PACIFIC **METEOROLOGICAL** COUNCIL

Vanuatu Klaemet blong Redy, Adapt mo Protekt Project Van-KIRAP



Allan Rarai, Director, VMGD Moirah Matou, VMGD Glenda Pakoa, VMGD Peter Tiamua, Vanuatu Fisheries Dept Albert Willy, VMGD Moses Bani, Dept of Tourism Sunny Seuseu, SPREP Geoff Gooley, CSIRO Dewi Kirono, CSIRO







ustralian Government epartment of Foreign Affairs and Trade Bureau of Meteorology







VDCC

PACIFIC METEOROLOGICAL COUNCIL OUTINE of Presentation

- a. About the Van-KIRAP (CISRDP) Project
- b. Rationale
- c. Fisheries/Tourism sector policy review and CIS Plans
- d. CIS (Seasonal Prediction) for Fisheries and Tourism sectors
- e. CIS (Climate Change) for Fisheries and Tourism sectors















Climate Information Services for Resilient Development Project (CISRDP)

APPROVED PROJECT SNAPSHOT:

- GCF Grant Amount: \$USD 18,106,905 million
- Co-financing: \$2,389,780
- VMGD to directly manage: \$US 11,541,465
- Implementing/Accredited Entity: SPREP
- Executing Entity: Ministry of Climate Change (VMGD) & SPREP (joint)
- Approved Delivery Partners CSIRO, BoM, APCC
- Additional Delivery Partners as needed
- Duration: 4 years and 3 months
- Key Sectors: Infrastructure, Agriculture, Fisheries; Tourism, Water. Communities

Vanuatu Climate Services

Rationale



Financed by Clinate Investment Funds through the Asian Development Bank (HOB) Strategic Fund and administened by the Regional Technical Support Mechanium (HTSM) at SPREP

Fisheries Policy Review Sector CIS Priorities

- Review Fisheries sector policies, institutional structure and plans
- Identify gaps (eg 5 x Sector Coordinators, 12 x Community Climate Centers)
- Provide recommendations (linkages to Regional and National policies and plans)
- Develop Fisheries sector CIS Action and Communications Plan

Table 1:The final list of Recommendations

| RANK | LEAD GFCS PILLAR | RECOMMENDATION |
|------|---|--|
| 1 | Climate Services Information System | Tailor climate information services for fisheries & aquaculture (freshwater, coastal, offshore) |
| 2 | User Interface | Make weather and marine climate data accessible on Aqua-Tails tablets |
| 3 | User Interface | Enable additional resource (area council - in remote areas and fishers' associations) to support a marine climate early warning system for Vanuatu |
| 4 | Climate Services Information System | Incorporate traditional knowledge relating to Fisheries into the Fisheries sector |
| 5 | Climate Services Information System | Climate related impact information available for fisheries and aquaculture |
| 6 | User Interface | Expand communities using marine monitoring toolkit and add climate information |
| 7 | Research, Modeling and Prediction | Climate change maps for fisheries and aquaculture (freshwater, coastal, offshore) |
| 8 | Climate Services Information System | An update to the ENSO Handbook (Klaud Nasara) for marine resource management is required and poster distribution |
| 9 | Climate Services Information System | Development of a Climate-Freshwater bulletin in partnership with the Department of Fisheries |



Fisheries sector CIS dissemination structure

Table 5: Climate Information required for Fisheries operation and decision-making processes

| Sector operation or decision- making process | Information/Product/Tool | Responsible person | | |
|--|--|--|--|--|
| Teach them to save and process fish (solar freezers). Fiberglass Solar Freezers can last for weeks without sunlight | Monthly climate forecasts of rainfall. Sunshine hours | Development and Capture Division & Seafood Division | | |
| Near shore FADS and ocean productivity | SST, Chlorophyll, wave height, wind direction, sub-surface temperature, currents | Development and Capture Division & Management Division | | |
| Pelagic Fisheries/Deep water | SST, Sub-surface temperature, currents | | | |
| Ecosystem monitoring (seagrass, mangroves, coral reefs) | Coral bleaching information, sub-surface temperature, SST, rainfall, sea level, atmospheric temperature, currents, subsurface currents | Research and Aquaculture Division and Development and capture Division | | |
| Crown of Thorns spawning and outbreak | SST, Currents | Research and Aquaculture Division | | |
| Aquaculture (including Mariculture) | SST, Rainfall data (weekly), ENSO information, coastal inundation, atmospheric temperature, water temperature at major rivers, tides, currents, sub-surface temperature | Research and Aquaculture Division | | |
| Subsistence fishing and artisanal fishing | Currents, sub-surface temperature, wave height, wave direction, tides, ENSO information | Development and Capture Division | | |
| Ciguatera (fish poisoning) | SST, TC info, precipitation, subsurface temperature | Research and Aquaculture Division and Seafood Division | | |
| General awareness | All ocean variables, ENSO, rainfall and temperature in simple language | Management and Policy Branch | | |



Tourism Policy Review Sector CIS Priorities

- Review and re-develop a guide for the construction of local bungalows using local materials.
- Develop specific information packages about climate change and major climate events and their impacts, and about climate services information for the tourism sector.
- Promote traditional knowledge of climate as a product for the tourism industry, to be used by local tourist operators.

NATIONAL ACTIVITY / LEAD GECS NUMBER ACTION PILLAR REGIONAL ACTIVITY Establish a consultative process for tourism Regional stakeholders [companies, ministries, development User Interface and partners] and the NMHS to identify and implement National required climate services for the tourism sector Include representatives from tourism agencies in 2 User Interface National national climate outlook forums and regular meetings. Climate Services Establish a Climate EWS for tourism. National Information System Identify through workshops and other consultative Regional Capacity processes the climate and ocean services that will and Building address the specific needs of Pacific tourism sector. National



Table 5: Recommended Actions for Tourism sector in PRSCS

Tourism sector CIS dissemination structure



Figure 4: Climate information and products dissemination structure

Vanuatu Ocean Climate Bulletin



Sea Surface Temperatures (SST) Outlook: October to December 2020

Warmer than average SSTs over Vanuatu generally strengthened compared to July. It is expected that warmer than average SSTs will persist into the next three months from October to December 2020.

Application: Different species of fish are sometimes known to be found at certain temperatures.

| Common name | Species | All occurrences (°C) | Abundant occurrences (°C) | Sampa Da Jacker | ingeneration formation 200 | Herede Herenetises Constant Con 2000 | Handle Handler French Galler Annual Control (1997) Annual Control | Handle Handle Markel (2012) And Andrew State (2012) Andrew State (| Terreture formation (2020) Competition (control for 2011) Competition (control for 2011) | mention formation (M 200) the poly of the body for program formation (M 200) the poly of the body for program formation (M 200) the poly of the poly o | And the second s |
|-------------|--------------------|----------------------|---------------------------|-----------------|----------------------------|---|--|--|--|--|--|
| Skipjack | Katsuwonus pelamis | 17-30 | 20-29 | N | | | | | | | |
| Yellowfin | Thunnus albacares | 18-31 | 20-30 | 1 | | | | | <u>b</u> | <u>b</u> | |
| Bigeye | T.obesus | 11-29 | 13-27 | | | | | | | | |
| Albacore | T. alalunga | 13-25 | 15-21 | | | | | | | | |
| Southern | Bluefin T.maccoyii | 10.5-21 | 17-20 | | . | . <u>,</u> | | | | | |

Sea Level (SL) Outlook: October to December 2020

The Seasonal Sea Level Forecast map shows above average sea level is expected over Vanuatu within the next three months.

Application

- High tides at higher sea level could cause inundation of waves overland (seas-flooding) during bad weather / windy conditions causing rough seas.
- Low tides at lower sea level could reduce sea level over wharfs and docks, and could also expose coral reefs further during low tides.





Coral Reef Outlook: November 2020

The 8 weeks Coral Bleaching outlook shows No Stress on corals over Vanuatu for the next 8 weeks. This means, there is no potential threat expected on corals until 15 November 2020.

Application

- Coral reef provide food for fishes and shells. When there is coral bleaching, the coral can die and the whole food chain is affected.
- Limiting fishing in the region can increase fish populations, which in turn maximizes the consumption of plant growth and limits their impact on the corals.
- (Marshall and Schuttenberg, 2006).

Monthly Chlorophyll

Chlorophyll concentration have decreased over Vanuatu since July 2020. Up to 0.15 mg/m³ of chlorophyll (blue colour) dominated most of the islands, with much less concentration evident over the Torba and Penama group.

Application

- Fishermen targeting smaller pelagic (open sea) fish may be interested in the chlorophyll concentration.
- Filter feeders (i.e. oysters, mussels, clams, scallops) thrive in high chlorophyll concentrations.
- Crown of thorns spawning is likely to be more successful under high chlorophyll concentrations.

The Convergence Zone Outlook: October-December 2020

The green line is the <u>average position</u> of the Warm pool—cold tongue Convergence zone. The purple line is the <u>adge</u> of the Warm pool—cold tongue Convergence zone. Forecast shows this Convergence Zone will remain over Solomon islands from October to November, before shifting south over Vanuatu in December.

Application:

Along the eastern edge of Warm pool-cold tongue Convengence zone is rich with nutrient which support high abandance of tuna.

Top Highest and Lowest Tides for October 2020 to December 2020: Luganville & Port Vila Harbour

| Luganville Harbour | | | | Port Vila Harbour | | | | | | | |
|--------------------|--------|------------|-----------------|-------------------|------------|----------------|--------|------------|-----------------|--------|------------|
| Lowest Tide | Date | Time (VUT) | Highest Tide | Date | Time (VUT) | Lowest Tide | Date | Time (VUT) | Highest Tide | Date | Time (VUT) |
| 0.24m | 19 Oct | 12:09 am | 1.89m | 17 Oct | 04:59 am | 0.23m | 20 Oct | 01:50 am | 1.63m | 17 Oct | 05:55 pm |
| 0.16m | 16 Nov | 11:58 pm | 1.94m | 15 Nov | 04:30 am | 0.14m | 17 Nov | 12:46 am | 1.66m | 15 Nov | 05:20 pm |
| 0.12m | 15 Dec | 11:48 pm | 1.92m | 14 Dec | 04:13 pm | 0.12m | 16 Dec | 12:35 am | 1.63m | 14 Dec | 04:56 pm |

Moon Phases for September 2020 to November 2020

| New Moon | First Quarter 🌘 | Full Moon | Last Quarter 🏾 🕕 | | |
|---------------|-----------------|---------------|------------------|--|--|
| | | 2nd October | 10th October | | |
| 17th October | 24th October | 1st November | 9th November | | |
| 15th November | 22nd November | 30th November | 8th December | | |
| 15 December | 22 December | 30th December | | | |

Contact Us: Call: (+678 23866), Free Toll: 116, Email: climate@meteo.gov.vu, visit: vmgd.gov.vu









Vanuatu Tourism Climate Bulletin



CLIMATE OUTLOOK FOR TOURISM Vanuatu Meteorology & Geo-Hazards Department

Department of Tourism

Traditional Knowledge Indicators As Vanuatu progresses into its dry season, certain plants and animals tend to change their behavior to adapt to the

Some local indicators of dry season

We highly recommend everyone to continue using their long term

time, it is very important in our

community in Vanuatu.

traditional knowledge indicator for dry

*Narara and bluwota tree loosing leave *grassiand turned brown & yellow *river and stream water level drop

change in season.

* Cracks in dry soil

includes:

DRAFT SAMPLE 1, June

The Climate Outlook for Tourism provides the Tourism Sector and relevant stakeholders a simple and concise outlook on imatic conditions for the coming 1 to 3 months. It highlights rainfall forecasts, air temperatures, and ocean conditions the local tourism operators and tourists can use for better decision-making on upcoming events in Vanuatu.

Rainfall and Temperature Outlook for June to August 2020



region. Below normal rainfall is forecasted for the southern region. Coral Reef Outlook

will remain normal for the next three months.

Sea Level Outlook



Coral Reef and Sea Level Outlook: No stress on corals are expected to remain over Vanuatu waters until 26 July 2020. Sea level for the next three months is also expected to remain normal.

Tide Outlook for July 2020: Port Vila: Highest tide is 1.47m on the 4th at 4:16am. Lowest tide is 0.11m on the 5th at 11:59am. Luganville: Highest tide is 1.74m on the 4th at 3:41am. Lowest tide is 0.14m on the 5th at 11:15am.

ENSO Status and SPCZ Location for the past 30 days ending 2nd June



Climate Smart Recommendations for Tourism Sector

| | Actions | | | | | | |
|---|---|---|--|--|--|--|--|
| Climate Variables | Tourism Industry | Tourist | | | | | |
| Rainfall | | | | | | | |
| Below Normal | Use water wisely Encourage fourist to use s Heavily mukhed flower beds Desailnation plants Avoid use of fire Change activity to suit weather conditions (e.g. swim mo reyless) | | | | | | |
| Above Normal | Save enough Water for consumption Reduce bush hiking activities and increase water activitie s increase extra shelter to accommodate rain day activitie s | | | | | | |
| Temperature | | | | | | | |
| Below Normal | | | | | | | |
| Above Normal | Encourage Use of sun cream for tourism Build Io huts near beaches to cool off Do not remove branches from trees near by Heavity multihed flower beds Provided shade tents and cooling stations Avoid areas of unfavorable weather- or climate determin ed conditions (e.g., move from sun to shade) Use structural or mechanical aids (e.g. umbrelies or wind breaka) | | | | | | |
| Coral Bleaching Level | | | | | | | |
| Wind | | | | | | | |
| Swells & Wave | | | | | | | |
| Humidity | | | | | | | |
| Sunshine hours | | Stay in the shade when ever possible. Wear a shirt, hat and su nglasses. Use SPF 30+ sunscreen. Reapply every 2 hours. | | | | | |
| Sea Level | | | | | | | |
| CONTACTEM MIFALA: • Department of Tourism PMB 9099 Telephone: (678) 33400. Ema | • Vanustu Meteorological & Ger PMB 9054 iit: tourism@vanustu.gov.vu iit: tourism@vanustu.gov.vu Free Toll: 116 | o-Hazards Department | | | | | |
| Supported by: | SPREP | | | | | | |

Traditional Knowledge

- Collect TK data relevant to all sectors (all 6 Provinces).
- Collect historical event data.
- CIS outputs will include TK.
 - Encourage communities in each sector to continue to practice TK in their livelihoods.



Climate Change Projections tools through CSIRO

Past and projected future impacts of coral bleaching on the reefs of Vanuatu

Jeffrey Maynard, Scott Heron, Ruben van Hooidonk, and Dieter Tracey





Assessing coral reef health & vulnerability to impacts of ocean warming (e.g. marine heatwaves) and acidification - GOAL

"...Adopt a multidisciplinary approach bringing together reef health, ocean chemistry and temperature science with a regionally specific coupled marine biogeochemical-hydrodynamic model to explore when, when and how coral ecosystems in Vanuatu will be impacted, what management options are available, develop key indicators and 'intervention points,' to inform longer-term planning for climate vulnerable/high impact areas and sectors.."

Assessing coral reef health & vulnerability to impacts of **ocean warming** (e.g. marine heatwaves) and **acidification**



Assessing coral reef health & vulnerability to impacts of ocean warming and acidification -TOOL



Leverages CSIRO's worldleading expertise in developing and implementing state-of-theart high resolution ocean biogeochemical models in key regions under threat such as the Great Barrier Reef (eReefs).

Relocatable fine scale coastal models

Underpinned by **(RECOM)** observations, and geospatial information e.g. LIDAR

https://ereefs.org.au/ereefs/platform/relocatable-fine-scale-coastal-models



Hazard impact mapping of the coastal zones in Vanuatu:

Wave Buoys

Water level/ocean

sensors

Dependencies:

- 1) Topography and bathymetry data (Activity 4.2);
- 2) Coastal wave and sea-level observations (Activity 4.3;)
- 3) Projected changes to tropical cyclone (Activity 5.4)

UAV/LiDAR Mapping





Satellite data (Sentinel-2)

When good coastal hazard analysis is coupled with the right spatial analytics, powerful risk analysis is possible.

Vanuatu Globe

The Vanuatu high resolution elevation data (LDAR) surveys were a partnership between the Vanuatu and Australian Governments, with funding from Australia's *Pacific-Australia Climate Change Science and Adaptation Planning* (PACCSAP) program.



Reset view

✓ Inundation Models Zoom to area ✓ Efate Zoom to area

> Highest Astronomical Tide Zoom to area HAT 2013 - Efate

> > Zoom to area

Zoom to area

Zoom to area

HAT 2090 - Efate

1 in 10 Year Storm

1 in 100 Year Storm

Malekula

Espiritu Santo

✓ Grids

Zoom to area

Digital Elevation Model

Digital Surface Model

Canopy Height Model

Fractional Cover Model



But high resolution bathymetric and topographic data is necessary.

Credit: Nathan Quadros (CRCSI)

Coral reefs are very good for coastal protection (natural breakwaters) – will it continue into the future? Impacts of coral bleaching and ocean acidification? (Activity 5.6) ...

(b)

Sea Level Rise (SLR = +1 m)

Wave Height (SLR – baseline)

Median H_s difference (%)

200

160

120

80

40

Up to 200% increase in nearshore wave heights

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