



MAY 2018



Mount Yasur Volcano on Tanna Island in Vanuatu
Credit: Kate Humble/Red Vanuatu

Volcano Risk in Vanuatu Can Insurance Play a Role?





Overview of Volcanic Risk in Vanuatu

Vanuatu has 83 islands, most of which are volcanic. There are total of 16 volcanoes in Vanuatu, of which six are active and ten are dormant. Since the 1600s, the major recorded eruptions resulted in substantial changes to Vanuatu's land formation and migration. This includes fatalities and permanent resettlements either within the island or to other islands. The most recent volcanic eruptions on record since 1995 are: Manaro Voui on Ambae in 2017, 2005 and 1995; Yasur volcano on Tanna in 2016 and 1998, Benbow and Marum on Ambrym Island and Gaua in 2010 and 2009. (See Table 1)

Table 1: Recent volcanic eruptions in Vanuatu (1995 – 2017)

Year	Name of Island	Name of Volcano	Alert Level	Government Response / Fiscal Impact / International Aid	No. of People Affected (Est.)
1995	Ambae	Manaro Voui	2	French aid for scientific assesment worth US\$19,000 (VT 2,000,000)	n/a
1998	Tanna	Yasur	3	Ban is placed on accessing areas surrounding the volcano; communities are evacuated and is funding by the government and development partners	7,000
2001	Lopevi	Lopevi	3	Government provides funds for scientific assessment - US\$4,703 (VT 500,000)	200
2003	Lopevi	Lopevi	3	Government funds scientific assessment and expenses to distribute humanitarian relief - US\$47,000 (VT 5,000,000)	500
2005	Ambae	Manaro Voui	3	Government funds scientific assessment and humanitarian relief for 5,000 people - US\$470,000 (VT 50,000,000)	4,500
2009	Ambrym	Benbow and Marum	3	Scientific assessment is undertaken and supported by the government, the Pacific Community (SPC) and Papua New Guinea (total cost is unknown)	none
2009 -10	Gaua	Mount Garet	3	Government funds the evacuation of 600 people and provides assistance for one year, valued at US\$940,000 (VT 100,000,000); NZ Aid provides funding for new scientific equipment valued US\$94,000 (VT 10,000,000)	600
2015	Ambrym	Benbow and Marum	3	Government provides funding to evacuate communities to designated evacuation centers and humanitarian relief, as well as new scientific equipment totaling US\$47,000 (VT 5,000,000)	3,000
2016	Tanna	Yasur	3	Ash fall impacts communities on Tanna island, for which the government provided humanitarian relief costing more than US\$1,410,000 (VT 150,000,000)	20,000
2017	Ambae	Manaro Voui	4	Evacuation is required, including to other islands; along with repatriation, total government appropriation is US\$1,881,000 (VT 200,000,000); additional humanitarian assistance is provided by development partners, both in kind and direct transfer of funds worth US\$2,855,000 (VT 306,736,000)	11,000

Source: Vanuatu Meteorology & Geo-hazards Department, 2017

Note: Actual figures are in VT; exchange rate (USD/VT 106.31)

Out of the six active volcanoes, the Manaro Voui Volcano is currently the most hazardous volcano in Vanuatu and is ranked among the most active in the world. The volcano is situated in the center of Ambae island, directly in the middle of a lake, which is inhabited by approximately 11,000 people. Geological studies indicate that at alert levels 3, 4 and 5, volcanic hazards can range from gas emissions, ash falls, mud flow and floods, lava flow, earthquakes and acid rain. (See Table 2)

Table 2: Vanuatu Volcanic Alert Level (VVAL)

Alert Level	0	1	2	3	4	5
Title	None	Signs of Unrest	Major Unrest	Minor Eruptions	Moderate Eruptions	Very Large Eruption
Hazards	None	Danger at the vent	Ash, gas	Huge ashfall, lava flow, earthquakes, acid rain	Explosions, lava flow, earthquakes, acid rain	Explosions, lava flow, earthquakes, acid rain
Description	No signs of change in the activity, limited danger	Notable signs of unrest, possible danger near eruptive vents	Danger around the crater rim and specific area, notable/ large unrest, considerable possibility of eruption and also chance of flank eruption	Danger within caldera, volcanic cone and other specific area, possibility of moderate eruption and also chance of flank eruption	Danger on volcanic cone, caldera and all Island, possibility of very large eruption and also chance of flank eruption	Danger beyond caldera, on entire and surrounding islands and also chance of flank eruption

Source: National Disaster Management Office, Vanuatu



Manaro Voui Volcano on Ambae Island, Vanuatu.

Credit: Dickson Tevi, 2018

Disaster Prevention and Monitoring

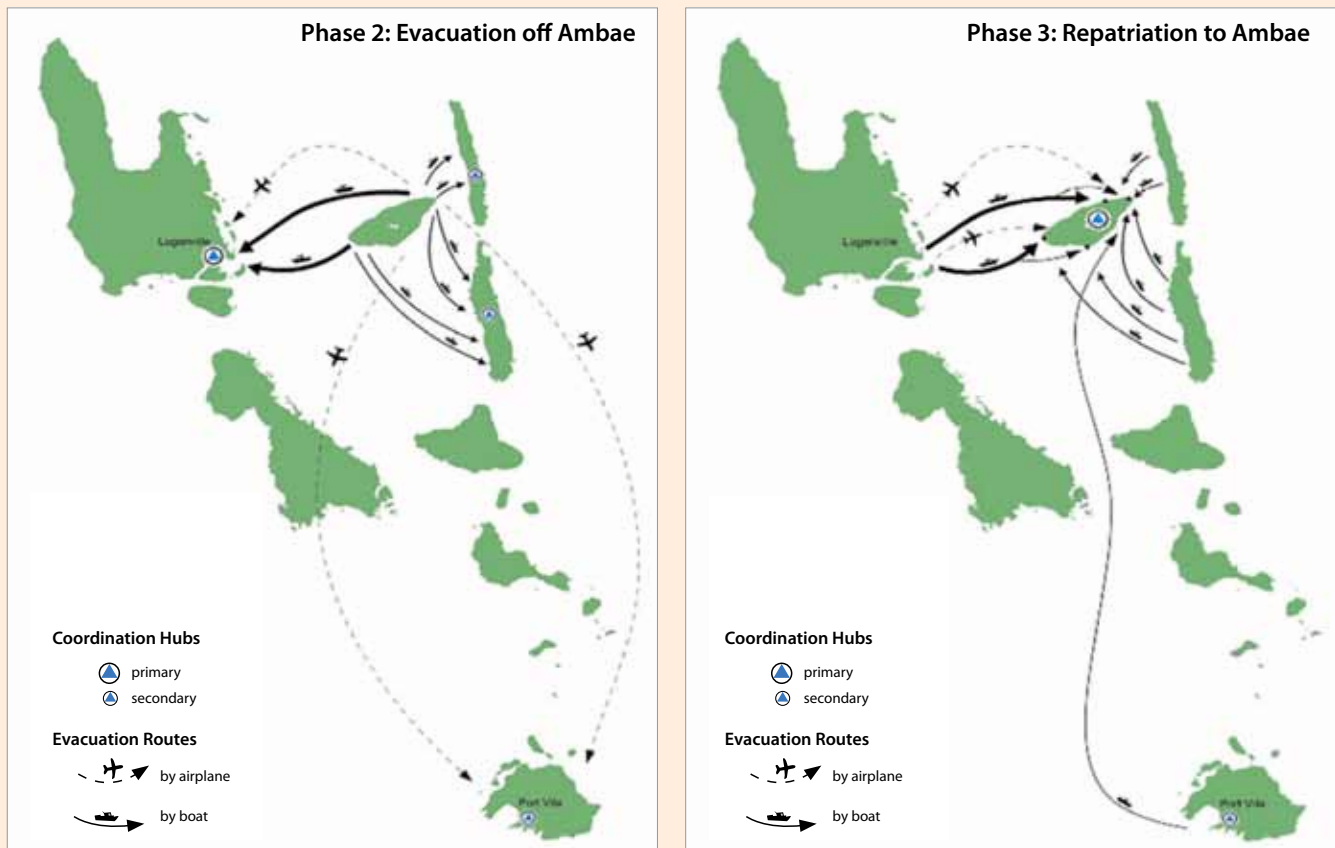
The Vanuatu Meteorology and Geo-Hazards Department (VMGD) is mandated to monitor seismic activity in real time, and when an increase in volcanic activity is observed, the VMGD issues a volcanic warning to nearby inhabitants, instructing residents to respond according to risks associated with the Volcanic Alert Level. The issuance of volcanic warnings begins at Level 1, but when the activity becomes particularly hazardous in the range of Level 3 to 5, regular warnings are required. Government interventions are most likely to occur when the volcanic activity reaches Level 3. The recent increase in volcanic activity in Vanuatu (since 1995 has required local and national governments to provide disaster relief, for a period of time ranging from three months to one year) and to engage in disaster prevention activities such as: seismic risk assessments; establishment of volcano monitoring systems, etc. The government response to volcano hazards is always a challenge due to the unpredictability of volcanic activity, in addition to the limited budget dedicated to natural disasters.

Case Study: Manaro Voui Volcano - Disaster Response 2017

Since 1995, the Vanuatu Meteorology and Geo-Hazards Department (VMGD) closely monitored seismic activity of the Manaro Volcano on Ambae island. After the 2005 eruption, a network of seismic monitoring equipment was installed at the base of the volcano crater, in addition to visual and monitoring cameras at different corners of the island to capture real-time visuals of the activity (this includes other volcanoes as well). In practice, the VMGD monitors volcanic activities in real time, and when there is an increase in volcanic activities, volcanic warnings are issued and disseminated through national and local media outlets, and surrounding communities on the island respond according to risks associated with the warnings. In the event a volcano poses an imminent threat to vulnerable communities, the National Disaster Management Office (NDMO) is mandated to manage the evacuation and provide relief supplies in a coordinated manner. For instance, the Penama Province Disaster Management Plan (PDMP) is used to guide disaster response to volcanoes by both the provincial government and the national government.

In September 2017, within 30 days the Manaro Alert Level increased from Level 2 to 3 and then to Level 4. As the situation quickly worsened, the Council of Ministers (CoM) – the highest decision-making body in the national disaster risk management structure – declared a state of emergency for Ambae Island on September 26, and soon after, concluded that a full evacuation of the island was necessary to avoid loss of life. On September 28, 2017, approximately 11,000 people were evacuated by the government off Ambae Island, including: 8,385 people evacuated to Santo, Sanma Province; 609 people to Maewo and 1,475 people to Pentecost which are both located in Penama Province. Approximately 591 people fled to Vila and other islands at their own expense (known as voluntary evacuation) to live with host families. After spending approximately four weeks in government-managed evacuation centers, the repatriation phase began on October 28, 2017 through November 5, 2017.

Figure 1: Maps of Ambae disaster response, Phases 2 and 3



Source: National Disaster Management Office, 2017

Fiscal Impact on the National Budget

The CoM approved approximately US\$1.96 million (VT 208,508,984) to fund the Manaro Volcano response on September 26, 2017. This budget allocation was four times higher than the 2005 crisis, largely due to the increased scope of the operation. Section 69 of the constitution authorizes the Public Finance and Economic Management (PFEM) Act to allocate up to 1.5 percent of the total budget for the fiscal year to fund disaster response activities when a state of emergency is declared (In 2017, this was equivalent to US\$2.86 million and VT 303,633,000). However, due to tight government fiscal position, the amount appropriated by PFEM was less than required to cover the costs of the operation. The disaster provision has been appropriated through a supplementary budget drawn from government savings for immediate disaster relief, including logistics (e.g. land, air and sea transport costs), social services, water and shelter at designated evacuation centers.

Although disaster funds were made available for the Manaro Volcano event in 2017, Vanuatu is exposed to many types of natural hazards (e.g. cyclones, drought) that can cause additional demands on the budget that may diminish the government's ability to adequately respond to additional disasters in a given year.

From the total appropriated budget, 74.3 percent of the allocated funding was spent on operations during a three-to-four-month period from September to December 2017. To reduce the fiscal impact and total expenditures, the Ministry of Finance and Economic Management (MFEM) deployed some of its staff to support various aspects of the operation; for example, staff deployed to evacuation centers provided financial oversight by verifying invoices and making payments to suppliers. Furthermore, MFEM staff were required to report back to the Director of Finance based on the actuals, and then submit a request to release the next tranche of funds.

Total expenditures from September to December 2017 were US\$1.87 million (VT 198,563,000) and the remaining unused budget was US\$551,000 (VT 58,532,000). Most of the expenditures were for immediate humanitarian relief, such as food and shelter, transportation (primarily for evacuation and repatriation), education and health services. Since the disaster is ongoing, support towards addressing emergency response and recovery programs needs to be closely monitored by the government with assistance from development partners.

Table 3: Manaro Disaster Expenditures (September - December 2017)

Type of Cluster	Food Cluster	Logistics Cluster	WASH Cluster	Shelter Cluster	Education Cluster	Security Cluster	Gender and Disability	Other Operations	Total
Amount (USD)	502,000	845,000	108,000	4,000	56,000	89,000	7,000	303,000	1,909,000
Amount (VT)	53,367,000	89,812,000	11,238,000	452,000	5,927,000	9,487,000	755,000	31,524,000	198,563,000

Source: Department of Finance and Treasury, 2017

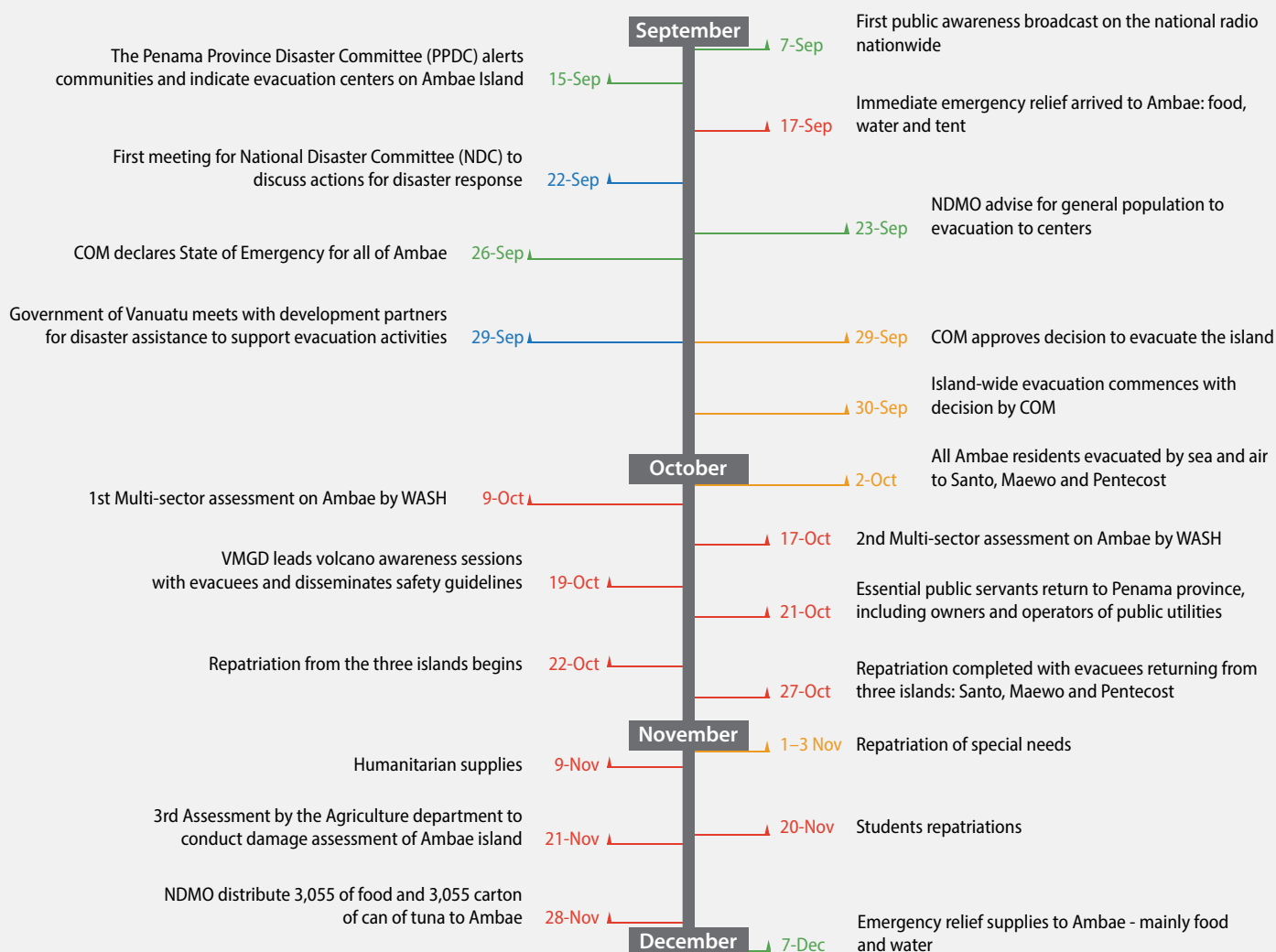
Note: Actual figures are in VT; exchange rate at time of quarterly report in September 2017 (USD/VT 106.31)

Fiscal Impact on the Provincial Budget - Penama

During the 2017 Manaro disaster, the Penama’s provincial government had to rely solely on the national government to fund all of the disaster-response activities. The Penama Province has a mandate under the provincial government development plan and the Penama Province Disaster Management Plan (PPDMP) to lead the disaster response. However, the provincial government did not have sufficient budget reserves to allocate funds towards the disaster response, especially for such a large-scale operation as was required for the Marano Volcano operation.

As of December 2017, the government received US\$536,000 (VT 57,000,000) in financial contributions from various donors¹ and the private sector. Other development partners² contributed substantially through in-kind contributions by providing humanitarian aid in the form of: shelter facilities; medical supplies; Red Cross facilities; cooking materials; water, sanitation and hygiene (WASH) facilities; in addition to funding logistics for scientific research and geological observations of the volcano. The total value of in-kind contributions is estimated at US\$2.89 million (VT 306,736,000).

Figure 2: Timeline of disaster response to Monaro Volcano, Ambae Island (September - December 2017)



¹ Asian Development Bank, Chinese Government

² AusAid, NZAid, France, Japan and Chinese government



Source: Boni Garae, Daveryl Tarimakem, March 2018

Ongoing Disaster Response and Community Impact

The Manaro Volcano was reduced to Alert Level 2 in December 2017. However, on March 11, 2018, the Volcano Alert Level was raised again to Level 3. Earlier in March, Vanuatu also suffered from Tropical Cyclone Hola, which exacerbated the Manaro situation when dense ash fall mixed with tropical cyclone rains, resulting in acid rain that severely impacted the southern part of the island. Thus, the combined hazards increased negative impacts on nearby communities with damages observed across small-scale subsistence farms and export-oriented root crop fields, as well as critical water sources, livestock, and the surrounding natural environment. Damaging ash fall continues to be reported on the southern and western areas of Ambae Island, and to a lesser extent, on the north and east sides of the island, including the provinces of Penama, Sanma, Malampa and Shefa.

On March 26, 2018, the CoM declared the southern and western parts of Ambae a disaster zone, ordering some 6,000 residents to be evacuated to safe zones, mainly situated on the eastern and northern parts of the island. The CoM subsequently approved additional funds (approximately US\$376,00; VT 40,000,000) to support these affected communities as part of the Manaro disaster response. Again on March 31, dense volcanic ash combined with heavy rainfall triggered localized flooding and landslides that completely washed away homes, as well as a primary school. From April 6 – 9, a meteorological front that later developed into Tropical Cyclone Keny began in the western part of Vanuatu; this front caused changes to the wind trajectory, which in turn resulted in severe ash fall on the northern and eastern part of Ambae. Observed impacts include: damaged subsistence farms and houses (including both local construction and permanent buildings), fallen trees causing road blocks, and the destruction of large-scale farms of cash crops, and surrounding water sources, and the natural vegetation in the area was destroyed. Due to growing intensity of volcano activity, the government declared the entire Ambae Island a disaster zone with a progressive evacuation expected to commence in June. Given the current Alert Level 3 (at the time of this publication), the full extent of damages and losses over the short and medium term is largely unknown, but it can potentially deplete the current disaster provision and may soon require humanitarian assistance from development partners.

Figure 2: Example of ash fall damage to community on Ambae Island (before/after)



Source: Ambae Bulletin, 2017



Source: Boni Garae, Daveryl Tarimakem, March 2018

Technical Assistance

Fiscal planning for volcanic hazards events remains a challenge for the government of Vanuatu, due to the unpredictability of volcanic activity. However, such disaster response activities are very costly and therefore require financial budget planning to consider potential fiscal shocks from volcanic hazards in order to arrange financing in advance. For example, parametric insurance or forecast-based financing can be an important financing tool in such circumstances. A request from the government of Vanuatu was made to the World Bank for technical assistance provided through the PCRAFI Technical Assistance Program to investigate the possibility of developing catastrophe insurance coverage against volcanic hazards to help the government meet the financing requirements for disaster response.

Key Challenges

- » **No dedicated source of finance:** In the early stage of the Manaro operation, there was no funding allocation for the disaster, thus limiting PPDC's capacity to embark on a full-scale disaster response, as is specified in the Penama Province Disaster Management Plan. As a result, the evacuation at the early stages were slow and there was a lack of food, water and shelter in the evacuation centers.
- » **Limited disaster relief supplies:** The need for food supplies on Ambae Island remains high due to extensive crop damage from the heavy ash fall and acid rain. Therefore, emergency supplies on the island need to be maintained for a longer period of time.
- » **Ongoing needs:** The remaining fiscal gap, as of December, 2017, can be viewed in a short and long-term scenarios. Over the short term, addressing immediate needs is most critical, such as humanitarian supplies that can be financed with the current net balance of US\$551,000 (VT 58,532,000) of the available disaster budget allocation from September 2017. However, in the long term, the focus will require consideration of costs for ash removal, reconstruction and community recovery that will increase the fiscal gap to manage the disaster; therefore fiscal needs over the short and medium term is fundamental.
- » **Economic impacts uncertain:** The economic impacts of the event were not calculated as part of this technical note, however, it is estimated to be US\$6 - 8 million (VT 637,372,050 - 849,829,400) – this includes cash crops, subsistence crops, building assets (public and private), loss of water resources and cost of rehabilitation.



Options for Consideration

- I. **Catastrophe risk insurance:** A request has been made to the PCRAFI technical assistance program to investigate the possibility of developing an insurance product to protect against volcanoes and offer the government quick access to funds for disaster response. This would help to provide a quick source of cash to the government, in order to facilitate timely disaster response and ensure the safety of the evacuated population.
- II. **Develop a disaster risk financing strategy:** The government of Vanuatu would benefit from developing a disaster risk financing strategy that contains contingency plans to provide guidance to government employees and to budget for disaster response efforts. This could include good practices such as deploying staff from MFEM to the affected areas, which proved successful to coordinate and better manage disaster response expenditures.
- III. **Convert the disaster provision into a fund:** This fund could accrue reserves over time. This would require the development of standard operating procedures and it could be used to channel post-disaster donor funds. In addition, development partners should provide a clear indication on the level of support they intend to provide.

Figure 3: Impact of ash fall on the environment and water resources on Ambae Island



Source: Boni Garae, Daveryl Tarimakem, March 2018

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