



Vanuatu Meteorology and Geo-Hazards Department



Annual Report 2015

**Ministry of Climate Change Adaptation, Meteorology, Geo-Hazards,
Energy, Environment and Disaster Management.**



This document comprises of a collection of reports submitted by heads of different Divisions within the Vanuatu Meteorology and Geo-Hazards Department and compiled by the Director. These reports are against the 2015 Business Plans as required by PSC through the Director General's office of the Ministry of Climate Change Adaptation, Meteorology, Geo-Hazards, Energy, Environment and Disaster Management.

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For more information contact:

The Director

The Vanuatu Meteorology and Geo-Hazards Department

Private Mail Bag 9054,

Port Vila,

Vanuatu

+678 24686

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SECTION ONE – OVERVIEW

Review of 2015 by the Director

2015 was a year where Vanuatu was at the receiving end of one of the most severe cyclone to have affected the southern hemisphere. TC Pam was christened on the 09th of March 2015, when it was 600 kilometres northeast of Banks. The monster cyclone took an initial south southeast track to central Vanuatu, and then turns south southwest as it causes havoc through the central and southern islands on the 13th of March 2015.

Tropical cyclone Pam (category 5) was the most severe and strongest cyclone to come very close as well as make landfall over Vanuatu's islands. It tested, to the very core, Vanuatu's tropical cyclone warning system. Despite its severity, the people of Vanuatu were warned well in advance on the projected forecast track and the severity of the category five system. The VMGD executed the warning system with perfection, using every communication medium available to transmit vital information. Because of the severity of the cyclone and its very close proximity to the islands of Vanuatu, the VMGD, for the first time, issued hourly warnings to the public. And for the first time, Vanuatu used an SMS warning system to alert people of the approaching cyclone. Pam caused severe damage to most of the central and southern islands of Vanuatu. Sadly, a total of 11 lives were lost.

One month after TC Pam, when Vanuatu was starting to rebuild, the country experienced one of the strongest El Nino event on record. The Vanuatu Meteorology and Geo-Hazards Department had informed communities through Vanuatu well in advance before the onset of the event and had used every medium of communication available, including SMS, to transmit vital messages to Vanuatu's population. Despite these timely messages, a lot of sectors, particularly agriculture and water, were severely affected.

Despite the setback, the Vanuatu Meteorology and Geo-Hazards Department (VMGD) has implemented a comprehensive number of the activities laid out in the Business Plan. At the core front, the new structure approved by the Public Service Commission in 2014 continues to be implemented, and near completion. Additionally, the department continues to build a robust multi-hazard early warning system, as well as maintaining a 24/7 weather watch.

The VMGD SDP (2014 – 2023), together with the Annual Business Plan (2015) drives development within the VMGD. These two plans are in line with the Corporate Plan and the National Plan (Priority Action Agenda), and will continue to direct developments within the VMGD over the next 10 years. The department continues to strengthen its human resource capacity. This year, a good number of staff have attended short, medium and long term courses, either locally or overseas. Most of these courses were funded from external sources. The VMGD continues to modernize its way of work. The highlight of the beginning of the modernization process was the installation of two automatic weather stations, two tide gauges and three seismic stations. The project “Improvement of equipment for Disaster management” was generously funded by the Japanese Government.

The establishment of the Project Management Unit/Climate Change and Disaster Risk Reduction Division allows the VMGD to manage a number of climate change and disaster risk reduction projects to assist sectors to adapt and become resilient to climate variability and climate change. Two projects, namely the Mainstreaming Disaster Risk Reduction Project and the Increasing Resilience to Climate Change and Natural Hazards Project will all continue to modernize as well as strengthen VMGD’s early warning system.

I would like to take this opportunity to thank the Director-General of the Ministry, the line Departments and their Directors for the support given to enable 2015 to be a successful one. I would also like to thank the Divisional Heads within the VMGD and their staff for their tremendous efforts in making 2015 a very successful year.



David Gibson

Director

About Vanuatu Meteorology and Geo-Hazards Department

The Vanuatu Meteorology and Geo-Hazards Department (VMGD) is a Department within the Ministry of Climate Change Adaptation, Meteorology, Geo-Hazards, Energy, Environment and Disaster Management. The VMGD consists of seven Divisions, being: Administration, Weather Forecasting and Services, Climate; Climate Change/Project Management Unit, Geo-Hazards, Observations, and ICT/Engineering. These Divisions work together to ensure the core functions are carried out as indicated in the annual Business Plans, the Corporate Plan, and Vanuatu Priorities and Action Agenda.

1. Vision

The Vision of the VMGD is:

To be a world class meteorological and geo-hazards institution that contributes to the sustainable development of Vanuatu, and the Pacific region.

2. Mission

The VMGD works to achieve its Vision by being:

A fully professional institution comprising skilled and motivated staff using updated and state of the art science and technology within an efficient and effective organisation, providing high quality meteorological and geo-hazards services that are widely available and accessible, effectively applied, beneficial and highly valued by all sections of the community in Vanuatu.

Specifically, this is achieved through the excellence in the following areas:

- Excellence in weather and climate forecasting processes/products.
- Leading in climate change adaptation and mitigation implementation, monitoring, and negotiations.
- Active monitoring and state of the art implementation of early warning systems for geo-hazards.
- Accessing and supporting international and regional observation networks.
- Research and innovation targeting improved products and services to all stakeholders.
- Facilitating cooperation with respect to its monitoring networks.
- Implementation and use of cutting edge technology.
- Quality control systems in place with supporting administrative and financial resources in place.

3. Principles

The guiding principles of the VMGD are:

1. **Vanuatu focus:** The work of the VMGD is primarily focused on the effective delivery of meteorological and geo-hazards services for the benefit of the people and communities of

Vanuatu, with its focus of development consistent with the priorities of the Vanuatu Priorities and Action Agenda.

2. **Partnerships:** Partnerships with the WMO, regional inter-governmental agencies and organisations, and technical partners are critical to the success of this Strategy. The participation of VMGD within a national and regional coordinated approach enhances effectiveness in increasing resources, while managing effort and potential overlap between agencies, organisations and development partners, especially where these are managed through national, bilateral and multilateral arrangements. Partnerships between VMGD and its counterparts in other Pacific Island countries have an important role in ensuring cooperation and sharing of lessons-learned within the region.
3. **Supporting gender equality and the most vulnerable in society:** VMGD accepts the need to operate and deliver services in ways that address and promote the principles of gender equality and the needs, both internally of the VMGD and in the development and delivery of VMGD services, to the most vulnerable in Vanuatu's society.
4. **Cost effectiveness:** Services should be delivered in an efficient, cost-effective way. The VMGD will endeavor to be strategic in the alignment of the development and delivery of VMGD services in ways that maximize the development support from national government and from regional partners.
5. **Sharing information:** The VMGD is committed to sharing data in line with national obligations and international policies; in particular the WMO commitment to free and unrestricted exchange of meteorological and related data and products (WMO Resolutions 40 and 25, respectively).
6. **Regional and global contribution:** The VMGD recognizes the regional and global character of weather, climate, and geo-hazards; and the need for an international approach that is consistent with relevant guiding regional frameworks amongst others, such as the Pacific Islands Meteorological Strategy, the Disaster Risk Management Framework and the Pacific Islands Framework for Action on Climate Change.

4. Objectives

VMGD aims to meet the growing demands of the Government of Vanuatu and all Ni-Vanuatu for improved meteorological and geo-hazards services that will:

- Ensure the safety, security and wellbeing of the people and communities of Vanuatu.
- Contribute to achieving national sustainable development.
- Fulfill Vanuatu's commitments and obligations under relevant regional and international agreements and conventions.

The objective of the VMGD is to meet the needs of all people living in Vanuatu for meteorological and geo-hazards information, understanding and services that are essential for their safety, security, and general well-being, and to ensure that meteorological and geophysical data and knowledge are effectively applied to Vanuatu's National Goals.

5. Areas of Responsibility

The VMGD provides short, medium and long term forecasts and warnings to Vanuatu's public. Its area of responsibility for meteorological and geo-hazard warnings includes 12°S to 23°S and 160°E to 175°E.

Locations

The VMGD has a total of seven observation stations throughout the country, with each weather station strategically located in each province. Sola Station is located in TORBA Province, Saratamata in PENAMA Province, Lamap in MALAMPA province, Pekoa in SANMA Province and Bauerfield in SHEFA Province. TAFEA Province has two observation stations, one on the island of Tanna and one on Aneityum. The head office of the VMGD is located at Nambatu, Port Vila, and houses all Divisions, including the Ministry of Climate Change, Corporate Service unit and the National Disaster Management Office (NDMO).

Outreach within Vanuatu

The VMGD continues to engage in outreach programs throughout the country. Establishing VMGD Communication and Outreach Partnership (COP) working group during 2014 was a strategic achievement for VMGD. VMGD COP working group which is made up of at least one rep from the 7 divisions within VMGD is Co-chaired by PSO Training and Community Liaison Officer and Information and Communication Officer within PMU. The group's main focus during 2015 was on Outreach activities such as community and schools awareness, Exhibitions, community group visits and schools careers talks. However due to funding limitations most of the Outreach activities were done around communities of Efate.

Regional and International Connections

The VMGD relies on regional and international partners to implement some of its core and planned activities, as the recurrent budget is not sufficient to carry out all activities stated in the Departmental Annual Business Plan. The VMGD is thankful for such assistance, and will continue to seek funding from these organisations now and into the future.

6. Programs, Functions and Sectors Served

The VMGD has seven major Divisions to carry out its programs and functions (see table below), they are: Administration Division, Weather Forecasting and Services Division, Climate Division, Climate Change and Disaster Risk Reduction/Project Management Unit Division, Observation Division, Geo-Hazards Division, and ICT and Engineering Division.

Table: VMGD Programs & Functions

Programs							Programs
Administration	Observation	Weather Forecasting and Services	Climate	Geo-Hazards	ICT and Engineering	Climate Change & DRR PMU	Functions
Provides the VMGD leadership and management structures for the operations of the VMGD.	Maintains adequate observational networks, providing the required data and information to the needs of the VMGD Divisions and other national, regional, and international users and networks.	Provides timely and quality weather services and products to the general public, mariners, and commercial end-users Provides timely warnings on severe weather events	Provides climate data and information, long term forecast and ENSO information	Delivers quality services and products on geo-hazards and related phenomena to mitigate against potential impacts of geological hazards (earthquakes, tsunamis and volcanic eruptions)	Enables the VMGD to adapt to technological changes and use up-to-date, modern and sound infrastructure and ICT to support all VMGD's services.	Manages and operates the implementation and integration of climate change and disaster risk reduction programs and projects to support national level commitments to Climate Change and Disaster Risk Management multilateral agreements.	
VMGD Management Team, All VMGD staff, Line Departments, WMO and other regional organisations	VMGD, Other National Meteorological Services	All sectors	All sectors	All sectors	VMGD, Line Departments	All sectors	Sectors

7. Structure and Staff

Structure

The new structure to reflect the amalgamation of Meteorology and Geo-Hazards was approved on the 29th January 2014. In the new structure a total of 89 positions and Job descriptions were created and approved by the PSC for VMGD. The Structure consist of six Divisional Managers, a Deputy Director and a Director.

Staff

The table below shows the number staff per divisions and against their employments and gender.

Divisions	Male Staff		Female Staff		Total Staff	Remarks
	Permanent	Temporary	Permanent	Temporary		
Administration	3	1	4	0	8	
Weather Forecasting	7		2	0	9	
Climate Serves	4	0	2	3	9	1 officer on Study Leave and one officer acting in the HRM position of the Ministry of MCCND 1 AVID volunteer
Geo-Hazards	3	3	3	1	10	1 World Bank Support Staff. One officer retired before the end year
Weather Observation	17	2	2		21	1 AVID Volunteer
Climate change (PMU)	1	4		3	8	Almost 10 Project Consultants
ICT & Engineering	4	1	2		7	4 Geo-Hazards Technicians have moved back to Geo-Hazards division
Totals	39	11	15	7	72	

8. Funding Basis

The total budget allocated and appropriated by Parliament to cover operations of VMGD for 2015 was 125,492,904 vatu, of which 102,849,013 vatu went to Salary/Personnel Expenses and 22,643,891 vatu went to operations.

The establishment of the Project Management Unit allows the VMGD to manage a number of aid projects, mostly in the area of climate change adaptation and disaster risk reduction. The two main large-scale projects are: Increasing Resilience to Climate Change and Natural Hazards (US \$ 11,100,000) and Mainstreaming Disaster Risk Reduction (US \$ 7,200,000). Most of the components of the two major projects are executed in other sectors, with the management of the project within the Project Management Unit.

SECTION TWO - PERFORMANCE 2015

Department Performance Overview

The VMGD's performance in of 2015 was above average, with more than 80% of the planned activities carried out.

An overview of VMGD's performance for 2015 is given in the table below.

Table: VMGD Department Performance	
Key Area	Key Results and Highlights
Amalgamation	Eighty percent of vacant positions within VMGD structure filled
QMS	Documents reviewed
Policy and Legislation	<p>Climate Change and Disaster Risk Reduction Policy has been launched</p> <p>Concept note on the transfer of Hydrology (science) has been developed and submitted to CSU.</p> <p>Concept note on setting a Melanesian Meteorological Society/Body is being developed and submitted to the MSG</p> <p>Draft legislation completed, and submitted to State Law Office, for enactment in parliament</p>
Operational Procedures	Operational procedures have been updated
Outreach	The VMGD has set up a working group named Communication and Outreach (COP) to oversee outreach activities.
Research and Development	The VMGD has set up a working group named Research and Development Working Group, to oversee research and development activities within VMGD
Infrastructure	<p>The Improvement of Instruments for Disaster Risk Management Project, funded by JICA, Japan has been completed. Two automatic weather stations, two tide gauges and three seismic stations have been build and installed.</p> <p>The VMGD office at Bauerfield Airport has been renovated</p>
People	The staff are one of the main assets of the VMGD. VMGD continues to ensure staff attended short, medium and long-term courses.
Finances	The annual budget for 2015 has seen a 10% reduction compared to the previous year.
Capacity Building	A good number of staff have attended short term training. One staff is currently attending a meteorologist course at PAGASA, completing his WMO Class one qualification in Philippines. Two are currently completing their post graduate qualifications.

Performance by Division

1. Administration Division

Division Purpose and Key Outcomes

The Administration Division provides the VMGD leadership and management structures for the operations of the VMGD. Given the relatively rapid development of the VMGD in the past decade, the Directorship and Corporate Division have sought the appropriate and relevant capacity building and resource support for the increasingly wide array of services the Administration Division provides, as well as building the resources to support those services that go with it.

The Administration Division continues to ensure that it has the necessary and appropriately skilled staff in relevant fields (finance, administrative and human resources) to have an effective administrative component which assures the operation of the various Divisions. The Division also strives to equip the VMGD with the highest possible degree of all resources allocated to it for its operations. The Division, in close consultation, continues to develop appropriate policy documentation to cover the management and operation of the VMGD.

2015 Priority Activities and Results – Administration Division

Programs and Objectives required by the 2015 Business Plan are summarized in the table below with results and commentary provided.

Table: Programs, Objectives and Results – Administration Division (Business Plan)			
Programs	Objective (Targets)	Result ✓ x	Result Summary
Amalgamation	Continue the amalgamation process	✓	More than 80% of vacant positions have been filled
	Implement approved structure		
Amalgamation	Transfer of Flood Forecasting to VMGD	✓	Concept Paper on the transfer of hydrology (Science) to VMGD has been developed and submitted to the Minister
Quality Management System	Quality Management system for all services	✓	Two policies were developed within the VMGD: Internal Policy on Quality Management System and Climate Change Policy. The latter has been approved and launched.
Strengthening Operations	Deliver services more effectively	✓	Directives are reviewed yearly to be in line with all changes.
Policies and Directive	Review implications for all VMGD Units	✓	The operational procedures for the Forecasting Division, the Climate Division and the

			Observations Division were completed, and are continuously reviewed each year. Some procedures for the ICT Division have been completed. Geo-Hazards Division procedures are currently in draft format.
Policy and Legislation	Develop policy and legislation for organizational operations and decision making	✓	<p>VMGD assisted the Ministry of Climate Change complete the Climate Change Policy.</p> <p>The new Legislation draft bill has been completed, and forwarded to the state law office.</p> <p>It will be enacted in parliament by the middle of 2016</p>
Operational Procedures	Review and Develop new operational Procedures if the need arise	✓	This has since been completed
VMGD Strategic Plan	Develop MOUs	✓	<p>MoU agreements have been signed with the following organisations:</p> <ol style="list-style-type: none"> 1. Department of Agriculture 2. NDMO 3. VBTC 4. Vanuatu Red Cross Society 5. Vanuatu Cultural Centre GIZ
Quarterly, Bi-Annual and Annual Reports	Develop appropriate monitoring and reporting systems to meet the required public service standard	✓	The VMGD continues to prepare Annual reports as per the requirements of the PSC.
Business Plans and Budgeting	Complete all reports, plans and budgeting	✓	Business plans and budget for 2016 was completed on time
Building of office for outer island stations	Maintain VMGD's presence at provincial level	✗	The department was not able to source additional funds to build offices for outer island stations. It however source funds for refurbishment.
Opening of New Building		✗	The opening of the new building did not eventuate
Continuation of Working Groups	Working groups function according to their terms of reference	✓	The COP and the Research working group have developed their terms of reference and

Strategic Development Plan 2014-2023

The VMGD has launched its Strategic Development Plan (SDP) 2014-2023. The plan is in line with the Ministry's Corporate Plan and the National Plan (PAA), and is also reflected in the Annual Departmental Plan. The plan will be reviewed in 2016.

VMGD Finances

The total budget allocated and appropriated by Parliament to cover operations of VMGD for 2015 was 125,492,904 vatu, of which 102,849,013 vatu went to Salary/Personnel Expenses and 22,643,891 vatu went to operations.

Expenses Detail Report	Government of Vanuatu
For transactions between 1 January 2015 and 31 December 2015	Extracted on 27/01/16 09:55

Filters Applied to this Report	
Fund	2-Recurrent Fund
Ministry	M20-Ministry of Climate Change Adaptation, Geo-Hazards, Meteorology and Energy
Dept	75-Vanuatu Meteorological Services
Cost Centre	
Activity	
Job Code	From 750004-Administration to 750015-Geohazards
Currency	Vatu
Book	Primary Book (vatu)

Account	Description	Actual	Commitment	Total	Budget	Under/(Over)
	Personnel Expenses					
8ASP	Provident Fund	268,543	-	268,543	-	(268,543)
8AWD	Daily Rated Wages	2,613,126	-	2,613,126	-	(2,613,126)
8AWL	Leave expense	379,112	-	379,112	-	(379,112)

8AWO	Overtime Wages	1,022,188	-	1,022,188	-	(1,022,188)
8AWP	Permanent Wages	4,295,372	-	4,295,372	-	(4,295,372)
	Personnel Expenses	8,578,341	-	8,578,341	-	(8,578,341)
	Operating Expenses					
8CAB	Subsistence Allowances	1,700,000	-	1,700,000	1,960,000	260,000
8CBI	International Accommodation	75,000	-	75,000	100,000	25,000
8CCL	Local Courses	-	-	-	280,000	280,000
8CET	Other Fees	273,807	-	273,807	280,000	6,193
8CFV	Vehicles Fuel	663,111	-	663,111	1,200,000	536,889
8CGM	Mail Carriage Freight	-	-	-	200,000	200,000
8CGO	Other Charges - Freight	67,814	-	67,814	280,000	212,186
8CGR	Transport - Freight	-	-	-	400,000	400,000
8CGS	Storage - Freight	-	-	-	188,000	188,000
8CIE	Equipment Hire	-	-	-	210,000	210,000
8CIF	Facilities Hire	-	-	-	30,000	30,000
8CIV	Vehicles Hire	154,223	-	154,223	20,000	(134,223)
8CJO	Office Cleaning	691,551	-	691,551	400,000	(291,551)
8CKD	Advertising - Communications	372,914	-	372,914	260,000	(112,914)
8CKP	Postage - Communications	69,540	-	69,540	100,000	30,460
8CKR	Printing - Communications	954,374	-	954,374	521,163	(433,211)
8CKS	Stationery - Communications	826,335	-	826,335	1,070,000	243,665
8CKT	Telephone / Fax - Communications	2,853,707	-	2,853,707	1,030,000	(1,823,707)
8CMG	General - Materials	1,876,206	-	1,876,206	220,000	(1,656,206)
8CMO	Office - Materials	20,174	-	20,174	20,000	(174)
8COF	Refunds	8,501	-	8,501	-	(8,501)
8COI	Incidentals	1,367,269	-	1,367,269	400,000	(967,269)

8COP	Official Entertainment	488,814	-	488,814	600,000	111,186
8COT	Termination Payment	3,889,620	-	3,889,620	-	(3,889,620)
8CRB	Buildings Repairs & Maintenance	1,753,635	-	1,753,635	1,070,000	(683,635)
8CRE	Equipment Repairs & Maintenance	208,433	-	208,433	1,111,000	902,567
8CRH	Houses Repairs & Maintenance	160,000	-	160,000	586,000	426,000
8CRV	Vehicles Repairs & Maintenance	876,001	-	876,001	1,020,000	143,999
8CTI	International Travel	276,823	-	276,823	360,000	83,177
8CTL	Local Travel	827,356	-	827,356	1,510,542	683,186
8CUE	Electricity Utilities	1,561,156	-	1,561,156	2,000,000	438,844
8CUW	Water Utilities	78,353	-	78,353	400,000	321,647
8CWL	Local Workshops	-	-	-	1,477,294	1,477,294
8CZV	Value Added Tax	2,191,120	-	2,191,120	200,000	(1,991,120)
8EBR	Buildings - Renovation	-	-	-	700,000	700,000
8EEA	Equipment - Additional General	12,445	-	12,445	200,000	187,555
8EEC	Equipment - Computer	696,973	-	696,973	1,060,000	363,027
8EER	Equipment - Replacement General	100,000	-	100,000	250,000	150,000
8EFO	Furniture - Office Furniture	37,333	-	37,333	220,000	182,667
8EHR	Houses - Renovation	-	-	-	80,000	80,000
8EVR	Vehicle - Replacement	3,777,780	-	3,777,780	1,629,892	(2,147,888)
8FCB	Bank Charges	12,500	-	12,500	-	(12,500)
	Operating Expenses	28,922,868	-	28,922,868	23,643,891	(5,278,977)
	Total Expenditure	37,501,209	-	37,501,209	23,643,891	(13,857,318)

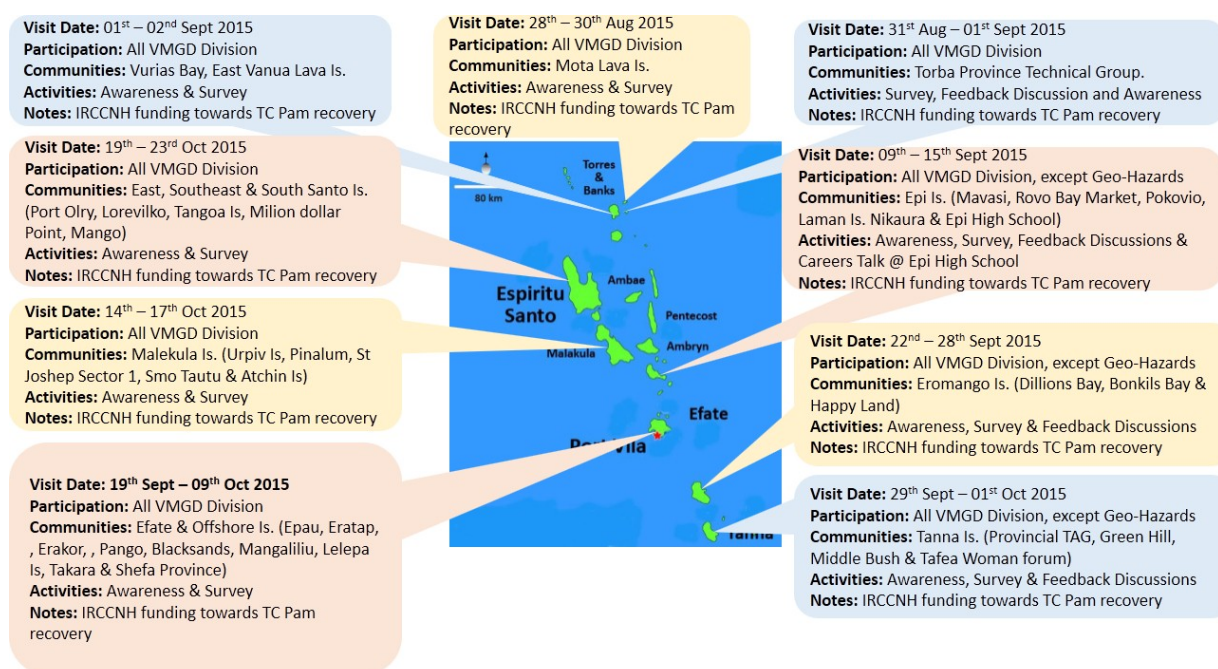
Communication, Outreach and Partnership (COP) Strategy 2014 - 2017

After the launching of the initial Communication and Engagement & Partnership (CEP) Strategy in 2012, the review in 2014 links the strategy to the VMGD Strategic Development Plan for the 2014 - 2023 which

alluded to the activities as the COP. In line with the COP strategy, VMGD used its communication channels and those established by other Government Departments, NGOs and Civil Society to share and receive information, knowledge and actions on meteorological and geo-hazard issues.

In 2014 the VMGD Communication, Outreach and Partnership Internal Working Group (COPIWG) including the terms of reference (TOR) for the group was established. The chairmanship was co-chaired by PSO-Training and Community Liaison officer and the PMU information and communication officer and the group composed of at least one rep from all VMGD 7 Divisions. Since 2012 AVID has been supporting VMGD COPIWG and in 2015 the COPIWG was very fortunate to have the invaluable contributions and expert guidance from Ms. Imogen Aitken. The monthly meetings of the COPIWG was the main avenue where all division reps brought in their COP related activities to the table and the COPIWG made proposals to the management on strategies and options on how to carry out the activities.

One main activity during 2015 after TC PAM was the IRCCNH funded Survey and awareness activities for Post Cyclone PAM. Below is an image of the coverage area including the dates and details of the communities that were visited:





**VMGD Team
talking to a
fully pack
Forum "Tafea
woman yumi
toktok",
Lenakel Tanna**

Achievements Comment

There were many developments within the VMGD in 2015. More than 80% of activities stipulated in the Division Business Plans were implemented across all Divisions, funded either through the recurrent budget or through regional funding and/or bilateral aid.

A high number of trainings were conducted over the course of the year thanks to donor funding. Most trainings were short term, but one staff member from the Forecasting Division and one staff member from the Climate Division completed longer term training, WMO Class 1 and PHD studies respectively.

At the national level, the creation of the Ministry of Climate Change Adaptation, Meteorology, Geo-Hazards, Energy, Environment and Disaster Management is seen as a huge success for the VMGD, as it reflects that the National Government sees the importance of the role played by the VMGD on the issues of weather, climate variability, climate change, disaster risk reduction, mitigation and early warning systems. Vanuatu is an island nation that is very vulnerable to natural hazards¹. In light of that fact, the establishment of the Ministry by the current government reflects an important mandate; to save lives and property, as well as reduce the risk of these natural hazards in the short, medium and long term, through better planning.

¹ Highest World Risk Index to Natural disasters; http://en.wikipedia.org/wiki/List_of_countries_by_natural_disaster_risk

In general, 2015 saw many achievements from each Division, each reflected in this annual report. At the Directorship level, the implementation of 80% the current approved structure, the continuous weather watch 24 hours a day/7 days a week, and the continued modernization of VMGD through various projects that will be implemented within the next two to three years.

The success of a Government organisation is measured on the services it provides to Vanuatu's population; importantly the number of services provided by the VMGD continues to grow. The VMGD continues to find ways deliver these services to the 'the last mile', and this includes building partnerships with various organisations, both government and non-government organisations.

Challenges Comment

The VMGD faced many challenges when trying to implement its plan in 2015. One primary challenge is the recurrent budget, which at times proves insufficient to assist Divisions in implementing all of their activities described in the business plan. The devastation caused by TC Pam has disrupted the VMGD's communication system, as well as damaged most of its infrastructure. The Head Office was also damaged during TC Pam, and is yet to be repaired.

Communicating products and services, particularly warnings, to remote communities in Vanuatu is also a challenge. This report below will detail each of the unique challenges specific to each Division in greater detail.

2. Weather Forecasting & Services Division (WFSD)

Background Information

The Weather Forecasting & Services Division (WFSD) is one of the seven divisions within the Vanuatu Meteorology & Geo-Hazards Department (VMGD). WFSD has a total of nine weather forecasters which comprises of the Divisional Manager, two Principal Scientific Officers (PSO's) and six senior and junior forecasters. Out of the nine forecasters, there are five WMO Class I which adds the number to six with the current Director of the Department, Mr. David Gibson. Currently, two are on study leave at which Moirah Matou is doing Masters in Environmental Science at Monash University in Australia, while Levu Antfalo is undertaking his WMO Class I Meteorology at the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) in the Philippines. Once Levu Antfalo returns, the number of WMO Class I forecasters will increase to seven by end of 2016.

The primary function of the WFSD is to provide short to medium range weather forecasts targeting mostly the Aviation, Marine, Tourism, Agriculture, fisheries, Government, nongovernment organizations and the public at large. WFSD also provides warnings for Severe Weather, such as heavy rainfall, flash flooding and inland winds, High Seas warnings for Vanuatu area during the Tropical Lows and Tropical Cyclones and Marine wind warnings for Vanuatu coastal waters. WFSD is also responsible for the Tsunami Advisories whenever an earthquake triggering a tsunami and posing a threat to Vanuatu Islands. WFSD also involved in a survey to improve the products and services and case studies (research) and other specifically tailored services.

Division's Purpose and Key Outcomes

The WFSD contributes significantly to VMGD's purpose by providing timely and quality weather services and products to the general public, mariners and commercial end-users, via qualified meteorologists deploying the appropriate and state-of-the-art weather forecasting systems.

The WFSD continuously monitors and ensures that all Division products and services are delivered in a timely manner. To further ensure quality services and products by way of recruiting the highest qualified science graduates for deployment as qualified meteorologists. As well as that, the Division regularly assesses and evaluates its weather forecasting systems to ensure the state-of-the-art and most appropriate technologies are being deployed to produce quality services. Finally, the Division is also responsible for the implementation of the Quality Management System (QMS) to monitor, evaluate and improve the Division's products and services standards.

Priority Activities and Results 2015

Weather Forecasting & Services Division (Business Plan)				
Programs	Objective (Targets)		Result ✓ or ✗	Result Summary
24-hours Operations	Provide weather forecast	24-hour watch	✓	24/7 operations sustained

Weather on TV	Provide weather presentation on TV	x	TV Weather Presentation, available daily on National TV and uploaded on Website
Services from the National Forecasting Center	Maintain all current forecast services, strive for improvement as well as add additional services	✓	Maintenance of the current forecasting services, continuous improvement and integration of additional services
Quality Management System	Attain ISO 9001:2008 Certification	x	Continuous Quality Management System implemented for aviation Services, continuous customer feedback ISO 9001: 2008 Certification by November 2014
All Forecasters to be graduated	Upgrade Human Resources	✓	Services improved to meet national and international standards
Improve forecast preparation and dissemination	Develop forecasting automated software - Integrated Weather Forecasting System (IWFS)	x x	Software to be used by end of 2015. Improve VMGD Website, automated product/service upload by end of 2015
Prepare Annual Report	Monitor and evaluate the overall work of the division	✓	Annual Report draft

Achievements

The 24/7 shift continued to be managed throughout the year generally well. The WFSD maintained the service delivery in terms of its quality weather forecasting products and continued to improve on all the current products, whilst endeavoring to meet the needs of the end users. As far as the human resources capability is concerned, WFSD is manned with 3 WMO class I Forecasters, with one female staff on WMO fellowship at BoM. Nonetheless, there are always areas with room for improvement which include: Weather TV production, development of an Integrated Weather Forecasting System (IWFS), improvement of the website and attaining the ISO standards for Aviation forecasters.

Challenges

One of the most challenging tasks for the WFSD was to get both the junior and the senior forecasters ready for the severe TC Pam Category 5. It was a real practical test for the entire operation. A real test for our human capacity, a test for the TC SOP's and Directives, a test in the Scientific know-how, a test in the network connectivity, communication and the backup system.

The WFSD has also faced a number of other challenges apart from the actually monitoring and tracking of TC Pam. One of which was to obtain permanent employment status for the three contracted staff from

the PSC in order to be compatible with the workload and shortage of staff. Another challenge was after TC Pam, the Manager received instruction from the PM's Office and the Office of the DG to coordinate the Disaster Relief Distribution in the urban and semi-urban areas within Port Vila. He spent five months from assessment, second, third and fourth food distribution. The temporary management of the forecast operation was managed by the PSO commercial & Public Weather with the cooperation from the senior forecasters.

The annual internal TC training had not been conducted as a preparation for the 2015/2016 TC season. As this is an important training that is usually being conducted by both the Director, Mr. David Gibson, and the Manager of the Forecasting Division Mr. Fred Jockley. Unfortunately, it was not possible since the Manager was still busy with the food distribution and finalizing the reports.

Products & Services Provided by WFSD

There are no additional forecast products or service introduced this year, 2015. The usual services and products are Public Weather Forecasts, Marine Weather Forecasts, Aviation Weather Forecasts Weather Warnings and Tsunami Advisories and they are as follow:

Public Weather Services

- 1) Forecast Policy is prepared and uploaded on website and accessible on:
<http://www.meteo.gov.vu/Forecasts/ForecastPolicy/tabid/126/Default.aspx>
- 2) 7-Day forecast for six provincial centres, issued twice a day via client email list and uploaded on:
<http://www.meteo.gov.vu/Forecasts/7DayForecastforSelectedCentres/tabid/192/Default.aspx>
- 3) Public Forecast is prepared and sent to the national Radio, FM stations every four to five hours a day, and uploaded on website which is accessible on:
<http://www.meteo.gov.vu/Forecasts/MediaForecast/tabid/283/Default.aspx>
- 4) Media forecast for Weekly IPV, Independent Newspaper and daily forecast for Daily Post Newspaper which is accessible on:
<http://www.meteo.gov.vu/Forecasts/MediaForecast/tabid/283/Default.aspx>
- 5) Hourly images are uploaded on the VMGD's website:
<http://www.meteo.gov.vu/MapsandCharts/LatestSatelliteImage/tabid/82/Default.aspx>
- 6) Vanuatu Cities forecast is prepared and sent via email to the World Cities Forecast of the WMO every 24 hours

Marine Weather Services

- 1) 7. 4-Day coastal Marine forecast including wave and swell heights, issued twice a day. The marine forecast covers six boundaries: The Northern, Central, Channel between Efate and Erromango and the Southern waters including Port Vila and Luganville Harbours is uploaded on: <http://www.meteo.gov.vu/Marine/tabid/65/Default.aspx>

- 2) High Seas forecast for Vanuatu's Area (from 12°S to 23°S and from 160°E to 175°E) is prepared and uploaded on website every twelve hours. This can be accessed on: <http://www.meteo.gov.vu/Marine/HighSeasForecast/tabid/293/Default.aspx>

Aviation Weather Services

- 1) Terminal Aerodrome Forecast (TAF) for all seven aerodromes (Sola NVSC, Pekoa NVSS, Saratamata NVSG, Lamap NVSL, Bauerfield NVVV, Whitegrass NVVW and Aneityum NVVA) are prepared and sent six hourly through GTS, to pilots email group and also uploaded on: <http://www.meteo.gov.vu/AviationServices/TerminalAerodromeForecasts/tabid/222/Default.aspx>
- 2) ARFOR – Area Forecast for the whole Vanuatu group is prepared and sent through GTS, to pilots email group and also uploaded on: <http://www.meteo.gov.vu/AviationServices/AreaForecast/tabid/223/Default.aspx>
- 3) TTFs are prepared and issued only for international aerodromes (NVSS, NVVV and NVVW) when weather warranted. This uploaded in website and can be access on: <http://www.meteo.gov.vu/AviationForecasts/TrendForecast/tabid/127/Default.aspx>
- 4) ROFOR-Route Forecast is prepared and issued to Air Vanuatu for its international flights as per its International weekly flight schedules.

Weather Warnings

- 1) Marine wind warning or strong wind warning issued six hourly only when weather warranted
- 2) High Seas wind warning issued only during tropical cyclones and or during a tropical low for Vanuatu area
- 3) Tropical Cyclone three Day outlook is prepared and uploaded on website twice a day only during cyclone season from the beginning of November 2013 till end of April 2014.
- 4) Tropical Cyclone Information, Advisories and Warnings are prepared and sent to tropical cyclone subscribers for any system which may be formed within Vanuatu's area of responsibility from the beginning of November 2013 January till end of April 2014.
- 5) Tropical Cyclone Forecast Track Map is prepared and sent to tropical cyclone subscribers only during a cyclone event affecting Vanuatu. This map indicates the past track and the next 48 hours forecast track.
- 6) Severe weather warnings issued for heavy rainfall $\geq 100\text{mm}/24\text{hr}$ and inland winds of $\geq 40\text{km/hr}$.
- 7) Tsunami Information and Advisory are prepared and issued with three hours validity only when there is an earthquake triggering a tsunami and posing a threat to Vanuatu.

Tsunami Information & Advisory

The Tsunami Information or Tsunami Advisory will be prepared and issued only during the events when earthquakes occurred and triggered potential tsunami threat to Vanuatu. There are basically two thresholds: (1) one for local or regional tsunami and (2) the other is for the Pacific wide or international tsunami. The Tsunami operation are stipulated under the Tsunami Directive or SOP. In any tsunami instances, the Tsunami Information or Tsunami Advisory will be issued with three hours validity only when there is an earthquake triggering a tsunami and posing a threat to Vanuatu. However, VMGD had no major tsunami during 2015, although it had recorded a few events:

- 1) A Tsunami Information was issued for an earthquake which occurred on the 20th March 2015 at 12:54 am local time. Its magnitude was 6.0 with epicenter near 18.6°S and 168.4°E. This was about 96 Km SSE of Efate Island and about 57 Km WNW of Erromango Island. No destructive Tsunami expected within Vanuatu.
- 2) A Tsunami Advisory was issued for an earthquake which occurred on the 30th of March 2015 at 10:49 am local time. Its magnitude was 7.6 with epicenter near 4.7°S and 152.7°E. This was about 1,800 Km NW of TORBA province. No significant destructive tsunami was expected within Vanuatu.
- 3) A Tsunami Information was issued for an earthquake which occurred on the 21st of May 2015 at 09:48 am local time. Its magnitude was 6.9, depth of 10 Km with epicenter near 10.9°S and 164.1°E near Santa Cruz Island. This was about 363 Km NW of Torres Group. No destructive tsunami expected within Vanuatu.
- 4) A Tsunami Information was issued for an earthquake which occurred on the 18th of July 2015 at 1:28 pm local time. Its magnitude was 7.5 with epicenter near 10.3°S and 165.2°E. This was about 613 Km north of TORBA. No destructive tsunami expected within Vanuatu.

Records of TC's during 2014-2015 Season

Following the release of the TC Seasonal forecast for 2014-2015 for Vanuatu's Area (12°S to 13°S and 160°E to 175°E), the Vanuatu Meteorology & Geo-Hazards Department through the Climate & Services Division (CSD), indicated that Vanuatu-New Caledonia region will experience the greatest cyclonic activity with at least 2 to 3 cyclones passing close to the countries. Given the ENSO neutral conditions observed to be existing over the Equatorial Pacific, with a weak El Nino developing in the following months. The forecast also indicated that there will be at least one or more cyclones with category 3 or higher. With the climate TC Outlook in perspective for the 2014/2015 TC season, at the end of the season, VMGD officially recorded three cyclones: (1) Tropical Cyclone Ola occurred on the 30th of January and lasted until 01st of February 2015 (2) The next was Severe Tropical Cyclone Pam from 9th till 14th March 2015 and finally (3) Severe Tropical Cyclone Solo which occurred from the 10th till the 12th of April 2015.

TC Ola Category 2 (30 Jan – 01 Feb 2015)

TC Ola started as a tropical low pressure on the 30th of January 2015 with central pressure estimated at 1000 hPa about 740 Km west of Malekula. The first TC Information was issued although the system was still outside of Vanuatu's Area of Responsibility. The low pressure headed east-southeast with potentially

developing. It then finally moved into Vanuatu's Area of Responsibility at 11:00 am. At that stage, there was no significant threat yet to any of the islands of Vanuatu. On the 31st of January, the tropical low was about approaching at 580 Km west southwest of Santo and continued to develop with central pressure decreasing to 998 hPa. At this time, a severe weather warning for heavy rainfall was issued for Northern and Central Vanuatu.

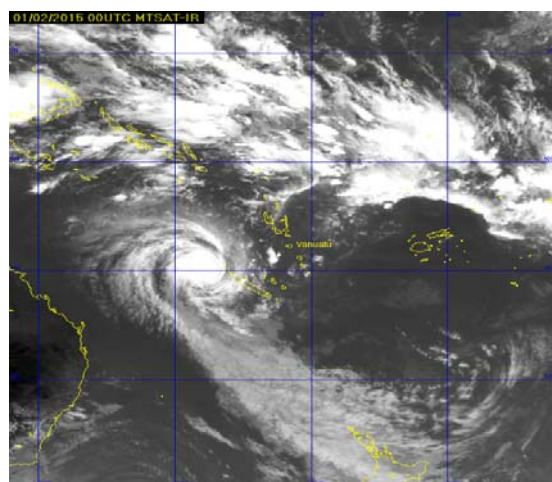
The Information bulletin was later upgraded to Advisory at 11:00am on the 31st of February 2015. That was when the Tropical Low met the criteria of becoming a Tropical Cyclone and was named Tropical Cyclone Ola with it central decreasing to 990 hPa, a Category 1. It arrived at 620 Km west southwest of Santo and continued to move south-southeast well away from the Vanuatu Islands. There were no direct threat of winds felt in Vanuatu islands however, High Seas Wind Warning was issued for open waters west of Vanuatu near the system. Severe weather warning for heavy rainfall and possible flooding was also issued for Northern and Central Vanuatu.

Tropical Cyclone Ola moved in a southeast direction and continued to intensify when it was 770 Km west of Erromango Island. By 11:00 pm, TC Ola was upgrade to Category 2 and continued to move south-southeast well away from southern Vanuatu. At 5:00 am on the 01st of February 2015, the final information was issued as Cat 2 TC Ola (984 hPa) moving away from Vanuatu Area of Responsibility.

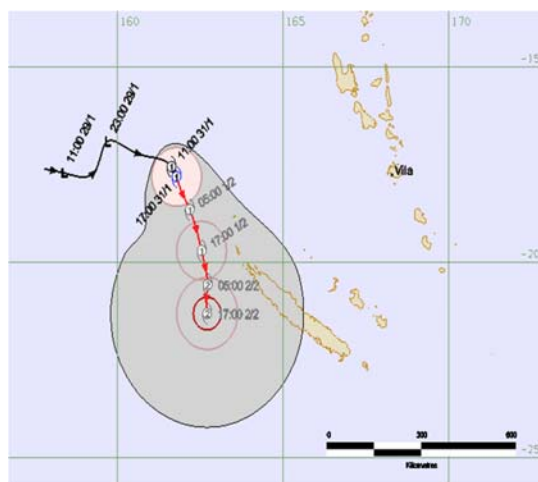
Based on the track of Tropical Cyclone Ola, there were no physical damages done to any islands of Vanuatu. However, marine strong wind and high seas wind warning were issued during the duration of TC Ola in Vanuatu area.

Number of TC Bulletins issued for TC Ola

Tropical Cyclone	Information Bulletins	Advisory Bulletins	Warning Bulletins	Forecast Track Maps
TC Ola	6	3	Nil	9



TC Ola at 11:00 am Sunday 01 February 2015



VMGD's Forecast track map

Severe TC Pam Category 5 (09 - 14 March 2015)

TC Pam began as a tropical Low on the 06th March 2015, some 800 Km northeast of Torres Group. At that time, its central pressure was 997hPa with winds near the center estimated at 30 knots.

Favorable environmental conditions near the surface and at upper level, allowed the system to develop and intensify and was named as TC Pam at 6:00 pm on the 09th of March 2015. At that time, the system was 600 Km northeast of the Banks group with winds increasing to 40 knots and its central pressure decreased to 990hPa.

The first TC Information on Pam was issued by VMGD on the 10th of March 2015 when Pam was somewhat 600 Km northeast of the Banks group but still outside of the Vanuatu Tropical Cyclone Tracking Map and of course outside of the Vanuatu's Area of Responsibility (12°S to 23°S and 160°E to 175°E).

The first TC Advisory was then issued at 6:00 pm on the 10th of March when Pam was 560 Km northeast of the Banks Group. The first TC Warning was issued at 9:00 am on the 11th of March when it was 425 Km northeast of Gaua. At that time, TC Pam had moved into the Vanuatu Tropical Cyclone Tracking Map. With a steady decline, the system quickly dropped its central pressure to 966hPa, with winds estimated at 130 km/hr.

Pam rapidly intensified into a Category 4 system towards 11:00 am on the 12th of March, as it moved closer to the northern islands of Vanuatu in the TORBA province. It then took a south-southwest direction, moving very close to Vanuatu. Within an hour, Pam quickly intensified and made history for VMGD for reaching the highest Category 5 on the 13th of March, as it took a south-southwesterly path to the east of PENAMA province.

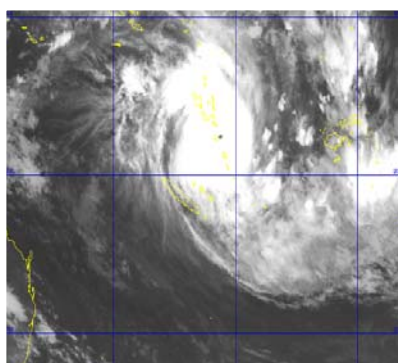
The VTCWC at that stage began to issue hourly warnings from an original three hourly warnings as of midday on Friday the 13th of March 2015. During that time, the system was moving closer to the eastern parts of MALAMPA and PENMA provinces. It moved with great momentum past the Shepherds group. Severe TC Pam at that instant, was heading south and intending to make a south-southeast curve as it was moving past the island of Efate within the eastern close proximity the island where capital Port Vila is. During that time, it was approaching midnight. The closest distance where the Cat 5 Pam passed within SHEFA province was 30 Km east-northeast of the Shepherds group and 45 Km east of Port Vila.

As Cat 5 TC Pam was leaving Efate Island, it took a south-southeast direction. It then made landfall on the island of Erromango in the TAFEA province at 5:00 am on the 14th of March. Towards 8:00 am, it picked up speed and was approximately 20 Km west of Tanna. It maintained a south-southeast direction of movement away from TAFEA province the whole day on Saturday. The last warning which was warning number 47 with the final Forecast Track map number 48 were last issued at 8:00 pm that evening on Saturday the 14th of March 2015.

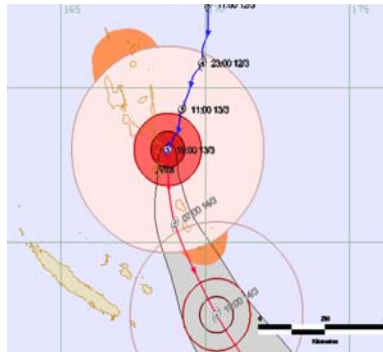
Tropical cyclone warnings from the Vanuatu Meteorology and Geo-Hazards Department were issued at least 24 hours before the onset of Gales. Warnings were issued every three hours, and then every one hour as the system moved closer to Vanuatu islands. Although the system came very close to Port Vila and caused a lot of damages to VMGD building, warnings continued to be issued interrupted given the backup generator that was immediately turned on to supply power to the VMGD building on the 13th of March 2015 toward 11:00 pm. Internet connection was also unaffected during the passage of the Severe Tropical Cyclone Pam.

Number of TC Bulletins issued for Severe TC Pam

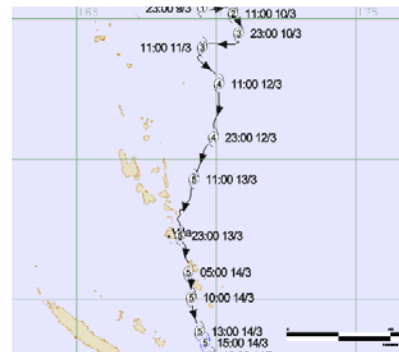
Name of TC	Information Bulletins	Advisory Bulletins	Warning Bulletins	Forecast Track Maps	SMS to both Digicel & TVL
Severe TC Pam	1	3	48	47	38



MTSAT IR image of TC Pam at 11:00 pm 13 March 2015



VMGD's 30th Forecast track map issued at 7:55 pm



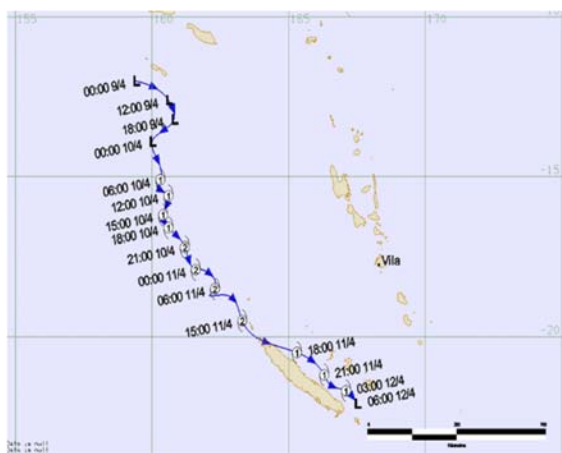
VMGD's Analysis track

TC Solo Category 2 (10 – 12 April 2015)

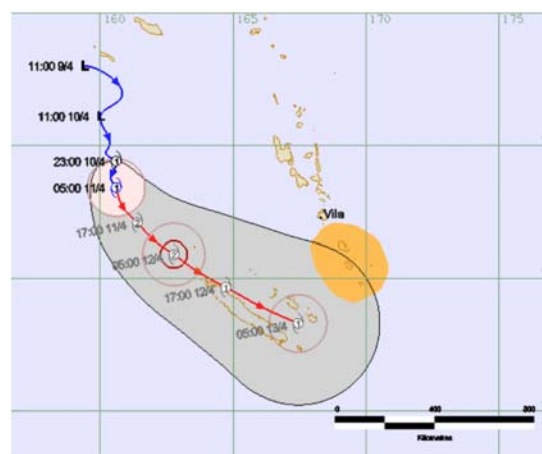
Tropical cyclone Solo is a unique systems as it is a hybrid of two low pressure systems. This was formed north of the Coral Seas between Papua New Guinea and the Solomon Islands. It had redeveloped into a cyclonic system with its central pressure at 996 hPa on the 10th of April 2015. The system was still outside of the Vanuatu Tropical Cyclone Tracking Map and was about 730 Km southwest of Torres islands in the TORBA province. TC Solo entered into Vanuatu's Area on the 11th of April 2015 and was somewhat 630 Km further west southwest of Santo.

At 0600UTC on the 10th of April, the system had reached Category 1. In the evening toward 2100UTC on the same day, the system intensified further and reached Category 2. Then, it tracked southeast and headed towards New Caledonia on the 11th of April. It was believed to be making landfall near the northern tip of the New Caledonia around 4:00pm on the same day.

It was observed and analyzed with the guidance from most of the global and regional TC forecast models not to be much of the concern to the southern parts of Vanuatu. As it was tracking through the channel between the main island of New Caledonia and the two islands of Lifu and Mare, it gradually lost energy because of the cooler sea surface area south of 22°S and so, it sheared and weakened down to low pressure towards 6:00am on the 12th of April 2015.



VMGD's Analysis track



VMGD's Forecast Track Map no 7 issued on Saturday 11 April 2015

Number of Tropical Cyclone Bulletins issued for TC Solo

Name of TC	Information Bulletins	Advisory Bulletins	Warning Bulletins	Forecast Maps	Track
TC Solo	4	15	Nil	19	

Tsunami Generated and Expected threat to Vanuatu islands during 2015

The VMGD through WFSD is mandated to issue Tsunami Information and Advisories if any earthquake triggering Tsunami and become a potential threat to Vanuatu Islands. During 2015, WFSD had issued Tsunami Information and Advisories for four Tsunami events. Given below in the table, the tsunami event.

Tsunami Event	Information Bulletins	Advisory Bulletins	Warning Bulletins
20 March 2015	1	Nil	Nil
30 March 2015	1	1	Nil
21 May 2015	1	Nil	Nil
18 July 2015	1	Nil	Nil

A total of 4 Tsunami Information bulletin, 1 Tsunami Advisory bulletin and no Tsunami Warning.

Other Notable Development

- WFSD fully engaged in the annual events of ICT & WMO Day activities as part of panel discussions, giving out presentations and brochures to students and the general public.
- Three senior contracted weather forecasters became permanent under the Public Service.
- JICA project and completed and live transmission of data from the two AWS at Pekoa and Bauerfield and two tidal gauges from Lenakel and Litzlitz were displayed in the WFSD operation room.
- VMGD through WFSD co-authored two research papers from the two separate research findings conducted by a team from the Kyoto University in Japan and a combined research Team by the Canadian and the United States research team.

Training and Human Resource Development

- Levu Antfalo attended Training at the Pacific Desk in Hawaii from 01 – 23 May 2015.
- Levu Antfalo took part in the Awareness workshop in Malekula from 02 – 03 July 2015.
- Levu Antfalo attended FINPAC training course from 17 – 20 August 2015.
- Tom Natick attended Training Course in Palau from 01 – 7 May 2015.
- Abel Kalo took part in the COP Awareness/Outreach program in Tanna from 15 – 28 September 2015.
- Abel Kalo took part in the COP Awareness/Outreach in Malekula and Santo from 13 – 25 October 2015.
- Fred Jockley Coordinated the Disaster Relief Distribution after TC Pam from April to October 2015.
- Fred Jockley attended CAAV stakeholders Training workshop at Onesua Presbyterian College from 01 – 07 August 2015.
- Yan Nelson took part in the COP Awareness/Outreach program in Vanua Lava in TORBA province from 28 – 31 August 2015.
- Yan Nelson took part in the COP Awareness/Outreach program in Epi and Erromango islands from 01 – 04 September; from 09 – 16 September and from 22 – 31 September 2015.
- Yam Nelson took part in the COP Awareness/Outreach program on Tanna from 01 – 04 October 2015.
- Jerry Timothy attended TC Training Course at the Bureau of Meteorology in Melbourne Australia from 03 – 18 October 2015.
- Jerry Timothy attended Oceanography/Marine Training course in the Solomon Islands from 07 – 14 November 2015.

3. Climate Division

The climate division is a division within the Vanuatu Meteorology and Geo-Hazards Department under the Ministry of Climate Change and Natural Disaster. The division consist of five main areas and they are namely the Seasonal forecast, Vanuatu Rainfall Network, Data Management, Traditional knowledge, Request and awareness. These activities work together to ensure the core functions are carried out as indicated in the 2014 annual business plans and in the new Strategy plan.

Performance Overview

The climate division's performance in 2015 has been above average, as more than ninety percent of the planned activities were carried out.

1. Seasonal Forecast

Program Purpose and Key Outcomes

The seasonal forecasting program contributes to climates purpose by providing timely and quality seasonal outlook services and products by way of skilled and motivated staff, using modern and sound technology and techniques.

The seasonal forecast activity is a highly scientific activity that's requires qualified staff using modern and sound technology for management and analysis of climate and related environmental data to monitor, predict and provide climate and other related environment information, forecasts, advisories and warnings.

The following are key outcomes identified by the seasonal forecast program:

1. Providing relevant information to aid decision making with regards to climate natural hazards
2. Expansion of climate services to other sectors

2015 Priority Activities and Results

Seasonal Forecasting (Business Plan)			
Programs	Objective (Targets)	Result ✓ x	Result Summary
National Climate Centre Monthly Bulletins	To produce, issue and circulate monthly bulletins to all government and relevant agencies 1. Teleconference preparation	✓	12 VCU bulletins were produced and circulated Preparation of OCOF tables


	2. Participate in monthly/quarterly teleconference 3. Publish rainfall outlook 4. Publish monthly VCU 5. Stakeholders meeting 6. Monthly briefing 7. Update provincial boards 8. Produce agro-met bulletins 9. Include Bislama language into SCOPIC	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✗ ✓	Participate in teleconference Outlook upload on webpage VCU produce 1 Stakeholder meeting 6 monthly briefings Update of provincial boards NO agro-met bulletin Will be included in the new version of SCOPIC
ENSO	1. Review of ENSO Directive 2. Integrate crop threshold into SCOPIC 3. ENSO timeline and stories for Vanuatu completed 4. Run an internal ENSO training for VMGD	✓ ✓ ✗	Review of ENSO Directive Initial research by VARTC NOAA help to develop this No ENSO internal training
Climate Early Warning System	1. Purchase and install equipment 2. Run stakeholders workshop 3. Build CliDE Desk (Interface) 4. Training on how to use the Dash Board	✗ ✗ ✗ ✗	EU-GIZ project not implemented yet. Funding approved. Activities will be included in the project activities to be implemented
Agro-Met	1. Produce 12 agro-met bulletins 2. Manage Vanuatu rainfall and agro-met face book for dissemination of information on line 3. Attachment of agriculture officers to climate section and vice versa 4. Conduct climate field schools 5. Review VMGD and DARD MOA 6. Implement recommendation from Tanna workshop 7. Talk with Agriculture department to set up Agro-Met stations	✗ ✗ ✓ ✗ ✓ ✓ ✓	Officer on study leave Officer on study leave Officer attend join trainings Cover under the new FAO funding Cover under the new FAO funding Discussions to fund this under EDF11 or GCF funding
Hydrology	1. Run workshop on climate dialogue in hydrology sector 2. Amend VMGD structure to include a post for Climate and Hydrology	✗ ✓	EU-GIZ project not implemented yet Draft structure in place to be presented to Management team
Marine	1. Run workshop on climate dialogue in Marine sector 2. Amend VMGD structure to include a post for Climate and Marine	✗ ✓	EU-GIZ project not implemented yet Draft structure in place to be presented to Management team


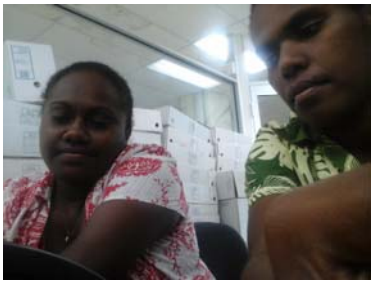
Health	1. Run workshop on climate dialogue Health sector	✗	EU-GIZ project not implemented yet Draft structure in place to be presented to Management team
	2. Amend VMGD structure to include a post for Climate and Health	✓	


One of the ongoing activities carried out within the climate division is the monthly seasonal forecasting. This requires the climate division to produce SCOPIC outlook table and send it to the Bureau of Meteorology. Once finalized a briefing is organized to update the officers of VMGD on the ENSO status and situation. There were 3 teleconferences on the following dates: 20th Jan, 17th Feb and 17th March. The climate division was only able to participate in 2 of this teleconferences as on the 17th March the State of Emergency for Cyclone Pam was still on.


The department's partnership with the Bureau of Meteorology Australia in the Climate and Oceans Monitoring and Prediction (COMP) project helps strengthen and facilitate the production of information that we provide to our stakeholders and the public.

BOM teleconference

Date	Time	Teleconference Summary
20 th /01/15	1200Z	 <p>The El Niño-like conditions in the tropical Pacific Ocean both in the atmosphere and ocean have weakened in recent weeks. Most of the surveyed models forecast tropical Pacific Ocean SSTs to remain above average, but within the neutral range, until at least April. Hence ENSO tracker remains at NEUTRAL unless observations and model outlooks indicate a heightened risk of either La Niña or El Niño developing later this year.</p> <p>Report: prepared by Melinda Natapei and submitted</p> <p>Attendance: Melinda Natapei, Daphne Nalawas and Shanna Joseph</p>
17 th /02/15	1200Z	<p>The borderline El Niño patterns in the tropical Pacific Ocean and atmosphere have continued to weaken during 2015. Sea Surface temperatures across the tropical Pacific Ocean have eased away from the near El Niño levels observed late last year. Models surveyed indicate tropical Pacific Ocean SSTs are likely to remain above average, but within the Neutral range, until May. By July, six of the eight models suggest a renewed warming with the NINO3.4 index likely to reach El Niño thresholds</p>

		Report: prepared and submitted by Daphne, checked by Manager Attendance: Daphne Nalawas and Shanna Joseph
17 th /03/15	1200Z	<p>We were not able to participate in this teleconference as during this time, there was a state of emergency for the whole country due to cyclone Pam damage.</p> <p>Report: Prepared by Daphne and checked by Manager. Submit to BoM a week later</p> <p>Attendance: None</p>
14 th /04/15	1200Z	<p>The trade winds have continued to weaken over the Western and central Pacific. Models indicate Sea Surface Temperatures continue to warm towards the eastern pacific, but still in the Neutral Range</p> <p>Report: prepared and submitted by Daphne, checked by Manager</p> <p>Attendance: Daphne Nalawas and Shanna Joseph</p>
12 th /05/15 	1200Z	<p>All models have indicated Sea surface temperatures to have reach the El Niño thresholds. South easterly trades continue to weaken across the Eastern Pacific and westerly's gaining more strength. SST anomalies continue to warm towards the Eastern Pacific.</p> <p>Report: Prepared and submitted by Daphne, checked by Manager</p> <p>Attendance: Daphne Nalawas and Shanna Joseph</p>
16 th /06/15 	1200Z	<p>The 2015 El Niño continues to develop. Most oceanic and atmospheric indicators are consistent with El Niño. Sea surface temperatures in the tropical Pacific have continued to warm. However, the Southern Oscillation Index (SOI) is currently rising with this due to local weather, not climate factors. Cloudiness near the Date Line has also eased towards more normal levels, but this shift may only be short-lived.</p> <p>Report: Prepared and submitted by Daphne, checked by Manager</p> <p>Attendance: Daphne Nalawas and Shanna Joseph</p>
14/07/15	1200Z	<p>The 2015 El Niño has strengthened during early July, largely due to recent tropical cyclone activity which caused strong westerly wind anomalies in the western and central Pacific. Sea surface temperatures in the central and western Pacific have continued to warm and cool anomalies in the western Pacific sub-surface have eroded during July.</p> <p>Report: Prepared and Submitted by Daphne, checked by Manager</p> <p>Attendance: Daphne Nalawas and Shanna Joseph</p>

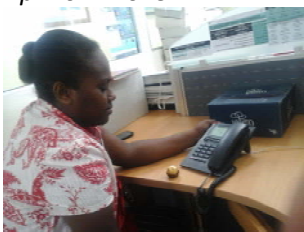

		
12/08/15	1200Z	<p>The 2015 El Niño is now well-established. Sea surface temperatures in the central and western Pacific have continued to warm and cool anomalies in the western Pacific sub-surface eroded during July. In the coming weeks, the central tropical Pacific Ocean (i.e. the NINO3.4 region) may exceed the peak values reached during the 2002 and 2009 El Niño events, but current anomalies remain well short of the 1982 and 1997 peaks. Trade winds remain weak; a situation likely to contribute to more warming of the tropical Pacific Ocean.</p> <p>Report: prepared and Submitted by Daphne, checked by Manager</p> <p>Attendance: Daphne Nalawas (in BoM) & Shanna Joseph (VMGD)</p>
15 th /09/15	1200Z	<p>The El Niño is likely to peak by December 2015. All models are suggesting a very strong El Niño and so far the warming in the east have exceeded the 1997/2998 thresholds.</p> <p>Report: Prepared and submitted by Daphne, checked by Manager</p> <p>Attendance: Mercy Nalawas (I was in Tanna in the COPIWG Outreach to communities)</p>
20 th /10/15	1200Z	<p>The 2015 El Niño is now the strongest since the 1997-98 event. The strong El Niño is expected to last until at least the end of the year before declining in the first year of 2016. Sea surface temperatures (SSTs) in the central to eastern tropical Pacific continue to warm, further entrenching El Niño.</p> <p>Report: Prepared and submitted by Daphne, checked by Manager</p> <p>Attendance: Daphne Nalawas</p>

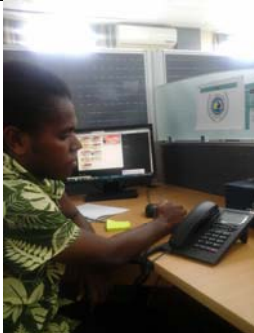

10 th /11/15 	1200Z	The El Niño is still developing to its final stages and models are indicating for it to peak by December 2015. Report: Prepared by Daphne, checked by Manager and submitted by Shanna Attendance: Shanna Joseph (I was in Tanna on the Climate/VRCS El Niño Workshop)
08 th /12/15	1200Z	The strong 2015 El Niño event is near its peak. While sea surface temperatures remain close to record-high values, some El Niño indicators are now showing signs of easing. However, the current El Niño is likely to persist well into 2016. Report: Prepared and submitted by Daphne Attendance: Shanna Joseph (I was in Fiji on Enhancing Climate Indices and Sector Applications workshop)

NIWA teleconference

Another partnership that helps facilitate our services is with the National Institute of Water and Atmospheric Research (NIWA) based in New Zealand. NIWA also holds monthly teleconferences that the department through climate division participates in. This year the Climate Division has participated in all the Teleconferences.

Date	Time	Teleconference Summary
January	10:30am	<ul style="list-style-type: none"> Sea surface temperatures across the equatorial Pacific Ocean are borderline between neutral and weak El Niño conditions. However - as was the case over the past few months – the atmospheric patterns are still inconsistent with El Niño. International guidance indicates that the probability of El Niño conditions developing the next three months (February – April 2015) is about 60%.
February 04 th 2015	10:30am	<ul style="list-style-type: none"> Tropical Pacific oceanic conditions near the equator are just below El Nino thresholds. Sea surface temperatures across the equatorial Pacific Ocean continued to reflect conditions between neutral and weak El Niño states during February 2015. Atmospheric patterns were also indicative of weak El Niño-like conditions. International guidance indicates that the probability of El Niño developing over the next three months (March – May 2015) is about 45%. This probability increases to ~60% in June – August 2015.

March 04 th 2015	10:30am	<ul style="list-style-type: none"> The equatorial Pacific remains in a neutral ENSO state. Sea surface temperatures (SSTs) remain higher than normal in the central south Pacific. The atmospheric patterns are also generally consistent with weak El Niño conditions. International guidance indicates that the probability for conventional El Niño thresholds being crossed over the next three months (April – June 2015) is about 70%.
April 01 st 2015 	10:30am	<ul style="list-style-type: none"> The SST's continue to warm towards the eastern Pacific and the TRMM continues to show anomaly conditions of drier than normal rainfall.
May 01 st 2015	10:30am	<ul style="list-style-type: none"> The El Nino Southern Oscillation has shown greater chances of meeting the El Nino thresholds. With SSTs warming further into the eastern pacific and cooler temperatures are moving in towards the western pacific.
June 03 rd 2015 	10:30am	<ul style="list-style-type: none"> El Nino thresholds have been reached towards the end of last month and all climate models have shown a positive sign for the El Nino to continue to develop further this month and to the year.
July 01 st 2015	10:30am	<ul style="list-style-type: none"> With SPCZ moving further North East, countries in the South western Pacific are facing drier than normal conditions and a drop in the rainfall patterns in the western pacific particularly over Papua New Guinea, Solomon Islands, Vanuatu, Fiji, Tonga and New Caledonia
August 04 th 2015	10:30am	<ul style="list-style-type: none"> The El Nino southern Oscillation index has shown a greater positive El Nino. SOI has continued to drop well below the threshold and SSTs continue to warm further east of the Pacific while Cooler anomalies continue to move in over the western pacific.

		
<i>September 03rd 2015</i>	10:30am	<ul style="list-style-type: none"> Still well inside the El Nino thresholds and all climate models continue to show an increase in the strength of the El Nino.
<i>October 01st 2015</i>	10:30am	<ul style="list-style-type: none"> The current El Nino is getting stronger still, although models have forecasted for it to peak around the end of December 2015. Forecasts is for the El Nino to go on further into 2016.
<i>November 04th 2015</i>	10:30am	<ul style="list-style-type: none"> Ocean conditions are still in responsive to El Nino like conditions.
<i>December 03rd 2015</i> 	10:30am	<ul style="list-style-type: none"> Most of the ENSO conditions are still within the El Nino thresholds although the Southern Oscillation Index has fallen back into normal conditions in the last weeks. El Nino is forecasted to still take it through until mid-next year 2016.

Briefings

The Climate Division conducted 5 briefings with the Stakeholders. These includes 2 regional stakeholder's briefing through video conferencing and 3 briefings with National Stakeholders.

2. Data Management

Program Purpose and Key Outcomes

The Data Management program contributes to climate's purpose by providing Vanuatu historical climate data by way of skilled and motivated staff using robust climate database skilled using modern and sound technology and techniques.

The data management activities require qualified staff using modern and sound technology for management and analysis of climate and related environmental data to monitor, predict and provide climate and other related environment information, forecasts, advisories and warnings.

The following are key outcomes identified by the seasonal forecast program:

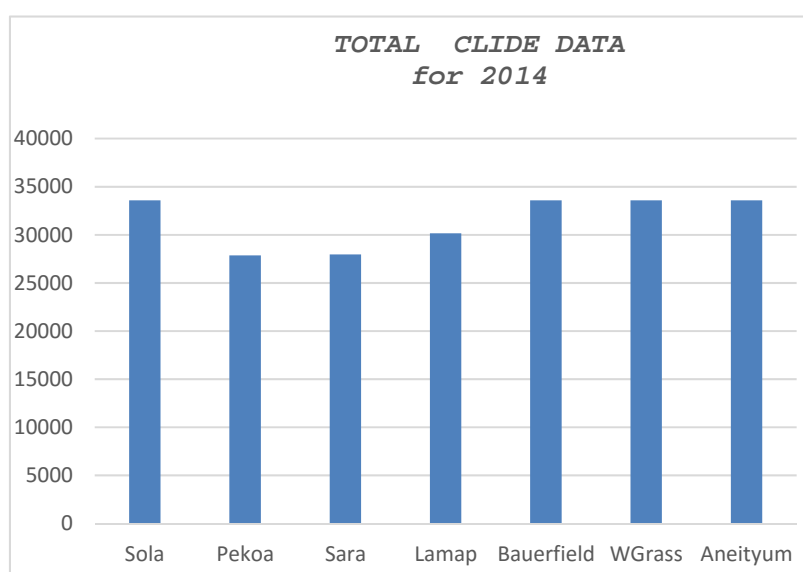
1. Safeguard historical and current climate data to aid national development in Vanuatu

2015 Priority Activities and Results

Data Management (Business Plan)			
Programs	Objective (Targets)	Result ✓ ✗	Result Summary
Data Digitization	1. Digitise 3 hourly data for Bauerfield, Port Vila, Lamap	✓	Done
	2. Validate climate data 2 days per week	✗ ✓	
	3. Finalise synoptic sites meta data and new rainfall sites into CliDE	✓	Discussion started and agreed
Data Archive	1. Produce a spreadsheet of monthly data in hard and soft copy.	✓	
	2. Discuss with Ann Naupa about the possibility of National Archive to host VMGD back-up climate data server:	✓	Discussion completed
	3. Store all 2014 climate data in excel in massive storage device provided	✓	Data stored in external hard drive

Data in CLiDE

Sola	Pekoa	Sara	Lamap	Bauerfield	WGrass	Aneityum
33580	27876	27968	30161	33580	33580	33580



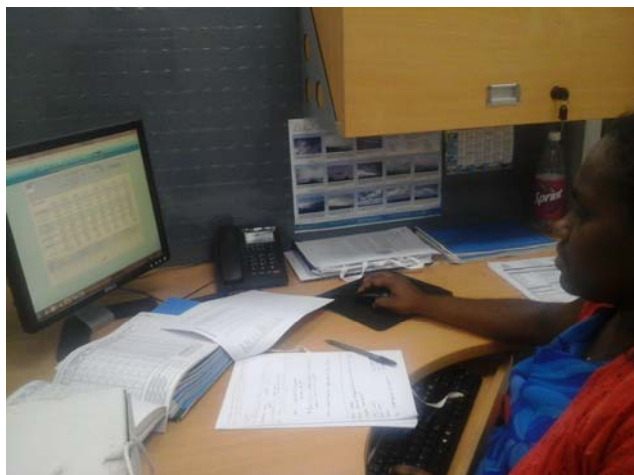
Data in Excel

Data in Excel 2014

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec
Sola	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pekoa	M	✓	✓	✓	✓	✓	M	✓	✓	✓	✓	✓
Saratamatam	M	✓	✓	✓	✓	✓	✓	✓	M	✓	✓	✓
Lamap	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bauerfield	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Wgrass	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Aneityum	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

M	Missing Fieldbooks
	A lot of missing observation -

Sub-daily digitization



Climate officers entering Aneityum sub-daily data from 2008 to 2000 into CliDe database and Excel Spreadsheet.

Data validation

This is a time consuming process when validation the two database of which the value from each database has to be the same as the other. However, the first year saw the completion of Rainfall data validation of Bauerfield from 1972 to 2013.

Examples of digitised data from CliDe with errors that were validated

"VAN31001";"1999-01-04 00:00:00";2.0	31.0
"VAN31001";"1977-07-21 00:00:00";0.0	30.0
"VAN31001";"2005-07-16 00:00:00";11.0	29.0
"VAN31001";"1999-11-05 00:00:00";2.0	30.5
"VAN26003";"2010-07-18 00:00:00";12.8	27.0
"VAN01001";"2008-07-01 00:00:00";-2.5	27.5
"VAN01001";"2008-07-02 00:00:00";-2.5	27.5
"VAN25001";"1988-09-03 00:00:00";-2.7	21.7
"VAN25001";"1988-09-05 00:00:00";-2.1	28.

3. Vanuatu Rainfall Network (VRN)

Program Purpose and Key Outcomes

The Vanuatu Rainfall network program contributes to climate's purpose by providing timely and quality rainfall data, services and products by way of skilled and motivated staff, using modern and sound technology and techniques.

The VRN activity is a community base activity that requires qualified staff using modern and sound technology for management and analysis of rainfall data to monitor, predict and provide climate and other related environment information, forecasts, advisories and warnings.

The following are key outcomes identified by the seasonal forecast program:

1. Expansion and collection of timely observation data

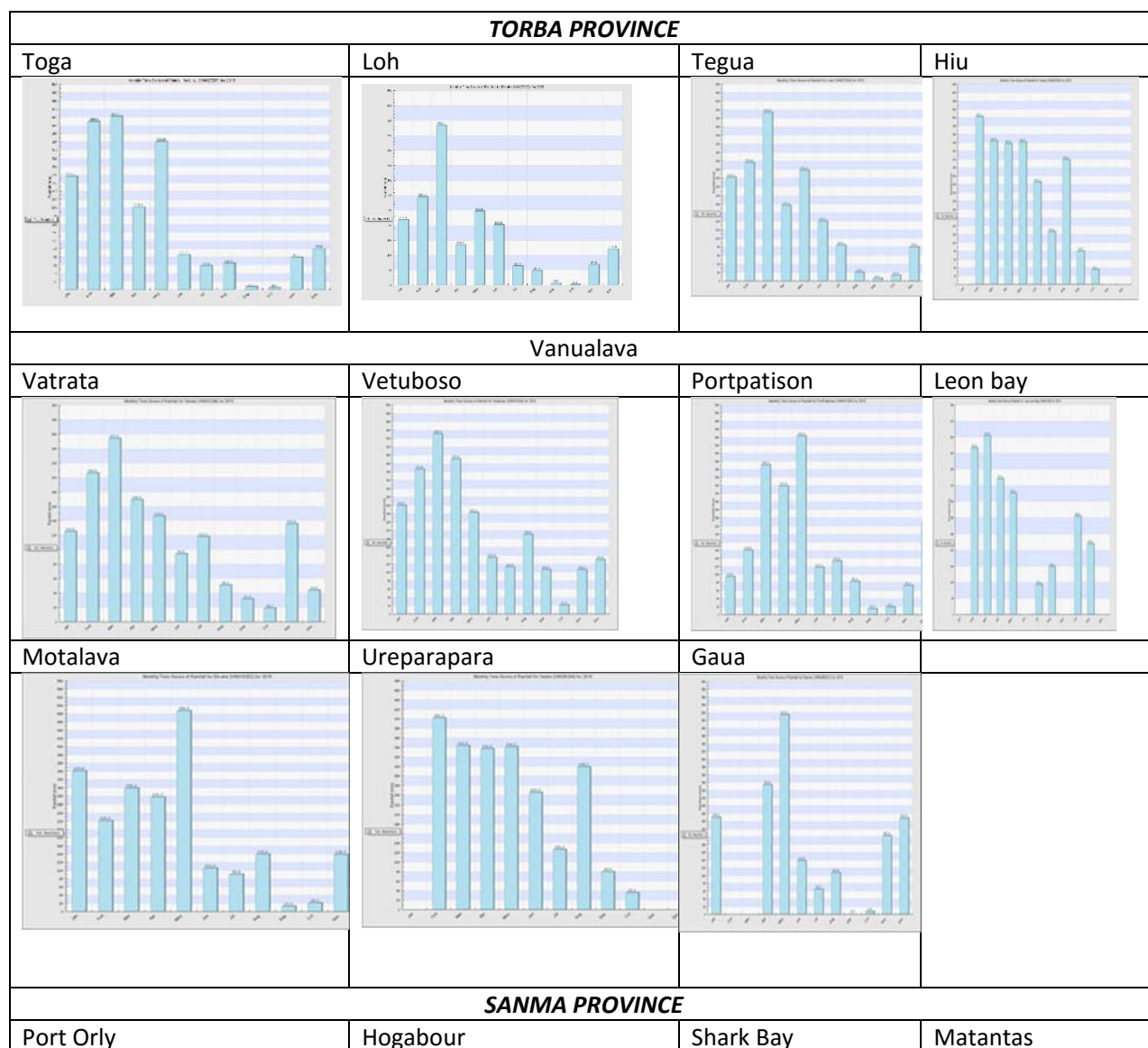
2015 Priority Activities and Results


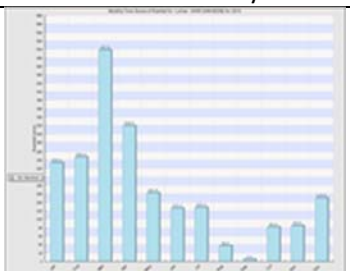
Vanuatu Rainfall Network(Business Plan)			
Programs	Objective (Targets)	Result ✓ ✗	Result Summary
Vanuatu Rainfall Network (VRN)	1. Install 9 automatic rain gauge g with the 9 AWS set up by V-CAP and JICA project	✓	Only two automatic rain gauge for under the JICA project
	2. Live streaming of rainfall data into data centre at VMGD	✓	Done under JICA project but into different database and not CliDE
	3. Display of rainfall data on CLEWS	✗	
	4. Visit of rainfall sites in Malampa province	✓	CLEWS not yet develop under the EU-GIZ project Visit rain gauge around Efate
	5. Commit LPO for payment for ANZ, NBV, BRED and WESPAC bank		
	6. Purchase a laptop computer to down rainfall data from automatic rain gauge	✗	Payment for 2015 done

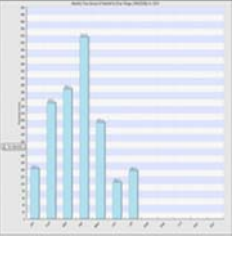

A total of 84 rainfall stations were around the country from 2005 to 2014. 20 were installed in Shefa province, 12 were installed in Malampa province, 12 were installed in Penama province, 14 were installed in Sanma Province, 12 were installed in Torba province, and 15 were installed in Tafea province.

1. Digitization of Rainfall data into CliDE

Rainfall sites – 2015

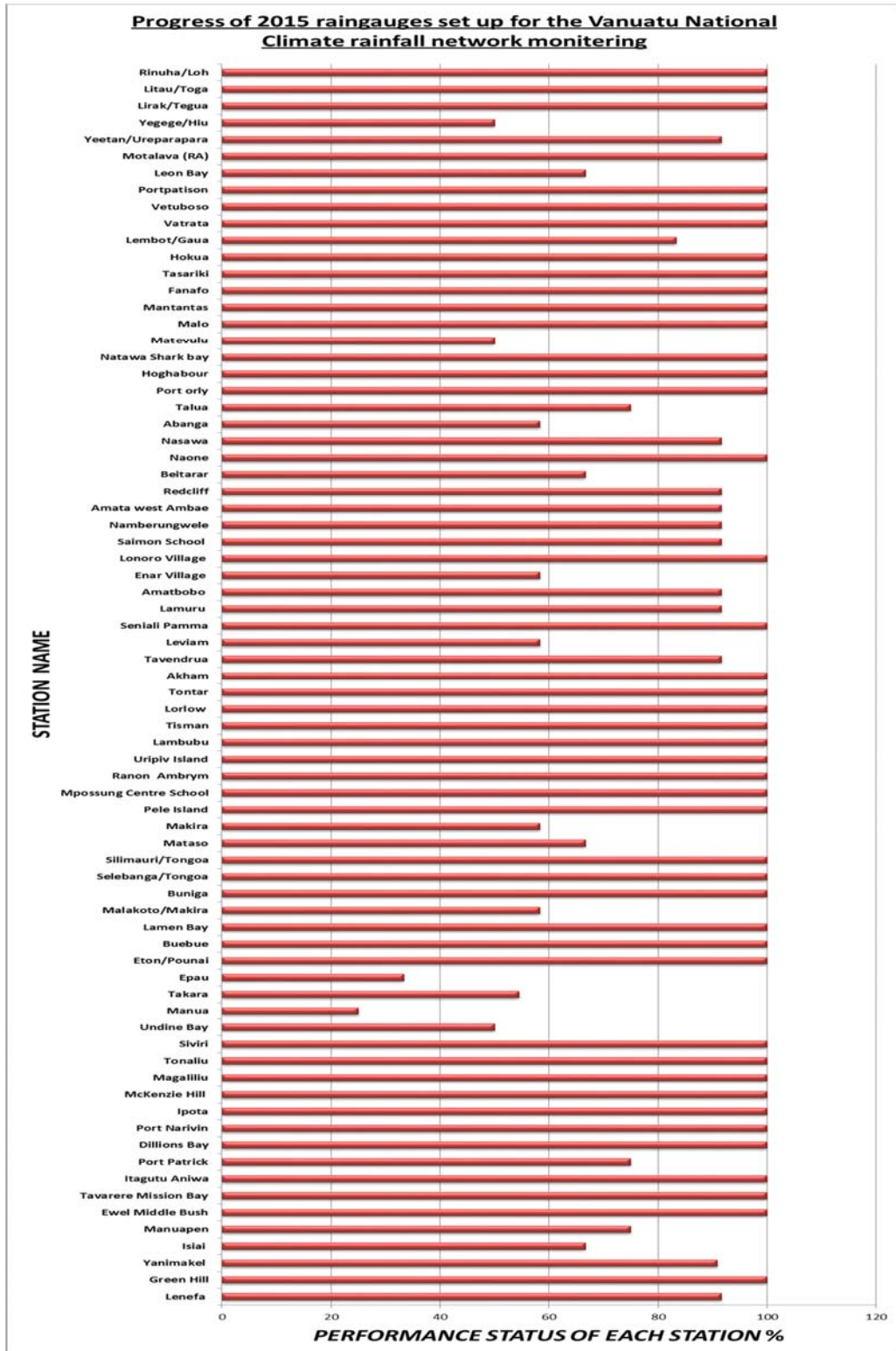


			
Fanafo	Matevulu	Talua	Tasariki
			
Hokua	Malo		
MALAMPA PROVINCE			
			
Lorlow Southwest bay	Dixon Reef	Lambubu	Leviam
			
Uripiv	Tisman	Ahkam	






Ranon Ambrym	Mbossung Ambrym	Liro Pamma	
			
PENAMA PROVINCE			
Amatbobo Penticost	Lonororo	Lamoru	Enar
			
Namberungwele	Amata	Lolovele	Saimon School.
			
Naone	Nasawa	Abanga	Beitarara
			
SHERFA PROVINCE			
Magaliliu	Tonaliu	Siviri	Undine Bay
			
Takara	Mackenzie Hills	Epau	Pangpang



2. Performance



3. Rain gauge damage during Pam

Province	Island	Station Name	Type of Raingauge
Sanma	Santo	Agriculture College	Nylex 100 mm
Malampa	Malekula	Leviam	Nylex 100 mm
Shefa	Togariki	Tongariki	daone
Shefa	Tongoa	Selebanga	done
Shefa	Makira	Malokoto	done
Shefa	Emae	Marae	
Shefa	Mataso	Na'asang	
Shefa	Efate	Manua	
Shefa	Efate	Undine Bay	
Shefa	Efate	Takara	

Shefa	Efate	Epau	
Shefa	Efate	Lelepa	No raingauge
Shefa	Epi	Buebue	Revived
Tafea	Tanna	Yanimakel	Revived
Tafea	Tanna	Isiai	Revived
Tafea	Tanna	Middle Bush	Revived
Tafea	Tanna	Burtonfield	Not yet
Tafea	Tanna	Lenefa	Revived
Tafea	Tanna	Hapilan	Revived
Tafea	Erromango	Ipota	Revived
Tafea	Erromango	Dillons bay	Revived
Tafea	Aneityum	Umetch	Revived

21 rain gauges were damaged during tropical cyclone Pam. 11 were damaged on Efate, 9 were damaged on Tafea, 1 was damaged on Malampa, and 1 was damaged on Sanma we province.

3.1. Installation of new rain gauge.

Date	station	Pictures
1/8/15	Mataso	
1/9/15	Makira	
20/10/15	Undine Bay	

20/10/15	Manua pounagisu	
20/10/15	Takara	
20/10/15	Epau	
1/11/15	Hapilan	
1/12/15	Agromet Santo	

4. Sea water data collection

Since 2011 sea water was collected and sent to the University of USA for experimental testing. In 2015 sea water was collected for the month of May through to November.



5. Payment

Payment for rainfall collectors were submitted to the finance officer during May of 2015. The first payment amount to 1,056,700 VT, and the final payment was 1,128,000 VT. Sixty-two rainfall collectors were eligible for payment.

Description	Yearly payment	Total amount
First and second year	1,056,700	1,056,700
Third and Fourth year	1,128,000	1,128,000
Annual Balance		2,184,700

4. Data Request

Program Purpose and Key Outcomes

The data request program contributes to climate's purpose by providing timely and quality climate data, products and information by way of skilled and motivated staff, using modern and sound technology and techniques.

The data request activity is a scientific activity that's requires qualified staff using modern and sound technology for management and analysis of climate and related environmental data to meet request of clients.

The following are key outcomes identified by the seasonal forecast program:

1. Reporting and proving data request facility to client using up to date technology and mode of communication

2015 Priority Activities and Results

Data Request (Business Plan)			
Programs	Objective (Targets)	Result ✓ x	Result Summary
	1. Input of interactive request form to new VMGD website with request database. 2. Request database build in VMGD new website 3. Analysis of in-coming request		

Name of Client	Organization	Types of Elements Requested	Comments
January			
Chris	VMGD	Temperature and Relative Humidity for Nambatu	Data use for comparison to AWS data
February			

Dominik Raab	University of Applied life science Vienna, Austria/Lincoln University, New Zealand	Average monthly Rainfall for all Stations from 2004-2014	Data use for master thesis about a sustainable sanitation solution for coastal communication of Vanuatu in collaboration with Oxfam NZ
Judy Bule	USP Student	Cyclones occurred in Vanuatu from 2009-2013	Data use for statistics project
Jason Mokoroi Peter		Total Cloud Cover/Rainfall & Relative Humidity– Jan 2015	
Tim	VMGD	Monthly Rainfall for Tanna	Data use do undertake risk assessment mapping
March			
Graem	NIWA	Daily Rainfall for Pekoa/Bauerfield/Port Vila	Data use for the inundation modelling and hazards risk mapping of Port Vila & Luganville
Brian		Port Vila yearly average Rainfall for 2005-2015	Data use for yearly quantity (5-10yrs) and Heaviest rainfall quantity.
Ben Gido	IsraAID Organization, Water Engineer	Monthly Rainfall for Shepherds Island	Data use for assess impact of rainwater harvesting
April			
Bob Nikaih	Ministry of youth and Sports	Pressure, Wind speed/direction and thunderstorm for port vila	Data use for demolishing of Korman
David Gibson	VMGD	Wind speed/direction, and pressure 3 hourly data	Passage of tropical cyclone PAM
May			
Lazarus Aising	Department of Industry	Monthly rainfall for Port Vila & Bauerfield	Data use in a survey jointly carried out by the department if Industry and Queensland University Australian.
Patricia Abbock	Student	Rainfall & Mena temperature for Port Vila	For year 12 Math's Statistics project
Christiane Crowby	Student	Rainfall, thunder & Mean temperature	For year 12 math's statistics project

Silas Tigona	Laucala Campus, USP, suva	Rainfall for all stations	
June			
Anna cumming	Care International	Rainfall for Erromango	Calculation of rainfall catchment areas for water security for communities on erromango
Feng Yuzi	China harbor engineering company	Rainfall, Max/Min/Mean temperature, pressure, wind speed/direction, sunshine hours, Humidity, Cloud Cover, Thunderstorm for all station	For project construction in Vanuatu. To construct wharves in Vanuatu
Jean-Luc Bador	The medical centre	Monthly rainfall for Pekoa, Bauerfield and Whitegrass	Daily rainfall-study of this year's rainfall
Francisca Miller	Student	Monthly rainfall for Port Vila	For year 12 math's statistics project
July			
August			
Yoko ASANA	JICA Vanuatu Office	Monthly Rainfall for Ebooka (Teuma area)	Data use to design the repairing work of teuma bridge more appropriate to reflect the change of climate along the river
September			
Ronald COUPRIE	French Red Cross	Monthly Rainfall for Gaua	Project of Rain water harvesting system implementation. In order to sizing water tanks
October			
Siobhan Talty	CARE International	Daily Rainfall for Whitegrass & Aneityum_2015	Data use for strategy development of El Nino activities
Marines Fonseca	NDMO/MCCA	Monthly Rainfall for all (VRN) Locations_2010-2015	Data use for Disaster Risk Reduction and Response for El Nino Event
Rashm Rita	NDMO	Monthly Rainfall for all Stations_2005-2015	Create a critical response area map for El Nino
Kaltack	Unelco	Daily Rainfall for Bauerfield	Analysis of El Nino
November			

Andrew Smith		Monthly Rainfall & Temperature_2014-2015	VAN HEMP
December			
Yoko Asano	Jica Office	3 Hourly Rainfall for Bauerfield and Port Vila.2000-2015	The data will be used to evaluate water flow of Teouma river for the purpose of maintenance of the current Teouma bridge.

- ❖ Below is the summary of the request done by different people, institution, Government and private sectors

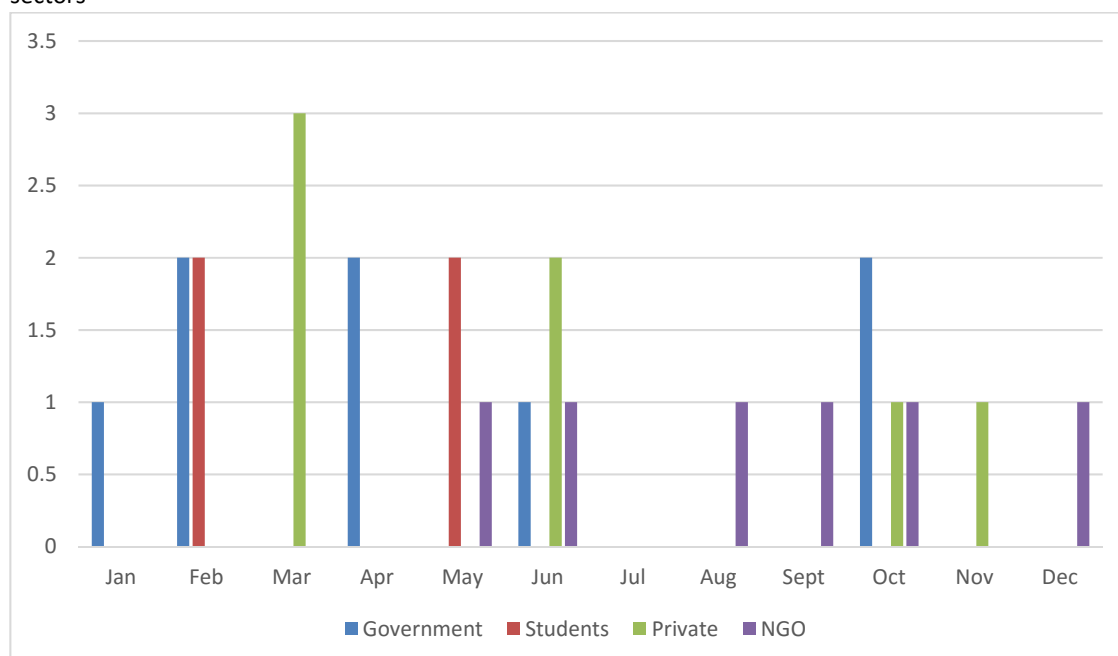
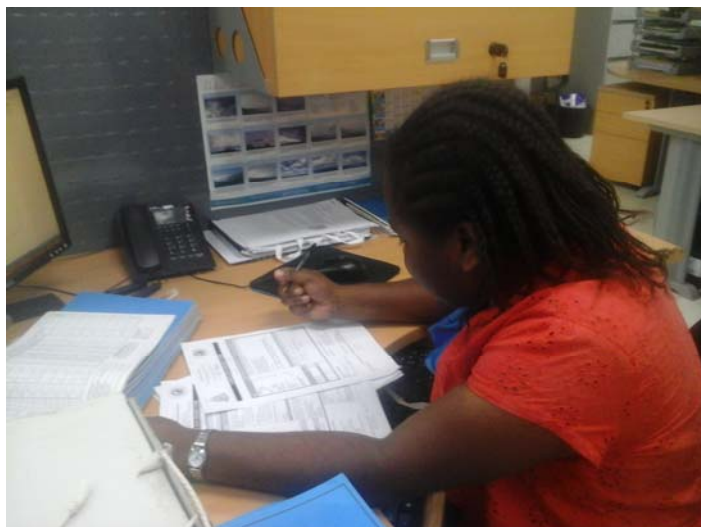
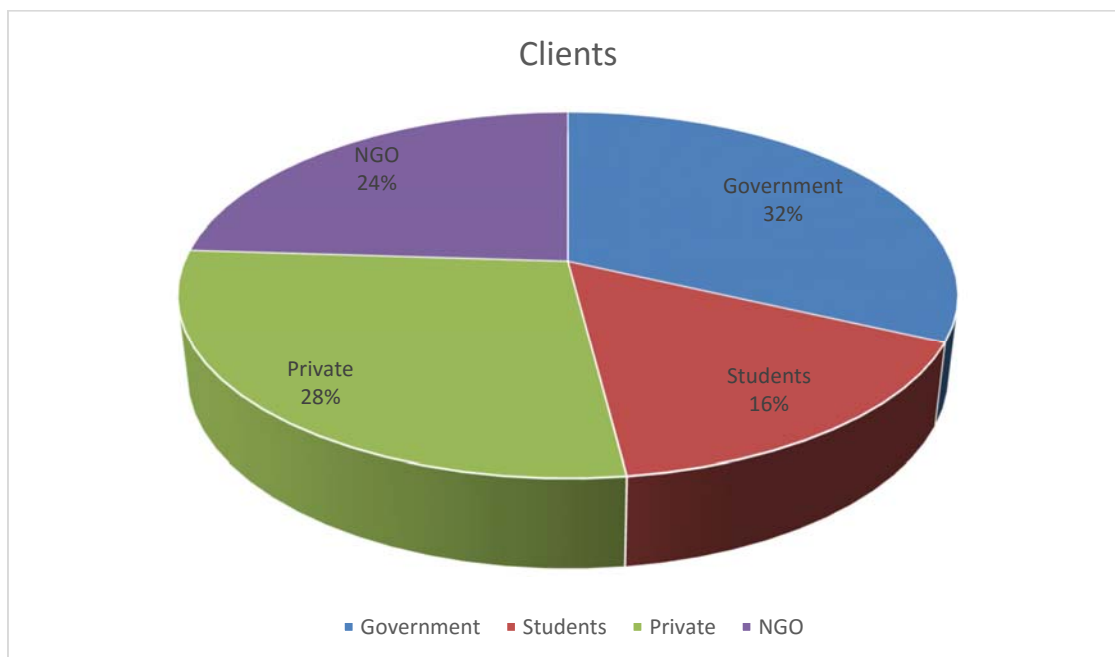


Fig 1.1 – Graph showing Climate Request Clients for Jan – Mar 2015



5. Traditional Knowledge

Program Purpose and Key Outcomes

The traditional Knowledge (TK) program is a project base activity that contributes to climate's purpose by collecting traditional weather and climate indicators. This will be useful in providing timely and quality seasonal outlook services and products to the communities for decision making.

The TK activity is a scientific activity that requires qualified staff using modern and sound technology for management and analysis of traditional climate and related environmental data to monitor, predict and provide climate and other related environment information, forecasts, advisories and warnings.

The following are key outcomes identified by the seasonal forecast program:

1. To provide easy and relevant information to aid decision making in the communities

2015 Priority Activities and Results

Traditional Knowledge (Business Plan)			
Programs	Objective (Targets)	Result ✓ ✗	Result Summary
1.	2. Pilot site visit to Tanna	✗	The TK project is on hold until a contract basis TK officer is recruited in 2016
	3. Enter TK information collected to TK database	✗	
	4. Pilot Visit to Pentecost	✗	
	5. Enter TK information collected to TK database	✗	
	6. Pilot visit to Malekula	✗	
	7. Enter TK information collected to TK database	✗	
	8. Pilot visit to Ureparapara	✗	
	9. Enter TK information collected to TK database	✗	
		✗	

6. Human resource, Policy, communications and improvement

Program Purpose and Key Outcomes

The Climate Division contributes to VMGD purpose by providing timely and quality climate services and products by way of skilled and motivated staff, using modern and sound technology and techniques.

The Climate Division is a highly technical section with qualified staff using modern and sound technology for management and analysis of climate and related environmental data to monitor, predict and provide climate and other related environment information, forecasts, advisories and warnings.

The following are key outcomes identified by the Climate Division:

1. To upgrade skills of climate officers and others to perform effectively and raise the profile of VMGD.
2. Establish mechanism to enable new initiatives in VMGD.
3. New initiatives to further enhance the work of Climate Services in Vanuatu.
4. Accessible climate information using modern technology that benefits all citizens of Vanuatu.
5. Increase VMGD's Outreach Activities.
6. Improvement of climate working environment and information.
7. Updated working procedures and environment to enable high productivity within Climate Division.
8. Appreciate hardworking officers.

2015 Priority Activities and Results

Human resource, Policy, communications (Business Plan)			
Programs	Objective (Targets)	Result ✓ ✗	Result Summary
Training	1. Attend COP 21 in Paris	✓	Participations funded by COSPPac project and Vanuatu Government
	2. Run FINPAC workshop in Epau Village	✓	Run workshop in Epau with Red Cross and SPREP
	3. Attend COSPPac annual planning and steering committee meeting	✓	Attended by Director

Policy	1. Develop Research Policy 2. Guidance document on National Climate and Climate Change Field Schools in Melanesia	✓ ✓	Include in the research policy of VMGD Paper submitted to environmental division of MSG and Agriculture department to take lead
Research	1. VRN paper publish and uploaded in webpage and intranet	✓	A paper not develop but a VRN poster was develop instead
Communication	1. Participate in Talk back shows 2. Update latest seasonal forecast on VMGD provincial notice board 3. Provide latest seasonal outlook to VNSO for display 4. Provide climate seasonal forecast (SMS)through Digicel network 5. Improvement of Climate website and Intranet 6. Climate officers to use travel board prior to local travel 7. Semi automation of updating climate information to email, webpage, intranet 8. Develop communication strategy 9. Participate in One-Day World Malaria Day Outreach Activity	✓ ✓ ✗ ✓ ✓ ✓ ✓ ✓ ✓	More than 4 talkback shows Done monthly VNSO screen not function anymore Done during El Niño event Funded under MDRR project and COSPPac Emails are use instead Funded under MDRR project Develop under COSPPac
Improvement	1. Purchase of new computers 2. Purchase of server 3. Purchase of new AWS 4. Produce Climate documentary- climate services and products 5. Develop Traditional knowledge value added products such as pull down banner, seasonal calendar 6. Automate SCOPIC and CliDE- automate rainfall data into SCOPIC	✗ ✗ ✗ ✓ ✗ ✗	V-CAP project not implemented V-CAP project not implemented V-CAP project not implemented Funding available and discussions are underway to find a producer TK project on hold There is no agreement on this since different organization take leading role in this two software. Internal copyright issues needs to be solve to get this achieved

Reporting	1. Write up quarterly report for Climate Division	✓	Done
Review	1. Review climate SOP with QMS criteria	✗	Move to 2016
Retirement	1. Inform HR about retirement of Peter Feke and Mercy Nalawas	✓	Officers to retire in 2016

This year the COPIWG Team conducted a survey/awareness program that took us through many of the main islands in each provinces in the second half of the year. There were two teams that carried out the assessments and conducted the survey. The main purpose of the survey is to find out how much the last mile is using VMGD services and products that is put out through the different divisions within the Department.

The outreach/Awareness went as far as from Banks down to Tanna. The table below shows the time and places where survey was carried out as well as awareness on different VMGD products and some feedbacks from people in the communities.

Date	Province/Island	Area/Village	Access to climate Info	Remarks
28 th /08/15 to 30 th /09/15	Mota Lava	RA, Kurrmante, Ngereniuman, Totoulag	Through radio, but they have reception problems when connecting to radio	Almost all communities hardly have access to Climate Information but they really want to know what the VCU is made up of.
31 st /08/15 – 03 rd /09/15	Vanua Lava	Sola and Vureas Bay	Through Rainfall collector only, sms when mobile networks permit.	the
	Epi	Malvasi, Market-Rovo Bay, Bonkovio, Lamen Island, Nikaura and Epi High School	Sms, Radio, Area secretary	
	Erromango	Dillon's Bay (North West Erro), Ponkil's bay, Happy	Get information through mobile phone SMS, Rainfall Collector-CDC members,	

		Land (South Erromango)	and direct phone call to VMGD during severe weather	
	Tanna	Lawital, Lamalu, Laminu Stadium (Women's conference)	Mobile phones-sms, NGO's, Peter Korisa-NDMO,	

1. COPIWG awareness & survey mission

The climate division was also involved heavily on the communication, Outreach and Partnership working group (COPIWG) activities. The group was divided into two (2) teams tasked for this mission. Climate division was chose to be part of Team 2 to carry out awareness and survey around Efate mainland/Offshore Island, Paama, Ambrym, Santo and Malekula. The main reason behind this is to help communities to understand the functions and activities of VMGD and how the department can help them by accessing, understanding and using the information

The Paama-Southeast Ambrym awareness and survey mission scheduled for 15th – 22nd September 2015 could not convened as planned due severe weather. The team had a short meeting on 16th September and decided to cancel the Paama-Southeast Ambrym trip.

The materials for Paama & Southeast Ambrym mission have been utilized to conduct the Efate awareness and survey. This mission involved visiting some communities on Efate and the Offshore Island of Lelepa. The Efate campaign commenced on the 19th September to 8th October 2015. Eight communities were visited during the Efate awareness and survey mission. Communities visited were:

- Erakor
- Pango
- Eratap
- Blacksand
- Mangaliliu
- Lelepa
- Takara
- Epau

The Malekula and Santo awareness and survey mission was conducted from 13th to the 25th October 2015. The Malekula mission starts from 13th to 18th October. A total of 5 communities were visited on Malekula including:

- St Joseph (Vao)
- Atchin Island

- Pinalum
- Smol Tautu
- Uripiv Island

The Santo awareness and survey mission starts from 18th to 25th October with a total of 5 communities visited:

- Port Olry
- Lorevilko
- Million Dollar Point
- Mango
- Tangoa Island

Here are some pictures below taken during awareness and survey mission in the communities:





2. Provincial stakeholder - Tanna workshop

VMGD through Climate Division in partnership Vanuatu Red Cross Society conducted a very successful 3days workshop from the 11th-13th November 2015 on Lenakel, Tanna Island. The main objective for the workshop is to teach and equip the VRN collectors as well as the Red Cross volunteers to understand more on Climate Particularly El Niño and see ways of how these two organization can work together to minimize the impacts of natural disasters mainly El Niño in the islands.

The workshop was facilitated by Red Cross VMGD representatives including the regional provincial officers from Agriculture, Health and Water Supply that were also present that time. There were 24 participants altogether from the Western and Northern part of Tanna and also Area Secretaries from East and South Tanna were also part of the training/workshop.

The first day (Tuesday afternoon) ended with the Monthly updated November Climate Update.

The second day activities kick off with the weather and Climate game. A run through the workshop programs was the first part of the morning session followed by the run through on the Ready-Set-Go process. The day ended with participants discussing together some awareness techniques to prepare for awareness on Thursday evenings and Friday mornings before the Vila team departure on Friday afternoon. The participants were also fortunate to hear some coping mechanisms from the other climate specific sectors, with Peter Iesul giving a presentation on Agriculture and also some words from the regional Health Team and the water supply representative.

Thursday started off with games and brief discussions on how, when, where and what to do and say during awareness in communities in the evening. There were three communities identified; Loukatai, Bethel and Lowiniou. The participants divided into three groups; North Tanna, West Tanna and a mix combination of East/Middle Bush and South Tanna formed the third group in which they work together to prepare themselves for the awareness on El Niño in the afternoon.



The West Tanna group doing awareness at Loukatai Village on Thursday evening

Friday was awareness all morning at the Market house before all assembled back at the meeting room for summary of everything.

Trainings and Workshops Attended

1. Australia Bureau of Meteorology (BOM) attachment

One climate officer has participated in the COSPPac's Climate, Ocean's and Communications Mentoring and Attachment Program in Melbourne.

The training focused on developing skills and sharing knowledge to better understand, apply and communicate Climate and Oceans information to stakeholders. The training has also allowed the climate officer to work alongside colleagues from other Met Services in the Pacific.



2. Information Management and Control

Information systems (IS) play a vital role in today's organizations and information is considered a valuable asset. Rapidly changing information technology (IT) is increasing the complexity of information management, while concerns about the confidentiality, privacy, validity, and accuracy of the data stored have been heightened. As a result, there is a growing need for both IS users and IS professionals to be aware of issues concerning information management and control and to develop appropriate practical skill in this area. This course introduces: managing, controlling and auditing complex information in modern organizations. The course also builds upon knowledge gained through previous studies in the area of information systems.

The objectives of the course are to be aware of the importance of Information Management and Control and its role in today's organizations. Issues to be addressed include: actions that an organization can take minimize the threats to its information assets: the major strategies available and how can these approaches to be successfully implemented: how an organization can ensure quality IS that will support operations and decision- making are developed and implemented: the role of risk and quality management in the context of Information Management and Control: and the legal quality management in the context Information Management and Control strategies and tools.

The training starts from 27th September to 10 October 2015.



Training in progress (Group discussion) inside the ICT Lab Laucala Campus USP

3. Inter-Governmental Panel on Climate Change meeting (IPCC)

The Forty-Second Session of the IPCC took place at the Valamar Lacroma Hotel in Dubrovnik, Croatia, from 5 to 8 October 2015. The main agenda item of the Forty-second Session of the IPCC was the election of the IPCC Chair, members of the IPCC Bureau and the Task Force Bureau (TFB). The Panel also addressed other items that require consideration and decision by the Panel. World Meteorology Organization (WMO) Region V (RAV) held side meetings to choose candidates to run for the different task force.



4. Pacific Island Climate Outlook Forum (PI-COF)

The First session of the Pacific Islands Climate Outlook Forum (PICOF-1), with a special focus on the Water Sector is co-organized and co-supported by the Secretariat of Pacific Regional Environment Programme (SPREP), World Meteorological Organization (WMO), the Global Framework for Climate Services (GFCS), University of the South Pacific (USP), the Government of Canada, the Government of Finland, the Secretariat of the Pacific Community (SPC), National Oceanic and Atmospheric Administration (NOAA) Pacific ENSO Application Climate (PEAC) Centre,

Australian Bureau of Meteorology (BoM), the New Zealand National Institute for Water and Atmospheric Research (NIWA), Asia-Pacific Economic Cooperation Climate Centre (APCC) and the European Union-Global Climate Change Alliance (EU-GCCA).

The PICOF was hosted by USP at the Laucala Campus in Suva, Fiji Islands from 12 to 16 October 2015. The forum brought together national, regional and international experts on climate services and the water sector.

The main purpose and overarching objectives of the forum were (a) to bring together national, regional and international experts on climate services and water sector; (b) to discuss seasonal climate forecast guidance for the Pacific Islands (PI) region (e.g. SCOPIC, ICU, PEAC, APCC), (c) to discuss application of climate information to the water sector; and (d) to co-explore common approaches and best practices for climate services that can be extended throughout the PI Region.

5. COSPPac Write-shop



The write-shop was organised for the Pacific national meteorological services. It will be hosted in Nadi, Fiji Islands from 7 -11 September, 2015 at the Fiji Meteorological Service.

The write-shop was co-organized and co-supported by the Secretariat of Pacific Regional Environment Programme (SPREP), the Government of Finland, the Finnish Meteorological Institute (FMI), World Meteorology Organization (WMO), Environment Canada and the Pacific Islands Climate Services (PICS) Panel.

The main objectives of the write-shop was to compile lessons-learned and best practices on climate services in the Pacific region. The write-shop brought together national experts on climate services from the NMSs, selected climate service using sectors, mentors and resource personnel's for 5 days of discussion, writing, mentoring and compiling a document.

Emphasis at the write-shop was placed on looking for common approaches and best practices that can be extended throughout the Pacific Region and shared with other regions through publications and on networks managed by SPREP. Vanuatu submitted 3 stories to be published.

6. COSPPac Tides and Oceans Conversation

Since 2013, COSPPac has been delivering training and development programs in our 14 partner countries in the South Pacific. So far the training has focussed mainly on climate variability and change. In the second part of COSPPac will focus more on oceans and tides.

Before commence design of the oceans/tides capacity development program for each partner country – the program would like to get a better understanding of what has already happened in this field, and to this end, there were 3 sub-regional meetings, with participants from 14 partner countries in the Pacific, to discuss the capacity in oceans and tides in each country. Including:

- The key agencies involved with oceans in each country
- What each agency does
- Issues and challenges in this field
- What development activities might help to address or mitigate the issues
- What information the community and key stakeholders might need

The first meeting was held in Hawaii with the northern Pacific partners from 2-6 February. The second meeting was held in Apia including participants from Niue, Cook Islands, Tonga and Samoa. The final meeting in Fiji will include participants from Fiji, Papua New Guinea, Solomon Islands, Vanuatu, and Tuvalu.

The participants from each country participate in discussions, group activities and information gathering sessions, and share expertise on oceans and tides capacity. Participants came from a range of industries including meteorology, ports, infrastructure, climate change and environment. Vanuatu was represented by Philip Malsale.

7. Pacific Meteorology Council meeting and 1st Pacific Ministerial meeting



The First Pacific Ministerial Meeting on Meteorology (PMMM-1) and the Third Pacific Meteorological Council Meeting (PMC-3) convened at the Fa'onelua Convention Centre in Nuku'alofa, Tonga on the 20 to 24 July, 2015. A total of a hundred and sixty eight (168) participants including ministers, associated ministers, directors from National Meteorological and Hydrological Services (NMHS) and government

officials from the following countries: American Samoa, Australia, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Kiribati, Marshall Islands, Nauru, New Caledonia, New Zealand, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, United States of America and Vanuatu plus development partners, media, regional institutions, regional and international organisations and donors.

The meeting adopted the theme: “Sustainable Weather and Climate Services for a Resilient Pacific”; underpinning the important role of NMHSs in the sustainable development context of Pacific Island Countries and Territories (PICTs).

The main objectives of the PMMM-1 was to engage ministers in the development of meteorological (weather and climate) and hydrological services in the Pacific; to discuss gaps and opportunities for strengthening the operations and provision of services by the NMHS and their role in contributing to resilient development; and to provide political support and direction for the development of the NMHSs. The meeting concluded with the endorsement of the Nuku’alofa Declaration by Ministers which promulgated that NMHSs must be given equal priority to build the necessary capacity to support national efforts towards sustainable development. Vanuatu was represented by Director David Gibson, Philip Malsale and Thomas Iakin: Climate Change Minister.

8. Pi-CLIM workshop



The Regional Training and Inception Workshop for the ROK-PI Climate Prediction Services Project, was co-hosted and co-organized by the Government of Tonga, Tonga Meteorological and Coastal Radio Services, the Secretariat of the Pacific Regional Environment Programme (SPREP), and the APEC Climate Centre (APCC). It was held in the DMO Conference Room, Nukualofa, Kingdom of Tonga on 15 to 17 July 2015.

The workshop was part of the new Pacific Climate Prediction Services (CliPS) Project funded by the Government of the Republic of Korea (RoK) through the Pacific Islands Forum Secretariat (PIFS) and implemented by SPREP and the (APCC). The workshop focus on enhancing capacity of Pacific Island Meteorological Services in seasonal climate prediction specifically the use of dynamical models provided by APCC's real-time global climate prediction information.

9. COP 21

The Republic of Vanuatu saw COP21, and the possibility of the Paris Agreement, as a critical milestone in our national and global struggle to cope with and overcome the adverse effects of climate change on our people, our islands, or environment, our culture and our development pathway. In this context, at COP21 the Vanuatu delegation aspired to many aspects of climate change. The meeting was held in Paris, France from the 30th November – 10 December 2015. The Paris agreement was beneficial to Vanuatu as many of the National stand was raised as a nation or as a group during the meeting which was reflected in the agreement.



10. Enhancing Climate Indices and Sector Applications Workshop

WMO organized a one-week workshop on Enhancing Climate Indices for Sector Applications involving 10 different Pacific Island Countries including American Samoa, Samoa, Cook Islands, Fiji, Marshall Islands, Papua New Guinea, Tonga, Tuvalu, Solomon Islands and Vanuatu. All participating countries were represented by 2 participants, one from the Met Service and the other from a climate sector, in Vanuatu's case- it was the water sector/hydrology Department.

We worked together alongside our sector representative to calculate the correlations between rainfall and using the sector data. The first day of the workshop was more into a brief about the ET-SCI team, Introduction to the ET-SCI pilot workshop held in Ecuador and outcomes. What outcomes can we expect from this workshop as well as Climate information for Agriculture and Food Security Climate and

information for Water Resources Climate information for Health. Second day was more hands-on CLIMPACT 2 software program. Downloading and using the software program to Quality Control Data from a weather station and then homogenizing the data. Errors and faults were identified and marked out for correction.



ET-SCI workshop group photo, Tanoa International Hotel, Nadi, Fiji, 7 Dec 2015.

The week ended with another presentation from all countries based on the results we have obtained from calculating the different correlations between the climate and sector data and also on what we have find out from quality controlling the different stations data.

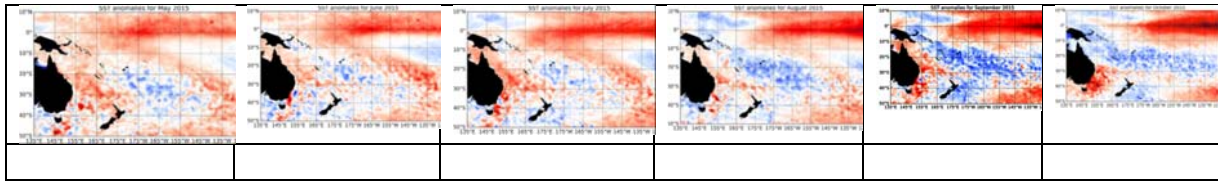
The rest of the other information can be found on the following website:

<http://www.wmo.int/pages/prog/wcp/ccl/opace/opace4/meetings/ET-SCI-fiji2015.php>

http://www.wmo.int/pages/prog/wcp/ccl/opace/opace4/documents/ClimPACT_workshop_PICT-2015_report_final.pdf

2015 El Niño

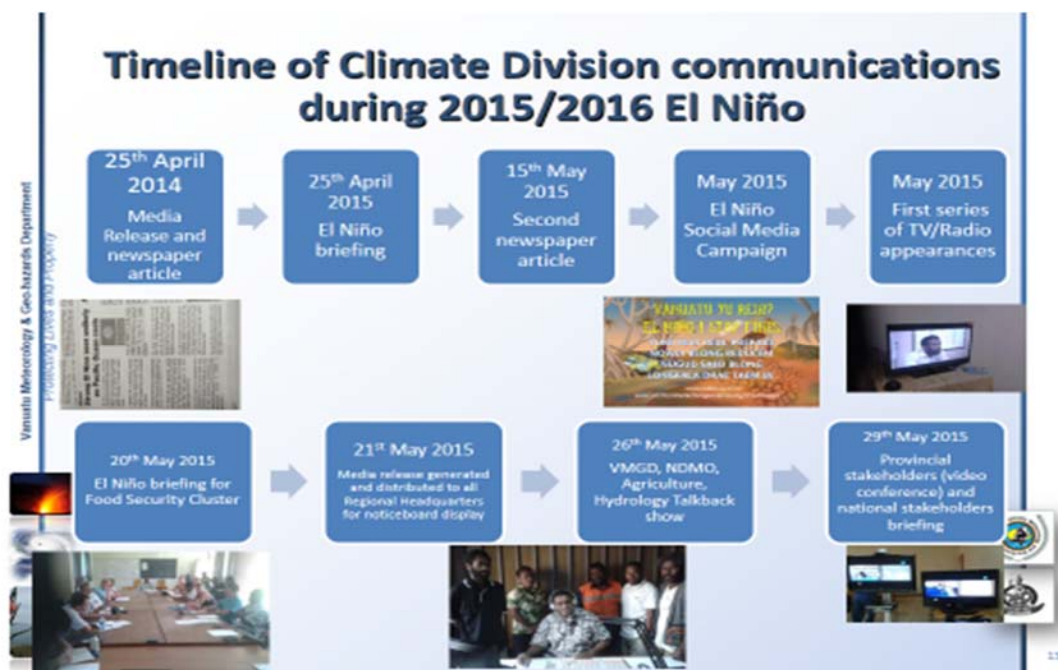
March 2015 the 2015/16 El Niño onset in the Pacific region. Initial media release from VMGD for this event was release way back in 2014. There were continuous monitoring of the event with regular monthly updates till March 2015. During that month, VMGD released another media release on El Niño onset in the Pacific in which during that time Vanuatu experienced a lot of rainfall. The impacts were felt three months later impacting all sectors particularly water, agriculture and health affecting socioeconomic livelihood of people.

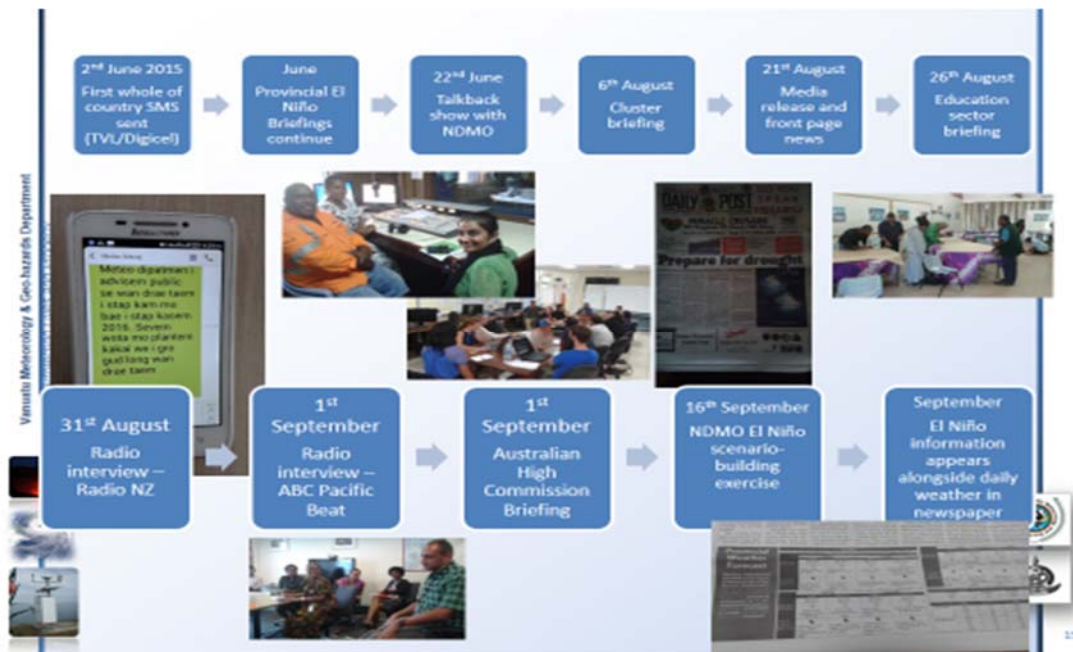


The mode of communication to get the information to the public were

- Vanuatu Climate Update (VCU)
- 3-month rainfall outlook (included within VCU)
- Vanuatu Monthly Climate Briefing (/regional video conference)
- Media briefing and press release
- Radio talkback/general radio appearances
- SMS
- 'One-off' Climate Briefings (e.g. to Govt. Departments, clusters etc.)
- Social media
- Klaod Nasara toolkit including animation

Below is a summary of timeframe of the communications the division had concerning the event.





2015-2016 Tropical Cyclone Season

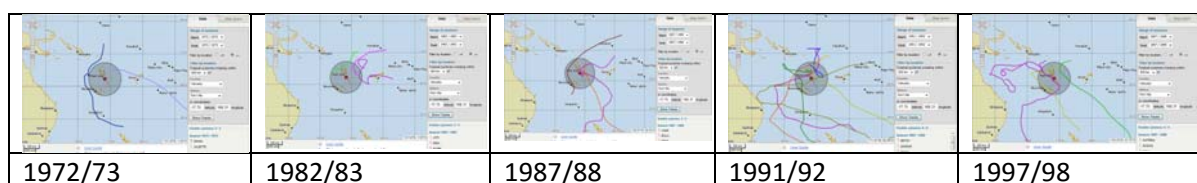
The 2015/16 Vanuatu tropical cyclone seasonal forecast was release on the 16th October 2016. The media release stated that Vanuatu is expected to have 2 to 6 Tropical Cyclones (TC) in 2015/2016 cyclone season. Possible impacts coupled with current El Niño event have adverse impacts on the livelihood of our people. Vanuatu is located in the hotspot of tropical cyclone activity in the region. Each year Vanuatu and New Caledonia experience the greatest cyclone activity with at least 2-3 cyclones passing close to the countries. The Pacific region is forecast to have 11-13 named tropical cyclones from November 2015 to April 2016. TC activity for Vanuatu is anticipated to be above average this season which means more than two events.

The current El Niño conditions are forecast to last until early 2016. In the past, these conditions existed in Vanuatu and have influenced higher probability of experiencing Category 3 cyclones or above such as Fran and Susan.

The conditions forecasted for the 2015/16 tropical cyclone season were similar to the seasons of 5 analog years of 1972/1973; 1982/83; 1987/88; 1991/92 and 1997/98. With the El Niño event, Sea surface temperatures have increased in the Pacific region and can influence the occurrence of TC events outside of the normal season (that is before and/or after the cyclone season). During El Niño events, there is high possibility of tropical cyclones to follow tracks that maneuver around the islands and last longer and this is shown by TC Ula. This will mean that an event can cause a lot of damage if it survive in an area for a long time. The same impact if a severe event transverse an island for a shorter period.

The 2015/16 season has not ended and Vanuatu has experienced 3 events of which all are category 4. Detail of these events are in the forecast division report. People are advised to continue undertake preparedness actions for the remainder of the season knowing that any tropical cyclone impact coupled with the current El Niño will have great effect on the socio-economic livelihood of people living in Vanuatu.

Below is a snapshot of the tropical cyclone tracks during the 5 analog years used for analysis



Projects

1. V-CAP

The V-CAP project will also address needs of the climate division under the component 2 of the project cost around 100,000,000vt of which about 70% will be targeting climate early warning system components. The project has started and roll out for the next 5 years and will complement the EU-GIZ project.

2. EU-GIZ

The project title 'Solar and Biogas based Rural Electrification with the implementation of a sector-specific Climate Early Warning System (CLEWS) 'Dashboard'. It involves 3 year program with an approximately 25,000,000vt for the climate division. This will set up the basis for climate early warning system known as CLEWS. This project will purchase 2 AWS, a vehicle, setting of the CLEWS (products and information) and computers for climate division. All of these will help with providing services and products that will target specific sector and in this project is the energy sector. The main problem facing Vanuatu currently is high vulnerability to climate change and variability, exacerbated by a low capacity to address and adapt. A major barrier limiting the capacity to address climate related events is the inability to effectively predict climate extreme events, assess potential impacts and deliver short-term alerts or long term warnings. This is due to a number of infrastructural constraints (such as lack of early warning systems) and human capacity limitations including inadequate tools and equipment for data processing and analysis and a shortage of qualified personnel who can process information into a suitable format for those who most need it.

The project is now at its financial agreement and now this is finalise and signed off by the donors and Vanuatu Government, the project will start implement its activities

3. AVID Red Cross Volunteer Imogen Aitken

Imogen Aitken has been volunteering at the VMGD since April 2015. She is based in the Climate Division and her work focusses on communications, community engagement and outreach. Within Climate, Imogen has worked with the team on stakeholder Climate briefings, an engagement workshop for key regional stakeholders in TAFEA in collaboration with the Vanuatu Red Cross, applications for funding and review of products and services and outreach materials. Cross-Divisionally, she has worked with the

Communications, Outreach and Partnerships Internal Working Group (COPIWG) to conduct a regional survey of access and understanding of VMGD products and services, and provide awareness about the VMGD throughout Vanuatu to the last mile. The results of the survey, along with the results of focus groups conducted with community members and key stakeholders will help to shape communications, outreach and engagement planning for the VMGD from 2016 onwards. The COPIWG has also worked to align Divisional outreach materials and define key messages. Imogen has also been involved in the content design and planning process for the upcoming VMGD website development, and has given general project and administration support where necessary. Imogen will leave Vanuatu in April 2016 having had a wonderful learning experience at VMGD.

Traditional Knowledge Project

VMGD through the climate division work closely with COSPPac to implement the traditional knowledge project in Vanuatu. Climate division coordinate the arrangements with local institutions such as the Vanuatu Kaljural Senta (VKS), EU-GIZ and Vanuatu Red Cross Society for documenting and integrating traditional knowledge of weather and climate forecasts with 'modern' scientific methods. Traditional knowledge on weather and climate indicators is fast becoming a popular topic in the region and there is a need for better coordination at this early stage.

The implementation of activities for this project has stopped for more than a year due to officer responsible for this project transfer to the ministry of climate change. Funds are available to implement the activities and an option of recruit a TK officer for six months is an option the division is working on now. Upon getting the new officer then activities for the project will be implemented in 2016.

Achievements Comment

The overall report for year 2015 shows or indicates that most activities for this year for the climate division have been well achieved. This is because of the good team work amongst officers within the Climate Division, other VMGD divisions, stakeholders (Vanuatu Government and NGOs) and donor partners.

Challenges Comment

Compare 2015 with the previous year, the climate division has done extremely well though there were many challenges and one in particular is lack of human resource (one officer was transferred to the CSU of the Ministry of Climate Change, and one is on study leave). This has hindered the progress of the division, particularly in agro-met service.

Last and foremost, some activities were delayed or not carried out during timeframe indicated in the 2015 business plan because of funding availability, weather related issues, sickness and the unavailability of officers.

5. Geo-Hazards Division

Division Purpose and Key Outcomes

The Geo-Hazards Division contributes to the Department's purpose by way of qualified, skilled and motivated staff using modern science and technology to mitigate against potential impacts of geological hazards (earthquakes, tsunamis and volcanic eruptions).

The Geo-Hazards Division Contributes to VMGD Overall Objective (High Level) by way of Improving accuracy, timelines, quality of Geo-hazards' information, alerts, warnings and services.

2015 Priority Activities and Results

Programs and Objectives required by the 2015 Business Plan and results are summarized in the table below and commentary provided in the following text.

Geo-Hazards Division (Business Plan)			
Programs	Objective (Targets)	Result ✓ x	Result Summary
Research and scientific collaborations	Improve current knowledge, and responses to volcanism, Seismicity and Tsunami	✓	<p>1.1. Engage in research activities with local and international scientists on earthquakes and volcanoes of Gaua, Ambae, Ambrym, Lopevi, and Tanna</p> <p>1.2. Carry out scientific assessment and research activities after major earthquake and tsunami events</p> <p>1.3. Training workshop on volcano-seismic data processing & analyze</p> <p>1.4. Coordinate & facilitate training workshop and attachment with other counterparts in Geo-Hazards field</p> <p>1.5. Participate in regional and international conferences and seminars</p>

			<p>1.6. Facilitate Internal technical trainings relevant to Geo-Hazards areas of work for Geo-Hazards staff</p> <p>1.7. Retrieve Lidar data and training on using data for tsunami modelling/hazard mapping</p>
Scientific collaborations and partnership for data sharing	<p>Enhance collaboration with regional institutes to promote the regional geophysical network</p>		<p>2.1 Establish Trilateral and multilateral agreements with ORSNET communities, DASE, , GEOSCOPE, MVN/MSG, To address Geo-Hazards Observations and data sharing</p> <p>2.2. Share seismic data with other Earthquake Information centre's to encourage research and to re-enforce monitoring system in Vanuatu</p> <p>2.3. Collaborate with Regional Partners in strengthening the Regional seismic network Vanuatu/New Caledonia with other observatories in the region</p>

Crisis response	Undertake responses to volcanism, Seismicity and Tsunami	✓ ✓	<p>3.1. Liaise with NDMO, and other stake holders for disaster response plan and action in times of volcanic eruptions, earthquake and tsunami</p> <p>3.2. Carry out hazard assessment in response to major volcano activity events</p> <p>3.3. Carry out earthquake intensity survey and hazards assessment in response to major earthquake events</p> <p>3.4. Carry out tsunami run up and hazards assessment in response to a major tsunami event</p>
Geo-hazards Warning System	To improve Geo-Hazards warning systems in Vanuatu		<p>4.1. Ensure Geo-Hazards Warning centre operations up and running.</p> <p>4.2. Contribute to the development of tsunami risk map for Port Vila and Luganville</p> <p>4.3. Contribute in the development of the tsunami warning signage project</p> <p>4.4. Contribute to the Development of the reviewed Hazard map and contingency planning for Tanna and Ambrym</p> <p>4.5. Finalize the Vanuatu Volcano Alert System review</p> <p>4.6. Maintain Geo Hazards warning centre operations g. Ensure 24H/7 on call services for Geo-Hazards Early Warning systems</p>

			4.7 Carry out the observations of earthquakes and volcanoes in real-time 24H/7 for tsunami and volcanic eruptions early warning
Earthquakes and volcano monitoring	Improve seismic and volcano monitoring systems to prevent disastrous consequences of natural disasters to humans and the environment	<div>✓</div> <div>✓</div>	<p>5.1. Establish agreements with provinces Malampa /Shefa/ Tafea and/ or customary landowners for the use of rural lands for Geohazards monitoring systems</p> <p>5.2. Upgrade the national seismic network by extending the network to Tanna , Malekula and Port Vila</p> <p>5.3. Upgrade the Efate seismic network</p> <p>5.4. Maintain the Efate seismic network</p> <p>5.5. Maintain the Geoscope station for global earthquake monitoring network</p> <p>5.6. Continue Installation of Real-time seismic monitoring system on Tanna, Lopevi, Paama, Ambrym, ,Ambae, Gaua and Vanua lava</p> <p>5.7 Improvement of Sea Level Monitoring in Vanuatu</p> <p>5.8. Volcanic hazards Assessment on Ambrym, Tanna, Ambae, Lopevi and Gaua</p>

Geo-hazards data/products and services	Organise Geo-hazards information into the hazards database and issue the corresponding hazards information to reduce Geohazards risks to local communities, the general public and the tourism industry	✓	6.1. Issue earthquake occurrence bulletins for local communities
		✓	6.2. Issue monthly and annual earthquake bulletins for scientific communities
			6.3. Issue volcano Alert Bulletins for tourism industry, local communities and general public
			6.3. Issue monthly and annual volcano activity bulletins for scientific communities
			6.4 Issue monthly volcano activity update bulletins for general public
			6.5. Issue weekly report of Geo-hazards monitoring systems and operations
			6.6. Review and develop specific education and awareness materials for specific audience using specific software
			6.7. Participate in education and outreach missions in schools and during global events as WMO/WW day, sciences week, environment week
			6.8. Prepare outreach/awareness materials based on thesis findings North Malekula/South Santo seismic gap
			6.9. Conduct outreach awareness based on thesis findings – North Malekula/South Santo

Geo-hazards management and operating procedures	To ensure a high standard operation of the Vanuatu Geo-Hazards Observatory and a proper management of Geo-Hazards staffs and assets	✓	<p>7.1. Update Draft SOPs for Admin response/Geo-Hazards response, emergency response, Issuance of Geo-Hazards products</p> <p>7.2. Review Tsunami detection and operation procedures</p> <p>7.3. Finalise Geo-Hazards operating manual/Geo-Hazards Directive including all hazards/Geo-Hazards Monitoring Systems Manual</p> <p>7.4 Engage in the VMGD Business/corporate planning and annual budgeting for 2014/2015</p> <p>7.5 Report annually and bi-annually on the Geo-hazards operations and achievements 2013</p> <p>7.6. Assess staffs through staff appraisal</p> <p>7.7 Control the Geo-Hazards assets</p> <p>7.8. Ensure the Geo-Hazards business plan is well implemented within means and timeframe</p>
Project Management	To ensure that all Go-Hazards projects are well implemented and that project targets are reached in a timely manner.	✓	<p>8.1 Mainstreaming Disaster Risk Management (MDRR) Project</p> <p>8.2. Increasing Resilience to Climate Change and Natural Hazards (IRCCNH) project</p> <p>8.3. Project of cooperation through the Government of New Caledonia</p>

I- Research and Development to improve current knowledge, and responses to volcanism, Seismicity and Tsunami

I.1. Engage in research activities with local and international scientists on earthquakes and volcanoes of Gaua, Ambae, Ambrym, Lopevi, and Tanna

Few research projects have been discussed with the international communities during the year 2015. Some of the projects have been finalized and implemented in 2015, some others have been proposed to seek funding in 2015 to be implemented in 2016. Among the proposed projects implemented in 2015, the post Cyclone PAM assessment that have been received through the Geo-Hazards Division and transferred to the rightful Divisions of Forecast and observations for implementation. The Research project proposal that have been received approved and started to be implemented in 2015 include:

- “Factors influencing short term and long term explosive variability at steady-state volcanoes, Yasur volcano, Tanna, Vanuatu”, a project funded by Auckland University and managed by

Professor Shane Cronin for his student leading the project implementation Ben Kennedy of Auckland University, one year project 2015-2016.

Within the number of projects that were in discussion during the year 2015 to be implemented in 2016, there are some projects in different areas:

- “Volcanic aerosols characterization, survey and forecast of volcanic plumes applied to Ambrym volcano” a project funded by IRD managed by Dr. Jerome Lefevre from GOPS/IRD and Joe Mala from VMGD a one year project.
- “The first attempt to sample the directional infrasonic wavefield for volcanic micro-eruptions by using microphone payloads on teathered weather balloons”, a research project funded by GNS Sciences and NIWA of New Zealand, led by Dr. Arthur Jolly and team, a two years project that aim to understand volcanic eruption processes in the subsurface.

Some others were under discussion but the dates of implementation is still not clear, depending on funding support. These includes:

- “The Drilling the late Quaternary coral record of climate on a subsiding reef at Sabine Bank, Vanuatu” project proposed by Texas Univeristy and partners including several researchers of various nationalities, managed by Dr. Fred Taylor of Texas University.
- “Reactive plume impacts of the tropical troposphere from the powerful magma degassing in the Vanuatu Arc”, the research project proposed to the National Agency for Research in France to seek funding. The project is led by Dr. Sylvie Vergniol and includes a dozen French scientists from the Institut Physique du Globe in Paris and others, it is a 2 years research project,

I.2. Carry out scientific assessment and research activities after major earthquake and tsunami events

1.2.1 Earthquake crisis

Two major earthquake sequences occurred in 2015; the February Northeast Paama earthquake crisis, the October Northeast Santo crisis and the December Northeast Erromango crisis.

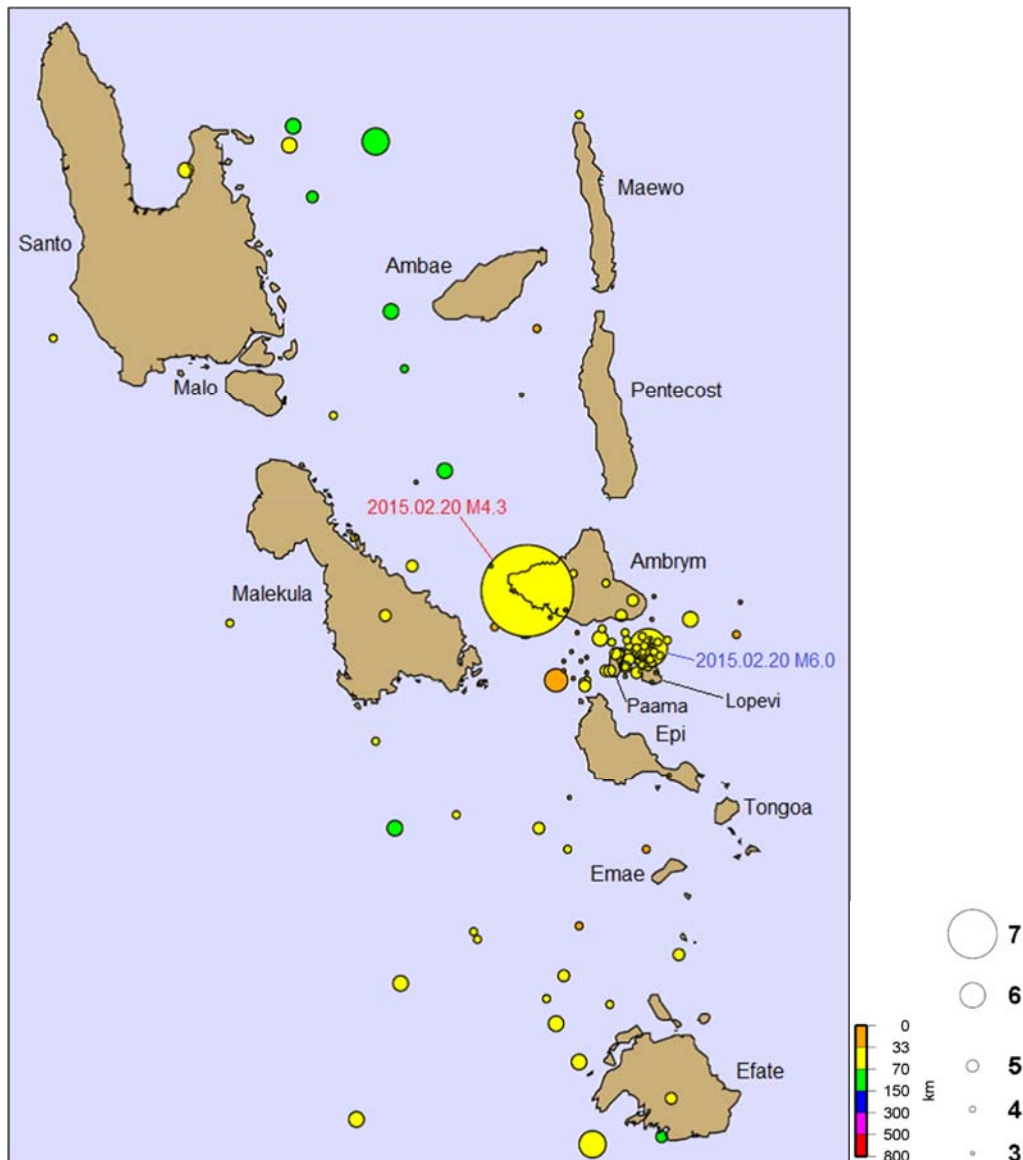
North-East Paama Earthquake – February 2015

On the 20th of February 2015, a magnitude 6.0 earthquake struck off the Northeast Coast of Paama [Figure 3]. The quake triggered a local tsunami that struck the northern coast line of Paama 10 minutes after. The earthquake sequence of this rupture was well constrained despite delay of seismic data from the seismograph station on Lopevi. The Lopevi station clipped upon impact from the mainshock. Within 6 days after the mainshock, a total of 38 aftershocks were computed from Seiscomp and 77 were computed from Seisan [Table 1]

Date	Events seiscomp	Events Seisan	Location Area
2015/02/19	26	56	Paama_Lopevi_Ambrym
2015/02/20	6	11	Paama_Lopevi_Ambrym
2015/02/21	2	3	Paama_Lopevi_Ambrym
2015/02/22	2	3	Paama_Lopevi_Ambrym
2015/02/23	1	3	Paama_Lopevi_Ambrym
2015/02/24	0	0	Paama_Lopevi_Ambrym
2015/02/25	1	1	Paama_Lopevi_Ambrym
Total	38	77	Paama_Lopevi_Ambrym

Aftershocks computed from 2 different seismic data software; Seiscomp and Seisan

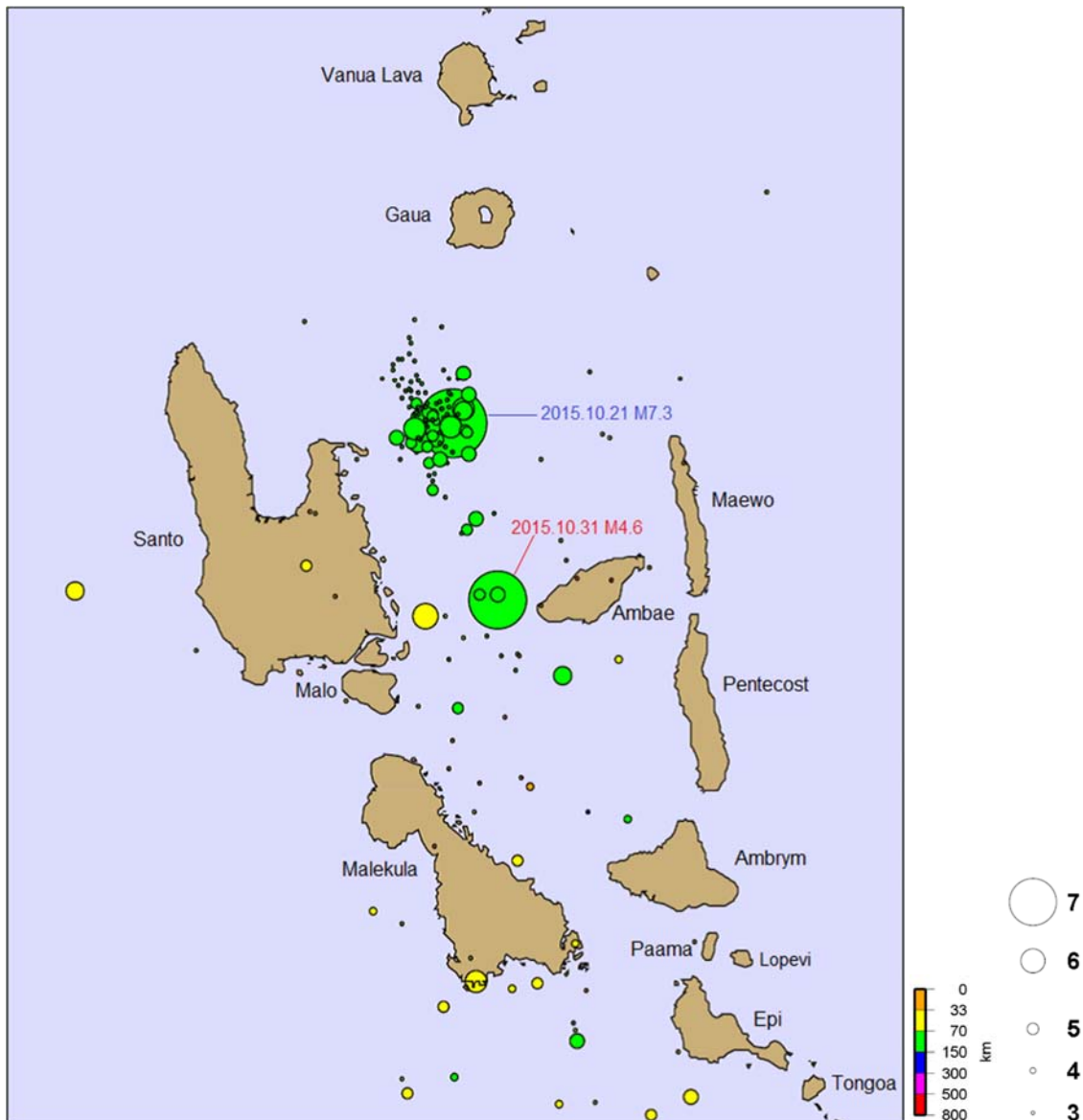
Seismic effects observed on Paama include landslides, rock fall and deep cracks on pathways and tracks. Structural damage is restricted to building foundations mainly residential dwellings and water wells. An intensity of VI (6) was inferred corresponding to strong shaking and light damage.



The 20th February 2015 Northeast Paama M6.0 Earthquake and aftershock events. Notice the magnitude 4.3 event (yellow circle) in red; an aftershock of the principal event but highly related to the fracture zone of Ambrym volcanic center. Hence, a highly localised event for Ambrym; off-setting the normal size representation of tectonic earthquakes within such magnitude range.

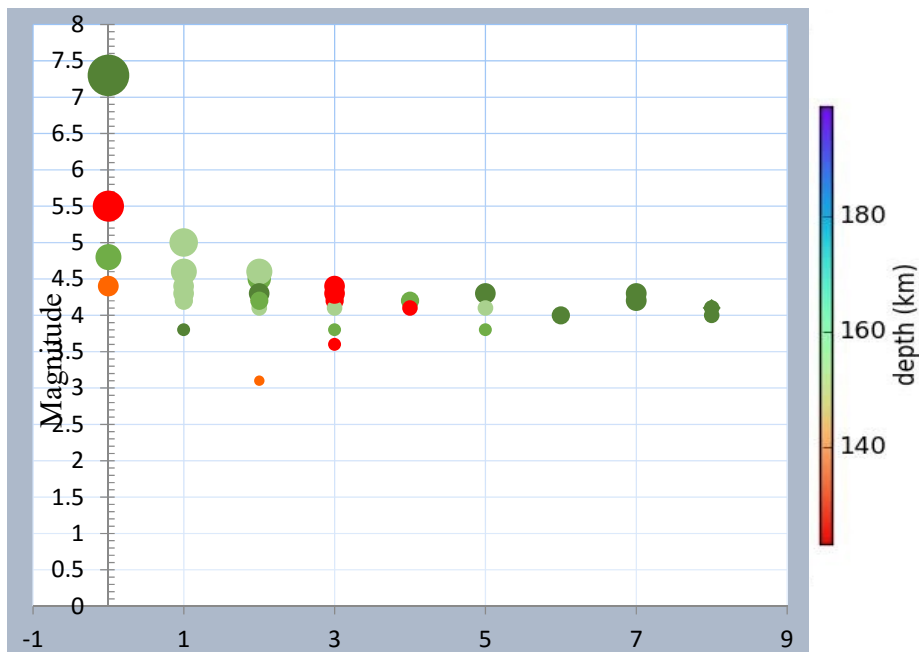
Northeast Santo Earthquake Crisis – October 2015

A major earthquake struck off northeast Santo at about 8:52 am local time Wednesday October 21st 2015. The regional seismic network located the event at 15.01°S and 167.21°E or 35 km east northeast of Port Olry, Santo [Figure 4] at a depth of 119 km with a magnitude of 7.3.



The 21st October Northeast Santo M7.3 Earthquake and aftershock events. Notice the magnitude 4.6 event (green circle) off West of Ambae in red; a highly localised event for Ambae; off-setting the normal size representation of tectonic earthquakes within such magnitude range.

Eastern Santo and Malo experienced strong to very strong shaking (VI – VII) as well as Gaua and Maewo. The shaking was also felt as far as Efate about 330 km away from the epicenter. The regional seismic network managed to locate approximately 39 aftershocks events within 7 days after the principal event. The Local seismic network [Efate Network] manages to relocate the principal earthquake epicenter and the subsequent aftershock events. The aftershock events ranged from magnitude 3.1 to 5.5 with at least 6 shallow focus events ranging from magnitude 3.6 to 5.5 [Figure 5].

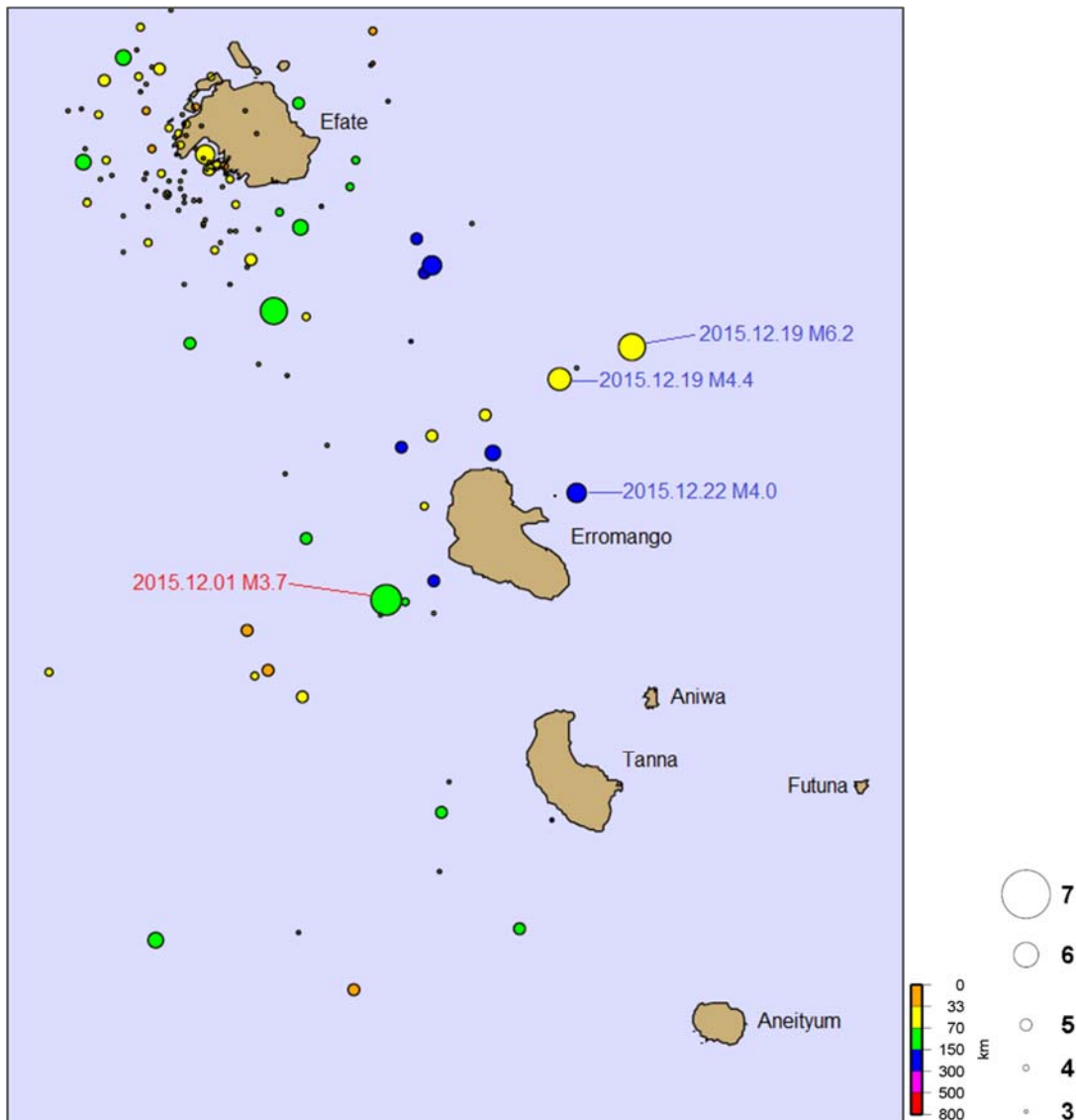


Aftershocks recorded by the regional seismic network within 7 days after the main shock on 21st October 2015. These aftershocks ranged from magnitude 3.1 to 5.5 with at least 6 shallow focus events ranging from magnitude 3.6 to 5.5.

The October 21st, 2015 M 7.3 Vanuatu earthquake occurred as a result of oblique-reverse faulting at an intermediate depth, approximately 119 km beneath the Pacific Ocean and 100 km to the east of the New Hebrides Trench [Vanuatu Trench], within the lithosphere of the subducting Australian plate. It is an intermediate-depth earthquake, representing deformation within the subducting Australian plate slab. Thus it is felt at great distance from its epicenter. Focal mechanisms indicate oblique rupture occurred on either a west-northwest or south-southeast-striking, moderately-dipping fault. At the latitude of the earthquake, the Australian plate moves east-northeast relative to the Pacific plate, subducting beneath the New Hebrides arc [Vanuatu archipelago] and the North Fiji Basin at a velocity of about 88 mm.yr⁻¹. The subducted Australian plate is seismically active to a depth of about 300 km in the region of this earthquake.

Other notable earthquakes in 2015

Other notable events include the M6.5 earthquake located about 84 km North-northeast of Port Vila, Efate that occurred at a depth of 201 km on the 23rd January and the M6.2 earthquake that struck off northeast Erromango [Figure 6] about 13:10 [1:10 pm] local time on December 19th 2015. Interestingly, the Northeast Erromango event show virtual no aftershocks or very few if any at all. The vast area between Efate and Tanna lacks seismograph stations. A station on Erromango would improve seismic data in this part of Vanuatu.



The Northeast Erromango M6.2 Earthquake that occurred on 19 December 2015. The event triggered virtually no aftershocks or if any very few. Notice the magnitude 3.7 event (green circle) in red; off-setting normal size representation of event of that size.

I.3. Training on volcano-seismic data processing & analyze

The Scientific officer volcano-Seismology provided an internal training to the newly recruited volcano data Analyst, Mrs. Melinda Aru in the system of volcano-seismic data analysis. She provided a brief presentation about the department, Geohazards division and volcanology section with more explanation about the volcano monitoring system, operation system (Linux and windows), process and analysis operation system and type of volcano seismic event during her first day at work. More than 3 reading books (Vol_sismo-Training, Dog_Training and volcanic seismicity books) were made available to to

Melinda to know more about volcano seismicity such as identification of volcano seismic event, type of waveforms and types of volcano seismic event.

1.4. Coordinate & facilitate training workshop and attachment with other counterparts in Geohazards field

1.4.1. Oceania Regional Seismic Network training

The Seismic data analyst and Processor, Sophie Turere participated in the Seismic Data Sharing Task Team and Oceania Regional Seismic Network (ORSNET) Training in Suva, Fiji from 2nd to 6th November 2015. The training was sponsored by ORSNET Project funds. The ORSNET training was provided by Sylvain Todman, the Geo-Hazards adviser. The training focused mainly on the basics in LINUX as the main operating system for seismic data analysis and SEISCOMP3 and include all Seismic observatories in the region (PNG, Solomon Islands, Vanuatu, New Caledonia, Fiji, and Tonga) including Geosciences Australia.

1.4.2 Student attachment

A Ni-Vanuatu second year student from the University of New Caledonia (UNC), Amanda Koroka spent about 3 weeks with the seismology team from December 1st to 23rd as part of her applied Geoscience credit (DEUST GEOSCIENCES APPLIQUEES) toward her program of study. She worked closely with the 2 Data Processor and Analysts Seismology, Sophie Turere and Juanita Laga during her short attachment.

1.5. Participate in regional and international conferences and seminars

1.5.1 26th Session of the ICG/PTWS

The PSO Seismology, Morris Harrison attended the 26th Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXVI) from 22 to 24 April in Honolulu, Hawaii, USA. He presented the National Progress Report for Vanuatu and voted on behalf of Vanuatu in the elections of officers in the ICG/PTWS. The meeting elected Miss Filomena Nelson from Samoa's Disaster Management Office Chairlady of ICG/PTWS replacing Dr. Ken Gledhill from New Zealand's GNS who was at the helm for the last 3 years. Mr Ofa Fa'anunu from the Tonga's Meteorology Department elected the chair of Working Group for the South West Pacific. The PSO Seismology, Morris Harrison was nominated as a member of Working Group 2 Tsunami Detection, Warning and Dissemination.

1.5.2 4th meeting of the ICG/PTWS seismic data sharing task team of the South west Pacific

The Seismic data analyst and Processor, Sophie Turere participated in the Seismic Data Sharing Task Team of the Intergovernmental Coordination Group for the Pacific Tsunami Warning System (ICG/PTWS). She also attended the Oceania Regional Seismic Network (ORSNET) Training in Suva, Fiji from 2nd to 6th

November 2015. The training and meeting were both sponsored by UNESCO and the ORSNET Project funds. The Task team meeting was chaired by Esline Garaebiti, Manager Geo-Hazards of Vanuatu.



Group photo of the ICG/PTWS training and meeting participants

1.5.3 Capacity Building Training workshop on “E-Government Development in Pacific Small Island Developing states”

The Geo-Hazards Manager attended this workshop in response to the OGCI request for VMGD participation in this workshop. This workshop is held at Suvavou house in Suva, Fiji, from 5th to 7th November 2015. It is co-funded by the United Nation Project Office in Governance (UNPOG) and the Ministry of Communication of Fiji for the participants from Asia and Pacific region, particularly those who use E-Government for Disaster Risk Management.

1.6. Facilitate internal technical trainings relevant to Geohazards areas of work for Geo-Hazards staff

1.6.1 On the Job training under JICA project

All Geo-Hazards staffs, especially technicians and Seismology team, underwent the on the job training on the installation, and maintenance of the STS2 Broad Band Seismograph and strong motion sensor. This on the Job training run on the 8th, 15th and 17th of June 2015 on the 3 station sites occupied by the JICA funded Seismometer, in Port Vila, Malekula and Tanna.

1.6.2 Tide Observation course

The PSO Seismology, Morris Harrison attended a tide observation course held at the Vanuatu Meteorology and Geo-hazards Department conference room. The course runs for 21 days between the

17th June to 22nd July 2015. It was conducted by Chuji Yamamoto, a consultant from the Yachiyo Engineering Co., Ltd of the Japan Meteorological Business Support Center (JMBSC). The training course is the soft component of “The Project for Improvement of Equipment for Disaster Risk Management” Tide Observation Systems for Vanuatu funded by the Japanese government through the World Bank. A certificate of participation was awarded after the training.

1.6.3 Website construction training

This training was provided under the JICA “Project for Improvement for Disaster Risk Management” as the soft component to the equipment that was installed on remote sites. This training intended to teach VMGD staffs on how to display the information collected by the JICA project to the general Public. Sandrine Cevuard, the Volcanology Scientific Officer was the Geo-Hazards participant in this training. The training run for 21 days from 17th June to 22 July 2015. Sandrine was selected at the end of the training to demonstrate the Geo-Hazards web page she created during the training she got from Mr. Koji Mitsuhashi, a consultant of the Japan Meteorological Business Support Center (JMBSC).

1.6.4 WMO’s Common Alerting Protocol (CAP) Workshop

Sandrine Cevuard, Scientific Officer Volcanology, attended the training workshop funded by WMO and provided by Dr. Christian Eliot who is the WMO CAP’s expert. The training intended to initiate the VMGD staffs on the international standard format for emergency alerting and Public warning. The training was held in the VMGD conference from 2nd to 3rd December 2015.

1.6.5 VMGD Website Design using Joomla - training

The PSO Seismology, Morris Harrison and SO Volcano-Seismic, Sandrine Cevuard attended a Website design training conducted by Thanh Phan, a volunteer with the Information, Communication and Technology (ICT) Division on the 14 and 15 December 2015. It is an in-house training for preparing officers on the development of a new Vanuatu Meteorology and Geo-Hazards Department website.

1.7. Retrieve Lidar data and training on using data for tsunami modelling/hazard mapping

1.7.1 QGIS Introduction and refresher course

The Seismic data analyst and Processor, Sophie Turere participated in the Increasing Resilience to Climate Change and Natural Hazards (IRCCNH) project free and open source Geographic Information System (QGIS) training course held at the Office of the Government Chief Information Officer (OGCIO) Training Room in Port Vila. The course runs over 2 days, 23rd and 24th November 2015. A certificate of Participation was offered after the training. The Training was conducted by Tim Gusten, a GIS consultant under the IRCCNH project.

II- Scientific collaboration and partnership for data sharing

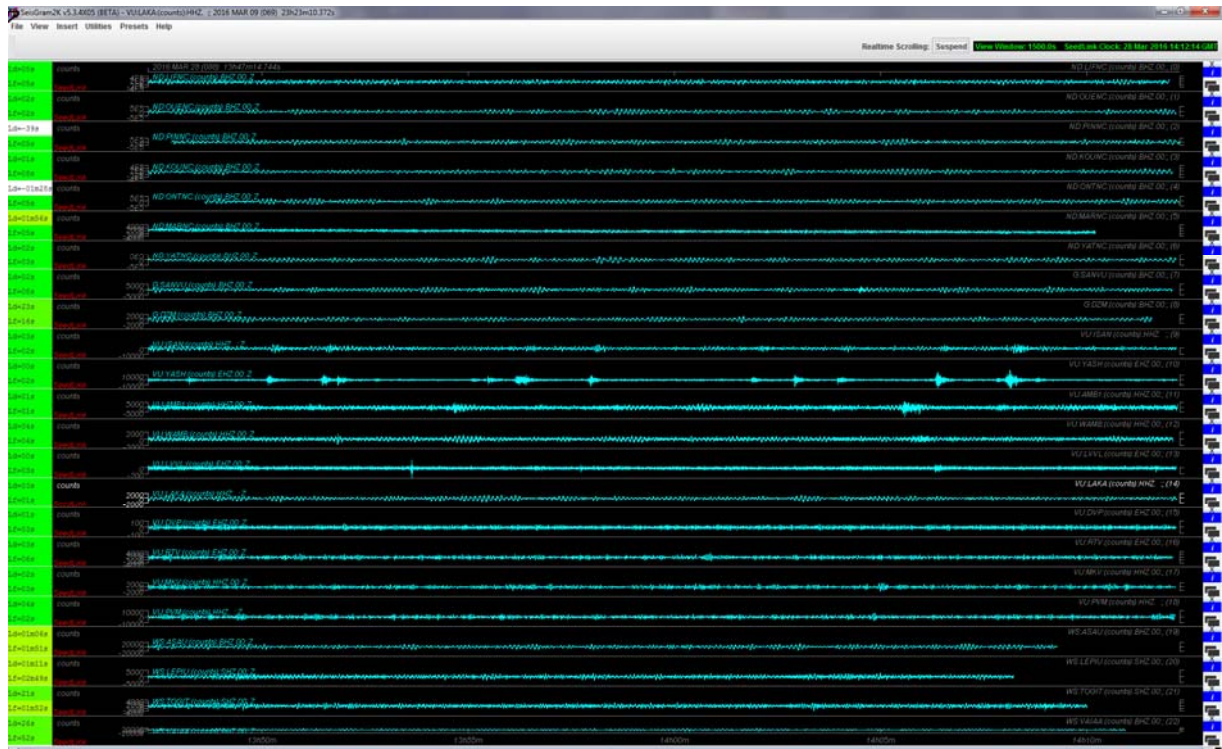
2.1 Establish Trilateral and multilateral agreements with ORSNET communities, GEOSCOPE, to address Geohazards Observations and data sharing

The Geo-Hazards Division contributed in the discussions and development of a number of agreements/MOUs, for the interest of partnership and collaboration with VMGD through the Geo-hazards Division in the exchange of scientific and technical expertise, data and resources. Some of these agreements are already signed.

- An MoU has been discussed and signed in February 2015 between the Director of VMGD and the Director of the Institute of Research and Development (IRD) based in New Caledonia regarding the partnership of the two organization in the hosting and running of the regional server of the Oceanai Regional Seismic network to facilitate seismic data sharing in the region.
- An MoU being signed between the Director of the Institute of Physics of the Globe based in Paris (IPGP) based in France, the then Acting Director of VMGD and the acting Director of the Vanuatu Agricultural Research and Technical Center (VRTC) in May 2015. This MOU is regarding the “Maintenance of the SANVU Seismic station” located in the premises of the VRTC on Espiritu Santo and funded by IPGP. This station is simultaneously providing seismic data to IPGP and VMGD for global earthquake detection.
- An MoU has been discussed and finalized in April 2015 between the Vanuatu and French Red Cross, VMGD and NDMO regarding the Red Cross support in Volcanic Hazards and Safety mapping design for Ambrym Volcano.
- An MOU regarding “Procedures for Broadcasting of official emergency Information” between Vanuatu Broadcasting and Television Corporation, NDMO and VMGD.

2.2. Share seismic data with other Earthquake Information centre’s to encourage research and to re-enforce monitoring system in Vanuatu

The Vanuatu Meteorology and Geo-Hazards Department through Geo-Hazards division is sharing data with 7 Pacific Island countries under the agreement of the Oceania regional Seismic network. Other global stations of other countries in the region are also integrated in this data sharing efforts. More than 20 stations of the region are contributing their seismic data to the national seismic data center of VMGD to contribute in the rapid earthquake detection for Tsunami early warning.



Seismograms showing the streams of seismic data from the flowing from other countries to the VMGD data center; each line represents one station in one country

2.3. Collaborate with Regional Partners in strengthening the Regional seismic network Vanuatu/New Caledonia with other observatories in the region.

2.3.1 Oceania regional Seismic network

The manager Geo-Hazards, Esline Garaebiti, and the Geo-Hazards Engineer, Sylvain Todman provided 2 technical visit to the national Seismic observatories of Fiji and Tonga to assist them in their connection to the Oceania Regional Seismic Network (ORSNET).

The Fiji visit in April 2015 allowed the team to establish cooperation between Fiji Telecom Company and the Seismic Observatory in their earthquake detection and information dissemination. This visit also allowed them to share their expertise with the Fiji seismic observatories in a form of refresher training in SEISCOMP3.



Training in progress on how to use SEISCOMP3 in the Fiji Seismic observatory

The visit to Tonga occurred at the end of October 2015 to expand the ORSNET to Tonga by connecting the Tonga national seismic network server to the regional seismic server of ORSNET. This visit was also including on the job training of the Tonga Seismology team in SEISCOMP3 and in manual earthquake detection review.

2.3.2 South-South exchange between Vanuatu and Solomon Islands under CRISP project

VMGD through Geo-hazards Division has been supporting the Solomon Islands Geo-hazards team in the establishment of the Solomon Islands volcano-Seismic monitoring network. After the design of the network, the VMGD technicians have been deployed to the Solomon Islands in September 2015 to conduct and train the Geo-Hazards counterpart in the technics of volcano-seismic monitoring site survey. Two technicians, Janvion cevuard and Athanas Worwor, and the Geo-hazards technical adviser, Sylvain Todman, have undertaken this mission. The training sessions in generalities occurred in Honiara and the Site survey and on the job training occurred on Isabelle and Makira Islands. This mission is funded by the Solomon Islands CRISP project.

III- Crisis responses to volcanism, Seismicity and Tsunami

3.1. Liaise with NDMO, and other stake holders for disaster response plan and action in times of volcanic eruptions, earthquake and tsunami

The Geo-Hazards Manager provided a briefing to the National Disaster Management Office in February 21st 2015 to provide the update on the Ambrym volcano activity and to guide the NDMO in their decision making in response to the Ambrym Minor eruption. A brief update report has been circulated to the NDMo and stakeholders for their information. The principal Scientific Officer in Seismology, Morris Harrison, provided a briefing to the NDMO and stakeholders after the Paama tsunami in February 2015.

3.2. Carry out hazard assessment in response to major volcano activity events

The Ambrym volcanic eruption

Observation and seismic data analysis show that from September 2014 to February 2015 Ambrym volcano maintained continuing major unrest phase.

On 19th February 2015 at 24:18 am VUT a local earthquake of 7.2 Magnitude with 10 Km depth located at North of Paama Island generated a sudden increase number of volcanic earthquake (Vol.EQ) and volcano-tectonic earthquake (VT).

On the 20th February 2015 local tour guide from Endu village (South East Ambrym) reported an observation of a dense emission of very dark volcanic plume around 9:00am. Seismic data confirmed that Ambrym volcanic activity has quite changed from 20th February 2015 after the earthquake. The minor eruption phase commenced on 20th February 2015 around 02:00 am.



Early morning around 5:45am of 21st February 2015, local observer from Indu village reported a huge ash column observed and heard explosions.

On 21st February 2015, the Alert Level was raised from Level 1 to Level 2 and few hours later it was increased to Level 3. Two aerial survey was done during the eruption phase; on the day of 21st February 2015 around 14:30pm the first aerial survey and observation done reported an observation of dense emission of very dark plume and gas, flank eruption accompanied with lava flow towards the South East area of edge of the caldera and lava fountain with explosions occurred from fissures vents;

The second are aerial survey and observation done on 23rd February 2015 at 11:00am reported that there is a continuing dark ash plume and gas emission, deposit of pumice and scoria at the South East

area of the caldera in which lava flow occurred, absence of lava fountain and lava flow but formation of new scoria cone along the fissure and continuing explosion; This minor eruption phase was ended on 28th February 2015.

On 2nd March 2015, its Volcanic Alert Level was dropped from Level 3 to Level 2.

3.3. Carry out tsunami run up and hazards assessment in response to a major tsunami event

3.3.1 Post Tsunami Survey

Of all the major earthquakes in the Vanuatu region in 2015 only the 20th February M6.0 earthquake off Northeast Paama generated a significant tsunami. The PSO Seismology Morris and an Observer from the Observations Division, Grace Johnalson were deployed to Paama a day after the tsunami to conduct a post-tsunami survey [Figure 7.].



Viong, a locality on Northwest Paama used for landing by sea vessel. Notice tsunami debris depicting inundation line, yet visible few days after the event. An inundation distance of 27.0 m (above high water) was measured here. Inferring for reef flat at time of tsunami attack it will be about double that distance.

Generally, the tsunami struck about 10 minutes after the principal earthquake or 10 minutes after 00:18 am or 00:28 am. There were 3 main waves separated about 10 minutes apart. The second wave is the biggest. Observation on the tsunami wave and flow direction along the North Paama coast strongly suggests that the epicentral region is off Northeast of Paama consistent with instrumental location when more data become available.

Tsunami runup heights, inundation heights and distances are high on the Northwest of the island, from Tavie to Liro Nessa. A tsunami flow depth of up to 2.0 m and a runup height of at least 6.0 m were measured [Figure 8]. Inundation distances of up to 120 m were observed on Northwest Paama. The tsunami struck at a time of abnormally very low tide conditions; lowest tide for the month of February

2015. The lowest tide as per the Luganville tide observation was 0.06 m at 23:31 pm (19th February) and for the Port Vila tide observations it was 0.18 at 00:22 am (20th February).



The coast at a locality on Northwest Paama; cobbles being displaced and shrubs stripped as result of tsunami waves. The sea Oak tree (Casuarina equisetifolia) shows strong resistance toward tsunami waves. Notice the scouring of the Sea Oak's stem and roots, and scars on the tree; provides insights on the tsunami strength. The measuring rod in this photo is about 2 meters high.

The abnormally low tidal condition at the time of tsunami attack had a significant impact on runup heights and inundation distances observed. The beach Sea Oak (*Casuarina equisetifolia*) displayed huge resistant to the tsunami waves hence a very good tsunami breaker. However lowering and scattering of cobbles along the North Paama coasts greatly exposes these coastlines to more severe erosion. No fatality or serious injury occurred during the tsunami; possibly due to the odd hour the event occurred [00:28 am] when everybody else was in bed or very few people were on the beach.

IV- Geo-Hazards warning systems in Vanuatu

4.1. Ensure Geohazards Warning centre operations up and running.

Technicians are rostered to do regular checks of the Geo-Hazards monitoring system every day. The Geo-Hazards Division is operating Xymon, a system that automatically display the status of all the systems both inhouse and remote in the field to assist the technicians in their reaction.

4.2. Contribute to the development of tsunami risk map for Port Vila and Luganville

The Manager Geo-Hazards Division is part of the executive responsible to advise in the implementation of the Mainstreaming Disaster Risk reduction project. Her contribution contributed to the establishment of different Hazard maps for the department:

- The 1:300,000 scale peak ground acceleration map for the whole Vanuatu with 100 years return period.
- The 1:300,000 scale peak ground acceleration map for the whole Vanuatu with 500 years return period.

- The 1:300,000 scale peak ground acceleration map for the whole Vanuatu with 2,500 years return period.
- The 1:90,000 scale Inferred Site class Port Vila study area
- The 1:30,000 scale Inferred Site class Luganville study area
- The 1:90,000 scale Inferred Liquefaction susceptibility, Port Vila study area
- The 1:30,000 scale Inferred Liquefaction susceptibility, Luganville study area
- The 1:90,000 scale Inferred landslide susceptibility, Port Vila study area
- The 1:90,000 scale Inferred Landslide susceptibility, Luganville study area
- The 1:90,000 scale Flood depth Mele catchment 10 year return period, Port Vila study area
- The 1:90,000 scale Flood depth Mele catchment 50 year return period, Port Vila study area
- The 1:90,000 scale Flood depth Mele catchment 100 year return period, Port Vila study area
- The 1:90,000 scale Flood depth Sarakata catchment 10 year return period, Luganville study area
- The 1:30,000 scale Flood depth Sarakata catchment 50 year return period, Luganville study area
- The 1:30,000 scale Flood depth Sarakata catchment 100 year return period, Luganville study area
- The 1:90,000 scale Flood velocity Mele catchment 10 year return period, Port Vila study area
- The 1:90,000 scale Flood velocity Mele catchment 50 year return period, Port Vila study area
- The 1:90,000 scale Flood velocity Mele catchment 100 year return period, Port Vila study area
- The 1:30,000 scale Flood velocity Sarakata catchment 10 year return period, Luganville area
- The 1:30,000 scale Flood velocity Sarakata catchment 50 year return period, Luganville study area
- The 1:30,000 scale Flood velocity Sarakata catchment 100 year return period, Luganville study area
- The 1:90,000 Scale tsunami evacuation zone for Port Vila
- The 1:30,000 Scale tsunami evacuation zone

4.3. Contribute in the development of the tsunami warning signage project

4.3. Contribute to the Development of the reviewed Hazard map and contingency planning for Tanna and Ambrym

The volcano-Seismology Scientific Officer finalized the draft copies of the Ambrym volcano Background map, the Ambrym volcano Safety maps, the volcanic risk signage for visitors and the exclusive zones of Ambrym ready for consultation. These products were translated into the 3 official languages, Bislama, English and French.

4.4. Finalize the Vanuatu Volcano Alert System review

The new version of Vanuatu Volcanic Alert Level (VVAL) was set by Geohazards Observatory on 5th December 2014 and tested during the minor eruption of Ambrym volcano on 20th February 2015 and also along the year. This version of the VVAL is proven to be the best version easily usable by the Geo-Hazards team, more realistic and appropriate than the previous version. This version is then the final version of the VVAL.

Vanuatu Volcanic Alert Level System		
Title	Level of Alert	Description Distance/Area
Very Large Eruption	5	Danger beyond caldera, on entire and surrounding islands and also chance of flank eruption
Moderate Eruption	4	Danger on volcanic cone, caldera and all island, possibility of very large eruption and also chance of flank eruption
Minor Eruption	3	Danger within caldera, volcanic cone and other specific area, possibility of moderate eruption and also chance of flank eruption
Major Unrest	2	Danger around the crater rim and specific area, notable/large unrest, considerable possibility of eruption and also chance of flank eruption
Signs of Volcanic Unrest	1	Notable signs unrest Possible danger near eruptive vents
Normal	0	No signs of change in the activity Limited danger
An eruption may occur at any level and levels may not move in sequence as activity can change rapidly		
<p>This system applies to all Vanuatu's volcanoes.</p> <p>The Volcanic Alert level is set by the National Geohazards Observatory within Vanuatu Meteorology and Geohazards Department based on the level of volcanic activity. For more information, see www.geohazards.gov.vu or email at geohazards@meteo.gov.vu or call at 24686 for alert levels and current volcanic activity. Version 2.0, 2014.</p>		

New Vanuatu Volcanic Alert Level system

4.5. Maintain Geo Hazards Warning Centre operations and ensure 24H/7 on call services for Geohazards Early Warning systems

Along with scientific officers, the technical team of Geo-Hazards Division were also on duty roster to ensure the monitoring system is always up and running. Various challenges they faced but they successfully conquered. Technicians are using XYMON to check the Health status of all the stations. It is the best system to rapidly detect station faults and respond accordingly to quickly fix the problem.

The Division is using a ticketing system for emergency communication between data analysts and technicians to ensure smooth running of the warning system.

4.6 Carry out the observations of earthquakes and volcanoes in real-time 24H/7 for tsunami and volcanic eruptions early warning

4.6.1 Volcano activity observations and volcano-seismic data availability

The volcano data analyst is tasked to be on duty 7 days a week to ensure that the volcano database is well maintained. This officer has 2 hours of duty each weekend and public holidays. This duty is required to properly monitor volcano data availability and quality.

Calendars showing the seismic data availability in all Vanuatu volcanoes that are equipped with monitoring systems can be found in the **Annexes 1**. Some stations are offline all through the year 2015, most of the data gaps were due to the impact of the tropical Cyclone PAM.

4.6.2 Earthquake activity observations and data availability

The earthquake data analyst is tasked to be on duty 7 days a week, 2 hours every weekend and public holiday to ensure daily update of the earthquake database, and appropriate data availability and quality for tsunami early warning.

Major seismic data gap exists in mid-March to April. However, when data were retrieved from the remote stations and the seismic network up and running this gap has been reduced significantly. A boost in data quality and availability occurred after installation of new permanent seismograph stations and the expansion of the Oceania Regional Seismic network.

V- Earthquakes and volcano monitoring system

5.1. Establish agreements with provinces Malampa /Shefa/ Tafea and/ or customary landowners for the use of rural lands hosting the Geohazards monitoring systems



Signing of the land agreement for Lopevi volcano monitoring station and Paama relay tower

Land agreements have been signed during the Environment and social safeguard (ESS) screening in the provinces of SHEFA, PENAMA, and MALAMPA.

A meeting was convened in the VMGD Warning Center in April 2015 to officiate the signing of the land agreement after the Environment and Social safeguard screening for the Land hosting the Mont Erskin station (MKV) and Devil's Point station (DVP). The signing was done between Mr. Monvoisin, land lessee, and Chief Andrew Popovi and the Customary Land owner.

In September 2015, a mission to the Penama provins allowed the Geo-Hazards team to get the land agreement by customary land owners and Penama province for the lands that should host the stations of Marino (North Maewo), Ambanga (North Ambae), and Lovuinilli (East Ambae).

In December 2015, the Geo-Hazards team obtained the land agreement from customary land owners and area secretary for Malampa province responsible for the land hosting the Geo-hazards monitoring station of Lopevi and the relay tower of Paama.

5.2. Upgrade the national seismic network by extending the network to Tanna , Malekula and Port Vila

The Upgrade of the Seismic station of Efate (PVM) and the extension to Tanna (ISAN) Malekula (LAKA) and Efate was funded by JICA under the "Project of improvement of Equipment for Disaster Risk Management".

On June 2015 3 seismograph stations for Vanuatu funded by the Japanese government through JICA were installed. The project sites are Lakatoro, Malekula, Vanuatu Meteorology and Geo-hazards Department premises, Efate and Isangel, Tanna. The hardware component of the project includes seismograph sheds [Figure 1], power supply (solar panel), installation of seismographs both broadband (velocity) and strong motion (acceleration) sensors. The soft component are an On-the Job Training for Solar Power and an On-the-Job Training (OJT) for Strong Motion Accelerator and Broadband Station System provided by Japanese technicians from the OYO Seismic Instrumentation Corp.



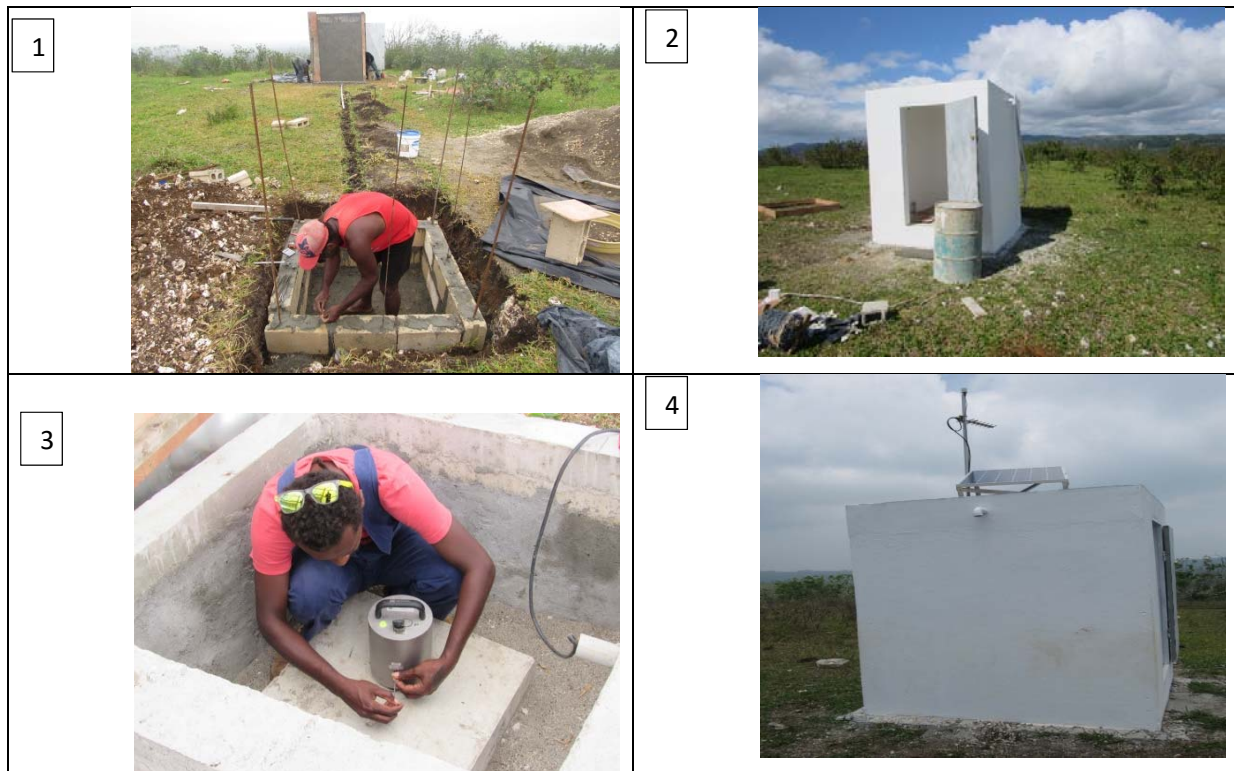
The Seismograph Shed at Lakatoro, Malekula funded under “The Project for Improvement of Equipment for Disaster Risk Management” for Vanuatu funded by the Japanese government through the World Bank. A similar shed is located at Isangel, Tanna and there is one in Port Vila. These sheds houses seismic monitoring sensors and instruments.

The PSO Seismology, Morris Harrison accompanied the Japanese technicians to Lakatoro, Malekula for the installations while a technician, Athanase Worwor accompanied the team to Tanna for the installation at Isangel. All the Geo-hazards staff participated in the OJT at the Port Vila Seismograph station at the VMGD premises.

At the moment only the broadband seismographs data from the 3 stations (Lakatoro-LAKA, Port Vila-PVM and Isangel-ISAN) are being transmitted whilst the strong motion (accelerometers) seismographs data are yet to be transmitted. This will need on-going collaboration with the Japanese technicians. Transmission from Lakatoro and Isangel to Port Vila is via e-government network whilst transmission from the Port Vila Station to the Data Centre is via cable line.

5.3. Upgrade the Efate seismic network

A new seismograph station was installed at Mt. Erskine (Acronym MKV (168° 17'20.8" E 17° 35'47.6" S 422 M), north Efate on October 2015. This station is funded by the Government of Japan through World Bank. It includes re-installation of the sensor and transmission connection via e-government network. The seismograph shed was completed in July as a partnership project between VMGD and Tanoliu community. With this seismograph station, there are now four seismograph stations on Efate; namely Rentapao Station (RTV), Port Vila Station (PVM), Devil’s Point Station (DVP) and the Mt. Erskine Station (MKV).







The different steps in the installation of the MKV seismograph from 29 June to 10 July 2015 beginning with the construction of the SHED foundation (1) the finishing of the shed (2), the installation of the equipment (3) and the installation of the data transmission system (4)

This station is transmitting to the Observatory via EGOV Network. MKV is hooking up to EGOV Network by setting the Point to Point link from the station to EGOV tower at Kleim's Hill (S 17°38'41.56" E 168°13'56.05" 964 M). This station transmitted in real-time to the Vanuatu Geo-Hazards Observatory under VMGD since the 27th October 2015.

5.4. Maintain the Efate seismic network

The Efate network maintenance during the year 2015 occurred several time as for other stations due to the tropical cyclone PAM impacts. The visits on each stations of the Efate seismic network, particularly the remote stations, were done according to the following schedules

Devil's Point (DVP)	Rentapau (RTV)	Mt Erskine (MKV)
25/03/2015 Assessment of the station after the passage of the tropical cyclone Pam. Electronics in the shed are safe but the solar panel was broken	25/03/2015 Assessment of the station after the passage of the tropical cyclone Pam. Station was safe but the data transmission antenna was moved by the tropical Cyclone from its original direction.	10/07/2017 Completion of the seismic station shed and installation of the seismograph running as a standalone station

<p>10/04/2015 The damaged solar panel is replaced by a new one.</p>  <p>The data transmission system is re-installed.</p>  <p>The station data is finally streaming in the data center after the installation.</p>	<p>16/06/2015 Due to the damage of power cable of the freeware transmitter the station can't transmit. The cable has been replaced to ensure it is working again</p>	<p>22/10/2015 Visit the station to download seismic data and found that the DM24 and the seismometer are not working properly.</p>
<p>20/08/2015 Due to the station breakdown, the sensor was brought to the Observatory for servicing.</p>	<p>28/08/2015 Cleaning of the station.</p>  <p>Upgrade of the short period Sercel L4-3D sensor to the long period CMG-40T sensor</p> 	<p>23/10/2015 Replace the seismometer and the DM24 with the new ones.</p>
<p>24/08/2015 The station is re-installed</p>	<p>11/11/2015 Cleaning inside of the station and spray CRC on battery lugs to avoid oxidation.</p>	
<p>11/11/2015: Cleaning of the station and electronics checks.</p>		

5.5. Maintain the Geoscope station for global earthquake monitoring network

With the repeated breakdown of the station due to power supply, the IPGP funded the the installation of solar power system in the station. This installation was done in collaboration with a Greentech technician from 6th to 8th October 2015.



The left photo shows the technician's working during the installation and the right photo shows the three (3) batteries installed in the basement.

This includes three (3) solar panels of 140W and three (3) batteries of 200AH. The plan is to have an independent power source and monitor remotely in real-time in using Studer Variotracker.

5.6. Maintain and continue Installation of Real-time seismic monitoring system on Tanna, Lopevi, Paama, Ambrym, Ambae, Gaua and Vanua lava

5.6.1 New installation of volcano monitoring systems

This activity was greatly disturbed by tropical cyclone PAM that slowed down the installation works on these islands. This year's work was limited to the confirmation of sites and the erection of the relay tower in Paama in December 2015.

The Paama relay tower, located at 168° 14' 48.1" E 16° 26' 21.6" S Elevation: 451 M, is built successfully on Paama islands. It has a webcam shooting Lopevi for visual observation and an antenna to receive Lopevi seismic data and relays then to EGOV tower on Ambrym. This tower will be one of the main relay that will divert network stations such as South east Ambrym and Epi to EGOV on Ambrym.



The complete setup of tower on Paama islands and the Webcam pointing to Lopevi for visual monitoring. It was built in the month of December from 15th to 21th

5.6.2 Maintenance of the existing volcano monitoring systems

Tropical Cyclone PAM impact aerial survey

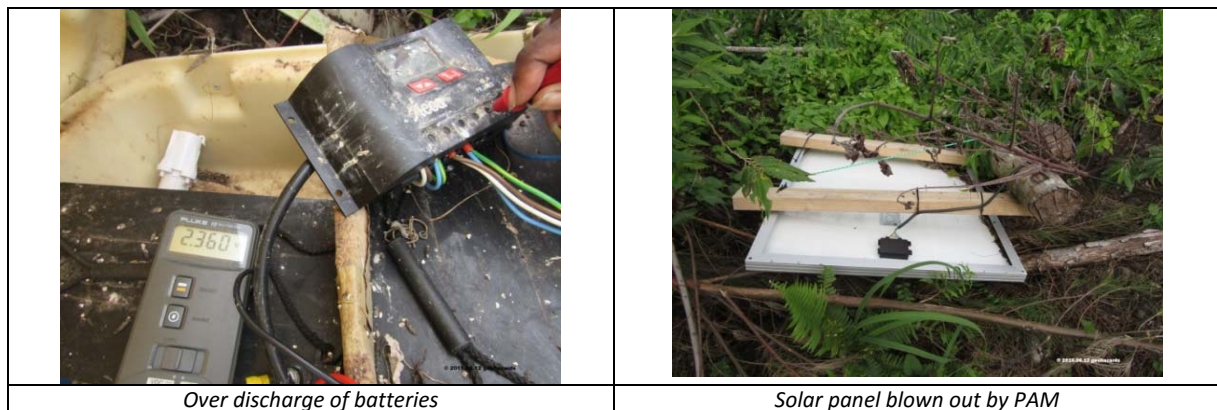
Sylvain Todman, Janvion Cevuard and Morris Harrison conducted an aerial survey and rapid assessment via an Australian aid helicopter few weeks after Tropical Cyclone Pam. The team flew over Paama, Lopevi and Ambrym conducted aerial survey on the seismograph station at Lopevi, the TVL Tower on Paama and the Camera Station on Ambrym. The team landed on the ash plain on Ambrym volcano and visited the seismograph station in the caldera.

Tropical Cyclone PAM impact on site assessment

Technicians have been deployed after the passage of tropical cyclone PAM to quantify the damage on the Geo-hazards monitoring system in order to evaluate the impact and plan for the recovery process of the network.

LOPEVI volcano monitoring system




With the visit on site from 9th to 13 June 2015, the team retrieved all electronic goods to Port Vila for servicing. After all only the Fit PC and the digitizer Q330 can be repaired, all others such as webcam, solar panels and batteries are broken.

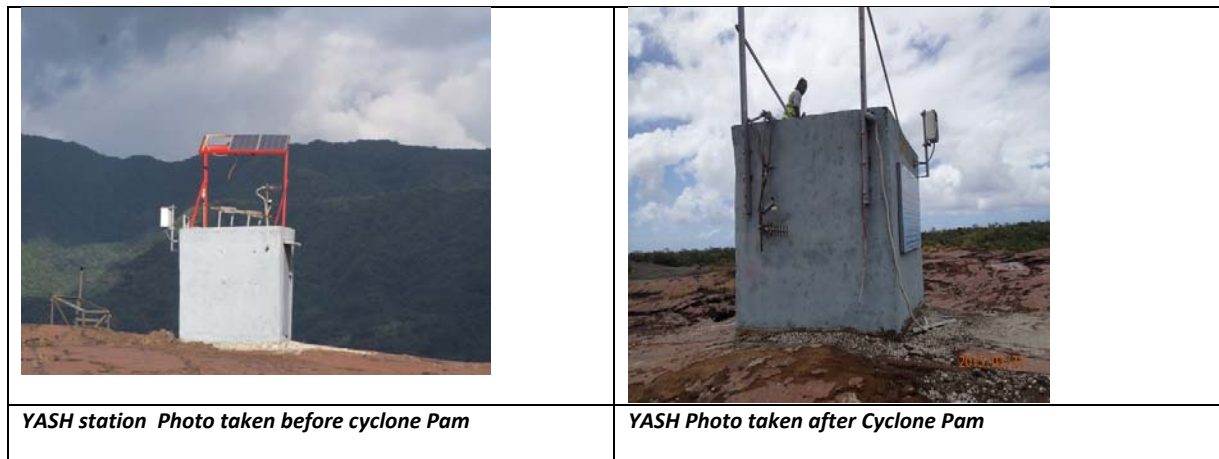


	
<p><i>Fallen TVL tower on which the webcam for Lopevi was mounted</i></p>	<p><i>Broken batteries that were used to power the Station</i></p>

Tanna volcano monitoring system

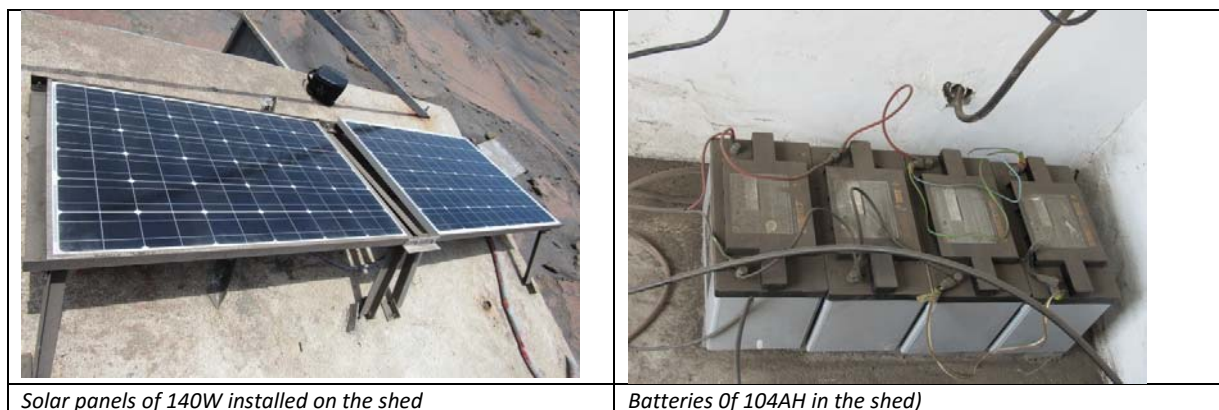
The tropical cyclone PAM impact assessment on Tanna from 30 March to 1st April by the Geo-Hazards scientific and technical team shows that all Yasur volcano monitoring stations including the web camera CAMYASUR and the seismic stations YAS and YASH were all destroyed

	
<p><i>CAMYASUR Photo taken before cyclone Pam</i></p>	<p><i>CAMYASUR Photo taken after Cyclone Pam</i></p>
	
<p><i>YAS station Photo taken before cyclone Pam</i></p>	<p><i>YAS station Photo taken after Cyclone Pam</i></p>



Volcano monitoring station maintenance

The YASH station in Tanna was re-installed in 2 November 2015 with the new solar panels of 140W to charge four existing batteries of 104AH.



The Ambrym station was also visited. From 21 to 27 March 2015 the Ubiquity Nano stations (NMS2) are replaced with Ubiquity Air grid. The idea is to a better link Point to Point as to ease the data flow transmission to Port Vila at the Observatory. It was the link between the station and the relay (AMCR) that is being upgraded.



Existing Nano Station transmitter	Upgrade from Nano to Air grid transmitter	The technician is checking the transmission quality of the Air Grid at MANTOWER RELAY (AMCR)
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Upgrade of the data transmission system for the Ambrym volcano monitoring station

From 12 to 16 May 2015 due to many weeks of bad weather, it causes the discharge of batteries, the station need to be rebooted manually. It affects the transmission as well. It was reset manually for reconfiguration and worked again.

From 25th to 27th July 2015 the fiberglass cabinet was installed to accommodate electronics equipment and protect against moisture. The power was then upgraded, three (3) new batteries of 100 A/H and 2 new solar panel of 140W were installed to replace old power system to have a good autonomy in the period of bad weather.

		
Fiberglass cabinet at back ground	New Batteries	New Solar Panels

Replacement of the power supply on Ambrym volcano monitoring station

5.7 Improvement of Sea Level Monitoring in Vanuatu

On June 2015 two (2) Tide Observation Systems were installed under “The Project for Improvement of Equipment for Disaster Risk Management” Tide Observations for Vanuatu funded by the Japanese government through the World Bank. The project sites are Litzlitz Wharf, Malekula, and Lenakel Wharf, Tanna. It is envisaged that tsunami waves will be recorded whenever a tsunami is generated with waves traveling to these locations. These installations have increased the number of tide observation systems in the Vanuatu region to four.

5.8. Volcanic hazards Assessment on Ambrym, Tanna, Ambae, Lopevi and Gaua

5.8.1 Volcanic Hazard assessment through permanent monitoring data analysis

Ambae volcano

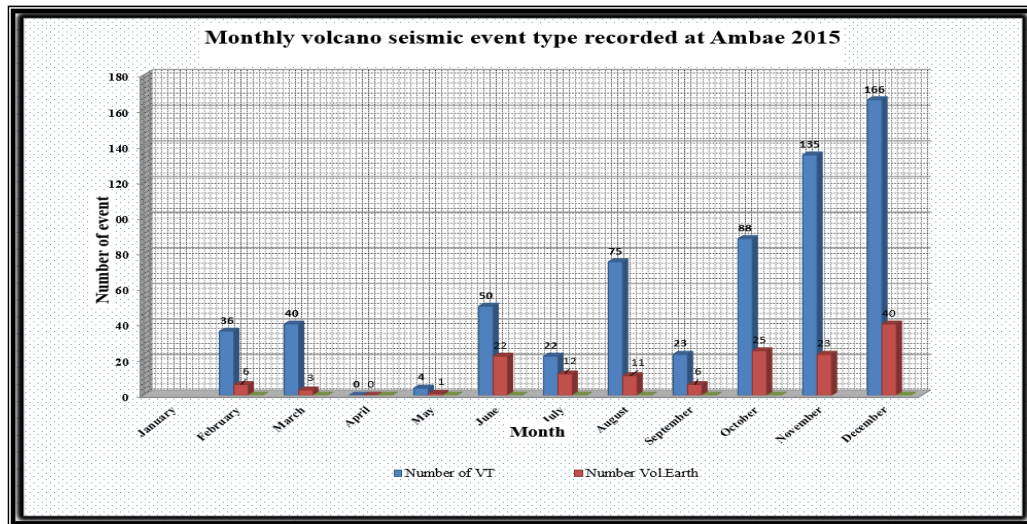
Volcanic activity summary

Observation and seismic data analysis of Ambae volcano show continuing slight increasing in level of signs of volcanic unrest with slight increase number of volcanic earthquake (Vol.EQ) and

volcano-tectonic earthquake (VT). **789** volcanic events are recorded at the vicinity of Mano Voui with daily light degasing. Its volcanic Alert Level is maintained along the year at **Level 1**.

Seismicity

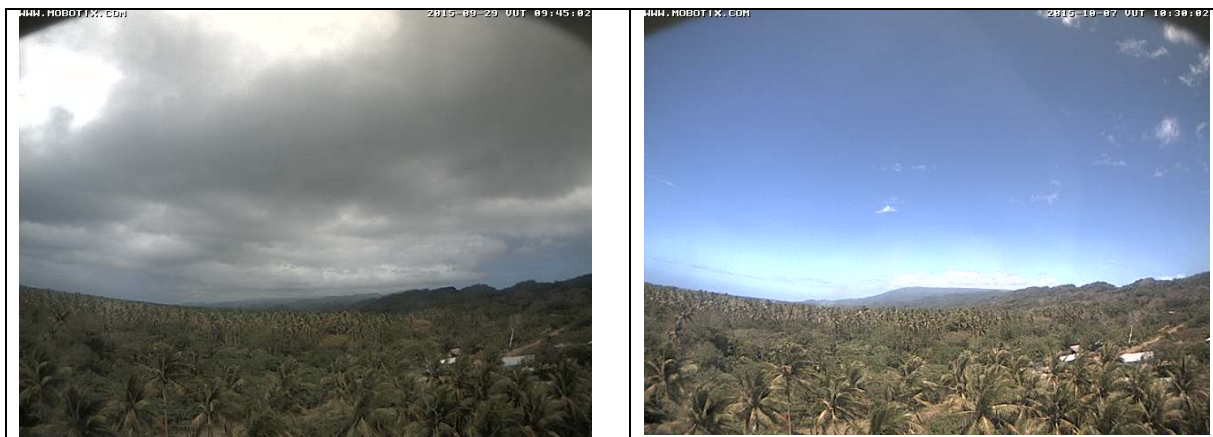
639 volcano-tectonic earthquakes and **149** volcanic earthquakes are recorded from LVVL station.



Annual volcano seismic event type recorded from LVVL station

Visual Observation

Photos below show that there is no volcanic plume observed at Ambae during the year.



Some images from the webcam at Ambae for volcano monitoring

So2 flux and volcanic gas monitoring (Satellite images)

Calendar below shows volcanic gas plume detected by the Modis _Terra & Aqua satellite in the atmosphere and the daily flux of SO₂ detected by the Ozone Monitoring Instrument-Aura emitted from Ambae volcano.

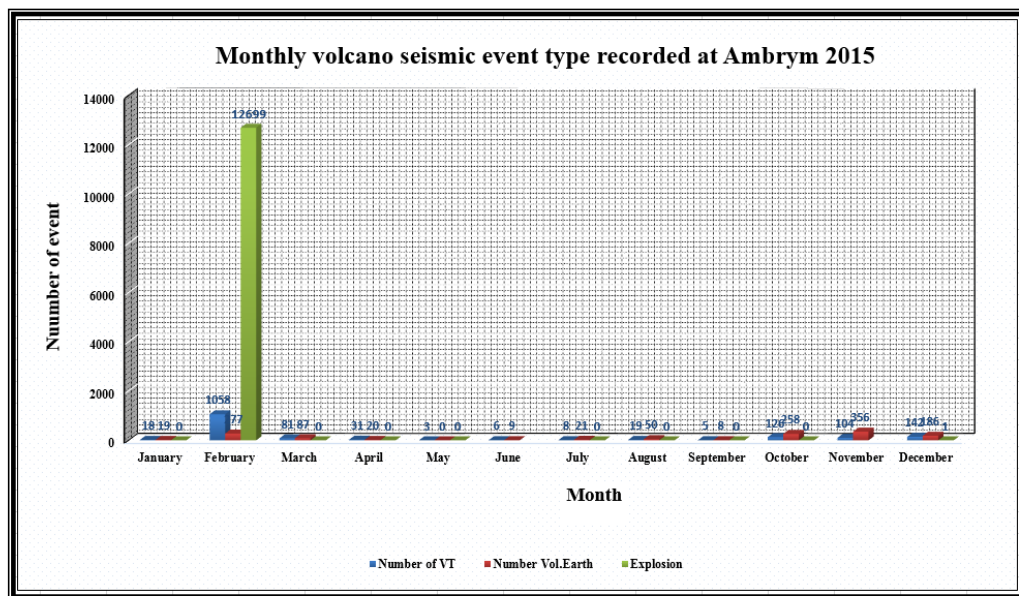
Ambrym volcano

Volcanic activity summary

Ambrym volcano underwent a minor eruption phase in February 2015. Its activity remains slightly increased in major unrest phase at Alert Level 2 until the end of the year 2015 with slight variable increase number of volcano seismic event type such as volcanic earthquake (Vol.EQ), volcano-tectonic earthquake (VT) and presence of short period (<1 minute) of harmonic tremor ranging between 4 000 to 20 000 maximum amplitude in early October to early December 2015. **15 592** volcanic events are recorded at the vicinity of Ambrym with daily substantial degassing.

Seismicity

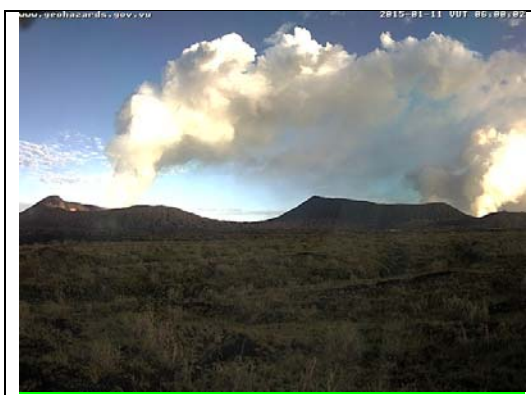

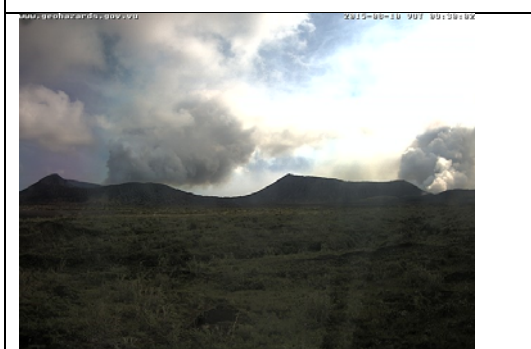




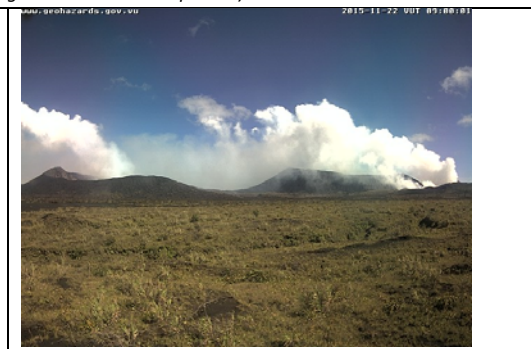
1 601 volcano-tectonic earthquakes, **1 291** volcanic earthquakes and **12 699** explosions are recorded from AMB1 and WAMB stations.

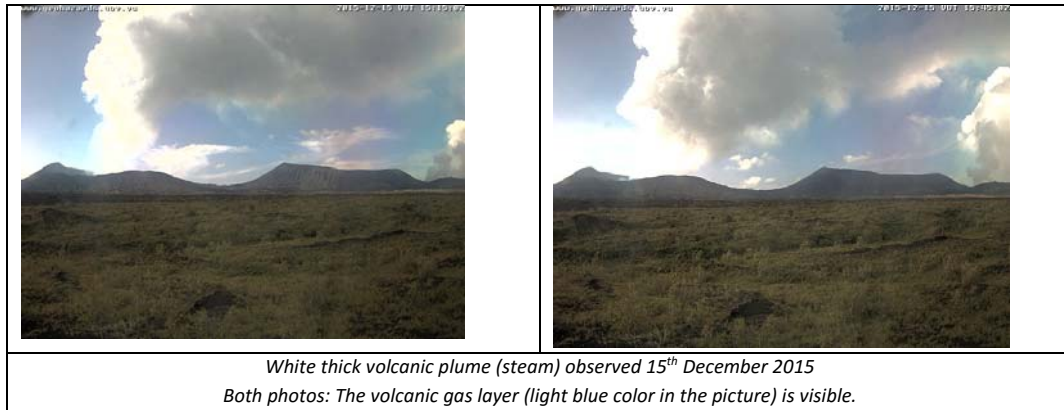


Annual volcano seismic event type recorded from AMB1 and WAMB station

Visual Observation

Significant photos below taken from the webcam at AMB1 station show volcanic activity of Ambrym with daily continuing steam plume emission and important degassing during the year, lava fountain, lava flow and explosive activity during the minor eruption on 21st February 2015.

	
White thick volcanic plume (steam) observed on 11 st and 24 th January 2015	
	
White thick volcanic plume (steam) observed 10 th of August and September 2015 Left photo: The volcanic gas layer (light blue color in the cloud) is visible.	
	
White thick volcanic plume (steam) observed 19 th and 20 th October 2015 Both photos: The volcanic gas layer (light blue color in the picture) is visible.	
	
White thick volcanic plume (steam) observed 21 st November 2015 Both photos: The volcanic gas layer (light blue color in the picture) is visible.	



Significant photos of Ambrym volcanic activity by the webcam at AMB1 station

So₂ flux and volcanic gas monitoring (Satellite images)

Calendar showing volcanic gas plume detected by the Modis _Terra & Aqua satellite in the atmosphere and the daily flux of SO₂ detected by the Ozone Monitoring Instrument-Aura emitted from Ambrym volcano is shown in Annexes 2.

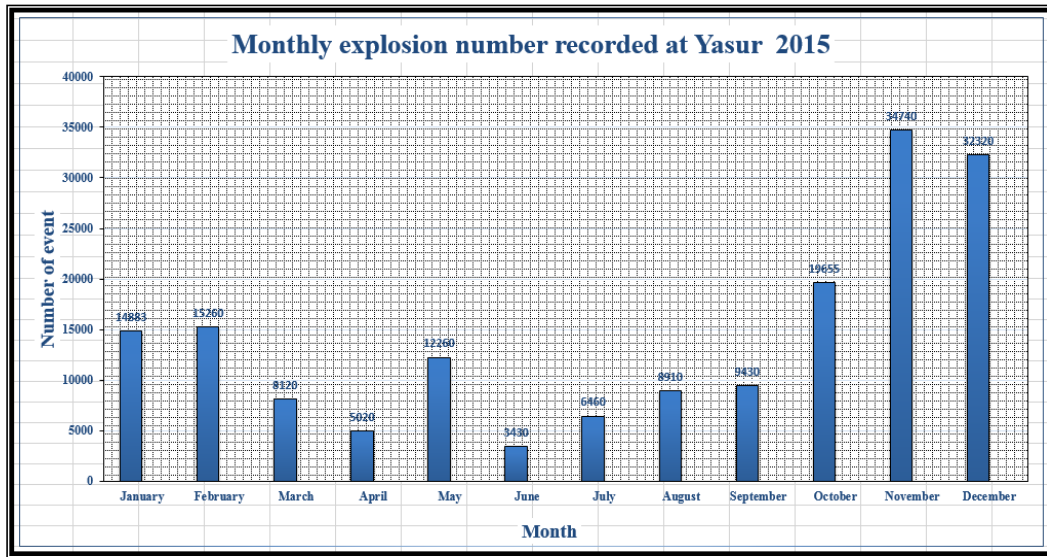
Tanna volcano

Volcanic activity summary

Observation and seismic data analysis of Yasur volcano show continuing slight increase in level of sign of volcanic unrest; Explosions become intense with increased number early November 2015. On 13rd November 2015, its volcanic Alert Level was raised from **Level 1** to **Level 2**. This Alert level and activity remains until the end of the year. **170 489** volcanic explosions are recorded at the vicinity of Yasur with daily substantial degassing.

Seismicity

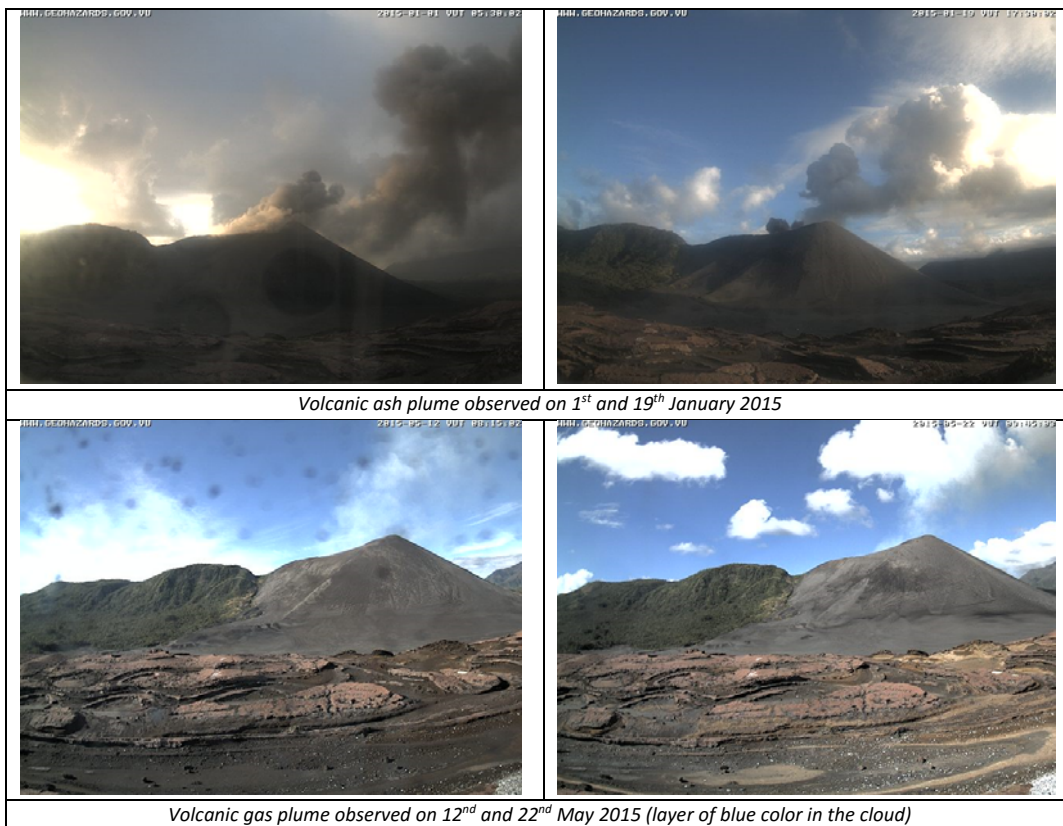
170 488 volcanic explosions are recorded from YASH station.



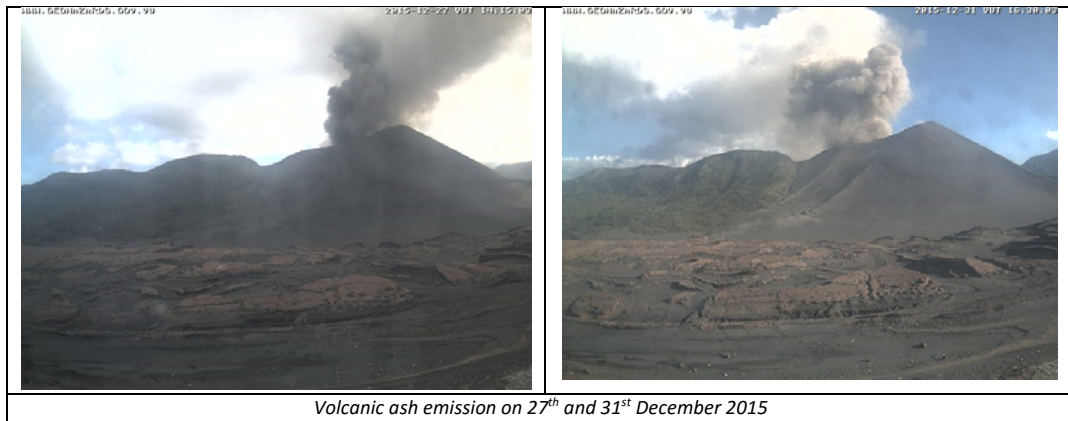
Annual number of explosion recorded at YASH station

Visual Observation

Significant photos below taken from the webcam at YASH station show volcanic activity of Yasur with continuing volcanic ash and steam plume emission, light degassing and ash fall during the year.







Volcanic ash emission on 27th and 31st December 2015
Significant photos of Yasur volcanic activity by the webcam at YASH station

So2 flux and volcanic gas monitoring (Satellite images)

The calendar showing volcanic gas plume detected by the Modis _Terra & Aqua satellite in the atmosphere and the daily flux of SO2 detected by the Ozone Monitoring Instrument-Aura emitted from Tanna volcano is shown in Appendix 2.

5.8.2 Volcanic hazards assessment through other means for non-permanently monitored volcanoes

Gaua volcano

Gaua volcano have no monitoring station. Its Alert Level is maintained at Level 1 since 21st December 2010.

So2 flux and volcanic gas monitoring (Satellite images)

The calendar showing the volcanic gas plume detected by the Modis _Terra & Aqua satellite in the atmosphere and the daily flux of SO2 detected by the Ozone Monitoring Instrument-Aura emitted from Gaua volcano is in Annexe 2.

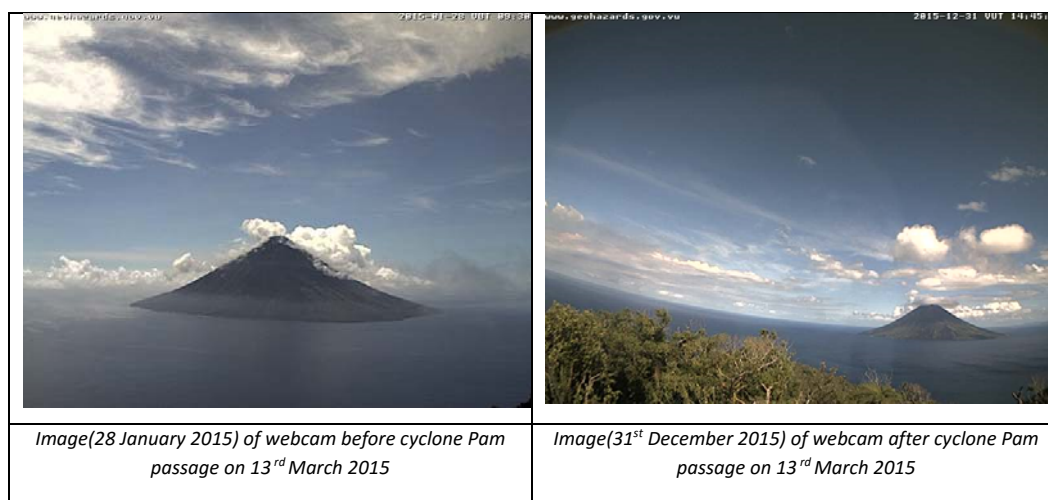
Lopevi volcano:

Lopevi volcano have no monitoring station. Its Alert Level is maintained at Level 1 since 15th December 2014.

On 21st December 2015, the Real Time Webcam was installed at Paama Island for Lopevi activity monitoring.

Visual Observation

Photos below show that there is no volcanic plume observed at Lopevi during the year.



Some images from the webcam at Ambae for volcano monitoring

VI- Geo-Hazards Data, products and services

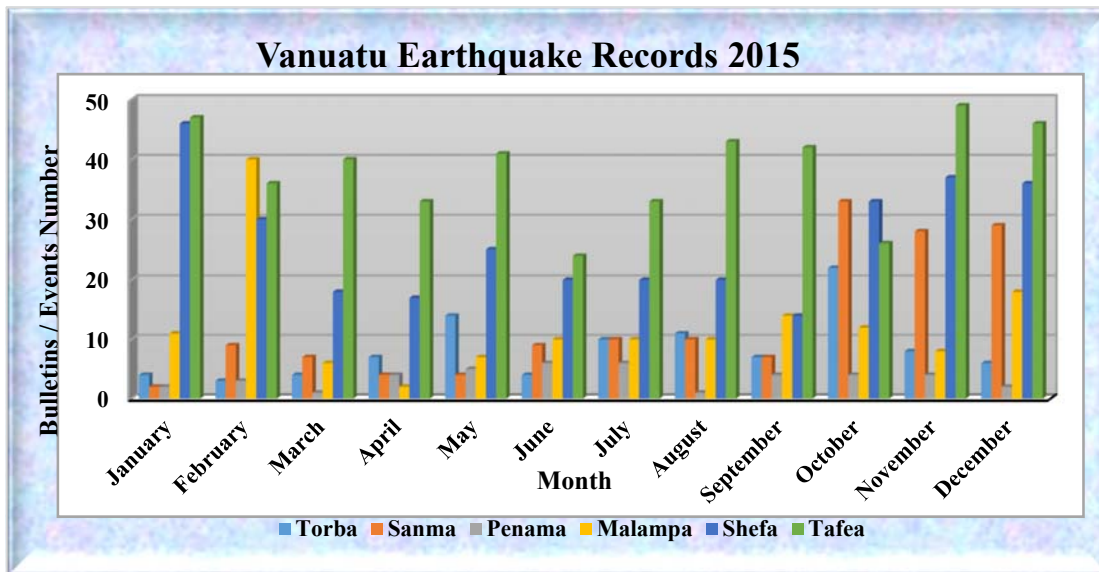
6.1. Issue earthquake occurrence bulletins for local communities

6.1.1 Automated products and services

Earthquake information is automatically uploaded in the website as soon as detected. However this detection system is yet to be upgraded to ensure appropriate filtering of false events that tend to appear automatically on the website. Therefore adequate training in the website uploading techniques is required for the seismology team.

6.1.2 Earthquake bulletins for local communities

A total of 1218 earthquake bulletins were produced in 2015 (Figure 9). Provincial wise, 100 bulletins for earthquakes that occurred in Torba region, 152 bulletins for earthquakes that occurred in Sanma region, 42 in Penama, 148 in Malampa, 316 in Shefa, and 460 in Tafea. Most bulletins were produced during the last quarter of 2015 corresponding well with high number of seismograph station in operation during that quarter. Despite Tropical Cyclone Pam destroying the Seismic Network Infrastructure and internet infrastructure on mid-March 2015, 76 bulletins were produced on March and about 67 on April.



Bulletins of Earthquake events per Province in 2015

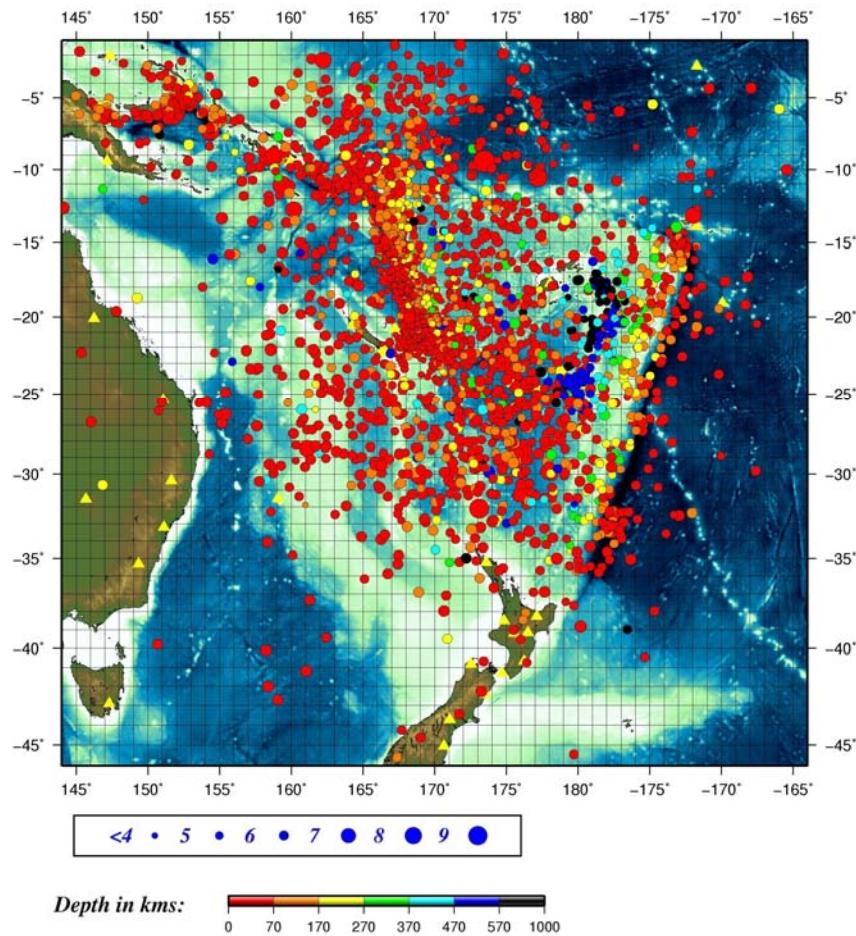
6.2. Issue monthly and annual earthquake bulletins for scientific communities

6.2.1 Monthly Bulletin

Monthly seismological bulletins from the Vanuatu Seismic Network are successfully produced. Though there were some delays in production related to Tropical Cyclone Pam disruptions for the month of March, April and May, and for the months of February, October, and December where there was an earthquake crisis. However, all significant events were re-computed before running the bulletins. The bulletins present seismic events in the Vanuatu region for a particular month. This success is attributed to our Data Analyst & Processor daily routines, weekly routines and monthly routines management.

6.2.2 Earthquake detection in the Vanuatu region and annual Bulletin

In 2015, the total number of individual events computed successfully (location, depth and magnitude) increased dramatically. This is due to upgrading of seismograph stations and installations of 4 new permanent stations throughout the archipelago and the expansion of the Oceania regional Seismic Network (ORSNET) to other countries that contributed both in the location of local and regional earthquakes. Over 2,700 events were detected in 2015 in the Vanuatu region. In a normal month an average of 130 events were computed successfully. More events are detected than in the past with events with magnitude <4 increasing significantly. These may be attributed to increase in seismograph stations. In the Vanuatu region, during an earthquake crisis up to about 300 to 500 earthquakes are detected on a monthly basis. Figure 2 shows individual earthquakes located by the regional seismic network in 2015.



Individual earthquake events located by the regional seismic network in 2015. Notice the increase of events in the Vanuatu region attributed to improvement of exiting seismic stations, installation of 4 new stations and earthquake crises in 2015.

6.3. Issue volcano Alert Bulletins for tourism industry, local communities and general public

Alert bulletins for monitoring volcanoes are monthly issued base on seismicity, visual (webcam) data and satellite images (OMI and Modis). This information is public and they are disseminated via:

- emails address list;
- Geohazards Observatory website (www.geohazards.gov.vu);
- Geohazards Observatory and Vanuatu Meteorology and Geohazards Department Facebook pages;

Soft copies of these bulletins are accordingly printed and archived in appropriate databases.

Table below shows dates of issuance of Volcanic Alert Bulletins of monitoring volcanoes and their appropriate Alert Level.

Volcanoes	Volcanic Alert Level	Dates of the issuance and Dissemination of Volcano Alert Bulletins
Manaro Voui (Ambae Island)	Alert Level 1 (Signs of volcanic unrest)	15 th June 2015
		7 th August 2015
		30 th September 2015
		30 th October 2015
		1 st December 2015
Benbow and Marum (Ambrym Island)	Alert Level 2 (Major unrest)	21 st February 2015
	Alert Level 3 (Minor eruption)	
	Alert Level 2 (Major unrest)	2 nd March 2015
		7 th April 2015
		18 th May 2015
		15 th June 2015
		22 nd July 2015
		21 st August 2015
		30 September 2015
		30 th October 2015
		1 st December 2015
Yasur (Tanna Island)	Alert Level 1 (Signs of volcanic unrest)	27 th April 2015
	Alert Level 2 (Major unrest)	21 st October 2015
		13 rd November 2015
		15 th December 2015

6.3. Issue monthly and annual volcano activity bulletins for scientific communities

Monthly and annual volcano bulletins issued are archived in the Volcano Database (Volnas_Product) and strictly internal within Geo_hazards Division

6.4 Issue monthly volcano activity update bulletins for general public

The monthly volcano activity update bulletin template has been discussed internally and developed. In 2015 the only Ambrym volcano activity of February 2015 update was provided for NDMO and donor partners for their action.

6.5. Issue weekly report of Geo-hazards monitoring systems and operations

Daily products issued are archived in the Volcano Database (Volnas_Product) and seismonas (earthquake database) and in the share folder of Geo-Hazards staffs. They are 3 different kind daily products issued by the volcanology team, the seismology team and the technical team according to their respective duties. Daily products are compiled each end of the weekend to a weekly product and they are strictly kept internal within Geo-Hazards Division to keep track of the daily and weekly operations.

6.6. Review and develop specific education and awareness materials for specific audience using specific software
Volcanology section of Geo-Hazards Division have developed, reviewed and finalized various volcanology awareness materials in forms of maps, brochures, glossary and posters.

6.6.1 Safety, scenario and background Maps

From 16th to 20th February 2015 with Dr. Graham Leonard, the section improved drafted volcanoes background, safety and scenario maps for Yasur, Ambrym, Ambae, Gaua and Lopevi using QGIS software. The next important stage is to do consultation with villages/communities about these maps to have their concerns, comments, ideas, priorities and languages (wording and meaning) before doing the final editing and printing.

6.6.2 Volcano Fact Sheet

Some information (Need to seek information from historical eruption) in the drafted volcano fact sheet have to be complete before doing the final editing and printing (e.g: Vanua-Lava, Ambae, Lopevi and Gaua).

6.6.3 Brochures

English brochures about volcano were created with the help of two attachment students from Leicester University in the UK, by Eleri Simpson and Ben Clark, on 11st August 2014 using inscape software. These brochures of information includes cartoons and were translated into French and bichelamar on September 2015. The next stage is to do the finale editing before printing for communities and villages awareness tools.

6.6.4 Volcanology Glossary

The glossary is drafted in tree languages (French, English and bichelamar) on July 2015 and need to finalize and standardize.

6.6.5 Volcanology Terminology

The Terminology is drafted in tree languages (French, English and bichelamar) on July 2015 and need to be finalized and standardized.

6.7. Participate in education and outreach missions in schools and during global events as WMO/WW day, sciences week, environment week

A survey and awareness campaign was conducted on Efate, Malekula and Santo under the activity of Communication and Outreach Partnership. The survey and awareness is on products and services provided by VMGD. The campaign team comprises representative of all Divisions in VMGD. The PSO Seismology, Morris Harrison is the team leader for this campaign team. On Efate, the campaign runs from

19 September to 8 October. A total of 8 communities were visited on Efate. On Malekula and Santo, a combined total of 10 communities were visited from 13 to 25 October. Mass awareness materials were distributed during the campaigns. Data entry and analysis of survey data are on-going.

VII- Geo-Hazards Management and Operating procedures

7.1. Update Draft SOPs for Admin response/Geohazards response, emergency response, Issuance of Geohazards products

The sections responsible for issuance of Geo-hazards products have reviewed their SOPs accordingly. In volcanology different systems utilized have been addressed to ensure proper procedures are in place for their usage.

7.1.1 Display, process and analysis operation systems

Kygalmas

Since 14th November 2014, the Volcano Database was moved from kygalmas to a Network Attached Storage-Nase with the assistance ICT Division (Helpdesk), which are distributed in 3 servers:

- *Vol_analysis;
- *Vol_Products;
- *Vol_Raw Data;

Early October 2015 kygalmas started to freeze and still continuing until current date. On 17th November 2015, the section received the new kygalmas (**hp**) computer with two monitor (24-inch) and one UPS from Spim Company paid from World Bank project.

Volcano Data Base, Volnase: (Vol_analysis, Vol_Products and Vol_Raw Data)

Data in the volcano Database are daily, monthly and annually update. The access of this Database is secured and restricted. Few staffs are identified to access it.

Programs and scripts

The automatic shell scripts (Linux) for volcano seismic data analysis in real time (rsam, ssam, tremor, drum, color_drum and calendar plots) was created on **11th November 2014** with the assistance of Dr. Steve Sherburn (Taupo Observatory, New Zealand Volcanologist) and Sylvain Todman and currently daily run via **crontab** (Linux) every 11:00am . Programs and scripts are working properly.

Dashboard

Dashboard was created on **1st December 2014** which displaying the Vanuatu Real Time Volcano Data with the assistance of Dr. Steve Sherburn (Taupo Observatory, New Zealand Volcanologist).

Volcano Observation-Data Record

Volcano seismic observation data (Database) was created on **3rd December 2014**, which contains daily volcano seismic event record at each stations. It is daily update.

7.1.2 Standard Operating procedures (SOP)

SOP's below have been reviewed on September 2015 and have to be finalize and standardize:

- Volcanology_Operation_Procedures/Templates;
- Volcanology_Analysis_Procedures/Templates;
- Volcanology_Products_Procedures/Templates;

7.2. Review Tsunami detection and operation procedures

Tsunami detection and operating procedures were internally heavily discussed. With the current upgrade of the network and other development in the Division the tsunami operating procedures must be reviewed in collaboration with the other division responsible for Tsunami warning. However more review should come into effect only when Geo-Hazards Division take over the Tsunami Warning system responsibility.

7.3. Finalise Geo-Hazards operating manual/Geo-Hazards Directive including all hazards/Geo-Hazards monitoring systems Manual

This Manual still remain the working documents. It will be finalized when the whole network is set up well aware of its operations.

7.4 Engage in the VMGD Business and annual budgeting for 2014/2015

The Division meetings have discussed the business plan for 2016.

7.5 Report annually and bi-annually on the Geo-hazards operations and achievements 2014

In 2015 the division mobilized in the writing of the annual report 2014.

7.6. Assess staffs through staff's appraisal

The staff appraisal work plans for 2016 have been drawn in October 2015. All Geo-Hazards staffs contributed. ‘

7.7 Control the Geohazards assets

The Geo-Hazards assets is well recorded in the Division inventory that was drafted in April 2015 capturing all assets that are funded by recurrent budget and project funds, particularly World bank funding and New Zealand Ministry of Foreign affairs. This asset inventory has been reviewed in December 2015 tracking the mobilization of all the equipment registered.

7.8. Ensure the Geo-Hazards business plan is well implemented within means and timeframe

The implementation of the Geo-Hazards business plan in 2015 was very challenging due to the passage of Tropical cyclone PAM that destroyed part of the Geo-Hazards network. Therefore part of the year 2015 was consecrated in the recovery of the Geo-Hazards monitoring network.

VIII- Project Management

8.1 Mainstreaming Disaster Risk Management (MDRR) Project

The manager Geo-hazards Division is part of the executive committee to control the implementation of the MDRR project. Executive meetings are organized once per month but regular contacts with project consultants where necessary.

8.2. Increasing Resilience to Climate Change and Natural Hazards (IRCCNH) project

The Geo-Hazards Division is implementing the component 1.3 of this IRCCNH project. Regular meetings were called with the project adviser and the Monitoring and Evaluation team to follow up on the implementation of this component according to World Bank standards.

8.3. Project of cooperation through the Government of New Caledonia

This project was implemented since few years, funding support is yearly renewed. Another project proposal has been submitted to the French Embassy to seek funding for the year 2015-2016. Unfortunately this request was not successful.

8.4. Oceania Regional Seismic Network (ORSNET) Project

This project is funded by the Pacific Funds through the French Gouvernement. It is managed by the Manager Geo-hazards for the ORSNET countries. She had to submit project acquittals before requesting new funding for 2016. Fortunately the request proposal was successful to get extra 40,000 Euros for 2016.

8.5 Other small project

CRISP project, Solomon Islands

Regular contacts with the Solomon Islands team especially in regards to the organization of the assistance of the Vanuatu Geo-Hazards team for the interest of the Melanesian brothers and ORSNET partners.

Red Cross- volcanic hazards and safety map design

The French Red Cross also provided their assistance to the Vanuatu Geo-Hazards team in the design of the volcanic hazards background and safety maps design. They also offer to assist in the installation and handing over of these tools to the local community in 2016. Several planning meetings were organized with them throughout the year 2015.

IPGP, Paris (France) - Maintenance of the Sanvu network

The Geo-hazards manager raised an invoice to IPGP under the MOU between VMGD and IPGP to cover for the Geo-hazards intervention on the SANVU seismic station in Santo. This station is part of the Global network and funded by IPGP. The amount of 582,000Vt have been requested in the invoice, this sum is being paid through late 2015 and ready to be used in 2016.

IX- Extra responsibility due to Cyclone PAM

Tropical cyclone warning

Sophie Turere, Juanita Laga, Sandrine Cevuard and Guillaume Kasten helped out in “answering phone calls” few days leading up to Tropical Cyclone Pam making landfall on Efate on the 13th March 2015. This involved being pick-up to work following a routine.

Distribution of relief supply

Tropical Cyclone Pam causes a lot of damage and disruptions on the local seismograph network. Monitoring stations on Ambrym, Lopevi, Efate and Tanna were down for about 2 months after the event. From mid-March to June 2015, officers helped out in the household survey and relief distributions around Efate under the state of emergency in place after the cyclone. Juanita Laga, the Data Analyst and Processor, and Morris Harrison, the PSO Seismology participated in both the household survey and relief distributions. Sophie Turere, Data Analyst and Processor, Athanase Worwor, Technician and Guillaume Kasten, Technician participated in the relief distributions.

Achievements Comment

The achievement of the Geo-hazards division during the year 2015 is tremendous despite the Category 5 Cyclone that disturbed a lot of activities initially planned for 2015. The main achievements that can be easily spotted are:

- The permanent recruitment of 3 staffs to 3 new posts for Geo-Hazards Division and the retirement of a long time served staff on medical ground.
- The development and establishment of the National Tsunami warning system for Port Vila and Luganville
- The recovery of the Geo-Hazards monitoring network after the passage of Cyclone PAM.
- The establishment of the new Volcanic risk management framework
- The extension of the national Seismic monitoring network to 4 extra stations
- The extension of the national seismic network to the region through data sharing with the ORSNET countries

All these would not be possible without the improvement of the data transmission systems in Vanuatu by the OGCI, which is the main partner to ensure all Geo-Hazards real-time monitoring in Vanuatu.

Challenges Comment

The main challenges the Geo-Hazards Division faced during 2015 was the impact of the tropical Cyclone PAM that damaged the Geo-hazards monitoring network and halted many activities planned for 2015, particularly the World Bank funded IRCCNH project component in Early Warning system. Fortunately, this challenge turned into an opportunity where the equipment purchased for the planned activities have been used in the recovery of the Geo-hazards monitoring network after the passage of the Cyclone.

The second challenge the Division faced was around the ongoing temporary status of few junior staff. Though the recruitment processes for the contract staffs have been launched in good time, it was still very complicated to get all contract staff permanently recruited in 2015.

Thirdly, with the improved geo-hazards monitoring system, the information is getting more and more accurate that demands appropriate work processes. This is a challenge that the Division will work through in 2016 to harmonizing SOPs internally and with other stakeholders, review work instructions, upgrading skills and knowledge in normal observations operations to better respond to the needs of the people of Vanuatu. This is a great challenge that will help the Division to standardize its operations and products in

6. Observations Division

Division Purpose and Key Outcomes

The Observation Division contributes to the Department's purpose by maintaining optimal observational Networks to meet the data and information needs of the VMGD Divisions and other national, regional, and international users and networks.

The Observation Division realizes its vision by deploying skilled and motivated staff, using modern and sound technology and techniques, to install, maintain and update observational networks that provide adequate coverage, real-time, accurate and high quality observation data for weather, climate and water. The Division also works closely with regional and international technical partners to meet VMGD's network data and information reporting obligations.

The key strategic outcomes for the Observations Division are as follows:

- Restore, expand and sustain observation data networks, stations, systems, sensors and equipment;
- Effectively maintain the quality of real-time observations from all observing networks of VMGD Divisions;
- Ensure that the VMGD headquarters and Divisions have consistent and reliable access to real time observation data; and;
- Increase the number of observation data for existing, new and additional networks, stations, systems, sensors and equipment

2014 Priority Activities and Results – Observations Division

Programs and Objectives required by the 2015 Business Plan are summarized in the table below with results and commentary provided.

Programs	Objective	Strategy/ies	ACTION/ Performance Indicators	Expected Key Result Areas/Achievements	Support Division/Project /Working Group	Results
Weather & climate Monitoring	365 days & 24/7 recording and measurement of land and Atmosphere	Observation reports issued every three hours at all seven weather station	Observation reports (Synoptic/Metar) issued every three hours at all seven weather station (sola, Saratamata, Santo, Lamap, Bauerfield, Tanna, Aneityums	19,040 Climate/Synoptic Data Reports	ALL	√

	ric condition s	(Sola, Saratamata, Santo, Lamap, Bauerfield, Tanna, Aneityum)	Hourly synoptic report issued at Bauerfield weather station	6,064 Synoptic Report (b/field)		√
			Hourly Aviation reports issued at Bauerfield weather station.	8,760 Aviation Report		√
			Climate data issued daily at Bauerfield	365 Climate Reports(all station)		√
			Daily Hourly Aviation report issued at Pekoa, Whitegrass, starting from 1800Z-0900Z GMT (santo), 1800Z-1700Z GMT (santo)	5475 Aviation Report (santo) 4015 Aviation Report (W/Grass). 16320 Aviation Report for 6 outer stations		√
Data Quality	Meet national & Internatio nal data requirem ents	Monthly/W eekly Calibration site/equipm ent	Cut back grass once a month. Wash/Paint instrument shelter. Clean all instrument from dust.	Monthly Maintenance report form completed and send to Via	ALL	√ Need improve ments on monthly reports
Training and Developme nt	Enhance the knowledg & Skills of staff to assist provincial customers & partnershi ps	2 staff to be attached with Fiji Meteorolog y and other external training, Vila/outer island staff to be attached with forecast/cli mate/obser vation division	Liaise with relevant divisions for date of On- job training, and training formats, logistical arrangements for airfares and accommodation	2 staff or more to be attached each year	ALL	x
Strengthen outstations Infra structure & Communic ations systems.	Improve Provincial weather Offices to be more responsiv e to Rural User	Improve communica tions technology. Improve office set- up equipment.	Purchase computers, internet connect and furniture's. Allocate Budget to provincial weather offices	All	ICT	√ on process

Transfer of Staff	Transfer of staff	Transfer timetable will be done to allow a smooth transfer process in relation to Budget.	Arrange payments of tickets/ posting allowances.	4 staff transferred	ADMIN	v
Upper air Observations	Monitor, Measure Profile of Atmosphere	Daily launching of weather balloons/soundings using hydrogen gas	Purchase consumables. Daily data, upper level winds, TTAA, TTBB, TTCC, and TTDD. Produce hydrogen with electrolyzer	365 data sets for national and international users	ADMIN	X
Student Attachment	Introduce Meteorological Science to students	Science Students will be attached during school holidays on 7 synoptic sites.	Shortlist applicants, and notify director. Notify students once director approval	21 students attached each year	ADMIN	X
Digitize Data at Bauerfield	Climate data bank & Other related divisions access the data faster	All data will be entered into CLIDE at Bauerfield		Training in basic weather observations		X
Installation of AWS on all Sites	Improve on real-time data	Purchase 7 AWS through Donor funding	1. Purchase of AWS. 2. Provide Training to Technicians. 3. Build and install AWS	7 AWS installed on Sola, Santo, Saratamat, Pekoa, Lamap, White gras, Aneityum		v 2 AWS installed successfully, 5 still on process

Achievements Comment

When TC Pam struck Vanuatu during the 13th of March 2015, almost all stations were down for some time, ranging from one day to one month. All communication were affected as well during TC Pam, which means no data were transmitted via GTS for a period of one day or more for some stations. Staff in the observation stations throughout Vanuatu were able to collect meteorological data, but were not able to transmit it live, as communication was down for some time in some outer island station. However, after few weeks to a month of hard work from the VMGD's technical personnel, all stations were back to normal.

The Observation Division has, for the first time, acquired two automatic weather stations installed, one at Bauerfield International Airport and one at Pekoia International Airport. Process for additional 5 AWS is underway and hopefully will be implemented during 2016.

Additionally, the Observation Division has achieved one of its long time goals, and that is to renovate the Bauerfield office. The building is now fully renovated and awaits new furniture's to be purchase under VCAP project.

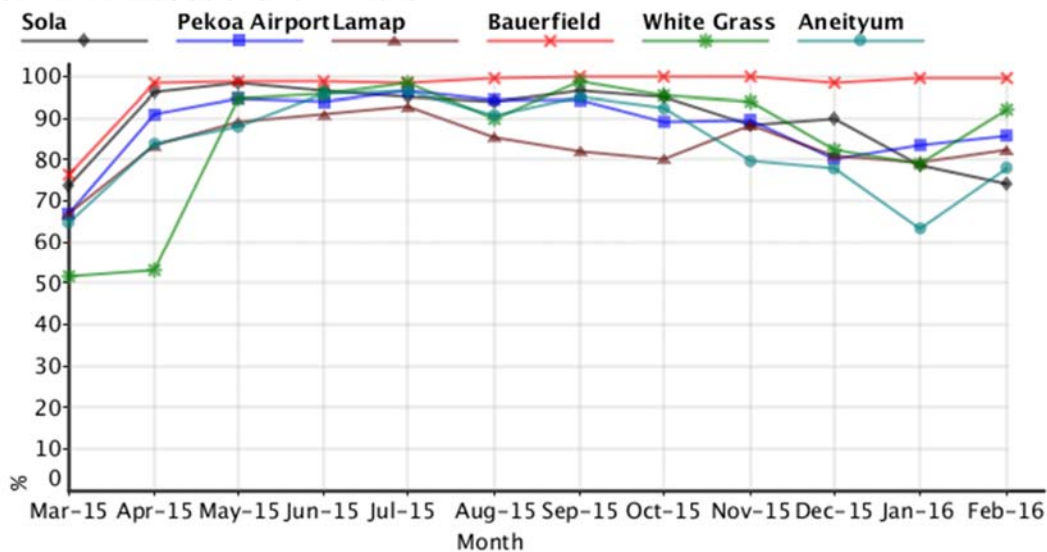
Below is the AWS at Bauerfield Weather Office; Picture to the right; Bauerfield building complete



Performances from Observation stations for the last twelve months

Percentage received RBSN synops, last 12 months (Vanuatu)

Generated at: 03:30 UTC 28 Mar 2016



Challenges

Communication Network

There are times when observation stations face difficulties in transmitting data to the head office due to communication network breakdown, particularly with the HF radio and telecommunication network.

Instruments/Thermometer

VMGD weather stations do not have spare thermometers to replace faulty ones. All thermometers on all 7 station are old and need immediate replacement.

No relieve to assist outstation observers

All stations are manned with 2 observers to carry out this 24/7 three hourly data collection. It is a very challenging situation when one observer is on annual leave and no relieve is provided.

Office equipment

Most of Observation Stations do not have PC, internet and printer.

Data quality

Most stations do not have equipment to maintain their station/instrument site to the required standards.

AWS archive

The AWS does not automatically archive data; it is done manually.

4. Climate Change and Disaster Risk Reduction Division

2015 Priority Activities and Results – Climate Change and Disaster Risk Reduction Division

The Climate Change and Disaster Risk Reduction Division contributes to VMGD purpose by being an effective Division in the management, operation and integration of climate change and disaster risk reduction activities and projects, by way of qualified, skilled and motivated staff appropriately trained and participating actively in national, regional, and international climate change programs, and working effectively with local, regional and international partners.

The Climate Change and Disaster Risk Reduction Division implements and operates an effective and efficient Climate Change Project Management Unit deploying qualified, skilled and motivated staff with appropriate access to sufficient resources, to manage and operate the implementation and integration of climate change and disaster risk reduction programs and projects to support national level commitments to Climate Change and Disaster Risk Management multilateral agreements.

The following are key outcomes identified by the Climate Change and Disaster Risk Reduction Division:

- Develop integrated climate change and disaster risk reduction action plan(s);
- Updated governance for climate change and disaster risk reduction;
- Ownership of climate change and disaster reduction integration; and
- Contribute to regional and global integrated climate change and disaster risk reduction agenda.

Priority Activities and Results 2015

Programs and Objectives required by the 2014 Business Plan and results are summarized in the table below and commentary is provided in the following text.

Programs	Objectives	Strategies	Action	Achievements	Results	Result Summary
NAB secretariat	Finalise the establishment of the NAB secretariat	a. Develop a NAB sec concept information package	a. NAB sec concept information package developed	Information package endorsed and implemented	√	Information Package developed and induction for 2 NAB Sec staff conducted
		b. secure donor funding for staffing positions	b. Donor funding secured	Minimum of two funding sources secured	√	Funding for 2 NAB positions sourced from PRRP Project/UNDP and contracts signed

		c. Develop and implement a recruitment plan	c.secretariat staff recruited	Two key positions filled	√	ToRs finalized and recruitment completed with contracting of NAB Sec Manager and Project Development Officer
		d. Develop COM paper for restructure of NAB chairmanship	d. Finalise ToRs	NAB chairmanship is restructured	√	Activity pending the enactment of the revised VMGDCC Bill by Parliament
NAB secretariat	Ensure CC/DRR is mainstreamed into sector policies, budgets and activities	a. develop a multi-sector engagement strategy	Engagement strategy developed	Engagement strategy commences with implementations by mid 2015	√	Ongoing work through the NAB Sec
		b. Continued participation in sector specific strategic planning activities	Sector plans inclusive of CC/DRR components	CC/DRR activities are prioritised budgeted for	√	Ongoing - Support to CCDRR Policy, Oceans Policy and linking Fisheries and Bio-Security policy development with CCDRR financing support - ongoing support to VMGD and NDMO legislative review
		c. Provide advise and guidance on CC/DRR directives	Evidence of NAB supported and endorsed initiatives	A minimum of 70% initiatives endorsed by NAB	√	3 Sessions of the NAB convened, 1 NAB Executive Committee session convened and 9 projects endorsed
NAB secretariat	Strengthen, promote and ensure effectiveness of NAB process and priorities	a. Develop NAB SOPs	SOPs developed	A minimum of 50% SOPs developed for NAB major roles	√	Ongoing work with Project Endorsement and IEC process,
		b. Operationalise project endorsement framework	Project endorsement framework implemented/operationalised	Key stakeholders are aware of the endorsement framework and are using it	√	9 projects facilitated through Project Endorsement framework
		c. Develop NAB strategic plan	NAB strategic plan developed	NAB priority activities are identified and communicated to stakeholders	√	Ongoing work with NAB Sec

NAB secretariat	Coordinate the continued efforts towards establishing NIE/climate finance	a. Establish priority activities	a. Priority activities identified	NAB is implementing NIE related activities	√	Priorities identified and workshops conducted with stakeholders with ongoing work progressing
		b. Develop implementation plan	b. Implementation plan developed	(Same as above...)	√	NIE captured in CC/DRR policy Implementation plan
		c. Engage key sectors	c. Participation of key sectors maintained	Key stakeholders are engaged in NIE related activities	√	Key stakeholders fully engaged in consultation processes
NAB secretariat	Finalise the CC/DRR policy and M&E framework	a. Recruit consultant	Consultant recruited	Policy draft work progressed	√	ToRs developed and consultant recruited
		b. Develop COM paper	COM paper developed	COM endorses the policy and implementation plan	√	COM paper developed
		c. Finalise CC/DRR policy	CC/DRR policy finalised	COM endorses the policy and implementation plan	√	CCDRR Policy presented, endorsed by COM and launched by Prime Minister
		d. Develop implementation plan for CC/DRR policy	Implementation plan developed	Parts of policy begin implementations	√	CC/DRR policy Implementation plan completed
		e. Design M&E framework and deliver training	M&E framework developed Key staff and sectors trained	M&E framework is pretested and commence implementations	√	Ongoing
NAB secretariat	Build negotiating capacity for Vanuatu to engage with UNFCCC	a. Secure funding for international negotiator within NAB sec	Funding secured	UNFCCC related activities are coordinated and Vanuatu delegation is prepared to attend COP21	√	Funding secured and negotiations training conducted by SPREP for Vanuatu delegates prior to COP21
NAB secretariat	Review and strengthen CC/DRR information management	a. Recruit IM system specialist	IM system specialist recruited	IM specialist commences work with PMU by July 2015	√	ToR finalized and funding secured with EDF10/SPC budget support

	system and tools including NAB portal	b. Undertake a needs and gaps analysis	Needs and gaps identified	Needs and gaps prioritised, planned for and addressed	√	Funding sourced, Consultant recruited and Needs and Gaps Analysis Report produced and presented to NAB
		c. Review and create information system framework	IM system framework reviewed and developed	CC/DRR related data and information is centralised and managed and easily accessed	√	Funding and TA support secured through SPREP RTSM for IM system backstopping through upgrade of NAB Portal
		d. Create CC/DRR IM database	IM database developed	Database is managed and updated to meet needs	√	Funding and TA support secured through SPREP RTSM for backstopping through upgrade of NAB Portal building on existing database
		e. Create IM tool i.e. review and update the NAB portal	IM tools reviewed and updated	Minimum of two tools are selected, developed and standardised for use	√	Ongoing work through portal upgrade (SPREP RTSM/iCLIM) and M&E software (C2M/IRCCNH)
PMU	Develop PMU strategic plan and ongoing yearly work plan	a. Design workshop and deliver inclusive of key staff and stakeholders	a. Strategic plan developed	PMU purpose, roles and responsibilities are clarified and stakeholders made aware	√	Workplans developed and all NAB Sec functions transferred to NAB Sec under the MoCC CSU
		b. Strengthen compliance and operating mechanisms to meet donor and government requirements	b. Mechanisms compliment donor and government guidelines	Current and on-going projects managed through PMU are effectively managed and meet all requirements	√	All reporting requirements met including annual audits. FM system restructure completed for enhancement of fiduciary functions and recruitment of 1 additional FM staff
PMU	Effective management, coordination and oversight of current and ongoing multi-sector	a. Develop PMU SOPs	a. Financial management SOP	Effective financial management of funds	√	Ongoing updates to SOPs Manual
			b. Procurement SOP	Goods and works procured meet standards	√	Ongoing updates to SOPs Manual

	projects (MDRR, IRCCNH, PACC, V-CAP, PRRP, ICLIM)		c. Monitoring and evaluation SOP	Demonstrable systematic M&E function	√	Ongoing updates to SOPs Manual
			d. Human resource management SOP	Effective HR management	√	Ongoing updates to SOPs Manual
			e. Performance standards SOP	Processes comply to PMU standards	√	Ongoing updates to SOPs Manual
			f. Training Guidelines	Key staff and stakeholders trained to comply and meet standards	√	Ongoing updates to SOPs Manual and 2 training attachments with ILO/ITC, Turin, Italy
		b. Support implementations and build capacity with key sectors	Implementation support provided and stakeholders well versed with project management best practices	Training, mentoring and advice provided in a timely manner to support implementations	√	Ongoing critical support to all projects as reflected in PMU quarter reports, annual reports and donor reports. All projects progressing well as per QRs.