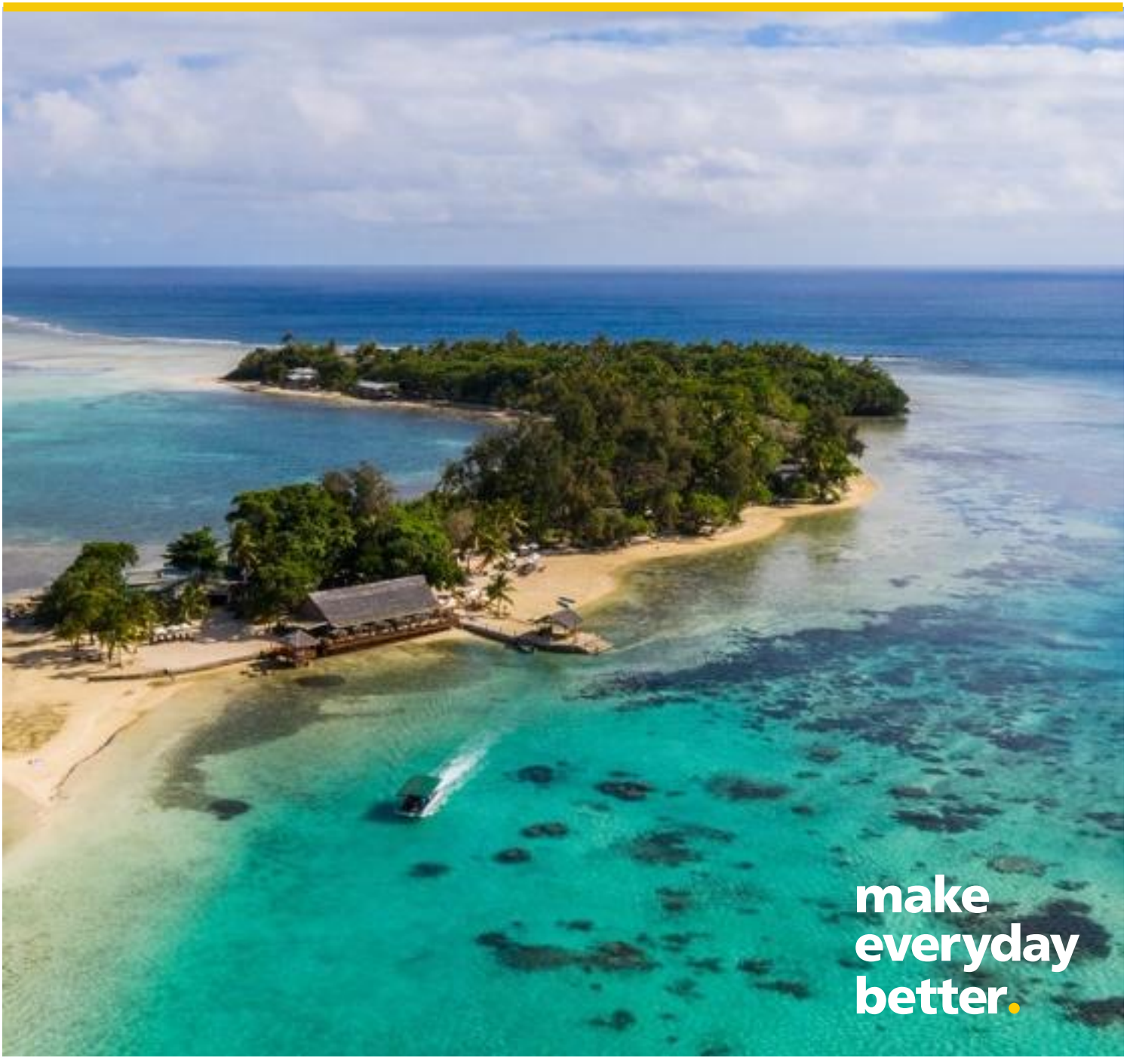
Appendix A – Vanuatu RCRAF and Methodology Report

Vanuatu Rapid Climate Risk Assessment Framework and Methodology

FINAL

Prepared for Secretariat of the Pacific Regional Environment Programme (SPREP)
Prepared by Beca International Consultants Ltd

12 December 2023



Contents

Appendices

Revision History

Revision Nº	Prepared By	Description	Date
1	Erin Connolly, Kayla Baker, Carlos Carvajal	Draft for Client Review	20/11/2023
2	Erin Connolly and Carlos Carvajal	Final Version	8/12/2023

Document Acceptance

Action	Name	Signed	Date
Prepared by	Erin Connolly, Kayla Baker, Carlos Carvajal		8/12/2023
Reviewed by	Mike Allis		11/12/2023
Approved by	Cushla Loomb		12/12/2023
on behalf of	Beca International Consultants Ltd		

Executive Summary

Beca International Consultants Limited (Beca) has been commissioned by the Secretariat of the Pacific Regional Environment Programme (SPREP) to prepare a Rapid Climate Risk Assessment Framework and risk screening tool, and test it on the tourism sector (the 'Project'). Beca has undertaken consultation with key stakeholders identified by SPREP and the Vanuatu Department of Tourism (DOT) to understand their climate risk assessment needs, their roles and the contributions they can make to this project. The engagement with these stakeholders and information gathered has been used to inform the development of the Vanuatu Rapid Climate Risk Assessment Framework (RCRAF) and methodology (this report and associated Excel screening tool), the application of the framework to a tourism case study and the development of a financial projection mechanism for tourism (future project outputs).

Van-KIRAP has developed the future projections for climate hazards and a hazard-based impact assessment guideline. This Project expands on the Van-KIRAP work to create a rapid climate risk assessment tool that enable a representative from an industry or sector, who has operational expertise but may have limited experience regarding climate hazards, to complete a rapid high-level risk screening of their operations. The risk assessment will identify areas within their operations that are at risk from climate hazards in the future.

The Tool is an Excel workbook that takes inputs from the user and provides the results in a report. The inputs to the Tool are prompted through questions relating to:

- The industry's interactions to both the natural and built environment and the specific activities it carries out,
- Which climate hazards are relevant to the industry and have previously impacted their operations, and
- What response measures are already in place to manage hazards.

The vulnerability of elements of the industry/sector is included in the Tool as default preliminary scores which consider how sensitive the element typically is to each climate hazard and its capacity to adapt in the face of challenges. These default values can be updated in the response form to better reflect the context of the user's industry/sector operations. The exposure of elements to climate hazards is filled out by the user and, with vulnerability, is used to determine the risk of the climate hazard to each element.

As part of the results report, the Tool produces the top three climate hazards that could impact the industry/sector and the top elements of the industry/sector that are at risk, based on the risk scores calculated from the user's vulnerability and exposure inputs.

This RCRAF tool can be used by industry/sector experts in the Infrastructure, Fisheries, Water, Agriculture and Tourism sectors to complete a high-level screen of their sectors assets and operations to determine the areas that will be most at risk to climate change. This identification will allow for prioritisation of risks that require further investigation or where adaptation activities need to be focussed.

1 Introduction

Beca International Consultants Limited (Beca) has been commissioned by the Secretariat of the Pacific Regional Environment Programme (SPREP) to prepare a Rapid Climate Risk Assessment Framework and risk screening tool and test the tool on tourism sector (the 'Project').

Vanuatu is subject to multiple natural hazards that have historically caused devastating damage, including tropical cyclones, earthquakes, intense rainfall, volcanic eruptions, and tsunamis. The 'on the ground' damages, severity and intensity of many of these natural hazards, alongside climatic hazards, will be exacerbated by climate change into the future. For example, tropical cyclones have a history of causing significant damage to infrastructure within Vanuatu, disrupting life and business, and are expected to intensify into the future. To minimise the future impacts of climate hazards, it is important that key industry sectors in Vanuatu have a sound understanding of the overall risks climate change poses to their existing and future operations and see how these risks may change over time. This enables informed decision making in future planning to increase the resilience of communities and sectors in Vanuatu.

The goal of this project was to develop a Rapid Climate Risk Assessment Framework (RCRAF or 'framework') and methodology that can be applied to five selected sectors within Vanuatu to allow them to identify where they are most at risk from climate change.

The Vanuatu RCRAF and screening tool has been developed to guide users through an assessment of the potential direct physical risks of climate change and is relevant to users and operations within the five key sectors of Infrastructure, Fisheries, Water, Agriculture and Tourism sectors. The framework is 'rapid' because it is intentionally at a high level allowing for a screening of relevant climate hazards, to identify existing or future operations or features that would be at risk from climate hazards, and how these risks change in the future. This RCRAF enables prioritisation of adaptation planning and response actions (noting adaption responses is not the focus of the tool).

The framework leverages the scientific climate hazard products and tools that have been produced in recent years by Van-KIRAP and partners (e.g. CSIRO, VMGD). The key climate hazards investigated for the five key sectors align with those assessed in Van-KIRAP and include:

- Coastal Inundation
- Drought
- Extreme Rainfall
- Tropical Cyclones
- Ocean Acidification
- Marine Heatwaves
- Extreme Temperatures

1.1 This Report

The purpose of this report is to explain the background, methodology development and application of the framework. This report follows from the project Inception Report (Beca, 2023a) and Stakeholder Consultation Report (Beca, 2023b) which have outlined the project aims, steps and summarise the feedback on consultation with key stakeholders.

This report introduces this project and how this RCRAF aligns with the existing Van-KIRAP climate information products and outputs (Section 2), provides a background to the rapid climate risk assessment (Section 3), the

specific intent and methodology within the framework (Section 4 and 5), and concludes in Section 6 with recommendations for how the RCRAF can be applied to maximise effectiveness and uptake.

Accompanying this report is the digital Excel workbook risk screening tool.

Future stages of this project include commission for Beca to provide i) user guidance training materials ii) a case study where the framework is applied to a specific tourism sector, and iii) a financial projections mechanism for the tourism sector.

Figure 1: Vanuatu tropical cyclone aftermath, Pango Road, Port Vila.

2 Project Background

2.1 Vanuatu Context

Vanuatu is a South Pacific Ocean nation consisting of approximately 80 islands. It is known for its beautiful landscapes, rich culture, and an extensive offering of tourist activities. Its position in the South Pacific and on the Pacific Ring of Fire means Vanuatu is subject to multiple natural hazards such as tropical cyclones, intense rainfall, earthquakes, volcanic eruptions, and tsunamis. The impact of many these natural hazards is increasing due to climate change, which poses additional risks including sea level rise, more frequent marine heatwaves and extreme rainfall events as well as hotter temperatures. Tropical cyclones have been particularly severe in the recent decade, resulting in significant damage to infrastructure and livelihoods.

To minimise the impacts of natural hazards and climate change and improve the nation's resilience, it is important to acknowledge that while risks cannot be eliminated, they can be identified, assessed, reduced, and managed. As such, resilient and sustainable development has been a key priority for the Vanuatuan government in recent years and there has been a significant effort to understand the climate risks and how they may change over time by undertaking climate risk and vulnerability assessments. These assessments enable the Vanuatu government to make informed decisions regarding the improvement of Vanuatu's climate resilience.

Some key pieces of climate risk and resilience work are detailed below.

2.1.1 Recent Climate Risk and Resilience Work in Vanuatu

Vanuatu Climate Futures Portal, a Climate Information Services portal has been established as part of Climate Information Services for Resilient Development in Vanuatu (Van-KIRAP) by the Commonwealth Science and Infrastructure Research Organisation (CSIRO), Vanuatu Meteorology and Geo-Hazards Department (VMGD), and SPREP. The portal includes a climate data visualisation tool, allowing users to view projections of climate hazards spatially and temporally, as well as data explainers, summaries, case studies, and other resources.

The aim of the portal is to facilitate the application of climate information within the agriculture, infrastructure, fisheries, tourism, and water sectors in Vanuatu. It sits alongside guidance for undertaking climate hazard impact assessments for those five sectors in Vanuatu[1].

Other climate risk work includes the following (non-exhaustive list):

- Vanuatu National Adaptation Plan of Action (2019-2030), developed by the National Advisory Committee on Climate Change, 2007[2].
- Climate Change and Disaster Risk Reduction Assessment for Greater Port Vila, developed by SPREP[3]
- Sarakata Flood Mitigation and Early Warning System Gap Analysis, developed by SPREP[4]

[1] CSIRO, SPREP and VMGD (2023). Climate hazard-based impact assessments for Vanuatu: A step-by- step guide on climate change related impact assessments for key sectors. https://www.vanclimatefutures.gov.vu/assets/docs/Van-KIRAP-Guidance.pdf

[2] National Advisory Committee on Climate Change (NACCC) (2006). National Adaptation Programme for Action (NAPA) https://unfccc.int/resource/docs/napa/vut01.pdf

[3] UN-HABITAT (2015). Climate Change Vulnerability Assessment: Greater Port Vila. https://fukuoka.unhabitat.org/wp-content/uploads/2021/12/PVVA_FullReport_Endorsed.pdf

[4] SPREP (2023). Sarakata Flood Mitigation and Early Warning System Gap Analysis report https://www.sprep.org/publications/sarakata-flood-mitigation-and-early-warning-system-gap-analysis-report

- ClimateWatch mobile app and the National Traditional Knowledge Indicators booklet to facilitate the use of observing nature to forecast weather and the climate, developed by Van-KIRAP and the Climate Information Services for Resilient Development in Vanuatu, and released in November 2023[5].

2.2 Project evolution

The step-by-step guide on climate change related impact assessments for agriculture, infrastructure, fisheries, tourism and water sectors, developed by CSIRO and VMGD for the Van-KIRAP Climate Futures Portal aims to guide users in undertaking climate impact assessments as the first step in completing comprehensive risk assessments used for policy development and adaptation planning[1](see Van-KIRAP portal). As an important element of a *comprehensive* risk assessment, their impact assessment is designed to be technically detailed and therefore is not easily implemented on the ground to inexperienced or unfamiliar users.

SPREP have identified the need for *rapid* assessments for use in resource-constrained situations that utilise qualitative, non-technical information to build an evidence base for identifying risks and prioritising adaptation options.

The goal of the Vanuatu Rapid Climate Risk Assessment Framework and Methodology project is to address that need and establish the assessment framework and associated methodology for use by non-experts on the ground. The assessment framework will enable the user to highlight key areas of high impact or risk for which adaptation options can be assessed.

To ensure consistency with other climate impact and risk assessments being carried out in Vanuatu, the RCRAF assessment has been informed by the Van-KIRAP guidance and is designed to be used alongside climate information products, resources within the Van-KIRAP Climate Futures portal, and to be applicable to the same key five sectors in Vanuatu.

Figure 2: Steps for conducting climate hazard-based impact assessments from the Van-KIRAP guidance on climate change related impact assessment for sectors.

[5] SPREP (2023). New mobile app and booklet to help preserve Vanuatu's traditional climate knowledge https://www.sprep.org/news/new-mobile-app-and-booklet-to-help-preserve-vanuatus-traditional-climate-knowledge

2.3 Stakeholder Engagement

Previous natural hazard events in Vanuatu, and the response to them, has shown that future guidelines, plans, and methodologies aiming to prepare and protect communities from natural hazards should be developed *with* the people of Vanuatu and should combine traditional knowledge and scientific knowledge[6].

Therefore, in developing the RCRAF, it was vital to include key stakeholders from across Vanuatu, including representatives from a range of sectors and government departments, were invited to engagement workshops, the aim being to understand their concerns, needs and roles within the framework.

These workshops were followed by an online survey, and guided the development of the RCRAF by providing insights into their needs and what role they can play within the framework development. The key questions asked are below:

- What is your organisation?
- Where do you operate within Vanuatu?
- What climate issues are you already seeing in your sector?
- How is climate change already affecting your organisation?
- What would help you to consider climate risks into your future planning?
- What role does your organisation play in identifying climate change risks in Vanuatu?
- Who do you think the end users of this framework will be?

Key outputs:

- The framework should be accessible, simple to use and cater to a wide range of abilities and a understanding of climate change and climate risks.
- The needs of the users will vary depending on the size and location of their operation.
- For tourism specifically, operators focus is typically on immediate day-to-day/season-to-season activities rather than mid to long term risk.
- Training, guidance and support is needed for the framework to be widely accepted and utilised throughout Vanuatu.

Refer to Section 4 for how these outputs have informed the development of the RCRAF. For a detailed account of the stakeholder engagement process, see Appendix D, and refer to the Stakeholder Consultation report[7] (Beca, 2023b).

Note that the final draft of this framework and methodology report was provided to Project Stakeholders. However, no review comments were received.

[6] Cronin, Shane J (2003). Participatory methods of incorporating scientific with traditional knowledge for volcanic hazard management on Ambae Island, Vanuatu. https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=934ef7196328d3ca4e38c7918d1d5f745d058825

[7] Beca (2023b). Stakeholder Consultation report FINAL- Appendix D.

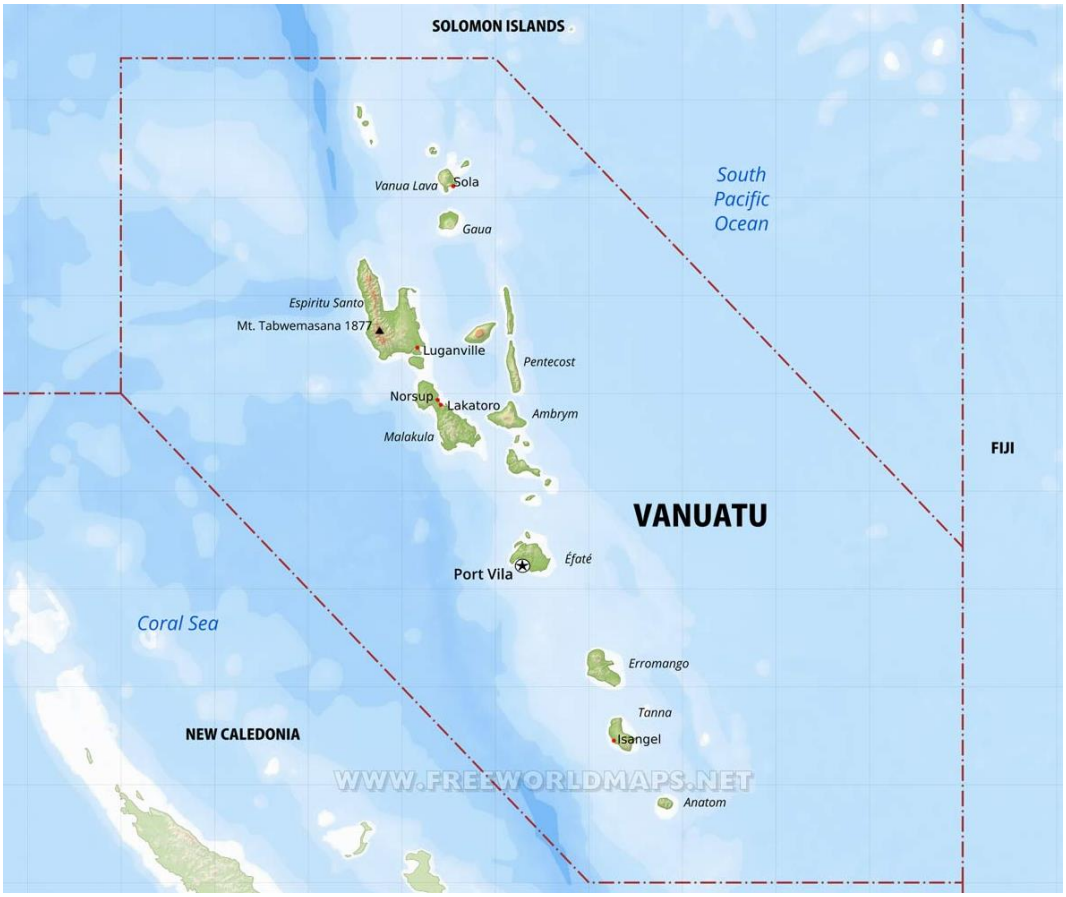


Figure 3: Vanuatu location Map.

3 Background to the Rapid Climate Risk Assessment Framework

3.1 Rapid Climate Risk Assessment Frameworks

A rapid climate risk assessment is a method of quickly and effectively screening risks which may arise as a result of climate change effects on natural climate-driven hazards.

The framework underpinning this RCRAF is intentionally high-level to cover a broad set of potential climate change hazards and consider the range of possible impact on the five key sectors. It is likely to highlight key areas of high impact or risk which may then be targeted for future detailed studies at regional, district or local level.

A RCRAF generally comprises three assessment steps:

1. A climate hazard assessment step which identifies the probability, intensity and timescale of the key hazards and identifying areas that may be particularly impacted, taking into account the historical trends and current situation, as well as future scenarios based on available scientific evidence. *The climate hazard information products produced by CSIRO within Van-KIRAP comprise the climate hazard step of this RCRAF. Login details are provided in Section 3.3.*
2. An impact screening step which identifies exposure and vulnerability (adaptive capacity and sensitivity) of features and elements at risk
3. A risk assessment step to help users to identify their key climate risks. The framework provides high level risk prioritization so that sectors can make informed decisions on actions and investment into climate adaptation and resilience.

The RCRAF developed for Vanuatu incorporates these three steps as described in Sections 3.3, 3.5, and 3.6, and shown in Figure 4. The steps, including sub-steps, outline the inputs and methodology for each step that make up the framework.

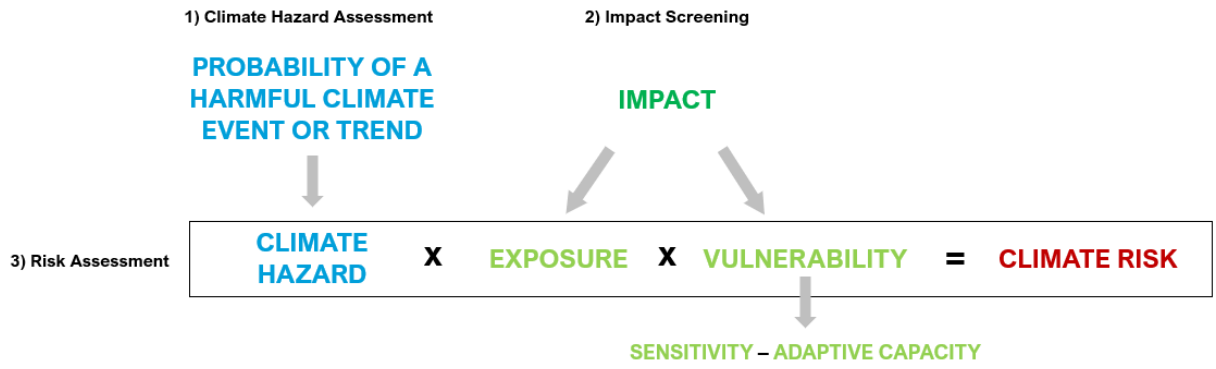


Figure 4: Risk within the C40 RCRAF assessment framework methodology.

3.2 The Vanuatu Rapid Climate Risk Assessment Framework

The Vanuatu RCRAF follows guidance in the New Zealand Ministry for the Environment (MfE) guidance for climate change risk assessments[8] by using a three of 'domains' to identify particular elements at risk. These include natural environment, built environment and people/operations. This MfE methodology was established

[8] NZ Ministry for the Environment (2021). A guide to local climate change risk assessments
https://environment.govt.nz/publications/a-guide-to-local-climate-change-risk-assessments/

by leading risk authors and shares common themes from other well established climate risk assessment frameworks, such as the C40 risk framework[9].

Additionally, as discussed in Section 2.2, this assessment framework is informed by, and aligns with, the Van-KIRAP Climate Futures Portal and associated climate risk assessment guidance, developed by CSIRO and VMGD. However, because the objective is to develop a rapid and easy to undertake assessment, the steps for conducting assessment have been adjusted from the steps in CSIRO's Figure 2 to the steps below (Figure 5).

The Rapid Climate Risk Assessment tool has been developed to support Step 4.

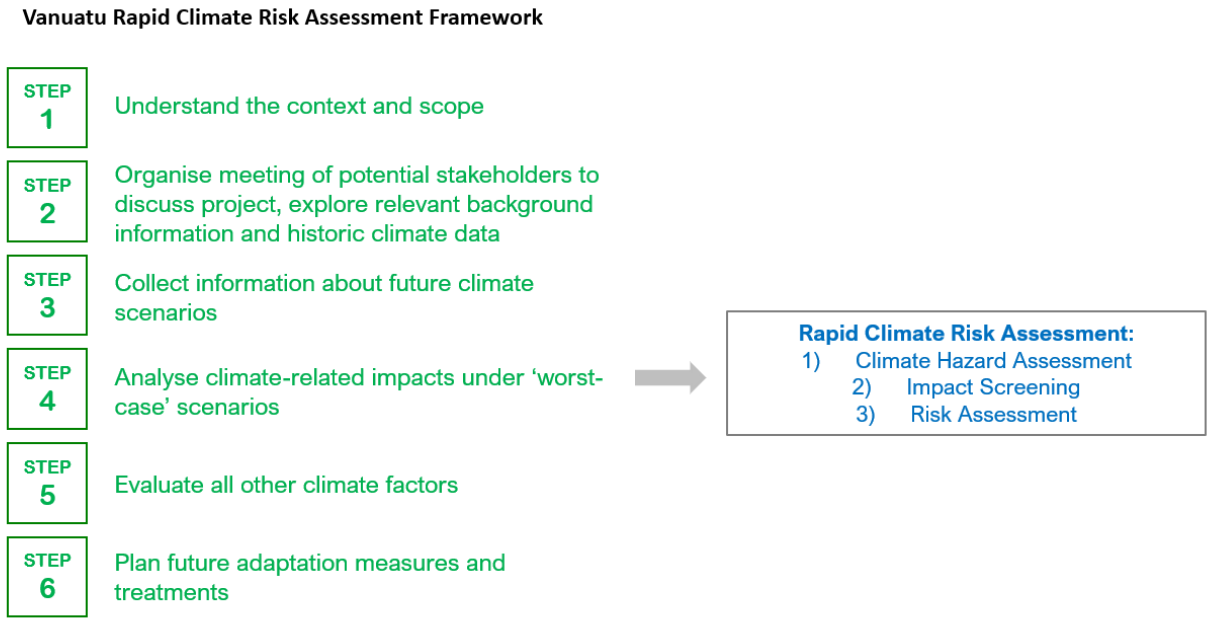


Figure 5: Steps for conducting the rapid climate risk assessment within the Vanuatu Rapid Climate Risk Assessment Framework, adapted from the Van-KIRAP guidance. The Rapid Climate Risk Assessment tool has been developed to support Step 4.

Figure 6shows the Vanuatu Rapid Climate Risk Assessment Framework, including the steps, objectives, users, inputs, outputs and outcomes.

[9] C40 Cites Climate Leadership Group, Inc. website (2023) https://www.c40.org/

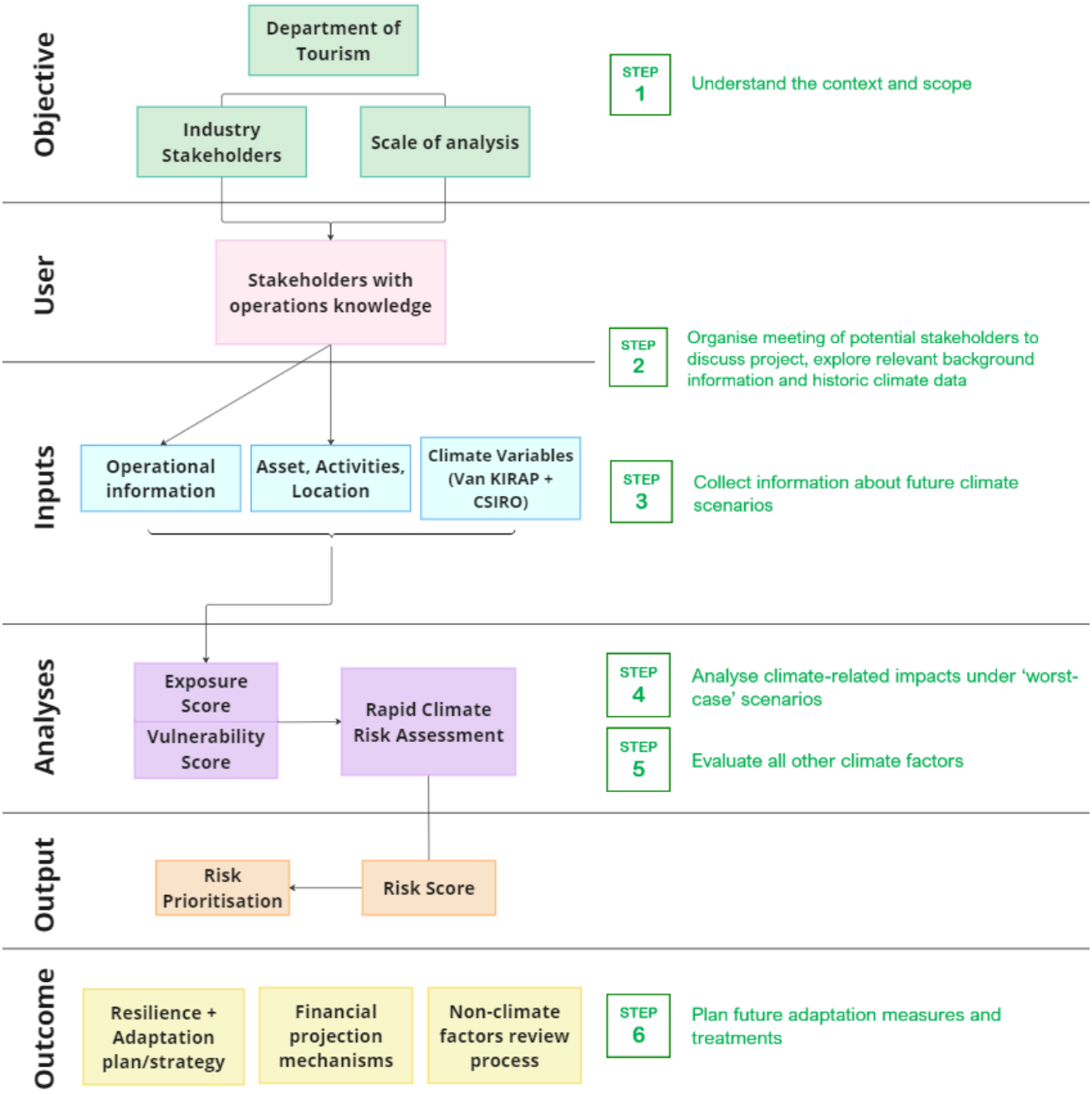


Figure 6: Flow chart showing the process of the Vanuatu Rapid Climate Risk Assessment Framework

3.3 Climate Hazard Assessment

The climate hazard assessment identifies the probability, intensity, and timescale for key hazards as well as the areas that may be particularly impacted, taking into account historical trends, the current situation and future scenarios based on scientific projections.

As discussed in Section 2.1.1, there has been a significant amount of work completed to date on Vanuatu's key climate hazards, including projections for a series of timescales. This assessment framework draws on this data, particularly the projections of climate hazards in the Van-KIRAP portal, with supplemental information from other sources where necessary. These hazards, and their definitions can be found in Table 1.

Representative Concentration Pathways (RCP) are emission trajectories from the IPCC 5th Assessment Report and the CMIP5 model ensemble (see Figure 7). The Van-KIRAP portal contains climate data, generally in two future emissions scenarios, RCP2.6 and RCP8.5 indicating the increase in radiative forcing in Watts/m² due to the net change of energy in the atmosphere due to greenhouse gas concentrations. RCP2.6 is an emission removal pathway, where greenhouse gases are removed from the atmosphere and the radiative forcing is stabilised by 2100. RCP8.6 depicts continuous high global emissions without effective mitigation. Within Van-KIRAP these are shown over four timeframes. This RCRAF utilises the high-emissions scenario RCP8.5 in present day, mid-century (2050) and end-of-century (2090) (Figure 7). Using RCP8.5 to screen the impacts achieves the conservatism needed to identify the most significant impacts for management and a greater level of confidence in the assessment.

A summary of the climate variable information available at the time of framework development can be found in Appendix B, with a synthesis of the key climate hazard data in Appendix C.

The Van-KIRAP portal can be accessed here, using the login details:

Username	test
Password	vanKirap123

The portal provides a walkthrough document to help users navigate the portal.

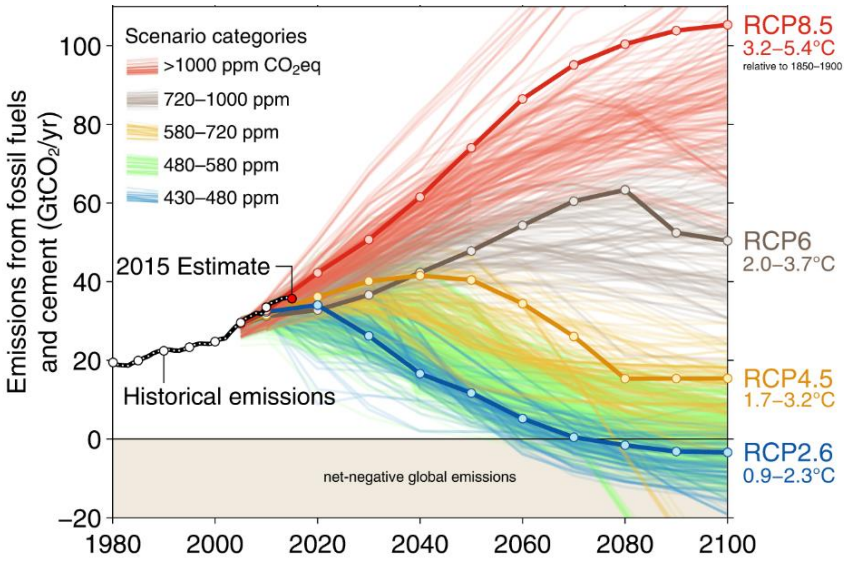


Figure 7: RCP scenarios showing annual emissions of fossil fuel per year until the end-of-century, including the projected global warming temperatures under each scenario.

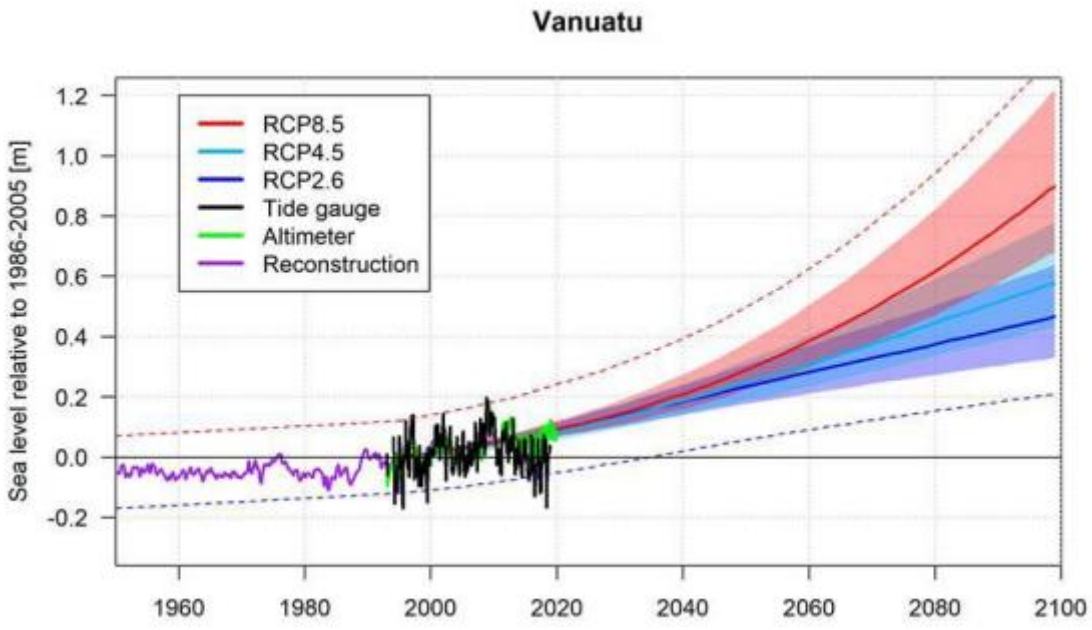


Figure 8: Observed and projected relative sea-level change for Vanuatu (VanKIRAP, 2023)

Table 1: Climate hazard definitions and Vanuatu examples

Climate hazard	Description [10]	Vanuatu Example
Coastal inundation (see Van-KIRAP explainer here)	Coastal inundation is flooding caused by a range of coastal processes, including a combination of tides, storm surges, storm waves, interannual sea level variability and future sea level rise. Inundation is also affected by tectonic processes such as seismic uplift or subsidence. Climate change will increase the severity of coastal inundation events, due to sea level rise and changes to storm wave generating events.	Coastal inundation includes flooding of coastal land areas (including crops and houses in these areas), infrastructure damage (such as roads, ports and buildings), and cause saltwater intrusion to groundwater, and coastal erosion. Examples occur during tropical cyclones, king tides, especially when it coincides with a coastal storm or combined with extreme rainfall and river floods.
Drought (see Van-KIRAP explainer here)	Drought is an acute lack of water compared to normal conditions due to a lack of rainfall over an extended period, usually more than a few months. The water shortage can impact activities, groups, sectors and related natural resources. Climate change is projected to increase the frequency, duration, and intensity of drought events. With the greatest droughts having the largest increase in frequency,	Drought conditions in Vanuatu have historically been influenced by the El Nino Southern Oscillation (ENSO). During a El Niño phase, Vanuatu tends to experience lower than usual rainfall and increased day time temperatures, leading to drought like conditions (Vanuatu Meterology & Geo-Hazards Department, 2023).

[10] SPREP, CSIRO & VMGD (2023). Vanuatu Climate Futures Portal https://vanclimatefutures.gov.vu/dashboard/climate-extremes

Climate hazard	Description [10]	Vanuatu Example
	duration and intensity. Therefore, the severe droughts will get more severe (Van-KIRAP, 2023)	This was last experienced during the severe 2015 droughts, and 2020 in the Southern Islands.
Extreme rainfall (see Van-KIRAP explainer here)	The risk of extreme rainfall is due to a combination of factors, including tropical cyclones, interannual rainfall variability (wet season from November – April), and the El Niño Southern Oscillation. The total amount of rainfall can be used as an additional indicator of extreme rainfall. Extreme rainfall events are expected to increase in intensity.	Vanuatu can experience periods of extreme rainfall due to the presence of tropical cyclones and the location of the Southern Pacific Convergence Zone and the Inter Tropical Convergence Zone. Additionally, the climate in Vanuatu during the La Niño phase of ENSO typically results in wetter than average conditions (Van-KIRAP, 2023).
Tropical cyclone (see Van-KIRAP explainer here)	Tropical cyclones are rotating storms that develop over tropical oceans that are over 25.5 °C and within 5 degrees of latitude from the equator where there is sufficient Coriolis force to create the rotation. In the South Pacific Ocean, a tropical cyclone is defined by a 10-minute sustained wind speed of 17.5 metres-per-second or greater. Tropical cyclones cause strong winds, heavy rainfall, and storm surges. The risk of tropical cyclones is greater during the southern hemisphere's 'cyclone season' from November – April. The frequency of tropical cyclones within 500km of Vanuatu is expected to decrease, but the intensity of these events will increase (Van-KIRAP, 2023).	Tropical Cyclones in Vanuatu are influenced by the position and intensity of the Southern Pacific Convergence Zone and the ENSO phase. Where, the El Niño phase is associated with fewer tropical cyclones and La Niña is associated with more tropical cyclones (Van-KIRAP, 2023).
Ocean acidification (see Van-KIRAP explainer here)	The risk of ocean acidification, a reduction of the ocean's pH, is due to an increase in atmospheric CO_2 concentrations and heat stress such as marine heatwaves. Aragonite Saturation State is the measure of how easily aragonite, a calcium carbonate produced and used by many marine organisms to build skeletons, shells or coral, dissolves in the ocean. The reduction of aragonite in the ocean strongly correlates to changes in ocean pH, therefore the Aragonite Saturation State is a useful indicator of ocean acidification. Ocean acidification is projected to increase in severity towards the end of the century, with a continual trend in decreasing ocean pH (Van-KIRAP, 2023).	Ocean acidification in Vanuatu is caused primarily driven by the absorption of excess carbon dioxide from the atmosphere. Temperature can have an indirect effect on this. Ocean acidification hinders the ability of marine organisms such as corals and shell-forming species requiring calcium carbonate to build and maintain their skeletal structures. In Vanuatu, this could lead to marine environments with reduced health and less diverse inhabitants.

Climate hazard	Description [10]	Vanuatu Example
Marine heatwaves (see Van-KIRAP explainer here)	Marine heatwaves are defined as 'discrete, prolonged anomalously warm water events which last for five or more days, with sea surface temperatures warmer than the 90th percentile relative to climatological values'. Marine heatwaves are caused by a number of factors, including ocean currents that build up areas of warm water, air-sea heat flux (warming of the oceans surface by the atmosphere), and climate variability drivers like the El Niño Southern Oscillation. Marine heat waves are projected to increase in frequency and duration, therefore increasing the intensity of each event. This projection is greater in the north of Vanuatu (Van-KIRAP, 2023).	Elevated sea temperatures associated with marine heatwaves can trigger coral bleaching, a stress response in which corals expel their symbiotic algae. This can lead to the loss of colour in coral reefs and, if prolonged, result in the death of coral colonies. In Vanuatu, this would have a direct impact on the fisheries and tourism sector.
Extreme Temperature (hottest day of the year) (see Van-KIRAP technical report here)	There is spatial distribution of temperature patterns throughout Vanuatu. This includes the mean daily temperature, mean annual temperature, the hottest day, and the coolest night. The coolest and drier months are from July to September, while the warmest and wettest months are from January to March. Additionally, the Northern region tends to be hotter and wetter than the Southern region.	The temperature in Vanuatu the temperature is influenced by its tropical climate and geographical location in the South Pacific characterized by warm temperatures throughout the year. Temperatures are generally higher during the wet season and cooler during the dry season. Coastal areas in Vanuatu may experience milder temperatures due to the moderating influence of the surrounding ocean and the cooling effect of sea breezes. Tropical cyclones will also affect local temperatures.

3.4 Elements

The elements defined in Table 2 have been drawn from the New Zealand National Climate Change Risk Assessment[11] and amended to reflect the Vanuatuan context for the RCRAF.

[11] Ministry for the Environment (2020). National Climate Change Risk Assessment for New Zealand: Main Report. https://environment.govt.nz/assets/Publications/Files/national-climate-change-risk-assessment-main-report.pdf

Table 2: Definitions of elements used for impact screening.

	Element	Definition
Natural	**Coastal/Marine Ecosystem**	Coastal ecosystems exist where the land meets the sea or the part of the marine environment that is strongly influenced by land-based processes, for example salt marshes, estuaries, beaches and mangrove forests. Marine ecosystems are aquatic environments which includes shallow reefs, deep oceans, coastal waters, and marine protected areas. Example: Vanuatu has many marine and coastal ecosystems, including coral reefs, mangroves, seagrass areas, seamounts, and deep-sea trenches. These ecosystems support over 770 fish species, whales, dolphins, and sea turtles and are susceptible to a range of climate hazards.
	Terrestrial Ecosystem	Terrestrial ecosystems are ecosystems found on land, including tundra, taiga, temperate deciduous forest, tropical rain forest, grassland, and deserts. Vanuatu's tropical and subtropical rainforests are home to a wide range of flora and fauna and are susceptible to changes in temperature and rainfall.
	Freshwater Ecosystem	Freshwater ecosystems are a subset of aquatic ecosystems and refer to water from rivers, lakes, reservoirs, and underground streams. Freshwater is used by a wide variety of plants and animals and are often used for recreation. Vanuatu is home to several freshwater springs, known as the blue holes, that attract both locals and tourists. Such freshwater sources are susceptible to many climate hazards including extreme rainfall, tropical cyclones, and drought.
Built	**Inhabited Buildings**	Inhabited buildings refer to all buildings in which people reside or work, relating to the industry and its operations. For example, office buildings, shops, hotels etc.
	Ports/Wharves	Ports refer to harbor areas in which ships and boats load and unload goods and passengers. Wharves are used to dock yachts, small boats and include vessel launching/retrieving facilities often located nearby. Vanuatu has two major ports, Port of Vila in the capital Vila on Efate Island, and Port of Luganville in Santo. Numerous ferry wharves and ramps support marine transport around the outer islands.
	Airports/Airfields	Airports refers to the 2 major airports (Port Vila and Luganville) and the 24 other airports and airfields in Vanuatu, including operational assets such as the airplanes, runways, vehicles, etc.
	Telecommunications	Telecommunications refers to all infrastructure associated with information transmitting technologies and communications, including wired phones, cellphones, radio and television broadcasting and the internet.
	Electricity	Electricity refers to all assets and infrastructure associated with the generation, transmission, and distribution of electricity to end-use customers. For example, power plants, transmission lines, electricity meters.
	Wastewater Infrastructure	Wastewater infrastructure refers to the network of pipes that collect and carry residential, business, and industrial effluents to wastewater treatment systems, and the treatment systems themselves.
	Transport Assets	Transport assets refers to the assets and infrastructure associated with transport, including private vehicles, public transport vehicles and infrastructure, roads, bridges, cycle, and foot paths.

	Water Supply	Water supply refers to the source, treatment, transportation, and distribution of potable water, for example wells, bores, pumps, pipe networks and treatment facilities.
	Storm Water/Flood Management	Stormwater/flood management refers to all stormwater infrastructure and assets, and any flood management infrastructure in place
	Uninhabited Buildings	Uninhabited buildings refer to all buildings in which assets are stored relating to the industry and its operations, and are not intended for people to inhabit. For example, boat sheds, warehouses, barns.
	Evacuation Structures	Evacuation structures refers to elevated structures with sufficient elevation, structural durability and weathertightness to elevate potential evacuees above floodwaters, shelter from extreme winds and rainfall, and be at a safer location inland from extreme waves. May also include emergency water supply, electricity supply and communications facilities.
	User Defined, or Other	Any element not listed, that is relevant to the industry and its operations.
Operations	**Outdoor Land activities**	Outdoor land activities refer to operations that take place inland and aren't protected by buildings/infrastructure, for example farming, tourist activities like hiking and ziplining.
	Outdoor Marine Activities	Outdoor marine activities refers to operations taking place within the marine environment, for example fishing, scuba diving, marine education and training
	Outdoor Freshwater Activities	Outdoor freshwater activities refer to operations taking place within freshwater environments, for example freshwater fishing and recreational swimming.
	Outdoor Coastal Activities	Outdoor coastal activities refer to operations taking place within the coastal environment, for example surfing, snorkeling and fishing.
	Land Transportation Activities	Land transportation activities refers to any land transport operations, for example transport of goods, taxi services.
	Water Transportation Activities	Water transportation activities refers to any marine transport operations, for example boat tours, water taxi services, cargo transport.
	Office/Shop/Admin Activities	Office/shop/admin activities refers to operations taking place within buildings, for example, retail, desktop-based business, education, and indoor training.
	Goods Supply Activities	The supply of critical physical goods/services the operation requires to operate. Those which are susceptible to a range of climate-related impacts, including extreme weather events, resource scarcity such that potential disruptions would prevent the operation. For example, a restaurant relies on food supply, a construction company relies on materials.
	Construction Activities	Construction activities refers to operations associated with the construction of assets or infrastructure, for example constructing buildings, infrastructure such as ports and bridges, roadworks. Construction activities can be disrupted due to climate events, causing delays in projects.

3.5 Impact Screening

The impact screening is to identify potential consequences of the climate-driven hazards to the sector being evaluated. The screening is to consider the range of possible sites, assets and activities or operations which the

industry relies on for their existing of potential future activities. Identification of these potential consequences by the user is to support strategy and planning of future operations.

As described above, the climate scenario and timeframe for the impact screening step is RCP8.5, a high-emissions scenario, at present day, mid-century, and end-of-century. To enable users to identify the potential impacts of climate change they must consider what elements of their industry or business could be impacted.

It is intended that the user is able to access the climate hazard information in the Van-KIRAP portal whilst completing the impact screening and risk assessment.

Table 3 contains the results of an initial screening potential impacts of climate hazards to each of the elements. For example, elements which are not directly associated with marine and ocean activities, such as farming or road construction, are not selected in the screening.

Table 3: Potential impacts of climate hazards on elements of industry

		Coastal Inundation	Extreme Rainfall	Tropical Cyclone	Drought	Marine Heat Waves	Ocean Acidification	Extreme Temperature
Natural	Coastal/Marine Ecosystem	X	X	X	X	X	X	X
	Terrestrial Ecosystem	X	X	X	X			X
	Freshwater Ecosystem	X	X	X	X			X
Built	Inhabited Buildings	X	X	X	X			X
	Ports/Wharves	X	X	X	X		X	X
	Airports	X	X	X	X			X
	Telecommunications	X	X	X	X			X
	Electricity	X	X	X	X			X
	Wastewater Infrastructure	X	X	X	X			X
	Transport Assets	X	X	X	X			X
	Water Supply	X	X	X	X			X
	Storm Water/Flood Management	X	X	X	X			X
	Uninhabited Buildings	X	X	X	X			X
	Evacuation Structures	X	X	X				X
Operations	Outdoor Land activities	X	X	X	X			X
	Outdoor Marine Activities	X	X	X	X	X	X	X
	Outdoor Freshwater Activities	X	X	X	X			X
	Outdoor Coastal Activities	X	X	X	X	X	X	X
	Land Transportation Activities	X	X	X	X			X
	Water Transportation Activities	X	X	X	X	X	X	X
	Office/Shop/Admin Activities	X	X	X	X			X
	Goods Supply Activities	X	X	X	X	X	X	X
	Construction Activities	X	X	X	X			X

3.6 Risk Assessment

The risk assessment step helps users to identify their key climate risks. The RCRAF will provide high level prioritised risks so that sectors can make informed decisions about actions and investment into climate adaptation and resilience.

In this framework, the assessment of risks involves scoring the *exposure* and *vulnerability* of the element-at-risk to climate hazards identified in the impact screening. Scoring the risks will allow the user to sort and prioritise them. Refer to Section 5.3 for details on vulnerability and exposure.

The scoring process has been informed by the New Zealand MfE (2021) guidance detailed in *A guide to local climate change risk assessments*[12]. Table 4 shows the risk scoring method based on the exposure and vulnerability.

Table 4: Risk rating matrix

		Exposure			
		Low	Moderate	High	Extreme
Vulnerability	Extreme	Moderate	High	Extreme	Extreme
	High	Low	Moderate	High	Extreme
	Moderate	Low	Moderate	Moderate	High
	Low	Low	Low	Moderate	High

Risks are prioritised according to:

- Risk rating in present day, mid-century and end-of-century
- Vulnerability

3.7 Existing Risk Management

Risk management is the process of developing plans, actions and strategies to reduce the probability and severity of the effects of identified risks, based on risk assessments and climate data that inform decision-making around climate hazard risk. The RCRAF guides the user through preliminary evaluation of existing risk management undertaken by their industry to educate about future planning following the results from the RCRAF assessment.

Risk management can include hard protection such as physical structures for flood control and evacuation. It can also include institutional and behavioural actions, such as creating inclusive strategies for individuals and communities to cope with risks and recover from them.

As discussed in Section 3.6, the risk scoring and prioritisation process is essential for risk management as it shows the main risks that need to be addressed with management measures.

3.8 Adaptation Approaches

The purpose of the Vanuatu RCRAF is to assess climate risks, consider existing adaptation approaches and provide prioritisation of risks for future adaptation planning, which may include detailed risk assessment of priority risks.

Adaptation is the process of adjustment to actual or expected climate and its effects, to moderate harm. Within communities, people can work together to reduce the impact of climate hazards, through social networks,

[12] NZ Ministry for the Environment (2021). A guide to local climate change risk assessments. https://environment.govt.nz/assets/publications/climate-risk-assessment-guide.pdf

nature-based or hard-engineering solutions, upgrades to existing buildings and infrastructure and by being better prepared[13].

There is no single 'correct' solution for adapting to more severe climate hazards, the adaptation approach depends on the element at risk, climate hazard and the people, property and systems/processes impacted. The approach can involve multiple strategies and can also be expected to change over time.

A common adaptation framework is the protect, accommodate, retreat, and avoid framework (PARA)(Figure 9):

- **Protecting** assets from risk, for example by building protective structures such as sea walls
- **Accommodating** risk, for example by incorporating adaptation options into the design of developments
- **Retreating** from risk, for example by relocating existing development away from high-risk areas
- **Avoiding** risk, for example by locating development away from areas prone to hazards

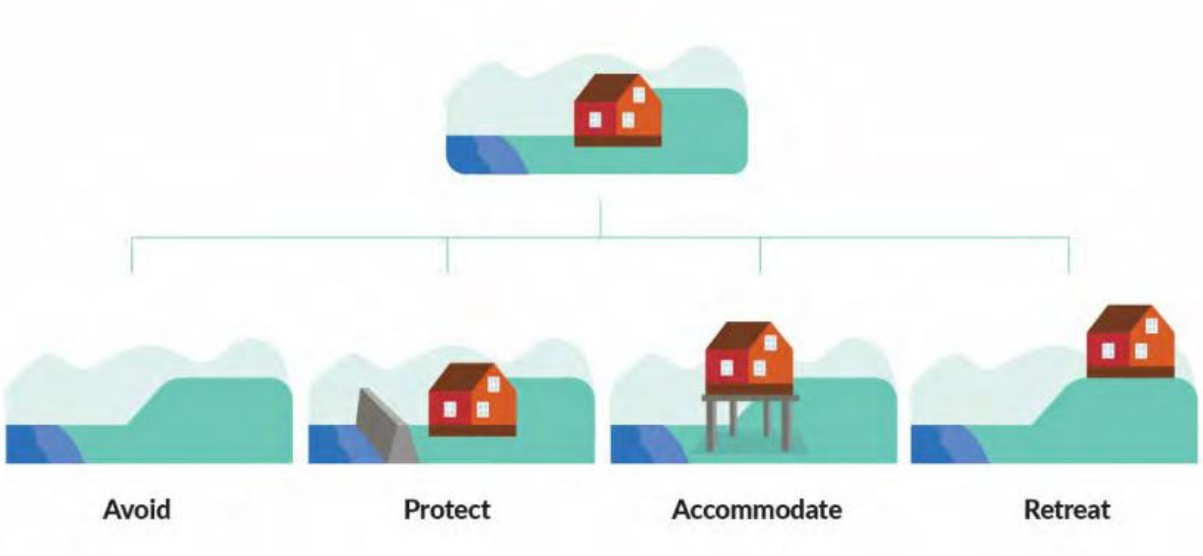


Figure 9: Adaptation options for responding to rising sea-levels - avoid, protect, accommodate, retreat.

4 Rapid Climate Risk Assessment Framework

The Vanuatu Rapid Climate Risk Assessment Framework has been developed to enable non-climate-experts in Vanuatu to identify and prioritise their climate risks and set them up for exploring adaptation options. Figure 10 shows the process of the assessment with user inputs, assessment outputs and examples.

4.1 End Users

Stakeholder engagement indicated that the end users for the framework should be those within the industry bodies, industry associations and government departments who can support individual businesses and operators to undertake climate risk assessments of their operations and activities and guide the individual operators to adaptation responses.

[13] NZ Ministry for the Environment (2022). Adapt and thrive: Building a climate-resilient New Zealand https://environment.govt.nz/assets/publications/climate-change/MFE-AoG-20664-GF-National-Adaptation-Plan-2022-WEB.pdf

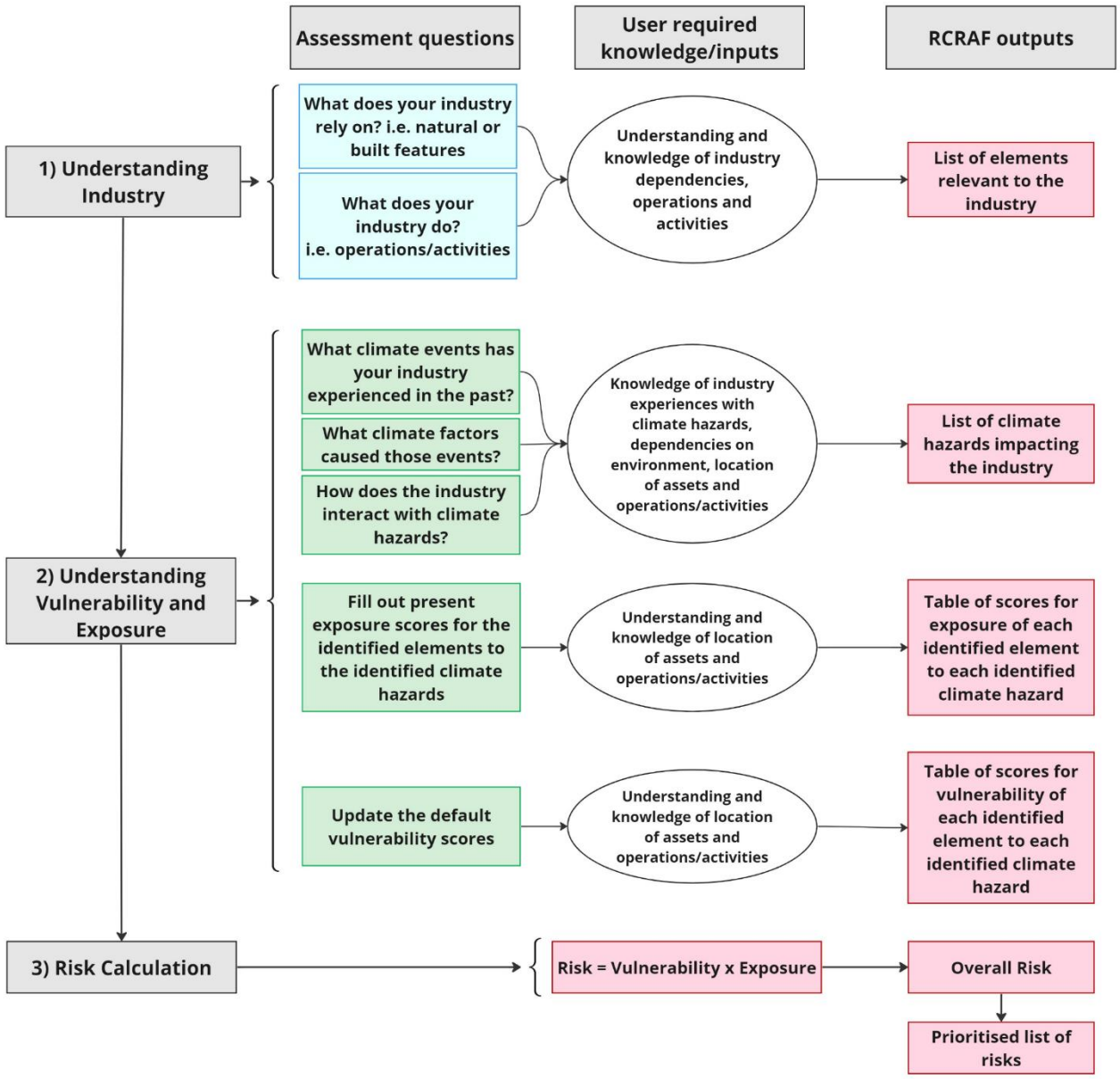
The end user is understood to have a working knowledge of the industry such that they can complete the rapid risk assessment. It is also anticipated that the end user be connected to the key operators on the ground and stakeholders in government licencing and regulation. This approach encourages use of the tool without needing to cater to the entire range of abilities when it comes to climate risk and digital competency.

Although, these agencies and departments can become central points at which training and guidance can be delivered, which is a need that was highlighted during consultation. Additionally, risk information can be gathered by such agencies and consolidated to inform decision making at different levels across short-, medium- and long-term climate risks throughout Vanuatu.

4.2 The Assessment Tool

The assessment framework is administered through a Microsoft Excel workbook which can be shared between agencies/government departments and individual operators.

The tool has been designed to be simple to use and hosted in desktop-based Microsoft Excel. Some of the benefits of using a workbook are that it can be used offline, transferable between users and is a widely used software with readily available user resources.



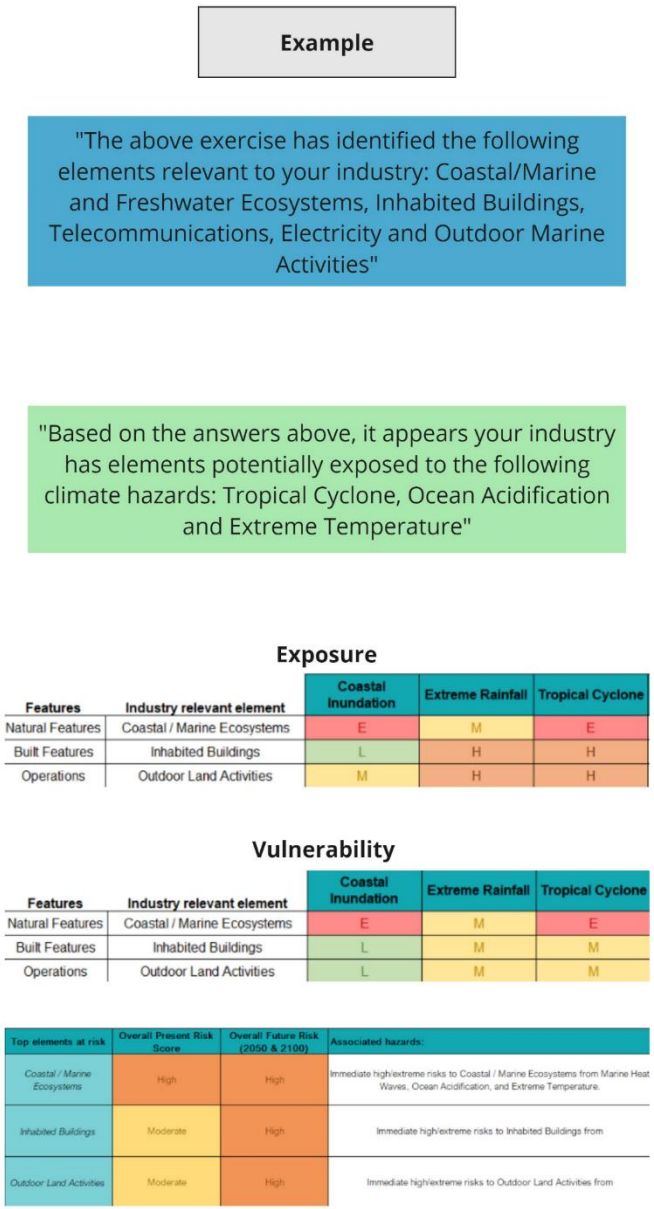


Figure 10: Vanuatu Rapid Climate Risk Assessment process.

5 Methodology

As discussed in Section 3.1 and Figure 10, the Vanuatu Rapid Climate Risk Assessment Framework follows the three steps: climate hazard assessment, impact screening and risk assessment.

5.1 Climate Hazard Assessment Methodology

The climate hazard assessment step is built into the assessment framework and draws on the work carried out by CSIRO on the Van-KIRAP Climate Futures portal and climate risk assessment guidance. The seven key climate hazards detailed in Section 0 have been identified as probable, impactful risks in the present day, mid-century and end-century timescales.

It is recommended that the Vanuatu Rapid Climate Risks Assessment workbook be used alongside the Van-KIRAP portal.

5.2 Impact Screening Methodology

The impact screening occurs through a series of questions. The user is able to identify which impacts of climate hazards on elements of the five industries will be material to them and their operations. Table 5 summarises the questions asked in the workbook. The climate information used to inform the initial vulnerability scoring is summarised in Appendix C (Table 14) along with the identified gaps in available data (Table 15).

Table 5: Impact screening questions

Understanding Industry *The user is asked to mark each element within the natural, built, and operational categories with a yes if it is relevant to them, or no if it is not.*	**Rationale**
Does your industry rely on or involve any of the following natural features, either now or potentially in the future? (i.e., coastal/marine ecosystems, terrestrial ecosystems etc.)	These questions identify which elements are relevant to the user's industry that could be impacted by climate change.
Does your industry rely on or involve any of the following built features, either now or potentially in the future? (i.e., telecommunications, electricity, inhabited buildings etc.)	
What does your industry do? Which of the following operations and activities are involved? (i.e., outdoor marine activities, Land Transportation Activities etc.)	
Exposure *The user is asked to mark yes for climate hazards that have already impacted their industry and no to those that haven't. They also need to respond yes or no to a series of location based questions and provide details where relevant.*	**Rationale**
What climate hazards have impacted your industry in the past? Tick 'Yes' to all that are relevant. Please describe how the climate hazard(s) impacted your industry's people, property, systems/processes.	These questions identify how the elements are exposed to the climate hazards and feed into the exposure scoring process.
Does your industry have elements located within 100m of the coast?	
Does your industry have elements located at less than 10m elevation from sea level?	
Does your industry have / use elements that can be impacted by (or rely on) ocean conditions? (i.e. Ocean acidification and marine heatwaves affecting reefs and fish stock) have elements located in the ocean? (i.e., reefs, fisheries)	

Understanding Industry *The user is asked to mark each element within the natural, built, and operational categories with a yes if it is relevant to them, or no if it is not.*	**Rationale**
Does your industry have elements that critically rely on a natural water supply (river, groundwater) (e.g., rainfall on crops, water intake at stream for drinking water)?	
Does your industry have elements located near a river, stream or lake with a history of flooding?	
Do high temperatures significantly impact the effectiveness or safety of work activities, ecosystems, agricultural productivity or sites / assets in your industry?	
Exposure Scoring *The user is provided five exposure ratings and their definitions (see Section 5.3 for definitions): Extreme, High, Moderate, Low, and Not Applicable, and asked to score the exposure of all elements identified to the climate hazards.*	Prompting the user to score their industry's exposure allows for a more accurate assessment.
Vulnerability	**Rationale**
Vulnerability scoring *The user is provided initial vulnerability scores of Extreme, High, Moderate, Low, or Not Applicable for each element. They are asked to use the definitions provided (see Section 5.3 for definitions) and their understanding of their industry to update the vulnerability scores.*	Default scores are provided based on the perceived vulnerability, however having the user update the scores using their understanding of their industry results in a more accurate assessment.
Understanding Existing Climate Risk Management *The user is asked to answer yes or no to the following questions.*	**Rationale**
Has your industry prepared or implemented measures to manage risk associated with Coastal Inundation?	These questions help to understand how the indicated disruption/damage to the user's industry due to climate hazards is being managed within the industry
Has your industry prepared or implemented measures to manage risk associated with Extreme Rainfall?	
Has your industry prepared or implemented measures to manage risk associated with Tropical Cyclone?	
Has your industry prepared or implemented measures to manage risk associated with Marine Heat Waves?	
Has your industry prepared or implemented measures to manage risk associated with Ocean Acidification?	
Has your industry prepared or implemented measures to manage risk associated with Temperature?	
Adaptation *Using the PARA framework presented in the tool (and in Section 3.8) the user is asked to think about their industry's current exposure and vulnerability and which PARA adaptation actions have been taken to manage the impacts from climate hazards. The user is given the chance to add commentary about the risk management actions taken.*	**Rationale**
Has a PROTECT action been taken? E.g. building seawall to protect site, protecting fields from flooding.	These questions help to understand what actions

Understanding Industry *The user is asked to mark each element within the natural, built, and operational categories with a yes if it is relevant to them, or no if it is not.*	**Rationale**
Has an ACCOMMODATE action been taken? E.g., raising buildings to allow flood water underneath.	have been taken to increase resilience to climate change.
Has a RETREAT action been taken? E.g., planting crops in less flood prone fields, moving dive operations to healthier reefs.	
Has an AVOID action been taken? E.g., banning construction of new structures within 100m of coast in flood prone areas.	
Hazard Forecasting Information *The user is asked to answer yes or no to the following questions. There are also links provided to the information referenced in the questions.*	**Rationale**
Does your industry use formal warning systems to forecast climate hazard events? (e.g. VMGD forecasting)	These questions help to understand what methods are currently used to forecast climate hazard events and increases awareness of available information and tools.
Does your industry use traditional indicators to notify of upcoming potential issues? (e.g. traditional observation of bird activity to warn of pending cyclone)	
Does your industry use the Van-KIRAP Climate Futures portal?	

5.3 Risk Scoring Methodology

The following exposure, vulnerability and risk matrices follow the New Zealand MfE guidance detailed in *A guide to local climate change risk assessments*[14].

5.3.1 Exposure

This identifies the scale of exposure of the Sector to climate hazards, from a high, medium or low, and based on how much of the sector-specific features (e.g. land, assets, population and systems) may be at risk from the climate hazards.

Example: Infrastructure located near the coast is likely to be exposed to coastal inundation (flooding from the sea during storms), the closer to the coast the infrastructure is located then the greater the exposure will be. Similarly, the greater proportion of assets near the coast would imply a greater exposure for the sector.

Table 6: Exposure rating scale

Exposure rating	Quantitative definition	Qualitative definition
Extreme	>75% of sector/element is exposed to the hazard	Significant and widespread exposure of elements to the hazard
High	50-75% of sector/element is exposed to the hazard	High exposure of elements to the hazard
Moderate	25-50% of sector/element is exposed to the hazard	Moderate exposure of elements to the hazard
Low	5-25% of sector/element is exposed to the hazard	Isolated elements are exposed to the hazard

[14] NZ Ministry for the Environment (2021). A guide to local climate change risk assessments. https://environment.govt.nz/assets/publications/climate-risk-assessment-guide.pdf

Present-day exposure

The exposure scoring is to be input by the user by comparing the location and characteristics of the industry's features with the spatial and temporal distribution of the climate hazards. Hence, the user is asked to input their *present-day* exposure score based on their knowledge of recent and present climate hazards to their industry or sector, and as prompted by the Impact Screening questions.

If the user does not input a present-day exposure score, the scoring (present and future) defers to a national-scale default exposure score determined using the Van-KIRAP climate hazard information and a generic representation of elements at risk within an industry or sector. The default scoring is primarily to inform the changing risk over time, and are only intended to build upon the user's own knowledge and exposure scoring.

Future exposure

The RCRAF, then, uses the user's exposure input to determine a *future* scoring. This future exposure scoring departs from the MfE guidance by including a default escalation of risks into the future. The escalation is based on climate scenario RCP8.5 projections where, at a national scale, the overall effects of climate change are expected to exacerbate most risks arising from climatic events (refer to Climate hazards described in Section 3.3 and the Van-KIRAP portal).

Within the framework, logic is applied to ensure the risks are escalated from the user's present-day input, and such that the scoring cannot be inadvertently de-escalated over future timeframes. This is indicated in Table 7.

The rules of 2050 and 2100 exposure scoring escalation are as follows:

- For 2050, scores can escalate or de-escalate by one exposure rating only.
- For 2100, scores can escalate by one exposure rating and cannot de-escalate.
    - Due to the climate scenario used, RCP8.5, climate hazards are worsening over time and are expected to be the more severe in 2100 than 2050.
- Extreme remains the highest score.

Table 7: Example of scoring escalation rules. The arrows represent the change from one level of exposure rating to another. The present-day arrow shows the difference between the default score (on the top) and the user's input (on the bottom), and the 2050 and 2100 arrows show the subsequent logic of the escalation/de-escalation.

		Default or user input	Default calculation for future timeframe	
	Description and logic	Present Day	2050	2100
Escalation	The user inputs a score which has escalation of the present-day score by one (from Low to Moderate). This results in the 2050 score escalating by one, from Moderate to High and the 2100 score escalating further, from High to Extreme.	Low (*Default*)	Moderate	High
		⬇	⬇	⬇
		Moderate (*User*)	High	Extreme
	The user inputs a score which has escalation of the present-day score by two (from Low to High). This results in the 2050 score escalating by one, from High to Extreme and the 2100 score remaining at Extreme.	Low (*Default*)	High	Extreme
		⬇	⬇	⬇
		High (*User*)	Extreme	Extreme
De-escalation	The user inputs a score which has de-escalation of the present-day score (from Moderate to Low). This results in the 2050 score de-escalating from Moderate to Low and the 2100 remaining at High.	Moderate (*Default*)	Moderate	High
		⬇	⬇	⬇
		Low (*User*)	Low	High
	The user inputs a score which has de-escalation of the present-day score by two (from High to Low). This results in the 2050 score de-escalating by one, from Extreme to High, and the 2100 remaining at Extreme.	High (*Default*)	Extreme	Extreme
		⬇	⬇	⬇
		Low (*User*)	High	Extreme

5.3.2 Vulnerability (Sensitivity and Adaptive Capacity)

Assessing vulnerability of the Sector to climate hazards involves a qualitative evaluation of how susceptible the exposed assets and operations are to climate risks. Consider factors like sensitivity (how easily they can be affected) and adaptive capacity (how well they can cope).

Example – Adaptive Capacity: If there are early warning systems in place and/ or the infrastructure has been designed with coastal inundation resilience in mind then this has increased its adaptive capacity and lowered its vulnerability.

Example – Sensitivity: If the infrastructure relies on ground water or has aging piped infrastructure then it would also be sensitive to rises in the groundwater table that is associated with coastal inundation. Making the infrastructure more vulnerable to the coastal inundation exposure.

Table 8: Vulnerability matrix (combining sensitivity with adaptive capacity)

		Sensitivity			
		Low	Moderate	High	Extreme
Adaptive Capacity	Very low	Moderate	High	Extreme	Extreme
	Low	Low	Moderate	High	Extreme
	Medium	Low	Moderate	Moderate	High
	High	Low	Low	Low	Moderate

Table 9: Vulnerability rating definitions

Vulnerability rating	Definition
Extreme	Extremely likely to be adversely affected, because the element or asset is highly sensitive to a given hazard and has a low capacity to adapt.
High	Highly likely to be adversely affected, because the element or asset is highly sensitive to a given hazard and has a low capacity to adapt.
Moderate	Moderately likely to be adversely affected, because the element is moderately sensitive to a given hazard and has a low or moderate capacity to adapt.
Low	Low likelihood of being adversely affected, because the element has low sensitivity to a given hazard and a high capacity to adapt.

5.3.3 Risk

Risk is the potential for consequences (positive or negative) to the exposed asset or operation of the sector that results from a particular climate hazard, whilst accounting for the vulnerability to that hazard.

Example: The risk faced by the owner/ user of the coastal infrastructure above involves the combination of exposure and vulnerability. If the infrastructure has high exposure to coastal inundation and low adaptive capacity (high vulnerability), the risk of property damage, displacement, economic loss, and social disruption is elevated. Alternatively, if the owner/ user has taken proactive measures to adapt (low vulnerability), the risk is mitigated.

Table 10: Risk matrix (combining vulnerability and exposure)

		Exposure			
		Low	Moderate	High	Extreme
Vulnerability	Extreme	Moderate	High	Extreme	Extreme
	High	Low	Moderate	High	Extreme
	Moderate	Low	Moderate	Moderate	High
	Low	Low	Low	Moderate	High

5.3.4 Overall Risk and Prioritisation:

To determine the overall risk and prioritisation of different hazards and/or elements, an average of the individual risk ratings (e.g. extreme rainfall risk to outdoor land activities) was computed with different weights. 'Extreme' risks had the highest weight and 'Low' risks the lowest weight (Table 10). The average was based on all the relevant elements or hazards for each category, so that they could be ranked by their risk rating.

Table 10: Exposure and Vulnerability scores

Rating Order	Rating Scores for Vulnerability and Exposure (Present, 2050, 2100)
Extreme	4
High	3
Moderate	2
Low	1
N/A	0

For instance, a feature that scores high exposure (score=4) and moderate vulnerability (score=2) at present time, will have an average overall present risk score equal to 3 (High). That overall risk score may stay the same for 2050 (overall risk = 3), and intensify in 2100 (overall risk = 4, extreme). Hence, the overall future risk for 2050 and 2100 will be extreme (average =3.5). The prioritisation of the features will be based on these overall risk scores.

The prioritisation reflects the severity and urgency of the threat, which means that the overall present risk was followed by future overall risk for 2050 and 2100. Based on this, a top (up to) 3 hazards and (up to) 5 elements can be identified in the results report for the user's prioritisation. Hazards ranked at the top are the ones that produce the highest overall risks (impact) for present and future across multiple industry features. Industry elements ranked at the top are the ones that have the highest overall risks scores affected by one or multiple hazards.

6 Limitations and Recommendations

There are certain limitations identified of the RCRAF, as detailed above. Recommendations on how these could be addressed are detailed below.

- **Uncertainty** of climate variables. Modelled data from Van-KIRAP portal does not include uncertainties. This has in part been addressed by using a probabilistic approach, where each climate exposure is classified into low, medium, high and extreme. Allowing the user to understand the range of possibilities and associated uncertainties that would come with a single value.
- **Confidence** of the climate variable data has not been assessed or verified as part of development of this framework. This could be addressed by completing a sensitivity check of the tool with different extremes of the data entered.
- **Mapping** of the spatial distribution of the climate variables is limited within the Van-KIRAP Climate Futures Portal. Mapping capabilities have not been included with this tool, if a full climate risk assessment were to be conducted then a mapping component could be considered to quantify inter island data variability.
- **Non-spatial** distribution of the climate variable data has been applied for this Rapid Risk Assessment Framework due to the reduced resolution in the mapping function on the Van-KIRAP Climate Futures Portal. This limitation has been addressed to some extent by relying on user's input to determine their proximity to climate hazards. This limitation can be minimised by undertaking a detailed climate risk assessment for specific sites, guided by the high level risk careening of priority risks.
- **Non-economic** or non-cost approach has been implemented to assess vulnerability, exposure, and consequently risk of climate hazards. Hence, the output is a qualitative overall risk with no associated costs. This limitation can be addressed when undertaking a detailed climate risk assessment following the results of the RCRAF, which should incorporate cost in order to guide future decision-making process.
- **Single RCP** of RCP8.5 has been used for this framework, using RCP8.5 to provide a rapid and high-level screening of climate risks achieves the conservatism needed to identify the most significant impacts for management and decision planning. If a more detailed risk assessment is undertaken of priority risks then that will allow for the exploration of a range of scenarios and multiple timeframes.
- **Five (5) sectors** of infrastructure, fisheries, tourism, agriculture, and water were used as the basis of creating this framework. The ability to expand the RCRAF outside of these sectors may be dependent on the further investment on the tool development which will incorporate engaging with a diversity of stakeholders to determine other sectors' needs.

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A

Appendix A – Glossary

Glossary

Term	Definition
Adaptation	Initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects. Various types of adaptation exist, e.g. anticipatory and reactive, private and public, and autonomous and planned.
Adaptive Capacity	The ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.
Airports	Airports refers to all 26 airports in Vanuatu, including operational assets such as the airplanes, runways, vehicles etc.
Climate Driver	A changing aspect of the climate system that influences a component of a human or natural system.
Climate Projection	A projection of the response of the climate system to emission or concentration scenarios of greenhouse gases and aerosols, or radiative forcing scenarios, often based upon simulations by climate models under different climate scenarios.
Climate Variability	Climate variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all spatial and temporal scales beyond that of individual weather events.
Coastal inundation	Coastal inundation is the flooding of coastal areas, caused by a range of factors, including tides, storm surges, storm waves, interannual sea level variability and sea level rise.
Coastal/Marine Ecosystem	Coastal ecosystems exist in the land close to the sea or the part of the marine environment that is strongly influenced by land-based processes, for example salt marshes and estuaries. Marine ecosystems are aquatic environments with high levels of salt (i.e. Pacific Ocean). Vanuatu has many marine ecosystems, including coral reefs, mangroves, seagrass areas, seamounts and deep-sea trenches. These ecosystems support over 770 fish species, whales, dolphins and sea turtles and are susceptible to a range of climate hazards.
Consequence	The outcome of an event that may result from a hazard. It can be expressed quantitatively (e.g., units of damage or loss, disruption period, monetary value of impacts or environmental effect), semi-quantitatively by category (e.g., high, medium, low level of impact) or qualitatively (a description of the impacts).
Construction Activities	Construction activities refers to operations associated with the construction of assets or infrastructure, for example constructing buildings, infrastructure such as ports and bridges, roadworks. Construction activities can be disrupted due to climate events, causing delays in projects.
Direct risk	Where there is a direct link between a hazard and an element at risk that is exposed and vulnerable. For example, storms and flooding damaging buildings and infrastructure, droughts leading to crop failure, or extreme temperatures causing heat stress.

Drought	Drought is an acute lack of water compared to normal conditions due to a lack of rainfall over an extended period, usually more than a few months. The water shortage can impact activities, groups, sectors and related natural resources.
El Niño Southern Oscillation (ENSO)	ENSO is a periodic bimodal variation in the sea surface temperature and air pressure across the equatorial Pacific Ocean. El Niño: Easterly trade winds over the Pacific Ocean weaken, slowing the ocean current drawing surface water away from the Western coast of South America, reducing the upwelling rate of colder deep ocean water on this coast and flattening the thermocline allowing the surface water on the east of the Pacific basin to warm. La Niña: Easterly trade winds over the Pacific strengthen, increasing the ocean current drawing surface water away from the Western coast of South America, increased the upwelling rate of nutrient-rich cold deep ocean water on this coast and increasing the thermocline, reducing the surface water temperature on the east of the Pacific basin. ENSO is strongly correlated with multiple tele-connections globally, causing effects to temperature, atmospheric pressure and precipitation.
Electricity	Electricity refers to all assets and infrastructure associated with the generation, transmission, and distribution of electricity to end-use customers. For example, power plants, transmission lines and electricity meters.
Elements at Risk	People, values, species, sectors, assets etc. that are potentially vulnerable to climate change impacts.
Evacuation Structures	Evacuation structures refers to elevated structures with sufficient height to elevate evacuees above inundation due to tsunami waves, and cyclone shelters. Legislation in Vanuatu regarding Natural Disasters determines the logistic hubs during a disaster of Port Vila and Luganville.
Exposure	The presence of people; livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or economic, social, or cultural assets in places and settings that could be adversely affected.
Extreme rainfall	The risk of extreme rainfall is due to a combination of factors, including tropical cyclones, interannual rainfall variability (wet season from November – April), and the El Niño Southern Oscillation. The total amount of rainfall can be used as an additional indicator of extreme rainfall.
Freshwater Ecosystem	Freshwater ecosystems are a subset of aquatic ecosystems and refer to water from rivers, lakes, reservoirs, and underground streams. Freshwater is used by a wide variety of plants and animals and are often used for recreation. Vanuatu is home to a number of freshwater springs, known as the blue holes, that attract both locals and tourists. Such freshwater sources are susceptible to many climate hazards including extreme rainfall, tropical cyclones, and drought.
Goods Supply Activities	The supply of critical physical goods/services the operation requires to operate. Those which are susceptible to a range of climate-related impacts, including extreme weather events, resource scarcity such that potential disruptions would prevent the operation. For example, a restaurant relies on food supply, a construction company relies on materials.

Hazard	The potential occurrence of a physical event or trend that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources.
Impacts	The consequences of realized risks on natural and human systems, where risks result from the interactions of climate-related hazards, exposure, and vulnerability. Impacts generally refer to effects on lives, livelihoods, health and well-being, ecosystems and species, socio-economic and cultural assets, services, and infrastructure. Impacts may be adverse or beneficial.
Inhabited Buildings	Inhabited buildings refers to all buildings in which people reside or work, relating to the industry and its operations. For example, office buildings, shops, hotels etc.
Land Transport Activities	Land Transportation Activities refers to any land transport operations, for example transport of goods or taxi services.
Marine Heatwaves	Marine heatwaves (MHWs) are a “discrete, prolonged anomalously warm water event” which lasts for five or more days, with temperatures warmer than the 90th percentile. MHW events were defined by their duration (number of days above the 90th percentile threshold), maximum intensity (maximum temperature above the climatological mean attained during the event), mean intensity, and cumulative intensity (sum of the daily intensities through the duration of the MHW event occurrence; Hobday et al. 2016). MHWs are categorised into four intensity categories, defined by multiples of difference between the mean climatology and the 90th percentile threshold, and includes “Moderate” (Category I, 1-2x), “Strong” (Category II, 2-3x), “Severe” (Category III, 3–4×), and “Extreme” (Category IV, >4x).
Ocean Acidification	A reduction in the pH of the ocean, caused by an increased uptake of carbon dioxide (CO2) from the atmosphere, accompanied by other chemical changes (primarily in the levels of carbonate and bicarbonate ions) over the time scale of years to decades.
Office/Shop/Admin Activities	Office/shop/admin activities refers to operations taking place within buildings, for example, retail, desktop-based business, education, and indoor training.
Outdoor Coastal Activities	Outdoor coastal activities refers to operations taking place within the coastal environment, for example surfing and fishing.
Outdoor Freshwater Activities	Outdoor freshwater activities refers to operations taking place within freshwater environments, for example fishing and recreational swimming.
Outdoor Land activities	Outdoor land activities refers to operations that take place inland and aren't protected by buildings/infrastructure, for example farming, tourist activities like hiking and ziplining.
Outdoor Marine Activities	Outdoor marine activities refers to operations taking place within the marine environment, for example fishing, scuba diving, education and training.
Ports/Wharves	Ports refer to harbour areas in which ships and boats load and unload goods and passengers. Wharves are used to dock yachts and small boats. Vanuatu has two major ports, Port of Vila in the capital Vila on Efate Island, and Port of Luganville in Santo.

Risk	The potential for adverse consequences for human or ecological systems, recognising the diversity of values and objectives associated with such systems. Relevant adverse consequences include those on lives, livelihoods, health and wellbeing, economic, social, and cultural assets and investments, infrastructure, services (including ecosystem services), ecosystems, and species. Risks result from interactions between climate-related hazards with the exposure and vulnerability of the affected system.
RCP	Representative Concentration Pathway. Emission trajectory from the IPCC 5th Assessment Report and the CMIP5 model ensemble.
Sea Level Change/Rise	Sea level can change, both globally and locally, due to; (1) changes in the shape of the ocean basins; (2) changes in the total mass of water and, (3) changes in water density. Factors leading to sea level rise under climate change include both increases in the total mass of water from the melting of land-based snow and ice, and changes in water density from an increase in ocean water temperatures and salinity changes.
Sea-Surface Temperature	The temperature of the ocean surface. The term sea-surface temperature is generally representative of the upper few metres of the ocean as opposed to the skin temperature, which is the temperature of the upper few centimetres.
Sensitivity	Refers to the degree to which an element at risk is affected, either adversely or beneficially, by climate variability or change. Sensitivity relates to how the element will fare when exposed to a hazard, which is a function of its properties or characteristics.
Storm Surge	The phenomenon of temporary sea level rising that is commonly associated with low-pressure weather systems (cyclones), excluding waves.
Storm Water/Flood Management	Stormwater/flood management refers to all stormwater infrastructure and assets, and any flood management infrastructure in place
Telecommunications	Telecommunications refers to all infrastructure associated with information transmitting technologies and communications, including wired phones, cellphones, radio and television broadcasting and the internet.
Terrestrial Ecosystem	Terrestrial ecosystems are ecosystems found on land, including temperate deciduous forest, tropical rain forest, and grassland. Vanuatu's tropical and subtropical rainforests are home to a wide range of flora and fauna and are susceptible to changes in temperature and rainfall.
Traditional Knowledge	The understandings, skills and philosophies developed by societies with long histories of interaction with their natural surroundings. For many indigenous peoples, this knowledge informs decision-making about fundamental aspects of life, from day-to-day activities to longer-term actions. This Traditional Knowledge (TK) is integral to cultural complexes, which also encompass language, systems of classification, resource use practices, social interactions, values, ritual, and spirituality. The TK informs weather and climate predictions based on the behaviour of plants and animals, temperature and rainfall, and astronomical indicators such as stars and the sun.
Transport Assets	Transport assets refers to the assets and infrastructure associated with transport, including private vehicles, public transport vehicles and infrastructure, roads, bridges, cycle, and foot paths.

Tropical Cyclone	Tropical cyclones are rotating storms that develop over tropical oceans that are over 25.5 °C and within 5 degrees of latitude from the equator where there is sufficient Coriolis force to create the rotation. In the South Pacific Ocean, a tropical cyclone is defined by a 10-minute sustained wind speed of 17.5 metres-per-second or greater.
Uninhabited Buildings	Uninhabited buildings refer to all buildings in which assets are stored relating to the industry and its operations. For example, boat sheds, warehouses, and barns.
User Defined, or Other	Any element not listed that is relevant to the industry and its operations.
Vulnerability	The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm, and lack of capacity to cope and adapt
Wastewater Infrastructure	Wastewater infrastructure refers to the network of pipes that collect and carry residential, business, and industrial effluents to wastewater treatment systems, and the treatment systems themselves.
Water Supply	Water supply refers to the source, treatment, transportation, and distribution of potable water, for example wells, bores, pumps, pipe networks and treatment facilities.
Water Transportation Activities	Boating activities refer to any marine transport operations, for example boat tours, water taxi services and fishing.

B

Appendix B – Climate Variables

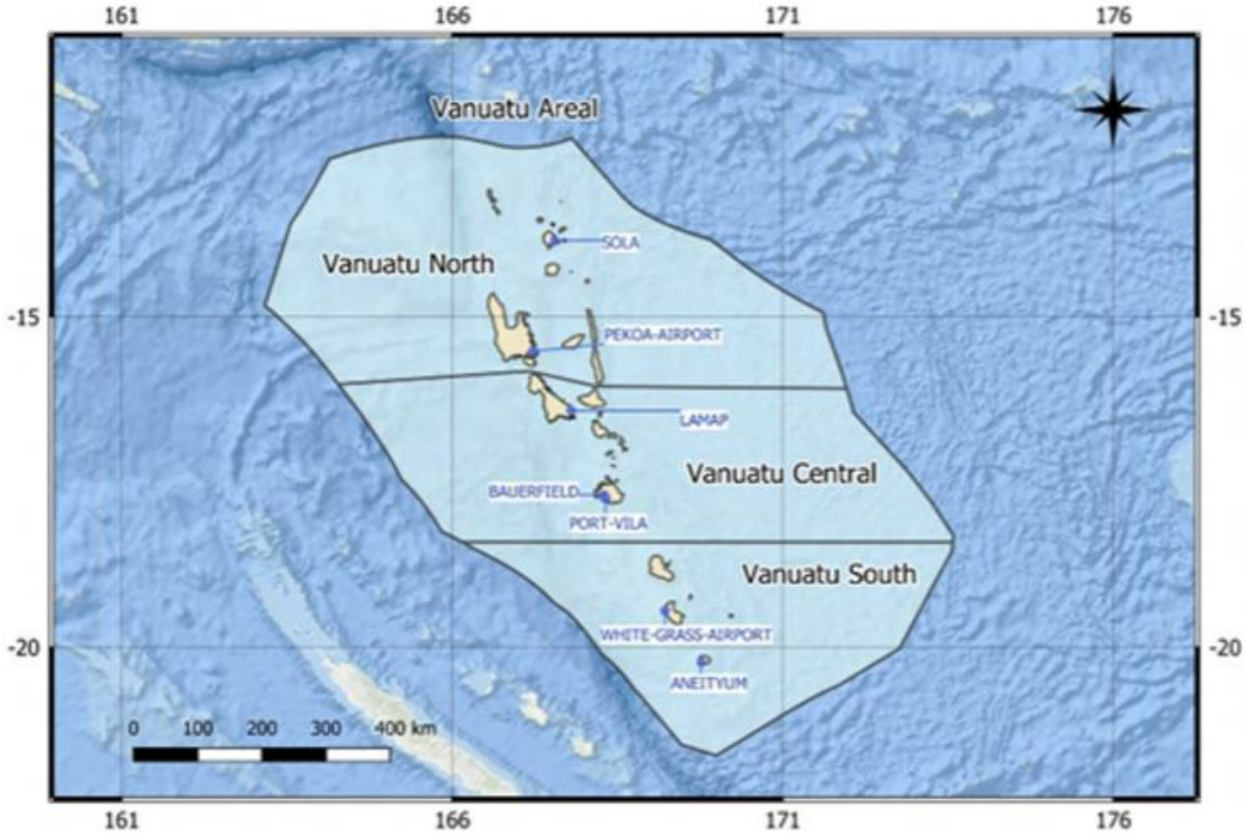


Figure 11: Map of Vanuatu and the three sub-national regions.

Relative to the 20-year period, 1986-2005, for RCP8.5. Median values with the 10th to 90th percentile range of uncertainty in brackets.

Climate Variable	Description
Temperature (°C)	Increase in average temperature?
Rainfall (%)	Percentage change in rainfall
Extreme rainfall (%)	Percentage increase in extreme rainfall
Sea level (m)	Sea level change in metres
Cyclone intensity (%)	Percentage increase in cyclone intensity
Cyclone frequency (%)	Percentage increase in cyclone frequency
Marine heatwaves (days)	Number of marine heatwave days in one year

Table 11: Summary of projected climate change for Vanuatu North for the present day, mid-century, and end of century (Van-KIRAP, 2023).

Vanuatu North			
Climate Variable	**2020 – 2039**	**2040 – 2059**	**2080 - 2090**
Temperature (°C)	0.7 (0.5 to 0.8)	1.2 (0.9 to 1.6)	2.7 (2.0 to 3.3)
Rainfall Nov-Apr (%)	-1 (-7 to 6)	-1 (-13 to 9)	-2(-17 to 18)
Rainfall May-Oct (%)	-2 (-15 to 10)	-0 (-23 to 15)	-3 (-34 to 27)
Extreme Rainfall (%)	8 (-12 to 24)	4 (-16 to 38)	-3 (-13 to 40)
Sea Level (m)	0.14 (0.10 – 0.18)	0.28 (0.22 – 0.37)	0.73 (0.56 – 0.99)
Cyclone Intensity (%)		1 (-6 to 12)*	5 (-10 to 20)*
Cyclone Frequency (%)		-12 (-40 to 0)*	
Marine Heatwaves (days)		200 – 330	340 - 360

Table 12: Summary of projected climate change for Vanuatu Central for the present day, mid-century, and end of century (Van-KIRAP, 2023).

Vanuatu Central			
Climate Variable	**2020 – 2039**	**2040 – 2059**	**2080 - 2090**
Temperature (°C)	0.7 (0.5 to 0.8)	1.2 (0.9 to 1.6)	2.7 (2.0 to 3.3)
Rainfall Nov-Apr (%)	0 (-15 to 7)	-2 (-17 to 10)	0 (-26 to 18)
Rainfall May-Oct (%)	-2 (-16 to 13)	-4 (-22 to 13)	-4 (-32 to 28)
Extreme Rainfall (%)	6 (-12 to 23)	11 (-5 to 30)	16 (9 to 54)
Sea Level (m)	0.14 (0.10 – 0.18)	0.28 (0.22 – 0.37)	0.73 (0.56 – 0.99)
Cyclone Intensity (%)		1 (-6 to 12)*	4 (-6 to 16)*
Cyclone Frequency (%)		-12 (-40 to 0)*	
Marine Heatwaves (days)		170 – 300	320 - 360

Table 13: Summary of projected climate change for Vanuatu South for the present day, mid-century, and end of century (Van-KIRAP, 2023).

Vanuatu South			
Climate Variable	**2020 – 2039**	**2040 – 2059**	**2080 - 2090**
Temperature (°C)	0.7 (0.5 to 0.8)	1.2 (0.9 to 1.6)	2.7 (2.0 to 3.4)
Rainfall Nov-Apr (%)	-2 (-14 to 7)	-1 (-17 to 8)	2 (-31 to 22)
Rainfall May-Oct (%)	-4 (-15 to 14)	-5 (-18 to 14)	-2 (-30 to 25)
Extreme Rainfall (%)	-6 (-12 to 9)	41 (-2 to 57)	23 (13 to 28)
Sea Level (m)	0.14 (0.10 – 0.17)	0.28 (0.22 – 0.37)	0.73 (0.56 – 0.99)
Cyclone Intensity (%)		1 (-6 to 12)*	2 (-6 to 11)
Cyclone Frequency (%)		-12 (-40 to 0)*	
Marine Heatwaves (days)		160 – 310	320 - 360

C

Appendix C – Climate Variable Information Availability

Table 14: Climate variable information availability. Note that CMIP5 projections are only available within Van-KIRAP portal for two emissions scenarios; low (RCP2.6) and high (RCP8.5).

Climate Variable	Historical Baseline	Projected Period	Source
Coastal Inundation flood mapping (1, 10 & 100-year ARI at increments of 0.25m SLR to 10m)	1995	CMIP5 (low, high) 2020-2039 2040-2059 2060-2079 2080-2099	Van-KIRAP
Extreme Rainfall (Yearly maximum rainfall for given ARI)	1985	CMIP5 (low, high) 2040-2070 2070-2100	Van-KIRAP
Total rainfall (annual, seasonal and monthly scale) or anomaly	1995	CMIP5 (low, high) 2020-2039 2040-2059 2060-2079 2080-2099	Van-KIRAP, CSIRO and SPREP publication
Sea level rise anomaly	1995	CMIP5 (low, high) 2100	CSIRO and SPREP publication
Temperature (min, mean and max annual)	1995	CMIP5 (low, high) 2020-2039 2040-2059 2060-2079 2080-2099	Van-KIRAP
Tropical cyclone frequency and intensity (% increase)	1985	CMIP5 (low, high) 2070-2100	Van-KIRAP
Tropical cyclones and extreme rainfall	-	2°C global warming	CSIRO and SPREP publication
Tropical cyclone wind speed (% increase)	1985	CMIP5 (low, high) 2070-2100	Van-KIRAP
Aragonite Saturation State (Proxy for ocean acidification)		CMIP5 (low, high) 2100	World Bank
Marine heatwave projections (multiple parameters)		CMIP5 (low, high) 2020-2039 2040-2059 2060-2079 2080-2099	Van-KIRAP

Table 15: Gaps or issues identified in review of climate variable information.

Variable	Issue	Approach
Catchment based flood hazard modelling and mapping	Other consultants have been commissioned within the Van-KIRAP programme to produce	The outputs of flood hazard mapping are anticipated to conform to typical flood mapping outputs; maps of

Variable	Issue	Approach
	catchment-based flood mapping for selected catchments in Vanuatu (We understand the catchments modelled are the Cara catchment on Santo and the Malae catchment on Efato). We understand NIWA and another consultant are leading this and interfacing with CSIRO and the PMU. However, draft or final results are not available or have been uploaded to the Van-KIRAP portal as of 20 November 2023.	flooding extent, depth and velocity for a range of storm magnitudes (rainfall intensity-duration ARI), climate change conditions (high/low emissions and SLR) and future timeframes (short-long term). We communicated with CSIRO and the flood modelling consultants to understand if their anticipated outputs support inclusion within the RCRAF framework. We received a draft of the report providing insights of flood mapping. However, the RCRAF is a non-spatial tool, so the information provided only helped the understanding of the overall flooding risk.
Vertical Land Movement (VLM)	Vanuatu is in a seismically active region and subject to tectonically driven uplift and subsidence. This vertical land movement can accelerate or offset the apparent sea-level rise rates at the coast. It is unclear whether VLM is included within the Van-KIRAP portal sea-level rise future scenarios.	We used Van-KIRAP portal information on SLR as it stands. No vertical land movement has been included in the analysis, however, this as an additional step that could be consider in the future based on clients needs.
All	The Van-KIRAP portal climate information services is based on CMIP5 projections (from the AR5 2013 suite of IPCC reports). Newer climate projections are available (CMIP6) from the latest IPCC reporting phase (2021, AR6) but are not included.	Continue to use Van-KIRAP and CSIRO climate information products as they exist. Request statement from CSIRO about alignment of CMIP5 projections with CMIP6 at national scale across Vanuatu.

Table 16: Nation wide sector related information available.

Name	Description	Source
Open street map	Open-source database of built assets (buildings, roads) with some building uses. No QA or validation available.	OSM (link)
Pacific Data Hub maps and data catalogue	Hub for pacific datasets. Internationally sourced mapping on ocean boundaries, reefs, wind zones and some population information.	PDH (link)
Pacific Climate Change programme (PACCSAP)	Pacific Climate Change information – based on AR5 assessment. Prepared by SPREP and CSIRO. Superseded by Van-KIRAP.	PACCSAP (link)

Name	Description	Source
Climate Change Knowledge Portal (World Bank)	World Bank Country Profiles (CMIP5). Superseded by Van-KIRAP.	World Bank (link)
NextGen projections (2021)	Current and Future Climate for Vanuatu. Superseded by Van-KIRAP.	RCCAP (link)
Pacific Risk Information System (PACRIS)	Data from 2012-2015 research. GIS and tabular data includes partial coverage of built and natural environment information.	PCRAFI (link)
Case study 'infobytes' information for 5 key sectors [Note – these outputs are not accessible at the time of writing, hence the quality and type of information is unknown]	Example case study information for: - Infrastructure (Road length exposed to 3x ARI coastal flooding events with SLR) - Fisheries (8 fishery sites and national mapping of coastal habitats (mangroves, coral) overlaid with recent future marine heatwave parameters) - Tourism (1 tourism site exposure to 3x ARI coastal flooding events) - Agriculture (suitability of 5x crops under climate scenarios) - Water (maps of average monthly rainfall and temperature)	CSIRO within Van-KIRAP

D

Appendix D – Vanuatu Stakeholder Consultation Report

Vanuatu Stakeholder Consultation Report

FINAL

Prepared for Secretariat of the Pacific Regional Environment Programme (SPREP)
Prepared by Beca International Consultants Ltd

23 November 2023

Contents

Appendices

Revision History

Revision Nº	Prepared By	Description	Date
1	Sophie Andrews		31/10/2023
2	Kristin Renoux		1/11/2023

Document Acceptance

Action	Name	Signed	Date
Prepared by	Kristin Renoux and Sophie Andrews		23/11/2023
Reviewed by	Mike Allis		23/11/2023
Approved by	Cushla Loomb		23/11/2023
on behalf of	Beca International Consultants Ltd (BICL)		

Executive Summary

Beca International Consultants Limited (Beca) has been commissioned by *the Secretariat of the Pacific Regional Environment Programme* (SPREP) to prepare a rapid climate risk screening and test on tourism sector (the 'Project'). For this stage of the project, Beca has undertaken consultation with key stakeholders identified by SPREP and the *Vanuatu Department of Tourism* (DOT) to understand their climate risk assessment needs, and the roles and contributions they can make to this project. The engagement with these stakeholders and information gathered is being used to inform the development of a rapid climate risk assessment framework and methodology, the application of the framework to a tourism case study and the development of a financial projection mechanism for tourism.

This report explains the stakeholder consultation process undertaken and the scope, needs and roles of stakeholders identified during the consultation sessions.

The impact of Tropical Cyclone *Lola* during the final week of consultation from the 24 October 2023 impacted planned engagement, and the third stakeholder session was not able to proceed, however valuable information and themes came through from the two consultation sessions held.

During consultation stakeholders highlighted the need for an accessible climate risk assessment framework that can be used by stakeholders across the five key sectors (Infrastructure, Fisheries, Water, Agriculture and Tourism) as well as future in country guidance and training to support the end users to successfully use and implement the framework.

Tourism stakeholders provided information about the impact of climate change on different tourism activities. In particular, stakeholders referenced the impact on the Vanuatu Dive Industry as being of particular concern. For this reason, the tourism case study selected the Dive Industry for testing the Rapid Climate Risk framework.

1 Engagement Scope

It was agreed with SPREP at the Inception Meeting that due to the compressed timeframe to deliver the project, stakeholder consultation would be undertaken over a two-week period and utilising set ‘sessions’ that stakeholders could choose from. To facilitate greater attendance by a broad range of stakeholders a mixture of days and times were provided.

Three sessions of 2 hours each were scheduled and invites sent to key stakeholders identified by SPREP and the Department of Tourism. Stakeholders were advised that they were only required to attend one session. The sessions were coordinated by the Department of Tourism, who invited the stakeholders to select a session and maintained the register of attendance for each session.

SPREP and DoT identified 18 target stakeholders to undertake consultation with. These stakeholders are as detailed in Appendix C.

The purpose of the consultation has been to understand the roles and needs of the stakeholders, and to identify the end users of the framework and the format that will be the most appropriate for these end users.

The purpose of this report is to analyse the information gathered from the consultation sessions to appropriately inform the direction and format of the framework and methodology, case study and financial projections mechanism for the project.

Guidance and training were included within the original scope of this project but were deferred due to funding timeframes.

2 Stakeholder Engagement Process

Stakeholders were provided with a 2-page project summary document prior to the consultation sessions. This provided a brief description of the project and the objectives of the engagement sessions. In each session, the Beca team utilised a presentation to describe the background to the project, the scope of the rapid climate risk assessment and pose particular questions of attendees around user needs for the framework. The project summary document and presentation are attached as Appendix A of this report.

Beca facilitated three virtual stakeholder consultation sessions on the 18th, 19th and 24th of October 2023. The minutes from the first two meetings can be found in Appendix B. Unfortunately, all Vanuatu-based stakeholders were unable to attend the third session due to Tropical Cyclone *Lola* impacting the country.

To supplement the absence of the third consultation session, all stakeholders were provided with an opportunity to respond to the key engagement questions through a short online survey questionnaire.

The questions asked to the stakeholders at these consultation sessions were as follows:

- What is your organisation?
- Where do you operate within Vanuatu?
- What climate issues are you already seeing in your sector?
- How is climate change already affecting your organisation?
- What would help you to consider climate risks into your future planning?
- What role does your organisation play in identifying climate change risks in Vanuatu?
- Who do you think the end users of this framework will be?

2.1 Session attendees

All sessions were attended by internal stakeholders of SPREP, with Session 1 and 2 attended by the Vanuatu Meteorology and Geo-Hazards Department (VMGD).

Session 1

The external stakeholders who attended Session 1 were three representatives of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) involved in the VanKIRAP project previously and the Country Manager for Tropical Agencies Limited who is also the Domestic Shipping National Representative for the Chamber of Commerce.

Session 2

The external stakeholders who attended Session 2 was the Acting director of the Department of Tourism and a representative from the Vanuatu Environmental Science Society (VESS). This representative is also the president of the Vanuatu Scuba Operators Association, she co-owns the Big Blue Dive Company which operates around Vanuatu, and her partner operates a metals recycling business.

Session 3

No external stakeholders were able to attend due to Tropical Cyclone *Lola.*

2.2 Stakeholder survey

To support the stakeholder consultation and increase the opportunity to provide comment, a survey with key questions was sent to all stakeholders provided by SPREP and the Department of Tourism.

The questions asked in this survey were:

1. What is the name of your organization and its core activities?
2. Where do you operate within Vanuatu? E.g. Regions, critical locations and infrastructure, key activities, and communities.
3. How do you currently consider climate risks to your infrastructure and activities? E.g. risk assessments, planning tools, national hazard information
4. What format of a rapid climate risk assessment tool would be most practical for your decision making? E.g. excel workbook, flow chart, app
5. What would prevent you from using a climate risk framework and methodology? E.g. capability, capacity, equipment

No responses to the survey were received by the deadline required to meet the tight project timeline (end of day on the 31st October 2023).

3 Engagement Outcomes

This section outlines the key messages and findings from the Engagement Sessions. A full record of meeting minutes of the sessions is included in Appendix B.

3.1 Session one

3.1.1 Stakeholders' organisation

The representatives from SPREP and VMGD offered stakeholder perspectives from the client and project manager point of view.

The Vanuatu country manager for Tropical Agencies Limited (TAL) also has a role as the domestic representative for the chamber of commerce as well as a role in commercial shipping. His role at TAL is to coordinate with cruise ships and their associated port, berthing and some shore excursion activities. There are two TAL offices in the country (Santo and Port Vila) and these support cruise activities during the cruising season (November to March).

The three CSIRO representatives attended the consultation session on behalf of CSIRO. They offered perspectives from multiple in-country missions and over 5 years working on the VanKIRAP project.

3.1.2 Climate change observations

The TAL representative relayed that the perspective of shipping agencies and cruise lines in Vanuatu is that their biggest concerns is the number of weather-related incidents which affect their operations and schedules. In the past these events caused impacts such as ships being diverted to other islands, bypassing Vanuatu for other ports, as well as flooding and landslips on roads which limit access to the Port and shore activities and truncates the time which tourists have for activities.

3.1.3 End user discussion

They provided ideas from previous community engagement in Vanuatu, expressing that the framework is more likely to get traction with end users if it is in a format that is accessible and caters to a range of capabilities. This should recognise both the time pressures and level of understanding of users, especially if it were the tourism operators. There was also a recommendation to use infographics to display information for the framework.

3.2 Session Two

3.2.1 Stakeholders' organisation

Our second stakeholder engagement session included the representatives from SPREP and VMGD with two additional stakeholders- the Acting Director for the Department of Tourism and a representative from the Vanuatu Environmental Science Society (VESS).

The representative from VESS is also the president of the Vanuatu Scuba Operators Association and the co-owner of Big Blue Dive company. From a scuba and diving perspective, the representative made many references to environmental degradation, bleaching of the coral reefs, particularly after a cyclone and marine heat waves.

The indirect risks to the tourism industry were also discussed, with mention of a reduction in local food production which is often used by a large number of the operators to provide to tourists on diving trips.

3.2.2 Climate change observations

From a scuba and diving perspective, the representative of VESS made many references to environmental degradation, bleaching of the coral reefs, particularly after a cyclone and marine heat waves. It was noted that as the temperature of the water cools again after the cyclone, the reefs start to return, however, recently, the temperature of the water hasn't returned to a cold enough temperature to provide relief to the reef.

The indirect risks to the tourism industry were also discussed, with mention of a reduction in local food production which is often used by a large number of the operators to provide to tourists on diving trips.

3.2.3 End user discussion

The President of the Vanuatu Scuba Operators Association notes the tourism industry operators are more focussed on the immediate day-to-day or season-to-season risks of the activity/operations, and that the medium to long-term risks such as increasing climate impacts are rarely looked at by tourism operators.

The majority of investment for operators goes into equipment and asset management, with a reduced focus on preparing for future risks. SPREP expressed that the framework would be useful to be targeted towards end users who need support and training, so they have the opportunity to build their capability in identifying potential future risks.

Training and support were also discussed with the intention of enhancing the skills of all operators to use the framework. The potential of incentives in the form of grants or business enhancements were suggested to help develop the buy in of a number of the operators, particularly as some operators are small and struggle with the day-to-day operation of their business. To appropriately provide for this support, the Acting Director of Tourism discussed the potential of involving the Product Development Officers (PDOs) to assist in the training or to offer support in the use of the framework. The PDOs are located in each of the 6 provinces across Vanuatu and are well connected to the operators and National Government Organisations (NGOs) in their respective province.

The need for simplicity in the framework was also emphasised, echoing the conversations from session one about the needs of the end users.

The needs of stakeholders were noted to vary, typically because of size and location of the operations and activities. This led to the suggestion of the end users being address in two levels- the smaller operators in more remote locations being provided with additional support and training to use the framework effectively, and the medium/large operators from islands such as Port Vila and Santo who can use the framework more independently.

It was proposed by the representative of VESS that in order to reach the attention of many operators it would be useful to produce a summary workbook with findings and suggestions for mitigation that are practical and can be used to plan for the future of their operations. This is likely to produce a higher rate of engagement as it reduces the overwhelming feeling of applying the framework or tool themselves.

4 Recommendations

4.1 Training and guidance

Providing for training and guidance to end users for this framework is a key message that has come across in the consultation sessions. Our recommendation is to continue with the proposed Stage 2 of this project which includes preparation of training and guidance materials and facilitation of in-country training sessions. This additional training would enhance uptake and implementation of the framework into the tourism sector of Vanuatu.

4.2 End users

There was varied discussed about the appropriate end users for this framework.

CSIRO and tourism stakeholders indicated that widespread individual operators are very likely to be focussed on their immediate day-to-day operational activities and are unlikely to have capacity to learn about or develop their understanding of the framework or its implementation. As discussed in Section 3.2.3 of this report, it is likely operators would be more receptive towards the framework if the assessment has already been undertaken and they are presented with relevant findings and recommendations.

The consultation identified tourism associations and some government agencies that may be more appropriate entry points to build climate resilience through using the rapid risk assessment framework and methodology.

Our recommendation is the end users for this framework are those within the tourism industry associations and government department officials who can support, as required, individual operators to undertake a climate risk assessment of their operations and activities.

This level of end user is understood to have a working knowledge of the industry such that they could complete the rapid risk assessment. They are also anticipated to be connected to the key operators on the ground and stakeholders in government licencing and regulation. These agencies can provide central points at which training, and guidance can be delivered and the risk information gathered from across sectors and consolidated to inform decision-making at different levels about the short, medium and long term climate risk being faced in Vanuatu.

4.3 Case study

Various tourism related industries were discussed in the consultation sessions; the large accommodation providers, smaller bungalow accommodation, cruise ships, agricultural ‘eco-tourism’ and tourism to experience the pristine reefs, wildlife and beaches. The dive industry was mentioned and discussed in both consultation sessions. This industry was noted as a large contributor to the economy, employed many people around the country, and was an activity that visitors to the island frequently take part in whether they arrive by cruise ship or airport.

During the consultation follow up session we have confirmed with SPREP and DoT that the dive industry is appropriate to take forward as a case study to apply the framework and develop the financial projection mechanisms around.

Relative to the purpose of the project and the information gathered through the stakeholder consultation sessions, focusing the case study on the dive industry appears to be appropriate to demonstrate the rapid climate risk framework.

A

Appendix A – Stakeholder consultation materials

Project: Rapid Climate Risk Assessment Framework, Methodology and Case Study for Tourism Sector and Associated Infrastructure and Fisheries in Vanuatu

Project Outline

This work continues from the VanKIRAP project with VMGD, SPREP and CSIRO.

To create: A high-level framework and methodology to achieve a rapid understanding of the climate change risks that will inform strategic decision making.

Goals: The framework and methodology are accessible and can be understood by stakeholders for future use.

It can be picked up by different sectors and applied in a consistent way that will allow for a sector-wide understanding of the climate risks and assist in building resilience.

It will include a case study of the tourism sector.

Key project outputs:

- Rapid Climate Risk framework and methodology report.
- A rapid assessment of the tourism sector as a case study.
- Financial mechanism for possible adaptation measures for the tourism sector.

Stakeholder Consultation Sessions (3 options)

- 18th October 11am – 1pm (Vanuatu local time)
- 19th October 1-3pm (Vanuatu local time)
- 24th October 11am – 1pm (Vanuatu local time)

Please select a session (**you only need to attend one**!) and join for the full 2 hours. We will start with an overview presentation before seeking your input.

What we want from you…

During the session we will discuss:

- Your specific climate risk related needs
- Who the end users of the framework will be
- The role your organisation has and how climate change may be affecting you
- What format of a risk framework is appropriate for you.
- How you currently consider climate risks
- What is already happening in response to climate risks

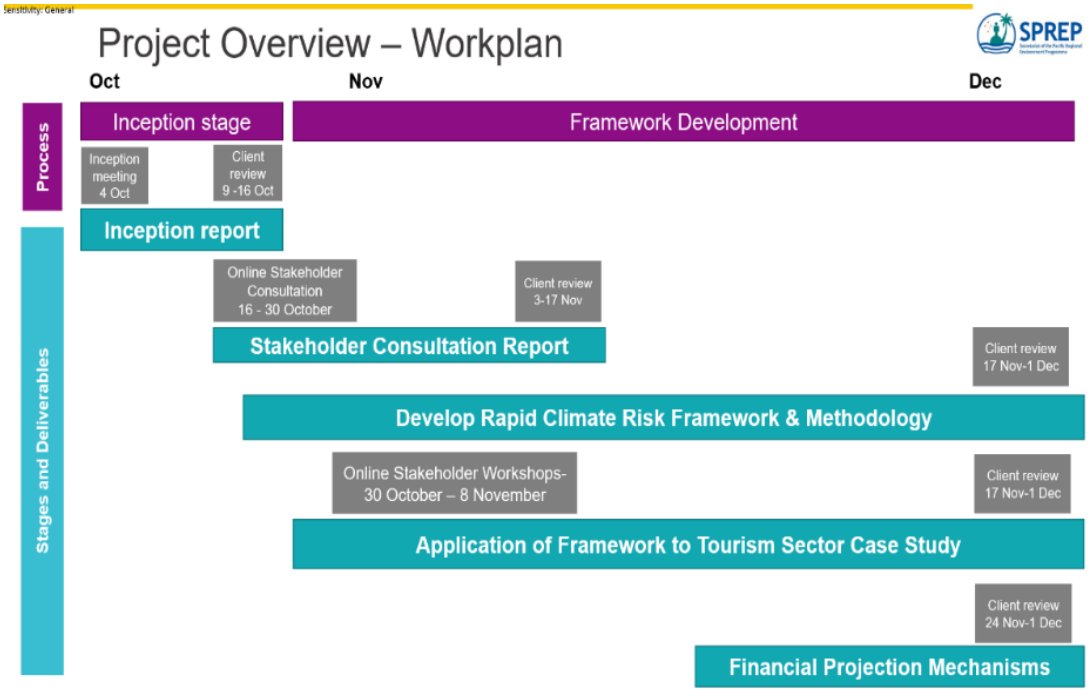
Beca Project Facilitators:

Mike Allis
Climate Science Expert

Sophie Andrews
Project Support

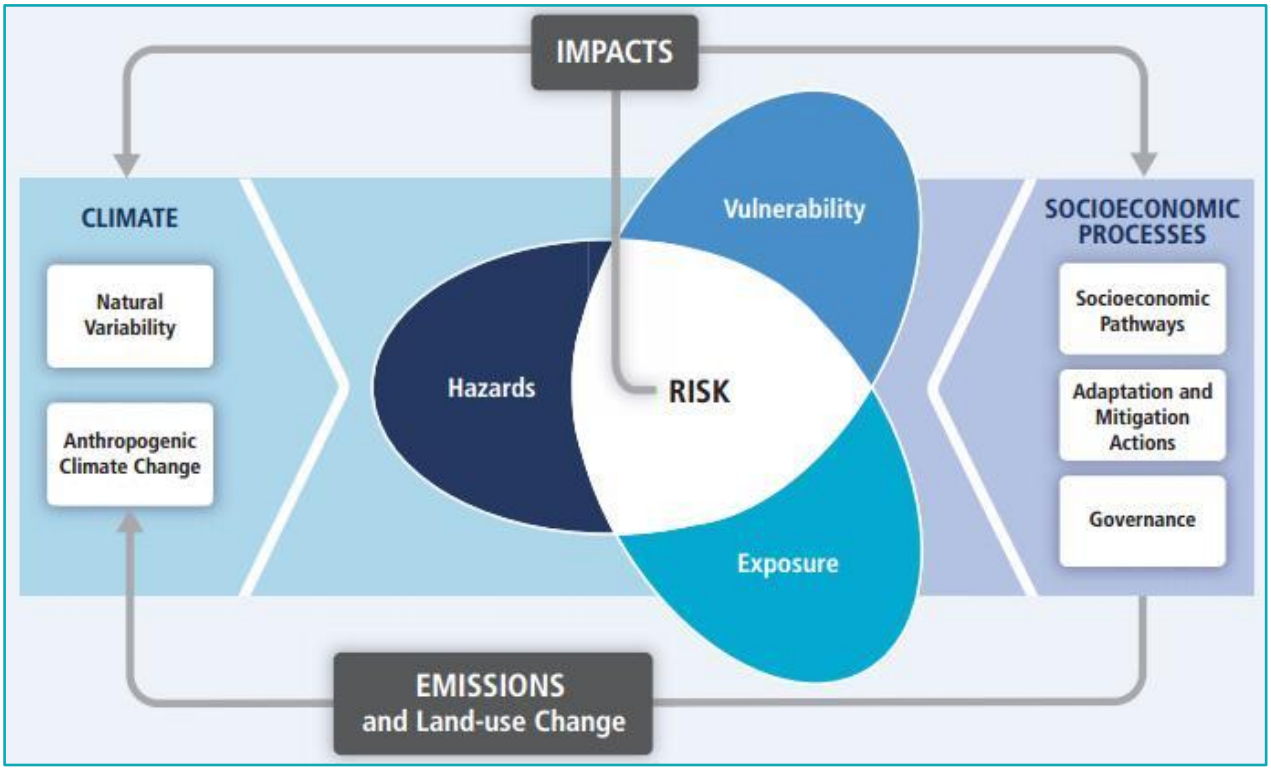
Kristin Renoux
Project Lead

Hannington Alatoa
On-island Support



Climate Risks

There are three factors that determine a risk (the physical impact), **Hazards, Vulnerability and Exposure**.



Hazards are a natural or climate change induced physical event that have the potential to cause damage. For example, cyclones, sea level rise, and droughts are hazards. We are not considering non-climate hazards (such as volcanic eruption and tsunami) as part of this project.

Vulnerability is the degree to which an asset or a community can be harmed by a hazard and the ability to adapt to reduce this harm. For example, coral reef areas are more vulnerable than fish to ocean acidification as coral reef species cannot 'move to other areas' as a result of their changing environment.

Exposure refers to the extent to which a system is exposed to a given hazard. For example, a coastal community in a low-lying area can be exposed to a certain level of inundation risk during a storm event.

Vanuatu Rapid Climate Risk Framework Consultation Meeting

18 October 2023

make everyday better.

Meeting Agenda

1. “House Keeping”
2. Introductions from Beca
3. Project, outline and scope
4. Introductions from Stakeholders
5. Project Goals and Discussion
6. Questions and answers

House Keeping

Free and open conversation

- Connectivity
  - Video on when talking if possible
- We want to hear from everyone, please be mindful of time
- Short online survey at the end, to capture your thoughts if we run out of time today
- Sessions will be recorded

Beca Project Facilitators

Kristin Renoux

Project Lead

Mike Allis

Climate Science Expert

Carlos Carvajal

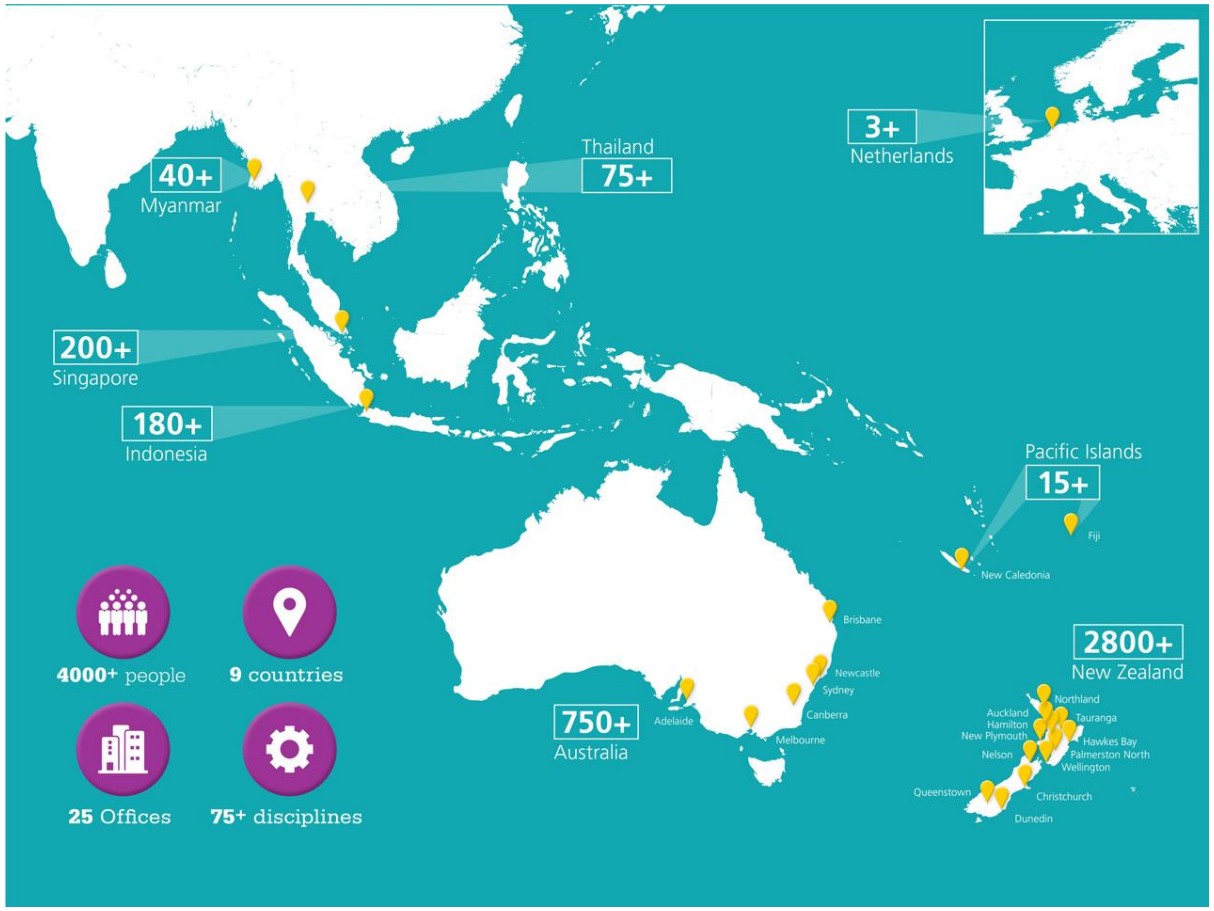
Climate Scientist

Hannington Alatoa

In Country Support

Sophie Andrews

Project Support



SPREP Secretariat of the Pacific Regional Environment Programme

Beca

Project Outline and Scope

Project Overview – Bigger Picture

Van-KIRAP Project

Climate variable mapping, Case studies, Factsheets

Consultation Sessions

- Today!
- Understand stakeholder needs to ensure the framework is accessible.

High Level Rapid Climate Risk Assessment Framework

- Case study on Tourism – Fisheries/ Infrastructure

Project Overview – Workplan

October **November** **December**

Process

Stages and Deliverables

Inception stage

Framework Development

Inception meeting 4 Oct

Client review 9 -16 Oct

Inception report

Today

Online Stakeholder Consultation 16 - 30 October

Client review 3-17 Nov

Stakeholder Consultation Report

Client review 17 Nov-1 Dec

Develop Rapid Climate Risk Framework & Methodology

Online Stakeholder Workshops- 30 October – 8 November

Client review 17 Nov-1 Dec

Application of Framework to Tourism Sector Case Study

Client review 24 Nov-1 Dec

Financial Projection Mechanisms

Stakeholder Introductions

Introductions

1. What is your organisation?
2. Where do you operate within Vanuatu?
3. What climate issues are you already seeing in your sector?

Project Goal & Discussion

CSIRO Climate hazard impact framework:

Rapid Climate Risk framework

-Determine the exposure to each climate hazard for each asset/ operation/ activity

-Collect asset/ operation / activity information to inform vulnerability to each climate hazard

- Analyse the vulnerability of asset / operation/ activity to each climate hazard

Existing knowledge: Van-KIRAP portal and information from CSIRO, SPREP and others

Consultation: Gather an understanding of the end users of the framework

Project Goal

Develop an accessible climate risk framework to provide a consistent way to assess climate risks across the different sectors.

Discussion

1. How is climate change already affecting your organisation?
2. What would help you to consider climate risks into your future planning?
3. What role does your organisation play in identifying climate change risks in Vanuatu?
4. Who do you think the end users of this framework will be?

Format Examples

1. Matrix

Determines the risk based on hazard exposure and vulnerability.

Pro: Could be incorporated into existing risk frameworks.

Likelihood \ Impact	Negligible	Minor	Moderate	Significant	Severe
Very Likely	Low Med	Medium	Med Hi	High	High
Likely	Low	Low Med	Medium	Med Hi	High
Possible	Low	Low Med	Medium	Med Hi	Med Hi
Unlikely	Low	Low Med	Low Med	Medium	Med Hi
Very Unlikely	Low	Low	Low Med	Medium	Medium

2. Excel Workbook

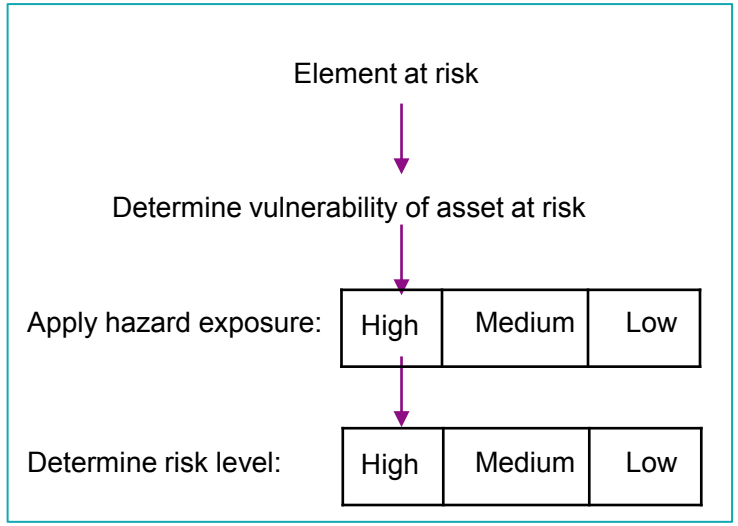
Uses a risk matrix to auto-populate the risk, based on the hazard exposure and vulnerability.

Pro: Would be a stand-alone tool

Climate hazard	Element at risk	Risk statement	Risk description	Exposure			Vulnerability	Risk		
				Present	Mid Century RCP8.5	End of Century RCP8.5		Present	Mid Century RCP8.5	End of Century RCP8.5
Sea level rise, coastal flooding	Roading network	**Risk to the roading network due to sea level rise & coastal flooding**	Roading network follows the coast and is at risk from sea level rise which, combined with severe weather and high tides, causing damage and outages.	Low	High	Extreme	High	Low	High	Extreme

3. Flow-chart

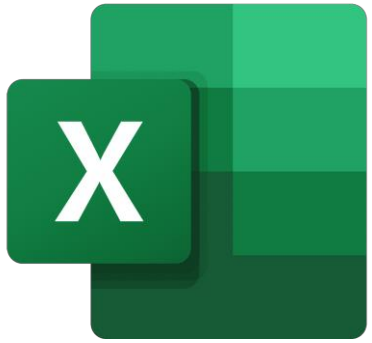
E.g. Step-by-step for each climate variable, accounting for hazard exposure and vulnerability. Could be worked into an excel format too.



Discussion

- Are you familiar with using risk frameworks (E.g, Financial, Health and Safety, Environmental)?

- What is the most useful format to you for making risk assessment decisions?



Likelihood \ Impact	Negligible	Minor	Moderate	Significant	Severe
Very Likely	Low Med	Medium	Med Hi	High	High
Likely	Low	Low Med	Medium	Med Hi	High
Possible	Low	Low Med	Medium	Med Hi	Med Hi
Unlikely	Low	Low Med	Low Med	Medium	Med Hi
Very Unlikely	Low	Low	Low Med	Medium	Medium

Q + A

Post Consultation Survey

- Questions discussed today, plus some additional ones
- Survey will be distributed by Sunny (SPREP) via email
- Responses required by **end of day 31st October**

make
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B

Appendix B – Minutes from stakeholder consultation sessions

Minutes of Meeting

Stakeholder Consultation Session One Minutes

Held 18 October 2023 at 11.00am-1.00pm (Vanuatu time)

Via Zoom

Present:	Sunny Seuseu (SPREP)	Leanne Webb (CSIRO)
	Moirah Matou (VanKIRAP)	Kevin Hennessy (CSIRO)
	Mike Allis (Beca)	Rebecca Gregory (CSIRO)
	Kristin Renoux (Beca)	Mark Pardoe (Country Manager for Tropical Agencies limited (TAL) and Domestic National Representative for the Chamber of Commerce)
	Carlos Carvajal (Beca)	
	Sophie Andrews (Beca)	
	Hannington Aatoa (Beca)	

Apologies:

Distribution:

Item	Notes
1 House Keeping and Introductions	
2 Stakeholder introductions 1. What climate issues are you already seeing in your sector	*1. What is organisation/background? Where do you operate within Vanuatu?* **Mark-** Cruise ship lines, two offices (Port Vila and Santo) Peak season for cruising is November to March- Cyclones, bad weather etc. effect port calls because of safety. From climate sector shipping agency perspective, biggest concern. Have number of this weather-related thing- ***Mark to send to Mike*** One road that leads to port villa is the one road for cruise tours- only road so if something happens, like erosion of road due to weather would have big impact. Wharf road (CSIRO- Vicky Tai might be able to help with detours of the road but not CSIROs wheelhouse yet. They will do some mapping of the road and see the level of risk). **Kristin -** Would you choose to not to go there because of the impacts? **Mark-** Yes, and cargo issues, won't sell or give these in tours- passenger experience dramatically affected. What's the number of people involved in providing experience? Summary to be projected of specific activities.

Item	Notes
	Moirah – rivers that run through roads that didn't happen before. Happening more and more often. Some resorts in Santo – Bungalows already washed out because of erosion and rain fall **Mark**- wearing commercial rep hat: roads washed away- people identifying and working with people to fix this **CSIRO – Leanne** – not mentioned, fisheries issues (to see sea turtles) and they are affected by climate in gender ratio. Roads bumpy already (construction quality). Tropical cyclones limit access to electricity. **Kevin-** Two of the info bites not yet accessible (will be by 12 Nov) NIWA will be doing modelling, to see the increasing issues of flooding (getting bad) **Leanne** - Tourists like to try local produce (plantations might get to expand because it's warmer but coffee really struggling) **Mark –** Infestation of rhinoceros beetle, eating copra plants (Port Vila, Efate) – is there a climate driver behind the infestation?
3 Project outline and scope	**Mike** • Excellent work done already for Vanuatu on project, Beca building on it • Timeline constraints • Financial projections
4 Project Goals and Discussion	**Mike and Kevin**- Beca fits into step 3 and 5 of the CSIRO framework. **Kevin-** It needs to be generic enough to be applied across different sectors (consistent so can be used in a consistent way) **Mark** - unaware of this project itself and haven't has too much to do with the VanKIRAP as private sector (aware but haven't dived into it) **Mike-** Compressed time wise so we can be testing along to see if it's usable *How is CC already affecting your organisation and roles?* **Sunny-** observations- have had discussion with tourism operators in Santo and Efate Tourism operator in Santo concerned in SRL- have a number of beach huts they use for tourists but effecting community and losing land through this. Providing adaptation options, provide for growth next door. One of the most popular places for cruise lines but SLR impacting this. Airport effected by flooding, flights couldn't come in and out- this impacts the ability for people to come to the islands Infrastructure heavily impacted so tourist can't get around

Item	Notes
	2020 cyclone impacted tourism heavily (also because of covid 19) Small scale tourism operators- do not have access to pool water, have to access from ground, but can't do that during a drought **Mark-** Telecommunication cut off during cyclone, no connection to outside world- can't tell family we're okay. In July in 2015, power off for two weeks- comms you can't do business without it. Mark brought back up generator for the office because you can't have that complacency. **Leanne-** took photos of cyclone resistant structure- then took photos afterwards to show that it was resilient (things that you can use to be resilient). What did they do differently? This one has big concrete anchor at the back, made of materials that are locally accessible. Has Vanuatu sustainable tourism strategy been implemented on a community level? Tourism strategy 2021, has been implemented – ***get information from Geraldine on how this is going at the moment.*** What about the people who are on the ground – drought obviously effect workers- has the impact of heat impacting airport workers unloading bags etc, or people unloading cargo. ***Talk to airport and DoT for this info.*** Electricity demand (increasing aircon use etc.) because of heat. **Mike-** what is the increase electricity sources? Mark- mainly uses diesel at the moment but looking at coconut oil etc. Impacts on Hospitals – dengue fever? *What would help you consider climate risks into your future planning?* **Mark**- only getting bigger in people wanting to come to islands, ports need to get bigger, looking at some of the climate impacts but as boots on the ground, couldn't tell you where they are looking at. **Sunny –** from his discussion from department of tourism, department is looking at strengthening their tourism mat. Strengthening between the two departments, the tourism sector will be more resilient working with DoT and Tourism Vanuatu. Methodology scheme to facilitate methodology where they encourage tourism operators to identify risks. Tool developing will help them with their journey providing for all stakeholders (wide range). Using data from the last 13 years, need to update data to help with process. Ministry looking at relocating communities and villages because of SLR but need a methodology like DRR's relocation policy to help inform the future planning decisions.

Item	Notes
	Moirah – Project started in 2018 so most of the planning for risk has been updated from then until now- people starting to include climate change thinking in their business plans. *What role does your organisation play in identifying climate change risks in Vanuatu?* **Mark-** we work in real time- start working with captains or marine managers if issues start to arise- if not booked It can be diverted from mystery island to Port Vila for example. *Are you getting any requests for assurance of operation – how far out?* **Mark –** After cyclone Judy, report asked to be done by minister and they said road is not to be used- public doc so cruise lines diverted from port villa. Against cliff face placed temporary protection/ fixes- report changes, cruise line back but said it's not a long-term solution so have concerns. Cruise line paid for some of works- Min tourism reduced fees by half to accommodate. *Are there any particular services involved in supporting the resilience projects?* **Sunny**- nothing comes to mind but will have a think. **Moirah-** indirect or direct? Both. 5 priority sectors already, will have to think of anyone outside of the these. Department of CC, department of Environment, department of health. ***Can get details for VTO and DoT (Geraldine might have some names and ideas)*** *Who do you think the end users of this framework will be?* **Sunny-** Tourism sector through VTO and Dot will have to provide guidance of who to use it. DOT and VTO responsible for distributing and providing to relevant users. Have to be flexible enough to be used by wide range- need to accommodate all areas ie. waterfalls, beaches, all sites. Are the developers of tourism seen as using this? **Sunny-** vision to be used as a multi sectorial approach but consultation and implementation needs to be done by a multilevel agency, lead by DoT. Need to decide if it will be used for big and small organisations etc. **Kristin-** Are we assuming that there are end users with different understanding of risk management or analyse it for others? Flowchart to outline all steps? Safe to assume that risk management is not everyone's background as should apply/design as such. **Sunny-** needs to be a categorisation of different activities- ie. small scale use this and work with department for CC and large scale use this one to independently access.

Item	Notes
	Leanne – in Santo- graphics used to display technical info in project for end user (info graphics simple and preferable) **Kevin-** very simple step by step guide very helpful. Important to provide for an infographic that give a high-level overview of the risks now, and the risks in the future. Targeted approach very important as sunny said. **Leanne-** Big language barrier- getting stakeholders to drive the consultation as some afraid to ask the questions in English so conversation in Bislama was so much more interactive. **Carlos-** Does the climate relate from Bislama to English the same? Is that understanding there? *Format of tool: Examples shown- are they too detailed based on infographics convo? Does anyone have ideas on how to display/pitch framework for the end users?* High level pitch but risk of losing detail and value with high-level structure. **Sunny-** there will be use of this (examples format) but is something we need to discuss with DOT. Sunny supports- it's a good start but should be refined. **Leanne-** target always the understanding of reasonable capacity. Most of it, as long as you can explain it. **Kevin-** People have in the past found it difficult to discuss or grip likelihood. Think laid out well. Finding balance is challenging. Skipping likelihood all good- exposure more important to discuss. **Kevin-** emissions targets at high level
5 Questions and answers	*We want feedback on how we're done the session- has this been useful to understand our direction of travel?* Yes, all found useful **Kevin-** good discussion- rapid assessment can only do so much **Moirah-** Good questions that really triggered responses etc. Note additional stakeholder came late- ***their question is to be discussed with Sunny and Moirah after meeting.***

Minuted by: Sophie Andrews

Minutes of Meeting

Stakeholder Consultation Session Two Minutes

Held 19 October 2023 at 1.00pm – 3.00pm (Vanuatu time)

Via Zoom

Present:

Sunny Seuseu (SPREP)

Moirah Matou (VanKIRAP)

Mike Allis (Beca)

Kristin Renoux (Beca)

Carlos Carvajal (Beca)

Sophie Andrews (Beca)

Hannington Aatoa (Beca)

Dr Christina Shaw (CEO Vanuatu Environmental Science Society (VESS), President Vanuatu Scuba association, Co-owner of Big Blue Dive Company)

Geraldine Tari (Acting Director for Department of Tourism)

Apologies:

Distribution:

Item	Notes
1 Project Overview	**Moirah**- This is a Green Climate funded project Main objective of project to provide and enhance services provided by CSIRO so more stakeholders can use it for their planning and have better decision making so they have more resilience in the face of Climate Change. Geraldine- Don't have all the answers, hard to find someone to lead the project/ climate resilience charge.
2 Project outline and scope	Purpose of today- meet and gauge incites from stakeholders in Vanuatu • Excellent work done already for Vanuatu on project, Beca building on it • Timeline constraints • Financial projections
3 Stakeholder introductions	1. *What is your organisation/ Background?* **Geraldine** – Acting Director for the Department of Tourism (DOT) **Christina-** CEO of the Vanuatu Environmental Science Society (VESS) and owns Big Blue Dive company with husband. She is the new president of scuba association, and her husband owns recycling company. 2. *Where do you operate within Vanuatu?* What climate issues are you already seeing in your sector?

Item	Notes
	Geraldine- Operate under the Ministry of Trade and Commerce, responsible for the policy and implementation of tourism, offices based in all the 6 provinces. Main activities work around product development office. Currently over a 1000 tourism operation listed (database needs to be updated) Most operators in outer islands (rural) and are often the most impacted through climate issues. We don't have level of impacts and how impacted. There is a programme to help record data and help them in phasing out the development of their operation. Is there a way of feeding people information or gathering information from them? Mosly the ones based in Santo Tana and Port Vila easily contacted, but otherwise, only contacted over social media. Opportunity in improving online accreditation certification. Will take a while – format existing platform, being built on. Can we see a copy of that? Yes, Geraldine will send this through. **Christina** – Environmental scientist role- Projects mostly of threatened species and conservation but also work on ecosystem threats. Depends on what project doing but all throughout Vanuatu. Deliberately not working on Climate change projects, sticking to biodiversity conservation niche. Effects seeing tropical cyclones, tree canopies effected (bats come close to villages, people hunting them after cyclones. High rainfall events that will impact the environment. Trying to make the environment more sustainable. Tourism generally have impacts on environment. Experience in staying in local tourist operations. Tours- very little connectivity on island. Radio used for information a lot in remote islands. Lots of NGOs working on CC but little NGOs working on biodiversity work. Making sure it's not all human focused, raise the voice of the voiceless (animals and plants). If there's a specific climate event, would you expect there would be no contact with them for a while? Probably yes. Planes in one a week, boats in one a month- tricky for repairs, particularly if there's high demand. Are you already seeing specific triggers in the effects on the ground (coral reef bleaching- biggest bleaching event -never seen it so long in….) Temperature changes, 29 degrees started in November, about 2 months early. Also, a crown of thorns outbreak at the moment- if cyclone, knocked over more coral (tipped over). Saw after cyclone pam- lots of canopies fell out and trees fell down, and they El Nino drought caused a lot of them to die because they couldn't recover. **Mike -** Frequency is a driver of that change as well. **Christina -** Usually when cyclone comes through, the water temp drops and the coral stops bleaching but didn't this time. Didn't provide relief.

Item	Notes
	Christina- Wearing scuba association hat. Operators in Santo, Port Vila, a couple up the east coast. Biggest climate effect is on the corals. Most of info of what is happening in terms of cyclones isn't from in Vanuatu. Juggle of when the best time to anchor things down etc. based on losing business is you do too early. Has there been more cancellations due to cyclones (before and after changes)? Biggest impact of concern is post covid recovery and issues with airline function. Climate hasn't come up as much but haven't seen too much change because of the cyclone possibility. People (Charity sector) over enhancing issues on how the recent cyclone impacted/ damage caused. NGOs said it wasn't that bad so although bringing money to charities, tourism sector impacted. Fruit impacted and tour groups do local biscuits and fruit but couldn't for around 3 months. Not much in the market available. Coconut rhinoceros beetle infestation mentioned. **Mike**- does your husband have anything from recycling business? **Christina-** lots of extra material after the cyclones such as metals. VESS have done a plastic survey- People had 18 more bottles in their homes in areas that they didn't think they could get water or relief services. **Moirah-** Been a while since we have had cases/examples of the sea temperatures and coral bleaching. Deployed buoys in Vanuatu to measure temperatures- higher than usual.
4 Project Goals and Discussion	What would help you to consider climate risks in your future planning? **Geraldine-** Said that each operator would have a risk management plan in place, but they haven't had the tools to do one. Varying abilities based on location. Project help in giving operator services to help them develop framework that provides them with sustainability and climate information. **Kristin-** Thinking that the end user goes beyond government organisations and be used by the operators themselves? **Geraldine-** Yes **Kristin-** sometimes developing framework with wide range of end users quite tricky. Need to note that framework can be used with smaller tourism opportunities however they will need to be provided with training and tools to achieve a risk management plan **Christina-**Diving risks common- but looking at short term and not really long term. Concerns going into cyclone seasons but usually not long-term thinking. Usually a lot of investment in equipment and asset management. Not sure there would be much update from medium type businesses unless there is a future risk assessment value to it.

Item	Notes
	Think there are a lot of other threats that get overlooked because of the many Climate change projects. **Geraldine-** do you have comments on who the framework should be targeted at, will it be particularly useful for the end users that don't look into the long term. Thinking who else will have these thoughts, need to look into this as to how these impacts on operators. **Kristin-** journey for a lot of people to get understanding- need to get the buy in from people as to why this is going to support the long term of people's business (case study will be a good example of how this can be implemented). **Christina-** Some operators struggle with the day to day- need to buy in, perhaps from the government with funding/grants if it's undertaken, enhancement to business in some way, or applications to awards etc. The value incentive. **Format of examples** – *Thoughts? What might be useful as an end user?* **Geraldine-** If officers on the ground- the Product development officers in 6 provinces (or provincial managers), excel works to help with the understanding. But if it is a tool for people to take away, needs to be an infographic etc (simple). Provide with both hard copy and electronic version on website. Product development officers well connected to all operators and NGOs in their province. Provincial tourism officers (PTO). What would be key takeaways to pick up and use it? **Christina-** 2 levels of stakeholders- you have the small individual operators on outer islands and medium Vanuatu wide organisation. Tourism association members- required to be a member of one association so good way of attacking it. Not having too much on show at the beginning so it's not overwhelming. Perhaps a workbook with actual suggestions and mitigations that are actual practical so it's useful for next steps (but not too overwhelming so people don't want to start) Have to be a member of a tourism association to get tourism permit. Christina is unfamiliar with VanKIRAP portal. She mentioned she doesn't know what we're going to do differently.
5 Questions and answers	*Feedback on session?* **Geraldine-** DoT doesn't have Questions now but will have questions that pop up as we more through the process and as the feedback comes in.

Item	Notes
	Christina- VanKIRAP project inception meeting a few years ago- don't see how it's going to make a difference. Don't see how it will be used or can be used on the ground- Private sector don't really get help from the government (ie. coral reefs- not much the operators can do themselves, need help). What ability do the small operators have to make a difference using this framework? **Kristin-** Would tourism associations be good entry points to relive the pressure and difficulty of using the framework on small operators? **Christina-** Yes

Minuted by: Sophie Andrews

C

Appendix C- Identified Stakeholders

Stakeholders Identified for Consultation

SPREP and DoT identified 18 key stakeholders to undertake consultation with. These stakeholders are as follows:

- SPREP
- Vanuatu Meteorology and Geo-Hazards Department (VMGD)
- Department of Tourism (DoT)
- Vanuatu Tourism Office (VTO)
- Public Works Department (PWD)
- Department of Geology and Mines
- Department of Ports and Harbor
- Vanuatu Chamber of Commerce and Industry
- Reserve Bank of Vanuatu
- Department of Finance and Treasury
- Commonwealth Scientific Industrial Research Organization (CSIRO)
- Department of Climate Change (DoCC)
- National Disaster Management Office (NDMO)
- Department of Environment Protection and Conservation (DEPC)
- Ministry of Tourism, Trade, Commerce and Ni-Vanuatu Business
- Vanuatu National Statistics Office (VNSO)
- Vanuatu Fisheries Department (VFD)
- Tropical Agency Limited (TAL)

B

Appendix B – Dive Operators and Vanuatu Tourism Websites

Dive Operators and Vanuatu Tourism Websites

- Adaptation – Coral Reefs of Vanuatu short film
  https://www.pbs.org/video/coral-reefs-of-vanuatu-zojpje/
- Big Blue
  https://bigbluevanuatu.com/
- Blue Water Dive Travel
  https://www.bluewaterdivetravel.com/vanuatu-diving
- Daily Post Vanuatu
  https://www.dailypost.vu/tourism/
- Department of Tourism
  https://tourism.gov.vu/index.php/en/about-department-of-tourism
- Dive Adventures
  https://diveadventures.com.au/country/vanuatu/
- Hideaway Island
  https://www.hideaway.com.vu/diving.html
- PADI – Vanuatu
  https://www.padi.com/diving-in/vanuatu/
- Vanuatu Scuba Operators Association
  https://vanuatuscubaoperatorsassociation.com/
- Vanuatu Travel
  https://www.vanuatu.travel/au/guide-to-diving-vanuatu
- Volcano Island Divers
  https://www.whitegrasstanna.com/diving

C

Appendix C – RCRAF Case Study Tool Inputs

Rapid Climate Risk Assessment Framework Tool Case Study Input

The inputs to the RCRAF tool are detailed below, with the input, commentary and the source of the information or assumptions made where required.

Impact Screening

Does Your Industry Rely on Any of the Following Natural Features?			
Natural Feature	**Yes / No**	**Commentary**	**Source**
Coastal / Marine Ecosystems	Yes	Our company has a main dive office in Port Vila, Efate with two smaller bungalows on outer islands. We offer shore diving (coastal ecosystem), reef, blue hole and wreck diving (marine ecosystem) at these locations.	Based on offerings from different Dive Operators listed in Appendix E.
Terrestrial Ecosystems	No	Our operation is solely focused on the marine and coastal ecosystems, we do not have anything to do with terrestrial ecosystems.	Based on offerings from different Dive Operators listed in Appendix E.
Freshwater Ecosystems	No	We do dive in blue holes; however, these are in the coastal / marine ecosystem.	Based on offerings from different Dive Operators listed in Appendix E.
Does Your Industry Rely on Any of the Following Built Features?			
Natural Feature	**Yes / No**	**Commentary**	**Source**
Inhabited Buildings	Yes	We have a main dive store front near the wharf in Port Vila. This is where we rent out equipment, take bookings from walk in customers, sell a small number of goods (sunscreen, bottled water) and perform all of our equipment maintenance. We also have two bungalows on Outer Islands.	Based on offerings from different Dive Operators listed in Appendix E.
Ports / Wharves	Yes	We berth our small boat at the local wharf in Port Vila where tourist board and disembark. We don't use the port; however we rely on the presence of the port to bring tourists to Efate from other islands and from cruise ships.	Based on information listed in Appendix E.
Airports / Airfields	Yes	Our business doesn't use the airport. However, we rely on the presence of the airport to bring international tourists to Efate.	Based on offerings from different Dive Operators listed in Appendix E.
Telecommunications	Yes	We use telecommunications in the form of internet to check tidal movements and weather warnings. We also take online bookings and process EFTPOS transactions using internet. Cell phones /	Based on information listed in Appendix E.

Does Your Industry Rely on Any of the Following Natural Features?			
		radios are used to coordinate with accommodation providers and with boat operators.	
Electricity	Yes	We use electricity run the shop front, office operations. Electricity is also used for specific dive operations to refill the tanks and for cleaning of equipment as detailed in the report. Also use EFTPOS payments. We have a diesel generator for backup supply.	Based on information listed in Appendix E and the stakeholder consultation (generator supply).
Wastewater Infrastructure	Yes	Our dive shop in Port Vila is connected to a septic tank. Our bungalows on the smaller outer islands have outside pit toilets.	Based on “Sanitation Options for Pacific Island Countries, Vanuatu and RMI, PRIF 2020”.
Transportation Assets	Yes	We rely on roads / vehicles or footpaths and motorbikes / bicycles to pick up tourists and bring them to the dive shop and transport to the wharves. We move our boats onto land when required for maintenance or to shelter them from high winds and tropical cyclones.	Based on information listed in Appendix E and the stakeholder consultation.
Water Supply	Yes	We have a rain harvesting tank at our main office in Port Vila where we collect water for use freshwater in equipment washdown after usage in salt water, maintenance and office usage. We use freshwater for drinking sometimes, but not after periods of heavy rain or a cyclone - we will use bottled water instead.	Based on information listed in Appendix E.
Stormwater / Flood Management	Yes	Roading infrastructure relies on stormwater management to prevent damage and allowing people to use the roads in rain events. We have water catchment on our roof and a channel to divert overland flow water away, protecting the shop front from flooding.	Based on information listed in Appendix E.
Uninhabited Buildings	Yes	We have three main shops, each one has its own storage. We have an inland area where we store our boat during tropical cyclone events.	Based on information listed in Appendix E.
Evacuation Structures	Yes	We need to be able to communicate with our boat operators / store team to notify them if there are evacuation warnings to ensure they are able to evacuate and get to a shelter in time. Our business needs to keep our customers safe, therefore	Based on information listed in Appendix E and the stakeholder consultation.

Does Your Industry Rely on Any of the Following Natural Features?			
		we rely on evacuation structures to ensure they are safe.	
Which of the following operations and activities are involved in your industry?			
Natural Feature	**Yes/No**	**Commentary**	**Source**
Outdoor Land Activities	No	We do not have any land activities.	Based on information listed in Appendix E.
Outdoor Marine Activities	Yes	We frequently visit the marine environment to carry out the marine activity of diving.	Based on information listed in Appendix E and the stakeholder consultation.
Outdoor Freshwater Activities	No	We occasionally dive at the blue holes, but these are freshwater sources that exist in the marine environment and aren't a freshwater activity.	Based on information listed in Appendix E.
Outdoor Coastal Activities	Yes	We dive within the coastal environment (shore dives).	Based on information listed in Appendix E.
Land Transportation Activities	Yes	We use land transportation taxi around the tourists (from the dive shop to the wharves and back). We utilise the waterfront walkway when it is close distances. We rely on the delivery of goods to our shop via the roads.	Based on information listed in Appendix E.
Water Transportation Activities	Yes	We provide water transportation to dive locations. Rely on water transportation between islands and bigger vessels (ferries and cruise ships) to bring the tourists to our Island. We rely on the supply of goods to our shop from ocean cargo.	Based on information listed in Appendix E.
Office / Shop / Admin Activities	Yes	We carry out office activities at the front of our shop, where we take bookings and check tourists in for each activity. We sell some small goods like sunscreen and bottled water, whilst renting out other items like snorkels and rash tops.	Based on information listed in Appendix E.
Goods Supply Activities	Yes	Rely on the supply of goods to our shop, including the diesel for generator, gases for tank filing, food for full day tours.	Based on information listed in Appendix E and the stakeholder consultation.
Construction Activities	No	No examples I can relate to as a dive tourism operator.	Based on information listed in Appendix E.
Outdoor Land Activities	No	We do not have any land activities.	Based on information listed in Appendix E.
Outdoor Marine Activities	Yes	We frequently visit the marine environment to carry out the marine activity of diving.	Based on information gathered on the internet.

Exposure

What Climate Hazards have Impacted Your Industry in the Past?			
Climate Hazard	**Yes / No**	**Commentary**	**Source**
Coastal Inundation, Extreme Rainfall, Tropical Cyclone, Marine Heat Waves and Extreme Temperature	Yes	Coastal inundation occurs with some tropical cyclones that affect us (Tropical Cyclone Pam in 2015, Tropical Cyclone Ivy in 2003). Extreme rainfall happens normally once a year with flash flooding that sometimes occurs with a tropical cyclone (Tropical Cyclone Irene, Judy, Kevin and Lola in 2023 caused flooding). We have many tropical cyclones that cause damage to Vanuatu. We haven't been impacted by drought before. Marine heat waves causing coral bleaching at some of our reef locations occurs through the peak of summer if it is hot. Our staff have been affected in the past on very hot days if there is no breeze, causing heat stroke.	Based on Climate Hazards effects in Vanuatu that have been made publicly available on the internet and described for each variable in Section 3.4. We have largely assumed that the dive industry has also been impacted by each of these.
Drought, Ocean Acidification	No	Did not find information regarding drought or ocean acidification effects presently or in the past for Vanuatu.	Have assumed that because no information could be located that these climate hazards do not impact the dive industry for our case study.
Which of the Following Operations and Activities are Involved in Your Industry?			
Interaction	**Yes / No**	**Commentary**	**Source**
Within 100m of the Coastline?	Yes	Our dive shop is located within 100m of the coastline. We rely heavily on access to the wharves for water transportation, requiring road access.	Based on different Dive Operators listed in Appendix E.
Less than 10m Elevation Above the Sea Level?	Yes	We rely on the wharves. These are not located more 10m above the sea level.	Based on different Dive Operators listed in Appendix E.
Can be Impacted by (or rely on) Ocean Conditions?	Yes	We rely on healthy and abundant coral reefs and marine species. These are at risk from ocean acidification and marine heat waves, negatively impacting the reefs and marine species.	Based on different Dive Operators listed in Appendix E.
Rely on a Natural Water Supply from a River, Groundwater or Rain-Harvesting?	Yes	Our shop has a tank where we harvest rainwater from for use in our dive shop operations including equipment washdown.	Based on different Dive Operators listed in Appendix E.
Located Near a River, Stream, or Lake that has a History of Flooding?	No	Our dive shop is located in a bay that doesn't have a significant river mouth. Our dive locations aren't near river mouths.	Based on different Dive Operators listed in Appendix E.

What Climate Hazards have Impacted Your Industry in the Past?			
Do High Temperatures Significantly Impact Your Operations?	Yes	Our operators are exposed to the hottest parts of the day when out on the boats. This also impacts the tourists.	Based on different Dive Operators listed in Appendix E.

Exposure of Elements

Features	Industry Relevant Element	Coastal Inundation	Extreme Rainfall	Tropical Cyclone	Drought	Marine Heat Waves	Ocean Acidification	Extreme Temperature
Natural Features	Coastal / Marine Ecosystems	H		H		H	H	L
Reasoning		Exposed to storm surge		Exposed to storm surge		Marine ecosystem is exposed	Both ecosystems exposed	Marine not exposed, coastal ecosystem is
Built Features	Inhabited Buildings	H	H	H				L
Reasoning		Exposed as most near the coast	Exposed as exposed to flooding	Exposed to high winds / extreme rain				Some buildings exposed
Built Features	Ports / Wharves	E	M	E				L
Reasoning		Extreme exposure to storm surge / SLR	Some exposure to extreme rain / flooding (debris)	Extreme exposure to high winds / storm surge				Materials are minorly exposed
Built Features	Airports / Airfields	H	M	E				L
Reasoning		Exposed as airport near the coast	Some exposure to extreme rain / flooding (debris)	Extreme exposure to high winds / storm surge (coast)				Runway exposed to extreme temperatures

Features	Industry Relevant Element	Coastal Inundation	Extreme Rainfall	Tropical Cyclone	Drought	Marine Heat Waves	Ocean Acidification	Extreme Temperature
Built Features	Telecommunications		L	M				
Reasoning			Exposed where flood debris can take out towers etc	Exposed to high winds / rain that can take out towers etc				
Built Features	Electricity			H				
Reasoning				Exposed to high winds / rain that can take out power lines etc				
Built Features	Wastewater Infrastructure	M	M	M				
Reasoning		Outfall pipes exposed	Septic tanks and pits exposed	Septic tanks and pits exposed to high rain and wind				
Built Features	Transportation Assets	H	H	H				L
Reasoning		Road network near coasts exposed	Exposed to heavy rain and flood debris	Extreme rain / winds expose roads through slips / floods				Road materials exposed to high temps (can melt)

Features	Industry Relevant Element	Coastal Inundation	Extreme Rainfall	Tropical Cyclone	Drought	Marine Heat Waves	Ocean Acidification	Extreme Temperature
Built Features	Water Supply	L	H	H				M
Reasoning		Groundwater supplies are exposed - rain harvesting not	Water supply can become polluted from extreme rainfall	Water supply can become polluted after Tropical Cyclone				Exposed when extreme temperatures increase bacterial growth in water storage and evaporation
Built Features	Stormwater / Flood Management	H	H	H				
Reasoning		Coastal inundation can make stormwater worse	Exposed to extreme rainfall	Exposed to high rainfall during Tropical Cyclone				
Built Features	Uninhabited Buildings	M	H	H				L
Reasoning		Exposed where buildings located near the coast	Exposed to flooding and debris	Exposed to high winds / high rainfall and flood debris				Some buildings exposed depending on what is stored in them
Built Features	Evacuation Structures							

Features	Industry Relevant Element	Coastal Inundation	Extreme Rainfall	Tropical Cyclone	Drought	Marine Heat Waves	Ocean Acidification	Extreme Temperature
Reasoning		Default values are used because the dive industry doesn't own, operate or be the sole user of the evacuation structures						
Operations	Outdoor Marine Activities	L	M	H		H	H	M
Reasoning			Visibility of ocean is effected by extreme rain	Heavy rain and winds limits the visibility and stability when diving – reducing safety		Outdoor marine activities rely on healthy coral reefs which are exposed to MHW	Outdoor marine activities rely on healthy coral reefs which are exposed to ocean acidification	Extreme temperatures expose the activity when in shallow waters
Operations	Outdoor Coastal Activities	H	M	E		H	H	M
Reasoning			Visibility of ocean is effected by extreme rain	Heavy rain and winds limits the visibility and stability when diving – reducing safety this is worse in shallow water where the ecosystem can also be exposed		Outdoor coastal activities rely on healthy coral reefs which are exposed to MHW	Outdoor coastal activities rely on healthy coral reefs which are exposed to ocean acidification	Extreme temperatures expose the activity when in shallow waters

Features	Industry Relevant Element	Coastal Inundation	Extreme Rainfall	Tropical Cyclone	Drought	Marine Heat Waves	Ocean Acidification	Extreme Temperature
Operations	Land Transportation Activities	M	M	H				L
Reasoning		Road network near coasts exposed	Exposed where extreme rainfall causes flooding, slips or flood debris	High winds and rain can expose land transport due to flooding, slips and flood debris				Extreme temperature can expose land transportation if road assets can melt
Operations	Water Transportation Activities	L	M	E				M
Reasoning		Exposed where wharfs and ports are impacted	Exposed where extreme rainfall causes flood debris in ocean	High winds expose water transportation activities				Extreme temperatures expose those on boats
Operations	Office / Shop / Admin Activities	M	M	H				M
Reasoning		Exposed where activities are carried out near the coast or commuting routes effected	Exposed when building or commuting routes effected by	Exposed when building or commuting routes are effected by tropical cyclones				Exposed where there is limited ventilation or air conditioning of indoor spaces

Features	Industry Relevant Element	Coastal Inundation	Extreme Rainfall	Tropical Cyclone	Drought	Marine Heat Waves	Ocean Acidification	Extreme Temperature
			extreme rainfall					
Operations	Goods Supply Activities	H	M	H				L
Reasoning		Exposed where goods are transported by land	Exposed where transport is exposed	Exposed where transport of goods is exposed				Exposed where production of goods (food) is exposed

Features	Industry relevant element	Coastal Inundation	Extreme Rainfall	Tropical Cyclone	Drought	Marine Heat Waves	Ocean Acidification	Extreme Temperature
Natural Features	Coastal / Marine Ecosystems	H		H		H	H	L
Built Features	Inhabited Buildings	H	H	H				L
Built Features	Ports / Wharves	E	M	E				L
Built Features	Airports / Airfields	H	M	E				L
Built Features	Telecommunications		L	M				
Built Features	Electricity			H				
Built Features	Wastewater Infrastructure	M	M	M				
Built Features	Transportation Assets	H	H	H				L
Built Features	Water Supply	L	H	H				M

Features	Industry relevant element	Coastal Inundation	Extreme Rainfall	Tropical Cyclone	Drought	Marine Heat Waves	Ocean Acidification	Extreme Temperature
Built Features	Stormwater / Flood Management	H	H	H				
Built Features	Uninhabited Buildings	M	H	H				L
Built Features	Evacuation Structures							
Operations	Outdoor Marine Activities	H	M	H		H	H	M
Operations	Outdoor Coastal Activities	L	M	E		H	H	M
Operations	Land Transportation Activities	E	M	H				L
Operations	Water Transportation Activities	L	M	E				M
Operations	Office / Shop / Admin Activities	M	M	H				M
Operations	Goods Supply Activities	H	M	H				L

Vulnerability

Default values were used.

Risk Management

Strategy	Yes / No	Commentary	Source
Measures to Manage Risk Associated with Coastal Inundation	Yes	Port Vila Seawall constructed within the last 5 years. Unsure on which industry was the driver of this but it is providing coastal inundation protection to the area.	Beca
Measures to Manage Risk Associated with Extreme Rainfall	No	No measures to manage extreme rainfall have been identified.	
Measures to Manage Risk Associated with Tropical Cyclone	Yes	Evacuation planning and weather forecasting and communications are in place to manage the risks associated with tropical cyclones.	Vanuatu Meteorology and Geo-Hazards Department
Measures to Manage Risk Associated with Drought	No	No measures to manage risks associated with drought have been identified.	
Measures to Manage Risk Associated with Marine Heat Waves	Yes	Forecasting for the tourism and fisheries sectors is provided by Vanuatu Meteorology & Geo-Hazards Department to manage the risks of marine heat waves.	Vanuatu Meteorology and Geo-Hazards Department
Measures to Manage Risk Associated with Ocean Acidification	Yes	Forecasting for the tourism and fisheries sectors is provided by Vanuatu Meteorology & Geo-Hazards Department to manage the risks of marine heat waves.	Vanuatu Meteorology and Geo-Hazards Department

D

Appendix D – RCRAF Case Study Results Report

Rapid Climate Risk Assessment Framework (RCRAF) - Results Report

FOR INTERNAL USE ONLY

Completion date: Wednesday, 13 December 2023
Assessment completed by: Beca - For Case Study Report Purposes
Industry/sector assessed: Theoretical Dive Industry - Tourism Sector in Vanuatu

The user has stated the objective of completing the Rapid Climate Risk Assessment is as follows: First test of our (case study) material to assess the current and future climate related risks affecting the Dive industry within the tourism sector.

1. Understanding Industry: interactions and activities

The industry relies on both natural and built features.

This includes reliance on the following natural features: Coastal / Marine. Ecosystems. The industry also relies on the following built features: Inhabited Buildings, Ports / Wharves, Airports / Airfields, Telecommunications, Electricity, Wastewater Infrastructure, Transportation Assets, Water Supply, Stormwater / Flood Management, Uninhabited Buildings, and Evacuation Structures.

The user defined built feature has not been assessed in the climate risk assessment framework but it is recommended that a similar process is used to understand the possible exposure and vulnerability this element may have.
The user has identified that the industry involves the following activities and/or operations: Outdoor Marine Activities, Outdoor Coastal Activities, Land Transportation Activities, Water Transportation Activities, Office / Shop / Admin Activities, and Goods Supply Activities.
The identified activities or features above provide a high-level overview of the potential activities or features that may be vulnerable or exposed to climate hazards as assessed in the following sections.

2. Climate Hazard Exposure

The following climate hazard events are events that are relevant to the industry and have been observed in the past: Coastal Inundation, Extreme Rainfall, Tropical Cyclone, Marine Heat Waves, and Extreme Temperature. These impacted the industry in the following ways: Coastal inundation occurs with some tropical cyclones that affect us (TC Pam in 2015, TC Ivy in 2003). Extreme rainfall happens normally once a year with flash flooding that sometimes occurs with a tropical cyclone (TC Irene, Judy, Kevin and Lola in 2023 caused flooding). We have many tropical cyclones that cause damage to Vanuatu. We haven't been impacted by drought before. Marine heat waves causing coral bleaching at some of our reef locations occurs through the peak of summer if it is really hot. Our staff have been affected in the past on very hot days if there is no breeze, causing heat stroke.

In addition the industry has elements with the following qualities that suggest possible exposure:

- located within 100m of the coastline
- located at less than 10m elevation above the sea level
- impacted by (or reliant on) ocean conditions
- that critically rely on natural water supply

High temperature have been assessed by the user as a feature that can significantly impact the effectivess or safety of work activities, ecosystems, agricultural productivity or industry sites/assets.
Based on the above, the Rapid Climate Risk Assessment Framework assesses the industry has exposure to the following hazards: Coastal Inundation, Extreme Rainfall, Tropical Cyclone, Drought, Marine Heat Waves, Ocean Acidification, and Extreme Temperature. The Framework asks the user to input a baseline score for the PRESENT exposure for each of the climate hazards based on their industry knowledge. If a score is blank, the framework will use default exposure score ratings based on Van-KIRAP data. The user's baseline scores are then adjusted using RCP8.5 to estimate likely exposure at 2050 and 2100. The default exposure takes into account the elements' general proximity to the climate hazard and the expected frequency and intensity over time.

3. Vulnerability

Vulnerability assesses the industry's sensitivity or capacity to adapt to the hazards identified above.

The vulnerability assessment has used default preliminary vulnerability scores. The default vulnerability considers how sensitive the element typically is to the climate hazard and how able it is to adapt to the changing climate.

4. Risk Assessment

Risk is a product of hazard exposure and vulnerability. Using the assessments completed above, risk ratings have been created for the elements and hazards relevant to the industry.

The below table identifies overall the top climate hazard risks (up to top 3) for the industry and shows their risk rating both now and in the future (combining the average of a 2050 and 2100 rating). It identifies which elements are at high or extreme risk from this climate hazard. These overall ratings are calculated using a weighted average of the risk ratings for all elements at risk from each climate hazard.

Top climate hazards	Overall Present Risk Score	Overall Future Risk (2050 & 2100)	Associated elements:
Tropical Cyclone	Extreme	Extreme	Immediate high/extreme risks from Tropical Cyclone to Coastal / Marine Ecosystems, Inhabited Buildings, Ports / Wharves, Airports / Airfields, Electricity, Transportation Assets, Water Supply, Stormwater / Flood Management, Uninhabited Buildings, Outdoor Marine Activities, Outdoor Coastal Activities, Land Transportation Activities, Water Transportation Activities, Office / Shop / Admin Activities, and Goods Supply Activities.
Extreme Rainfall	High	High	Immediate high/extreme risks from Extreme Rainfall to Transportation Assets, Stormwater / Flood Management, Outdoor Marine Activities, Outdoor Coastal Activities, Land Transportation Activities, and Water Transportation Activities.
Marine Heat Waves	High	High	Immediate high/extreme risks from Marine Heat Waves to Coastal / Marine Ecosystems.

The below table identifies overall the top elements (up to top 5) at overall risk for the industry, providing information for the high or extreme climate hazards that are contributing to these risks. These overall ratings are calculated through a weighted average of risk ratings from all climate hazards for each element of the industry.

Top elements at risk	Overall Present Risk Score	Overall Future Risk (2050 & 2100)	Associated hazards:
Coastal / Marine Ecosystems	High	Extreme	Immediate high/extreme risks to Coastal / Marine Ecosystems from Coastal Inundation, Tropical Cyclone, Marine Heat Waves, and Ocean Acidification.
Outdoor Coastal Activities	High	Extreme	Immediate high/extreme risks to Outdoor Coastal Activities from Coastal Inundation, Extreme Rainfall, and Tropical Cyclone.
Airports / Airfields	High	High	Immediate high/extreme risks to Airports / Airfields from Coastal Inundation, and Tropical Cyclone.
Stormwater / Flood Management	High	High	Immediate high/extreme risks to Stormwater / Flood Management from Extreme Rainfall, and Tropical Cyclone.
Inhabited Buildings	High	Extreme	Immediate high/extreme risks to Inhabited Buildings from Coastal Inundation, and Tropical Cyclone.

5. Understanding Existing Climate Risk Management

Given the risks identified for the industry, it is worth considering whether:

- A more in-depth assessment could be beneficial to define the potential climate risks to the industry
- Exposure to the climate risk could be avoided or minimized through altering how the industry functions
- The impact or consequences of exposure to future climate events could be minimized or reduced (i.e. continuity plan/emergency response plan, education awareness material, monitoring and alerts)
- There are any opportunities to adapt to the increased risk through changes to infrastructure and other industry functions

The user has identified that the industry has prepared or implemented measures to manage risks associated with Coastal Inundation, Tropical Cyclone, Marine Heat Waves, Ocean Acidification, and Extreme Temperature.

6. Adaptation

Adaptation is the process of adjustment to actual or expected climate hazards and their effects, in order to moderate risk. The protect, accommodate, retreat and avoid (PARA) framework has been introduced as a way to identify options to adapt.

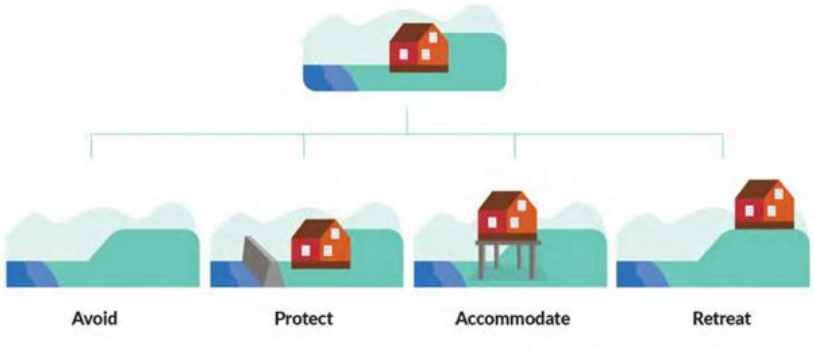


*Image adapted from New Zealand Ministry for the Environment (2022)

The user has identified that a PROTECT action has been taken. This is explained as: Sea wall constructed at Port Vila. This management approach has been tested in an event and was effective at managing the risk.

The user has identified that an ACCOMMODATE action has been taken. This is explained as: Shade sails have been installed on our boats to ensure there is shelter from direct sunlight during marine transportation. Upgrades to the rainwater harvesting of Port Vila shop to reduce flooding in an extreme event. This management approach has not been tested in an event.

The user has not identified any RETREAT actions that have been taken.This is explained as: We have the ability to pick the dive locations we visit based on currents and the time of year to get optimal water visibility.

The user has not identified any AVOID actions that have been taken.

7. Hazard Forecasting Awareness

The user has stated that the industry uses formal warning systems to forecast climate hazard events, and traditional indicators to notify of upcoming potential issues.
These can be key tools to improve industry preparedness to climate hazards. For further information on these resources please see the below links.

Formal warning systems: Vanuatu Meteorology & Geo-Hazards Department	*Access here*
Traditional indicators: National Advisory Board on Climate Change & Disaster Risk Reduction, Government of Vanuatu	*Access here*
Van KIRAP Climate Futures Portal Username: test Password: vanKirap123	*Access here*

The framework results presented in this report should be considered in conjunction with other non-climate factors to inform decision making. This report has been designed to be able to be exported as a pdf. Please click on 'file' then 'export' and save it under a file name specific to your industry.

End of Report

Appendix 1: Further assessment details

The following tables provide further detail that have informed the report findings. Risk ratings are identified over the three exposure timeframes (present day, 2500 and 2100) using the RCP8.5 baseline high emission scenario.

The below table presents the overall risk rating for each climate hazard that the industry is exposed to. The overall risk ratings are calculated using a weighted average of the risk ratings for all elements at risk from each climate hazard. The table is ordered based on severity and immediacy of the risks caused by that hazard.

Climate Hazard	Rating Present	Rating 2050	Rating 2100
Tropical Cyclone	Extreme	Extreme	Extreme
Extreme Rainfall	High	High	Extreme
Marine Heat Waves	High	High	High
Coastal Inundation	High	High	High
Ocean Acidification	Moderate	High	High
Drought	Moderate	Moderate	Moderate
Extreme Temperature	Moderate	Moderate	High

The below table presents the overall risk rating for each element that is relevant to the industry. The overall risk ratings are calculated using a weighted average of all the risk ratings from each hazard for that element. The table is ordered based on severity and immediacy of elements' risk rating.

Elements at Risk	Rating Present	Rating 2050	Rating 2100
Coastal / Marine Ecosystems	High	High	Extreme
Outdoor Coastal Activities	High	High	Extreme
Airports / Airfields	High	High	Extreme
Stormwater / Flood Management	High	High	High
Inhabited Buildings	High	High	Extreme
Transportation Assets	High	High	Extreme
Office / Shop / Admin Activities	High	High	High
Land Transportation Activities	High	High	High
Ports / Wharves	High	High	High
Outdoor Marine Activities	High	High	High
Water Supply	Moderate	High	Extreme
Uninhabited Buildings	Moderate	High	Extreme
Evacuation Structures	Moderate	High	High
Goods Supply Activities	Moderate	High	High
Water Transportation Activities	Moderate	Moderate	Moderate
Wastewater Infrastructure	Moderate	High	High
Electricity	Moderate	Moderate	High
Telecommunications	Moderate	Moderate	High

The assessment framework has calculated the following individual risks for the industry. These are presented in order of highest risk from present to 2100. Where statements have the same risk rating there is no distinction in the ordering of statements.

Risk	Risk Ratings		
Risk Statement	*Present*	*2050*	*2100*
Coastal Inundation risk to Coastal / Marine Ecosystems	Extreme	Extreme	Extreme
Coastal Inundation risk to Ports / Wharves	Extreme	Extreme	Extreme
Marine Heat Waves risk to Coastal / Marine Ecosystems	Extreme	Extreme	Extreme
Ocean Acidification risk to Coastal / Marine Ecosystems	Extreme	Extreme	Extreme
Tropical Cyclone risk to Coastal / Marine Ecosystems	Extreme	Extreme	Extreme
Tropical Cyclone risk to Ports / Wharves	Extreme	Extreme	Extreme
Tropical Cyclone risk to Airports / Airfields	Extreme	Extreme	Extreme
Tropical Cyclone risk to Outdoor Marine Activities	Extreme	Extreme	Extreme
Tropical Cyclone risk to Outdoor Coastal Activities	Extreme	Extreme	Extreme
Tropical Cyclone risk to Land Transportation Activities	Extreme	Extreme	Extreme
Tropical Cyclone risk to Water Transportation Activities	Extreme	Extreme	Extreme
Coastal Inundation risk to Inhabited Buildings	High	Extreme	Extreme
Coastal Inundation risk to Airports / Airfields	High	Extreme	Extreme
Coastal Inundation risk to Transportation Assets	High	Extreme	Extreme
Coastal Inundation risk to Outdoor Coastal Activities	High	Extreme	Extreme
Tropical Cyclone risk to Inhabited Buildings	High	Extreme	Extreme
Tropical Cyclone risk to Electricity	High	Extreme	Extreme
Tropical Cyclone risk to Transportation Assets	High	Extreme	Extreme
Tropical Cyclone risk to Water Supply	High	Extreme	Extreme
Tropical Cyclone risk to Stormwater / Flood Management	High	Extreme	Extreme
Tropical Cyclone risk to Uninhabited Buildings	High	Extreme	Extreme
Tropical Cyclone risk to Office / Shop / Admin Activities	High	Extreme	Extreme
Tropical Cyclone risk to Goods Supply Activities	High	Extreme	Extreme
Extreme Rainfall risk to Transportation Assets	High	High	Extreme
Extreme Rainfall risk to Stormwater / Flood Management	High	High	Extreme
Extreme Rainfall risk to Outdoor Marine Activities	High	High	Extreme
Extreme Rainfall risk to Outdoor Coastal Activities	High	High	Extreme
Extreme Rainfall risk to Land Transportation Activities	High	High	Extreme
Extreme Rainfall risk to Water Transportation Activities	High	High	Extreme
Coastal Inundation risk to Wastewater Infrastructure	Moderate	High	Extreme
Coastal Inundation risk to Uninhabited Buildings	Moderate	High	Extreme
Drought risk to Water Supply	Moderate	High	Extreme
Extreme Rainfall risk to Goods Supply Activities	Moderate	High	Extreme
Extreme Temperature risk to Water Supply	Moderate	High	Extreme
Extreme Temperature risk to Outdoor Marine Activities	Moderate	High	Extreme
Extreme Temperature risk to Outdoor Coastal Activities	Moderate	High	Extreme
Tropical Cyclone risk to Telecommunications	Moderate	High	Extreme
Tropical Cyclone risk to Wastewater Infrastructure	Moderate	High	Extreme
Tropical Cyclone risk to Evacuation Structures	Moderate	High	Extreme
Coastal Inundation risk to Stormwater / Flood Management	Moderate	High	High
Coastal Inundation risk to Land Transportation Activities	Moderate	High	High

Coastal Inundation risk to Goods Supply Activities	Moderate	High	High
Extreme Rainfall risk to Water Supply	Moderate	High	High
Marine Heat Waves risk to Outdoor Marine Activities	Moderate	High	High
Marine Heat Waves risk to Outdoor Coastal Activities	Moderate	High	High
Ocean Acidification risk to Outdoor Marine Activities	Moderate	High	High
Ocean Acidification risk to Outdoor Coastal Activities	Moderate	High	High
Extreme Rainfall risk to Evacuation Structures	Moderate	Moderate	Extreme
Drought risk to Inhabited Buildings	Moderate	Moderate	High
Drought risk to Airports / Airfields	Moderate	Moderate	High
Drought risk to Uninhabited Buildings	Moderate	Moderate	High
Drought risk to Office / Shop / Admin Activities	Moderate	Moderate	High
Extreme Rainfall risk to Inhabited Buildings	Moderate	Moderate	High
Extreme Rainfall risk to Airports / Airfields	Moderate	Moderate	High
Extreme Rainfall risk to Wastewater Infrastructure	Moderate	Moderate	High
Extreme Rainfall risk to Uninhabited Buildings	Moderate	Moderate	High
Extreme Rainfall risk to Office / Shop / Admin Activities	Moderate	Moderate	High
Extreme Temperature risk to Office / Shop / Admin Activities	Moderate	Moderate	High
Marine Heat Waves risk to Goods Supply Activities	Moderate	Moderate	High
Coastal Inundation risk to Office / Shop / Admin Activities	Moderate	Moderate	Moderate
Extreme Rainfall risk to Ports / Wharves	Moderate	Moderate	Moderate
Extreme Rainfall risk to Electricity	Moderate	Moderate	Moderate
Extreme Temperature risk to Evacuation Structures	Moderate	Moderate	Moderate
Extreme Temperature risk to Coastal / Marine Ecosystems	Low	High	Extreme
Extreme Temperature risk to Inhabited Buildings	Low	Moderate	High
Extreme Temperature risk to Goods Supply Activities	Low	Moderate	High
Coastal Inundation risk to Evacuation Structures	Low	Moderate	Moderate
Drought risk to Ports / Wharves	Low	Moderate	Moderate
Drought risk to Wastewater Infrastructure	Low	Moderate	Moderate
Extreme Temperature risk to Electricity	Low	Moderate	Moderate
Extreme Temperature risk to Wastewater Infrastructure	Low	Moderate	Moderate
Extreme Temperature risk to Transportation Assets	Low	Moderate	Moderate
Ocean Acidification risk to Ports / Wharves	Low	Moderate	Moderate
Coastal Inundation risk to Telecommunications	Low	Low	Moderate
Coastal Inundation risk to Electricity	Low	Low	Moderate
Coastal Inundation risk to Water Supply	Low	Low	Moderate
Coastal Inundation risk to Outdoor Marine Activities	Low	Low	Moderate
Drought risk to Transportation Assets	Low	Low	Moderate
Drought risk to Land Transportation Activities	Low	Low	Moderate
Drought risk to Goods Supply Activities	Low	Low	Moderate
Extreme Rainfall risk to Coastal / Marine Ecosystems	Low	Low	Moderate
Extreme Rainfall risk to Telecommunications	Low	Low	Moderate
Extreme Temperature risk to Ports / Wharves	Low	Low	Moderate
Extreme Temperature risk to Airports / Airfields	Low	Low	Moderate
Extreme Temperature risk to Telecommunications	Low	Low	Moderate
Extreme Temperature risk to Uninhabited Buildings	Low	Low	Moderate
Ocean Acidification risk to Goods Supply Activities	Low	Low	Moderate
Coastal Inundation risk to Water Transportation Activities	Low	Low	Low

Drought risk to Coastal / Marine Ecosystems	Low	Low	Low
Drought risk to Telecommunications	Low	Low	Low
Drought risk to Electricity	Low	Low	Low
Drought risk to Outdoor Marine Activities	Low	Low	Low
Drought risk to Outdoor Coastal Activities	Low	Low	Low
Drought risk to Water Transportation Activities	Low	Low	Low
Extreme Temperature risk to Stormwater / Flood Management	Low	Low	Low
Extreme Temperature risk to Land Transportation Activities	Low	Low	Low
Extreme Temperature risk to Water Transportation Activities	Low	Low	Low
Marine Heat Waves risk to Water Transportation Activities	Low	Low	Low
Ocean Acidification risk to Water Transportation Activities	Low	Low	Low

E

Appendix E – Project Inception Report

Vanuatu Rapid Climate Inception Report

FINAL

Prepared for Secretariat of the Pacific Regional Environment Programme (SPREP)
Prepared by Beca International Consultants Ltd

23 October 2023

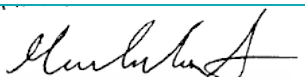
Contents

Appendices

Revision History

Revision Nº	Prepared By	Description	Date
A	Sophie Andrew / Kristin Renoux	For client review	23 Oct 2023

Document Acceptance

Action	Name	Signed	Date
Prepared by	Sophie Andrews, Kristin Renoux, Carlos Carvajal, Kayla Baker		23 Oct 2023
Reviewed by	Mike Allis		23 Oct 2023
Approved by	Cushla Loomb		23 Oct 2023
on behalf of	Beca International Consultants Limited (Beca)		

1 Introduction

1.1 Project background

Vanuatu is subject to multiple natural hazards such as tropical cyclones, earthquakes, intense rainfall, volcanic eruptions and tsunamis. The impact of many these natural hazards is increasing due to climate change. Tropical cyclones have been particularly severe in the recent decade resulting in significant damage to infrastructure and communities. To minimise future impacts, it is important that the key Vanuatu sectors have a good understanding of the climate risks and how they may change over time so that informed decisions can be made, and the resilience of its communities enhanced.

The scope of this project is the development of a Rapid Climate Risk (RCR) framework and methodology that can be applied from within Vanuatu to aid in assessing risks and prioritising response actions.

An effective climate risk framework for Vanuatu is one that will be able to be easily applied on the ground, relevant to a variety of sectors and designed in such a way that the outputs inform good long-term decision making.

The framework will be tested and deployed through a case study in the Tourism Sector (including infrastructure and fisheries associated with tourism).

1.2 Purpose of report

This Inception Report confirms the scope of work, programme, the stakeholders, the contributions and roles in the risk framework, how we will work successfully together to deliver this project and any other relevant information as discussed in the Inception Meeting.

The Inception Meeting for this project was held on 4 October 2023. The Agenda and Minutes from the meeting are attached as Appendix C.

The Inception Report includes:

- Programme of work and deliverables at each stage
- Planned stakeholder consultation and engagement
- Scope of the rapid climate risk framework and methodology
- Scope of the sector case study, including how the rapid climate risk framework will be applied to the sector case study on the Tourism and associated infrastructure and fisheries sectors (hereafter Tourism sector)
- Scope of the financial projections mechanism

1.3 Confirmation of scope and programme

1.3.1 Scope revision and project meeting outcomes

The initial scope for this project was revised to deliver as much as possible of the original project within the existing Green Climate Fund (GCF) Project programme constraints which emerged during contracting discussions.

The revised proposal was discussed and agreed with SPREP ahead of the Inception Meeting.

The key change to the original proposal was to remove the development of training materials guidance and hosting of training sessions in Vanuatu from the project scope and deliverables. Beca and SPREP noted that

this part of the project could be agreed and delivered in the new year (2024) depending on the availability of GCF finance.

In recognition of the reduced timeframe, the following further changes were agreed:

- Workstreams proceeding in parallel; development of framework and methodology in conjunction with undertaking the case study for Tourism (i.e. 'testing as we go')
- A condensed consultation process: 3x multi-stakeholder consultation sessions (to replace individual stakeholder meetings)
- Consultation meetings are to be organised and coordinated by SPREP and the Department of Tourism and supported by the Beca in country representative.
- Agreement on 18 stakeholders to include in consultation (refer Stakeholder Consultation plan and agreed list of stakeholders in Appendix A).
- Arrangement by SPREP of information sharing session with VanKIRAP climate information services partner CSIRO (10-10-2023).

The RCR framework will be developed with the intention that it can eventually be applied to the 5 key sectors for which CSIRO have focussed their climate information on and where stakeholder engagement has been undertaken. The 5 sectors are Infrastructure, Fisheries, Water, Agriculture and Tourism, with the RCR framework case study being in the Tourism sector specifically.

The RCR framework; will be developed to guide the user through an assessment of the potential direct physical risks. The scope of the RCR does not include supply chain risks, governance risks, transition risks (those risks arising from a rapid decarbonisation of the economy), cascading (the cross-sector sequence of risks from an initial direct event) and compounding risks (e.g. risk from extreme rain and extreme water levels at the same time).

The scope is outlined in full in Section 3.

1.3.2 Revised Programme

The revised programme for the project and deliverables is shown below. A more detailed plan is included in Appendix B to this report.

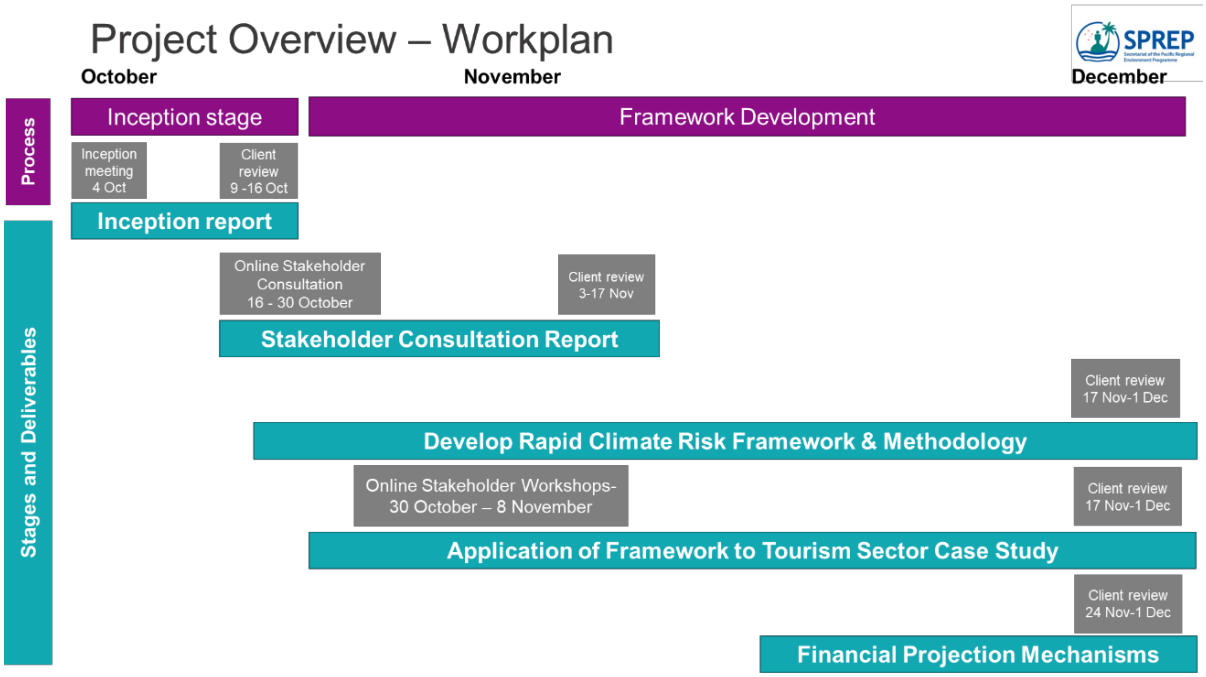


Figure 1 Diagram of Part 1 of project programme

We note that the compressed timeline requires timely review (review period indicated above) from SPREP and Department of Tourism for each deliverable.

Final deliverables are due on 8 December 2023 with the contract ending at this time. As agreed in the Inception meeting, if review comments are not received within the allocated client review window (as shown in the Work Plan above) then the draft deliverable will be considered the final.

2 Information Review

A brief information review has been carried out as part of this inception phase to understand what climate risk data exists and identify any data gaps that would need to be filled to ensure the successful development and implementation of the RCR framework. This information falls into two categories 1) climate hazard variables applicable to all sectors, and 2) sector specific information (e.g. asset, operations) on vulnerability to potential climate change impacts.

2.1 Climate hazard variables

The information that will be used for the future projections of climate hazards in the case study is briefly detailed below (Table 1), including the historical baseline, projection horizon, model ensemble used (where applicable) and the source. This information will predominantly be from the Vanuatu Climate Futures Portal (VanKIRAP), supplemented by other sources where necessary. There are a small number of identified data gaps (Table 2) around catchment-based flood mapping and vertical land movement. An understanding of which of the global climate models were used and potential differences to the latest models will also need to be explored further through the project.

The climate variable information to be used for the RCR case study assessment will reflect the information available at the time the framework is developed. This information will be predominantly from the Vanuatu Climate Futures Portal (VanKIRAP) portal as it stands 13th October 2023, supplemented by additional information shared by CSIRO and SPREP if in time for the framework development. No new climate hazards or climate variability information will be sought or updated. There will not be any on-the-ground consultation, surveying or mapping completed. An information review has been carried out for the availability of relevant

climate variables, but this work does not include a provision for assessing the technical robustness of the hazards information acquired; relying instead on CSIRO's quality assurance processes (as the provider of that information). Non climate hazards such as tsunami, earthquakes and volcanic eruption are excluded from the RCR framework

Table 1 Climate variable information availability. Note that CMIP5 projections are only available within VanKIRAP portal for two emissions scenarios; low (RCP2.6) and high (RCP8.5).

Climate Variable	Historical Baseline	Projected Period	Source
Coastal Inundation flood mapping (1, 10 & 100-year ARI at increments of 0.25m SLR to 10m)	1995	CMIP5 (low, high) 2020-2039 2040-2059 2060-2079 2080-2099	VanKIRAP
Extreme Rainfall (Yearly maximum rainfall for given ARI)	1985	CMIP5 (low, high) 2040-2070 2070-2100	VanKIRAP
Total rainfall (annual, seasonal and monthly scale) or anomaly	1995	CMIP5 (low, high) 2020-2039 2040-2059 2060-2079 2080-2099	VanKIRAP, CSIRO and SPREP publication
Sea level rise anomaly	1995	CMIP5 (low, high) 2100	CSIRO and SPREP publication
Temperature (min, mean and max annual)	1995	CMIP5 (low, high) 2020-2039 2040-2059 2060-2079 2080-2099	VanKIRAP
Tropical cyclone frequency and intensity (% increase)	1985	CMIP5 (low, high) 2070-2100	VanKIRAP
Tropical cyclones and extreme rainfall	-	2°C global warming	CSIRO and SPREP publication
Tropical cyclone wind speed (% increase)	1985	CMIP5 (low, high) 2070-2100	VanKIRAP
Aragonite Saturation State (Proxy for ocean acidification)	-	CMIP5 (low, high) 2100	World Bank
Marine heatwave projections (multiple parameters)	-	CMIP5 (low, high) 2020-2039 2040-2059 2060-2079 2080-2099	VanKIRAP

Table 2 Gaps or issues identified in review of climate variable information

Variable	Issue	Approach
Catchment based flood hazard modelling and mapping	Other consultants have been commissioned within the VanKIRAP programme to produce catchment-based flood mapping for selected catchments in Vanuatu (We understand the catchments modelled are the Cara catchment on Santo and the Malae catchment on Efato). We understand NIWA and another consultant are leading this and interfacing with CSIRO and the PMU. However, draft or final results are not expected to be available or uploaded to the VanKIRAP portal until 13 November 2023 (pers comm. email Geoff Gooley 12-10-2023).	The outputs of flood hazard mapping are anticipated to conform to typical flood mapping outputs; maps of flooding extent, depth and velocity for a range of storm magnitudes (rainfall intensity-duration ARI), climate change conditions (high/low emissions and SLR) and future timeframes (short-long term). We will interface with CSIRO and the flood modelling consultants to understand if their anticipated outputs support inclusion within the RCR framework.
Vertical Land Movement (VLM)	Vanuatu is in a seismically active region and subject to tectonically driven uplift and subsidence. This vertical land movement can accelerate or offset the apparent sea-level rise rates at the coast. It is unclear whether VLM is included within the VanKIRAP portal sea-level rise future scenarios.	We will use VanKIRAP portal information on SLR as it stands. We will include a link to available VLM studies within the RCR framework methodology and identify this as an additional step for advanced users to consider in sea-level rise impacts.
All	The VanKIRAP portal climate information services is based on CMIP5 projections (from the AR5 2013 suite of IPCC reports). Newer climate projections are available (CMIP6) from the latest IPCC reporting phase (2021, AR6) but are not included.	Continue to use VanKIRAP and CSIRO climate information products as they exist. Request statement from CSIRO about alignment of CMIP5 projections with CMIP6 at national scale across Vanuatu.

2.2 Sector specific information

The sector specific information needed to prepare an RCR framework falls into two main categories: assets that are used, owned or necessary to each sector's activities (e.g. buildings, wharfs) and the operations, services and activities that are carried out within the sector. Initial information sources relevant for multiple sectors in Vanuatu are indicated in Table 3. The consultation phase will be used to discover and request further information on assets and operations to inform RCR framework development.

Table 3 Nationwide sector related information available

Name	Description	Source
Open street map	Open-source database of built assets (buildings, roads) with some building uses. No QA or validation available.	OSM (link)
Pacific Data Hub maps and data catalogue	Hub for pacific datasets. Internationally sourced mapping on ocean boundaries, reefs, wind zones and some population information.	PDH (link)
Pacific Climate Change programme (PACCSAP)	Pacific Climate Change information – based on AR5 assessment. Prepared by SPREP and CSIRO. Superseded by VanKIRAP.	PACCSAP (link)
Climate Change Knowledge Portal (World Bank)	World Bank Country Profiles (CMIP5). Superseded by VanKIRAP.	World Bank (link)
NextGen projections (2021)	Current and Future Climate for Vanuatu. Superseded by VanKIRAP.	RCCAP (link)
Pacific Risk Information System (PACRIS)	Data from 2012-2015 research. GIS and tabular data includes partial coverage of built and natural environment information.	PCRAFI (link)
Case study 'infobytes' information for 5 key sectors [Note – these outputs are not accessible at the time of writing, hence the quality and type of information is unknown]	Example case study information for: - Infrastructure (Road length exposed to 3x ARI coastal flooding events with SLR) - Fisheries (8 fishery sites and national mapping of coastal habitats (mangroves, coral) overlaid with recent future marine heatwave parameters) - Tourism (1 tourism site exposure to 3x ARI coastal flooding events) - Agriculture (suitability of 5x crops under climate scenarios) - Water (maps of average monthly rainfall and temperature)	CSIRO within VanKIRAP

For the tourism case study, the sector specific information that has been located is detailed below in Table 4. Similar to the climate variable information, there have been gaps identified in the information available, this is detailed in Table 4. It is noted that additional information on past disruptions to tourism activities and impacts on assets will be sought through engagement.

Table 4 Tourism Sector specific information available

Name	Description	Source
Case study 'infobytes' information for 5 key sectors	Example case study information for: - Tourism (1 tourism site exposure to 3x ARI coastal flooding events)	CSIRO within VanKIRAP
Allen Coral Atlas	Mapping of benthic and geomorphic characteristics along with reef locations.	VanKIRAP
Fisheries statistics	Employment, vessel fleet size and limited catch information for varied time periods.	Food and Agriculture Organization of the United Nations (Link)

Name	Description	Source
Open street map data	Open-source database of built assets (buildings, roads) with some building uses. No QA or validation available.	https://www.openstreetmap.org
Vanuatu Sustainable Tourism Strategy 2021-2025	National strategy to implement a higher value low impact diversified tourism model	Vanuatu Sustainable Tourism Strategy 2021-2025
Vanuatu Pacific Tourism Sector Snapshot	Tourism sector overview and status for 2021	Pacific Private Sector Development Initiative report (link)
Pacific Data Hub maps	Hub for pacific datasets. Internationally sourced mapping data on administrative and ocean boundaries, reefs, wind zones and some population information.	https://map.pacificdata.org/

Table 5 Gaps identified in review of required information for application of RCR framework to Tourism case study

Variable	Issue	Approach
Sector contribution to national GDP	To determine past, current and projected contribution to assess future sectorial resilience.	We will interface with Department of Tourism to understand sectorial contribution.
Storm recovery spending invested in the sector	The ability for a sector to recover after a natural disaster will alter its vulnerability to climate change in the future. If there is contingency storm recovery funding then the vulnerability could be reduced.	We will interface with Department of Tourism to understand storm recovery spending post-events and proactively investment towards future events
Future projected investment into the sector	To understand current and future changes in investment strategy that could influence risk and vulnerability	We will interface with Department of Tourism to understand future investment and the current national sectorial investment strategy.
Fisheries statistics and logistics information.	Limited data from the Food and Agriculture Organization of the United Nations regarding fishery statistics.	We will interface with Department of Tourism to obtain required information
Asset information across all key sectors (e.g. buildings, structures, transport, hospitality, food, recreation, ports, electricity and network)	To determine the risk of climate change, information regarding the assets owned / used by the sector and their adaptive capacity/ sensitivity to climate change needs to be determined. As part of this, the location of assets is required to overlay with the climate hazard exposures.	We will interface with Department of Tourism to obtain required information
Tourism value chain analysis report(s)	To determine the direct and indirect impact of climate risks on the sector	We will interface with Department of Tourism to obtain required information
Policy and sectoral reports for each of the 5 sectors.	Reports including some identified vulnerabilities and risks for each sector. Access would provide	Request access to these reports from PMU (Sunny)

Variable	Issue	Approach
	background information for RCR framework development.	
Government (national or local) engagement and/ or survey information.	To supplement the stakeholder consultation workshops, any government engagement and/ or surveys regarding the sectors in terms of climate hazards, risks or vulnerability would be highly useful.	We will interface with Department of Tourism to obtain required information

Regarding applying the RCR framework and methodology for Vanuatu to a sector case study (Tourism and associated infrastructure and fisheries sectors), the preliminary analysis will rely on the information and consultation procedures collected and reported in CSIRO's sector case studies for Vanuatu. The case study analyses will incorporate the new information provided during the virtual consultation stage of this work. In the absence of information, any embedded assumptions in the framework development and case study analysis will be discussed with Department of Tourism and described in the methodology and results of the case study report.

3 Revised Project Scope

3.1 Develop a rapid climate risk framework and methodology for Vanuatu

A rapid climate risk (RCR) assessment is a method of quickly and effectively screening risks which may arise through climate change. The framework underpinning a national-scale RCR will be high-level to cover a broad set of potential climate change hazards and consider the range of possible impacts on relevant sectors across the country.

A RCR, rather than a detailed risk assessment, is targeted for use in resource-constrained situations and using qualitative, non-technical information to build an evidence base for identifying risks and prioritizing adaptation actions. A RCR is likely to highlight key areas of high impact or risk which could be the targets of a future detailed study at district level.

We will discuss with users of the RCR through engagement the potential structuring of the framework but we will follow similar internationally available examples, modified to suit the specific Vanuatu context and user needs.

Applying this framework will allow a sector within Vanuatu to produce:

- A qualitative overview of relevant climate hazards, including historical trends and projections.
- A summary of key climate risks across the relevant sectors
- Potential impacts across the relevant sectors.

A RCR framework comprises three assessment steps:

1. A climate hazard assessment step which identifies the probability, intensity and timescale of the key hazards and identifying areas that may be particularly impacted, taking into account the historical trends and current situation, as well as future scenarios based on available scientific evidence.
    - **We assume CSIRO and the Van-KIRAP portal will provide all evidence and information for climate hazards and have not allowed for any climate hazard assessments, mapping or**

analysis. We will consult with SPREP and CSIRO on the relevant and available climate hazard variables so the RCR framework aligns with VanKIRAP climate products developed by CSIRO.

- We will review outputs from the VanKIRAP project to understand the available climate information products and consider how they may be carried over to the RCR framework and methodology. Section 2 above outlines the availability of relevant climate variables within VanKIRAP but does not assess the technical robustness of the information; we rely instead on CSIRO's quality assurance processes.
- The climate variable information to be used for the RCR assessment will reflect the information available at the time the framework is developed. This information will be predominantly from the Vanuatu Climate Futures Portal (VanKIRAP) portal as it stands at submission of the draft inception report (13th October 2023), supplemented by additional information shared by CSIRO and SPREP. No new climate hazards or climate variability information will be sought or updated. There will not be any on-the-ground consultation, surveying or mapping completed.
- The VanKIRAP climate information portal data generally includes maps of climate variables under 2 future emissions trajectories (low - RCP2.6 and high - RCP8.5) at 4 future timeframes (2030, 2050, 2070, 2090), except for sea-level rise which is in 0.25m increments to 10m above present day. The RCR will utilise the RCP 8.5 for the risk assessment and consider present, 2050 and 2090 timescales).

2. An impact screening step which will identify potential consequences of the risk collectively on health and safety, financial, environmental and legal.

   This includes:

   - Understanding the scale of *exposure* of the Sector to climate hazards, from a high, medium or low, and based on how much of the sector-specific features (e.g. land, assets, population and systems) may be at risk from the climate hazards.
   - Assess *vulnerability* of the Sector to climate hazards: qualitative evaluation of how susceptible the exposed assets and operations are to climate risks. Consider factors like sensitivity (how easily they can be affected) and adaptive capacity (how well they can cope).
   - Analyse *impacts* to the Sector: Qualitatively understand the potential consequences of climate risks on different sector components, like infrastructure, agriculture, activities, health, or the environment.
   - As described above, for the timeframe and climate scenarios for the RCR, we will utilise the high emissions projection (RCP 8.5) at a present day, mid-century and end century timeframe. Selection of the high-emissions scenario is a conservative approach to identifying and prioritising actions and adaptation steps for risks that are likely to emerge sooner.

3. A risk assessment step to help users to identify their key climate risks. The framework will provide high level information on how to prioritize risks so that sectors can make informed decisions on actions and investment into climate adaptation and resilience. The prioritization will include aspects such as:
   - The qualitative risk rating framework and descriptions
   - Considering existing risk mitigations and adaptations: what actions are already in place to deal with climate risks.
   - Whether there are wider plans programmes of work that mean that certain risks are prioritized to gain efficiencies in addressing them
   - Confidence and urgency level for risks

- Identify adaptation options: Look for different ways to reduce the identified risks. Explore both physical (like building protections) and non-physical (like policies or community involvement) options.
- Consider costs and benefits: Evaluate the costs, advantages, and potential trade-offs associated with different adaptation options, including discussion about financial, economic, social, and environmental factors. This will be informed by the Financial Projections Mechanisms (see Section 3.3)

We aim to develop the RCR assessment framework in an easy-to-use format, such as an excel spreadsheet. The advantage of this format is that it can include the relevant formulas for scoring risks and enable users to filter and sort climate hazards according to their sector or element at risk. We will discuss the possible formats of the framework with stakeholders during the consultation sessions.

The RCR assessment framework will use qualitative criteria to score the exposure, impact and confidence of each climate risk. For example, low, medium, high, or severe for impacts scoring criteria. We will develop these criteria in collaboration with SPREP, VMGD, and the Department of Tourism. We will also supplement these criteria with quantitative data from the Van-KIRAP Portal and CSIRO products, where possible.

At the conclusion of this phase, we will present the draft Rapid Climate Risk Assessment Framework to SPREP, VMGD, Department of Tourism and project stakeholders. Following feedback from SPREP, VMGD, Department of Tourism and project stakeholders, we will deliver the final rapid climate risk assessment framework (Deliverable 3).

a) Apply the rapid climate risk framework and methodology for Vanuatu to sector case study – Tourism (to be selected) and associated infrastructure and fisheries sectors.

We will apply the RCR framework and methodology for Vanuatu to a sector case study site (Tourism and associated infrastructure and fisheries sectors), including virtual workshop consultation.

The specific site for the case study will be determined with the Department of Tourism ahead of consultation; we anticipate this will be either a countrywide but high-level application to the Tourism sector, or a district/island scale application to at higher granularity than a national level. We do not anticipate a site-specific assessment such as application to Port Vila city.

To apply the RCR framework we will draw on current and future risks based on information provided by CSIRO as part of the VanKIRAP project and intersect this information with the information on exposure, vulnerability, and adaptive capacity across the tourism sector (and associated infrastructure and fisheries) drawn from the initial stakeholder consultation phase, and our own experience with climate risks throughout the pacific.

The RCR framework will be used to prioritize the top 4-5 risks for the Tourism sector (nonspatial) and specifically include an identification of risks associated with tourism infrastructure such as ports/airports and fisheries associated with the tourism sector. These key risks will be used as the basis for the identification of potential adaptation measures for each risk (including in the main adaptation areas of Accommodate, Protect, Avoid and Retreat). In addition, our team will identify any urgent adaptation measures that may be required in the short-term across all risks identified for the Tourism Sector. These urgent adaptation measures will be limited to those risks where there is an immediate significant threat, where there is other adaptation or programmes planned or underway that adaptation measures could link to or where adaptation measures will inform longer term planning (such as monitoring measures).

Consultation regarding the case study will take place in the second phase of workshops and will entail only two 3-hour workshops due to the compressed project timeframe. These workshops will be virtual and will interact with the financial projection mechanisms task (Section 3.3).

We will produce a case study report (Deliverable 3) outlining the results of the RCR framework applied to the tourism sector. We will bring this as an outline draft to the second phase of consultation workshops (refer Figure 1), and will come to the workshops with an early draft of the pre-populated assessment on the Tourism sector to discuss where there are gaps or information to be incorporated. The workshops are an opportunity iterate on its development. The final case study report will follow the RCR framework and provide simple, visual graphics and narrative that can be used by other sectors as a worked example of applying the RCR.

At these workshops we will seek to understand whether there are currently any adaptation projects underway for the risks identified, and to understand the adaptation shortfalls identified and use this to inform the identification of urgent adaptation measures.

3.2 Consultation

Virtual consultation will commence with the relevant stakeholders based in Vanuatu to understand their needs, roles, and contributions to the project.

It was agreed at the Inception Meeting that in view of the compressed timeframe to deliver this project, stakeholder consultation will be undertaken through grouped stakeholder sessions over a two-week period. In email exchanges between SPREP, the Department of Tourism and Beca following the Inception Meeting it was agreed that 3 sessions of 2 hours each will be proposed to the list of relevant stakeholders identified by SPREP and the Department of Tourism. The stakeholders will only be required to attend one session. These sessions will be coordinated by the Department of Tourism, who will invite the stakeholders to select a session and maintain the register of attendance for each session, and compile information provided from the stakeholders.

The stakeholder consultation will be led by Kristin Renoux and Mike Allis and supported by our local engagement specialist Hannington Alatoa.

We will begin this consultation by providing the relevant stakeholders with a brief description of the project and what we are seeking from them. We will then hold virtual consultation sessions with the stakeholders to understand their specific needs, what role they will play and how they will contribute to this project. This information will enable the team to identify very early on the level of information and awareness of climate hazards in Vanuatu, particular end user needs for the framework (such as what format may work best for users) to achieve the best use of the tool.

The information provided during the consultation will be recorded and captured in a Consultation Report to be delivered to the client at the end of the consultation process (Deliverable 4).

A detailed description of the proposed consultation is discussed in the stakeholder engagement plan which can be found in Appendix A of this document.

3.3 Financial projection mechanism

In line with our project proposal, we will engage virtually with key stakeholders identified by the Department of Tourism and utilize our local engagement specialist to develop the scope and requirements of the financial projection mechanism which is appropriate for tourism investment.

We anticipate that the framework of the projection mechanism will be developed closely following and building upon the rapid climate risk framework and methodology developed earlier in this assessment, where climate-related hazards and the impact of those hazards are defined.

For the development of financial projections related to these risks, we will consult with the key stakeholders identified in the inception stage to develop adaptation measures for the top 4-5 priority climate risks for the tourism sector. These high-level measures will cover the key adaptation approaches of Accommodate, Protect, Avoid and Retreat. It is anticipated that 2-3 main adaptation measures will be identified under each approach

that can be selected in the development of specific approaches. Following this, we will develop the financial projection mechanism, which will show the financial projection framework based on the different climate scenarios and the high-level adaptation measures developed for these scenarios.

Broadly, the development of the scenario analysis will define a set of plausible climate scenarios (based on the rapid climate risk framework), identify key variables or indicators within each scenario that are most likely to affect the tourism investment, and the respective adaptation strategies. This will then be developed into a mechanism that helps with the financial projection for the tourism investments.

4 Programme and Personnel

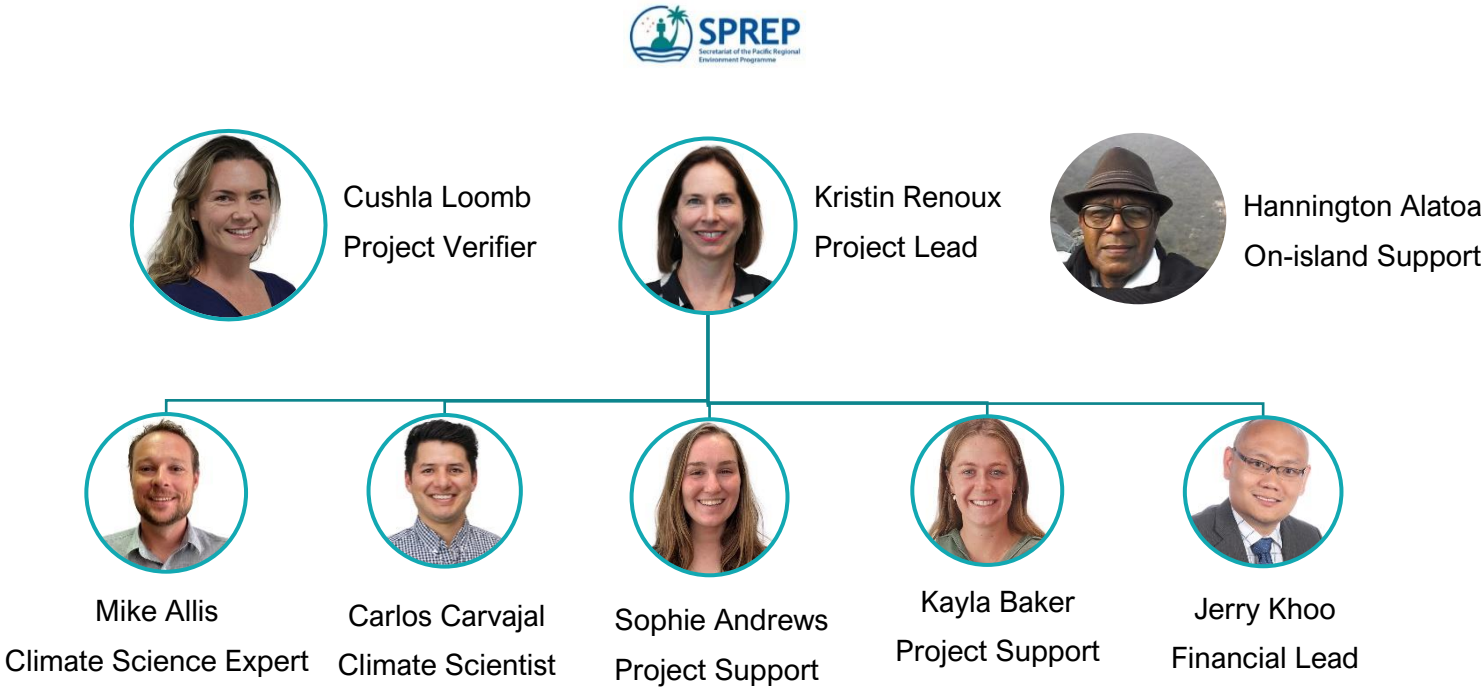
4.1 Project programme

The programme of works is attached as Appendix B of this report. It is important to note that the deliverables are as per the proposal with a compressed timeframe, running them in parallel due to the requirements of the funding for the project by the Green Climate Find (GCF). The compressed timeline also requires timely review (review period indicated above) from SPREP and Department of Tourism for each deliverable.

Final deliverables are due on 8 December 2023 with the contract ending at this time. Unless otherwise agreed, if review comments are not received within the allocated client review window (as shown in the Work Plan above) then the draft deliverable will become the final.

4.2 Project team

The BICL project team is outlined below:



5 Client reporting and approval process

Beca will provide a fortnightly email update starting 24 October 2023 that will include up-to-date workplan, challenges, and budget update. If needed, a meeting could be scheduled with SPREP.

SPREP has advised that the Department of Tourism is the organisation providing the review of draft deliverables. SPREP will combine the comments from Department of Tourism and SPREP as prescribed within the deliverable deadlines.

6 Project Risks

The following project risks were discussed at the second part of the Inception Meeting, which was confined to only SPREP and Beca attendees:

Project Risks	Outcome from meeting
Time constraints	• Consultation will be led by Department of Tourism and facilitated with SPREP. • Both organisations are aware of the time constraints. • SPREP confirms that no comment equates to an assumption of approval by Department of Tourism
Stakeholder engagement	• Consultation needs will need to happen with the next couple of weeks of October 2023. • Consultation to be set up in time slots where stakeholders would sign in and provide input
Delay to availability of information	• In that eventuality, Beca will inform SPREP about the information gaps the implications of the gaps and mitigate by progressing by making certain assumptions. SPREP approved of that approach and asked to note of those assumptions in the methodology
Political Risk	• No possible delays immediately identified by SPREP or Government • SPREP will keep Beca informed about any change in political status

7 Financial Management

Beca International Consultants Ltd (BICL) will invoice SPREP in line with progress payments of fixed fees set out in the table below, which are taken from the legal agreement for this project.

It was noted during the Inception Meeting that the Vanuatu Department of Tourism will be the organisation undertaking the review of the deliverables, however SPREP will combine the comments from Department of Tourism and SPREP to meet the milestones in the legal agreement.

Milestone Date	Milestone /Deliverable	Milestone Payment (USD)
23 October 2023	Submission of Inception Meeting report including approved work-plan (10%)	16,486.20
24 November 2023	Acceptance of Final Stakeholders' consultation Report including scope, needs and roles clearly identified (10%)	16,486.20
8 December 2023	Acceptance of Final Rapid Climate Risk Assessment Framework and methodology –up to 30 pages (30%)	49,458.60
8 December 2023	Acceptance of Final Applied Case Study for Tourism and as-sociated infrastructure and fisheries in Vanuatu (up to 20 pages) (20%)	32.972.40
8 December 2023	Acceptance of Financial protection mechanism to assist in the development standard costs analysis for tourism investments (10%)	16,486.20
	TOTAL (inclusive of GST)	**131,889.60**

A

Appendix A – Stakeholder Engagement Plan

Vanuatu Stakeholder Engagement Plan

FINAL

Prepared for Secretariat of the Pacific Regional Environment Programme (SPREP)
Prepared by Beca International Consultants Ltd

23 October 2023

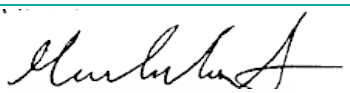
Contents

Appendices

Revision History

Revision Nº	Prepared By	Description	Date
1	Sophie Andrews, Kristin Renoux, Carlos Carvajal	For client review with inception report	23 October 2023

Document Acceptance

Action	Name	Signed	Date
Prepared by	Sophie Andrews, Kristin Renoux, Carlos Carvajal		23 October 2023
Reviewed by	Mike Allis		23 October 2023
Approved by	Cushla Loomb		23 October 2023
on behalf of	Beca International Consultants Limited		

1 Purpose

The purpose of this document is to provide a high-level overview of planned engagement activities Beca International Consultants Limited (Beca) will be undertaking for the Vanuatu Rapid Climate Risk Assessment project. It documents the organisations to be consulted, contact names, key messages/strategy and our proposed method of engagement.

2 Background

The Secretariat of the Pacific Regional Environmental Programme (SPREP) has engaged the Beca team, consisting of local and international specialists with knowledge in climate risk assessment and stakeholder engagement, to deliver this important project.

Beca will undertake stakeholder consultation with 18 key stakeholders who are made up of organisations that use the RCR framework and those with a connection to the tourism sector, to inform the development of the Rapid Climate Risk Assessment framework and methodology.

This framework will then be tested and deployed through a case study in the Tourism Sector (including infrastructure and fisheries associated with tourism).

3 Key terms

For the avoidance of doubt, we have briefly defined each of the key terms used in this high-level plan below.

Risk: The probability of occurrence of hazardous events or trends multiplied by the impacts if these events or trends occur. In this Project, the term risk is used to refer to the risks of climate-change.

Hazard: Climate-related physical events or trends, and their physical impacts, such as sea level rise or severe weather events.

Impact: Effects on lives, health/wellbeing, ecosystems and infrastructure as a result of realised or potential risks. Impacts can be adverse or beneficial.

Vulnerability: The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

Exposure: The presence of people; livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or economic, social, or cultural assets in places and settings that could be adversely affected by climate change.

4 Engagement Goals

The stakeholder engagement the Beca team will be undertaking is intended to gather input and information from key stakeholders which will be used to support the development of the framework and methodology, case study and financial projections for the tourism sector.

We intend to address the key messages and questions outlined in section 7 of this report and aim to understand each stakeholder's specific needs, what role they will play and how they will contribute to this project.

5 Consultation methodology

We will undertake this consultation through providing the 18 stakeholders identified by SPREP and the Department of Tourism with a brief description of the project and what we are seeking from them.

We will hold virtual consultation sessions with the stakeholders to understand their specific needs, what role they will play and how they will contribute to this project. This engagement will be concentrated into 3 x 2-hour sessions in the interest of accommodating the revised project timeframes.

Our understanding is that feedback and comments from the stakeholders will be gathered and consolidated through the Department of Tourism and communicated to our project team within the stakeholder consultation timeframe to allow for it to be incorporated in our reporting deliverable. Any feedback and commentary not received within the workplan timeframes will not be able to be incorporated.

The information provided during the consultation will be recorded and captured in a Consultation Report to be delivered to the client at the end of the consultation process.

This information will enable the team to identify very early on the level of information and awareness of climate hazards in Vanuatu, particular end user needs for the framework (such as what format may work best for users).

6 Key stakeholders

The following list of organisations have been identified as relevant stakeholders by the SPREP and Department of Tourism:

- SPREP
- Vanuatu Meteorology and Geo-Hazards Department (VMGD)
- Department of Tourism (DoT)
- Vanuatu Tourism Office (VTO)
- Public Works Department (PWD)
- Department of Geology and Mines
- Department of Ports and Harbor
- Vanuatu Chamber of Commerce and Industry
- Reserve Bank of Vanuatu
- Department of Finance and Treasury
- Commonwealth Scientific Industrial Research Organization (CSIRO)
- Department of Climate Change (DoCC)
- National Disaster Management Office (NDMO)
- Department of Environment Protection and Conservation (DEPC)
- Ministry of Tourism, Trade, Commerce and Ni-Vanuatu Business
- Vanuatu National Statistics Office (VNSO)
- Vanuatu Fisheries Department (VFD)
- Tropical Agency Limited (TAL)

7 Key messages and questions

The key messages that we want to convey to the stakeholders are:

1. The value in having an accessible climate risk framework that different stakeholders can implement.
    - Create comparative analysis and cooperation during decision-making processes.
2. The benefits of employing a standard framework to consistently evaluate climate risks.
3. The ability to identify priority risk areas for more detailed assessment and future entry point adaptation actions.
4. The impact of the frameworks' guidance on financial projections mechanisms for future strategy and investment.

Our approach to the stakeholder engagement is that we want to understand the relevant stakeholder needs and who the end user of this tool will be to develop an accessible framework, which can provide a consistent way to assess climate risk across the different sectors.

Key questions to the stakeholder groups will include:

- What are your core activities?
- Where do you operate within Vanuatu (critical locations/infrastructure, key activities, people)?
- Can you share any specific climate-related challenges, or risks that you have encountered in your sector? (With a specific lens on Tourism)
- What information do you already have about climate risk and vulnerabilities within your sector?
- What experience do you have with using risk frameworks?
- How could this climate risk framework be valuable to support your activities?
- What is the most useful format to you for making risk assessment decisions (do you have ready access to Microsoft excel)?
- What could prevent you from using this framework and methodology?

A

Appendix A - Register of stakeholders

Agency/ organisation	Stakeholder Group	Name of key contact	Title / role	Email/ Contact number
SPREP	All	TBC by DoT/SPREP		
Department of Tourism (DoT)	Tousism	Paul Pio	Director of Tourism	ppio@vanuatu.gov.vu (678) 33 400
The Vanuatu Tourism Office (VTO)	Tourism	Adela Issachar Aru	CEO	aissachararu@vanuatu.travel
The Department of Ports and Harbour	All	Kembro Manderson		kmanderson@vanuatu.gov.vu
Vanuatu Meteorology and Geo-Hazards Department (VMGD)	All	Junior Niroa		jjniroa@vanuatu.gov.vu
Public Works Department (PWD)	Tourism and fisheries	Andre Iatipu	Deputy Director	pwdheadoffice@vanuatu.gov.vu +678 33460 or +678 22790
The Department of Geology and Mines	All	Michel Leodoro	Geoscientist	mleodoro@vanuatu.gov.vu
the Vanuatu Chamber of Commerce and Industry	Tourism and fisheries	Joanna Spencer	Advisor	advisor@vcci.vu + 678 27543
The Reserve Bank of Vanuatu	Tourism and fisheries	Robert Peter	Senior Economist	(+678) 23333 rpeter@rbv.gov.vu
The Department of Finance and Treasury	Tourism and fisheries	Henderson Tagaro	Deputy Director	htagaro@vanuatu.gov.vu
Commonwealth Scientific Industrial Research Organization (CSIRO)	All	TBC by DoT/SPREP		
Department of Climate Change (DoCC)	Tourism and fisheries	Jerry Timothy	Manager, Climate Services	jerryt@vanuatu.gov.vu
National Disaster Management Office (NDMO)	Tourism and fisheries	Abraham Nasak	Director	anasak@vanuatu.gov.vu
Department of Environment Protection and Conservation (DEPC)	Fisheries	Rolenas Bareleo or Dean Wotlolan		r.tavue@gmail.com OR deanwotlolan@gmail.com
Ministry of Tourism, Trade, Commerce and Ni-Vanuatu Business	Tourism	Jack Lowane	Policy Coordinator	jlowane@vanuatu.gov.vu
Vanuatu National Statistics Office (VNSO)	All	Benuel Lenge	Chief Statisticain	blenge@vanuatu.gov.vu
Vanuatu Fisheries Department (VFD)	Fisheries	June Brian Molitaviti		jbmolitaviti@fisheries.gov.vu
Tropical Agency Limited [TAL]	Tourism	Mark Pardoe	Managing Director	mark@tal.vu OR (678) 22205

B

Appendix B – Work Plan

	Task	Due date	September			October					November				December			
			11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25
	Phase 1																	
	Commencement	14/09/2023																
	Inception meeting (virtual)	26/09/2023																
	Submission of Draft Inception meeting report	9/10/2023																
	Client review of draft inception meeting report	16/10/2023																
Deliverable 1	Submission Final Inception meeting report	23/10/2023																
	Invoice - Inception Meeting report including approved work-plan	23/10/2023																
	Approx [14] virtual stakeholder consultations																	
	Draft Stakeholder consultation report - scope / needs / roles identified	3/11/2023																
	Client review of stakecholder consultation report	17/11/2023																
Deliervable 2	Acceptance of Final Stakeholder consultation report - scope / needs / roles identified	24/11/2023																
	Invoice - Final Stakeholders' consultation Report including scope, needs and roles clearly identified	24/11/2023																
	Draft Climate risk assessment framework and methodology (up to 30 pages).	17/11/2023																
	Present the draft Rapid Climate Risk Assessment Framework and Methodology to SPREP, VMGD, DoT and project stakeholders.	TBC (Week of 20 November 2023)																
	Client review of Climate risk assessment framework and methodology	1/12/2023																
Deliverable 3	Final/ Client acceptance of Climate risk assessment framework and methodology	8/12/2023																
	Invoice - Final Rapid Climate Risk Assessment Framework and methodology	8/12/2023																
	Send out stakeholder workshop invitations																	
	Undertake 3 x 3-hour stakeholder workshops virtual (1 for Tourism, 1 for Fisheries and 1 for Infrastructure)	TBC (23 October to 1 November 2023)																
	DRAFT Apply case Study for Tourism and associated infrastructure and fisheries in Vanuatu (up to 20 pages).	17/11/2023																
	Client Review of Case Study for Tourism and associated infrastructure and fisheries in Vanuatu	1/12/2023																
Deliverable 4	Final/ Client acceptance of Case Study for Tourism and associated infrastructure and fisheries in Vanuatu	8/12/2023																
	Invoice - Final Applied Case Study for Tourism and as-sociated infrastructure and fish-eries in Vanuatu	8/12/2023																
	Draft Financial Projections Mechanism for Tourism Investments	24/11/2023																
	Client review of Financial Projections Mechanism for Tourism Investments	1/12/2023																
Deliverable 5	Final/Client acceptance of Financial Projections Mechanism for Tourism Investments	8/12/2023																
	Invoice - Financial protection mechanism to assist in the development standard costs anal-ysis for tourism investments.	8/12/2023																

C

Appendix C – Inception Meeting Minutes and Presentation

Vanuatu Rapid Climate Risk Assessment Framework Inception meeting minutes

Held 4th October at 11.30am NZDT (9.30am VUT)

Teams Meeting

Attendees:

- Sunny Seuseu - SPREP
- Geraldine Tari Natu – Vanuatu Department of Tourism (DEPARTMENT OF TOURISM)
- Geoff Gooley - CSIRO
- Rebecca Gregory - CSIRO
- Hannington Alatoa - On-Island Consultant
- Cushla Loomb – Beca Project Director
- Kristin Renoux – Beca Project Lead
- Mike Allis – Beca Climate Science Expert
- Carlos Carvajal – Beca Climate Scientist

Part 1 – Welcome and Background

Item	Action
1. Key Project Objectives • Team introductions • Awareness of: – Deadline for the project Phase 1 is 10th of December – Phase 2 is dependent on an extension decision by end of the year • Demonstrate how the information produced by SCIRO can be embedded within the Tourism case study • Confirm that the Rapid Climate Risk Assessment Framework (RCRAF) methodology will use the information already available and ensure that the framework will usable by broader sectors • Clarify that the nature of the RCRAF is one that allows non-technical people within the government agencies to be able to do a quick assessment across their relevant sector and highlight the prospect of future detailed planning	• SPREP to ensure that stakeholders are aware of project kick-off and deadlines, as their needed involvement is critical. • SPREP and Department of Tourism to confirm stakeholder list with 1-2 representatives • Department of Tourism to send a notification memo to start the stakeholder engagement

2. Key Deliverables and Workplan There are 5 project deliverables 1. Inception meeting and inception meeting report 2. Stakeholder consultation and report 3. Rapid Climate Risk Framework Methodology report 4. Tourism sector case study report 5. Financial projection mechanism report • All these deliverables need to be "usable and used" by the people of Vanuatu to provide insight into risks and opportunities in different sector context • The rapid framework is one that is easily applicable and intentionally high level • There is no National Adaptation Plan for Vanuatu [Outside current scope] • Gap: no method for a standard risk assessment factor of exposure and vulnerability [Outside current scope] • CSIRO has data regarding case studies and tools that guide sectors. • CSIRO and VanKIRAP provides the portal to see the climate information	• Inception report to be delivered by the 9/10 depending on information delivery. (BECA) • Coordinate a meeting with CSIRO (Geoff, Rebecca, Liam, Nathan) through SPREP (1 hr)
3. Stakeholder Consultation • Who are the stakeholders and the key contacts? • 18 stakeholders identified so far • Other stakeholders that may be worth adding: – GIZ consultancy is working on national vulnerability assessment. – Save the Children has a project about risk assessment and could be a key framework user. This stakeholder is under the Department of Climate Change • The shortened project timeframe requires a condensed consultation process (3x multi-stakeholder meetings to replace 14x individual stakeholder meetings).	• SPREP and Department of Tourism to confirm list of stakeholders and provide 1 or 2 key contacts • Department of Tourism (Geraldine) to start engaging with list of stakeholders with a memo to notify about the upcoming consultation • SPREP to confirm GIZ's involvement and national vulnerability assessment development. SPREP to find the timeline and scope of project. • Beca will coordinate consultation material and create a virtual meeting program to engage with stakeholders (time slot format)

4. Information Gaps • Information review from VanKIRAP. Will a compilation of all the data be available to Beca? Geoff (CSIRO) confirmed yes. • Fluvial flooding data is not available because it is under preparation with NIWA. The final report was due at the end of September. It should be out in the next few weeks. For Santo, it would be the Cara catchment, and for Efato would be Malae catchment (a combination of 3 rivers) • VanKIRAP 3.0 to get published in November which is the last contractual commitment of CSIRO with SPREP. However, CSIRO is happy to share information before uploading version 3.0. • Beca noted that the project timeline cannot wait for additional NIWA and CSIRO outputs and will proceed with the information available at project commencement (10 October).	• CSIRO team to coordinate data transfer with Beca in the next meeting • Department of Tourism will facilitate data information requests and provide information as per the due date.

Part 2 - Administration, Project Management, reporting and invoicing

Item	Action
1. Project reporting and invoicing • 5 Deliverables with 5 payments. As soon as the deliverable is clear with Department of Tourism, then invoice needs to be sent and SPREP authorises the payment. • Department of Tourism is the organisation providing the review. SPREP will combine the comments from Department of Tourism and SPREP as prescribed with deadlines	• Beca will provide a fortnightly update that will include: up-to-date workplan, challenges, and budget update. If needed a meeting could be scheduled.
2. Project Risks • Consultation will be led by Department of Tourism and facilitated with SPREP. Both are aware of the time constraint. • SPREP confirms that no comment equates to the assumption of approval by Department of Tourism. • Consultation needs to happen with the next couple of weeks for the project to remain on programme. • Consultation to be set up in time slots where stakeholders would sign in and provide input. • Delays due to information availability. In that eventuality, Beca will inform SPREP about the information gaps the implications of the gaps, and mitigate by progressing by making certain assumptions. SPREP approved of that approach and asked to note of those assumptions in the methodology. • No other anticipated delays from SPREP or Government, just keeping informed about political status	
3. Other Business None	

Minutes by: Carlos Carvajal

Vanuatu Rapid Climate Risk Framework Inception Meeting

4 October 2023

make everyday better.

Meeting Agenda - Part 1

1. Introductions
2. Objective of the meeting
3. Timelines and deliverables
4. Questions and answers

Introductions

Beca Project Team

Cushla Loomb
Project Verifier

Kristin Renoux
Project Lead

Hannington Alatoa
On-island Consultation

Mike Allis
Climate Science Expert

Carlos Carvajal
Climate Scientist

Sophie Andrews
Project Support

Kayla Baker
Project Support

Jerry Khoo
Financial Lead

Key Project Objectives

Key Deliverables and Milestones

Project Overview – Workplan

October **November** **December**

Process

Inception stage

Framework Development

Inception meeting 4 Oct

Client review 9 -16 Oct

Inception report

Stages and Deliverables

Online Stakeholder Consultation 16 - 30 October

Client review 3-17 Nov

Stakeholder Consultation Report

Client review 17 Nov-1 Dec

Develop Rapid Climate Risk Framework & Methodology

Online Stakeholder Workshops- 30 October – 8 November

Client review 17 Nov-1 Dec

Application of Framework to Tourism Sector Case Study

Client review 24 Nov-1 Dec

Financial Projection Mechanisms

Stakeholder consultation

Identified Stakeholders

1. SPREP
2. Department of Tourism (DoT)
3. The Vanuatu Tourism Office (VTO)
4. The Department of Ports and Harbour
5. Vanuatu Meteorology and Geo-Hazards Department (VMGD)
6. Public Works Department (PWD)
7. The Department of Geology and Mines
8. the Vanuatu Chamber of Commerce and Industry
9. The Reserve Bank of Vanuatu
10. The Department of Finance and Treasury
11. Commonwealth Scientific Industrial Research Organization (CSIRO)
12. Department of Climate Change (DoCC)
13. National Disaster Management Office (NDMO)
14. Department of Environment Protection and Conservation (DEPC)

Information Gaps

Information Request

- Key Contact Information per organisation

- Purpose: Tool Framework Development
  - Climate and Hazard data (Historical data ends in 2000-2005):
    - Daily rainfall, temperature, wind, sunshine data
    - Drought and freshwater availability
    - Marine ecology survey data/monitoring data national + local
    - Storms historical records
    - Seismic historical records
    - ENSO historical records
    - Coral bleaching records

Information Request

- Purpose: Tourism Case Study
  - Sector contribution to national GDP and economic sector breakdown
  - Storm recovery spending invested in the sector
  - Future projected spending (long-term plan)
  - Fisheries statistics and logistics information
  - Infrastructure assets information (capital and operational costs)
    - Location of assets
    - Transport infrastructure
    - Hospitality
    - Food
    - Recreation
    - Ports
    - Electricity and network infrastructure
  - Any government (national or local) engagement/survey

Q + A

Meeting Agenda Part 2

1. Project reporting / Invoicing
2. Project Risks
3. Other Business

Project reporting / Invoicing

Project Risks

Other Business

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F

Appendix F – Stakeholder Consultation Report

Vanuatu Stakeholder Consultation Report

FINAL

Prepared for Secretariat of the Pacific Regional Environment Programme (SPREP)
Prepared by Beca International Consultants Ltd

23 November 2023

Contents

Appendices

Revision History

Revision Nº	Prepared By	Description	Date
1	Sophie Andrews		31/10/2023
2	Kristin Renoux		1/11/2023

Document Acceptance

Action	Name	Signed	Date
Prepared by	Kristin Renoux and Sophie Andrews		23/11/2023
Reviewed by	Mike Allis		23/11/2023
Approved by	Cushla Loomb		23/11/2023
on behalf of	Beca International Consultants Ltd (BICL)		

Executive Summary

Beca International Consultants Limited (Beca) has been commissioned by *the Secretariat of the Pacific Regional Environment Programme* (SPREP) to prepare a rapid climate risk screening and test on tourism sector (the 'Project'). For this stage of the project, Beca has undertaken consultation with key stakeholders identified by SPREP and the *Vanuatu Department of Tourism* (DOT) to understand their climate risk assessment needs, and the roles and contributions they can make to this project. The engagement with these stakeholders and information gathered is being used to inform the development of a rapid climate risk assessment framework and methodology, the application of the framework to a tourism case study and the development of a financial projection mechanism for tourism.

This report explains the stakeholder consultation process undertaken and the scope, needs and roles of stakeholders identified during the consultation sessions.

The impact of Tropical Cyclone *Lola* during the final week of consultation from the 24 October 2023 impacted planned engagement, and the third stakeholder session was not able to proceed, however valuable information and themes came through from the two consultation sessions held.

During consultation stakeholders highlighted the need for an accessible climate risk assessment framework that can be used by stakeholders across the five key sectors (Infrastructure, Fisheries, Water, Agriculture and Tourism) as well as future in country guidance and training to support the end users to successfully use and implement the framework.

Tourism stakeholders provided information about the impact of climate change on different tourism activities. In particular, stakeholders referenced the impact on the Vanuatu Dive Industry as being of particular concern. For this reason, the tourism case study selected the Dive Industry for testing the Rapid Climate Risk framework.

1 Engagement Scope

It was agreed with SPREP at the Inception Meeting that due to the compressed timeframe to deliver the project, stakeholder consultation would be undertaken over a two-week period and utilising set ‘sessions’ that stakeholders could choose from. To facilitate greater attendance by a broad range of stakeholders a mixture of days and times were provided.

Three sessions of 2 hours each were scheduled and invites sent to key stakeholders identified by SPREP and the Department of Tourism. Stakeholders were advised that they were only required to attend one session. The sessions were coordinated by the Department of Tourism, who invited the stakeholders to select a session and maintained the register of attendance for each session.

SPREP and DoT identified 18 target stakeholders to undertake consultation with. These stakeholders are as detailed in Appendix C.

The purpose of the consultation has been to understand the roles and needs of the stakeholders, and to identify the end users of the framework and the format that will be the most appropriate for these end users.

The purpose of this report is to analyse the information gathered from the consultation sessions to appropriately inform the direction and format of the framework and methodology, case study and financial projections mechanism for the project.

Guidance and training were included within the original scope of this project but were deferred due to funding timeframes.

2 Stakeholder Engagement Process

Stakeholders were provided with a 2-page project summary document prior to the consultation sessions. This provided a brief description of the project and the objectives of the engagement sessions. In each session, the Beca team utilised a presentation to describe the background to the project, the scope of the rapid climate risk assessment and pose particular questions of attendees around user needs for the framework. The project summary document and presentation are attached as Appendix A of this report.

Beca facilitated three virtual stakeholder consultation sessions on the 18th, 19th and 24th of October 2023. The minutes from the first two meetings can be found in Appendix B. Unfortunately, all Vanuatu-based stakeholders were unable to attend the third session due to Tropical Cyclone *Lola* impacting the country.

To supplement the absence of the third consultation session, all stakeholders were provided with an opportunity to respond to the key engagement questions through a short online survey questionnaire.

The questions asked to the stakeholders at these consultation sessions were as follows:

- What is your organisation?
- Where do you operate within Vanuatu?
- What climate issues are you already seeing in your sector?
- How is climate change already affecting your organisation?
- What would help you to consider climate risks into your future planning?
- What role does your organisation play in identifying climate change risks in Vanuatu?
- Who do you think the end users of this framework will be?

2.1 Session attendees

All sessions were attended by internal stakeholders of SPREP, with Session 1 and 2 attended by the Vanuatu Meteorology and Geo-Hazards Department (VMGD).

Session 1

The external stakeholders who attended Session 1 were three representatives of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) involved in the VanKIRAP project previously and the Country Manager for Tropical Agencies Limited who is also the Domestic Shipping National Representative for the Chamber of Commerce.

Session 2

The external stakeholders who attended Session 2 was the Acting director of the Department of Tourism and a representative from the Vanuatu Environmental Science Society (VESS). This representative is also the president of the Vanuatu Scuba Operators Association, she co-owns the Big Blue Dive Company which operates around Vanuatu, and her partner operates a metals recycling business.

Session 3

No external stakeholders were able to attend due to Tropical Cyclone *Lola.*

2.2 Stakeholder survey

To support the stakeholder consultation and increase the opportunity to provide comment, a survey with key questions was sent to all stakeholders provided by SPREP and the Department of Tourism.

The questions asked in this survey were:

1. What is the name of your organization and its core activities?
2. Where do you operate within Vanuatu? E.g. Regions, critical locations and infrastructure, key activities, and communities.
3. How do you currently consider climate risks to your infrastructure and activities? E.g. risk assessments, planning tools, national hazard information
4. What format of a rapid climate risk assessment tool would be most practical for your decision making? E.g. excel workbook, flow chart, app
5. What would prevent you from using a climate risk framework and methodology? E.g. capability, capacity, equipment

No responses to the survey were received by the deadline required to meet the tight project timeline (end of day on the 31st October 2023).

3 Engagement Outcomes

This section outlines the key messages and findings from the Engagement Sessions. A full record of meeting minutes of the sessions is included in Appendix B.

3.1 Session one

3.1.1 Stakeholders' organisation

The representatives from SPREP and VMGD offered stakeholder perspectives from the client and project manager point of view.

The Vanuatu country manager for Tropical Agencies Limited (TAL) also has a role as the domestic representative for the chamber of commerce as well as a role in commercial shipping. His role at TAL is to coordinate with cruise ships and their associated port, berthing and some shore excursion activities. There are two TAL offices in the country (Santo and Port Vila) and these support cruise activities during the cruising season (November to March).

The three CSIRO representatives attended the consultation session on behalf of CSIRO. They offered perspectives from multiple in-country missions and over 5 years working on the VanKIRAP project.

3.1.2 Climate change observations

The TAL representative relayed that the perspective of shipping agencies and cruise lines in Vanuatu is that their biggest concerns is the number of weather-related incidents which affect their operations and schedules. In the past these events caused impacts such as ships being diverted to other islands, bypassing Vanuatu for other ports, as well as flooding and landslips on roads which limit access to the Port and shore activities and truncates the time which tourists have for activities.

3.1.3 End user discussion

They provided ideas from previous community engagement in Vanuatu, expressing that the framework is more likely to get traction with end users if it is in a format that is accessible and caters to a range of capabilities. This should recognise both the time pressures and level of understanding of users, especially if it were the tourism operators. There was also a recommendation to use infographics to display information for the framework.

3.2 Session Two

3.2.1 Stakeholders' organisation

Our second stakeholder engagement session included the representatives from SPREP and VMGD with two additional stakeholders- the Acting Director for the Department of Tourism and a representative from the Vanuatu Environmental Science Society (VESS).

The representative from VESS is also the president of the Vanuatu Scuba Operators Association and the co-owner of Big Blue Dive company. From a scuba and diving perspective, the representative made many references to environmental degradation, bleaching of the coral reefs, particularly after a cyclone and marine heat waves.

The indirect risks to the tourism industry were also discussed, with mention of a reduction in local food production which is often used by a large number of the operators to provide to tourists on diving trips.

3.2.2 Climate change observations

From a scuba and diving perspective, the representative of VESS made many references to environmental degradation, bleaching of the coral reefs, particularly after a cyclone and marine heat waves. It was noted that as the temperature of the water cools again after the cyclone, the reefs start to return, however, recently, the temperature of the water hasn't returned to a cold enough temperature to provide relief to the reef.

The indirect risks to the tourism industry were also discussed, with mention of a reduction in local food production which is often used by a large number of the operators to provide to tourists on diving trips.

3.2.3 End user discussion

The President of the Vanuatu Scuba Operators Association notes the tourism industry operators are more focussed on the immediate day-to-day or season-to-season risks of the activity/operations, and that the medium to long-term risks such as increasing climate impacts are rarely looked at by tourism operators.

The majority of investment for operators goes into equipment and asset management, with a reduced focus on preparing for future risks. SPREP expressed that the framework would be useful to be targeted towards end users who need support and training, so they have the opportunity to build their capability in identifying potential future risks.

Training and support were also discussed with the intention of enhancing the skills of all operators to use the framework. The potential of incentives in the form of grants or business enhancements were suggested to help develop the buy in of a number of the operators, particularly as some operators are small and struggle with the day-to-day operation of their business. To appropriately provide for this support, the Acting Director of Tourism discussed the potential of involving the Product Development Officers (PDOs) to assist in the training or to offer support in the use of the framework. The PDOs are located in each of the 6 provinces across Vanuatu and are well connected to the operators and National Government Organisations (NGOs) in their respective province.

The need for simplicity in the framework was also emphasised, echoing the conversations from session one about the needs of the end users.

The needs of stakeholders were noted to vary, typically because of size and location of the operations and activities. This led to the suggestion of the end users being address in two levels- the smaller operators in more remote locations being provided with additional support and training to use the framework effectively, and the medium/large operators from islands such as Port Vila and Santo who can use the framework more independently.

It was proposed by the representative of VESS that in order to reach the attention of many operators it would be useful to produce a summary workbook with findings and suggestions for mitigation that are practical and can be used to plan for the future of their operations. This is likely to produce a higher rate of engagement as it reduces the overwhelming feeling of applying the framework or tool themselves.

4 Recommendations

4.1 Training and guidance

Providing for training and guidance to end users for this framework is a key message that has come across in the consultation sessions. Our recommendation is to continue with the proposed Stage 2 of this project which includes preparation of training and guidance materials and facilitation of in-country training sessions. This additional training would enhance uptake and implementation of the framework into the tourism sector of Vanuatu.

4.2 End users

There was varied discussed about the appropriate end users for this framework.

CSIRO and tourism stakeholders indicated that widespread individual operators are very likely to be focussed on their immediate day-to-day operational activities and are unlikely to have capacity to learn about or develop their understanding of the framework or its implementation. As discussed in Section 3.2.3 of this report, it is likely operators would be more receptive towards the framework if the assessment has already been undertaken and they are presented with relevant findings and recommendations.

The consultation identified tourism associations and some government agencies that may be more appropriate entry points to build climate resilience through using the rapid risk assessment framework and methodology.

Our recommendation is the end users for this framework are those within the tourism industry associations and government department officials who can support, as required, individual operators to undertake a climate risk assessment of their operations and activities.

This level of end user is understood to have a working knowledge of the industry such that they could complete the rapid risk assessment. They are also anticipated to be connected to the key operators on the ground and stakeholders in government licencing and regulation. These agencies can provide central points at which training, and guidance can be delivered and the risk information gathered from across sectors and consolidated to inform decision-making at different levels about the short, medium and long term climate risk being faced in Vanuatu.

4.3 Case study

Various tourism related industries were discussed in the consultation sessions; the large accommodation providers, smaller bungalow accommodation, cruise ships, agricultural ‘eco-tourism’ and tourism to experience the pristine reefs, wildlife and beaches. The dive industry was mentioned and discussed in both consultation sessions. This industry was noted as a large contributor to the economy, employed many people around the country, and was an activity that visitors to the island frequently take part in whether they arrive by cruise ship or airport.

During the consultation follow up session we have confirmed with SPREP and DoT that the dive industry is appropriate to take forward as a case study to apply the framework and develop the financial projection mechanisms around.

Relative to the purpose of the project and the information gathered through the stakeholder consultation sessions, focusing the case study on the dive industry appears to be appropriate to demonstrate the rapid climate risk framework.

A

Appendix A – Stakeholder consultation materials

Project: Rapid Climate Risk Assessment Framework, Methodology and Case Study for Tourism Sector and Associated Infrastructure and Fisheries in Vanuatu

Project Outline

This work continues from the VanKIRAP project with VMGD, SPREP and CSIRO.

To create: A high-level framework and methodology to achieve a rapid understanding of the climate change risks that will inform strategic decision making.

Goals: The framework and methodology are accessible and can be understood by stakeholders for future use.

It can be picked up by different sectors and applied in a consistent way that will allow for a sector-wide understanding of the climate risks and assist in building resilience.

It will include a case study of the tourism sector.

Key project outputs:

- Rapid Climate Risk framework and methodology report.
- A rapid assessment of the tourism sector as a case study.
- Financial mechanism for possible adaptation measures for the tourism sector.

Stakeholder Consultation Sessions (3 options)

- 18th October 11am – 1pm (Vanuatu local time)
- 19th October 1-3pm (Vanuatu local time)
- 24th October 11am – 1pm (Vanuatu local time)

Please select a session (**you only need to attend one**!) and join for the full 2 hours. We will start with an overview presentation before seeking your input.

What we want from you…

During the session we will discuss:

- Your specific climate risk related needs
- Who the end users of the framework will be
- The role your organisation has and how climate change may be affecting you
- What format of a risk framework is appropriate for you.
- How you currently consider climate risks
- What is already happening in response to climate risks

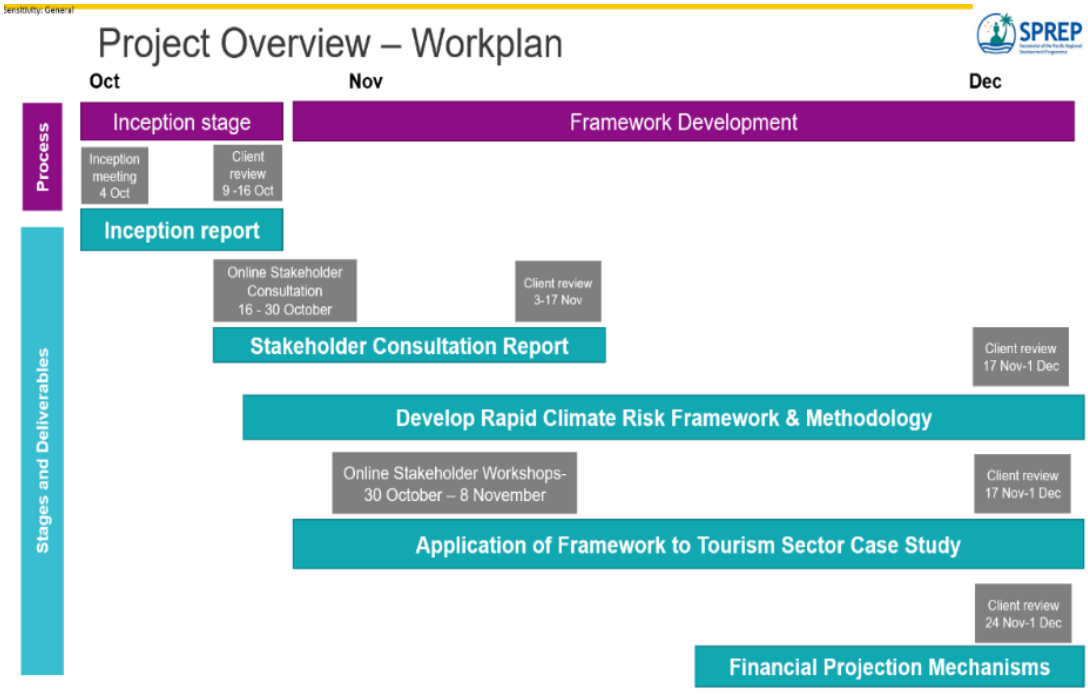
Beca Project Facilitators:

Mike Allis
Climate Science Expert

Sophie Andrews
Project Support

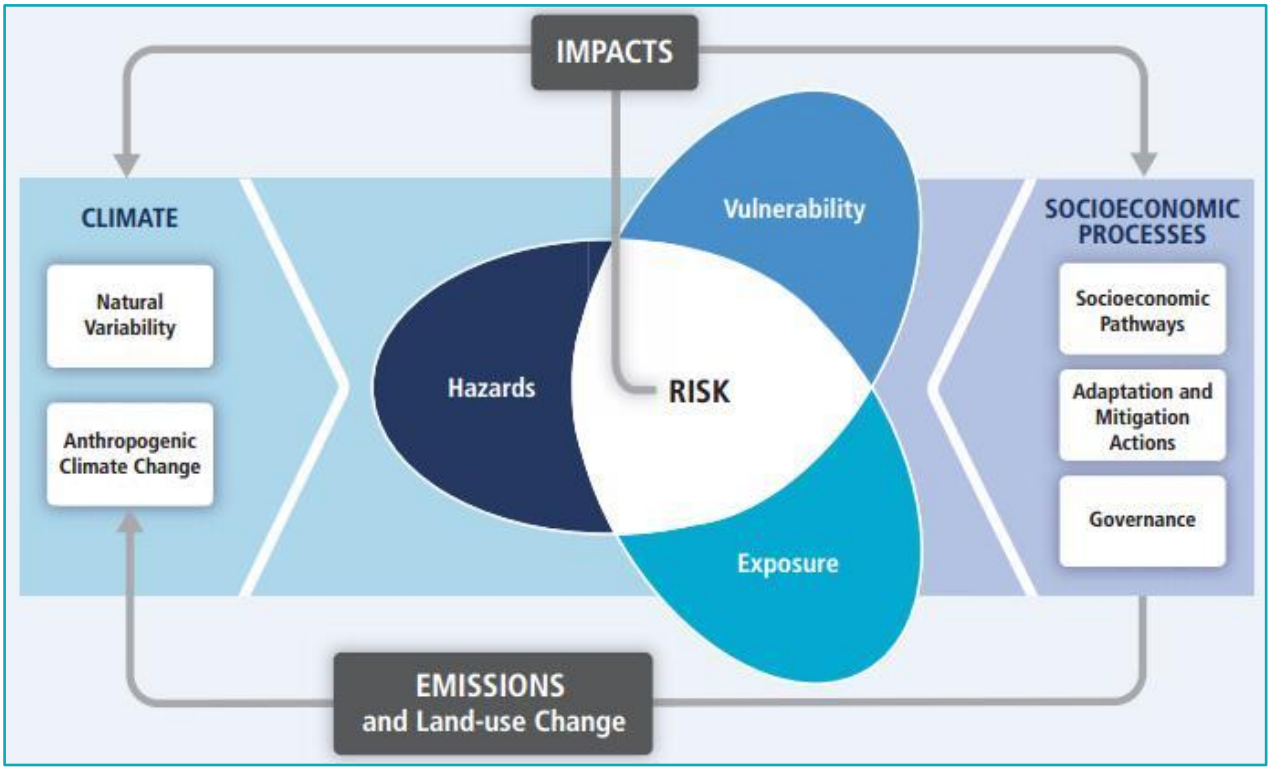
Kristin Renoux
Project Lead

Hannington Alatoa
On-island Support



Climate Risks

There are three factors that determine a risk (the physical impact), **Hazards, Vulnerability and Exposure**.



Hazards are a natural or climate change induced physical event that have the potential to cause damage. For example, cyclones, sea level rise, and droughts are hazards. We are not considering non-climate hazards (such as volcanic eruption and tsunami) as part of this project.

Vulnerability is the degree to which an asset or a community can be harmed by a hazard and the ability to adapt to reduce this harm. For example, coral reef areas are more vulnerable than fish to ocean acidification as coral reef species cannot 'move to other areas' as a result of their changing environment.

Exposure refers to the extent to which a system is exposed to a given hazard. For example, a coastal community in a low-lying area can be exposed to a certain level of inundation risk during a storm event.

Vanuatu Rapid Climate Risk Framework Consultation Meeting

18 October 2023

make everyday better.

Meeting Agenda

1. “House Keeping”
2. Introductions from Beca
3. Project, outline and scope
4. Introductions from Stakeholders
5. Project Goals and Discussion
6. Questions and answers

House Keeping

Free and open conversation

- Connectivity
  - Video on when talking if possible
- We want to hear from everyone, please be mindful of time
- Short online survey at the end, to capture your thoughts if we run out of time today
- Sessions will be recorded

Beca Project Facilitators

Kristin Renoux

Project Lead

Mike Allis

Climate Science Expert

Carlos Carvajal

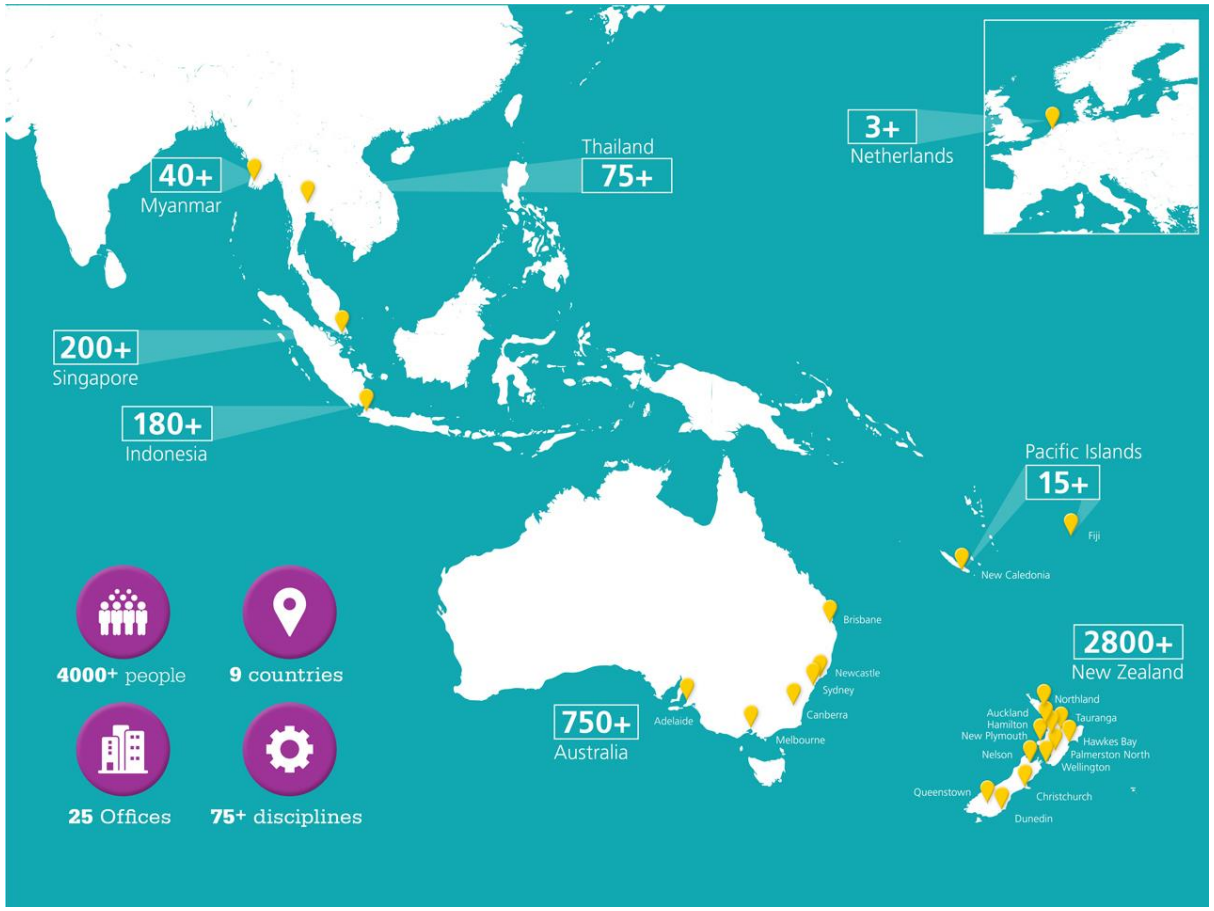
Climate Scientist

Hannington Alatoa

In Country Support

Sophie Andrews

Project Support



SPREP Secretariat of the Pacific Regional Environment Programme

Beca

Project Outline and Scope

Project Overview – Bigger Picture

Van-KIRAP Project

Climate variable mapping, Case studies, Factsheets

Consultation Sessions

- Today!
- Understand stakeholder needs to ensure the framework is accessible.

High Level Rapid Climate Risk Assessment Framework

- Case study on Tourism – Fisheries/ Infrastructure

Project Overview – Workplan

October **November** **December**

Process

Stages and Deliverables

Inception stage

Framework Development

Inception meeting 4 Oct

Client review 9 -16 Oct

Inception report

Today

Online Stakeholder Consultation 16 - 30 October

Client review 3-17 Nov

Stakeholder Consultation Report

Client review 17 Nov-1 Dec

Develop Rapid Climate Risk Framework & Methodology

Online Stakeholder Workshops- 30 October – 8 November

Client review 17 Nov-1 Dec

Application of Framework to Tourism Sector Case Study

Client review 24 Nov-1 Dec

Financial Projection Mechanisms

Stakeholder Introductions

Introductions

1. What is your organisation?
2. Where do you operate within Vanuatu?
3. What climate issues are you already seeing in your sector?

Project Goal & Discussion

CSIRO Climate hazard impact framework:

Rapid Climate Risk framework

-Determine the exposure to each climate hazard for each asset/ operation/ activity

-Collect asset/ operation / activity information to inform vulnerability to each climate hazard

- Analyse the vulnerability of asset / operation/ activity to each climate hazard

Existing knowledge: Van-KIRAP portal and information from CSIRO, SPREP and others

Consultation: Gather an understanding of the end users of the framework

Project Goal

Develop an accessible climate risk framework to provide a consistent way to assess climate risks across the different sectors.

Discussion

1. How is climate change already affecting your organisation?
2. What would help you to consider climate risks into your future planning?
3. What role does your organisation play in identifying climate change risks in Vanuatu?
4. Who do you think the end users of this framework will be?

Format Examples

1. Matrix

Determines the risk based on hazard exposure and vulnerability.

Pro: Could be incorporated into existing risk frameworks.

Likelihood \ Impact	Negligible	Minor	Moderate	Significant	Severe
Very Likely	Low Med	Medium	Med Hi	High	High
Likely	Low	Low Med	Medium	Med Hi	High
Possible	Low	Low Med	Medium	Med Hi	Med Hi
Unlikely	Low	Low Med	Low Med	Medium	Med Hi
Very Unlikely	Low	Low	Low Med	Medium	Medium

2. Excel Workbook

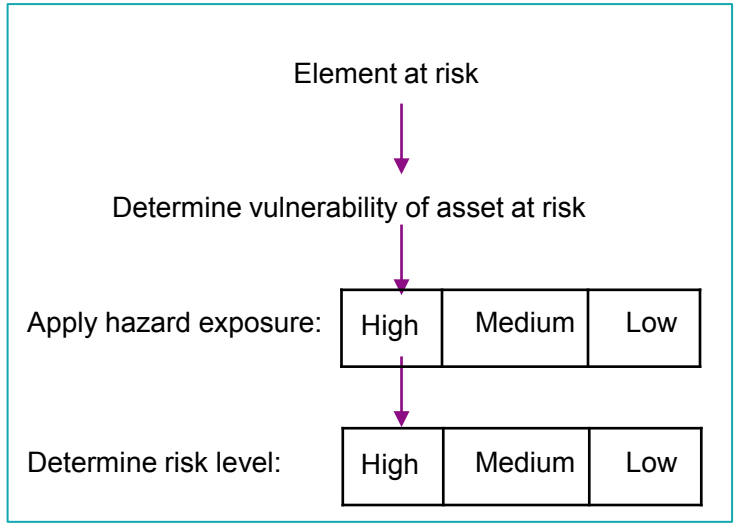
Uses a risk matrix to auto-populate the risk, based on the hazard exposure and vulnerability.

Pro: Would be a stand-alone tool

Climate hazard	Element at risk	Risk statement	Risk description	Exposure			Vulnerability	Risk		
				Present	Mid Century RCP8.5	End of Century RCP8.5		Present	Mid Century RCP8.5	End of Century RCP8.5
Sea level rise, coastal flooding	Roading network	**Risk to the roading network due to sea level rise & coastal flooding**	Roading network follows the coast and is at risk from sea level rise which, combined with severe weather and high tides, causing damage and outages.	Low	High	Extreme	High	Low	High	Extreme

3. Flow-chart

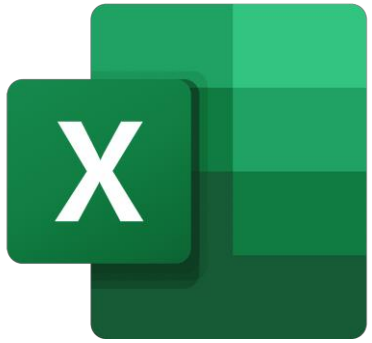
E.g. Step-by-step for each climate variable, accounting for hazard exposure and vulnerability. Could be worked into an excel format too.



Discussion

- Are you familiar with using risk frameworks (E.g, Financial, Health and Safety, Environmental)?

- What is the most useful format to you for making risk assessment decisions?



Likelihood \ Impact	Negligible	Minor	Moderate	Significant	Severe
Very Likely	Low Med	Medium	Med Hi	High	High
Likely	Low	Low Med	Medium	Med Hi	High
Possible	Low	Low Med	Medium	Med Hi	Med Hi
Unlikely	Low	Low Med	Low Med	Medium	Med Hi
Very Unlikely	Low	Low	Low Med	Medium	Medium

Q + A

Post Consultation Survey

- Questions discussed today, plus some additional ones
- Survey will be distributed by Sunny (SPREP) via email
- Responses required by **end of day 31st October**

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better.

B

Appendix B – Minutes from stakeholder consultation sessions

Minutes of Meeting

Stakeholder Consultation Session One Minutes

Held 18 October 2023 at 11.00am-1.00pm (Vanuatu time)

Via Zoom

Present:	Sunny Seuseu (SPREP)	Leanne Webb (CSIRO)
	Moirah Matou (VanKIRAP)	Kevin Hennessy (CSIRO)
	Mike Allis (Beca)	Rebecca Gregory (CSIRO)
	Kristin Renoux (Beca)	Mark Pardoe (Country Manager for Tropical Agencies limited (TAL) and Domestic National Representative for the Chamber of Commerce)
	Carlos Carvajal (Beca)	
	Sophie Andrews (Beca)	
	Hannington Aatoa (Beca)	

Apologies:

Distribution:

Item	Notes
1 House Keeping and Introductions	
2 Stakeholder introductions 1. What climate issues are you already seeing in your sector	*1. What is organisation/background? Where do you operate within Vanuatu?* **Mark-** Cruise ship lines, two offices (Port Vila and Santo) Peak season for cruising is November to March- Cyclones, bad weather etc. effect port calls because of safety. From climate sector shipping agency perspective, biggest concern. Have number of this weather-related thing- ***Mark to send to Mike*** One road that leads to port villa is the one road for cruise tours- only road so if something happens, like erosion of road due to weather would have big impact. Wharf road (CSIRO- Vicky Tai might be able to help with detours of the road but not CSIROs wheelhouse yet. They will do some mapping of the road and see the level of risk). **Kristin -** Would you choose to not to go there because of the impacts? **Mark-** Yes, and cargo issues, won't sell or give these in tours- passenger experience dramatically affected. What's the number of people involved in providing experience? Summary to be projected of specific activities.

Item	Notes
	Moirah – rivers that run through roads that didn't happen before. Happening more and more often. Some resorts in Santo – Bungalows already washed out because of erosion and rain fall **Mark**- wearing commercial rep hat: roads washed away- people identifying and working with people to fix this **CSIRO – Leanne** – not mentioned, fisheries issues (to see sea turtles) and they are affected by climate in gender ratio. Roads bumpy already (construction quality). Tropical cyclones limit access to electricity. **Kevin-** Two of the info bites not yet accessible (will be by 12 Nov) NIWA will be doing modelling, to see the increasing issues of flooding (getting bad) **Leanne** - Tourists like to try local produce (plantations might get to expand because it's warmer but coffee really struggling) **Mark –** Infestation of rhinoceros beetle, eating copra plants (Port Vila, Efate) – is there a climate driver behind the infestation?
3 Project outline and scope	**Mike** • Excellent work done already for Vanuatu on project, Beca building on it • Timeline constraints • Financial projections
4 Project Goals and Discussion	**Mike and Kevin**- Beca fits into step 3 and 5 of the CSIRO framework. **Kevin-** It needs to be generic enough to be applied across different sectors (consistent so can be used in a consistent way) **Mark** - unaware of this project itself and haven't has too much to do with the VanKIRAP as private sector (aware but haven't dived into it) **Mike-** Compressed time wise so we can be testing along to see if it's usable *How is CC already affecting your organisation and roles?* **Sunny-** observations- have had discussion with tourism operators in Santo and Efate Tourism operator in Santo concerned in SRL- have a number of beach huts they use for tourists but effecting community and losing land through this. Providing adaptation options, provide for growth next door. One of the most popular places for cruise lines but SLR impacting this. Airport effected by flooding, flights couldn't come in and out- this impacts the ability for people to come to the islands Infrastructure heavily impacted so tourist can't get around

Item	Notes
	2020 cyclone impacted tourism heavily (also because of covid 19) Small scale tourism operators- do not have access to pool water, have to access from ground, but can't do that during a drought **Mark-** Telecommunication cut off during cyclone, no connection to outside world- can't tell family we're okay. In July in 2015, power off for two weeks- comms you can't do business without it. Mark brought back up generator for the office because you can't have that complacency. **Leanne-** took photos of cyclone resistant structure- then took photos afterwards to show that it was resilient (things that you can use to be resilient). What did they do differently? This one has big concrete anchor at the back, made of materials that are locally accessible. Has Vanuatu sustainable tourism strategy been implemented on a community level? Tourism strategy 2021, has been implemented – ***get information from Geraldine on how this is going at the moment.*** What about the people who are on the ground – drought obviously effect workers- has the impact of heat impacting airport workers unloading bags etc, or people unloading cargo. ***Talk to airport and DoT for this info.*** Electricity demand (increasing aircon use etc.) because of heat. **Mike-** what is the increase electricity sources? Mark- mainly uses diesel at the moment but looking at coconut oil etc. Impacts on Hospitals – dengue fever? *What would help you consider climate risks into your future planning?* **Mark**- only getting bigger in people wanting to come to islands, ports need to get bigger, looking at some of the climate impacts but as boots on the ground, couldn't tell you where they are looking at. **Sunny –** from his discussion from department of tourism, department is looking at strengthening their tourism mat. Strengthening between the two departments, the tourism sector will be more resilient working with DoT and Tourism Vanuatu. Methodology scheme to facilitate methodology where they encourage tourism operators to identify risks. Tool developing will help them with their journey providing for all stakeholders (wide range). Using data from the last 13 years, need to update data to help with process. Ministry looking at relocating communities and villages because of SLR but need a methodology like DRR's relocation policy to help inform the future planning decisions.

Item	Notes
	Moirah – Project started in 2018 so most of the planning for risk has been updated from then until now- people starting to include climate change thinking in their business plans. *What role does your organisation play in identifying climate change risks in Vanuatu?* **Mark-** we work in real time- start working with captains or marine managers if issues start to arise- if not booked It can be diverted from mystery island to Port Vila for example. *Are you getting any requests for assurance of operation – how far out?* **Mark –** After cyclone Judy, report asked to be done by minister and they said road is not to be used- public doc so cruise lines diverted from port villa. Against cliff face placed temporary protection/ fixes- report changes, cruise line back but said it's not a long-term solution so have concerns. Cruise line paid for some of works- Min tourism reduced fees by half to accommodate. *Are there any particular services involved in supporting the resilience projects?* **Sunny**- nothing comes to mind but will have a think. **Moirah-** indirect or direct? Both. 5 priority sectors already, will have to think of anyone outside of the these. Department of CC, department of Environment, department of health. ***Can get details for VTO and DoT (Geraldine might have some names and ideas)*** *Who do you think the end users of this framework will be?* **Sunny-** Tourism sector through VTO and Dot will have to provide guidance of who to use it. DOT and VTO responsible for distributing and providing to relevant users. Have to be flexible enough to be used by wide range- need to accommodate all areas ie. waterfalls, beaches, all sites. Are the developers of tourism seen as using this? **Sunny-** vision to be used as a multi sectorial approach but consultation and implementation needs to be done by a multilevel agency, lead by DoT. Need to decide if it will be used for big and small organisations etc. **Kristin-** Are we assuming that there are end users with different understanding of risk management or analyse it for others? Flowchart to outline all steps? Safe to assume that risk management is not everyone's background as should apply/design as such. **Sunny-** needs to be a categorisation of different activities- ie. small scale use this and work with department for CC and large scale use this one to independently access.

Item	Notes
	Leanne – in Santo- graphics used to display technical info in project for end user (info graphics simple and preferable) **Kevin-** very simple step by step guide very helpful. Important to provide for an infographic that give a high-level overview of the risks now, and the risks in the future. Targeted approach very important as sunny said. **Leanne-** Big language barrier- getting stakeholders to drive the consultation as some afraid to ask the questions in English so conversation in Bislama was so much more interactive. **Carlos-** Does the climate relate from Bislama to English the same? Is that understanding there? *Format of tool: Examples shown- are they too detailed based on infographics convo? Does anyone have ideas on how to display/pitch framework for the end users?* High level pitch but risk of losing detail and value with high-level structure. **Sunny-** there will be use of this (examples format) but is something we need to discuss with DOT. Sunny supports- it's a good start but should be refined. **Leanne-** target always the understanding of reasonable capacity. Most of it, as long as you can explain it. **Kevin-** People have in the past found it difficult to discuss or grip likelihood. Think laid out well. Finding balance is challenging. Skipping likelihood all good- exposure more important to discuss. **Kevin-** emissions targets at high level
5 Questions and answers	*We want feedback on how we're done the session- has this been useful to understand our direction of travel?* Yes, all found useful **Kevin-** good discussion- rapid assessment can only do so much **Moirah-** Good questions that really triggered responses etc. Note additional stakeholder came late- ***their question is to be discussed with Sunny and Moirah after meeting.***

Minuted by: Sophie Andrews

Minutes of Meeting

Stakeholder Consultation Session Two Minutes

Held 19 October 2023 at 1.00pm – 3.00pm (Vanuatu time)

Via Zoom

Present:

Sunny Seuseu (SPREP)

Moirah Matou (VanKIRAP)

Mike Allis (Beca)

Kristin Renoux (Beca)

Carlos Carvajal (Beca)

Sophie Andrews (Beca)

Hannington Aatoa (Beca)

Dr Christina Shaw (CEO Vanuatu Environmental Science Society (VESS), President Vanuatu Scuba association, Co-owner of Big Blue Dive Company)

Geraldine Tari (Acting Director for Department of Tourism)

Apologies:

Distribution:

Item	Notes
1 Project Overview	**Moirah**- This is a Green Climate funded project Main objective of project to provide and enhance services provided by CSIRO so more stakeholders can use it for their planning and have better decision making so they have more resilience in the face of Climate Change. Geraldine- Don't have all the answers, hard to find someone to lead the project/ climate resilience charge.
2 Project outline and scope	Purpose of today- meet and gauge incites from stakeholders in Vanuatu • Excellent work done already for Vanuatu on project, Beca building on it • Timeline constraints • Financial projections
3 Stakeholder introductions	1. *What is your organisation/ Background?* **Geraldine** – Acting Director for the Department of Tourism (DOT) **Christina-** CEO of the Vanuatu Environmental Science Society (VESS) and owns Big Blue Dive company with husband. She is the new president of scuba association, and her husband owns recycling company. 2. *Where do you operate within Vanuatu?* What climate issues are you already seeing in your sector?

Item	Notes
	Geraldine- Operate under the Ministry of Trade and Commerce, responsible for the policy and implementation of tourism, offices based in all the 6 provinces. Main activities work around product development office. Currently over a 1000 tourism operation listed (database needs to be updated) Most operators in outer islands (rural) and are often the most impacted through climate issues. We don't have level of impacts and how impacted. There is a programme to help record data and help them in phasing out the development of their operation. Is there a way of feeding people information or gathering information from them? Mosly the ones based in Santo Tana and Port Vila easily contacted, but otherwise, only contacted over social media. Opportunity in improving online accreditation certification. Will take a while – format existing platform, being built on. Can we see a copy of that? Yes, Geraldine will send this through. **Christina** – Environmental scientist role- Projects mostly of threatened species and conservation but also work on ecosystem threats. Depends on what project doing but all throughout Vanuatu. Deliberately not working on Climate change projects, sticking to biodiversity conservation niche. Effects seeing tropical cyclones, tree canopies effected (bats come close to villages, people hunting them after cyclones. High rainfall events that will impact the environment. Trying to make the environment more sustainable. Tourism generally have impacts on environment. Experience in staying in local tourist operations. Tours- very little connectivity on island. Radio used for information a lot in remote islands. Lots of NGOs working on CC but little NGOs working on biodiversity work. Making sure it's not all human focused, raise the voice of the voiceless (animals and plants). If there's a specific climate event, would you expect there would be no contact with them for a while? Probably yes. Planes in one a week, boats in one a month- tricky for repairs, particularly if there's high demand. Are you already seeing specific triggers in the effects on the ground (coral reef bleaching- biggest bleaching event -never seen it so long in….) Temperature changes, 29 degrees started in November, about 2 months early. Also, a crown of thorns outbreak at the moment- if cyclone, knocked over more coral (tipped over). Saw after cyclone pam- lots of canopies fell out and trees fell down, and they El Nino drought caused a lot of them to die because they couldn't recover. **Mike -** Frequency is a driver of that change as well. **Christina -** Usually when cyclone comes through, the water temp drops and the coral stops bleaching but didn't this time. Didn't provide relief.

Item	Notes
	Christina- Wearing scuba association hat. Operators in Santo, Port Vila, a couple up the east coast. Biggest climate effect is on the corals. Most of info of what is happening in terms of cyclones isn't from in Vanuatu. Juggle of when the best time to anchor things down etc. based on losing business is you do too early. Has there been more cancellations due to cyclones (before and after changes)? Biggest impact of concern is post covid recovery and issues with airline function. Climate hasn't come up as much but haven't seen too much change because of the cyclone possibility. People (Charity sector) over enhancing issues on how the recent cyclone impacted/ damage caused. NGOs said it wasn't that bad so although bringing money to charities, tourism sector impacted. Fruit impacted and tour groups do local biscuits and fruit but couldn't for around 3 months. Not much in the market available. Coconut rhinoceros beetle infestation mentioned. **Mike**- does your husband have anything from recycling business? **Christina-** lots of extra material after the cyclones such as metals. VESS have done a plastic survey- People had 18 more bottles in their homes in areas that they didn't think they could get water or relief services. **Moirah-** Been a while since we have had cases/examples of the sea temperatures and coral bleaching. Deployed buoys in Vanuatu to measure temperatures- higher than usual.
4 Project Goals and Discussion	What would help you to consider climate risks in your future planning? **Geraldine-** Said that each operator would have a risk management plan in place, but they haven't had the tools to do one. Varying abilities based on location. Project help in giving operator services to help them develop framework that provides them with sustainability and climate information. **Kristin-** Thinking that the end user goes beyond government organisations and be used by the operators themselves? **Geraldine-** Yes **Kristin-** sometimes developing framework with wide range of end users quite tricky. Need to note that framework can be used with smaller tourism opportunities however they will need to be provided with training and tools to achieve a risk management plan **Christina-**Diving risks common- but looking at short term and not really long term. Concerns going into cyclone seasons but usually not long-term thinking. Usually a lot of investment in equipment and asset management. Not sure there would be much update from medium type businesses unless there is a future risk assessment value to it.

Item	Notes
	Think there are a lot of other threats that get overlooked because of the many Climate change projects. **Geraldine-** do you have comments on who the framework should be targeted at, will it be particularly useful for the end users that don't look into the long term. Thinking who else will have these thoughts, need to look into this as to how these impacts on operators. **Kristin-** journey for a lot of people to get understanding- need to get the buy in from people as to why this is going to support the long term of people's business (case study will be a good example of how this can be implemented). **Christina-** Some operators struggle with the day to day- need to buy in, perhaps from the government with funding/grants if it's undertaken, enhancement to business in some way, or applications to awards etc. The value incentive. **Format of examples** – *Thoughts? What might be useful as an end user?* **Geraldine-** If officers on the ground- the Product development officers in 6 provinces (or provincial managers), excel works to help with the understanding. But if it is a tool for people to take away, needs to be an infographic etc (simple). Provide with both hard copy and electronic version on website. Product development officers well connected to all operators and NGOs in their province. Provincial tourism officers (PTO). What would be key takeaways to pick up and use it? **Christina-** 2 levels of stakeholders- you have the small individual operators on outer islands and medium Vanuatu wide organisation. Tourism association members- required to be a member of one association so good way of attacking it. Not having too much on show at the beginning so it's not overwhelming. Perhaps a workbook with actual suggestions and mitigations that are actual practical so it's useful for next steps (but not too overwhelming so people don't want to start) Have to be a member of a tourism association to get tourism permit. Christina is unfamiliar with VanKIRAP portal. She mentioned she doesn't know what we're going to do differently.
5 Questions and answers	*Feedback on session?* **Geraldine-** DoT doesn't have Questions now but will have questions that pop up as we more through the process and as the feedback comes in.

Item	Notes
	Christina- VanKIRAP project inception meeting a few years ago- don't see how it's going to make a difference. Don't see how it will be used or can be used on the ground- Private sector don't really get help from the government (ie. coral reefs- not much the operators can do themselves, need help). What ability do the small operators have to make a difference using this framework? **Kristin-** Would tourism associations be good entry points to relive the pressure and difficulty of using the framework on small operators? **Christina-** Yes

Minuted by: Sophie Andrews

C

Appendix C- Identified Stakeholders

Stakeholders Identified for Consultation

SPREP and DoT identified 18 key stakeholders to undertake consultation with. These stakeholders are as follows:

- SPREP
- Vanuatu Meteorology and Geo-Hazards Department (VMGD)
- Department of Tourism (DoT)
- Vanuatu Tourism Office (VTO)
- Public Works Department (PWD)
- Department of Geology and Mines
- Department of Ports and Harbor
- Vanuatu Chamber of Commerce and Industry
- Reserve Bank of Vanuatu
- Department of Finance and Treasury
- Commonwealth Scientific Industrial Research Organization (CSIRO)
- Department of Climate Change (DoCC)
- National Disaster Management Office (NDMO)
- Department of Environment Protection and Conservation (DEPC)
- Ministry of Tourism, Trade, Commerce and Ni-Vanuatu Business
- Vanuatu National Statistics Office (VNSO)
- Vanuatu Fisheries Department (VFD)
- Tropical Agency Limited (TAL)